

Chapter 5: Natural Resources

Goals and Objectives	5-1
Inventory of Natural Resources with Associated Programs	5-2
Watershed Management	5-17
Policies and Actions	5-21

Natural Resource Protection

Chapter 5

Natural Resource Protection

The natural resources of Charles County, its rivers and streams, marshland, forests and shoreline support a wide variety of plant and wildlife communities. These diverse environments also greatly contribute to the County's overall beauty, quality of life and rural character, rural economy and provide the framework for which the built environment is planned and developed. In return, natural resource lands require few government services, support clean air and clean water, provide opportunities for eco-tourism, and help enhance property values in developed areas.

This chapter contains an inventory of the County's natural resources and identifies associated planning programs and regulatory controls, as well as watershed management. Natural hazards, impacts of climate change, and the County's Hazard Mitigation Plan are discussed in Chapter 9. Water resources programs and regulatory controls, such as Total Maximum Daily Loads, National Pollution Discharge Elimination System permits, and Tier II waters are discussed in Chapter 4.

Goals and Objectives

- 5.1 Maintain a safe and healthy environment by protecting air, water, and land resources, and preventing the degradation of those resources from pollutants.
- 5.2 Protect 50 percent of Charles County as open space.
- 5.3 Implement and enforce the County's Critical Area Program, which is designed to foster more sensitive development along the shoreline so as to minimize damage to water quality and wildlife habitats.
- 5.4 Preserve and enforce the Resource Protection Zone as a buffer to ensure protection of sensitive inland and environmental features in stream valleys outside the Critical Area such as the Mattawoman Creek, Zekiah Swamp Run, Gilbert Swamp Run, Port Tobacco River, Nanjemoy, Swanson, and Indian Creeks' watersheds.
- 5.5 Protect the habitats of rare, threatened and endangered species to maintain their long-term survival and biodiversity.
- 5.6 Conserve large tracts of contiguous forestland and forest interior dwelling bird habitat (FIDS) determined to be of significance due to their value for wildlife habitat, water quality and air quality.
- 5.7 Promote awareness of environmental issues through public outreach, public access and educational programs, to cultivate a basic understanding of the natural environment and its valuable resources.
- 5.8 Provide public access to open space, forestland and the waterfront as an amenity to an enhanced quality of life.

Inventory of Natural Resources with Associated Programs

Air Quality

An ozone pollution plume is found over and around the I-95 corridor through Maryland. Ozone concentrations are typically higher in areas downwind of urban areas. The highest ozone concentrations in Charles County are found in the northern portion.

In April 2012 the Environmental Protection Agency issued its final area designations for the 2008 National Ambient Air Quality Standards for ozone and kept the Washington DC-MD-VA region as a nonattainment area, the same as the 1997 designation. The County is a member of the Metropolitan Washington Air Quality Committee (MWAQC) which is the entity certified by the mayor of the District of Columbia and the governors of Maryland and Virginia to prepare an air quality plan for the DC-MD-VA area under the federal Clean Air Act.

Geology, Soils and Topography

Charles County is located within the Atlantic Coast Plain physiographic province and wholly underlain by layers of sand, gravel, silt, and clay. These unconsolidated layers range in age from 135 million to 1 million years old, which in geologic time represent relatively recent deposits.

The landscape of Charles County can be divided into four general regions: nearly level upland plateau; steep slopes between uplands and low terraces; shoreline stream terraces; and floodplains and tidal marsh. Approximately 58 percent of Charles County is nearly level or gently sloping, 26 percent is moderately or strongly sloping (i.e. slopes 10-15 percent), and 16 percent is considered steep (i.e. slopes 15 percent and over) (see Figure 5-1)¹.

The Soil Survey of Charles County categorizes the soil types by association. In general the soils of Charles County are naturally acidic, low in fertility, and highly intermixed and variable as to their suitability for various land uses. The Soil Survey also provides generalized guidance as to the suitability and limitation of specific soils for various land development activities. High water tables are prevalent in the County².

Protection of Steep Slopes

The County's Grading and Sediment Control Ordinance defines steep slopes as slopes over 15 percent grade. Grading is permitted provided an applicant obtains an approved erosion and sediment control plan. Steep slopes near streams are given additional protection through the Resource Protection Zone (RPZ); the minimum buffer from streams is increased to account for 15 percent steep slopes contiguous or adjacent to the buffer. Areas of steep slopes over 25 percent and over 10,000 square feet are encouraged to be preserved as undeveloped open space under design standards contained in the subdivision regulations. Within the Critical Area, the buffer from tidal waters is expanded to account for contiguous steep slopes greater than 15 percent.

¹ Source: MD Department of Natural Resources based on LIDAR, 2004.

² Source: Soil Survey of Charles County, 2008.

Grading & Sediment Control

The Charles Soil Conservation District and the Codes, Permits, and Inspections Division of the Department of Planning and Growth Management, review and enforce all development permits to insure compliance with County and State regulations regarding soil disturbance. By enforcing these laws the sediment loading of waterways is reduced thereby preserving water quality in downstream areas.

