Chapter 4 – Environmental Resources and Protection

Introduction

The Maryland Economic Growth, Resource Protection, and Planning Act of 1992 requires that jurisdictions adopt measures to protect environmentally sensitive areas which are identified in Section 3.05 of Article 66B. The County is required to develop goals objectives, principals, policies and standards to protect the following sensitive areas from the adverse impacts of development:

- Streams and Buffers
- 100-year Floodplains
- Habitats of threatened and endangered species
- Steep slopes
- Other Sensitive Areas the County wants to protect

Dorchester County is characterized by a pristine, natural setting with environmental features that serve many important ecological, social, recreational, and economic benefits. The fluvial, nutrient rich soils provide some of the best agricultural lands in Maryland. The wetlands are the richest and most biodiverse regions in the Nation and provide habitats for a host of both common and rare and threatened species of terrestrial and aquatic plants and animals.

Dorchester's natural resource protection policies and strategies herein are established to encourage conservation of natural resources and support for sustainable natural resource-based industries such as farming, forestry, fishing, hunting, trapping, and eco-tourism. The future of Dorchester County depends on the conservation of natural areas and resources by guiding growth to the municipalities and designated growth areas, and through minimal resource conservation standards, such as those required by State and Federal law, that address the threats to the County's natural resources. With much of the County's land area either consisting of natural resource areas, susceptible to sea level rise and shoreline erosion, or facing large lot development pressures, the County's land use and environmental policies, as well as Federal and State Natural Resource Conservation Programs, become even more important for the social and economic well-being of present and future generations.

This Chapter serves as a foundation for the County's environmental protection regulations and further integrates the growth and resource protection strategies set forth in Chapter 3 - Land Use. This chapter addresses the sensitive areas listed above as well as watersheds, groundwater, sea level rise, shoreline erosion, and the Chesapeake Bay Critical Area programs.

Goals and Objectives

The overall goals of this Comprehensive Plan are to preserve Dorchester County's open and rural character, support natural resource-based industries, protect maritime cultural heritage, and ensure safety from natural hazards. These goals are dependent on the conservation of sensitive natural areas and the presence of abundant natural resources including farmland, forest, wetlands, and open water.

Goals:

- Protect the quality of the air, water, and land from the adverse effects of development and growth.
- Protect the diversity of natural resources, with special attention given to habitats of threatened and endangered species and other unique ecosystems.
- Adopt and meet the goals established in the Chesapeake Bay Tributary Strategies.

Objectives:

To help ensure the protection of natural resources the County has established the following objectives:

- Define, identify, and protect sensitive and other environmentally significant areas as part of the comprehensive planning and zoning process.
- Direct growth away from sensitive areas so that impacts are avoided altogether.
- Establish a network of streams and other natural areas which connect and protect sensitive areas and other environmental features determined to be of importance.

- Integrate and coordinate sensitive areas protection with other locally adopted environmental and growth management programs such as stream valley protection, forest conservation, Chesapeake Bay Critical Area protection, watershed management and protection, rural conservation, economic development, greenways, open space and recreation, water and sewerage, transportation, and community design.
- Discourage random-pattern and sprawl development to enhance sensitive areas and other environmental resource protection capabilities in rural areas.

Sensitive Areas

Natural systems are vulnerable to significant degradation at the most sensitive points. Realizing this, the Maryland General Assembly passed the 1992 Maryland Planning Act which requires that jurisdictions adopt measures to protect environmentally sensitive areas. Under the Planning Act, environmentally sensitive areas include: 1) streams and their buffers; 2) 100-year floodplains; 3) habitat of threatened and endangered species; and 4) steep slopes. These environmental features have been regulated in the Chesapeake Bay Critical Area since the late 1980s. The Planning Act of 1992 extended protection for these features throughout the State.

Streams and Buffers

Rivers and streams are valuable to the County in many ways. For example, streams are used for irrigation and for industrial uses; provide important spawning grounds for finfish and shellfish and help support other kinds of wildlife. Streams also support commercial and recreational fishing and attract outdoor enthusiasts such as hunters, boaters and bird-watchers. Stream managers categorize streams based on the balance and timing of the stormflow and baseflow components. These include:

- Ephemeral streams - flow only during or immediately after periods of precipitation. They generally flow less than 30 days per year.
- Intermittent streams - flow only during certain times of the year. Seasonal flow in an intermittent stream usually lasts longer than 30 days per year.
- Perennial streams - flow continuously during both wet and dry times. Baseflow is dependably generated from the movement of ground water into the channel.

Stream buffers are areas along the lengths of stream banks, established to protect streams from manmade disturbances. Buffers are a "best management technique" that reduces sediment, and nitrogen, phosphorus and other runoff pollutants by acting as a filter, thus minimizing damage to streams. Stream buffers also improve habitat for fish and other stream life.

