

CHAPTER 1

BACKGROUND, HISTORY, RECENT DEVELOPMENTS AND TRENDS

A. BACKGROUND

This Comprehensive Plan is a series of related documents for use by Lancaster County to anticipate and deal constructively with the many changes occurring in the community and its immediate surroundings. The plan was prepared by the county planning staff in collaboration with the Planning Commission, the Board of Supervisors, other County and State officials, and citizens of Lancaster County. The report also contains information obtained from many other sources, such as other comprehensive plans, professional papers, periodicals, public documents, environmental and health regulations, and information required by State and Federal statutes to be included in all county comprehensive plans. The Lancaster County Comprehensive Plan has two broad objectives: first, to identify near-term, long-range and strategic needs of the county's population, and second, to provide a planning framework for guiding the physical, social and economic changes occurring in response to future growth and development. This plan also complies with the Commonwealth of Virginia's Title 15.2-2223 of the State Code (See Appendix II), which requires all counties to prepare a comprehensive plan. The requirement to review the plan every five years is a very significant part of the Code.

The following chapters of the Comprehensive Plan focus on current physical and environmental conditions that may influence or limit the future use of land. The conditions examined include both natural and man-made conditions that, for purposes of analysis, are grouped into categories. They reflect the planning emphasis of the Chesapeake Bay program, with the exception of the category "redevelopment of intensely developed areas." No areas in Lancaster County meet the Chesapeake Bay criteria for "intensely developed."

The views indicated above are further illustrated in later chapters. In Chapter 2, environmental issues and assessment of existing conditions are discussed as they relate to suitability of land for development in Lancaster County. In Chapter 3, the structural framework of the future land use plan and land use policies will flow from the evaluation, plus the issues of Chapter 2.

The Chesapeake Bay Preservation Act mandated further requirements for Tidewater localities. Regulations adopted in accordance with this Act are as follows:

- Physical constraints to development: Addresses those natural geographic qualities that seriously limit the potential for development.
- Protection of Potable Water Supply: Addresses protection of the existing and potential supply of drinkable water within the community to include quality and quantity.
- Shoreline Erosion Control: Focuses on the loss or potential loss of shoreline due to wind and wave erosion.

- Access to Waterfront Areas: Addresses access to state waters and the potential access of areas for private and public use.
- Redevelopment of Intensely Developed Areas and other Areas Targeted for Redevelopment: Focuses on opportunities to reduce pollution through conversions of existing development.

In Chapter 4, the "Water Quality Preservation Plan," a strategy for meeting the requirements of the Chesapeake Bay preservation laws and regulations will be organized around the same topics.

B. HISTORY

Lancaster County is located at the southeastern end of Virginia's Northern Neck peninsula, between the Rappahannock and Potomac Rivers. It was formed in 1651 from portions of Northumberland and York Counties. Over time, other counties were formed from its original area. Creeks and waterways with rolling woodlands and fields characterize the county. It is also known for its quiet rural charm, the retention of which citizens attending input sessions in early 2006 overwhelmingly supported.

Lancaster was settled shortly after 1640, predominantly by people of English descent moving from settlements along the James and York Rivers. The first County seat was established at Queenstown on the west side of the Corrotoman River. In 1742, the courthouse was moved inland to what is now Lancaster Courthouse. The present courthouse dates to 1863 and houses basically all records dating from 1652. On the Courthouse Green, the original clerk's office (1797), and the old jail (dating to the first quarter of the 19th century) still stand. Mary Ball Washington Museum, Incorporated uses these two buildings.

Prior to the Civil War, the economy of the county depended on tobacco and other types of agriculture. After the Civil War, the economy began to rely on the seafood industry. The shared importance of agriculture and seafood was evident by the early 1900's. By 1920, the economy included forestry as well. Fish, crab, and oyster industries were also important to the people. Trucking of tomatoes and potatoes was the prevalent agricultural industry. These industries were aided by inexpensive and easy transportation to market by steamboats. The menhaden industry has been a mainstay since the early 1900's, and remains important today.

During the 1920's, tourism and retail industries began to develop in White Stone and Kilmarnock. The commerce of Kilmarnock offered many shops and services to county residents. White Stone was seen as a thriving community. Irvington was the largest town and the center of the seafood business.

Changes that occurred during the 1930's made great impact on the county's economy. Automobiles became commonplace, and trucks began to replace steamboats as a means to transport marketable goods. After a devastating hurricane in 1933, many docks and wharves

were destroyed and were not rebuilt, thus ending reliance on outside markets.

Although employment was good in the 1940's, the economy of the county declined during the 1950's. Lancaster County became relatively unknown and unimportant, because of poor means of travel to any outlying areas.

With the opening of the Robert O. Norris Bridge in 1957, Lancaster County was provided ready access to counties on the Middle Peninsula. This led to several trends. The age distribution of people in the county began to change. Young people were seeking employment elsewhere and the number of senior citizens was increasing. There was quick growth in the trade and service industries, and tourism and recreation industries regained strength. The Tides Inn, Windmill Point Marine Resort, and the Tides Lodge were all established between 1945 and 1970 and began to flourish.

Other services and facilities began to appear in response to the changing community needs. The Lancashire Nursing Home, Rappahannock General Hospital, and Rappahannock Community College were all established during the 1960's and 1970's.

Although the basic industries of manufacturing, agriculture, and fisheries declined slightly in the 1980's, dramatic increases were noted in retail trade, recreational activity, and professional service employment. Kilmarnock has become the hub of retail and service businesses in the Northern Neck. The influx of retirees and outflow of younger people began in the early 1990's and continues today. The Rappahannock Westminster-Canterbury retirement community, opened in 1985, is a multi-million dollar investment, providing services that continue to attract retirees to the county.

Abundant sights and attractions encourage tourism and recreation today. Historic buildings, restaurants, marinas, and resorts all entice tourists interested in the serene, natural beauty of the county as well as the recreational activities available.

C. RECENT DEVELOPMENTS AND TRENDS

Land development in Lancaster County has recently accelerated with every indication that the current pace will continue for the foreseeable future. Hill's Quarter, a multi-use development approved in 1997 for construction on tracts of land adjoining Route 200 midway between Irvington and Kilmarnock, is currently building out with over eighty building permits for single family residences issued, mostly within the last two years. An eighteen-hole golf course has also been built within the community and began full operation in the spring of 2005. Development will also include a significant commercial area.

While much of the future development will continue to be residential, as evidenced by major residential developments at the Golden Eagle and Windmill Point, there is also evidence of significant commercial development. This is most evident in the Kilmarnock Technology Park where several local and new businesses are constructing new facilities. Also, the demand for mini-storage units has resulted in the construction and approval of new facilities of this type with several more in the planning stage.

What of the future? The population of Lancaster County was 11,600 as of the 2000 census, was estimated to be 12,030 as of 2004, and is expected to be in excess of 13,500 by the year 2015 based on current rates of growth. Given that growth is occurring and will likely continue to do so, it must be managed and controlled in a positive manner to preserve the natural beauty and rural character of the area. Expansion of tourism, the recreation industry, and retail trade are still feasible within this context. Support of the basic industries of agriculture and those that are water dependent, as well as those related to the building trades and services, is key to maintaining a self-sufficient economy in Lancaster County. Best management practices designed to protect the natural environment must be mandated where they are critical and encouraged in all other activities. Detail consistent with and in support of these views will be provided in later chapters.

CHAPTER 2

I. LANCASTER COUNTY SUITABILITY OF LAND FOR DEVELOPMENT

A. ASSESSMENT OF EXISTING CONDITIONS

Lancaster County covers approximately 135 square miles or approximately 86,267 acres of land. The County is rural in nature with limited public infrastructure such as public water supplies and sewage collection/treatment works. Due to this limited public infrastructure, development in Lancaster County usually requires on-site sewage facilities for disposal of waste and individual or community wells for domestic water supplies. Therefore, development of land in Lancaster County is closely tied to the physical characteristics of the land. These characteristics include the suitability of the soil for septic systems, the degree of slope of the land, the depth of the soil to the water table, the shrink-swell potential of the soil, and the proximity of the intended development to sensitive environmental features.

Sometimes the physical characteristics can act to preclude development such as when a parcel of land has steep slopes, wetlands, no suitable septic sites, or the presence of other environmentally sensitive features. Often development can occur, but with sensitivity to the unique physical properties of the particular parcel. The overall goal of the Lancaster County Suitability of Land for Development Plan is to provide a comprehensive base of information concerning physical constraints to development in Lancaster County. This base will provide a resource from which to draw policies and recommendations concerning future development in the County.

B. PHYSICAL FACTORS THAT INFLUENCE OR CONSTRAIN DEVELOPMENT

1. Chesapeake Bay Preservation Areas

The Chesapeake Bay Preservation Act of 1989 requires each county in Tidewater Virginia to designate land areas in their county that, if improperly developed, would contribute to significant degradation of the water quality of the Chesapeake Bay and its tributaries. The Chesapeake Bay Preservation Areas were broken into two classifications: Resource Protection Areas and Resource Management Areas. Resource Protection Areas (RPAs) are those lands and features that have a direct water quality function or impact. Resource Management Areas (RMAs) are lands that, if not properly managed, have the potential to degrade water quality or impact the functioning of RPAs. Detailed descriptions of the two Chesapeake Bay Preservation Areas and lands included in each are given on the next page.

a. Resource Protection Area (RPA)

The RPA includes: 1) tidal wetlands, 2) non-tidal wetlands connected by surface flow and contiguous to tidal wetlands or tributary streams, 3) tidal shores, 4) other

lands as designated and 5) a 100' buffer adjacent to and landward of any of the preceding components. This buffer area acts to filter run-off from developed areas, to provide natural stabilization of soils from forces of tidal and upland erosion, and to provide a setback that protects dwellings from erosion, wave action, and flooding. The total amount of land designated as RPAs in Lancaster County is estimated to be 3,356 acres.

Resource Protection Areas are strictly regulated. Development in the RPA is limited to new water-dependent facilities, expansion of existing water-dependent facilities, and redevelopment. In the RPA, a 100 foot buffer area of vegetation that is effective in limiting runoff, preventing erosion, and filtering non-point source pollution from runoff must be retained if already present, or established if it does not exist. Clearing in the RPA is limited to what is necessary to provide for reasonable views of the water, access to the water, and for general woodland management purposes. Cleared vegetation must be replaced with other vegetation that is equally effective in protecting water quality.

b. Resource Management Area

In Lancaster County all land outside of the designated RPA is classified as an RMA. The RMA is protected by the Chesapeake Bay Preservation Act and the Lancaster County Chesapeake Bay Preservation Ordinance through the establishment of performance standards that apply to all development and redevelopment.

Performance standards are as follows:

- 1) No more land shall be disturbed than is necessary to provide for the desired use or development;
- 2) Indigenous vegetation shall be preserved to the maximum extent possible consistent with the use and development allowed;
- 3) A maintenance agreement with the owner or developer shall be established where best management practices require regular or periodic maintenance;
- 4) All development exceeding 2,500 square feet of land disturbance shall require the issuance of a permit and be accomplished through a plan of development review process;
- 5) Land development shall minimize impervious cover consistent with the use or development allowed;
- 6) Any land disturbing activity regardless of size shall comply with the requirements of the Lancaster County Erosion and Sediment Control Ordinance;
- 7) On-site sewage treatment systems not requiring a Virginia Pollutant Discharge Elimination System (VPDES) permit shall be pumped out at least once every five years, and, for new construction, a reserve sewage disposal site with a capacity at least equal to that of the

- primary sewage disposal site shall be provided;
- 8) Stormwater management criteria which accomplish the goals and objectives of the Virginia Stormwater Management Regulations shall be satisfied;
 - 9) Land upon which agricultural activities are being conducted, including but not limited to crop production, pasture, and dairy and feedlot operations, or lands otherwise defined as agricultural land, shall have a soil and water conservation plan;
 - 10) Silvicultural activities are exempt provided that these activities adhere to water quality protection procedures prescribed by the Virginia Department of Forestry in the January, 1997 edition of "Forestry Best Management Practices Handbook for Water Quality In Virginia";
 - 11) All wetlands permits required by law must be obtained prior to authorizing grading or other on-site activities to begin.

2. Flood-Prone Areas

Due to its proximity to large tidal bodies of water, Lancaster County has a number of flood prone areas. Damage from floodwaters in these areas can result in expensive repairs to structures, loss of use of structures (damaged homes), temporarily inoperable septic systems, contamination of water supplies, and quite possibly in bodily injury or loss of life. These are problems that can be further aggravated by the cumulative impact of development in flood-prone areas.

Once developed, land in the flood plain is lost as an area of filtration due to the resulting placement of structures and impervious cover. The result is that flood events can cause more damage than they did prior to development. For example, floodwater will travel faster and crest higher if water is not allowed to filtrate into the ground, or travel down streams unimpeded from man-made structures. The increased velocity of floodwaters can result in increased damage to properties, and the higher flood elevations could result in damage to properties that were not affected previously.

In all, the County has approximately 12,448 acres, or 19.45 square miles, of land that lies within the 100- year flood plain. These areas are highlighted in the "100 Year Flood Map" and are summarized in the chart below.

	Area in Acres	% of County
100 Year Floodplain	12,448	14
Outside 100 Year Floodplain	<u>73,819</u>	<u>86</u>
Total	86,267	100

3. Wetlands

Wetlands are defined by the United States Fish and Wildlife Service as "lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water" (Pg. 4, Atlas of National Wetlands Inventory Maps of Chesapeake Bay. U.S. Fish and Wildlife Services; September, 1986.).

Generally, wetlands can be classified as either tidal or non-tidal. Locally, Lancaster County has approximately 4,500 acres of tidal wetlands and 1,349 acres of non-tidal wetlands. (Figures were obtained using the Lancaster County Geographic Information System utilizing a digital National Wetland Inventory map layer. Distribution of tidal and non-tidal wetlands in Lancaster County can be viewed on the "Tidal and Non-Tidal Wetlands" Map.)

Wetlands are important natural resources that provide many positive benefits to the man-made and natural environments. Wetlands provide aesthetic, recreational, and economic benefits to the community. Furthermore, wetlands are spawning and nursery grounds for finfish and shellfish, feeding and wintering sites for migratory waterfowl, nesting habitat for shore birds, and homes to a wide variety of wildlife. Wetlands further serve as important areas for groundwater recharge, flood control, pollution absorption, and retention of sediment from storm water run-off (Pg. 1, Atlas of National Wetlands Inventory Maps of Chesapeake Bay. U.S. Fish and Wildlife Services; September, 1986.).

The inclusion of non-tidal wetlands within the Resource Protection Areas (RPAs) is crucial and integral to meeting the criteria in the Chesapeake Bay Preservation Act Regulations adopted by the Chesapeake Bay Local Assistance Board. The designation of RPAs requires the inclusion of tidal wetlands as well as non-tidal wetlands that are both contiguous and connected by surface flow to either tidal wetlands or tidal waters. Surface flow means perennial streams. Intermittent streams and their associated wetlands are not required to be included in the RPA. However, it is policy within Lancaster County that a wetland contiguous to and connected by surface flow to an intermittent stream will be designated as part of the RPA.

4. Steep Slopes

Development and disturbance of land on steep slopes (over 15%) can have many negative impacts. First, stabilization of soils after development is often costly and difficult due to the fact that highly erodible soils are often found on steep slopes. Disturbance of these areas can result in erosion of the soils, causing sedimentation from run-off soils to flow into the streams and main bodies of water. Furthermore, steep slopes, and the soils found there, are not suitable for septic systems. The combination of unstable soils and poor septic suitability can result in higher construction costs if development is allowed to occur.

In Lancaster County, steep slopes are often found adjacent to the tributary streams and creeks of the Rappahannock River and Chesapeake Bay. In the County there are 19,415

acres of land which are classified as steep slopes. These areas can be seen in more detail on the "Slope Map" and "Topography Map" and are summarized in the following chart.

Degree of Slope	Area in Acres	% of County
0 -6%	56,763	66
6 - 15%	10,002	12
15 - 45%	15,652	18
Over 45%	3,763	4
N/A	<u>87</u>	<u>0</u>
Total	86,267	100

5. Shrink-Swell Soils

Shrink-swell soils are those that can greatly change in volume when their moisture level fluctuates normally throughout the year. The shrink-swell potential of the soil is a measurement of how much volume change can be expected in a soil with an increase or decrease in moisture levels. This measurement is important because continued expansion of shrink-swell soil can result in heaving, which places additional pressure on foundations. Contraction of these soils can lead to void areas that do not provide uniform, adequate support to the footing of the foundation.

The shrink-swell potential of Lancaster County soils was mapped using the County's Geographic Information Systems and the Lancaster and Northumberland Counties Soil Survey. Soil types in the County were studied as to their shrink-swell potential up to depths of 60". Sixty inches was chosen to account for any change in grade along the length of any planned or future structures. If any soil type was classified as having high shrink-swell potential anywhere in this 60" range, it was grouped in the "high" category. The extent of shrink-swell soils in Lancaster County can be seen on the "Shrink-Swell Potential Map" and are further described in the following chart.

Shrink-Swell Potential	Area in Acres	% of County
None	416	0.40
Low	24,992	29.10
Moderate	56,201	65.10
High	4,571	5.30
N/A	<u>87</u>	<u>0.10</u>
Total	86,267	100.00

6. Septic Suitability

- a. Septic Systems/Sewage Disposal

Approximately 83% of all private residences in Lancaster County utilize on-site septic systems for sewage disposal purposes. The potential for septic systems causing pollution of surface water bodies can stem from the initial improper siting of the system, or from the failing of aged or not properly maintained systems. Often septic systems have been placed in soils that can act to heighten the negative impact of the system. Specific soil characteristics that can impact operation of septic systems are discussed below.

b. Depth to Water table

Depth to the water table varies greatly throughout Lancaster County. In some areas of Lancaster County the seasonal high water level is as much as 40 or more feet below the ground surface. However, in other areas of the County the seasonal high water table is often less than 24 inches from the ground surface. The depth to the water table is important because soils where the water table is higher are not suitable for the use of septic systems.

First, in areas with high water tables, groundwater can rise into septic drain fields, mixing with untreated effluent. This situation can result in contamination of the water table aquifer that is used by over one fourth of all homes in Lancaster County. Additionally, septic systems in areas with seasonally high water tables can act to contaminate nearby surface water bodies. During times of high water table levels, effluent in an affected system is not able to percolate down through the drain field. Instead the effluent can rise to the surface untreated and pool because of the high water table. During a rainstorm, this pooled effluent can quickly drain into nearby surface water bodies.

Areas in Lancaster County with high water tables can be viewed in the "Water Depth Map" and are further summarized in the following chart.

	Area in Acres	% of County
< 24" to Water Table	24,386	28.40
> 24" to Water Table	61,794	72.50
N/A	87	0.10
Total	86,267	100.00

c. Highly Permeable Soils

Highly permeable soils also can act to increase negative impacts of septic systems. These soils allow septic effluent to percolate more quickly through soils underneath the drain field, while not allowing for proper filtration. If the effluent percolates before it is properly treated then it can become a threat to the ground or surface water that it acts to recharge.

The combination of high water tables and highly permeable soils is particularly a

problem in densely developed areas close to the county's shoreline. The high number of septic systems in conjunction with poor soil conditions can lead to elevated levels of fecal coliform bacteria in adjacent surface water bodies, which can then result in the condemnation of the area for shell fishing. (See "Septic Suitability Map")

Highly permeable soils in Lancaster County include the following types:

1. Coastal Beach (0.48%)
2. Dragston fine sandy loam (3.2%)
3. Lakeland loamy fine sand, gently sloping (0.6%)
4. Rumford loamy sand, gently sloping (0.2%)
5. Rumford loamy sand, sloping, eroded (0.05%)
6. Sloping sandy land (9.3%)
7. Steep sandy land (18.0%)

d. Low Permeability Soil

Clayey soils with low permeability are not desirable for septic systems. These types of soils do not allow effluent to percolate down properly out of the drain field. If the effluent does not percolate down through the system's drain field, because of low permeability soil conditions, it could instead rise to the surface. This is an undesirable situation, which can be worsened in times of run-off when untreated effluent can run off into nearby surface water bodies. (See "Septic Suitability" map)

e. Steep Slopes

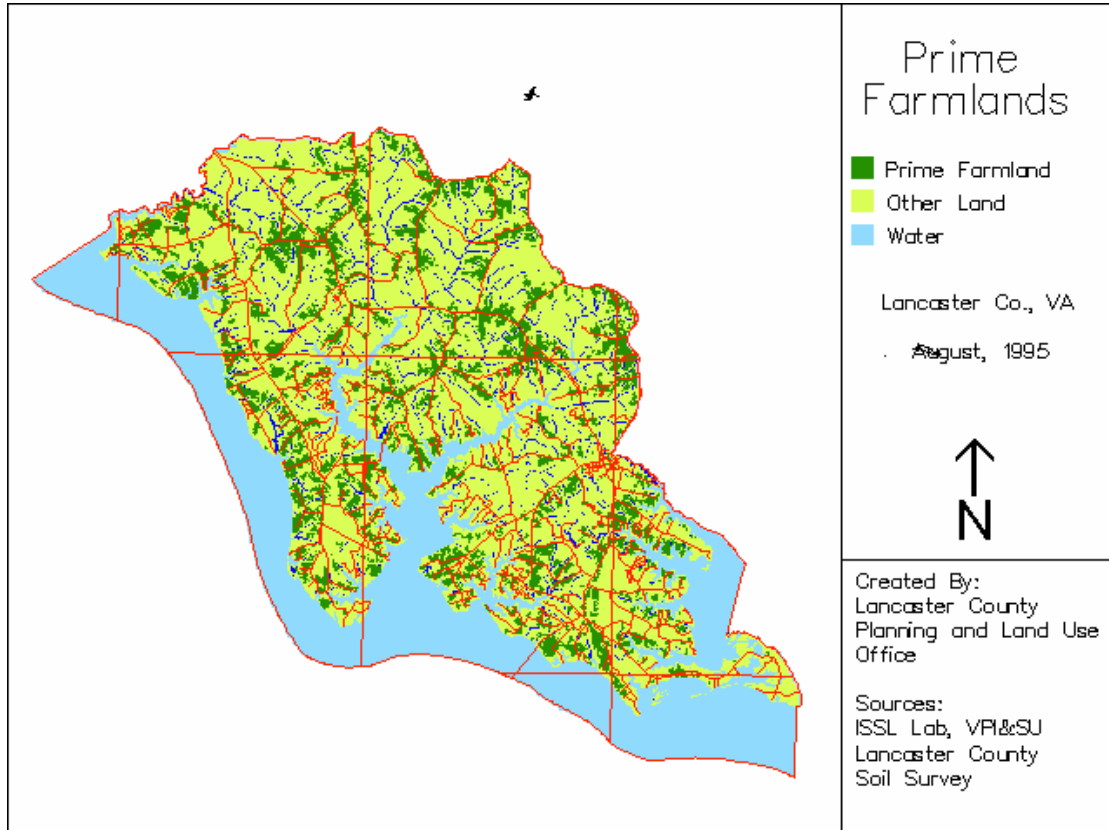
As discussed in the "Steep Slopes" Section, areas of steep slopes are not suitable for the placement of septic systems. Generally, septic systems need level areas for drain fields. Septic systems placed on slopes do not allow for the proper treatment of wastewater because the resulting effluent will travel down-hill to the end of a drainfield, where it can leach out, instead of slowly and evenly percolating through the entire length of the drain field. (See "Slope Map" and Chart)

Septic Suitability	Area in Acres	% of County
Poor	30,336	35
Fair to Poor	742	1
Fair	21,902	25
Good	31,452	37
N/A	<u>1,835</u>	<u>2</u>
Total	86,267	100

7. Prime Farmlands

Lancaster County has a rich history of agriculture dating back to the Colonial Era. Agriculture and related services are important contributors to the local economy. Even though their role in the local economy has diminished, farms in Lancaster County still serve many important purposes. First, farmlands provide an aesthetically pleasing landscape that is enjoyed by all residents of the County. The 1992 adopted comprehensive plan cites farmlands as strong contributors to the County's rural nature. Additionally, farmlands play an important environmental function in that they are prime areas for recharge of the County's groundwater aquifers. Areas of undeveloped, pervious land, such as woodland and farmland, are necessary for the purposes of aquifer recharge. It is because of these important roles that the 1992 Comprehensive Plan identified farmlands as resources that are worthy of conservation and preservation.

However, lands that have historically supported agriculture in Lancaster County are also the lands that are the most suitable for development. Lands in agricultural use are usually level, cleared, well drained, and consist of soils suitable for septic systems. These are conditions that are usually sought for other land uses such as residential development. This is further evident when it is seen that of the 42,930 acres of land in Lancaster County considered to be prime for agricultural activity, only 15,071 acres were in use in as of June 2005.



The Lancaster and Northumberland Counties Soils Survey ranks soil as to its potential for farming. Soils are grouped into eight different "capability units" which define their suitability for farming. The classifications are based on the limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. Class I soils are the best soils for farming, descending to Class VIII soils which have limitations that make them unsuitable for farming, as well as most other uses. For purposes of this plan, all Class I and some Class II soils were considered to be prime soils for agriculture. Areas of prime agricultural soils can be seen in the "Prime Farmlands" map and are further detailed in the following chart. (A list of soil types considered prime for agricultural activity can be seen in Appendix IV.)