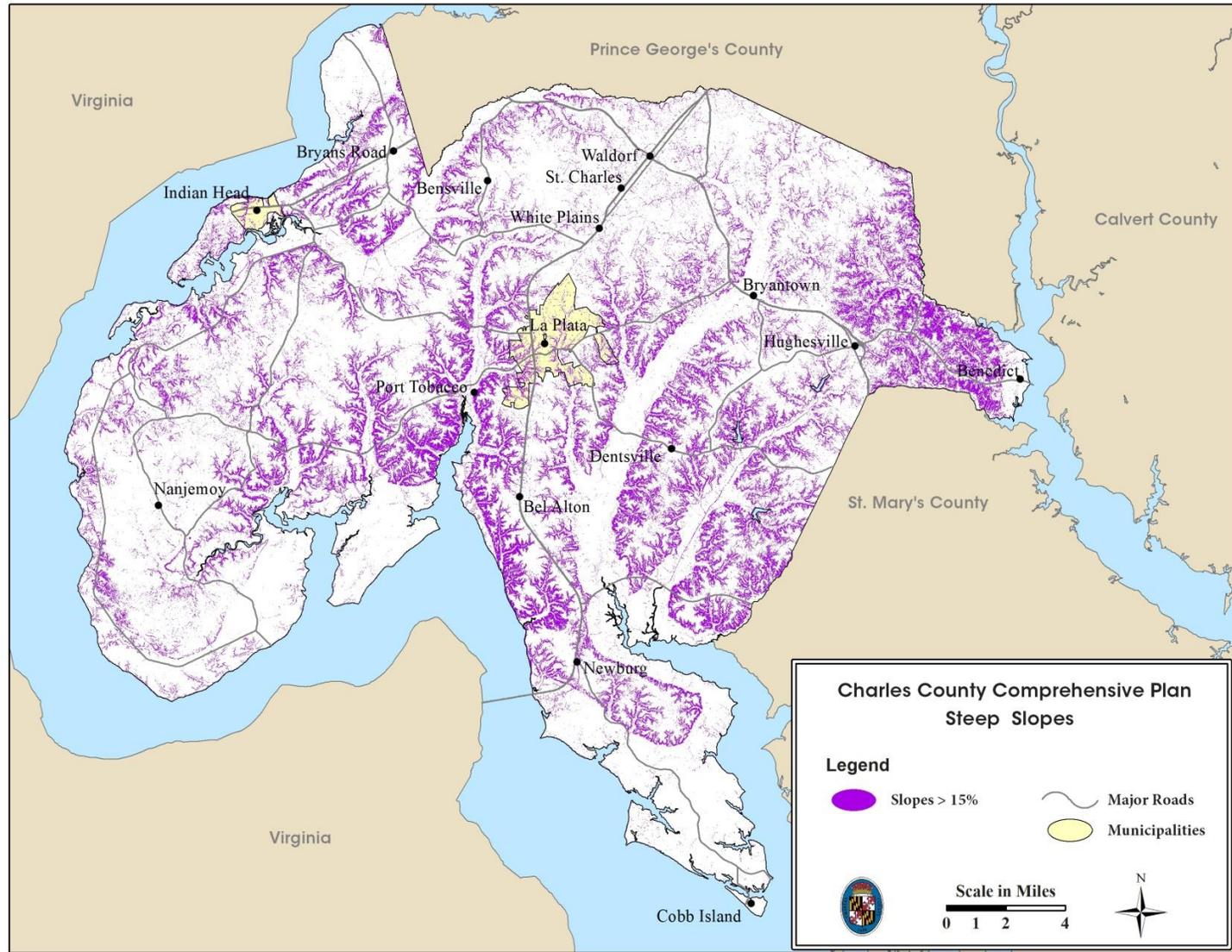
Waterways, Floodplains and Wetlands

The County's extensive network of rivers, estuaries, and streams originate from a myriad of small, often ephemeral or intermittent streams and wetlands. Natural processes occur in these headwater streams and wetlands which are critical to the health of the entire network. Streams are ordered from zero-order, first-order, second-order and so-on. Even zero-order streams serve as conduits of water, sediment, nutrients and debris during storms and snowmelts. The lower order streams are slow moving, thus allowing many microbial processes to occur that naturally clean the water. Forested buffers around streams are critical to maintain stream function, bank structure, cooler water temperatures, a source of leaf litter, and the biota. Floods are natural phenomena that occur when waterways are unable to contain an abnormally high volume of water within their channels. Since waterways can only accommodate a specific rate of flow, the increased volume periodically overflows the banks onto the stream valley floor. The relatively level valley floor that is inundated by the floodwaters is referred to as the floodplain. Floodplains are often described in terms of flood frequency which is related to discharge. A 100-year flood refers to a flood with a one percent probability of occurring in any given year.

Floodplains moderate and store floodwaters, absorb wave energies, provide long term storage of nutrients and sediment, denitrify stormwater, dilute nutrients during groundwater recharge, provide for the uptake of nutrients by vegetation, and reduce erosion and sedimentation. Although flooding is a natural occurrence, flood damage is a result of allowing development to occur in flood hazard areas. Floodplain development poses a considerable risk to human health and safety, and may disturb both aquatic and terrestrial habitat areas. Wetlands are of major importance to the ecosystem of the County and of the Chesapeake Bay. The County has approximately 35,000 acres of vegetated wetlands, some of which are located in floodplains (see Figure 5-2).³

³ Source: Maryland Department of Environment 2012 estimate based on combination of National Wetland Inventory and MD DOQQ wetland Maps.

Figure 5-1 Steep Slopes



Tidal wetlands have long been recognized as particularly productive ecosystems. Many of the major streams in the County develop into tidal marshes at their confluence with the Potomac, Wicomico and Patuxent rivers. Tidal wetlands provide a transition zone between dry land and open water, and serve numerous ecological functions.

Nontidal wetlands, although similar in function to tidal wetlands, differ greatly in their range of habitats, and species composition. Non-tidal wetlands are often referred to as inland or upland wetlands and include freshwater swamps, bogs and bottomland hardwood forests. The largest non-tidal wetland in Charles County is the Zekiah Swamp.

Acidic Coastal Fens are groundwater-fed, saturated wetlands (can be open and shrub or herb-dominated), and commonly referred to as Magnolia bogs. They are globally limited and found only along the Mid-Atlantic fall-line. Located at toe slopes of highly weathered, highly acidic, fluvial-estuarine terrace gravel deposits, they are formed by abundant groundwater seepage forming shallow, braided channels. These acidic fens are characterized by an understory of Sweetbay Magnolia, with moss-covered hummocks and abundant ferns. Rare plant and animal communities are found in these unusual conditions. Fewer than 10 fens remain, two of which are in Charles County, Araby Bog and Bryans Road Bog.

Figure 5-2 Wetlands and Resource Protection Zone



Tidal and nontidal wetlands are valuable natural resources. They provide habitat for plants, fish, and wildlife, maintain water quality, and act as ground water recharge areas, and control flooding and erosion.

Protection of Streams and their Buffers

The Resource Protection Zone (RPZ) is an overlay zone applying to streams outside the Chesapeake Bay Critical Area. The purpose of the zone is to protect stream valley habitat and stream water quality. The RPZ encompasses stream valleys, steep slopes, associated wetlands and floodplains, if present, as a buffer. Inside the RPZ, most forms of development are prohibited, and permitted uses, such as agriculture and commercial timber harvesting, must follow management plans. The RPZ buffer is a minimum 50 feet for small and intermittent streams and 100 feet for larger streams. The buffer is expanded to account for non-tidal wetlands, 100-year flood plains and steep slopes. Changes to this plan include considering new revisions to the RPZ and establishment of a density of one unit per ten acres (1:10) for all major stream valleys and one unit per twenty acres (1:20) for the Watershed Conservation District to protect the stream valley of the Mattawoman Creek.