The effectiveness of buffers depends on their width and other factors such as steep slopes, soil erodibility and wetlands. The basic structure of a stream buffer in an urban setting is broken up into three zones which differ in functions, width, vegetative target, and allowed uses. In the eastern and northwestern U.S. the streamside zone is often maintained as mature forest, with strict limitations on all other uses. The streamside zone also produces the shade and woody debris that is so important to stream quality and biota. The middle zone is typically a 50 to 100 feet wide forested area that is managed to allow some clearing. The outer zone, usually about 25 feet wide, is ideally forest but also can include turf. The three-zone buffer is variable in width and should be increased to allow for protection of special areas such as wetlands and the floodplain.

For managing forest harvest operations, the Maryland Forest Service defines adequate buffer width as at least 50 feet forested on each side of a stream, with an increase of four feet for each percent slope. In 1988, the Maryland Forest Service Inventory reported that, countywide, Dorchester County's stream buffers are approximately 60 percent inadequate. This is based on a definition of 100 feet forested on each side of a stream (the minimum width that can be picked out from satellite imagery).

Some jurisdictions have developed complex, "systems" approaches to defining adequate stream buffers. Others have adopted a standard buffer width, such as 50 or 75 feet, which they require to remain undisturbed. Within Dorchester County's Chesapeake Bay Critical Area (50 percent of Dorchester County's land area), existing regulations require an undisturbed minimum buffer of 100 feet, although the forest service can allow clear cutting down to 50 feet, as part of a buffer management plan.

Currently, Dorchester County's approach to stream buffer protection outside the critical area relies on assisting property owners and developers to comply with current state law governing the protection of wetlands. This law requires an undisturbed 25-foot buffer around non-tidal wetlands. In some cases, wetlands along streams form a

natural buffer, and may be more extensive than a standard buffer width of 50 or 75 feet. However, in areas where there are no non-tidal wetlands adjacent to the stream, little or no buffer may be required. Most recent studies recommend some sort of stream buffer, especially in urbanizing areas.

100-year Floodplain and Flood Hazards

In Dorchester County, flood origins include riverine flooding from rivers, creeks and streams and coastal flooding from the Chesapeake Bay. Approximately 56 percent of the County lies within the 1-percent-annual-chance floodplain (100-year flood) area (see Map 4.1 – Flood Hazards). The vast majority of this area is tidal floodplain. Residents are at risk from tidal flooding, strong winds, storm surge, heavy rains and sea level rise that can cause temporary and permanent destructive flooding in both waterfront and inland areas.

Notable recent flood events include Hurricane Isabel in 2003 and Hurricane Irene in 2011, which underscore the significance of the threat of flooding in Dorchester County. Hurricane Isabel was technically downgraded to a tropical storm by the time it hit Maryland, however its sustained winds (combined with high tides) created a storm surge reaching over eight feet in some areas of Dorchester County. The storm caused extensive damage in Dorchester County, including major damage to the Hoopers Island bridge and approach road, and throughout most of the low-lying communities in the coastal areas of the County. The Maryland Department of Planning determined that 123 properties in Dorchester County incurred damage or loss to structures during the storm. Hurricane Irene was also downgraded to a tropical storm as it made landfall. The County Council of Dorchester County declared a state of emergency, and public shelters were made available. Dorchester County sustained massive power outages, many fallen trees, several damaged roads and a few damaged buildings. The Dorchester General Hospital in Cambridge was evacuated due to wind and water damage.

Dorchester County has participated in the National Flood Insurance Program since 1981. Dorchester County's zoning ordinance contains a supplementary Floodplain Management District (Section 155-37): a zone overlaying the area of the 100-year floodplain as shown on the Flood Insurance Rate Maps published by the Federal Emergency Management Agency (FEMA). Buildings and structures within this zone must be designed to minimize flood damage within the flood prone area. Development within the riverine floodplain is strictly controlled in the ordinance.

Flood insurance is also available to Dorchester County homeowners of property located in the floodplain through the National Flood Insurance Program (NFIP). The NFIP offers flood damage protection to communities, such as Dorchester, that have worked to manage and reduce the dangers of local flooding.

Towards addressing current hazards and mitigating future risks, the County and the State have prepared numerous plans and studies. In 2017, the County prepared a Hazard Mitigation Plan (HMP) and a Flood Mitigation Plan (FMP). The FMP compliments and expands upon the HMP by specifically identifying cost effective actions that reduce or eliminate the long-term risk of flood damage. While critical facilities and general building stock were the focus of both the overall HMP and the FMP, the 2018 County Historic and Cultural Resources Mitigation and Risk Plan specifically considered flood hazard risk and vulnerability to cultural and historic resources throughout Dorchester County.