Type of Land	Area in Acres	% of County
Prime Agricultural Land Being Farmed	17,014	20
Other Land Being Farmed	4,591	5
Prime Agricultural Land in Other Use	25,916	30
Other Land/Other Use	<u>38,746</u>	<u>45</u>
Total	86,267	100

C. EXISTING LANCASTER COUNTY ORDINANCES

1. Erosion and Sediment Control Ordinance

The Lancaster County Erosion and Sediment Control Ordinance establishes a program to protect and improve the water quality of the Chesapeake Bay that can be implemented on the local level. The ordinance regulates any land disturbance equal to or greater than 2,500 square feet in size. Before any site disturbance occurs, an erosion and sediment control plan for the site must be submitted and approved by the County's erosion and sediment control officer. Furthermore, all land-disturbing activities must comply with the Chesapeake Bay Preservation Ordinance.

2. Zoning Ordinance

a. Waterfront Residential Overlay Zone (Article 18; Zoning Ordinance)

The Waterfront Overlay Zone regulates all parcels of land recorded on or after May 11, 1988 which are for residential use or residential-development and that lie within 800 feet of tidal waters and wetlands. This zone requires lots to have a two-acre minimum size. Additionally, the zone requires a 100-foot buffer landward from high water mark and tidal wetlands, and a 50-foot buffer landward from non-tidal, non-RPA wetlands, as well as a 200 foot wide average waterfront requirement for new subdivision lots.

b. Chesapeake Bay Preservation

This zone and its requirements were discussed in the "Chesapeake Bay

Preservation Areas" section on pages 2-1 and 2-2.

c. Flood Plain Overlay (Article 23; Zoning Ordinance)

The Flood Plain Overlay Zone applies to all lands within the County that are identified as being in the 100-year floodplain by the Federal Emergency Management Agency. All activities in the flood plain district can be undertaken only after issuance of a zoning permit, and any development has to strictly comply with the Virginia Uniform Statewide Building Code and the Lancaster County Subdivision Ordinance. All applications for development and building permits in the floodplain further require submission of a site plan. The site plan must detail the existing and proposed topography on the site, the 100-year flood elevation, and the elevation of the first floor of any future residential structures.

3. Subdivision Ordinance

The Subdivision Ordinance of Lancaster County recognizes that the County's economic viability is dependent on the wise use of its land and other natural resources. Many water quality related issues are addressed by this ordinance including the proper siting of wastewater disposal systems, assurances of strict adherence to the requirements of the Chesapeake Bay Preservation Act, and the adequate provision of proper erosion and sedimentation control, drainage, storm water management and flood control.

4. Wetlands (Article III, Environmental Ordinance; Lancaster County Code)

The Wetlands Ordinance of Lancaster County applies to all tidal, non-vegetated and vegetated wetlands in Lancaster County. This ordinance requires any person pursuing a permitted use in a wetlands area, to first file an application with the Virginia Marine Resources Commission. The permit application details the intended use, the scale of the project, equipment to be used in construction and how the equipment will access the site, the cost of the project, the purpose of the project, and other applicable information. After submittal of the application, the proposed project will go to public hearing at a regularly scheduled meeting of the Lancaster County Wetlands Board, which has the authority to approve or deny the permit application.

II. LAND USE

Development in Lancaster County is closely tied to the physical characteristics of the site to be developed. This close bond with the land is further magnified by the wide variety of environmentally sensitive areas found in the County including steep slopes, flood plains, prime agricultural lands, wetlands, and soils not suitable for septic systems. In all, approximately 56,229 acres or 65% of Lancaster County land is limited in some form. There is still a large quantity of land that has no limitations and is suitable for development. In total 30,038 acres or 35% of Lancaster County land has no physical constraints to development. These areas can be seen on the "Existing Conditions" Map, and the accompanying inset maps.

A. PHYSICAL CONSTRAINTS TO DEVELOPMENT

Specific physical limitations to development that cause concern in Lancaster County include the suitability of soils for septic systems, the loss of prime agricultural farmlands to development, and the presence and location of shrink-swell soils in Lancaster County.

Approximately 30,336 acres, or 35%, of land in Lancaster County is classified as "poor" for suitability of its use for septic systems. However, four out of five private residences in Lancaster County are dependent on septic systems for their sewage disposal purposes. Moreover, the total number of septic systems will continue to grow as more land becomes developed in the County with many new systems being placed in marginal or poor soils. The dependency on septic systems is amplified because the Town of Kilmarnock possesses the only public sewage treatment facility in Lancaster County. Therefore, continued protection of ground and surface water supplies in Lancaster County will be contingent on the proper siting of new septic systems. This is even more significant given that the water table aquifers (the Yorktown-Eastover and the Columbia) are the ones most susceptible to contamination and are used by over 25% of all homes in Lancaster County.

The continuing loss of farmland to other uses in Lancaster County is a trend that needs to be stopped and ideally reversed. Farmlands provide acres of pervious land surface that act as recharge areas for groundwater aquifers. As more land is developed, remaining recharge areas become increasingly important. This is of particular importance in Lancaster County, which is totally dependent on groundwater for its drinking water supply.

Shrink-swell soil can act to damage the foundations and walls of buildings, resulting in expensive repairs to affected structures. However, the negative impacts of shrink-swell soil can be prevented during the initial construction of a building, if the builder is aware of this soil condition. In Lancaster County there is approximately 4,571 acres (5% of the County), of soil with "high" shrink-swell potential. Awareness of this soil condition needs to be heightened in Lancaster County to better protect property owners and their investments.

B. EXISTING COUNTY ORDINANCES

All new development in Lancaster County has to adhere to existing county ordinances and is often subject to the public hearing process. Lancaster County has many ordinances that regulate new and existing development including the Zoning Ordinance, the Wetlands Ordinance, the Subdivision Ordinance, and the Erosion and Sediment Control Ordinance. A standalone ordinance deals with Chesapeake Bay Preservation and makes violations a Class I misdemeanor. Overall, Lancaster County's present ordinances are strong in the protection of water quality and the current level of enforcement is high.

C. HEIGHTENED AWARENESS

Residents in Lancaster County are very attuned to many environmental topics such as residential shoreline development, the Chesapeake Bay Preservation Regulations, the value of wetlands in protecting water quality, the location of flood-prone areas in the County, and the impact of land use on surface water quality. However, there is significantly less awareness of other sensitive environmental features that need to be considered in planning for new development. Many citizens in Lancaster County are not aware of the presence of shrink-swell soils in Lancaster County, the important role farmlands play in providing ground water recharge areas, the effect of development on steep slopes, and the impact of improper septic system placement on surface and groundwater supplies. Providing County residents this information, particularly in regard to their own property, will help them make environmentally sound decisions when considering new development on their lands.

The pace of development in Lancaster County, and the size of the county is such that people developing sites have significant interaction with County officials throughout the process. Having a system in place that enables County officials to advise citizens and potential property developers of limitations on their property, prior to development, can prevent much of the negative impact of development before it occurs.

III. LANCASTER COUNTY SUITABILITY OF LAND FOR DEVELOPMENT PLAN

A. PHYSICAL CONSTRAINTS/LIMITATIONS DATABASE

To assure that new development occurs with full knowledge of site constraints prior to development occurring, the County has begun to develop a countywide, parcel specific database highlighting the physical constraints present on each parcel of land. County staff is utilizing the County's Geographic Information System to develop a customized database showing the different limitations present on individual properties. When complete this database can be used to make printouts that can be checked when property owners start the development process. The printout will let County staff and property owners know if there is the possibility of a physical constraint on the property at the onset of development plans. Alternative plans made necessary by the limitation can then be discussed at this point in the development process.

Implementations of this type of system will save time in the initial planning stages, will save property owners costly repairs at a later date, and will prevent possible negative environmental impacts of development before they occur.

B. SEPTIC SYSTEM INVENTORY

To help identify areas of the county where there are already high concentrations of septic systems, it is recommended that Lancaster County inventory and map existing septic systems in the County. Information obtained from this inventory would be valuable in developing a future land use map for Lancaster County. Additionally, once compiled, this information would aid in any future efforts to identify and prioritize areas for efficient placement of a wastewater treatment works. This recommendation is consistent with a similar proposal in the Lancaster County Protection of Potable Water Supply Study and Plan, put forth to assure continued protection of Lancaster County's surface and groundwater resources. The proposed inventory would help to pinpoint high concentrations of septic systems in the County, which could act together to negatively impact the quality of Lancaster's surface and groundwater supplies.

C. CONTINUE PRESENT ENFORCEMENT AND PLANNING LEVELS

To assure continued protection of the quality of Lancaster County's surface water bodies, the County must continue its present, active enforcement of the Chesapeake Bay Preservation and Erosion & Sediment Control Ordinances.

D. ENCOURAGE RE-USE OF SUITABLE ABANDONED STRUCTURES

To limit the need for new construction on undeveloped sites and to limit increases in the amount of impervious surface cover in the County, it is recommended that Lancaster County strongly encourage re-use and rehabilitation of suitable, abandoned structures. This proposal is designed to serve many purposes. First, these properties are sometimes safety hazards and often have abandoned wells. Improvements to the on-site water and sewage facilities at these structures would act to protect water quality in Lancaster

County. Additionally, improvements to abandoned properties would result in increased assessments and, in turn, increased tax revenue. Lastly, by using an existing structure the user prevents undeveloped land from being developed at that time and also prevents an increase in impervious surface cover in Lancaster County.

E. INVESTIGATE FEASIBLE METHODS OF PRESERVING PRIME FARMLAND IN LANCASTER COUNTY

Preservation of the rural character of Lancaster County was the most prevalent and agreed upon objective of those identified during public input sessions held in March of 2006. To assure continued protection of the quality of groundwater supplies, to assure that farming remains a viable occupation in the County, and to retain the rural character of the County, feasible methods of preserving prime farmland as described in the Farmland Protection Committee Report of August 2006 must be developed. Such strategies as expansion of the existing land use taxation program, conservation planning whereby farmland is designated a primary conservation area, and, most importantly, promoting new market opportunities will be pursued. While obvious, protection and enhancement of the livelihood of the farmer through new markets is essential to farmland preservation.

F. IDENTIFY POSSIBLE IMPOUNDMENT AREAS

This recommendation would be carried out in conjunction with the similar proposal put forth in the Lancaster County Protection of Potable Water Supply Plan. It is further recommended that the County explore strengthened county ordinances to assure protection of proposed impoundment areas.

IV. GOALS AND OBJECTIVES

GOAL #1: Encourage new and orderly development in areas of the County most

suitable for new growth.

Objective: Create zoning incentives and ordinance amendments that help direct new development to areas of the County most suitable for growth.

Objective: Develop amendments to the zoning ordinance that help protect property owners from potential hazards of shrink-swell soil and high water tables.

GOAL #2: Assure that new development is designed in a manner that provides for continued protection of the surface and groundwater resources of Lancaster County and the State of Virginia.

Objective: Continue consistent enforcement of the Chesapeake Bay Preservation Act and Erosion and Sediment Control Act Regulations to assure protection of the water quality of the Chesapeake Bay and its tributaries.

Objective: Protect possible water impoundment areas presented in the Lancaster County Protection of Potable Water Supply Plan.

Objective: Support enhancement of county ordinances to protect proposed impoundment areas.

Objective: Develop methods of preserving prime farmlands in Lancaster County in order to protect groundwater recharge areas.

Objective: Provide incentives for re-use and rehabilitation of existing, vacant structures in order to limit need for new construction and increases in impervious surface cover in the County.

GOAL #3: Preserve farm and forest land to help Lancaster County retain its rural character.

Objective: Develop ordinances that discourage “checkerboard” subdivision and encourage grouping or clustering of development into a limited area leaving dedicated open space of sufficient size and quality for farming operations.

Objective: Create a Rural Conservation District with sliding scale density that decreases as acreage increases, including a maximum dwelling lot size with uses limited to agricultural or forestal including hunting.

Objective: Encourage the creation of permanent conservation easements.

Objective: Create a Purchase of Development Rights (PDR) program consistent with stated guidelines to receive matching funds to purchase permanent

easements on farm and forestland.

Objective: Create a Transfer of development Rights (TDR) program consistent with state guidelines to direct development away from farm and forestland and toward already developed areas.

GOAL #4 Preserve the industry of farming in Lancaster County

Objective: Eliminate the personal property tax on farm machinery as is done in other localities within the state.

Objective: Provide additional educational materials and advertising to inform all residents of the land use taxation program, open its enrollment period year round with deadlines corresponding to year end, and make land use taxation available to forestland as allowed by the state.

Objective: Make Lancaster County “farm-friendly” by putting up tractor “Share the Road” signs in cooperation with the Virginia Department of Transportation.

Objective: Create a countywide farmers market to encourage small vegetable and alternative crop farms.

Objective: Actively promote in conjunction with other state or local governments the production and use of biodiesel and ethanol.

Objective: Take every action as appropriate to ensure that Lancaster County farmers have a market in close proximity for traditional grain crops.

CHAPTER 3

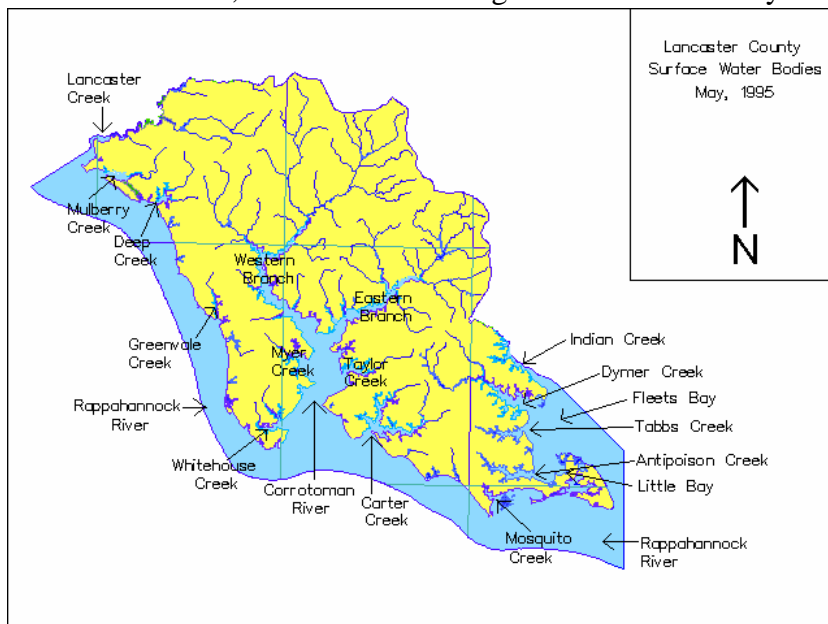
I. PROTECTION OF WATER IN LANCASTER COUNTY

The groundwater and surface water supplies of Lancaster County are recognized to be some of its most valuable natural resources. Lancaster's groundwater resources provide the County with 100% of its potable water supply. Meanwhile, the County's surface water provides a source of employment for the seafood industry, a major attraction for the tourism industry, a source of recreation for citizens, and a potential future water supply for the County. The health of the people, the economy, and the hope for future growth all depend on the quality of these important water resources.

The Lancaster County Potable Water Supply Study and Plan will assess the existing state of these resources, develop goals and objectives concerning the water supply, and present recommendations for protecting and enhancing the water supply in the future. The study will be divided into two sections. The first will examine the existing surface water conditions in Lancaster County. The second will investigate the existing groundwater conditions in the County. The plan will be realistic in that it recognizes that surface and groundwater resources are regionally shared and therefore require regional efforts to assure their protection. However, the plan also recognizes that much can be done within the county's boundaries to protect our vital water resources. Recommendations proposed in this plan address the regional and local nature of these resources.

A. SURFACE WATER

Lancaster County is bordered by the Chesapeake Bay to the East and the Rappahannock River to the South. Many tidal water bodies meander through the County on the way to the Bay and River including Lancaster Creek, the Eastern and Western branches of the Corrotoman River, including the Western and Eastern Branches, Carters Creek, Indian Creek, Dyrmer Creek, Tabbs Creek, Antipoinson Creek, as well as many smaller creeks. Combined, these water bodies give Lancaster County 265 miles of tidal shoreline.



Lancaster County also has many existing privately owned millponds that are categorized as surface water. These millponds are generally located in the freshwater sections at the headwaters of creeks and were created through the use of impoundment structures. Included in this group are Balls, Blakemore, Kamps, Chinns, Davis, Dunton, and Norris millponds.

1. Surface Water Quality

The quality of surface water is of vital importance to the Lancaster County community. First, many commercial fishermen, seafood industry owners, marina owners, and related employees depend on local waters for their livelihood. Second, citizens of the county enjoy living in a rural, scenic setting that is enhanced by views of, and access, to the water. Lastly, the water is a source of recreation for many in the Lancaster County community, as well as for many visitors to the area.

Agriculture is a major industry within Lancaster County and one whose activities can significantly affect the quality of surface water. Farmers and county officials are and will continue to actively work with the local Soil and Water Conservation District in the development of conservation plans that will provide protection to Bay waters while allowing farmers to maximize the productivity of their land.

Conservation plans consider the existing conditions of each individual farm. The plan takes into account soil types, slope, drainage patterns, crop cover and animal populations. Based on the available data and using the Soil Conservation Field Office Technical Guide, a plan is drawn up that recommends the most appropriate conservation practices for each farm. Components of the plan may include grassed waterways for drainage, rotating crop covers, crop rotation, contour strips, water diversion structures, nutrient management, pesticide management, and herbicide management.

Farmers in Lancaster County generally control the use of fertilizers and pesticides as a matter of complying with law, but also as a matter of economics. With the depressed price of crops and drought conditions of recent years, farmers are extremely careful to prevent runoff and to use only the amount of fertilizer and pesticide that can be absorbed into the soil rapidly. No-till farming is commonplace and has helped considerably to control runoff by limiting disruption to the soil.

The map, Lancaster County Farm Plan Inventory CBLAD and NNSWCD Farm Plan Data, shows cultivated areas in Lancaster County. It draws a distinction between those farms for which a plan is on record and those for which a plan is not on record. While this map indicates a large number of farms for which a plan does not exist, or is not recorded, it is believed that many do have a plan. It will be considered a priority to accurately establish the inventory of existing plans and take the necessary action to ensure plans are developed for the remainder.

While the potential for redevelopment is limited in Lancaster County, opportunity exists primarily on former seafood processing sites. There are several of these sites in Lancaster County, some covering fairly extensive areas of shoreline with impervious cover. There appears to be little demand to reopen these sites for seafood processing, and, as the crab population becomes more depleted, there is indication that some existing

sites may go out of business. These sites occupy prime real estate for redevelopment for residential purposes. All site plans submitted for development must show a reduction in impervious cover within the buffer area and must also show at least the required ten percent reduction in the introduction of pollutants and nutrients to protected waters.

2. Measures of Surface Water Quality

a. Condemned Shellfish Grounds

One indicator of surface water quality is the location of condemned and seasonally condemned shellfish grounds. Every two years the Commonwealth of Virginia prepares a report on the quality of the State's Waters and presents it to the U.S. Environmental Protection Agency and the United States Congress. The document is called the 305 (b) Report to EPA and Congress and addresses how well the State is meeting the Federal Clean Water Act's goals of providing waters suitable for swimming and fishing. In this report, state waters are evaluated as to whether they are "Fully Supporting," "Fully Supporting But Threatened," "Partially Supporting," or "Not Supporting" concerning the goal of fishable waters. Local waters that have been condemned for shell fishing by the Virginia Department of Health fall under the category of Partially Supporting in regard to fishing.

Lancaster County has approximately 1,370 acres of condemned shellfish grounds. Typically shellfish condemnation areas in Lancaster County are found only in small portions of creeks, not throughout the entire creek. Exceptions are Carter Creek, Greenvale Creek, Paynes Creek, Beach Creek, Lancaster Creek, and Mulberry Creek, which are all mostly, or totally, designated as condemned or seasonally condemned.

Locations of shellfish condemnations are important water quality indicators because the waters have been condemned due to elevated levels of fecal coliform bacteria. High levels of fecal coliform bacteria can be due to animal (domestic and wild) waste, failing septic systems, marinas, or the flushing characteristics of the particular water body.

b. Ambient Water Quality Monitoring

Another measurement of water quality that is addressed in the 305 (b) Report is ambient water quality monitoring results. The Virginia Department of Environmental Quality has designated monitoring stations at various locations in the different surface water bodies throughout the state. The stations are used to monitor four conventional pollutant levels including dissolved oxygen, pH, temperature, and fecal coliform bacteria. Data collected from each station is then assessed to see if it meets the Virginia Water Quality Standards for Dissolved Oxygen, pH, and Maximum Temperature. There are seven ambient water quality stations located in, or very close to, Lancaster County's boundaries. Five of these are located in the Rappahannock River, one in the Corrotoman River, and one in Indian Creek. Results from these seven stations are indicated on the map and

listed below:

W 22 (Station ID: 3-CRR003.38) - This station is located in the Corrotoman River near Red Buoy #6 in Lancaster County. This station recorded 0 violations of the Virginia Water Quality Standards. During the reporting time frame, there were 25 samples taken for temperature, 24 samples of dissolved oxygen, 26 for pH, and 14 for coliform bacteria. (p. B-7 of the Appendix, 305 (b) Report to EPA and Congress.)

W 23 (Station ID: 3-RPP010.60) - This station is located in the Rappahannock River off Orchard Point near the Lancaster County and Middlesex County boundary in the Rappahannock River Basin. This station recorded 0 violations of the Virginia Water Quality Standards. During the reporting time frame, there were 26 samples taken for temperature, 24 samples of dissolved oxygen, 26 for pH, and 15 for coliform bacteria. (p. B-8 of the Appendix, 305 (b) Report to EPA and Congress.)

W 24 (Station ID: 3-RPP017.72) - This station is located near buoy #8 southwest of the mouth of Greenvale Creek near the Lancaster County and Middlesex County boundary in the Rappahannock River Basin. This station recorded 0 violations of the Virginia Water Quality Standards. During the reporting time frame, there were 27 samples taken for temperature, 22 samples of dissolved oxygen, 27 for pH, and 14 for coliform bacteria. (p. B-8 of the Appendix, 305 (b) Report to EPA and Congress.)

W 25 (Station ID:3-RPP025.52) - This station is located near buoy #11 off Goose Point on the Middlesex County side in the Rappahannock River Basin. This station recorded 0 violations of the Virginia Water Quality Standards. During the reporting time frame, there were 23 samples taken for temperature, 20 samples of dissolved oxygen, 23 for pH, and 0 for coliform bacteria. (p. B-8 of the Appendix, 305 (b) Report to EPA and Congress.)

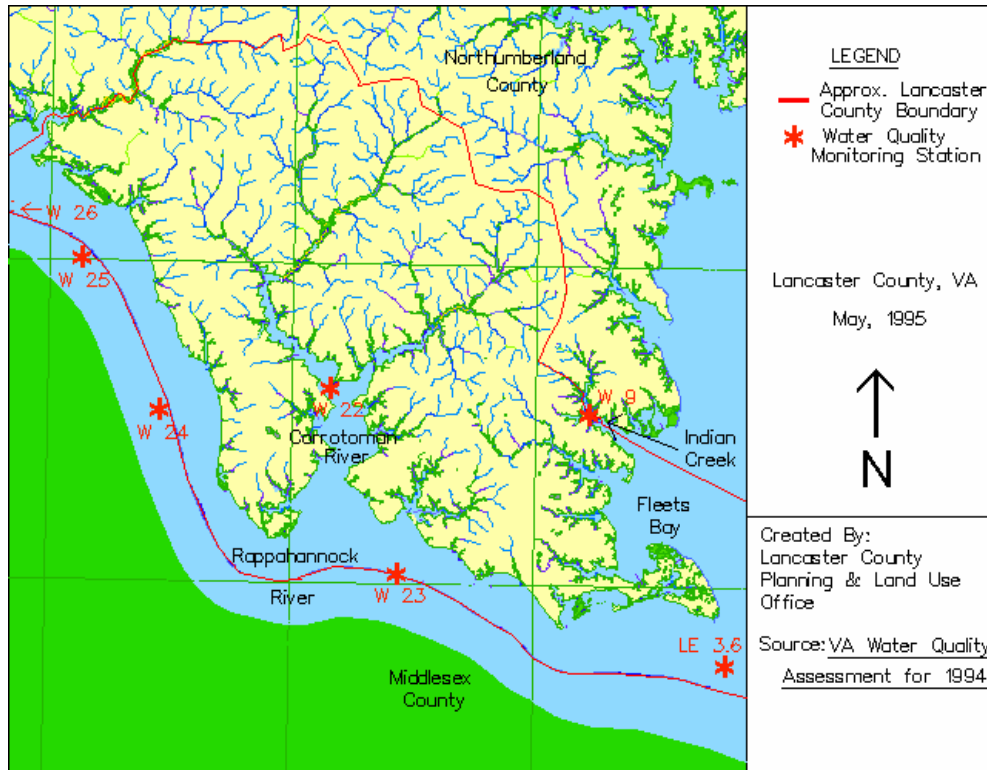
W 26 (Station ID:3-RPP031.57) - This station is located opposite Morattico on the Middlesex County side in the Rappahannock River Basin. This station recorded 0 violations of the Virginia Water Quality Standards. During the reporting time frame, there were 23 samples taken for temperature, 21 samples of dissolved oxygen, 23 for pH, and 0 for coliform bacteria. (p. B-8 of the Appendix, 305 (b) Report to EPA and Congress.)