Floodplain Management

The County's comprehensive Floodplain Management Program is administered through the Charles County Floodplain Ordinance. The ordinance establishes and delineates those areas in Charles County that would be inundated by the 100-year regulatory flood. The ordinance establishes three floodplain zones: a non-tidal floodplain zone; a tidal floodplain zone; and a coastal high hazard zone. The ordinance provides for the issuance of permits and also imposes certain restrictions on construction and development within the floodplain district in order to protect human life and health and minimize public and private property damage.

Wetland Protection

The Maryland Department of Environment (MDE) and the U.S. Army Corps of Engineers (Corps) regulate the alteration of any floodplain, waterway, or tidal or nontidal wetland through a joint permitting process.

All development applications submitted to the County are reviewed for the potential presence of wetlands, based on U.S. Department of Interior, National Wetland Inventory maps and the Maryland Department of Natural Resources Wetland Inventory maps. If wetlands may be present, the applicant is required to identify the boundaries by field analysis. The County will approve a subdivision or site plan, but on the condition the applicant obtains the necessary state and federal wetland permits.

Nontidal wetlands of Special State Concern are the best examples of Maryland's nontidal wetland habitats and are designated for special protection under the State's nontidal wetlands regulations. These special wetlands most often have rare, threatened or endangered species, and, at minimum, must have a unique plant and/or animal community. Activities which involve any clearing of vegetation, filling, excavating, flooding or draining are regulated by the State, which requires a 100-foot protective buffer around the non-tidal wetlands of Special State Concern. The State adopted 12 wetlands of Special State Concern in Charles County including Zekiah Swamp.

Wetlands will migrate inland over the next 100 to 150 years, as sea level rises. It is important to maintain these areas as undeveloped to accommodate the wetlands and their important functions which support and improve water quality and biodiversity.

Forests

Forest land occupied almost all of Charles County prior to colonization. These forests were primarily hardwoods including oaks, chestnuts, sweet gum, yellow poplar, and beech. The first settlers to the County cleared large expanses of land for agricultural production, predominantly to cultivate corn, tobacco, small grain, and hay.

Immediately preceding the Civil War, a large percentage of the original forest land had been cleared for agricultural uses, but during the first half of the 20th century there was a gradual reversion back to forest cover. Forest lands now represent the dominant land use in Charles County with approximately 164,600 acres or 56 percent of the land area (see Table 5-1).

Table 5-1 Distribution of Forest by Forest Type

<i>Forest Type</i>	<i>Acres</i>	<i>Percent of County</i>
<i>Deciduous Forest</i>	109,017	37
<i>Coniferous Forest</i>	13,163	4.5
<i>Mixed Forest</i>	36,252	12
Shrub/Scrub and Regenerating Forest	6,178	2
Total Forest	164,610	56
Total County	294,621	100

Source: Maryland Department of Planning, 2004 (2009 Land Use Land Cover dataset)

The coniferous forest type is composed primarily of Virginia Pine with small additions of Loblolly, and occurs on the higher, well drained sandy ridges, old fields, and cut over woodlands. Oaks are predominant in three forest types with the red oak being the primary oak species.

Forests provide significant community benefits by absorbing and storing nutrients and sediment from stormwater runoff and near surface groundwater flow, minimizing erosion, absorbing carbon from the atmosphere, mitigating the effects of atmospheric warming and supporting wildlife.

As of 2007, several patches of forest remained that were over 1,300 acres, however only a few patches were over 3,000 acres. As of 2016, there are less than 10 unprotected forested parcels that are 500 acres or larger (highest priority for retention).⁴ In addition to benefits rural forests provide for the natural environment, studies have shown that urban forests attract shoppers and visitors to business districts⁵ and are correlated with reductions in crime.⁶

⁴ Source: Analysis by MD Forest Service based on data from The Conservation Fund.

⁵ Wolf, Kathy, Ph.D., Center for Urban Horticulture, University of Washington, College of Forest Resources, "Trees in Business Districts: Positive Effects on Consumer Behavior." Nov 1998.

Between 1997 and 2009, the County had a net loss of approximately 13,200 acres of forest cover (see Table 2-1). In 2009 the MD DNR Forest Service completed a Strategic Forest Assessment of Charles County. This assessment identified priority conservation and reforestation areas for regulatory mitigation purposes, water quality treatment, and habitat. It's important to note that Charles County still remains the third most forested County in Maryland, only behind Allegany and Garrett counties.

Forest Protection & Legacy

The County's forest conservation ordinance applies to all lands outside the Critical Area and requires development proposals to include forest stand delineations and forest conservation plans. The forest conservation plan can require afforestation or reforestation. Afforestation is planting trees where forest cover has been absent, such as farm fields. Reforestation is replacing existing trees. The majority of forest outside of the County's Development District is eligible for the federal Forest Legacy Program through USDA Forest Service. This program offers incentives for protection.

Habitat and Wildlife

Charles County's extensive open water shoreline marshes and mature forests provide excellent habitat for numerous plant, fish, bird, amphibian, reptile, insect, and mammal species.

Anadromous fish, species that live in marine environments and migrate to freshwater to spawn, utilize the Patuxent, Potomac and Wicomico Rivers. Striped bass spawning occurs in the Potomac River between Indian Head and Riverside. Remaining portions of the river are important nursery areas for spot, croaker, gray trout, white perch, and yellow perch.

Colonial water bird nesting sites, and waterfowl staging and concentration areas exist along tidal shorelines, tributary streams, and non-tidal wetlands throughout the County. The only colonial water bird to nest in Charles County in recent history is the Great Blue Heron. Great Blue Heron rookeries can be found on Mattawoman Creek, Nanjemoy Creek, Zekiah Swamp Run, and Swanson Creek, and numerous active Bald Eagle nests have been identified along the County's extensive shoreline.

During the year, Charles County is inhabited by approximately 30 species of water fowl, 70 species of other wetland birds, three species of upland game birds, 20 species of birds of prey, 150 species of upland song birds and neotropical migrants, 25 species of amphibians, 32 species of reptiles, and 45 species of mammals.

Many of the birds of prey and migratory song birds found in Charles County are classified as Forest Interior Dwelling Species (FIDS). Large forests are required to support these populations. For example, more than 250 acres are necessary to sustain a breeding pair of Red-shouldered Hawks.⁷ It is also necessary for the interior forest habitat to be more than 300 feet from any forest edge to reduce impacts of predators on these species. Fragmentation of large forests increases forest edges and is associated with a significant reduction in the number of young birds that are fledged in a year.