The County's land use policies generally guide growth away from flood prone areas and low-lying wetland areas. Where development as already occurred or is unavoidable, the County has adopted techniques that minimize the adverse environmental impacts of development in the floodplain and address safety issues. The Land Use Plan in Chapter 3 guides new development and population to be centered in and around designated growth areas and out of hazard areas including storm surge areas and projected sea level rise inundation areas. However, many existing developed areas and areas in low lying areas along the coast and streams in the growth areas are susceptible to flooding associated with heavy rain events. The Land Use Plan designates nearly all of the 100-year floodplain area as natural resource or agricultural conservation areas. Current zoning, along with health regulations also minimize densities in this area reducing the risk of flood damage. The Land Use Plan recognizes that coastal villages are areas most vulnerable to coastal change and other flooding hazards. These areas are not suitable for higher density development because of environmental sensitive areas, including soil constraints, surrounding wetlands, flood hazards, coastal erosion and subsidence. Increasing the number of homes would exacerbate the issues and put more people and property in high hazard risk areas. Therefore, it is the intent of this plan to limit growth in the Coastal Village Conservation Areas on existing lots of record while recognizing high-risk hazard areas and reinforcing appropriate safeguards to minimize risks to flood hazards, storm surges and coastal changes related to rising sea level and shoreline subsidence.

Habitats of Threatened and Endangered Species

Federal and state laws protect habitats of threatened and endangered species. Since much development activity that affects species habitat is processed through the County, The County has an important role to play in helping property

owners comply with federal and state laws. Protecting animal and plant species and their habitats is important for many reasons. Protecting animal and plant species and their habits is important for many reasons:

- Animal and plant species contribute to the County's environmental quality, making the County and attractive place to live
- An abundance of animal and plant species support outdoor recreational activities such as hunting, boating, wildlife viewing and hiking

The Wildlife and Heritage Service Natural Heritage Programs (WHS) tracks over 1280 native plants and animals that are among the rarest in Maryland and most in need of conservation efforts as elements of our State's natural diversity. Lists of rare, threatened and endangered animals and plants, including federally listed species are maintained by the WHS, statewide, approximately 541 animals and 741 plants appear on the lists, although not all are listed as threatened or endangered, thereby offering them different levels of legal protections. As of 2019, within Dorchester County, 21 animals and 70 plants are listed. Of these, 2 animals and 1 plant are listed as threatened or endangered by the United States Fish and Wildlife Service and include the American Burying Beetle and Red-cockaded Woodpecker which are Endangered and Swamp pink which is threatened (See Table X-X).

State Listed Species in Dorchester County*		
Category	**Plants**	**Animals**
Endangered	52	8
Threatened	13	5
In Need of Conservation	n/a	6
Endangered Extirpated	4	2
Total	69	21

*State listed aquatic species are not included

In August 2017, NOAA designated Marshyhope Creek and Nanticoke River Critical habitat for the Federally Endangered Atlantic Sturgeon. One of the most significant threat to the Atlantic Sturgeon is poor water quality and dredging of spawning areas.

Degradation and loss of forests, riparian buffers, and wetlands, which serve as their habitats, impose a major threat to the survival of these endangered and threatened species. To assist in identifying the potential habitats for these species areas, DNR designates Sensitive Species Project Review Areas (SSPRA). SSPRA represents the general locations of documented rare, threatened and endangered species, and other areas of concern including, but not limited to, Critical Areas, Natural Heritage Areas, Listed Species Sites, and Nontidal Wetlands of Special State Concern.

The County Department of Planning and Zoning determines whether a development project might affect a habitat, and if so, then the project applicant is referred to the Maryland Natural Heritage Program. The project applicant then works with the Heritage Program or other appropriate agencies to minimize any project impacts on species habitat. Typically, this involves project design changes affecting features such as access, lot layout or storm water management.

Map 4.2 – Sensitive Species Resource Areas shows significant wildlife assessment areas in Dorchester County including SSPRAs, forest interior dwelling species habitats, and green infrastructure.

Steep slopes

Dorchester County is very flat. According to the Dorchester County Soil Survey (1998) the only mapping unit with over 15 percent slopes is Evesboro series found on uplands, stream terraces and side slopes of the Mid-Atlantic Coastal Plain. Slopes ranger from 5-30 percent. This series cover approximately 244 acres of the County, primarily along the Marshyhope River within the Chesapeake Bay Critical Area. Other areas of the unit are small inclusions within other mapping units. Given Dorchester County's topography, detailed regulations governing protections of steep slopes are not necessary.