W 9 (Station ID: 7-IND002.26) - This station is located in Indian Creek opposite Kilmarnock Wharf on the Northumberland County side of the creek in the Chesapeake Bay Basin. This station recorded 0 violations of the Virginia Water Quality Standards. During the reporting time frame, there were 22 samples taken for temperature, 21 samples of dissolved oxygen, 22 for Ph, and 21 for coliform bacteria. However, there was one instance where the test of sediments exceeded standards due to copper (metals) in the creek sediment (p. B-14 of the Appendix, 305 (b) Report to EPA and Congress).

LE 3.6 (Station ID: LE3.6) - This station is located at the mouth of the

Rappahannock River between Windmill and Stingray Points in the Chesapeake Bay Basin and is designated as a Chesapeake Bay Water Quality Monitoring Station. No data could be found to determine water quality for this area.

- c. Nonpoint Source Pollution Monitoring (will be addressed below under "Threats to Surface Water Quality" section.)



3. Sensitive Surface Water Features

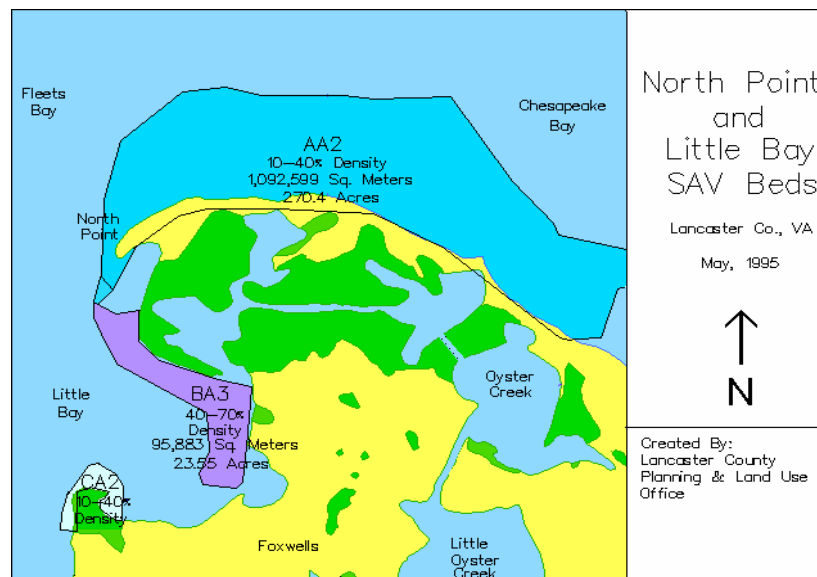
Lancaster County is fortunate to benefit from an abundance of marine resources that are directly related to the quality of its surface water bodies. These natural resources include Submerged Aquatic Vegetation, Wetlands, and Shellfish Grounds. Descriptions of these features, their functions in the man-made and natural environments, and the extent of their presence in Lancaster County are given below.

- a. Submerged Aquatic Vegetation

Submerged Aquatic Vegetation (SAV), or sea grass, is a valuable natural marine resource that is found adjacent to the shoreline in many parts of Lancaster County. SAV is important because it provides ideal habitat for blue crabs and juvenile finfish. SAV also acts to provide protection for molting crabs and is a source of food for waterfowl. Lastly, as evidenced by the important role it plays in the marine environment, SAV is also of great value to the County's commercial and recreational fisheries.

According to the 1993 Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay (Virginia Institute of Marine Science, School of Marine

Science; The College of William and Mary), SAV beds in Lancaster County are found in the Corrotoman River, along the north shore of the Rappahannock River from the Corrotoman River to Windmill Point; as well as in Dyer Creek, Indian Creek, Little Bay, and Fleets Bay. Furthermore, this report notes that SAV beds have declined in the area of the Rappahannock River between Carters Creek and the mouth of the Corrotoman River. However, SAV has also slowly expanded in some areas of Lancaster County. One large bed near Windmill Point is cited as having grown from 28 hectares in 1992 to 44 hectares in 1993. (Specific distribution of SAV in the lower part of Lancaster County can be seen in the "Submerged Aquatic Vegetation, 1993 Irvington, Fleets Bay, Wilton, and Deltaville, VA Quadrangles.")



b. Wetlands

Wetlands are defined by the United States Fish and Wildlife Service as "lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water" (Pg. 4, Atlas of National Wetlands Inventory Maps of Chesapeake Bay. U.S. Fish and Wildlife Services; September, 1986.). Generally, wetlands can be classified as either tidal or non-tidal. Locally, Lancaster County has approximately 4,504 acres of tidal wetlands and 1,349.26 acres of non-tidal wetlands (Figures were obtained using the Lancaster County Geographic Information System utilizing a digital National Wetland Inventory map layer.)

Wetlands are important natural resources that provide many benefits to the man-made and natural environments. Wetlands provide aesthetic, recreational, and economic benefits to the community. Furthermore, wetlands are spawning and nursery grounds for finfish and shellfish, feeding and wintering sites for migratory waterfowl, nesting habitat for shore birds, and homes to a wide variety of wildlife. Wetlands further serve as important areas for groundwater recharge, flood control, pollution absorption, and retention of sediment from storm water run-off (Pg 1, Atlas of National Wetlands Inventory Maps of Chesapeake Bay.

U.S. Fish and Wildlife Services: September, 1986.).

c. Shellfish Grounds

Lancaster County has a wealth of suitable shellfish grounds in the water adjacent to its shores. Despite dramatic decreases in shellfish populations and catches in the last decade due to the diseases MSX and Dermo, these grounds remain a valuable resource that should be protected. Although it cannot be determined if, or when, shellfish populations will recover from these diseases, the possibility remains that the resource could thrive again or disease resistant varieties of shellfish could be introduced.

4. Threats to Surface Water Quality

a. Role of Soils in Pollution

Pollutants generally affect water quality through two different methods: run-off and leaching. Run-off refers to water that is not absorbed by the soil, but is instead carried off by natural or man-made drainage courses to a surface water body. Leaching refers to water that is absorbed by the soil and percolates into the soil layers underneath. The effect of this type of pollution is usually felt on the groundwater supply. The amount of run-off or leaching in a community is usually dependent on the present land cover. Generally the more heavily an area is developed, the more susceptible the area is to run-off due to increased amounts of impervious land cover such as parking lots, buildings, and roads. The less intensely an area is used, the more the area is prone to leaching because of the [extensive](#) pervious groundwater recharge areas such as large tracts of farmland and forest.

Impacts from run-off and leaching are further complicated by the types of soils present in different areas of the County. Highly erodible soils have the potential to become a source of pollution in times of large run-off such as heavy rainstorms and melting periods after ice or snowstorms. This combination of a high amount of run-off and the presence of highly erodible soils can result in a higher concentration of sediments entering the county's surface waters. Furthermore, individual occurrences of pollution through leaching can be worsened through the presence of highly permeable soils. Awareness of these soil properties as they relate to existing and future land uses can help in pinpointing areas currently in need of mitigation efforts, as well planning for the avoidance of further contamination of water resources through improper land use.

Lancaster County Soils that are highly erodible and the percent each soil type comprises of the County's total soils:

1. Caroline very fine sandy loam, sloping eroded (0.17%)
2. Caroline clay loam, sloping, severely eroded (0.05%)
3. Caroline clay loam, strongly sloping, see. eroded (0.18%)
4. Craven silt loam, sloping, eroded (0.02%)

5. Craven clay loam, strongly sloping, severely eroded (0.21%)
6. Kempsville fine sandy loam, sloping, severely eroded (0.09%)
7. Matapeake silt loam, strongly sloping, eroded (<0.01%)
8. Sassafra fine sandy loam, sloping, severely eroded (0.46%)
9. Sassafra fine sandy loam, strongly sloping, eroded (0.07%)
10. Sassafra fine sandy loam, str. sloping, sev. eroded (0.08%)
11. Sloping sandy land (9.26%)
12. Steep sandy land (18.13%)

Lancaster County Soils that are highly permeable and the percent each soil type comprises of the County's total soils:

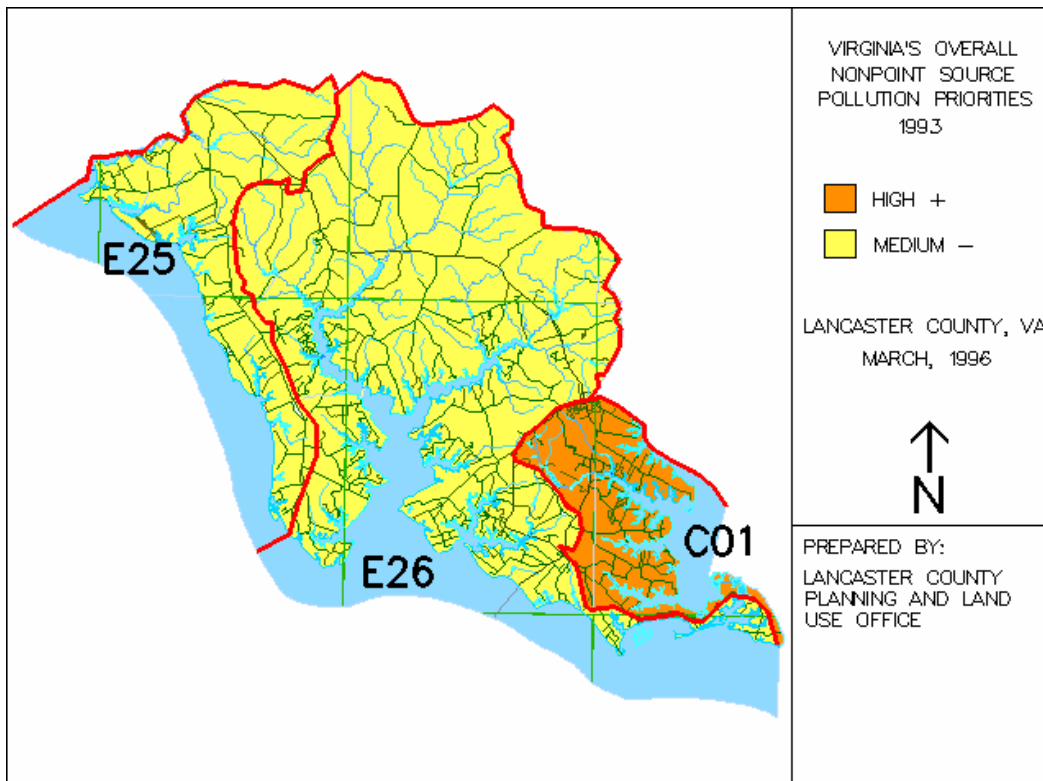
1. Coastal Beach (0.48%)
2. Dragston fine sandy loam (3.19%)
3. Lakeland loamy fine sand, gently sloping (0.61%)
4. Rumford loamy sand, gently sloping (0.16%)
5. Rumford loamy sand, sloping, eroded (0.05%)
6. Sloping sandy land (9.26%)
7. Steep sandy land (18.13%)

b. Sources of Surface Water Pollution

(1) Non-point Source Pollution

One measure of the effect of pollution on the water quality of Lancaster County's surface water is found in the Virginia Non-point Source Pollution Watershed Assessment Report (VA Department of Conservation and Recreation; March, 1993). This report divides the State of Virginia into 491 different watersheds or hydrologic units. A watershed is defined as "a land area drained by a river/stream or system of connecting rivers and streams such that all water within the area flows through a single outlet." There are three state hydrologic units in Lancaster County: E25, E26, and C01. E25 and E26 are part of the Rappahannock River Basin and C01 is part of the Chesapeake Bay Coastal Basin. This report compares water quality of hydrologic units throughout the state in order to prioritize nonpoint source pollution protection efforts.

c. State Hydrologic Units in Lancaster County



- (1) A brief summary of watersheds in Lancaster County is given below:

E25 - This watershed is cited as having "significant levels of urban use impacts due to urban erosion and nutrient loading, and the amount of disturbed urban land." However, this watershed is not described as having any significant water quality violations for fecal coliforms or pH levels. Statewide this watershed is given a final non-point source pollution rank of "MEDIUM -", with a rank of "High+" being the highest priority watersheds for state non-point source pollution protection efforts.

E26 - This watershed is not described as having any significant water quality violations due to fecal coliforms or pH level. Additionally, this watershed is not cited for having "significant levels of urban use impacts." Statewide this watershed is given a final nonpoint source pollution rank of "MEDIUM -", with a rank of "High+" being the highest priority watersheds for state non-point source pollution protection efforts.

C01 - This watershed is rated as a "medium priority watershed for agricultural non-point source pollution concerns. Due primarily to existing development, watershed C01 is rated in the top 10% statewide for urban pollution potential." Additionally, the watershed is cited as having a large number of shellfish condemnations because of "urban non-point source influences." However, the watershed was not cited for having any significant violations of state water quality standards. Statewide this watershed is given a final non-point source pollution rank of "High+," with a rank of "High+" being the highest priority watersheds for state non-point

source pollution protection efforts.

(2) Point Sources/Permitted Discharges

Point source pollution sources are often referred to as the "end of the pipe" type of pollution. This means that the discharge into the water body can be traced to a single, identifiable source. The Federal Water Pollution Control Act requires a uniform permit program nationwide which acts to regulate this type of pollution. In Virginia, the Department of Environmental Quality runs a permitting program named the Virginia Pollutant Discharge Elimination System (VPDES) which carries out the requirements of the federal act. VPDES is a permit program which establishes, on an individual basis, limits on the quantity and/or concentration of pollutants allowed in the discharge.

When a VPDES permit is issued, guidelines are established which discharged effluent is required to meet. Moreover, the owner of the discharging facility is required to monitor the quality of the effluent and report the results of testing to the state. Additionally, the Virginia Department of Health designates condemned shellfish areas around certain point source discharges to act as a buffer zone from the impact of the discharge. In Lancaster County there are currently 10 VPDES, 14 Special Consent Orders (Extensions to VPDES), and 1 VPA permit issued to various businesses throughout the County. The chief industry utilizing these types of permits in Lancaster County is the seafood industry, with resort hotels a distant second.

(3) Septic Systems/Sewage Disposal

Approximately 89% of all private residences in Lancaster County utilize septic systems for sewage disposal purposes. The chart below gives some indication of the actual numbers of septic systems in the County and if they are located in or outside of the three towns.

Septic/Cesspool for Sewage Disposal Lancaster County, VA - 1990			
Towns	534	52%	of Housing Units in Towns
County	<u>4,370</u>	89%	of Housing Units in County
Total	4,904		Housing Units
Source: 1990 United States Census Statistics			

The potential for septic systems causing pollution of surface water bodies can stem from the initial improper siting of the system, or from the failing of aged or not properly maintained systems. Often septic systems have

been placed in soils that can act to heighten the negative impact of the system. In soils with seasonally high water tables, the water table can rise into the septic systems' drain fields and intermix with the relatively untreated effluent. Furthermore, high water tables can cause pooling of septic effluent on the ground surface. During a rain storm, pooled effluent can then quickly drain into nearby surface water bodies.

Highly permeable soils also can act to increase negative impacts of septic systems. These soils allow septic effluent to percolate more quickly through soils underneath the drain field, while not allowing for proper filtration. If the effluent percolates before it is properly treated then it can become a threat to the ground or surface water that it acts to recharge. The combination of high water tables and highly permeable soils is particularly a problem in densely developed areas close to the county's shoreline. A high number of septic systems in conjunction with poor soil conditions can lead to elevated levels of fecal coliform bacteria in adjacent surface water bodies, which can then result in the condemnation of the area for shell fishing.

d. Potential of Surface Waters for Future Water Supply

Much of the surface water in Lancaster County is tidally influenced and has saline levels too high to be considered as a potential drinking water source. Additionally, in the upper reaches of the creeks where the water is fresh enough to be used for drinking water, there is not enough stream flow to allow for direct intakes from the water body. However, at the headwaters of these creeks there are a number of existing millponds. Furthermore, with improved, higher impoundment structures there is the potential to create larger ponds or reservoirs. The existing millponds, or the potential new ponds, could be possible surface water drinking water sources, subject to the Joint Permit Application review process for activities in the waters and wetlands of the Commonwealth of Virginia.

In 1973, the Northern Neck Planning District Commission conducted a water and sewage facilities plan for the Northern Neck (Water Quality Management Plan - Planning District 17. Northern Neck Planning District Commission and Deward M. Martin and Associates, Inc.; Callao, VA: 1973). This plan recommended several possible impoundment sites for each of the counties of the Northern Neck. In most cases the proposed impoundment sites roughly coincided with existing millpond locations at the headwaters of the creeks. However, the proposed impoundments were usually larger than the existing millponds, with new impoundment structures located a little further downstream than the existing structures. Eight possible impoundment sites and their proposed sizes were identified in Lancaster County. They included:

Reservoir #: LBBI Streams: Balls Branch, Lancaster Creek

The drainage area for this proposed reservoir site is approximately 1,287 acres or two square miles. The proposed reservoir would have a total maximum storage of 1,212 acres. The 1,212 acres would be divided into 483 acres allotted for flood and sediment

volume, 561 acres for water supply volume, and 167 acres for fish and wildlife volume.

The maximum water supply draft from the reservoir would be 0.58 Million Gallons Daily.

Reservoir #: LCMI Streams: Camps Millpond

The drainage area for this proposed reservoir site is approximately 3,944 acres or six square miles. The proposed reservoir would have a total maximum storage of 849 acres. The 849 acres would be divided into 164 acres allotted for flood and sediment volume, 685 acres for water supply volume, and 0 acres for fish and wildlife volume. The maximum water supply draft from the reservoir would be 1.78 Million Gallons Daily.

Reservoir #: LLBI Streams: Little Branch, Corrotoman River

The drainage area for this proposed reservoir site is approximately 2,694 acres or four square miles. The proposed reservoir would have a total maximum storage of 1,736 acres. The 1,736 acres would be divided into 562 acres allotted for flood and sediment volume, 1,174 acres for water supply volume, and 0 acres for fish and wildlife volume. The maximum water supply draft from the reservoir would be 1.22 Million Gallons Daily.

Reservoir #: LLB2 Streams: Little Branch, Corrotoman River

The drainage area for this proposed reservoir site is approximately 1,178 acres or two square miles. The proposed reservoir would have a total maximum storage of 1,350 acres. The 1,350 acres would be divided into 442 acres allotted for flood and sediment volume, 792 acres for water supply volume, and 116 acres for fish and wildlife volume. The maximum water supply draft from the reservoir would be 0.53 Million Gallons Daily.

Reservoir #: LMSI Streams: McMahon Swamp, Corrotoman River

The drainage area for this proposed reservoir site is approximately 3,390 acres or five square miles. The proposed reservoir would have a total maximum storage of 4,693 acres. The 4,693 acres would be divided into 1,271 acres allotted for flood and sediment volume, 1,479 acres for water supply volume, and 1,943 acres for fish and wildlife volume. The maximum water supply draft from the reservoir would be 1.53 Million Gallons Daily.

Reservoir #: LMS2 Streams: McMahon Swamp, Corrotoman River

The drainage area for this proposed reservoir site is approximately 2,657 acres or four square miles. The proposed reservoir would have a total maximum storage of 2,365 acres. The 2,365 acres would be divided into 996 acres allotted for flood and sediment volume, 1,159 acres for water supply volume, and 210 acres for fish and wildlife volume. The maximum water supply draft from the reservoir would be 1.20 Million Gallons Daily.

Reservoir #: LCRI Streams: Upper West Branch Corrotoman River

The drainage area for this proposed reservoir site is approximately 5,495 acres or nine square miles. The proposed reservoir would have a total maximum storage of 3,719 acres. The 3,719 acres would be divided into 1,322 acres allotted for flood and sediment volume, 2,397 acres for water supply volume, and 0 acres for fish and wildlife volume. The maximum water supply draft from the reservoir would be 2.48 Million Gallons Daily.

Reservoir #: LOCI Streams: Quarter Cove

The drainage area for this proposed reservoir site is approximately 3,944 acres or six square miles. The proposed reservoir would have a total maximum storage of 849. The 849 acres would be divided into 164 acres allotted for flood and sediment volume, 685 acres for water supply volume, and 0 acres for fish and wildlife volume. The maximum water supply draft from the reservoir would be 1.78 Million Gallons Daily.

Source: Martin, Clifford, & Associates, NEDCO Report, Volume II, Pg.. VIII-44, VIII-45.

Precise locations and boundaries for these reservoir locations can be viewed in the Future Land Use Map found in Chapter 8.

B. GROUNDWATER

1. Groundwater Structure

As stated previously, Lancaster County residents are 100% dependent on groundwater for their drinking water supplies. Lancaster County's groundwater resources come from an underground system of aquifers that reflect the geology of the Coastal Plain Region of Virginia. Underground, the coastal plain is made up of unconsolidated gravels, sands, silts, and clays in addition to variable amounts of shells. This mixture of deposits rest on an underground rock surface called the basement, which slopes gently eastward. The basement rocks actually come out of the earth's surface at the fall line of the rivers, which is the dividing line between the Piedmont and Coastal Plain Regions of Virginia. As a point of reference the fall line of the Rappahannock River is at Fredericksburg, the fall line of the James River is at Richmond, and the fall line of the Potomac River is at Washington, DC. At the fall line the thickness of the coastal plain sediments is zero; however, going east from the fall line the basement rock slopes down and the coastal plain sediments become thick. At the coastline the coastal plain sediments are over 6,000 feet thick and continue to deepen under the continental shelf.

Contained in the Coastal Plain sediments are a system of underground aquifers, or water-bearing units. Aquifers are recharged at the fall line, except for the Brightseat-Upper Potomac which is not recharged directly from the land surface. The Brightseat-Upper Potomac are the aquifers that offer the best source of potable water.

Each aquifer is separated from those above and below by clay confining beds, from which they get the name, confined aquifers. These confining beds act to trap the water in between, allowing water to escape up and down only at very slow rates. When the aquifers are tapped by a well, the pressure enhances the flow of the water upward.

Throughout the Coastal Plain there is also an unconfined, water table aquifer. The water table aquifer is found between the ground surface and the top of the first confining bed. This aquifer is not pressurized and is the one used by shallow wells. This aquifer is recharged at ground surface level by rainwater and below the ground surface by water

bodies such as creeks and rivers. Because this aquifer is unconfined and recharges from the surface, it is very susceptible to contamination. Anything that permeates the ground surface can quickly reach the water table aquifer.

Wells in Lancaster County tap four underground aquifers. Shallow wells utilize the Columbia and Yorktown-Eastover Aquifers, which are the water table aquifers. Deep wells, or artesian, tap the Chickahominy-Piney Point Aquifer and the deeper Brightest-Upper Potomac Aquifer. Detail on each of these aquifers is given below.

a. Columbia Aquifer (Water Table)

The water table aquifer in the higher elevated parts of the western and central, and throughout the entire eastern section of Lancaster County is actually an aquifer named the Columbia. The Columbia Aquifer is moderately used as a drinking water supply by the residents and businesses utilizing shallow wells in Lancaster County (See Shallow Well Chart on Page 3-15). This aquifer is unconfined and made up of sand and sediment deposits found underground from an elevation approximately at sea level, to about 100 feet above sea level. However, clayey sediments can produce localized confined or semi-confined conditions (Pg. C52, USGS Professional Paper 1404-C).

The saturated thickness of the Columbia Aquifer ranges from 15 feet at the aquifer's western limit to about 80 feet in the southeastern part of the Coastal Plain (Pg. F5, USGS Professional Paper 1404-F). The local recharge area for the Columbia Aquifer is the ground surface of Lancaster County. Sources of recharge are rain, ice, and snow. This aquifer also affects lower aquifers because the Columbia is also a source of recharge for the underlying confined aquifers (Pg. F5, USGS Professional Paper 1404-F). However, recharge by cross-formational flow is exceedingly slow, requiring hundreds or even thousands of years. Contamination through this process is essentially negligible.

Local conditions including topography, drainage patterns, and land cover influence where the most important recharge areas in the county are located. However, because the aquifer recharges primarily from the surface, it is very susceptible to contamination. Septic system discharge, agricultural and lawn fertilizers, leaking underground storage tanks, and improper disposal of hazardous home waste can cause contamination of this aquifer. Contamination in this aquifer also affects lower aquifers, because the Columbia is also a source of recharge for the underlying confined aquifers (Pg. F5, USGS Professional Paper 1404-F).

The groundwater supplies of the Columbia Aquifer usually fluctuate according to the seasons of the year, with lowest supplies present during local drought conditions. Lastly, localized high chloride concentrations in wells utilizing the Columbia are due to local intrusion of water from the Chesapeake Bay and its major estuaries (Pg. 11, USGS WRI Report 92-4175). This condition is reported to be present in shallow wells in some parts of Lancaster County that are very

close to large surface water bodies.

Water samples from some wells in this aquifer have elevated levels of nitrate, above the Maximum Contaminant Level recommended by the U.S. Environmental Protection Agency. High nitrate concentrations in groundwater are the result of human activities, especially agricultural fertilization practices and septic systems.

b. Yorktown-Eastover (Unconfined, Water Table and Confined)

The Yorktown-Eastover Aquifer is unconfined in its western limits, but becomes confined as the aquifer slopes eastward (Pg. F7, USGS Professional Paper 1404-F). The western limit of the Yorktown-Eastover is in the western part of Lancaster County. In this part of the County, the Yorktown-Eastover acts as the water table aquifer. This area also serves as the recharge area for the confined part of the aquifer (Pg. F7, USGS Professional Paper 1404-F). The unconfined, water table recharge areas of the Yorktown-Eastover are important because it is where contaminants can quickly reach the aquifer through the ground surface. This is of further concern because the Yorktown-Eastover Aquifer is a primary source of drinking water for the Eastern Shore of Virginia (Pg. C51, USGS Professional Paper 1404-C).