⁶ Troy, A, Grove, J.M., O'Neil-Dunne, J., University of Vermont and USDA Forest Service Northern Research Station, "The relationship between tree canopy and crime rates across gradient in the greater Baltimore Region." March 2012.

⁷ Jones, C., McCann, J., McConville, S., "A Guide to the Conservation of Forest Interior Dwelling Birds in the Chesapeake Bay Critical Area." May 2001.

Private lands in the County support the majority of wildlife, and active farms support the greatest upland game populations. Waterfowl and upland game meet a significant demand for hunting by County residents. Wildlife also provides opportunities for passive recreation and educational activities, observing, and photographing them in their natural habitat.

Natural Heritage Areas

Natural Heritage Areas (NHAs) are composed of plant or animal communities that are considered to be among the best statewide examples of their kind. In addition, all NHAs contain at least one species designated or proposed as endangered, threatened, or in need of conservation. There are four NHAs in Charles County (see Figure 5-3).

1. *Allen's Fresh NHA-16*
2. *Chicamuxen Creek NHA-17*
3. *Popes Creek NHA-18*
4. *Upper Nanjemoy Creek NHA-19*

Development activities or other disturbances in these areas are not allowed unless it can be shown that the proposed activity will have no adverse impacts on habitats. Specifically, it must be shown that the structure and overall species composition of the plant and animal communities will be retained.

Habitat Protection Areas Outside the Chesapeake Bay Critical Area

The County Subdivision Regulations protect habitat areas, including but not limited to:

- *Habitat of rare, threatened and endangered species*
- *Fish spawning areas*
- *Submerged aquatic vegetation*
- *Forest Interior Dwelling Bird habitat*
- *Colonial waterbird nesting sites*

Habitat of Threatened and Endangered Species are defined in the regulations as:

An area which, due to its physical or biological features, provides important elements for the maintenance, expansion, and long term survival of threatened and endangered species listed in COMAR 08.03.08. This area may include breeding, feeding, resting, migratory, or overwintering areas. Physical or biological features include, but are not limited to: structure and composition of the vegetation; faunal community; soils, water chemistry and quality; and geologic, hydrologic, and micro climatic factors. This area may need special management protection because of its importance to conservation of the threatened or endangered species.

Lists of rare, threatened and endangered animals and plants, including federally listed species, are maintained by the Maryland Department of Natural Resources Wildlife and Heritage Service. Statewide, approximately 167 animals and 445 plants are afforded some level of legal protection. As of November 2015, 26 animal and 92 plant species were listed within Charles County. This is an increase of 13 species since 2004. Of these, one animal and one plant were listed as threatened or endangered by the U.S. Fish and Wildlife Service. These are the dwarf wedge mussel, and the sensitive joint vetch. The Bald Eagle was delisted under the federal Endangered Species Act in 2007, however remains protected by the Migratory Bird Treaty Act, and the Bald

and Golden Eagle Protection Act. Charles County continues to protect Bald Eagle nests in the Critical Area.

The County requires Habitat Protection Plans for addressing the protection of the habitats of rare, threatened and endangered species, and these are required at time of property subdivision. Habitat Protection Plans must be prepared with the assistance of the Maryland Department of Natural Resources.

In addition to the protection by the Charles County Subdivision Regulations, habitat of rare, threatened and endangered species is a priority forest retention area under the State and County Forest Conservation regulations.

Biodiversity Conservation Network (BioNet)

The State's BioNet integrates Natural Heritage Areas, Critical Area Habitat Protection Areas, Ecologically Significant Areas, and Sensitive Species Project Review Areas for the purpose of prioritizing Maryland's vanishing natural landscape to highlight those areas that are important to conserve the full complement of species and natural communities currently found within the State.

The areas are prioritized into a 5-tiered system, with Tiers I and II being the most significant for biodiversity conservation. Ranking criteria focuses on both the most irreplaceable species and habitats, as well as on the habitats that concentrate large numbers of rare species. Charles County contains about 34,202 acres of Tiers I and II, and 129,165 acres of Tiers III through V.

Green Infrastructure

Maryland's Green Infrastructure initiative was a state-wide effort in the late 1990s by the Maryland Department of Natural Resources (DNR) to identify large, contiguous blocks of ecologically significant natural areas (hubs) and to link them with natural corridors to create an interconnected network of natural resource lands across the state. Corridors allow for animal and plant seed movement between hubs, to offset any localized extinction. The Green Infrastructure initiative has evolved over the years into a program called Maryland GreenPrint that identifies Targeted Ecological Areas preferred for Statewide Program Open Space funding based on their high ecological value. The County's Land Preservation, Parks and Recreation Plan addresses consistency between the boundaries of the County priorities for natural resource protection and GreenPrint.

Shorelines

There are approximately 183 miles of tidal shoreline in Charles County as mapped by the Chesapeake Bay Critical Area Commission. However, more accurate GIS data indicates that the total county shoreline is closer to 300 miles. Over 90 percent is dominated by forests, wetlands, or agricultural fields. Maryland's Chesapeake Bay Critical Area law adopted in 1984 identified the lands within 1,000 feet of tidal waters as critical environmental areas in need of protection (see Figure 5-3).

Chesapeake Bay Critical Area Program

The Chesapeake Bay Critical Area Law requires Charles County to adopt and implement a Critical Area management program and ordinance to protect the water quality and wildlife habitats of the Bay and its tributaries. The State Critical Area Commission reviews the program

and ordinance every six years. All development activity within the Critical Area must comply with criteria affecting development density, water dependent uses, buffers from waterways, and protections for natural shorelines and wildlife habitats.

Growth Allocation in the Chesapeake Bay Critical Area

Growth Allocation refers to the size of growth areas assigned to each county based on their shoreline. They are divided into three categories as listed below. Charles County has a fixed amount of 1,120.1 acres of Growth Allocation available for the purposes of increasing the acres of Intensely Developed and Limited Developed Zones. As of 2015, 927.36 acres remain.