Other Sensitive Areas

Wetlands

A wetland is a low-lying land area that is saturated with water, either permanently or seasonally, and contains hydric soils and aquatic vegetation. Wetlands may be permanently flooded by shallow water, permanently saturated by groundwater, or periodically inundated or saturated for varying periods during the growing season in most years. Many wetlands are the periodically flooded lands that occur between uplands and salt or fresh waterbodies (i.e., lakes, rivers, streams and estuaries). Other wetlands may be isolated in areas with seasonally high-water tables that are surrounded by upland or occur on slopes where they are associated with groundwater seepage areas or drainageways. Wetlands are important natural resources providing numerous values to society, including fish and wildlife habitat, flood protection, erosion control and water quality preservation. Wetlands comprise a range of environments within interior and coastal regions of Maryland [1]

According to the National Wetlands Inventory survey, the County contains approximately 144,000 acres of tidal and nontidal wetlands[2], which is about 40% of the total County land area. Per MDE Wetland Conservation Plan Work Group, Dorchester contains over ¼ of all the State's wetlands, which is the highest of all the counties. The County's wetlands are two main types, estuarine and palustrine. The most abundant type is estuarine wetlands (salt and brackish wetlands) representing 60% of the County's total wetlands, equivalent to 87,054 acres. Palustrine or freshwater wetlands may be either tidal or nontidal, and represent 40% of the County's total wetlands, equivalent to 56,573 acres. These coastal wetlands are extremely important to the Chesapeake Bay ecosystem and the economy of County.

Map 4.3 – Wetlands shows the general location of mapped wetlands in the County. While the United States Geological Survey and the Maryland Department of Natural Resources both provide generalized mapping of wetland areas, the specific location and extent of wetlands require a site by site analysis. Final delineation of wetlands locations is typically required as part of the development review process.

The United States Army Corp of Engineers and the Maryland Department of the Environment jointly regulate the wetland activities in Dorchester County. That regulation occurs through Section 404 of the Clean Water Act, Maryland Nontidal Wetlands Protection Act, Maryland Tidal Wetlands Act, and the Waterway and 100-year Floodplain Construction Regulations.

Nontidal Wetlands of Special State Concern **–** In Maryland certain wetlands with rare, threatened, endangered species or unique habitat receive special attention. They are best example of Maryland's nontidal wetland habitats and are designated for special protection under the State's nontidal wetland regulations. These wetland sites have exceptional ecological and educational value and offer landowners opportunities to observe and safeguard the beauty and natural diversity of Maryland's best remaining wetlands. Many of these special wetlands contain populations of rare and endangered native plants and animals.[3] Other nontidal wetlands of Special State concern represent examples of unique wetland types and collective habitats for species that thrive in specialized environments.

Examples of these special types of wetlands are bogs, Delmarva bays and coniferous swamp forests. Bogs are highly acidic wetlands that lack the nutrients most common plants require and, therefore, provide habitat for specific communities of plants and animals. Dorchester contains Delmarva bays, which are depressions that occur only on the Delmarva Peninsula that fill with water in the winter and spring, and dry in the late summer and fall. Because these environments are self-contained, they support many rare and unique species. One example is the Dorchester Pond, which is the largest coastal plain pond in Maryland and possibly on the Delmarva Peninsula. The Nature Conservancy preserves 52 acres surrounding the pond, which includes mostly loblolly pine forest.

The Code of Maryland Regulations (COMAR) Title 26, Subtitle 23, Chapter 06, Sections 01 & 02 identifies these Wetlands of Special State Concern (WSSC) and affords them certain protections including a 100-foot buffer from development.

<u>Critical Area</u>

The Chesapeake Bay Critical Area Program was enacted in 1984 by the Maryland General Assembly out of concern for the decline of natural resourced of the Chesapeake Bay. Each jurisdiction around the Bay adopted its own local Critical Area program based on criteria promulgated by the Critical Area Commission. In 2008, the Maryland General Assembly passed HB 1253 concerning the Chesapeake and Atlantic Coastal Bays Critical Area Protection Program Administration and Enforcement Provisions. HB 1253 include:

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[1] *Overview of the Wetland and Water Resources of Maryland prepared by the Department of the Environment for the Maryland Wetland Conservation Plan Work Group, January 2000*

[2] *Maryland Wetlands - National Wetlands Inventory, 1992*

[3] *https://mde.state.md.us/programs/Water/WetlandsandWaterways/DocumentsandInformation/Documents/www.mde.state.md.us/assets/document/WetlandsWaterways/ssc.pdf*

- Critical Area Mapping
- Lot Coverage
- Erosion Control Measures
- Enforcement
- Growth Allocation
- Regulatory Authority
- 100-foot Buffer and 200-foot Expanded Buffer Requirements
- Variances

The Dorchester County Critical Area Program, adopted in 1988 and periodically updated, is to provide special regulatory protection for the resources located within the County's Critical Area and to foster more sensitive development activity for shoreline areas. Following the adoption of the Dorchester County Critical Area Program in 1988, the County amended zoning and subdivision requirements to implement the requirements of the State law and Critical Area criteria. Approximately 50 percent of the County's land area, mostly in South Dorchester, is affected by the Critical Area Program.