The Yorktown-Eastover Aquifer is not used heavily in Lancaster County (See Shallow Well Chart Below). Use in Lancaster County would be by people with shallow wells in the western part of the County, and with wells reaching 75-85 feet in depth in the eastern parts of the County. Lastly, localized high chloride concentrations in wells utilizing the Yorktown-Eastover, like the Columbia, are due to local intrusion of water from the Chesapeake Bay and its major estuaries. This condition is reported to be present in shallow wells in some parts of Lancaster County that are very close to large surface water bodies.

c. Chickahominy-Piney Point Aquifer (Confined)

This confined aquifer is located approximately 200-425 feet below the ground surface in Lancaster County and averages 50 to 100 feet in thickness throughout its reach, with a maximum thickness of 140 feet in Lancaster County (Pg. C46, USGS Professional Paper 1404-C). The Chickahominy-Piney Point starts at outcrop areas near the major stream valleys in Stafford and King George Counties, on down through Caroline, Hanover, and Henrico Counties, just east of the fall line (Pg. C46, USGS Professional Paper 1404-C). The major recharge area for this aquifer is also found at the outcrop location. Water entering from the recharge area flows down and eastward to reach Lancaster County. Lesser recharge of the aquifer also occurs in smaller amounts from vertical seepage between the confining beds of the other aquifers and along existing well conduits. This aquifer is not as prone to contamination as the water table aquifer due to its limited recharge potential in Lancaster County. Furthermore, supply in this aquifer is not as susceptible to decreases due to local drought conditions.

This aquifer is moderately used as a deep/artesian well supply by many light industrial, small municipal, and domestic users in Lancaster County (See Individual Drilled Well Chart on Page 3-18. Furthermore, the aquifer is thought to be capable of supplying large quantities of water suitable for most uses (Pg. C47, USGS Professional Paper 1404-C). However, there have been scattered reports of odor and other water quality problems in wells dug in this aquifer. Water in this aquifer contains concentrations of sodium, dissolved solids, and fluoride, which decrease while moving west in the aquifer. Specifically, sodium concentrations exceed 20mg/L throughout most of the aquifer, fluoride concentrations exceed 2mg/L in the south-central part of the aquifer, and concentrations of sulfate, chloride, and dissolved solids exceed the U.S. EPA Secondary Maximum Contaminant Level in the eastern part of the aquifer (Pgs. 13, 14, and 15, USGS WRI Report 92-4175).

d. Brightseat-Upper Potomac Aquifer (Confined)

This aquifer is located approximately 525-820 feet below the ground surface in Lancaster County. The aquifer is actually two aquifers located very close together, and separated by a thin confining bed. The Brightseat is the smaller aquifer and is located above the Upper Potomac Aquifer. The Upper Potomac Aquifer is located further below the surface at depths of 750 feet to 820 feet. These aquifers start from "subsurface pinch outs" east of the fall line and build to almost 400 feet in thickness to the east (Pg. C42, USGS Professional Paper 1404-C). These aquifers have no significant source of surface recharge. Recharge occurs in much smaller amounts from vertical seepage between aquifers and along existing well conduits. These aquifers are not as prone to contamination as the water table aquifer due to their limited recharge potential in Lancaster County. Supply of these aquifers is not susceptible to decreases due to local drought conditions either.

Most deep wells in Lancaster County tap the Brightseat Aquifer, not the Upper-Potomac. Water in the Brightseat Aquifer is of the sodium bicarbonate type in the central part of the aquifer, and becomes of the sodium chloride to the east and southeast of Lancaster County under the Bay. Groundwater in this aquifer also becomes more mineralized the further one moves southeast. For Lancaster County this means that certain parts of the county utilizing this aquifer have higher concentrations of sodium and fluoride in their drinking water.

Specifically, dissolved-solid concentrations exceed the 500 mg/L U.S. EPA SMCL in the eastern part of the aquifer, fluoride concentrations exceed the 4mg/L U.S. EPA MCL in the south-central part of the aquifer and the 2mg/L U.S. EPA SMCL in the rest of the aquifer. Chloride concentrations exceed the 250 mg/L U.S. EPA SMCL in the southeastern part of the aquifer (Pg. 15, USGS WRI Report 92-4175). However, Virginia Department of Health records do not show chloride concentrations exceeding 132 ppm in Lancaster County. The highest chloride concentration is 132 ppm at Foxwells and the next highest is 71 at Mosquito Point. Locally, there are elevated concentrations of sodium, fluoride, and chloride in water drawn from this aquifer. These levels are particularly high in areas from White Stone east including Palmer, Foxwells, and Windmill Point. Sodium levels are approximately 230 mg/L in White Stone, 300 mg/L in Palmer, 400 mg/L in Foxwells, and as high as 500 mg/L at Windmill Point. Sodium

levels in the artesian aquifers in the entire County exceed the USEPA advisory limits for persons with health conditions requiring limitation of sodium intake.

(1) Effects of Drawdown in the Brightseat-Upper Potomac

The Brightseat-Upper Potomac Aquifers are heavily tapped for deep/artesian well supplies in Lancaster County and regionally (See Individual Drilled Well Chart on Page 3-18). The aquifers are a principal source of groundwater for municipal, industrial, and agricultural use in the York-James, Middle, and Northern Neck Peninsulas of Virginia (Pg. F9, USGS Professional Paper 1404-F). In 2004 the Maryland Geological Survey released a report on the need to assess the sustainability of the Ground-water Resources in the Atlantic Coastal Plain and in 2006 began a cooperative effort with the U.S. Geological Survey (development in Maryland draws from aquifers shared with the Northern Neck of Virginia).

Due to heavy use there has been some regional draw down in the aquifer throughout the Coastal Plain Region. Draw down is caused by the withdrawal of large amounts of groundwater from the confined aquifers. The result of draw down is that water levels in the confined aquifers have declined and the underground flow of water has changed. These resulting situations present future problems for Lancaster County deep well users.

Several United States Geological Survey reports have studied the Coastal Plain groundwater aquifers, as well as the effect of drawdown caused by heavy pumping. According to one report, the decline in the level of water in the aquifers has changed the direction of ground-water flow toward the major pumping centers. When considering the Brightseat-Upper Potomac Aquifers, these centers are located near the cities of Franklin, Williamsburg, Suffolk, and Alexandria and the towns of West Point and Smithfield. Total withdrawal from these centers is estimated to have been 65 MGD in 1980. Franklin alone had withdrawals over 40 MGD in 1980 (Pg. F83, USGS Professional Paper 1404-F).

Furthermore, this report states as a general principle that heavy withdrawals increase vertical leakage through confining units, reduce the volume of water stored in the ground-water flow system, increase flow from the water-table aquifer into the confined flow system, and decrease local ground-water discharge to streams and regional discharge to coastal water. Basically the natural balance between recharge and discharge that existed prior to periods of heavy pumping has been disturbed. Areas of heavy pumping now capture a large part of the water previously discharged from the ground-water flow system to surface water, such as the Chesapeake Bay and the Rappahannock River (Pgs. F10, F11, and F12, USGS Professional Paper 1404-F).

Future underground water supplies are decreasing at faster rates than before periods of heavy pumping. Lastly, groundwater supplies that used to travel all the way to the coast to recharge surface water bodies with fresh water get detoured before they reach the surface water bodies. Impacts of this situation on the water quality of the Chesapeake Bay and its tributaries is unknown. (Specific data on water levels in wells monitored in Lancaster and surrounding counties by the United States Geological Survey, documentation of artesian aquifer recharge areas and declining water supplies, as well as a list of major water use areas can be seen in Appendix VII.)

The Brightseat-Upper Potomac Aquifer were documented in 1988 as capable of producing large quantities of high-quality water suitable for most uses (Pg. C42, USGS Professional Paper 1404-C). However, more recent activities of the USGS suggest a serious concern over declining artesian water supplies.

2. Existing And Projected Demand For Groundwater in Lancaster County, VA

In 1990 there were 10,896 people in Lancaster County, including approximately 1,100 people in the Town of Kilmarnock. (1,053 in Lancaster, and 56 in Northumberland) The 1,100 people in Kilmarnock used a total of .129 MGD (million gallons daily) of groundwater in 1990. The 9,769 people in the remainder of Lancaster County used a total of .88 MGD of groundwater in 1990. This comes to a countywide total of 1.01 MGD for 1990. These figures were approximating a 117 gallons used per customer per day (GPCD) in the Town of Kilmarnock and 90 gallons used per customer per day in the remainder of Lancaster County. These averages were obtained from the 1988 Rappahannock Water Supply Plan prepared by the State Water Control Board. These figures can further be used to predict future demand for groundwater in Lancaster County.

First, recent population projections were obtained for Lancaster County from the Virginia Employment Commission (VA Population Projections, 2010. VEC, June 1993). The projected annualized growth rate for the County was then applied to the Town's 1990 population to calculate projections. Lastly, the previous water use average for each customer per day was multiplied by the appropriate population for the Town or County to calculate projected groundwater demand. This is detailed in the following chart.

Year	Town Population	Town GPCD	Town MGD	County Population	County GPCD	County MGD	Total Population	Total MGD
1990	1,100	117	.129	9,796	90	.88	10,896	1.01
1995	1,141	117	.133	10,162	90	.91	11,303	1.04
2000	1,183	117	.138	10,508	90	.95	11,691	1.09
2010	1,250	117	.146	11,140	90	1.00	12,390	1.15

As is evidenced in the above chart, Lancaster County's projected groundwater supply needs are not expected to grow significantly. This projection would be in line with the 1988 Rappahannock Water Supply Plan that stated the present groundwater system should be adequate to meet the needs of Kilmarnock's water supply through the 50-year planning period. These projections would indicate that despite the negative impacts of drawdown, the amount of the water supply is not the immediate problem. Instead the problems with the quality of the supply, as discussed under the individual aquifer sections, appear to be of more immediate concern.

3. Threats to Groundwater Supply

a. Septic Systems/Sewage Disposal

As discussed previously in the "Surface Water Section," individual homeowners sewage disposal means can act to negatively impact groundwater supplies. The aquifers most susceptible to contamination from individual sewage disposal systems are the Columbia and the unconfined water table part of the Yorktown-Eastover. Localized soil conditions such as high water tables and highly permeable soils in conjunction with large concentrations of septic systems can threaten the quality of the water table aquifers.

An additional concern is the recently approved engineered wastewater treatment systems. A means to monitor their long term effectiveness and impact must be developed. This is even more imperative given that these systems are almost always placed in areas with high water tables and/or percolation.

b. Underground and Aboveground Storage Tanks

According to the Department of Environmental Quality's Underground Storage Tank database there are approximately 326 regulated underground storage tanks in Lancaster County (Local Inventory of Regulated Underground Storage Tanks can be viewed at the Lancaster County Planning and Land Use Office). Additionally, many people in the county have unregulated storage tanks which contain fuel for the home heating source or their personal vehicles. These underground storage tanks can be a possible source of contamination for groundwater in Lancaster County.

Regulated storage tanks in the county are all tanks over 110 gallons, except for residential/non-commercial tanks less than 1,100 gallons, farm tanks less than 1,100 gallons, and residential/commercial heating fuel tanks less than 5,000 gallons. Therefore, regulated tanks are generally the tanks found at most gas stations, convenience stores, and automobile distributors in the county. Current state regulations have strict requirements for the operation of regulated underground storage tanks. First, these tanks must be protected from corrosion if they are to be placed underground. Second, owners and operators of new and existing tanks must provide a method, or combination of methods for release detection. Additionally, these tanks are required to be monitored periodically by

the owners for leaks. Lastly, the owner and operator must report, investigate, and clean up any spills and overfills in accordance with state regulations.

Residential underground storage tanks are not regulated by the Department of Environmental Quality. Most leaks are discovered and taken care of by the owners of the tanks. Information available from local oil companies suggests that problems with leaks are only found in areas with low groundwater tables. In areas with high water tables, water leaks into leaking tanks instead of fuel leaking out. Leaks in these cases will often be detected when water levels in the tank cause the

owner's furnace or heating source not to light. However, in areas with low water

tables fuel will often leak out and down when a leak occurs. Leaks in these cases will be detected only by noticing a drop in tank levels, or an increase in the usage of the fuel. The chart below indicates the number of housing units in the county which utilize fuel oil, kerosene, propane, etc. for the home heating fuel. It is assumed that these individual heating supplies are stored in either above or underground storage tanks. The percentage of these tanks located underground is undetermined.

Aboveground storage tanks for home heating oil have also proven to be a serious hazard to water wells drawing from the surface aquifer. Even when the tank is secure, leaks around the valve and oil line have contaminated water wells beyond repair. Currently a program exists under the Virginia Department of Environmental Quality to replace shallow wells contaminated by fuel oil with artesian wells

c. **Uncapped/Abandoned Wells**

Uncapped and abandoned wells are potential sources for groundwater contamination. These wells act as direct conduits to the groundwater supply. Disposal of waste into these wells can quickly lead to contamination. Abandoned artesian wells may allow direct access to deep aquifers. Census figures for Lancaster County indicate that there are possibly several hundred wells in the county that are no longer used but have not been properly abandoned. Procedures for abandoning a well are established by the Virginia Department of Health and can be costly.

d. **Improper Disposal of Household Hazardous Waste**

Due to tightened regulations and prohibitive costs, many rural counties no longer operate their own landfills to dispose of solid waste. In the Northern Neck each of the four counties have switched to waste transfer types of waste collection and disposal. In Lancaster County, waste and recyclable material are collected at three transfer sites. Waste collected at these sites is then carried by a waste carrier to a large regional landfill in King & Queen County. Furthermore, marketable recyclable materials such as cardboard, paper, aluminum, and glass collected at these sites are sold by the county to generate revenue to support the costs of

operating the collection centers.

However, due to limitations on the type of waste accepted by the regional landfill and the high costs of collection and proper disposal of household hazardous waste, Lancaster County has no system in place for citizens to dispose of this type of waste. Household hazardous waste can include used motor oil, paint thinners, solvents, antifreeze, etc. Therefore, limited options can lead homeowners to choose improper means for disposing of this type of waste, which in turn becomes a threat to groundwater supplies.

II. ASSESSMENT OF EXISTING CONDITIONS

A. SURFACE WATER

Lancaster County is fortunate to have large areas of surface water within its boundaries. Overall, the condition of these surface waters is good; however, there are some areas for concern. Non-point source pollution has caused some degradation of water quality in the E25 (Corrotoman River) and C01 (Chesapeake Bay) watersheds. The E25 watershed was cited as having significant levels of urban use impacts due to urban erosion and nutrient loadings, and the amount of disturbed land. This type of pollution would be attributed to new home or business construction, particularly on the water. The C01 watershed was cited as having a large number of shellfish condemnations due to urban non-point source influences. This type of pollution would be attributed to high densities of septic systems, or a number of failing septic systems located close to surface water. The C01 watershed also was negatively impacted from agricultural non-point source pollution. However, despite being mentioned for these specific non-point source pollution impacts, none of the three watersheds were cited as having violations of state water quality standards.

Lancaster County's surface water resources also have potential, although limited, for use as a future potable water supply. In the County, there are no smaller fresh water streams that have suitable flow to allow for raw intake for drinking water purposes. Furthermore, saline conditions in the larger tidal portions of the County's surface water bodies would make them unsuitable as a supply for drinking water. However, the County does have a large number of existing millponds, as well as other possible locations for impoundment of fresh surface water supplies.

The existing millponds already serve an important function, since they act as areas of recharge for water table aquifers. Furthermore, the existing millponds are generally located at the headwaters of streams or creeks, and many have sparsely populated areas surrounding them. With enlarged impoundment structures, these millponds could be potential surface water supplies for drinking water. Lastly, all the millponds are located upstream of permitted discharges. This situation would prevent discharges from affecting millpond or reservoir waters.

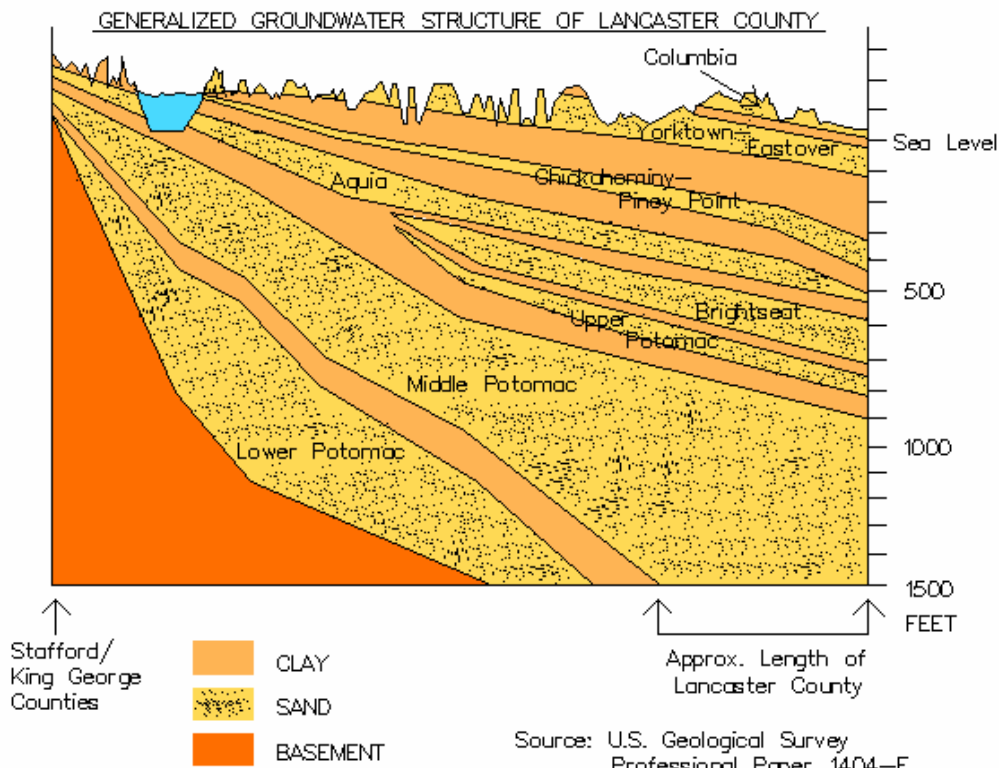
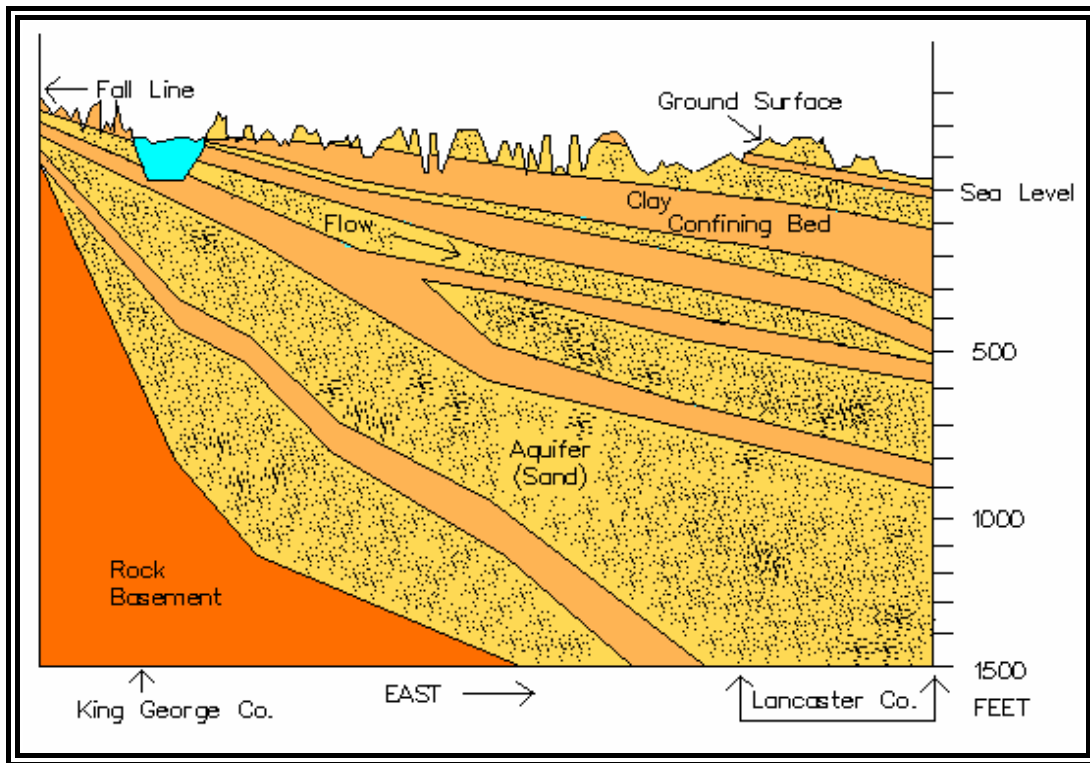
B. GROUNDWATER

Lancaster County's citizens get their water from four aquifers; the Columbia, the Yorktown-Eastover, the Chickahominy-Piney Point, and the Brightseat/Upper Potomac. The Chickahominy-Piney Point and the Brightseat/Upper Potomac are the deeper, confined aquifers. The two deeper confined aquifers also supply other regions of Virginia with water, as well as parts of Maryland. Quality problems exist in the Chickahominy-Piney Point and Brightseat-Upper Potomac aquifers, mainly due to elevated levels of chloride, sodium, and fluoride. Levels of sodium and fluoride are of particular concern in Lancaster County. Sodium levels in the artesian aquifers are elevated in the entire county with the highest levels near White Stone and going towards Windmill Point. Patterns of fluoride levels are more random, but tend to be high throughout the County.

Each of the four aquifers has a particular recharge area. The Columbia Aquifer recharges from the ground surface in Lancaster County. The County has some influence through land use controls on protecting these areas. The Yorktown-Eastover Aquifer recharges at the outcrop of this aquifer in the western part of Lancaster County. Again, the County has some control over the protection of these areas through land use ordinances. This area is of particular importance because the Yorktown-Eastover Aquifer is the primary supply of drinking water for the Eastern Shore of Virginia. Lastly, the two deeper aquifers, the Chickahominy-Piney Point and the Brightseat-Upper Potomac, primarily recharge at their outcrop areas just east of the fall line. They also recharge to a lesser degree through vertical leakage from the water table aquifers. However, the outcrop recharge areas are located near Westmoreland, King George, and Stafford Counties, and the City of Fredericksburg. The Groundwater Management Study Committee, under the direction of the Northern Neck Planning District is developing methods to protect the recharge areas.

Locally, Lancaster County can act to protect the two water table aquifers. The Columbia is the principal water table aquifer, and the Yorktown-Eastover is the secondary aquifer. The main users of the water table aquifers are owners of shallow wells. The water table aquifers are the most susceptible to pollution, and the recharge area is the land above the aquifers in Lancaster County. Direct threats include septic systems, underground storage tanks, improper disposal of hazardous home waste (oil, gas, etc.), and abandoned, uncapped wells. Additionally, recharge areas can be affected by large areas of impervious cover, local drainage patterns, vegetation, and drought conditions. Lastly, the highest concentrations of shallow well, water table aquifer users are most likely found in the older developed areas of the county.

On the surface there appears to be an adequate supply of groundwater for the immediate future. However, recent studies conclude that regional drawdowns due to heavy pumping of deeper, confined aquifers should cause concern and warrant further study. This study should include specific plans for a more diverse water supply to include the use of surface water, or reservoirs.



III. POTABLE WATER SUPPLY PLAN

A. GROUNDWATER

1. Water Table Aquifers

In Lancaster County, the water table aquifers are those most susceptible to contamination. Failing septic systems, agricultural fertilizers, hazardous home wastes, etc. can act to pollute water table aquifer resources. Furthermore, no regular water quality testing is done on these shallow wells to determine present areas of contamination. Therefore, it is strongly recommended that a parcel specific inventory be taken of homeowners utilizing shallow wells for their drinking water supply. After the inventory is completed, parcels with shallow wells in high septic system and agricultural areas will be targeted for water sampling. Available outside resources for water quality testing will be explored and pursued. When funds are obtained, a series of water samples will be taken to see if these shallow wells are contaminated by fecal coliform, organic and inorganic chemicals, and nitrates or some other foreign matter. Determine of contamination of water will be based on MCL's, as specified in the Waterworks Regulation. Areas with large numbers of contaminated wells will be targeted for local water system improvements and homeowner education.

If there are existing clusters of contaminated wells, it is recommended that outside funds again be pursued for improvements to these wells or replacement with shared artesian systems. If a new well is created, it is recommended that a blanket well user agreement be established for users wanting to switch to the new well. This agreement will be a legally binding document that each homeowner signs. The agreement will assure that homeowners are fully responsible for their fair share of maintenance or repair costs for the new well system. This will hopefully reduce any future disagreements over who is financially responsible for any well maintenance or repairs.

2. Abandoned Wells

The county should undertake a parcel specific inventory of all abandoned wells in the county. After wells are identified, an informative mailing will be prepared to send to each property owner with an abandoned well. The mailing will caution owners to protect the well area and not to use it for disposal of solid or liquid waste. Furthermore, it will ask the owners if they would be interested in participating in a countywide permanent well abandonment.

The County will launch an intensive campaign on well care and pursue grants for upgrading wells. Wells which were constructed after 1992 should be fitted with a seal under the well cap.

A project to properly cap existing wells or abandon wells would utilize available outside funding offered. The county would explore sources of such funding and apply for any available amounts.