The following chart tracks the use of the Growth Allocation between 2001 and 2015:

<i>Overlay Zone</i>	<i>2001</i>	<i>Growth Allocation Acres (Project)</i>	<i>2015</i>
<i>Resource Conservation</i>	<i>27,929 acres</i>	<i>-26.11 (Villages at Swan Point)</i>	<i>27,902.89 acres</i>
<i>Limited Development</i>	<i>2,217 acres</i>	<i>-22.61 (Town of Indian Head) -1.43 (Cobb Island VFD) -3.10 (Town of Indian Head) -138.12 (Villages at Swan Point) -1.37 (Benedict VFD)</i>	<i>2,050.37 acres</i>
<i>Intense Development</i>	<i>278 acres</i>	<i>+22.61 (Town of Indian Head) +1.43 (Cobb Island VFD) +3.10 (Town of Indian Head) +164.23 (Villages at Swan Point) +1.37 (Benedict VFD)</i>	<i>470.74 acres</i>

Figure 5-3 Chesapeake Bay Critical Area and Natural Heritage Areas



Habitat Protection Areas in the Chesapeake Bay Critical Area

In the Chesapeake Bay Critical Area, Charles County defines Habitat Protection Areas as land containing specialized plant or wildlife habitat, where protection is essential to the preservation of biological species and water quality (Figure 5-2). Habitat Protection Areas in Charles County include:

- The 100-foot Critical Area Buffer for all tidal waters and wetlands
- Threatened and endangered species habitat
- Non-tidal wetlands
- Colonial waterbird nesting areas
- Forest areas with forest interior dwelling birds
- Other important plant and wildlife habitat areas
- Expansions of the Critical Area Buffer
- Habitats of Local Significance
- Natural Heritage Areas
- Historic waterfowl staging areas
- Anadromous fish propagation waters

All proposed development activities are subject to the Habitat Protection guidelines and requirements found in the Zoning Ordinance.

The Habitats of Local Significance in the Critical Area are:

1. Audubon Woods
2. Bullitt Neck Point
3. Cornwallis Neck Marshes
4. Friendship Landing
5. Porter Woods
6. Purse Uplands and Ravines
7. Thoroughfare Island
8. West Stump Shoreline
9. Bald Eagle Habitat

Living Shorelines

The Charles County shoreline has experienced varying degrees of erosion over time. The erosion process is a function of the County's geology and shoreline terrain, the nature of soils adjacent to water areas, and off-shore water depths. The degree of erosion is further influenced by shoreline characteristics and land cover, as well as wave, tide, and other coastal processes. Less than 7 percent or 12 miles of the county's shoreline experiences serious erosion rates of greater than two feet per year.⁸ They are on the Potomac shoreline from Sandy Point south to lower Thomas Point, Blossom Point to Windmill Point, the eastern shore of Port Tobacco River to Pope's Creek; and the southwestern shore of Cobb Island. In some areas along the Potomac, bluffs are as high as 50 feet.

⁸ US Geological Survey, Historic Shorelines and Erosion Rate Map Atlas (MCZMP, 1975).

Almost 70% of the County's shoreline is experiencing accretion⁹; however the risk of shore erosion is expected to increase due to more intense weather events and sea level rise resulting from climate change.

The Living Shoreline Protection Act of 2008 requires that improvements to protect a person's property against shoreline erosion consist of marsh creation or other nonstructural shoreline stabilization measures that preserve the natural environment. Structural practices such as revetments and bulkheads, may be used only if the project shoreline is mapped by the Maryland Department of Environment as appropriate for such, or it is demonstrated that nonstructural measures are not feasible due to excessive erosion, severe high energy conditions, or the fact that the waterway is too narrow for effective use of nonstructural measures.

Climate Change

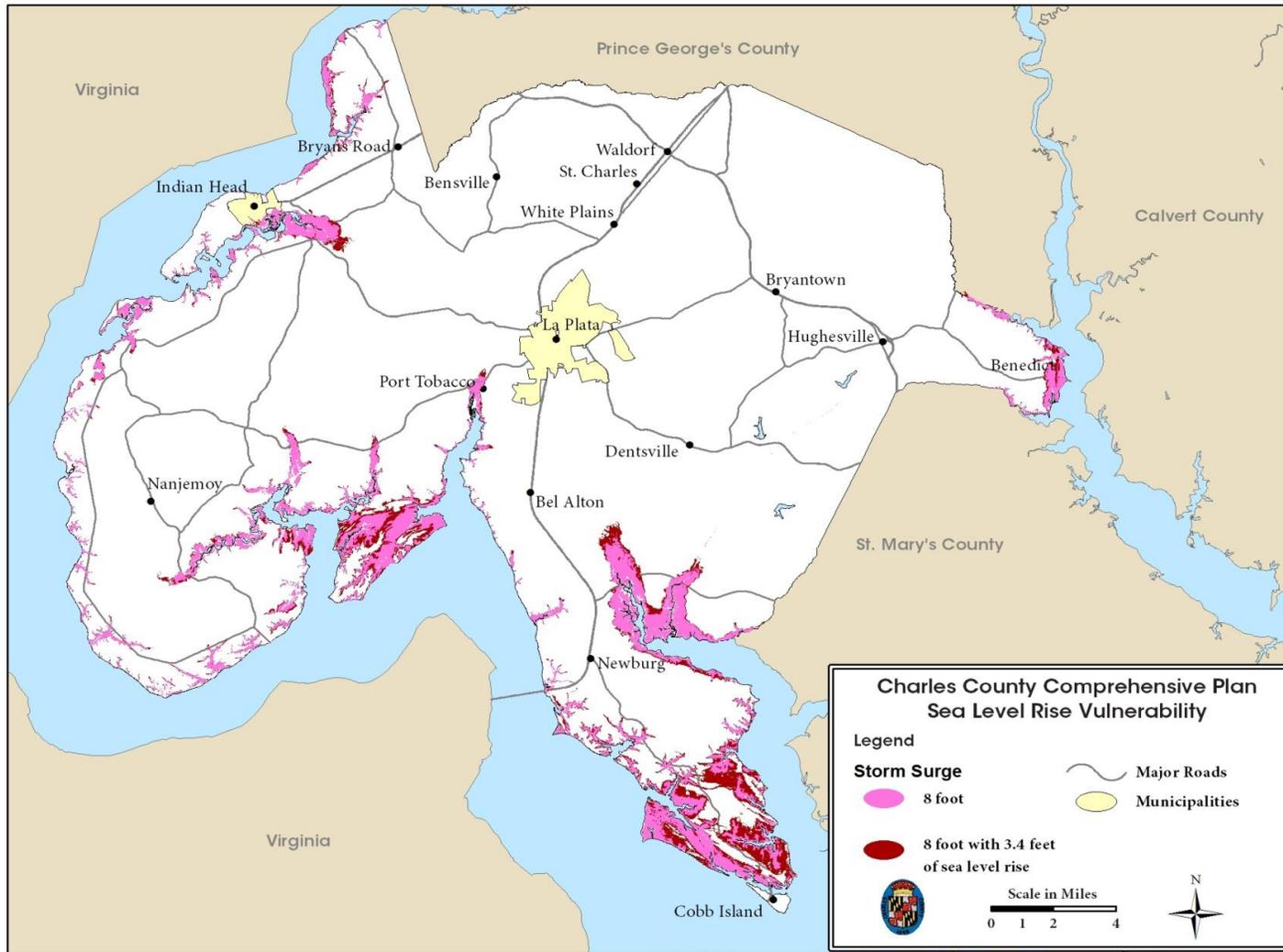
Global scientific consensus is that climate change is happening and is set to accelerate, with potentially severe consequences to the public and private lands, assets and infrastructure. Governments around the world are focusing on preparing responses to the consequences of climate change impacts that are unavoidable.