In 2008 state legislation was passed and signed into law requiring the State to work with local governments to update the Critical Area Maps in all affected jurisdictions. Dorchester County remapping has been initiated but draft maps have not been reviewed or approved.

Land within the Critical Area is categorized by use and development intensity. Lands with twenty or more adjacent acres of residential, commercial, institutional or industrial lands is categorized as Intensely Developed Area (IDAs); lands with low or moderately intense development and areas of natural plant and animal habitat are categorized as Limited Development Areas (LDAs); and lands characterized by natural environmental or where resource utilization activities take place are categorized as Resource Protection Areas (RCAs).

The goals of the Dorchester County Critical Area Program are:

- Minimize adverse impacts on water quality that result from pollutants that are discharged from structures or run off from surrounding lands;
- Conserve fish and wildlife and plant habitat; and
- Establish land use policies for development that accommodate growth as well as address the environmental impact that the number, movement, and activities of persons have on the area.

Strategies:

- Complete the Critical Area remapping efforts and approved the update maps

<u>Forest and Woodlands</u>

According to the Maryland Department of Planning 2010 Land Use Land Cover Classification, the County contains approximately 127,000 acres of forest coverage, which represents roughly one-third of the County land mass. In addition to enhancing the rural character of the County, large portions of the forested lands are owned and operated by timber companies making silviculture (the growing of trees) an integral part of industry within the County. Because of the nature of forested land use, and limited development potential of the soil types typically associated with extensive woodlands, fewer County services are necessary in largely forested areas. Additionally, large forest tracts provide a variety of ecological benefits.

Between 1973 and 2010, more than 9,000 acres of forest land was lost in Dorchester County, mostly to large lot residential developments. Development on large lots consumes land at a significantly faster rate than other more concentrated land use types. It results in the loss and fragmentation of forest land which decreases ecological diversity, economic benefits and recreational value. And particularly if built using septic systems, it increases the threat of damaging water quality and biodiversity. To mitigate the loss of forested areas while still enabling growth in Maryland, legislation was passed entitled The Forest Conservation Act of 1991 (Natural Resources Article Sections 5-1601-5-1613). This legislation demands that the conditions of forested areas be taken into consideration during the planning and development processes. The Department of Natural Resources has adopted regulations to implement the legislation, and local governments administer and implement its requirements.

Requirements to conserve forest resources in the development review process throughout Dorchester

County are governed by Dorchester County Forest Conservation Standards (Chapter 96). These regulations provide special protection of the forest lands and timber resources located within Dorchester County. Development standards and requirements established by the Forest Conservation Act are intended to foster more sensitive development activity occurring on forested areas, as well as to minimize potential adverse impacts of development activities on water quality (case by case evaluation). The provisions of this Ordinance place limitations on clearing natural vegetation and provisions for preservation of native vegetation, where possible. Also, these provisions establish a ratio of mitigation required for activities on parcels of record if the activities are not exempt from Forest Conservation Law. These regulations are adopted by all the municipalities in the County and administered through the County.

Green Infrastructure

Green infrastructure is the natural support system, providing ecosystem services necessary to people, plants and animals. Modern development fragments the landscape, converting near contiguous forest and wetlands into small, isolated islands of habitat. Statewide efforts began in the late 1990's, using high resolution aerial photography to identify the most ecologically important lands and create a mapped network of large blocks of intact forest and wetlands called "hubs" linked together by linear features such as forested stream valleys, ridges lines and other natural areas called 'corridors". Maryland has defined hubs as contiguous forest blocks and wetland complexes of at least 250 acres; rare of sensitive species habitats, biologically important rivers an streams and existing conservation lands and corridors as being at least 1,100 feet wide following the best ecological or most natural route between hubs.

These hubs and corridors provide important unbroken tracts of forest interior forest habitat and hubs which enable animals, plant seeds water and other valuable process to move between hubs. Habitat conditions, biological data, connectivity, size and other pertinent information was assessed for each hub and corridor and a score assigned to assist in prioritizing conservation funding. See Map 4.2 – Sensitive Species Resource Areas.