3. Household Hazardous Waste Collection Day

To provide further protection to the County's groundwater resources it is recommended that Lancaster County establish a semi-annual Household Hazardous Waste Collection Day. This event could be held at the existing solid waste refuse sites. To sponsor such an event, the County would have to hire a certified waste disposal contractor who would have proper authorization to handle and dispose of this type of waste. The event would be widely marketed to the public and on this particular day, Lancaster County residents would be allowed to properly dispose of household hazardous waste. This type of event is offered by other localities and provides an alternative disposal option for residents with this type of waste.

4. Groundwater Management Area (GMA)

It is recommended that Lancaster County actively support efforts to have the Eastern Virginia Groundwater Management Area extended through Middlesex County and the Northern Neck. This would ensure that future entities that wish to withdraw large amounts of water would be required to seek a permit and report to the Virginia Department of Environmental Quality. See Appendix A for a map of the current Eastern Virginia GMA.

The County will also encourage conservation efforts on the part of current and future users. Any future golf courses will be required to develop plans that include surface or recycled water sources for their needs rather than being totally dependent on groundwater withdrawals.

5. Drilling Test Monitoring Wells

To expand existing knowledge of the groundwater resources of Lancaster County and the Northern Neck, it is proposed that the County endorse previous recommendations made by the Department of Environmental Quality (then the State Water Control Board) to establish monitoring wells in Lancaster County and the Northern Neck. Specifically, it is recommended that a monitoring well be developed to track the possible inland migration of elevated sodium, chloride, and fluoride levels in the White Stone, Palmer, Foxwells, Windmill Point area. Understanding water quality problems in the southeastern part of the County is vital to assure protection of less affected supplies located nearby in the more densely populated areas in and around Kilmarnock. Additional monitoring wells may be desirable to provide a more adequate information base on the decline of water in the artesian aquifers and possible tapping of deeper aquifers.

6. Regional Water System Plan

To prepare for the coordination and efficient use of the future water supply in Lancaster County, it is recommended that the County support the preparation of a regional water system plan. The State Water Control Board made the original proposal for such a plan in the 1988 Rappahannock Water Supply Plan. The goal was to develop a plan that would encompass the County as well as the Towns of Irvington, Kilmarnock, and White Stone. The plan would emphasize the cost savings of using a coordinated, regional approach to address the future water supply needs, and water quality problems of Lancaster County.

B. SURFACE WATER**1. Inventory Septic Systems**

As part of the effort to assure continued protection of Lancaster County's Surface and Groundwater Resources, it is proposed that the County inventory and map existing septic systems in the County. This effort would help to pinpoint high concentrations of septic systems in the County, which could act cumulatively to deteriorate the quality of Lancaster's surface and groundwater supplies. Information obtained from this inventory would be valuable in developing a future land use map for Lancaster County. Additionally, once compiled this information would aid in any future efforts to identify and prioritize areas for efficient placement of a wastewater treatment plant.

2. Identify Possible Impoundment Areas

Lancaster County shall take action as necessary to ensure that potential reservoir sites are protected for use as such. This step shall take priority in its own right without waiting for any further coordinated efforts.

3. Continue Present Enforcement Levels

To assure continued protection of the quality of Lancaster County's surface water bodies, it is recommended that the County continue its present, active enforcement of the Chesapeake Bay Preservation Act and the Erosion and Sediment Control Acts.

IV. GOALS AND OBJECTIVES FOR LANCASTER COUNTY POTABLE WATER SUPPLY PLAN

GOAL #1: Protect and improve quality of surface waters of Lancaster County to assure their continued benefit to the economy, recreation, and health of the County.

Objective: Continue strict enforcement of the Chesapeake Bay Preservation Act and Erosion and Sediment Control Act Regulations to assure protection of the water quality of the Chesapeake Bay and its tributaries.

Objective: Explore possible water impoundment areas presented in plan for Lancaster County.

Objective: Support strengthened county ordinances to assure protection of proposed impoundment areas.

GOAL #2: Develop methods to prevent groundwater pollution in order to protect the supply of groundwater in Lancaster County and to assure that an adequate future supply exists for the continued growth of the County.

Objective: Organize a hazardous home waste collection day to give residents an opportunity to safely dispose of their waste.

Objective: Inventory all wells in the County for environmental hazards and structural defects. Encourage the upgrading of well structure, removal of environmental hazards near wells, well head protection measures, and regular laboratory analyses of water samples.

Objective: Seek state and federal funding to assist in upgrading wells or installing purification systems.

Objective: Develop a method of collecting waste oil in the county to give residents a safe disposal option.

Objective: Discourage the placement of shallow wells near agricultural operations.

GOAL #3: Develop methods to improve and protect groundwater quality in Lancaster County to assure the continued safe health of the local people and the economy.

Objective: Work in coordination with existing community organizations and the health department in efficiently utilizing existing local resources to improve drinking water quality.

Objective: Endorse regulations by the Virginia Department of Professional and Occupational Regulation that will take effect July 2007, limiting all work on wells to qualified professionals.

- Objective:** Inventory and map active shallow wells in the county to lay groundwork for identification of concentrations of contaminated shallow well, investigate the causes, and recommend appropriate action by homeowners.
- Objective:** Identify possible funding for community well improvements.
- Objective:** Strongly support Department of Environmental Quality proposals to drill test wells in the eastern half of the county to monitor water quality problems. (Track inland movement of dissolved solids; chloride, sodium, and fluoride in groundwater aquifers.)
- Objective:** Support future regional efforts to establish a groundwater management district for the Northern Neck and Middle Peninsula areas of Virginia.
- Objective:** Support preparation of a regional water system plan for the southeastern part of Lancaster County. The plan would encompass the county, as well as the towns of Irvington, Kilmarnock, and White Stone. The plan would emphasize cost savings of using a coordinated, regional approach to address future water supply.

GLOSSARY OF TERMS

Terms and measurements used to further understanding of groundwater quality descriptions are listed and detailed. They have been obtained from the following United States Geological Survey Report:

Water-Resources Investigations Report 92-4175, "Quality of Groundwater in the Coastal Plain Physiographic Province of Virginia." Focazio, Michael J.; Speiran, Gary K.; and Rowan, M. Eileen; U.S. Geological Survey; Richmond, VA: 1993.

Chloride - The U.S. EPA has established a SMCL for chloride of 250 mg/L. (U.S. Environmental Protection Agency, 1990c;) Furthermore, the State of Virginia maintains an antidegradation standard for chloride in groundwater in the Coastal Plain of 50 mg/L (Commonwealth of Virginia, 1988)

Dissolved Solids - This refers to the measure of the concentration of all dissolved material in the water. The U.S. EPA SMCL for dissolved solids is 500 mg/L (U.S. EPA, 1990c). The State of Virginia's antidegradation standard for dissolved solids in groundwater in the Coastal Plain is 1,000 mg/L. (Commonwealth of Virginia, 1988)

Fluoride - The U.S. EPA has established both an MCL of 4.0 mg/L and an SMCL of 2.0 mg/L for fluoride. The State of Virginia enforces a standard of 1.8 mg/L. (Commonwealth of Virginia, 1982)

MCL - This refers to Maximum Contaminant Levels, which is a U.S. Environmental Protection Agency (1990a) designation. Reported MCL's are set for health concerns. This is the maximum permissible level of a contaminant in water that is delivered to any user of a public-water system. These levels are enforceable.

SMCL - This refers to Secondary Maximum Contaminant Levels, which is a U.S. Environmental Protection Agency (1990a) designation. Reported SMCL's are set for aesthetics (such as taste or odor) or for limits on properties that affect use of the water (such as chemical aggressiveness, or potential for the water to deposit solid chemicals). These levels are not enforceable.

Sodium - Presently, there are no Federal drinking water regulations concerning sodium; however, the State of Virginia maintains an antidegradation standard for sodium in groundwater in the Coastal Plain of 100 mg/L. The State also advises that persons on sodium-restricted diets avoid drinking water with sodium concentrations greater than 20mg/L, if the restriction is severe, and 270 mg/L, if moderate.

CHAPTER 4

I. LANCASTER COUNTY SHORELINE PROTECTION STUDY AND PLAN

Lancaster County is a coastal community that has, as previously stated, over 264 miles of tidal shoreline. The environment created by this interaction between the land and water along the County's coasts has helped to form our community's identity. Residents who want to live in a scenic setting, citizens who come to the water for recreation, and watermen who earn a living off the rich resources found here value this area of land and water. The high value that is felt by Lancaster County's citizens for their shoreline is reflected in their desire and actions to protect this area.

However, the action of people to protect the natural shoreline can act to disrupt the delicate natural balance that exists here. Understanding this balance can help decision makers and property owners make the most informed and best possible decisions concerning the protection of the shoreline. This is the goal of the Lancaster County Shoreline Protection Study and Plan.

The Lancaster County Shoreline Protection Study and Plan addresses the issues and policies concerning shoreline erosion protection and control measures in Lancaster County. The study will first investigate the existing shoreline condition and erosion situation in Lancaster County and the plan will then make recommendations based on those findings. The plan will attempt to balance all the factors present when considering shoreline erosion; the natural forces of erosion, the present shoreline condition, the type of water body, and the property owner.

The first key in understanding Lancaster County's shoreline situation is to determine how much of the shoreline is eroding and where these sections of shoreline are located. After areas of erosion are determined, the reasons for erosion have to be considered. Lastly, property owners' responses to erosion problems, such as alteration of their shoreline, have to be investigated as to their effectiveness and the impact of their efforts.

A. EROSION RATES

The Virginia Institute of Marine Science has created three different categories to group shoreline erosion. The first group is Slight/None, which describes shoreline that is eroding at a rate of less than 1 foot per year. The second group is Moderate, which is shoreline that is eroding at the rate of 1 to 3 feet per year. The third group is Severe, which is shoreline that is eroding at a rate of 3 or more feet per year. Lastly, to suit the needs of the County's Plan, an additional category -- Accretional -- has been added to describe shoreline area that is actually building or increasing over time.

The 2001 Lancaster County Shoreline Situation Report completed by the Virginia Institute of Marine Science grouped the County's waterfront parcels into categories based on their shoreline situation. The results are detailed below:

Slight/None

83%

Moderate	11%
Severe	5%
Accretional	2%

This same report also divides the County into four segments. Highest erosion is in Segment 1 that includes Bay shoreline with rates ranging from 1.6 to 7.9 feet per year. Erosion in remaining segments ranges from 0.0 to 5.1 feet per year. In the 100-year period prior to the first Shoreline Situation Report, 792 acres had eroded from the 43 miles of Bay Shore and 561 acres from the 125 miles of river shore.

B. EROSION FACTORS

1. Fetch and Water Body Energy

The distance wind and waves travel across open water before they reach land is called the "fetch." For example the fetch across the Chesapeake Bay is over 20 miles in the parts of Lancaster County along the Bay. The fetch across most tidal creeks in Lancaster County ranges from a few hundred feet in the upper reaches to ½ to 1 mile near the creeks' mouths. The fetch is important because it is a major factor in the amount of energy a water body generates. The greater the fetch, the greater the amount of wave energy and the greater the potential for erosion.

Low Energy Water Bodies

This category includes the inland part of all the tidal creeks, coves, and upper reaches of rivers in Lancaster County including the following:

Indian Creek	Myer Creek
Dymer Creek	Whitehouse Creek
Tabbs Creek	Greenvale Creek
Antipoison Creek	Deep Creek
Oyster Creek	Mulberry Creek
Mosquito Creek	Lancaster Creek
Carter Creek	Upper Eastern Branch
Taylor Creek	Moran Creek
Upper Western Branch	

Medium Energy Water Bodies

Main Branch Corrotoman River
 Mouths of Tidal Creeks along Main Branch of Corrotoman River
 Little Bay
 Rappahannock River above Towles Point
 Mouths of Tidal Creeks along Rappahannock River above Towles Point

High Energy Water Bodies

Mouth of the Corrotoman River

Rappahannock River Below Towles Point
Mouths of Tidal Creeks along Rappahannock River Below Towles Point
Fleets Bay
Chesapeake Bay
Mouths of Tidal Creeks along Chesapeake Bay

2. Boat Traffic and Wake

Wakes caused from boat traffic can greatly worsen erosion on adjacent shoreline. Effects of boat wakes are generally greater in narrow water bodies where the resulting wake has less area to dissipate before it reaches the shoreline and in areas where there is a large amount of boat traffic. Generally, wakes tend to dissipate over larger distances such as major rivers and bays. However, in narrow stretches of water the shoreline usually absorbs the impact of the boat wake.

Heavy boating areas in Lancaster County include Carters Creek, the Rappahannock River, the main branch of the Corrotoman River, Fleets Bay, and the Chesapeake Bay. Medium areas of boating activity include Myer Creek, Lancaster Creek, Greenvale Creek, Whitehouse Creek, Indian Creek, Dyer Creek, Tabbs Creek, and Antipoison Creek.

3. Existing Shoreline Condition

a. Topography and Soil Type

The topography of the shoreline plays a large role in how the shoreline erodes. Large shoreline bluffs adjacent to the water can be threatened by wave scour at their base and seepage of groundwater along their faces. The base of the bluff is weakened and soil that is saturated with groundwater collapses downward and "sloughs off." This trend will continue until the bluff's base is protected and the face is stabilized.

Steep areas along many upper reaches of Lancaster County's tidal water and shoreline are stable only until they are disturbed by development. These areas, which can be difficult to re-stabilize, tend to be present where there is the existence of steep land and sandy soils. Sandy soil types are found throughout Lancaster County and make up approximately 28% of the county's soil. These soils are generally found along natural drainage courses along upper or inland reaches of tidal creeks and smaller tidal rivers.

b. Natural Protection

Existing vegetation along the shoreline can act to stabilize erosion of the shoreline.

Additionally, wetlands adjacent to the shoreline can act as a buffer or baffle which can protect the shoreline. Barrier island beaches and sand spits can also act to absorb wave energy before it reaches the shoreline of the mainland. Lastly, Submerged Aquatic Vegetation can act to slow and dissipate wave energy before it reaches the shore.

c. **Man-made Protection**

Altered shoreline can act to prevent erosion at the point where the shoreline is altered. However, the alteration of the shoreline in one location usually acts to increase erosion in areas down drift of the altered shoreline area. Natural erosion of land results in sediment loss that acts to nourish down drift shoreline. When a shoreline is altered, this natural supply of nourishment is lost.

C. SHORELINE ALTERATION

Shoreline is altered by the construction of erosion protection structures on, adjacent to, or abutting the shoreline. These artificial stabilization structures include bulkheads, revetments, breakwaters, groins, and jetties.

Alteration of the shoreline can have positive and negative impacts. Positive impacts are the stabilization of severely eroding land, protection of endangered structures, and the protection of surface water quality. Negative impacts include possible down drift erosion, loss of wetlands, and a disruption of natural shoreline processes. Negative impacts are often magnified as the amount of altered shoreline rises. Increased alteration can also result in a further loss of natural balance in the shoreline environment.

In 1978, 14 miles or 73,920 feet (5%) of shoreline was artificially stabilized in Lancaster County. The 1994 Lancaster County Shoreline Inventory completed by the Northern Neck Planning District Commission showed that 28.7 miles or 151,620 feet of shoreline had been altered in Lancaster County by 1993. By 2006, 73.12 miles of shoreline (23.1% of the total) had been altered. While the trends for shoreline stabilization using almost exclusively hard methods accelerated in the last ten years, there is an indication that more property owners are turning to green or “soft” solutions for shoreline protection as knowledge and commercial availability of these solutions has increased.

High areas of altered Shoreline in Lancaster County include:

1. Morattico
2. Monaskon
3. Main Branch Corrotoman
4. Mouth of Corrotoman/Weems
5. Carter Creek
6. Palmers/Brightwater
7. Windmill Point and Marina Area
8. Norris Bridge area

Source: Lancaster County Shoreline Situation Report, Virginia Institute of Marine Science, Gloucester Point, VA, June 2001.

D. TYPES OF SHORELINE PROTECTION

1. Dunes

Dunes are a natural form of shoreline protection. They are basically a ridge or mound of loose, wind-blown material, such as sand. Dunes are very effective when vegetated.

However, dunes must be protected from foot and vehicular traffic. In Lancaster County, there are several isolated areas of sand dunes, all of which are on private property.

The larger areas of dunes in Lancaster County are generally found along the lower Rappahannock River and the Chesapeake Bay, including parts of Fleets Island and Deep Hole Point. Smaller dune areas are found scattered throughout the County and are usually adjacent to higher energy water bodies. Access to dune areas in Lancaster County is through private property or state-owned waters. Therefore, vehicular traffic is very limited with access available only to property owners with dunes on their land. However, pedestrian access to dune areas is not as limited; both individual property owners and boaters generate traffic. Realistic methods of minimizing negative impacts of pedestrian traffic in dune areas, which also recognize the Chesapeake Bay Preservation Act's allowances for access to state waters, need to be further explored in Lancaster County. Possible protection methods could include the requiring of raised walkways over dunes and other environmentally sensitive features when considering future development.

2. Vegetation (Fringe Marsh Establishment)

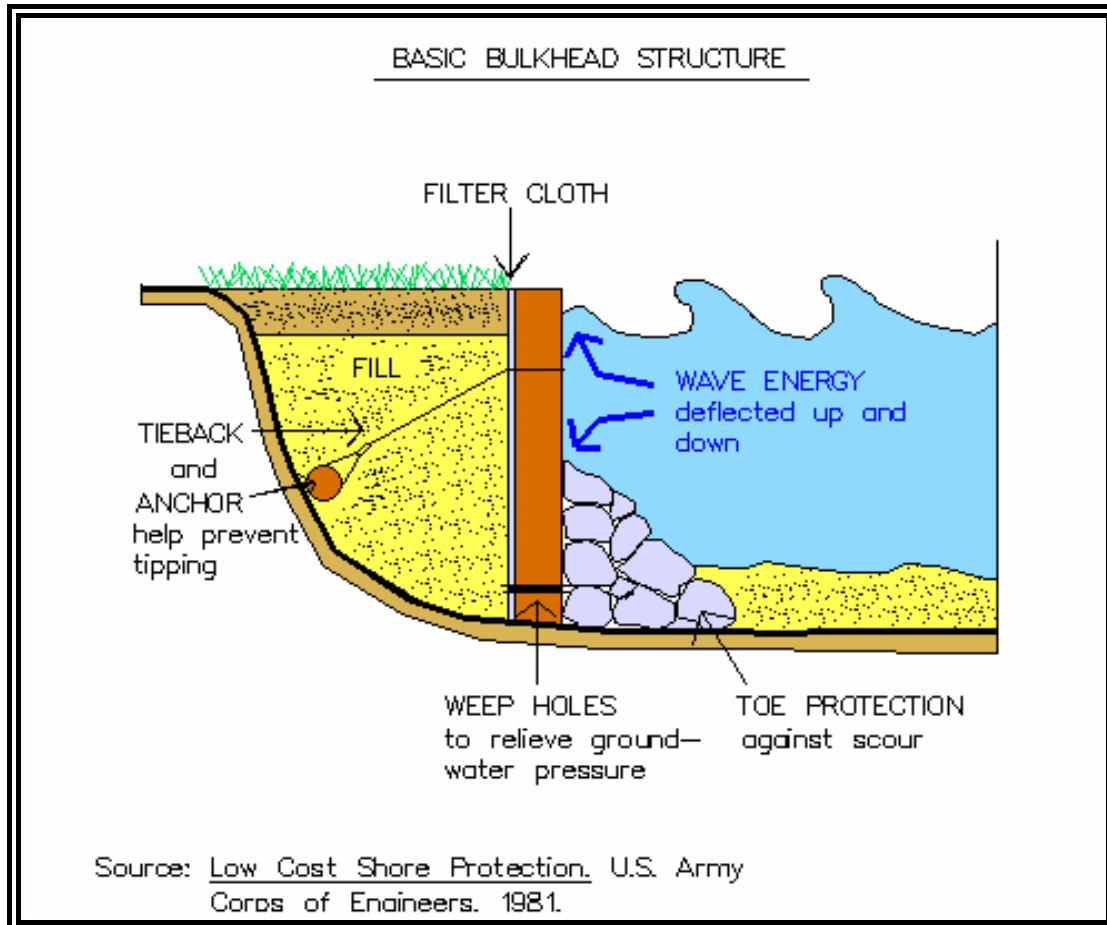
Vegetative shoreline protection is usually limited to creeks, smaller rivers, coves and partially protected shorelines where there are smaller fetches, and therefore less wave energy. Fringe marsh establishment is an environmentally sound shoreline protection alternative that is far less expensive than other commonly used methods for shoreline erosion protection and often requires no permits.

Many shoreline areas in Lancaster County are ideal for fringe marsh establishment. Often, previous fringe marsh in these areas has died due to boat wakes, the long-term effects of wave action, and the blocking of sunlight by large overhanging trees. The result is that a bank starts to erode where vegetative buffer existed before. Establishment of a new marsh fringe can reverse this erosion situation.

Fringe marshes have many desirable impacts. First, an established marsh traps sand moving with the tide and helps maintain a suitable marsh elevation. Additionally, fringe marsh acts as a baffle, which diminishes wave energy in the vegetated area before it reaches and erodes the upland bank. Fringe marshes also act to enhance water quality and wildlife habitat. Finally, fringe marsh is by far the most inexpensive method of shoreline protection.

3. Bulkheads and Seawalls

Bulkheads and seawalls protect banks and bluffs by completely separating the land from



the water. Bulkheads act as retaining walls keeping the earth or sand behind them from crumbling or slumping. Seawalls are primarily used to resist wave action. Construction of bulkheads and seawalls can act to hasten erosion of beach areas immediately in front of the structures. This is because the structures redirect wave energy downward to the toe and beach areas. Bulkheads and seawalls are most appropriate where fishing and boating are the primary uses of the shore. They would not be appropriate on gently sloping beach areas.

4. Breakwaters

Breakwaters are structures placed offshore to diminish the energy of incoming waves. Larger breakwaters are suitable for protection of deep harbors. Individual property owners can use much smaller breakwaters to protect their shoreline. Breakwaters in this category are usually one to three hundred feet offshore in relatively shallow water and are designed to protect a gently sloping beach. Additionally, after wave energy is dissipated, sandy drift material can then be deposited behind the breakwater and act to build up the beach or protected shoreline.

Breakwaters must be properly designed. If they are too high they can interfere with natural shoreline processes, and if they are too low the shoreline will be inadequately protected. Breakwaters are also prone to scour, so the toe of the structure must be protected. Lastly, breakwaters can have negative impacts on neighboring or down shore properties. Drift material trapped by breakwater can stop renourishment of down shore shoreline.

5. Groins

Groins are structures that extend, finger-like, perpendicularly from the shore. Groins are usually constructed in groups called fields. The primary purpose of a groin is to trap and retain sand, nourishing the beach compartments between them. Groins are designed to interrupt the long shore transport of littoral drift. They are more effective where long shore drift is predominantly in one direction. If not properly placed, groins can decrease nourishment of downdrift shore, resulting in erosion of that shore.

Groins are suitable erosion control measures where a beach is desirable, and they are compatible with most recreational activities. Sand trapped by groins eventually provides a buffer between incoming waves and backshore and inland areas. The waves break on the new beach and expend most of their energy there. Groins are effective protection during normal weather conditions but offer only limited protection against storm-driven waves.

6. Revetments

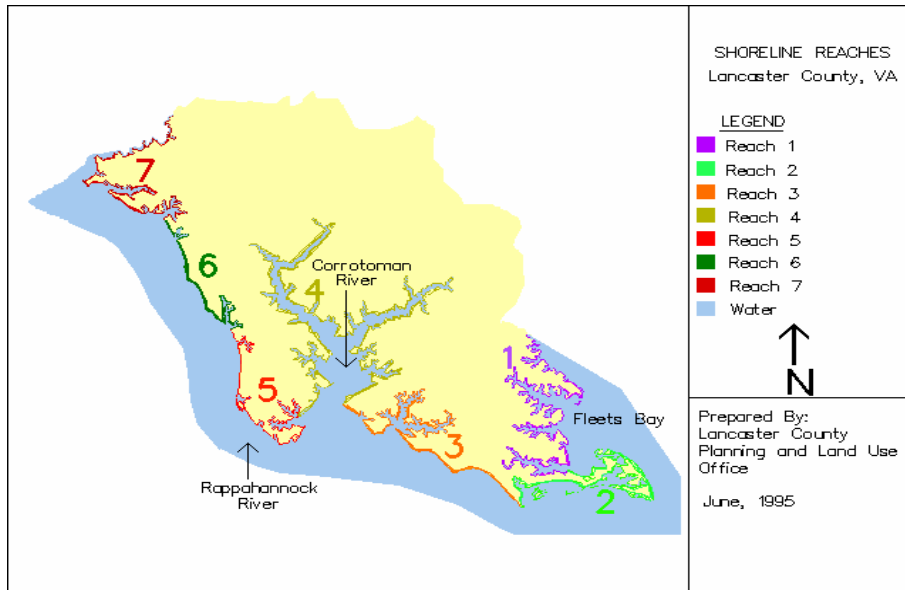
Revetments are structures placed on banks or bluffs in such a way as to absorb the energy of incoming waves. The most common type of revetment used in Lancaster County is the rip-rap. Revetments are usually constructed to preserve the existing use of the shoreline and to protect the slope. Like seawalls, revetments armor and protect the land behind them. Additionally, depending on construction materials, revetments can be either watertight or porous. Porous revetments are most desirable because they can act to further diminish wave energy, while allowing less wave energy to be reflected off of the structure's surface to beach or marsh areas in front of the structure.