The State of Maryland developed a Climate Action Plan in 2008¹⁰. In Maryland the key consequences of climate change are expected to include warmer temperatures, rising sea levels,

⁹ US Geological Survey, Historic Shorelines and Erosion Rate Map Atlas (MCZMP, 1975).

¹⁰ Climate Action Plan: State of Maryland, Maryland Commission on Climate Change, 2008.

Figure 5-4 Sea Level Rise Vulnerability



increased numbers of storm events, such as hurricanes and Nor'easters, as well as problems associated with shore erosion, coastal flooding, storm surge, and inundation.

Maryland is experiencing a greater rise in sea level than many other parts of the world due to naturally occurring regional land subsidence. The Maryland Commission on Climate Change, Scientific and Technical Working Group (STWG), assessed the Intergovernmental Panel on Climate Change 4th Assessment Report (2007) and three scientific reports that incorporated acceleration of ice loss, along with regional land subsidence variables to provide a conservative estimate that by the end of this century, Maryland's coasts may experience an average relative sea-level rise of 2.7 feet under a lower-greenhouse gas emissions scenario, and as much as 3.4 feet under the higher-emissions scenario. The Maryland Department of Natural Resources has developed mapping of areas at risk from sea level rise. Much of Charles County's shoreline is vulnerable (see Figure 5-4).

Adapting to climate change is essential to protect residents' and businesses' assets, and safeguard a strong economic future. Maryland's Greenhouse Gas Emissions Reduction Act of 2009 requires the State to reduce greenhouse gas emissions 25 percent by 2020, relative to 2006 levels. Charles County is taking steps to understand its energy baseline and identify opportunities to reduce Greenhouse Gas Emissions (see Chapter 6).

Watershed Management

Watershed management is key to maintaining and improving water quality and the natural resources described above. It is a comprehensive framework for applying management tools to achieve water resource and natural resource goals for the watershed as a whole. Watershed management often involves both restoration and protection projects, regulatory and programmatic changes, and land use changes to achieve desired goals.

Because the County still has several healthy watersheds, identified as Stronghold Watersheds,¹¹ (i.e. areas with the highest biodiversity of stream insects and greatest occurrence of rare aquatic species), opportunities remain to apply less expensive protection efforts in lieu of allowing the resources to degrade to the point of costly restoration or an irrecoverable condition.

Land preservation is one of the most cost effective protection measures widely accepted by communities, and is an integral watershed management tool. Using various programs, the County and State agencies, and private conservancies work with property owners and citizens' groups to promote the preservation of sensitive environmental areas, and natural resource areas, including such areas where they exist on agricultural land. The voluntary Rural Legacy Program and Zekiah Watershed Rural Legacy Area is one such example.

¹¹ Maryland Department of Natural Resources, Maryland Biological Stream Survey (2008) identifies portions of Mattawoman Creek, Zekiah Swamp, upper Wicomico River, Budds Creek, Nanjemoy Creek and Middle Potomac as Stronghold Watersheds.

The Charles County Land Preservation, Parks, and Recreation Plan (LPPRP) inventories programs for natural resource land conservation, along with recreation land, and agricultural land conservation. The LPPRP also discusses Charles County's goal to protect 50 percent of the County as open space. This goal was first adopted as part of the 2006 LPPRP. Since then the County has carefully tracked protected lands in the County and makes an annual map with acreage tabulations. The most recent map was updated in 2015 and indicates that the County has 93,771 acres of protected lands, which is 64% of the overall goal. This included adding over 2,000 acres of land just over the past two years.

Mattawoman Creek Watershed

The Mattawoman Creek extends 20 miles through the County draining 45,000 acres of the County. Tidal wetlands of the Mattawoman are essential nursery areas for numerous species of fish. The main stem and tributaries of the creek have been among the Potomac basin's most important spawning waters; however marked declines in the tidal fish community have been recently documented.

In 2003 the US Army Corps of Engineers completed a watershed management plan for Mattawoman Creek in Charles County. The plan was developed in response to concerns that development within the Development District had the potential to significantly affect Mattawoman Creek resources, with water quality and aquatic biota the primary concerns. This management plan demonstrated the most effective (and least expensive) way to maintain water quality and ecological benefits is to protect the Mattawoman Creek Stream Valley to top of slope. The delineation of the Stream Valley was completed by the Maryland Department of Natural Resources (MDNR) in 2007 (see Figure 5-5).

Due to the Mattawoman beginning to show signs of stress, but still being at a point of recovery, an interagency taskforce lead by MDNR issued its 2012 final recommendations in a report titled, "The Case for Protection of the Watershed Resources of Mattawoman Creek." This report emphasizes the value of protecting the stream valley in order to maintain a functional ecosystem. Many of the recommendations from this report have been incorporated into this plan as new policies or action items. To further protect the Mattawoman Creek, the County Commissioners have directed staff to apply to designate a new Nanjemoy-Mattawoman Rural Legacy Area which will allow Charles County to qualify for additional funds to be used for conservation purposes.

Zekiah Swamp Watershed

The Zekiah Swamp watershed encompasses about 65,307 acres and traverses the eastern half of the County in a north/south orientation. The swamp itself is 20 miles long, averages 0.75 miles wide, and is the largest hardwood swamp in Maryland. Zekiah Swamp and Gilbert Swamp Run, adjacent to Zekiah's eastern watershed boundary, are designated wetlands of Special State Concern.