Sensitive Area Policies and Strategies

- Development should avoid impacts on sensitive areas which are located outside of Plan designated growth areas.
- Direct development away from sensitive areas, thus avoiding impacts altogether in both growth and non-growth areas. Impacts to habitats of threatened and endangered species, or natural systems that are otherwise important and unique, should be avoided altogether.
- Generally, in those Plan designated growth areas where floodplains and stream buffers are largely developed or do not otherwise provide substantial environmental benefits, development should employ best management practices which are aimed at improving environmental quality.
- Development in Plan designated growth areas, as a rule, should employ streamlined flexible development regulations, innovative site design, incentives, best management practices, and mitigation measures to protect the natural environment and sensitive areas.
- In recognition of the situation where sensitive areas may constitute all, or nearly all of a property, and where protection may preclude all reasonable uses of the property, environmental protection regulations should provide for transfer of development rights, variances, special exceptions, and or other administrative relief to prevent the taking of private property in violation of the Federal and Maryland constitutions. Exceptions may also be warranted to protect public health and safety and avoid property damage.
- Strategies for hazard mitigation of critical and public facilities are set forth in Chapter 9 - Community Facilities as well as in the HMP (Chapter 12, pg. 129) and in the FMP (Chapter 6).
- Through outreach and education efforts, promote a universal stewardship ethic for the land and water to guide individual and group actions.

Sensitive Area Standards:

- As a general rule, in areas which meet Federal or State environmental standards, developers should strive to make the post-development quality of air, land, and water as good as pre-development levels.
- For development where Federal or State environmental standards have not been attained, post-development environmental quality should be improved over pre-development levels.
- The quality of storm water runoff associated with redeveloping sites should be improved over pre-development levels by 10%.

- Buffer widths should vary with the functional classification of the stream and should be expanded for additional protection where steep slopes, highly erodible soils, wetlands, and natural nontidal floodplains and other fragile lands abut the buffer.
- In rural population centers, to conserve rural character and protect sensitive areas, 80% of a subdivision project should remain in protected open space through the use of cluster development or density zoning.
- As a general rule, protection of habitats of threatened and endangered species and other unique areas should follow both State and Federal species lists and protection guidelines.
- Where the floodplain is not already largely developed, protection of 100-year floodplains should include environmental protection aspects in addition to traditional safety concerns.

Water Resources

The Environmental chapter is complementary to the Water Resources chapter of the Comprehensive Plan since the local ground and surface water resources are major factors in determining the amount and location of new development. The Water Resources chapter evaluates the projected future growth and development against the availability of sufficient water supply sources, the capacity of water supply and sewage treatment infrastructure, and the capacity of surface water in the County to absorb the nutrients generated by both point and non-point sources. In addition, the WRE contains a description of the major aquifers used to supply potable water.

Watersheds

Located in the Atlantic Coastal Plain, Dorchester County is low lying, with a maximum elevation of 50 feet in the northeastern section of the County. The land north of Route 50 is generally well drained. The land south of Route 50 is generally poorly drained and includes extensive tidal marsh or fresh swamp land, making up about one-quarter of the County's land area. Around two-thirds of the County drains into the Nanticoke River watershed (see Map 4.4 – Watersheds). The other major watershed is the Choptank River watershed.

The Nanticoke River Watershed contains over one-third of all the State's wetlands and is one of the most pristine and ecologically significant watershed basins in the Chesapeake Bay region. The 725,000-acre watershed supports a wide variety of plant and animal species, including more rare plants than any other landscape on the Delmarva Peninsula. Approximately two-thirds of the County's land area is in the Nanticoke River Watershed and faces on issues that are agriculture and forest related. An estimated 20 percent of the watershed, including farmland, forests wetlands and natural habitats, has been protected though the work of the Nature Conservancy and its partners.[4]

The Choptank Watershed covers approximately 700 square miles including portions of Caroline, Talbot, Dorchester, and Queen Anne's County. The predominant land use in the watershed are agriculture and forest, with growing urban areas of Cambridge, Easton, Denton, and Trappe. The watershed contends with a wide range of water quality issues associated with agriculture and a growing population, such as non-point agricultural runoff to failing and inefficient residential septic systems, as well as fisheries and habitat concerns.

Each watershed is served by a Maryland Tributary Team. The mission of the Maryland Tributary Teams is to build consensus and advocate for policy solutions, to promote stewardship through education, and to coordinate activities and projects necessary to protect and restore the Chesapeake Bay's water quality and assure healthy watersheds with abundant and diverse living resources. The Teams are made up of local citizens, government representatives, farmers, watermen, sportsmen, and business people who promote wise stewardship of the watersheds in which they live and work. The Team helps to identify sources of pollution, guide decision making and policy, propose restoration activities, support best management practices, and increase awareness.[5]

Tributary Strategies resulted from the 1983 Chesapeake Bay Agreement between the Bay States to restore the Chesapeake Bay. The Tributary Strategies are intended to describe ways in which nutrient pollution loads can be reduced by 40 percent in many sub-watersheds that drain into the Bay. The tributary stream strategies focus on best management practices to reduce pollutant loadings in the receiving streams.