Most revetments do not act to interfere with transport of littoral drift. Furthermore, they do not act to redirect wave energy to unprotected areas, except for beaches immediately in front of the structure. However, protecting previously eroding land cuts off the supply of the eroding material that before acted to nourish down shore beaches. This causes downshore beaches to have less nourishment and can result in their eventual erosion.

Revetments must be built with armor material sufficient enough to withstand storm conditions prevalent in the area being hardened. Undersized armor rocks or material will cause the revetment to fail. The toe or base of the revetment should be buried or protected to prevent scouring of the structure. Revetments also should be built on gentle slopes with 2 to 4 feet of run for every foot of rise. Lastly, failure to tie the revetment structure back into the shoreline can result in flank erosion around the structure, because the flank area now receives no up shore nourishment from the now protected shoreline.

E. EXISTING CONDITION OF LANCASTER COUNTY SHORELINE

For purposes of study, the Virginia Institute of Marine Science (VIMS) has grouped Lancaster County's shoreline into like sections called reaches. Reaches are sections of shoreline sharing similar topographic and physical characteristics. There are seven reaches in Lancaster County and their locations can be seen on the "Shoreline Reaches" map. Below is a summary of the seven reach segments in Lancaster County. The reach summaries have been compiled from information found in VIMS' Shoreline Situation Report for Lancaster County.



1. Reach 1

Reach 1 is approximately 55 shoreline miles in length and extends from Indian Creek to the southern mouth of Antipoison Creek (See Reach 1 Map). Included in this reach is all shoreline along Indian, Dymmer, Tabbs, and Antipoison Creeks; as well as the shoreline fronting Fleets Bay. Shoreline topography in this reach is described below:

Shore Form

- 98.2% Low Shore
- 1.4% Low Shore with Bluffs
- 0.4% Filled Fastland

Shoreline Type

- 78% Fringe Marsh
- 8% Beach
- 12%* Artificially Stabilized
- 1% Embayed Marsh
- 1% Extensive Marsh

* Estimated

The shoreline in this reach is prone to flooding during coastal storms due to its low elevation. High storm waters would inundate all structures below 5 feet in elevation. Areas of beach in Reach 1 are generally of good quality. Considering erosion, areas of severe erosion exist along the Fleets Bay shoreline between Indian and Dymmer Creek (6.6 feet/year) and the Bay front near Tabbs Creek (5.6 to 6.0 feet/year). Additionally, one area north of the Tabbs Creek mouth is accreting at a rate of 1.6 feet per year. All other shoreline areas in this reach, particularly along the creeks, have slight or no change due to erosion.



2. Reach 2

Reach 2 is approximately 37 miles in length and extends from the southern mouth of Antipoison Creek, around Windmill Point, and back to Mosquito Point on the Rappahannock River (See Reach 2 Map). Included in this reach are the shoreline areas along Little Bay, Fleets Island, Windmill Point Creek, Oyster Creek, the Rappahannock River and Mosquito Creek. Shoreline topography in this reach is detailed below:

Shore Form

99%	Low Shore
1%	Low Shore with Bluffs

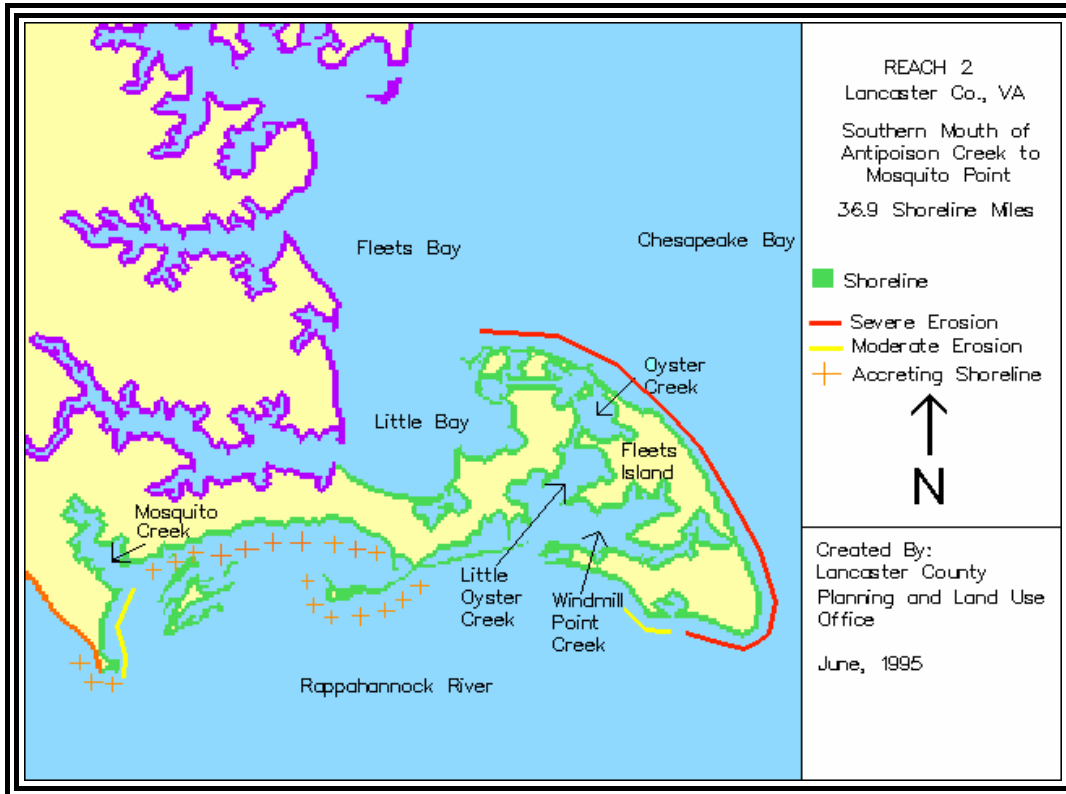
Shoreline Type

34%	Fringe Marsh
25%	Extensive Marsh
16%	Beach
21%*	Artificially Stabilized
5%	Embayed Marsh

* Estimated

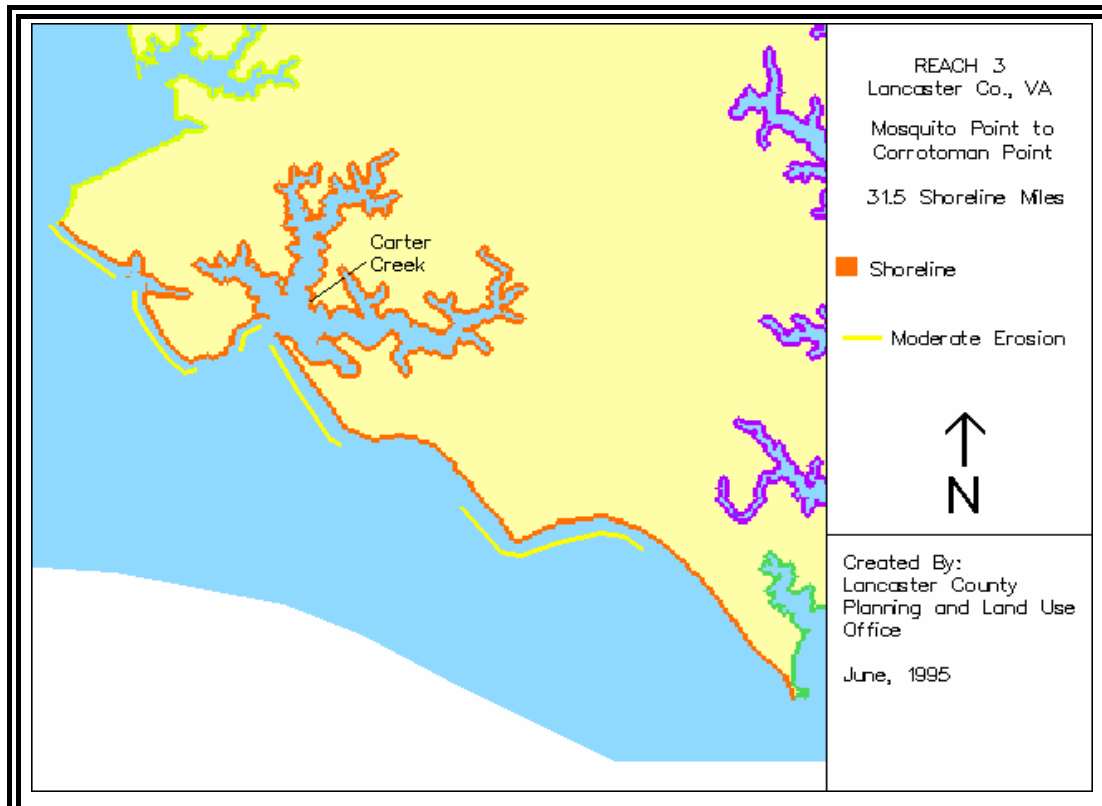
The shoreline in Reach 2 is very low and susceptible to flooding. The majority of the structures in this area are situated 5 feet or less in elevation and would be flooded during periods of high storm water. Beach quality in this reach ranges from poor to excellent. Very good beach areas exist along stretches of Fleets Island and between Windmill Point to Windmill Point Creek. Erosion in Reach 2 is severe from North Point to Windmill Point Marina (2.9 to 7.9 feet/year). Moderately eroding shoreline is found from Mosquito Creek to Mosquito Point (2.7 feet/year). Lastly, accreting shoreline is found between the mouths of Windmill Point Creek to Mosquito Creek (1.5 feet/year).

3. Reach 3



Reach 3 is approximately 31.5 miles long and is comprised of all the shoreline from Mosquito Point to the mouth of the Corrotoman River. Include in this reach is all the shoreline along Carter's Creek from Crab Point to Weems. Shoreline topography in this reach is presented below:

Shore Form	
34%	Moderately Low Shore with Bluffs
22%	Low Shore
20%	Moderately Low Shore
12%	Low Shore with Bluffs
7%	Moderately High Shore
4%	Moderately High Shore with Bluffs
1%	Filled Fastland



Shoreline Type	
50%	Fringe Marsh
19%	Beach
25%*	Artificially Stabilized
6%	Embayed Marsh

* Estimate

The majority of this shoreline area is considered a low flood hazard area. The exceptions are structures built in low elevation areas at White Stone Beach and at the creek mouths. Those sections are high risks for flood hazards. Over 50% of the shoreline in Reach 3 is comprised of bluffs. Shoreline bluffs can be susceptible to erosion at their base from scour, on their surface from drainage patterns, and in the area in between through groundwater seepage.

Beach quality in Reach 3 ranges from poor to good. Good beaches are present from Mosquito Point to Crab Point. Erosion rates in Reach 3 vary from slight or none, to moderate. Moderately eroding shoreline areas are found along the Rappahannock River (1.5 to 1.7 feet/year, around Weems (1.1 feet/year), and at the mouth of the Corrotoman River (1.2 to 1.6 feet/year). Areas of slight or no erosion are found in Carter's Creek.

4. Reach 4

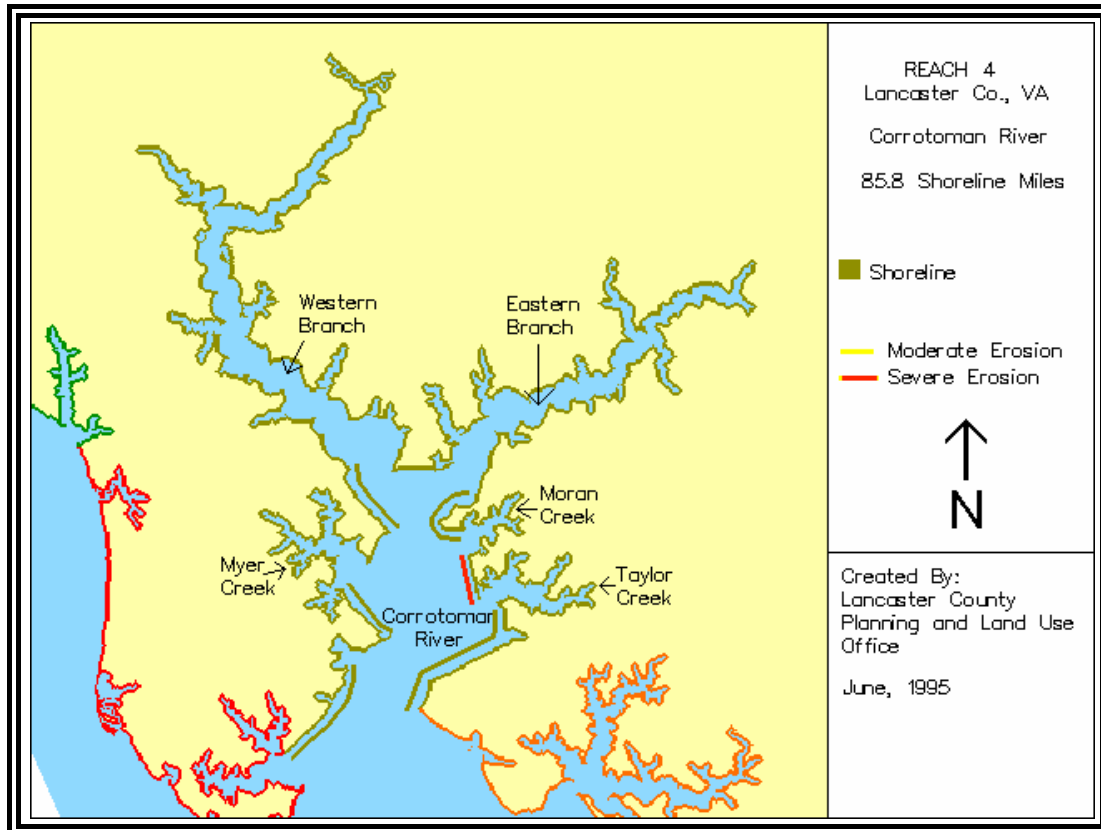
Reach 4 is approximately 85.8 miles in length and covers the entire length of the Corrotoman River. Included in this reach are the Eastern and Western Branches of the

Corrotoman River; and Taylor, Myer, and Moran Creeks.

Shoreline topography in this reach is described below:

Shore Form

57.4%	Moderately Low Shore
17.6%	Low Shore
9.7%	Moderately Low Shore with Bluffs
9.4%	Moderately High Shore
3.5%	Low Shore with Bluffs



2.3%	Moderately High Shore with Bluffs
0.1%	Filled Fastland

Shoreline Type

65%	Fringe Marsh
19%	Embayed Marsh
6%	Beach
*10%	Artificially Stabilized

* Estimate

The majority of Reach 4 is a low flood hazard area. The exceptions are the few structures built below 5 feet elevation and the road located on the northern side of the mouth of Taylor's Creek. The quality of the beaches in this reach is poor. The exception is the beach at Bar Point that is fair in quality. Almost the entire beach length has erosion rates

of slight or none. However, moderate erosion rates can be found from Ottoman Wharf to Bar Point (1.0 feet/year), at Black Stump Point (1.7 feet/year), and on the West Bank of the Main Branch of the Corrotoman River (1.7 to 1.9 feet/year). Additionally, one area with severe erosion rates exists on the Corrotoman River between Taylor and Moran Creeks (5.1 feet/year), but the situation appears to have been stabilized by placement of effective shoreline protection structures.

5. Reach 5

Reach 5 is approximately 25 miles in length and stretches from the mouth of Whitehouse Creek on the Corrotoman River to the mouth of Belmont Creek on the Rappahannock River. Included in this reach is all the shoreline along Ewells Prong, Whitehouse Creek, Wyatt Creek, Beach Creek, and Paynes Creek. Shoreline topography in this reach is detailed below:

Shore Form

64%	Low Shore
28%	Moderately Low Shore
6%	Moderately Low Shore with Bluffs
2%	Low Shore with Bluffs

Shoreline Type

73%	Fringe Marsh
15%	Embayed Marsh
6%*	Artificially Stabilized
6%	Beach

* This is a 1978 figure that has probably doubled in the last 15 years.

Almost 65% of Reach 5 shoreline is low-lying, making the reach prone to flooding from coastal storms. One area of particular concern is the shoreline around Beach Creek. Most of the beach quality in the reach is considered poor with the exception of some good quality beaches found along Beach Creek. Erosion rates in reach 5 range from slight or no change to moderate. The moderately eroding shoreline is found from the southern mouth of Whitehouse Creek to Towles Point, and along the Rappahannock River from Towles Point to Belmont Creek. Lastly, there is slight or no erosion along the creek shorelines in this reach.

6. Reach 6

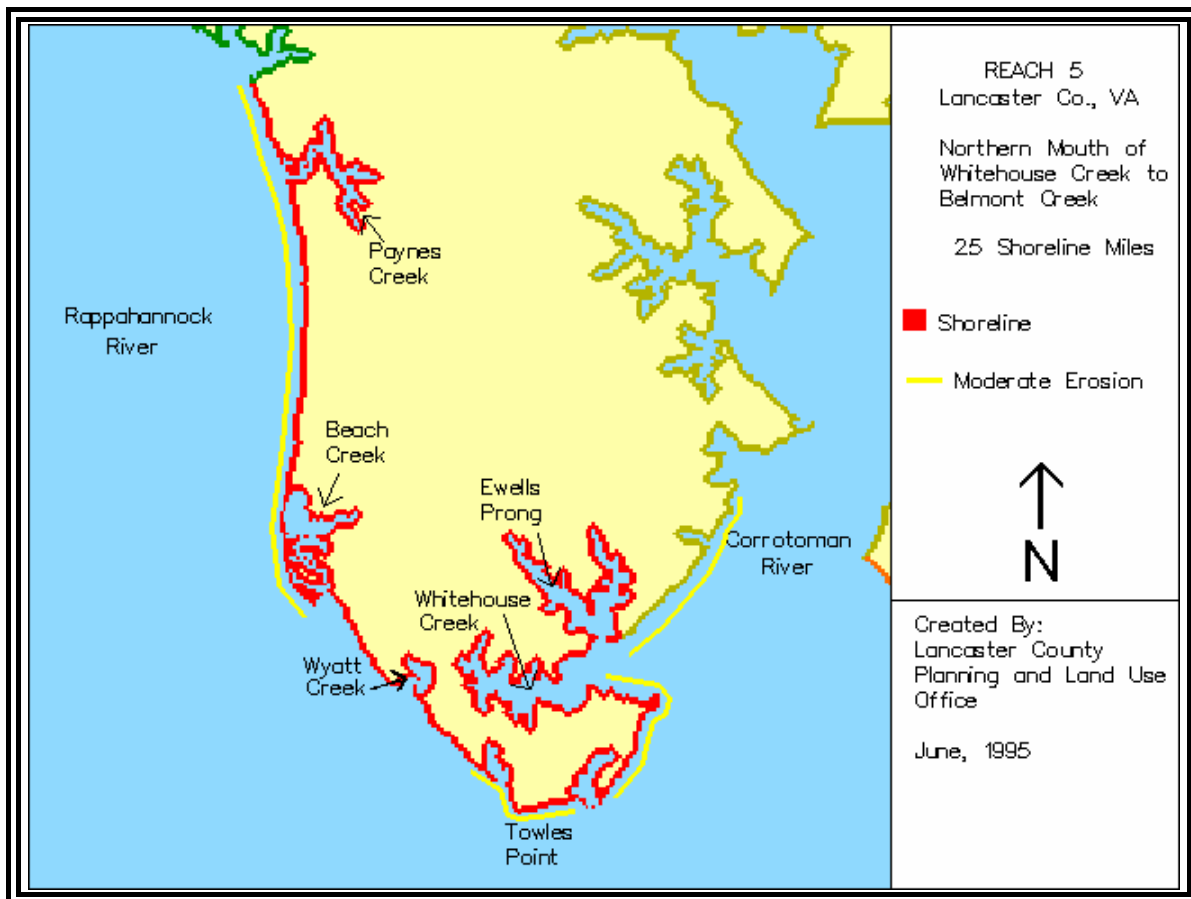
Reach 6 is approximately 14 miles long and runs from Belmont Creek to Deep Creek. This reach includes shoreline along the Rappahannock River, Belmont Creek, Greenvale Creek, and Midway Creek. Shoreline topography in this reach is presented below:

Shore Form

- 49% Moderately Low Shore
- 41% Low Shore
- 5% Moderately Low Shore with Bluffs
- 3% Filled Fastland
- 2% Low Shore with Bluffs

Shoreline Type

- 36% Fringe Marsh
- 35%* Artificially Stabilized



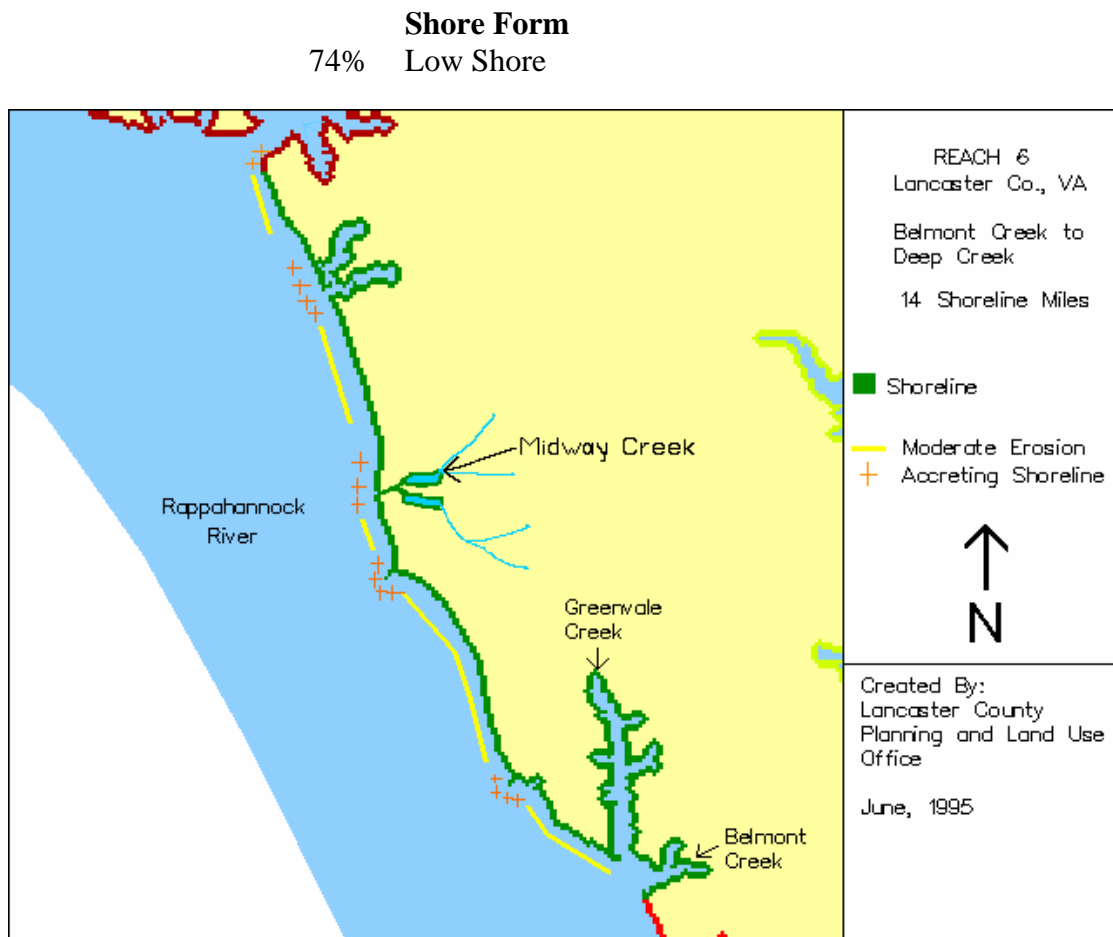
- 15% Beach
- 14% Embayed Marsh

* Estimate

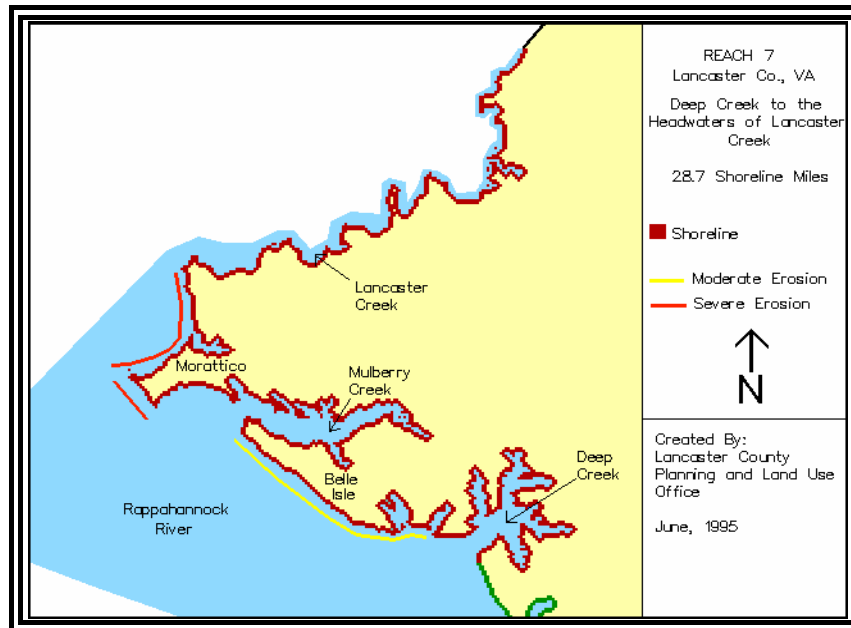
Flood hazards along Reach 6 range from low to moderate. The shoreline from Belmont Creek to Midway Creek has elevations above 5 feet and is not in danger of flooding. However, the shoreline from Midway Creek to Deep Creek is moderately at risk to flooding from coastal storms due to the many structures built very close to the shoreline. Beach quality in Reach 6 is generally considered poor. Erosion rates in Reach 6 vary from slight or none to moderate. The Rappahannock River from Greenvale Creek to Midway Creek has an erosion rate of 1.4 feet/year to 1.7 feet/year. However, there are some minor areas of accretion in this same section. Additional erosion occurs along the Rappahannock River from Midway Creek to Deep Creek at a rate of 1.3 to 2.9 feet/year. The exceptions in this section are accreting areas at the mouth of Deep Creek and near Midway Creek.