In 1998 the State of Maryland approved the County's plan to establish a Rural Legacy Area in the Zekiah Swamp Run Watershed (see Figure 5-5). This designation is for the purpose of preserving the rural landscape of this ecologically diverse watershed that contains many endangered plant and animals along with areas of great archeological, historical and cultural significance for Charles County. The Maryland Biological Stream Survey has rated the Zekiah

Swamp Watershed as the highest ranked watershed for aquatic biodiversity in the State. As of 2015 nearly 8,000 acres of land have been protected within this Rural Legacy Area through conservation easement or public lands.¹²

Port Tobacco River Watershed

This 28,000 acre watershed is completely contained within the County, and at its center. Many significant historical sites are located here including the historic County Seat of Port Tobacco, which was once a deep water port. Due to late 19th century deforestation, high sedimentation rates filled in the tidal wetlands and the port. Today, the watershed contains portions of the Development District and the new County Seat of LaPlata, which have recently experienced significant population growth. The valley surrounding the estuary has beautiful scenic water views, which helps to perpetuate growth pressure in the watershed.

In 2004 the County received a state Watershed Restoration Action Strategies (WRAS) grant to work with stakeholders in the watershed to address water quality issues. The WRAS process focused on achieving the residents' visions of: (1) safe, abundant seafood including crabs, fish, and oysters, (2) preservation of the natural state, both for its ecological and scenic benefits, (3) water quality that allows safe boating and swimming, and (4) navigable water for boating. These visions correlated into nine strategies to achieve safe bacteria levels for contact recreation, reduce nutrient inputs to prevent summer algal blooms, and mitigate changes to watershed hydrology to reduce stream erosion. The WRAS was adopted by the County for implementation in 2007.

Nanjemoy Creek Watershed

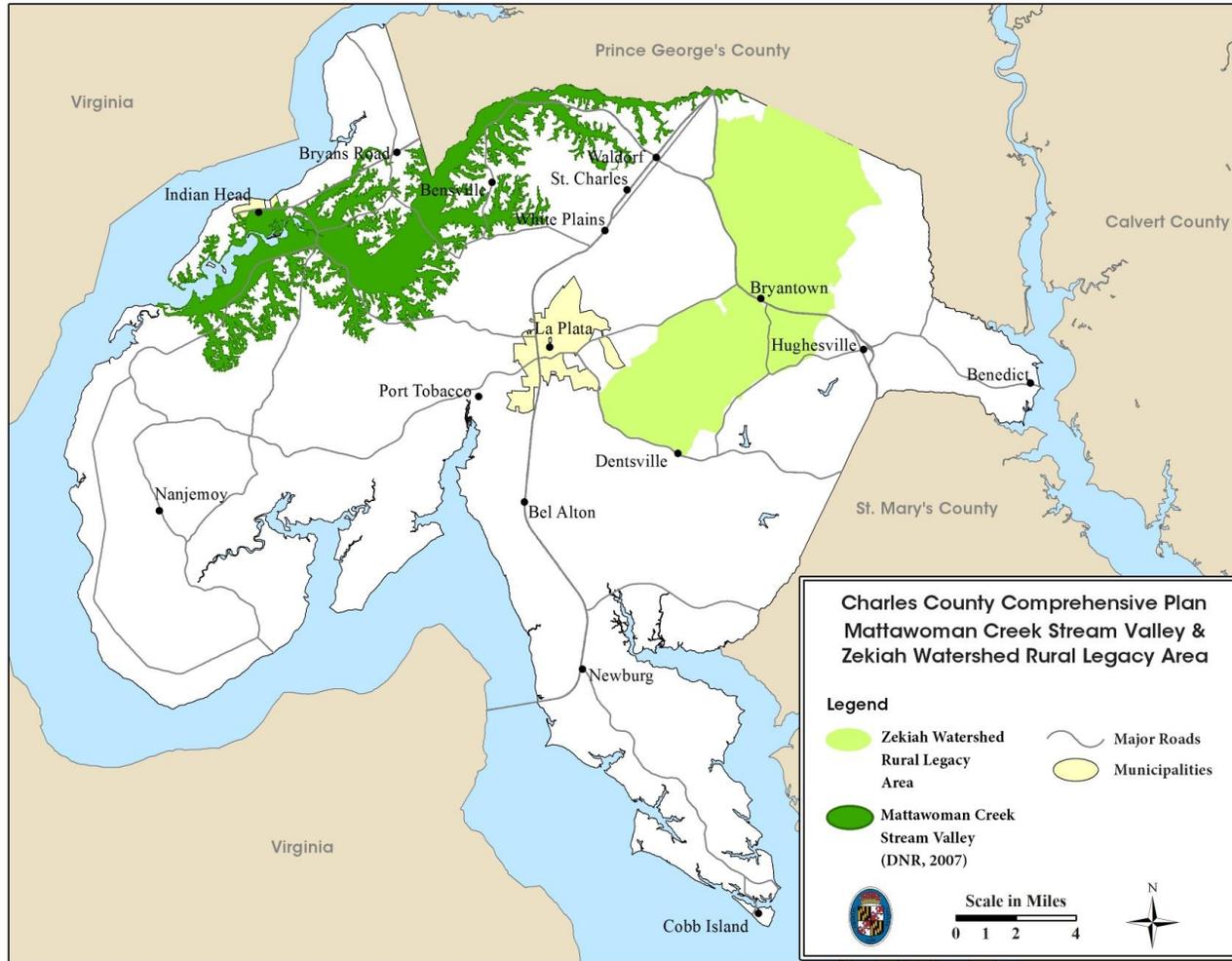
The Nanjemoy Peninsula, which includes portions of the Lower Potomac watershed, is one of the most ecologically and culturally significant landscapes remaining in the State. Migratory waterfowl and wading birds find shelter in over ten miles of undisturbed shoreline. The federally listed rare dwarf wedge mussel survives here. Early Native American archeological sites offer rare insight into indigenous cultures of this region.

Natural resource protection occurring in this watershed includes over 3,000 acres owned by the Nature Conservancy to support a large blue heron rookery, and rare, threatened and endangered species, including the dwarf wedge mussel. Additional land protection of about 2,000 acres by the federal, state and local agencies is defined in the 2005 Lower Potomac River Coordinated Management Plan. Ongoing stewardship of the Nanjemoy Natural Resource Management Area is by an interagency team, which includes the County.

Numerous recreational and ecotourism opportunities are available in this watershed. Many of the County's students experience overnight adventures at the Nanjemoy Creek Environmental Education Center.

¹² Source: Charles County Protected Lands Map, February 2015

Figure 5-5 Mattawoman Creek Stream Valley and Zekiah Watershed Rural Legacy Area



Patuxent River Watershed

The portion of the Patuxent River watershed in Charles County includes the major tributaries of Swanson Creek and Indian Creek which have headwaters near Hughesville and flow east towards Benedict. There is approximately one mile of tidal waterfront in Charles County. Oyster sanctuaries and working oyster bars are established in this vicinity of the river.