In addition, the Dorchester County Department of Public Works is serving as the lead agency on the Chesapeake TMDL Phase II Local Team effort to work with the Maryland Department of the Environment to meet the pollutant reduction goals set forth by the Environmental Protection Agency (EPA). Maryland's Phase II Watershed

[4] https://www.nature.org/

[5] http://choptanktribteam.net/index.html

Implementation Plans (WIP) identified a comprehensive set of pollution control strategies that collectively will achieve the nutrient and sediment reductions needed to meet the State's 2025 goals for restoring the Bay and improving local waters. In support of the State's continuing engagement of its local partners in that effort, MDE shares WIP related resources and tracks and reports ongoing implementation progress towards meeting nutrient and sediment reduction targets.[6]

Groundwater

Groundwater is a critical natural resource to Dorchester County. It is the sole source of drinking water and essential for industry and agriculture. Because most of the County's surface waters are brackish, ground water is likely to remain Dorchester County's sole water source for the foreseeable future. This resource is of limited capability for water supplies because of (1) the County's low relief which is a deterrent to economic surface storage; (2) high salinity in major tidal streams; and (3) drainage basins of small fresh water streams are too small to provide adequate stream flow.

In 1988 the County adopted a Ground Water Protection Report: a management plan to protect ground water resources, particularly the surficial aquifer, and particularly in areas with seasonal high-water tables. The Report's key findings are presented in the form of tables and supporting text that identify and describe the type of septic system (including specific construction techniques) that should be permitted in each of four zones (identified based on soil characteristics, water table, and other features) in the County. It also recommends minimum well depths, well construction techniques, and other factors to further reduce the possibility of contamination. The Ground-Water Protection Report is adopted by reference into the County's Water and Sewer Master Plan.

MDE has also prepared source water assessments for each of the public water systems in Dorchester County. The County should work with its municipalities to implement any action items identified in those assessments.

Stormwater

A change in land cover type from vegetated to impervious increase stormwater run-off volumes which can contribute to reduced water quality and increased flooding downstream. The Stormwater Management Act of 2007 developed comprehensive stormwater management and erosion and sediment control programs to minimize the adverse impacts associated with changes in land cover types. The County has a stormwater management regulations[7] which establishes minimum requirements and procedures that control the adverse impacts associated with increased stormwater runoff. The goal is to manage stormwater by through site design to maintain after development the predevelopment runoff characteristics, and to reduce stream channel erosion, pollution, siltation and sedimentation, and local flooding, and use appropriate structural best management practices (BMPs) only when necessary. The regulations are intended to restore, enhance, and maintain the integrity of streams, minimize damage to public and private property, and reduce the impacts of land development.

Water Resources Strategies

- Continue active participation in the Tributary Strategies and lobby for increased Dorchester County representation on both tributary teams, particularly the Lower Eastern Shore Tributary Team, whose area covers most of the County. Tributary Team projects such as municipal storm drain stenciling, wastewater treatment plant upgrades and forest and grassed (agricultural land) buffers should be targeted for more extensive use in Dorchester County.
- Integrate the recommendations of the Tributary Stream Strategy Teams in its growth management and facilities planning and development regulations.
- Additional water resource protection strategies are set forth in Chapter 9 - Water Resources, which creates a policy framework to address the impacts of development and population growth County's waterways and riparian ecosystems by managing point and nonpoint source water pollution.

Environmental Factors Impacting Sensitive Areas

Sea Level Rise

Planning for the protection of sensitive areas requires an understanding of the long-term threats facing the natural resources. Such concerns are the rising sea level and more frequent and more intense storms as a result of climate

[6] MDE, https://mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Pages/WIP_Implementation.aspx

[7] *Dorchester County, MD, The Code, Part II, Administrative and General Legislation, Chapter 134 Stormwater Management.*

change, as well as shoreline subsidence. These occurrences are eroding shorelines, expanding high tide areas and floodplains, and increasing storm surge and flood hazards.[8]

According to the 2013 Updating Maryland's Sea Level Rise Projections Report, in the Chesapeake Bay, sea level may rise as much as 2.1 feet by 2050 and 5.7 feet by 2100. See Maps 4.5 to 4.7 – Sea Level Rise. As a result, its projected sea level rise will impact >50% of the County by 2100, primarily Southern Dorchester County. Dorchester County has been identified as one of the largest populated regions vulnerable to sea level rise due to its low elevation, long narrow peninsulas incised by many creeks, guts, streams and ditches and extensive areas of tidal marsh. There is an increasing risk to the County's residents, property, infrastructure, agriculture, and environmental resources.