7. Reach 7

Reach 7 is approximately 28.7 miles long and extends from Deep Creek to the headwaters of Lancaster Creek. Included in this reach is Deep Creek, Belle Isle, Mulberry Creek, Morattico, and the Lancaster County side of Lancaster Creek. The shoreline topography in this reach is detailed below:



26% Embayed Marsh
9% Extensive Marsh



12%* Artificially Stabilized
2% Beach

* Estimate

Flood hazards in this reach are high for areas around Belle Isle and Morattico, but are low for Lancaster Creek. Beach quality in Reach 7 ranges from poor to fair. The fair beaches are located around the mouth of Mulberry Creek. Erosion rates for Reach 7 are slight or none along the creek shorelines, moderate along the Rappahannock River side of Belle Isle (2.5 feet/year), and Severe near Morattico (3.1 to 4.4 feet/year). However, much of the Morattico shoreline has been stabilized with shoreline protection structures.

II. ASSESSMENT OF EXISTING CONDITIONS

Lancaster County is fortunate to have a large amount of tidal shoreline and related natural resources. As this shoreline area becomes more developed, proper management of this resource will be required to preserve its attractive qualities. The first part in the management process is recognizing the natural dynamics that shape the County's shoreline. The second part in this process is to understand how man's actions can positively or negatively impact these resources. Lastly, proper management requires balancing the natural shoreline processes with man's interaction in order to reach the goal of a protected, but enhanced environment.

Several areas of Lancaster County have historically experienced severe shoreline erosion including areas along Fleets Island, Fleets Bay, Morattico, and the Main Branch of the Corrotoman River. Also several areas of the County have historically been impacted by

moderate shoreline erosion including, much of the shoreline along the Rappahannock River and the Main Branch of the Corrotoman River. There are many reasons for this shoreline erosion including the fetch and energy of the particular body of water, the topography and condition of the existing shoreline, the previous alteration of the shoreline, and wakes caused by boats.

While necessary in high wave energy areas, the cumulative impact of shoreline hardening in Lancaster County should be a cause for concern. The result of further alteration of the County's shoreline could be a continued loss of shoreline wildlife habitat, a non-uniform shoreline with spotty and unpredictable patterns of erosion and an increase in the loss of wetlands and beach areas.

As a separate but related consideration, Lancaster County has a limited system of non-intermittent and intermittent streams that feed tributary waters. Because of the topography of Lancaster County, erosion along the banks of these streams is virtually nonexistent. All streams have less than two feet of drop from their source to the point they enter tributary waters. As a result, under normal flow conditions, there is no opportunity for water to gain velocity that could cut banks. In periods of high rain where much greater levels of flow occur, the increased flow tends to spread over heavily vegetated stream basins, dissipating velocity while creating little or no erosion in the basin or on the banks. The fact that the highest point in Lancaster County is no more than 100' in elevation above adjacent streambeds is significant. There is therefore little opportunity for stormwater to gain velocity as it runs off land adjoining streams. Finally, most development in Lancaster County is concentrated around tidal waters.

III. SHORELINE PROTECTION PLAN

A. EQUAL SITE SITUATION

Individual property owners must review all shoreline protection alternatives and decide upon the protection method most suitable for their shoreline. In many cases protection methods such as fringe marsh establishment are more economically and environmentally suitable solutions for shoreline protection, particularly in the many creeks in Lancaster County.

The over-armoring of the shoreline is costly environmentally and economically. Bulkheads and rip-rap can result in a loss of wetlands and beach areas due to scouring at the base, and wave energy reflected off the body of these structures. Hardening of the shoreline can cause down drift erosion due to the loss of nourishment supplies that have now been cut off through alteration, and of the protection structures themselves. Finally, the property owner loses because they chose an expensive protection means when an alternative, cheaper method would have been sufficient.

Where hardening of the shoreline is necessary County staff and the Wetlands Board must encourage methods which have the least impact on the environment. For example, this policy would encourage the use of properly designed porous revetments such as rip-rap over impenetrable means such as concrete revetments and bulkheads. Porous revetment structure can act to dissipate the wave's energy as the wave breaks up the structure. Impenetrable structures instead act to deflect wave energy up, down, and back out, which can result in loss of sensitive environmental features in front of the structure.

B. INCENTIVES FOR SUBDIVISION WIDE SHORELINE PROTECTION EFFORTS IN PROPOSED SUBDIVISIONS

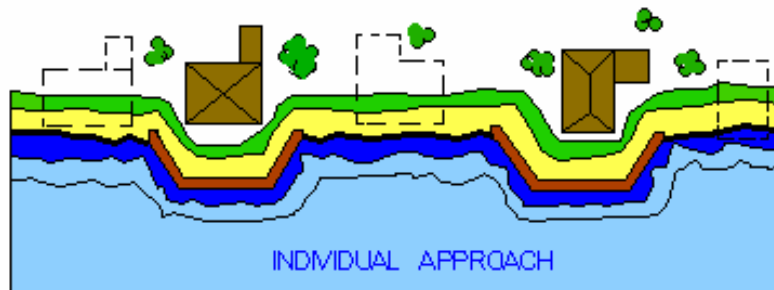
The Lancaster County Subdivision Ordinance requires a shoreline management plan for new waterfront subdivisions to provide subdivision-wide shoreline protection efforts vice individual efforts. This requirement assures that unique on-site characteristics related to shoreline protection would be studied and addressed in a coordinated, subdivision-wide manner. It also gives the County a chance to influence the shoreline protection efforts of a larger area at one time before they become the many separate, individual efforts of property owners in a new subdivision.

C. COOPERATIVE APPROACHES TO SHORELINE PROTECTION

Cooperative protection efforts in existing subdivisions would benefit both the County and the waterfront property owners. First, the county would gain through the preservation or enhancement of waterfront land values that in turn support the tax base. Secondly, property owners would benefit by sharing construction costs perhaps reduced by the economies of scale, while assuring that flanking properties as well as their own are protected. The result is that the County is left with a more attractive, uniform shoreline, a constant or increased tax base, and citizens who have saved through shared shoreline protection costs.



Cooperative approach to shoreline protection results in more effective protection against erosion, enhanced safety for personal property, an increased number of desirable building sites, and cost savings due to shared expenses.



Individual approach to shoreline protection results in possible increased erosion risk to neighboring properties due to flanking of the bulkheads, a decrease in the number of desirable build-sites, and a disjointed, uneven shoreline.

Source: Low Cost Shore Protection. U.S. Army
Corps of Engineers, 1981.

D. ENCOURAGE VEGETATIVE ALTERNATIVES FOR SHORELINE PROTECTION AND VEGETATIVE ENHANCEMENT OF RESOURCE PROTECTION AREAS

Vegetative methods of shoreline protection could be effectively used in many parts of Lancaster County, including areas along tidal creeks, coves, and other low-energy water bodies with smaller fetches. Fringe marsh establishment, selective trimming of branches overhanging existing shoreline vegetation, landscaping, and enhancement of existing vegetation are some options available to property owners in applicable shoreline areas. Additionally, all waterfront property owners could undertake vegetative enhancement of Resource Protection Areas. Such efforts could include the planting of vegetative buffer areas or the replenishment and enhancement of existing shoreline vegetation. The benefits are that the property owner can save money through not opting for bulkheads or rip-rap, the shoreline is left in a natural state, and wildlife habitat is enhanced.

E. SUPPORT EFFORTS TO EDUCATE PROPERTY OWNERS CONCERNING SHORELINE PROTECTION ISSUES AND ALTERNATIVES

It is recommended that Lancaster County continue supporting programs for educating

waterfront property owners on shoreline protection. The more knowledgeable property owners are of issues and alternatives surrounding shoreline protection, the better prepared they will be to decide upon their shoreline protection methods. The County can work with the Northern Neck Planning District Commission in re-instituting a workshop specifically for waterfront property owners considering shoreline protection strategies.

GLOSSARY OF TERMS

Accretion - The natural building up of sedimentary material along a given segment of shoreline. Areas of accretion are gaining land over time due to natural processes.

Fetch - The unobstructed distance over water in which waves are generated by wind of relatively constant direction and speed. Classifications are as follows:

- a. Narrow
- b. Moderate
- c. Wide
- d. Unlimited

Littoral Drift - Sedimentary material moving along the shoreline under the influence of waves and currents.

Nourishment - The process of replenishing a beach. It may be brought about naturally, by accretion due to the long shore transport, or artificially, by the deposition of dredged materials.

Scour - Removal of underwater material by waves and currents, especially at the base or toe of a shoreline structure.

Shoreforms

- a. Cliffs A high, steep face of rock; a precipice.
- b. Bluffs A high, steep bank composed of erodible materials.
- c. Marshes Areas of soft, wet or periodically submerged land which is generally treeless and usually characterized by grasses and other low vegetation.
- d. Beaches The zone of sedimentary material that extends landward from the low water line to the place where there is marked change in material or form, or to the line of permanent vegetation (usually the effective limit of storm waves). The seaward limit of a beach - unless otherwise specified - is the mean low water line. A beach includes the foreshore and backshore.

IV. GOALS AND OBJECTIVES

GOAL #1: Actively encourage shoreline protection measures that are equal to the erosion potential at a particular site.

Objective: Encourage alternative shoreline protection methods such as fringe marsh establishment in shoreline areas with less wave energy, light boat traffic, and small fetches.

Objective: Discourage use of bulkheads and rip-rap in low energy, lightly traveled water bodies; unless erosion justifies shoreline hardening for protection purposes.

Objective: Encourage use of revetments instead of bulkheads in high energy shoreline zones, while also assuring that revetment structures are armored adequately enough to provide the intended protection.

GOAL #2: Encourage vegetative enhancement of Resource Protection Area (RPA) sections

Objective: Evaluate subdivision proposals as to their existing shoreline condition and upland characteristics in regard to erosion. If necessary, recommend RPA enhancements to offset impacts of proposed development.

Objective: Encourage individual property owners to maintain and enhance their RPA areas in ways that protect the existing shoreline, improve water quality, and mitigate the impact of their development.

GOAL # 3: Encourage coordinated shoreline protection efforts in existing waterfront communities and in new subdivisions.

Objective: Propose changes to the Subdivision Ordinance that would encourage submission of a shoreline management plan.

Objective: Propose changes to the Subdivision Ordinance which would offer incentives such as density credits to developers who initiate appropriate, coordinated, on-site shoreline protective measures.

Objective: Encourage waterfront property owners in existing communities to consider multi-parcel shoreline protection strategies before they pursue individual approaches.

CHAPTER 5

I. ACCESS TO STATE WATERS

A. INTRODUCTION

In 1988, the Chesapeake Bay Preservation Act (CBPA) was passed into law in Virginia. The purpose of the CBPA is to protect and improve the water quality of the Chesapeake Bay, its tributaries, and other state waters by minimizing the effects of human activity upon these waters. The CBPA is designed to protect certain lands that if improperly used or developed may result in substantial damage to the water quality of the Chesapeake Bay and its tributaries. The CBPA resulted in the creation of the Chesapeake Bay Local Assistance Board, which was charged with developing regulations that establish criteria providing for the protection of water quality, but will also accommodate economic development. The Chesapeake Bay Preservation Area Designation and Management Regulations were developed and became final in November, 1990. These regulations have become the Tidewater Counties' guide in developing their own required local programs. Lancaster County implemented its Chesapeake Bay Preservation Ordinance in September 1991.

The Final Regulation (VR 173-02-01) Part V, Implementation, Assistance, and Determination of Consistency, details what is required of localities in carrying out the Chesapeake Bay Preservation Act. One requirement placed on the localities is that their Comprehensive Land Use Plan comply with the CBPA. The CBPA regulations state that the comprehensive plan, or plan component, should consist of the following basic elements: (i) a summary of data collection and analysis; (ii) a policy discussion; (iii) a land use plan map; (iv) implementing measures, including specific objectives and a time frame for accomplishment.

As part of the comprehensive plan element of the CBPA regulations, localities must address policies on a number of water quality issues. These issues include physical constraints to development, protection of potable water supply, relationship of land use to commercial and recreational fisheries, appropriate densities for docks and piers, and the provision of public and private access to waterfront areas and the effect on water quality.

This document represents a revision of the adopted Lancaster County Comprehensive Land Use Plan (2001). It addresses the water quality issues listed in the regulations, and is designed to fulfill the County's requirements under the Chesapeake Bay Preservation Act.

B. ASSESSMENT OF EXISTING CONDITIONS

According to the Chesapeake Bay Act Regulations, local governments should prepare policy statements on the following issues for inclusion in the plan: relationship of land use to commercial and recreational fisheries; appropriate density for docks and piers;

public and private access to waterfront areas and effect on water quality. Chesapeake Bay Act Regulations regarding public and private access to the water encourage localities to maximize human access to the water while minimizing the impact on the environment. The Regulations recognize there are many groups competing for access to the water, but only a limited amount of shoreline. Waterfront homeowners, commercial fishermen, seafood industry owners, commercial business owners, and recreational users all require access to the water. These same users have the ability to negatively impact the water to which they are attracted.

The Regulations recognize that human access to the water can have many negative impacts on the environment. Construction of boat ramps and piers can result in the disrupting of wetlands, the clearing of shoreline vegetation, and alteration of the existing shoreline. Dredging required to maintain access to navigable channels can result in the stirring up of pollutants settled on the water bottom, as well as loss of submerged aquatic vegetation. Boat wake may result in an increase in shoreline erosion. Lastly, boating activity can result in water pollution from toxic hull paints, engine fluids, and improperly disposal of human waste (Page VI-80 Local Assistance Manual, Chesapeake Bay Local Assistance Department; Richmond, VA: November, 1989). The Regulations encourage localities to find ways to minimize these resulting impacts of human access to the water.

The goal of the Lancaster County Public and Private Access to Waterfront Areas Study and Plan will be to present alternatives which can satisfy access demands within our County, while assuring continued protection of our unique waterfront environment. The study will first inventory the existing shoreline situation in Lancaster County from which trends in shoreline land uses can be determined and evaluated. Existing access opportunities will be inventoried. Demand for access will be determined and additional need for access in Lancaster County identified. Feasible recommendations concerning public and private access to waterfront areas in Lancaster County will then be made.

Many sources of data were used in developing the Public and Private Access to Waterfront Areas Study and Plan. Included are the Department of Health's Shoreline Sanitary Surveys for Lancaster County's water bodies, 2000 U.S. Census Data for the County, the Virginia Institute of Marine Science's 2001 Shoreline Situation Report for Lancaster County, and County-owned digital tax map coverage of Lancaster County from the Information Support System Lab at VPI&SU. The tax map delineation is the reference for identification of areas within the County.

C. EXISTING CONDITIONS

The Chesapeake Bay to the East and the Rappahannock River to the South border Lancaster County. Other tidal water bodies flow through the County on the way to the Bay and River including Lancaster Creek, the Corrotoman River (Western and Eastern Branches), Carters Creek, Indian Creek, Dymer Creek, Tabbs Creek, Antipoison Creek, and/or branches off of these.

1. Shoreline Land Ownership

Over 97% (approximately 258 miles) of the land adjacent to tidal shoreline in Lancaster County is owned privately. The exceptions include Belle Isle State Park, Greenvale Creek Public Boat Landing, Brightwater and the turn-around waterfront area at the end of Route 695.

2. Shoreline Land Uses

Land uses along the shoreline include private residential, agricultural, industrial, commercial, recreational, forest, and wetland. The April, 1994 Lancaster County Shoreline Inventory conducted by the Northern Neck Planning District Commission detailed the following land use categories: residential; agricultural; seafood industry; commercial; forest; wetland; public/recreational; other. When this inventory was done there were 2,713 residential parcels in Lancaster County with fewer than 3% having more than one dwelling unit per parcel. The fact that there were 6,854 dwelling units in Lancaster County by 2004 (Source: U.S. Census Bureau) highlights the significant growth in this already predominant category. This growth has occurred primarily on the shoreline through planned developments, subdivision of larger parcels, and, of great concern, redevelopment of dormant seafood processing sites.

The growth in residential shoreline use is important because it reflects the demand for access to the water. Waterfront locations are valued as desirable sites for home building due in part to the unavailable water access for non-waterfront residential areas. However, growth in the number of residences on the can result in degradation of water quality. The initial clearing of a building lot, followed by the actual construction of a new home can lead to increased run-off of sediment into state waters. New waterfront residences also allow more opportunity for increased recreational use of state waters, as well as more opportunity for development of individual boat access and mooring structures. The cumulative effect of lot clearing, home construction, increased recreational use of water, and additional development of individual water access can result in degraded water quality.

As more land is devoted to residences, less land is available for other uses. Residential land generally provides access only to the owners of the property. This is not the case with other types of land uses such as commercial marinas, which satisfy considerable water access demand with a single parcel. Therefore, tax maps with high percentages of residential shoreline uses are considered priorities in targeting potential access opportunities. Such maps in Lancaster County are 4, 11, 12, 19, 20, 22, 26, 27, 29, 30, 31, 33, 34, 35, and 39.

a. Commercial Uses

Shoreline commercial uses in Lancaster County include marine resorts, inns, restaurants, boat repair facilities, and marinas. These uses contribute greatly to the County's economic vitality. Many tourists, seasonal homeowners, and recreational water users are drawn to Lancaster County because of the access

opportunities and services that are provided here. Access in commercial areas can range from views of the water while dining to the rental of a boat for a day of sailing. Overall, commercial shoreline uses are necessary in order to satisfy a large amount of the public demand for access to the water.

Shoreline commercial uses can also have an impact on the environment. These uses generate increased amounts of boating activity, as well as providing areas for long-term boat mooring. The cumulative effect of intense boating activity and boat mooring can result in decreased water quality and condemnation of shellfish grounds in the vicinity of the boating operation. Therefore, new shoreline commercial uses should not be located in areas with viable shellfish beds and other sensitive resources.

b. Industrial Uses

Industrial shoreline uses are mainly comprised of seafood processing businesses, with the exception of one grain loading facility on Indian Creek. The seafood industry has traditionally been a strong component of Lancaster's economy. However, during the period from 1984 to 1994 the seafood industry has seen a decline in Lancaster County due to decreases in marketable oyster and fish populations, and, as earlier indicated, the deactivation of industry. Seafood industry sites, active and inactive, provide access to commercial watermen and others, and they stand as reminders of the important role this industry has played in the history and culture of Lancaster County.

c. Public/Recreational Uses

Recreational shoreline uses are valuable because they provide access to the water for the general public. Recreational shoreline users include visitors to the area, recreational boaters, and residents of the County who have no other access options. In Lancaster County there are few public recreational shoreline uses. Lancaster County and the Department of Game and Inland Fisheries provide boating access at the Greenvale Creek Public Boat Landing, Windmill Point, and the Windmill Point Canoe/Kayak Launching Facility. Windmill Point offers public swimming to the citizens of Lancaster. Belle Isle State Park, nearly fully developed as of 2006, offers boating, swimming, and fishing access as well as camping, nature trails and observation decks.

3. Population

According to the 2000 U.S. Census, Lancaster County had 11,567 residents. The population in Lancaster County is greatest in the part of the County east of the Corrotoman River near the three towns of Kilmarnock, White Stone, and Irvington. Population densities in this part of the County range from 50 - 249 people per square mile. This is in contrast to the more sparsely populated western part of the County which has population densities ranging from 0 - 49 people per square mile.

4. Water Quality

Quality of surface waters is of vital importance to the Lancaster County community. Commercial fishermen, seafood industry owners, marina owners, and related employees depend on local waters for their livelihood. Citizens of the County enjoy living in a rural scenic setting that is enhanced by views of, and access, to the water. Finally, the water is a source of recreation for many in the Lancaster County community, as well as for many visitors to the area.

a. Non-point Source Pollution

One measure of the water quality of Lancaster County's surface water is found in the Virginia Non-point Source Pollution Watershed Assessment Report (VA Department of Conservation and Recreation; March, 1993). This report divides the State of Virginia into 491 different watersheds or hydrologic units. A watershed is defined as "a land area drained by a river/stream or system of connecting rivers and streams such that all water within the area flows through a single outlet." There are three state hydrologic units in Lancaster County: E25, E26, and C01. E25 and E26 are part of the Rappahannock River Basin and C01 is part of the Chesapeake Bay Coastal Basin. This report compares water quality of hydrologic units throughout the state in order to prioritize non point source pollution protection efforts.

A brief summary of watersheds in Lancaster County is given below:

E25 - This watershed is cited as having "significant levels of urban use impacts due to urban erosion and nutrient loadings, and the amount of disturbed urban land." However, this watershed is not described as having any significant water quality violations for fecal coliforms or pH levels. Statewide this watershed is given a final non-point source pollution rank of "MEDIUM -," with a rank of "High+" being the highest priority watersheds for state non- point source pollution protection efforts.

E26 - This watershed is not described as having any significant water quality violations due to fecal coliforms or pH level. Additionally, this watershed is not cited for having "significant levels of urban use impacts." Statewide this watershed is given a final non point source pollution rank of "MEDIUM -," with a rank of "High+" being the highest priority watersheds for state non-point source pollution protection efforts.

C01 - This watershed is rated as a "medium priority watershed for agricultural non-point source pollution concerns. Due primarily to existing development, watershed C01 is rated in the top 10% statewide for urban pollution potential." Additionally, the watershed is cited as having a large number of shellfish

condemnations because of "urban non-point source influences." However, the watershed was not cited for having any significant violations of state water quality standards. Statewide this watershed is given a final non-point source pollution rank of "High+," with a rank of "High+" being the highest priority watersheds for state non-point source pollution protection efforts.

b. **Condemned Shellfish Grounds**

Another indicator of surface water quality is the location of condemned and seasonally condemned shellfish grounds. As of 1988, Lancaster County had 1,372 acres of condemned shellfish grounds (Pg. 84, Lancaster County Shoreline Management Study Preliminary Results, 1988). Typically shellfish condemnation areas in Lancaster County are found only in small portions of creeks, not throughout the entire creek. Exceptions are Carter Creek, Greenvale Creek, Paynes Creek, Beach Creek, Lancaster Creek, and Mulberry Creek, which are all mostly, or totally, designated as condemned or seasonally condemned. A current listing of Lancaster County shellfish condemnations can be found by accessing <http://www.vdh.virginia.gov/OEHS/Shellfish/Lancaster.asp>.

Locations of shellfish condemnations are important water quality indicators because the waters have been condemned due to elevated levels of fecal coliform bacteria. High levels of fecal coliform bacteria can be due to animal (domestic and wild) waste, failing septic systems, marinas, or the flushing characteristics of the particular water body.

While the statistics related to water quality stated above are from what is now becoming a dated report, there is little evidence of significant improvement in 2006. Shellfish Sanitation Reports issued on a regular basis by the Virginia Department of Health rarely show a reduction in a shellfish condemnation area and more frequently show an expansion.

5. Marine Resources

Lancaster County is fortunate to benefit from an abundance of marine resources. These natural resources include Submerged Aquatic Vegetation, Wetlands, and Shellfish Grounds. Descriptions of these features, their functions in the man-made and natural environments, and the extent of their presence in Lancaster County are given below.

a. **Submerged Aquatic Vegetation**

Submerged Aquatic Vegetation (SAV), or sea grass, is a valuable natural marine resource that is found adjacent to the shoreline in many parts of Lancaster County. SAV is important because it provides ideal habitat for blue crabs and juvenile finfish. SAV also acts to provide protection for molting crabs and is a source of food for some waterfowl. Because of the important role it plays in the

marine environment, SAV is of great value to the County's commercial and recreational fisheries.

According to the 1993 Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay (Virginia Institute of Marine Science, School of Marine Science; The College of William and Mary), SAV beds in Lancaster County are found in the Corrotoman River, along the north shore of the Rappahannock River from the Corrotoman River to Windmill Point; as well as in Dymer Creek, Indian Creek, Little Bay, and Fleets Bay. The report shows that SAV beds have declined in the area of the Rappahannock River between Carters Creek and the mouth of the Corrotoman River. However, SAV has also slowly expanded in some areas of Lancaster County.

b. Wetlands

Wetlands are defined by the United States Fish and Wildlife Service as "lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water" (Pg. 4, Atlas of National Wetlands Inventory Maps of Chesapeake Bay. U.S. Fish and Wildlife Services; September, 1986.). Generally, wetlands can be classified as either tidal or non-tidal. Locally, Lancaster County has approximately 4,504 acres of tidal wetlands and 1,349 acres of non-tidal wetlands (figures were obtained using the Lancaster County Geographic Information System utilizing a digital National Wetland Inventory map layer).