In 1971, the State designated the Patuxent a state scenic river. The County has been actively involved in watershed-wide planning efforts on the Patuxent involving seven counties and numerous state and federal agencies to protect the river's resources through land management and pollution control strategies. This effort began in 1984 with the development of the Patuxent Policy Plan that identified key goals and objectives for minimizing pollution throughout the watershed. The Patuxent River Commission was formed in 1988 to oversee the implementation of the Patuxent River Policy Plan.

Wicomico River Watershed

In 1974, the State designated the Wicomico a state scenic river. Almost a decade later, an interagency committee was formed by the State to coordinate research and management efforts in the Wicomico and its numerous tributaries. The resulting Wicomico Scenic River Study and Management Plan was completed and adopted by Charles County in 1993. The plan is not regulatory, but is intended to serve as a guide for state and local governments.

Potomac River Watershed

The Interstate Commission on the Potomac River Basin (ICPRB) is an interstate compact commission established by Congress in 1940 to help the Potomac basin states and the federal government to enhance, protect, and conserve the water and associated land resources of the Potomac River basin through regional and interstate cooperation.

In 1998 the Potomac River was designated one of the first 14 American Heritage Rivers in a program designed to streamline federal participation in local efforts to protect and enhance the natural, cultural, and economic resources inherent in the waterways.

Policies and Actions

The following are policies and actions recommended to continue to protect and enhance Charles County's natural resources:

Policies

General

- 5.1 Place special emphasis on watershed management to balance the protection of the Mattawoman Creek's natural resources and water quality with the County's development plans. In addition to the Priority Preservation Area (PPA), the Mattawoman Creek watershed should be targeted for acquisition for conservation purposes.
- 5.2 Implement and enhance the County's environmental preservation and conservation

objectives through administrative mechanisms including subdivision regulations, sediment and erosion control, environmental review processes, development regulations, and zoning.

- 5.3 Continue to coordinate and implement the goals and objectives of adopted policy plans including the Patuxent River Policy Plan, the Wicomico Scenic River Study and Management Plan, the Zekiah Swamp Rural Legacy Area Plan, the Port Tobacco River Watershed Restoration Action Strategy, Lower Potomac River Coordinated Management Plan (Nanjemoy Peninsula), and other watershed restoration and management plans including watershed implementation plans (see Chapter 4).
- 5.4 Guide development away from areas vulnerable to natural hazards especially areas subject to flooding, storm surge, and shore erosion
- 5.5 Require best management practices including low-impact development techniques to minimize the impacts of development on the natural environment.
- 5.6 Through public and private resources, purchase or otherwise acquire conservation easements to preserve environmentally sensitive resources. Develop parks, recreation and open space plans in conjunction with stream valley protection objectives.
- 5.7 Work cooperatively with the Metropolitan Washington Area Air Quality Committee to ensure the area complies with the requirements of the 1992 Clean Air Act.
- 5.8 Utilize the State of Maryland's GreenPrint maps for Targeted Ecological Areas as a guide to focus conservation efforts in Charles County.

Land resources - including floodplains, steep slopes, and forest lands

- 5.8 Restrict development within 100-year floodplains.
- 5.9 Conserve remaining wooded areas in the County. Pursue grant opportunities or other programs to increase, enhance and protect forests, and require new native plantings to support other natural resource objectives including enhancing riparian buffers, reducing erosion and sedimentation, improving air quality, and mitigating the effects of stormwater runoff.
- 5.10 Retain as much of the forest and tree cover as practical within urban areas.
- 5.11 Require special engineering and construction standards when development occurs on erodible soils, steep slopes, or areas requiring special geotechnical consideration.
- 5.12 Promote wildlife education through the development of nature centers and park visitor centers to explain the importance of preserving natural habitat areas.
- 5.13 In order to implement the USACOE stream valley protection measures, amend the zoning code to better protect the Resource Protection Zone in stream valley areas to the top of slope

Shorelines

- 5.14 Place a high degree of restriction on the use of waterfront land in the form of low residential densities, and high levels of protection for forest land and agricultural land regulated under the Chesapeake Bay Critical Area Program.

- 5.15 Protect in stream and stream bank habitats of anadromous fish spawning waters. Promote land use policies in the watersheds of spawning streams that minimize adverse impacts to aquatic resources.
- 5.16 Protect shoreline habitats such as tidal wetlands, shellfish harvesting areas, colonial water bird nesting sites, and waterfowl staging and concentration areas through the habitat protection policies established in the County's Critical Area Program.
- 5.17 Manage development in shoreline areas to minimize problems of shoreline erosion.

Actions

- 1. Mattawoman Stream Valley. Change the Zoning and development regulations regarding standards to increase protection of the Mattawoman Stream Valley.
- 2. Stream Valley Protection. Use State grant funds and County funds as available to target stream valley protection through land acquisition or conservation easements.
- 3. In order to further protect stream valley areas in the County, review and revise as needed:
 - a) Low impact design standards in the Stormwater Management Ordinance;
 - b) Impervious coverage standards in the Zoning Ordinance;
 - c) Regulations to ensure protection of Tier II streams and other designated sensitive natural resource areas, including expanding riparian buffer requirements;
- 4. Urban forests. Evaluate the existing urban forest and consider adopting an urban forest canopy coverage goal.
- 5. Limit forest fragmentation. Adopt regulations that protect forest hubs (greater than 100 acres) and forest corridors for the survival of the remaining biodiversity and Forest Interior Dwelling Species (FIDS) of Charles County. Under the Forest Conservation Ordinance, add a requirement that priority forests be maintained on development sites, unless a variance is granted by the Board of Appeals.
- 6. Shoreline. Adopt buffers and development setbacks from areas vulnerable to over 3 feet of sea level rise in the next 100 years to protect private and public investments, and accommodate inland wetland migration.
- 7. Transfer of Development Rights. Enhance the effectiveness of the Transfer of Development Rights program per recommendations of the LPPRP.
- 8. Habitat Protection. Adopt Biodiversity Conservation Network Tier I and II categories as habitat protection areas, and increasing protection for these areas.
- 9. Conduct a comprehensive review of the Resource Protection Zone (RPZ) regulations to enhance protections of stream valleys, especially those with assigned Total Maximum Daily Loads.
- 10. Apply to the State of Maryland to establish a new Nanjemoy-Mattawoman Rural Legacy Area designation.