Wetlands are important natural resources that provide many positive benefits to the man-made and natural environments. Wetlands provide aesthetic, recreational, and economic benefits to the community. Furthermore, wetlands are spawning and nursery grounds for finfish and shellfish, feeding and wintering sites for migratory waterfowl, nesting habitat for shore birds, and home to a wide variety of wildlife. Wetlands further serve as important areas for groundwater recharge, flood control, pollution absorption, and retention of sediment from storm water run-off (Pg. 1, Atlas of National Wetlands Inventory Maps of Chesapeake Bay. U.S. Fish and Wildlife Services; September, 1986).

c. Shellfish Grounds

Lancaster County has suitable shellfish grounds in the water adjacent to its shores. Despite dramatic decreases in shellfish populations and catches, these grounds remain a valuable resource that should be protected. While it cannot be determined if or when shellfish populations will recover, the possibility remains that they will, or that a more disease resistant strain of oyster will be introduced.

6. Existing Access

a. Private Access

The large majority of access to the water in Lancaster County is private. Private access includes private waterfront, boat ramps, piers, docks, boathouses, and beaches. As discussed in the Shoreline Land Use section, people utilizing private access to the water in Lancaster County include private homeowners, commercial business operations, and water-dependent industries.

b. Private Access and Pier Densities

Private access to the water satisfies a large part of the access demand within Lancaster County. However, impacts of private access to the water can clearly be seen in the results of the June 2001, Lancaster County Shoreline Situation Report . The inventory shows there are 1,690 piers in the waters of Lancaster County. As of 2006, it is estimated that this number has increased to approximately 1,750 piers or roughly one for every two shoreline parcels. Densities of piers vary widely within the County. Tax maps which have a higher than average percentage of piers include maps 20, 22, 26, 27, 29, 33, 34, 35, 39, and 41. However, as other areas are developed, this distinction will be less apparent, and a high concentration of piers can be expected throughout the County.

The majority of piers are located at residential parcels along the shoreline. Access provided by these private residences is often of low-intensity, but not without impacts on the environment. In areas of the County where pier densities are greatest, almost every parcel has its own pier. These piers are often used for long-term boat mooring, not just for day use of boats. The cumulative effect of high pier densities and long-term boat mooring can result in decreased water quality within that body of water.

c. Public Access

Presently there is limited public access to the water in Lancaster County. Greenvale is a public boat landing located on the western side of the County at Greenvale Creek. This boat landing is a day use facility with an in-out ramp and a boarding dock. The Windmill Point facility is located at the end of VSH 695, Windmill Point Road, on the east side of the County. Public access is available at Belle Isle State Park, which is also located in the western half of the County. Existing public access sites can be located on tax maps 12, 15, 19 and 40.

Public Access can be beneficial in that usually an in-out ramp and parking are the only services provided boaters. The lack of long-term mooring encourages the use of these facilities by recreational boaters, who put boats in the water and take them out in the same day. This helps to minimize the negative impacts on the water from boating.

II. DETERMINING ADDITIONAL NEED FOR PUBLIC ACCESS

In assessing access to the water in Lancaster County it is evident that the supply of access is also in transition. In the past, much of the general public was able to access state waters through informal arrangement. That is no longer the case. Access has become very limited for non-waterfront residents, and the rest of the general public (visitors).

These people can dine near the water, charter fishing boats, or keep their own boat at a marina, but their options are limited by a lack of variety and financial constraints. Currently, there is no public pier for fishing in Lancaster County. Of the two public boating access sites, Greenvale is located away from the majority of the population in the County, is not near the Chesapeake Bay, and access is difficult absent regular dredging operations. **Future opportunities to expand the variety and number of public access sites in Lancaster County are jeopardized by the expanding use of shoreline for residential purposes, and could very well become nonexistent in the near future.**

Loss of access opportunities in Lancaster County could also limit viable options for the seafood industry. Although the decline in shellfish and finfish might have harmful effects on resources needed to sustain a seafood processing company, the supply could possibly be enough to support small commercial fishing operations and markets. Additionally, the remaining supply could definitely support a thriving recreational fishing market in Lancaster County. **Reactivation of inactive seafood industry sites could assure that these unique landmarks on the County's waterfront remain.**

As far back as 1989, the Virginia State Outdoor Plan documented the need for expanded access to tidal waters. This situation has not changed during the intervening seventeen years and, arguably, has worsened, especially in Lancaster County. Aerial surveys, public boat ramp surveys, and commercial marina surveys were conducted to measure existing demand and additional need of access.

First, the plan states that additional access is needed to the Rappahannock and Corrotoman Rivers. Second, the plan recommends that additional access sites should be considered in the western half of the County. Third, the plan encourages that access sites in the portion of the County east of the Route 3 (Norris) Bridge be considered. Lastly, the plan cites the Fleets Bay and Indian Creek areas of the County as having many protected sites. These sites would offer direct access to the Chesapeake Bay. The plan recommends that undeveloped publicly owned sites should receive attention for evaluation and development. **These recommendations are as valid in 2006 as they were in 1989.**

As the various surveys in the 1989 plan documented, the average Tidewater county has approximately four public boat ramps and eight total public access sites to the water. When considering the total amount of shoreline miles in each county, this equates to one public access site for each 31.5 miles of shoreline. Lancaster County has fewer than the average number of public boat ramps, total public access sites, and access sites per mile of shoreline. While one access site was added in 2003, an additional six access sites is needed to have an average of one access site per 31.5 miles of shoreline in the County.

III. ADDRESSING THE NEED

In 2002 a Citizens Advisory Group was formed to address the need for public access to state waters in Lancaster County. Their report contained specific recommendations for expansion of public access to the state waters while acknowledging obstacles. Foremost among these obstacles is the price of suitable land with shoreline, on the rare occasions

that such land becomes available, and the corresponding limited amount of available state and local funds. To overcome this obstacle alternative means must be employed. These alternatives include Public/Private Partnerships, Use Agreements, and recreational land acquisition funds.

A. GENERAL SITE CONSIDERATIONS AND ACCESS NEEDS

In determining locations for potential public access sites to the water, there are general site criteria that should be considered for initial screening purposes. Generally, public access sites to the water should have state road access, a location close to population centers, and availability of water suitable for the planned use of the site. Additionally, when acquisition funds are limited, a parcel of land publicly owned is optimal. These general site criteria can be applied as screening tools for all types of potential public access locations. Additional site considerations are dependent on the intended use of the parcel of land. Types of access and additional site considerations are discussed below. Many of the presented site considerations are drawn from the Chesapeake Bay Area Public Access Technical Assistance Report (see p. 5-18 for Cited Sources).

1. Types of Access and Site Considerations

a. Natural Area Access

Natural area access can be sited on small or large parcels. Smaller parcels can be utilized for viewing, observation, or overlook areas adjacent to roadways. These parcels should have enough room to provide parking for several cars, and should also have enough area to allow users to safely enter and leave the adjacent roadway. Lastly, this type of public use should be located where expansive views are offered the user. These locations would include scenic views of the water or of large marsh/wetlands areas.

Natural area access can also be provided on large parcels of land. These parcels are best suited for nature trails that provide the user active recreation while also offering opportunities for nature observation and scenic views. Examples of this type of use in Lancaster County include the Hickory Hollow Nature Trail. Parcels that are best suited for this use would be large farms, or the large tracts of woodlands owned by the timber companies.

b. Beaches and Swimming Areas

Beaches and swimming areas are a moderately intense to intense use of land. Sites for these activities should be medium to large size parcels of land, with a minimum size of approximately 3 acres. In some instances adjacent land uses and specific lot configuration could allow use of a smaller parcel. However, all potential sites should have sufficient area for parking and support facilities. Additionally, candidate sites should have ample shore frontage, preferably with an existing beach. If possible the beach should be wide, sandy, and not in danger

of erosion. Water access at the site should be in easy walking distance from parking areas. Swimming water at potential sites should be clean, have little current, no sharp drop-offs, and a sandy, firm bottom. Additionally, candidate sites for beaches and swimming areas should be located away from commercial waterfront areas and heavy boating traffic. Wetland areas should be avoided in areas planned for pedestrian traffic or water access. Additionally, areas of shore where there is submerged aquatic vegetation (SAV) growth and threatened or endangered species present should be avoided.

c. Fishing Piers

Fishing piers are moderately intense uses, which can be more intense at the peaks of the fishing season. Potential sites for fishing piers can either be small or large parcels of land. Size is more dependent on the particular layout of a potential site.

Whatever the size, candidate sites should have good shore frontage. Above all, potential sites should be located along a body of water that has a sufficient population of game fish. Availability of fish to catch will be the deciding factor in the success of the pier.

Additionally, potential piers should offer no obstructions for navigable channels. Water at the site should have an average depth of two feet at mean low water. Erosion rates at the site should be less than two feet a year or erosion protection might be needed. Wind and wave action should also be considered due to the effect they may have on long-term maintenance of the facility. Environmentally, no wetlands should be disrupted and areas of submerged aquatic vegetation (SAV) should be avoided. Lastly, the site should have sufficient area for parking and support facilities.

d. Bank Fishing and Crabbing

Bank fishing and crabbing is generally a less intensive use. Potential sites should be located on small or large parcels of lands. Smaller parcels would have to be configured with a large shoreline area and sufficient room for parking. Access could be provided on a parcel as small as a 1/3 acre, particularly if a dock is used or there is good shoreline.

Bank fishing and crabbing areas should be on water with a good supply of fish and crabs. As with piers, the success of the site will depend on the availability of fish and crabs to catch. Potential sites should have an average depth of two feet at mean low water and should be located away from commercial or industrial waterfront areas. Candidate sites should also have low erosion rates, little wind/wave action, and offer no obstruction to navigable channels. Lastly, pedestrian walkways and water access should not disrupt any wetlands on the site.

e. Car top Boat Launching

Car top boat launching is usually a less intensive use. These areas are used to provide access to users of canoes, rowboats, wind boards, etc. Sites are generally located on smaller, shallower bodies of water. These sites can be developed on parcels as small as ½ acre depending on lot configuration and adjacent uses.

Potential sites should have sufficient area for parking, a shoreline area suitable for launching of small boats, and no wetlands in the utilized area. Water at the site should be conducive to operation of small boats and can have a depth as shallow as one foot at mean low water.

f. **Marinas, Boat Ramps and Boarding Docks**

Boating access areas that provide ramps are generally intensely used during boating and fishing season. Due to the possible impacts boating can have on the environment, it is important to target suitable areas for these facilities. The Virginia Marine Resource Commission's Subaqueous Guidelines publication details criteria to be followed in choosing potential locations for boating facilities. The criteria are found in "Criteria for the Siting of Marinas or Community Facilities for Boat Mooring." (4VAC-20-360-10)

VMRC Marina And Community Facility Siting Criteria Check List

Criteria	Undesirable	Desirable
Water Depth	< than 3 ft. MLW.	> than 3 ft. MLW.
Salinity	Suitable for shellfish growth	Unsuitable for shellfish growth
Water Quality	Approved, conditionally or seasonally approved for shellfish harvesting	Closed for direct marketing of shellfish. Little or no potential for future productivity
Designated Shellfish Grounds	Private leases or public oyster ground in proximity	No private leases or public ground within affected area. No potential for future productivity
Maximum Wave Height	> than 1 ft.	< than 1 ft.
Current Dredging	Greater than 1 knot. Requires frequent dredging. No suitable site for dredged material	Less than 1 knot. Does not require frequent maintenance. Suitable for all dredged material
Flushing Rate (Tidal Exchange)	Inadequate to maintain water quality	Adequate to maintain water quality
Proximity to Natural or Improved Channel	> than 50 ft. to navigable water depths	< than 50 ft. to navigable channel
Threatened or Endangered Species	Present as defined in existing regulations, or project has potential to affect habitat	Absent; project will not affect
Adjacent Wetlands	Cannot maintain suitable buffer	Suitable buffer to be maintained
Navigation and Safety	Water body difficult to navigate or presently overcrowded	Navigation not impeded

	conditions exist	
Existing Use of Site	Presently used for skiing, crabbing, fishing, swimming or other potentially conflicting uses	Not presently used for skiing, fishing, swimming, or other recreational uses
Submerged Aquatic Vegetation	Present	Absent.
Shoreline Stabilization	Bulkheading Required	Shoreline Protected by natural or planted vegetation or riprap.
Erosion Control Structures	Groins and/or jetties necessary	No artificial structures needed
Finfish Habitat Usage	Important spawning and nursery area	Unimportant area for spawning or nursery for any commercially or recreationally valuable species

B. RECOMMENDATIONS

In considering recommendations for public access in Lancaster County, availability of land is a major factor. Recommendations must first look at publicly owned land. The Brightwaters site has been improved since 2000 to include a car top launch facility, and two more unimproved sites have been secured for public use on the upper part of the Western Branch of the Corrotoman and Taylor Creek respectively. While a step in the right direction, the need in the lower part of the County remains. This need must be addressed by focusing on land that might be used at minimal cost through use agreements or partnerships. Included in this category are inactive seafood industry sites, large timber tracts and farms, and private boat ramps that are currently available for use by the public. Land that might be acquired at reasonable cost, such as smaller parcels for bank fishing/crabbing and car top boat launching, must also be pursued if and when it becomes available.

1. Natural Area Access

In addition to Belle Isle State Park, there are two publicly owned tracts of land which are suited for natural area access -- Windmill Point, located at the end of the Windmill Point Road and the Western Branch of the Corrotoman which is accessed from VSH 3. Consistent with the Master Plan, Belle Isle Park now has a well developed natural area access including both nature trails and observation areas or decks. Future efforts must focus on Windmill Point and further development of the Western Branch site.

While restricted in size, the Windmill Point Road site is suitable for natural area access and an observation or overlook site. The site offers extensive scenic views of the Rappahannock River and Chesapeake Bay. When considering environmentally sensitive features, there are no wetlands present at the site, there are no SAV beds growing immediately adjacent to the shoreline, and the nearby shellfish grounds are condemned due to a nearby marina. Parking spaces could be provided in the present turnaround area or a possibly expanded area, and a walkway constructed to allow access to the waterfront. A large wooden deck could be constructed near the waterfront area, which would also

have wooden benches for viewing purposes of visitors. Another option would be to construct a small elevated observation deck which would allow visitors expanded views of the water. Development of this site for natural area access must be done so as to retain as much of the beach area as possible. As the only public beach in the County, it is heavily used and widely popular among those seeking beach access.

Other opportunities for natural area access exist on the many large tracts of privately owned land adjacent to tidal waters in Lancaster County. Many of the larger tracts of timber, farm, and wetlands are ideal for natural area access, and should be targeted for access by negotiating use agreements. Ideally, large tracts of land not in active use would be pursued first. Additionally, it is recommended that the larger tracts owned by timber companies would be the initial targets. These companies are tied to long-term land ownership due to the nature of the product they produce. In the past these companies have also responded to the recreational needs of the community.

2. Beaches and Swimming Areas

Lancaster County currently has only 50 feet of beach area suitable for swimming in the total 275 miles of waterfront. In addition to Windmill Point, Belle Isle State Park is the only publicly owned land that has area available for the development of beach and swimming areas. Due to the limited area for beach development, Belle Isle State Park Master Plan indicates development of a swimming area away from the waterfront.

The vast majority of land suitable for public beaches is in private ownership. This situation has severely limited the options for public beaches in Lancaster County and will only become worse with each year beyond 2006.

3. Fishing Piers

Publicly owned land in the eastern side of the County is strongly recommended as a site for a public fishing pier. In the event that no current publicly owned sites are found suitable for this purpose, the County should identify and purchase suitable privately owned properties. Environmental considerations such as the presence of wetlands, submerged aquatic vegetation, and viable shellfish grounds shall be considered when acquiring the potential site.

After a suitable location is found the County should actively pursue development funds from the state for this site. The County has an advantage in that current state recreational access plans call for the much-needed expansion of access to state waters in our region. The Department of Game and Inland Fisheries offers grant programs for access development. A local public access fee for new waterfront construction could also serve as source of funding.

The Virginia Marine Resources Commission is involved with the capital funding of saltwater recreational access sites. Available funds in these programs may vary from year to year, but the maximum amount should be pursued. After construction funds are

obtained the pier should be developed, and a management agreement worked out with the Virginia Marine Resources Commission and the Department of Game and Inland Fisheries.

In the event that a suitable location cannot be found for a public fishing pier in the eastern half of the County, it is recommended that the County focus its efforts on the development of fishing facilities at Belle Isle State Park. The Master Plan for Belle Isle State Park calls for the construction of two fishing and crabbing piers at the park. As of 2006, one fishing pier has been constructed. To assure that the remaining piers are built, the County should work in a cooperative effort with the Division of State Parks in applying for construction funds from available grant programs.

4. Bank Fishing/Crabbing and Car top Boat Launching

These two categories of recreational access will be addressed at the same time due to their similar site considerations. Bank fishing, crabbing and car top boat launching facilities will all be offered on publicly owned land at Belle Isle State Park when it is further developed.

Additionally, Greenvale Creek Public Boat Landing has a boarding dock that can accommodate a small number of fishermen or crabbers. Further opportunities for publicly owned bank fishing and crabbing could become available if the Merry Point Ferry were to ever go out of operation. The two ferry landing sites would be ideal access areas for bank fishing and crabbing. It is strongly recommended that the County gain ownership of these lands in the event the ferry stops operating. Furthermore, it is recommended that these sites also be developed as car top boat launching areas. These two uses would be best suited for the ferry sites due to the limited amount of area available for parking spaces.

Creation of a recreational access fund is also strongly recommended for the development of bank fishing, crabbing, and car top boat launching sites in the County. The fund would be administered by the County and used to provide public access to the water. This fund would be built slowly over time from available resources in the community. The funds would be used for the acquisition and development of small parcels in areas on shallower creeks, which have been traditionally less desirable for residential use. The fund would be open to private donations of both money and land. When ample funds accrue and parcels became available, they would be acquired. Development of these sites would also occur as sufficient funds were accumulated.

5. Boat Ramps and Boarding Docks

Belle Isle State Park now has a boat ramp and boarding dock. While examination of other publicly owned sites in the County finds them unsuitable for use as boat launch sites, there is reason to believe that public road endings have not been investigated as thoroughly as they might be for siting of boat ramps or docks.

The County must also pursue the provision of public boating access through the use of public/private partnerships. The County should actively pursue partnerships with owners of the many inactive seafood industry sites in the County. When using the VMRC boating-facility-siting criteria, it is evident that inactive seafood industry sites are ideal candidates for public boating access locations. The majority of these areas already have altered shoreline, existing access facilities, access to navigable channels, sufficient parking area, and are adjacent to waters that are condemned for shell fishing. Therefore use of these sites would be the least damaging option when considering the environment. Lastly, there are a number of inactive seafood industry sites in the areas targeted for public access to the water.

Reuse of inactive seafood industry sites would serve many purposes. Public boating access could be provided in Lancaster County on creeks that provide direct access to the Lower Rappahannock River and Chesapeake Bay. Many of these inactive seafood industry sites are still used for water access by commercial fishermen. Assuring that these sites remain dedicated to providing access would help sustain our remaining commercial fishing industry. Owners of these seafood industry sites would be given options that they don't currently have. Incentives could be offered to these owners by the County, which would allow them to start some type of complementary business at the site. Currently unused buildings could be rehabilitated and used to provide bait, tackle, seafood, or small grocery products for sale. Lastly, important landmarks on the County's waterfront could be saved from abandonment, and re-used in a way that assures their continued role in the County's future development.

Additional County efforts should focus on negotiating agreements with owners of existing privately owned, non-commercial boating access sites, which are made available for public use. One example in Lancaster County is a much-used privately owned site available for public use located in Irvington. Agreements with these property owners would assure that the sites will continue to be used in the future as boating access sites. Furthermore, it is possible that the County could find at least one property owner who would be willing to transfer management of existing site to the Department of Game and Inland Fisheries or the County. If this occurred, the County could take an active role in assuring that the property owner's intentions for the site are fulfilled, and that the site is named for the donating party.

6. Policies for Private Access to the Water

Policies for private access to the water have been developed with the realization that the County has almost no authority to limit an individual property owner's access to adjacent state waters. Policies concerning private access to water center on awareness of the impacts of individual access and encouragement of voluntary measures for environmental protection to be taken by individual property owners.

- a. Continue to encourage subdivision designs that provide adequate community facilities for the provision of water access. Presence of good community

facilities could deter some private landowners from developing their own on-site access structures. Community boat ramps also give neighborhood boat owners convenient opportunity to take their boats out of the water when not in use.

- b. Heighten public awareness concerning the impacts of boating on water quality. During boating season, use public service announcements on the radio that encourage boat owners to take their boats out of the water when not in use. Furthermore, target the growing number of seasonal homeowners, and develop a information pamphlet which could be sent to their homes. The pamphlet would describe the impacts of long-term boat mooring, and would enlist their help in removing boats from the water when not in use during the week.

C. IMPLEMENTATION

1. Local Efforts

County must continue laying the groundwork for the provision of public access sites to the water in Lancaster County, especially Bay access. Initial steps as follows will involve staff time and will require no other expenditure public funds.

- Actively recruit owners of inactive seafood industry sites to see if there is interest in re-using these sites for public access purposes.
- Pursue owners of private ramps currently being used by public to see if use agreements are a possibility.
- Apply for grant funds for development of these sites (see Outside Funding Sources).
- Make known the objective of gaining ownership of publicly owned sites at the Merry Point Ferry Landings, if and when they become available.
- Contact owners of large tracts of timber on state waters and attempt tonegotiate use agreements for these lands.

2. Outside Technical Assistance

Representatives from the Department of Conservation and Recreation have stated their willingness to provide technical assistance in site selection and in negotiating agreements between localities and private landowners for public access sites. Assistance would be contingent on whether or not the proposed project was compatible with state recreational access plans. All of the proposals in this plan are compatible with state plans.

3. Outside Funding Sources

- Land and Water Conservation Fund (LCW) - This is a Federal fund administered by

the Virginia Department of Conservation and Recreation (DCR) through their Virginia Outdoor Fund Program. According to DCR, Virginia's allocation from the LCWF has been averaging \$500,000 a year in recent years. Money is made available to localities on a competitive basis. Funds are provided on a 50/50 matching basis, with localities putting up the other 50% of the project cost. The funds can be used for either acquisition or development of recreation sites.

Boating and Water access projects are given priority by DCR in the awarding of grant funds. Currently, DCR tries to fund four to five projects each year. These projects usually average \$100,000 in federal funds, for a total project cost of \$200,000.

- Coastal Zone Management Program 306A Construction Grants - This program has limited funds available on a competitive basis. The program has had a total of approximately \$200,000 available for grants in recent years. Funds for this program are also provided on a 50/50 matching basis, with localities matching half the cost of the project.
- DG&IF Grants to Localities Program - Program provides 75% of development costs for selected public boating access projects up to a maximum of \$50,000, and up to \$25,000 for selected public fishing access projects. Approximately 6 to 8 projects were funded during fiscal year 1995-96. Funds are awarded on a competitive basis. If successful, the County would have to enter into a cooperative agreement with the Department of Game and Inland Fisheries to maintain and operate the facilities.
- Private Funding Sources - Virginia is home to many large angling clubs, especially in the larger urban areas of Tidewater, Richmond, and Northern Virginia. These groups could be solicited for private donations in support of the development of public fishing and boating facilities. Virginia also has many private foundations which should be contacted to determine if they offer grant funds for public access to water projects.

IV. GOALS AND OBJECTIVES

- GOAL # 1 Provide and encourage adequate recreational access to State waters, while assuring continued protection of the natural environment.**

Objective: Actively encourage community access facilities in new residential subdivisions as an alternative to individual ramp and pier construction.

Objective: Support the development of convenient public access facilities in areas of high pier densities in order to give boat owners options for taking their boats out of the water when not in use.

GOAL #2 Create public access opportunities that offer varied waterfront experiences.

Objective: Support the development of a public boat ramp site on the eastern side of the County that can provide direct access to the Chesapeake Bay or the lower Rappahannock River.

Objective: Support the development of a public fishing pier on publicly owned land in the eastern half of the County.

Objective: Encourage private owners of waterfront and other unique properties to negotiate use agreements that can provide access to their lands for nature trails, observation, and study.

Objective: Support the development of a public access acquisition fund that would be used to buy affordable water front lots to be used as car top boat launching and bank fishing/crabbing sites.

GOAL #3 Create public access sites which can enhance economic opportunities in Lancaster County.

Objective: Actively encourage owners of vacant industrial waterfront sites to re-use these sites in a way that provides access, while also creating new chances for business.

Objective: Actively encourage owners of waterfront sites that currently provide access to commercial fishermen, to work with the County in a public/private partnership which would guarantee continued commercial, as well as public, access at these sites.

Objective: Create public access sites in locations where they can act to generate traffic to nearby businesses.

SUMMARY

The preceding goals and objectives are both specific and general in terms of an approach to solving the basic problem—insufficient availability of access to state waters for those Lancaster County citizens who cannot obtain it by private means. In solving the problem the difficulties of obtaining sufficient funding to acquire shoreline property for

public use and overcoming objections to locations proposed must be recognized as limiting factors. Given that, it should be resolved that the following will be achieved within the next five years:

- 1) A launching ramp on the Corrotoman River proper;
- 2) A launching ramp on Carters Creek;
- 3) A launching ramp on the Lower Rappahannock River;
- 4) A public beach or expanded existing beach at the eastern end of the County, or in as close a proximity as possible to the population centers of Kilmarnock, White Stone, and Irvington.

Given the continuing pace of private development, it will not likely be possible to achieve any of these facilities beyond the next update to the Comprehensive Plan