As sea level rises, the groundwater table also rises and areas that were once upland transition to non-tidal wetlands; the mean high tide also encroaches further inland and the roadways are flooded more frequently and plant communities' change. This change is most evident where low lying roads are inundated for frequently and remain inundated for longer periods of time and at the interface of emergent tidal marshes and maritime forests where the trees die due to increased moisture and salinity.

The biggest threat from sea level rise is the loss of physical land mass and the associated property values and the disruption of emergency service response times. In addition, sea level rise will lead to the failure of conventional septic systems, contaminated drinking water supplies, loss of productive agricultural lands and damage to seafood processing infrastructure (piers, ramps and packing and shipping plants). Impacts to private property will negatively impact the County tax base making it increasingly difficult for the County to continue to repair vital infrastructure damaged by sea level rise.

There are multiple studies and plans prepared by Federal, State and non-profit organization's that evaluate sea level rise vulnerabilities within Dorchester County, and that set forth adaptation strategies towards improving the area's physical, economic and ecological resiliency. Such studies and plans include, but are not limited to:

- Dorchester County Inundation Study: Identifying Natural Resources Vulnerable to Sea Level Rise Over the Next 50 Years, 2006, Angie Carlisle, Caleb Conn, and Steven Fabijanski
- Sea Level Rise: Technical Guidance for Dorchester County, 2008, Maryland Eastern Shore Resource
- Conservation and Development Council
- Dorchester County Hazards Mitigation Plan, 2018
- Dorchester County Flood Mitigation Plan, 2017
- Dorchester County Historic & Cultural Resources Hazard Mitigation & Risk Plan, 2018
- Sea-level Rise: Projections for Maryland, 2018, University of Maryland Center for Environmental Science
- Maryland Coastal Resiliency Assessment, 2016, The Nature Conservancy and the Chesapeake and Coastal Services
- Blackwater 2100, A Strategy for Salt Marsh Persistence in an Era of Climate Change, 2013, The Conservation Fund and Audubon Maryland-DC
- Saving the Salt Marshes of Blackwater National Wildlife Refuge: The Final Report on Assessing Sea Level Rise Impact and Recommending Comprehensive Strategies for Marsh Management and Migration in Southern Dorchester County, 2013; prepared by the Conservation Fund and Audubon Maryland-DC with guidance from the US Fish and Wildlife Service and Maryland Department of Natural Resources.

The land use and sensitive area policies and strategies set forth in this Comprehensive Plan aim to conserve natural resources and mitigate impacts from flooding and erosion, and therefore generally support Federal, State and non-profit organization's efforts to enhance the region's resilience to sea-level rise and climate change.

Strategies:

- Work with communities as requested to prepare a Community Assessment to evaluate sustainable shoreline protection measures, where appropriate, and identify funding sources for implementation

[8] *Horton, R. et al, 2014, Ch.16 Northeast, Climate Change Impacts in the United States: The Third National Climate Change Assessment, U.S. Global Change Research Program, 16-1-nn.*

- Work with State and Federal agencies to identify appropriate funding sources for planning and implementation of appropriate programs and/or shoreline protections measures
- For the most vulnerable communities, identify appropriate resources to assist in the documentation and/or preservation of the community's cultural heritage
- Evaluate the potential use of conservation easements as a direct tool for supporting coastal resiliency. By restricting development along shorelines that are vulnerable to sea level rise, man-made infrastructure is kept out of high-risk areas. This would eliminate the need to protect homes and other structures from impacts of future storms and flooding. An undeveloped shoreline allows both natural marshes and agricultural land to adapt and migrate in response to sea level rise. It also provides a buffer for human communities from tidal and wind driven water surges. One example is a transfer of development rights program that would allow a property owner to transfer a development right from a lot of record that is vulnerable to sea level rise and/or coastal change to another parcel to allow for additional development that would otherwise be prohibited by the base zoning and/or Critical Area requirements.
- Continue to review, evaluate, update and implement County studies/plans that address sea level rise resiliency, and coordinate with Federal, State, and non-profit organizations to ensure consistency between the various studies/plans.

Shoreline Erosion

Maryland's tidal zone consists of unconsolidated sands, silts and clays making it relatively easy for water to erode the shoreline. Dorchester County has over 2,000 miles of shoreline,[9] of which nearly 50% is susceptible to erosion by natural causes such as ebb and flow of the tide and storm surges and by manmade causes such as excessive upland runoff, adjacent harden shorelines and boat wake. These factors along with predicted acceleration of sea level rise will accelerate the County's shore erosion problem.

The loss of susceptible unprotected shoreline results in reduced property values; increased response times for emergency services; increased capital budget expenses; loss of historic properties and cultural sites; loss of recreational lands including beaches and loss of productive farmland and forests. In addition, the sediment degrades water quality and aquatic resources. Priority Shoreline Areas have been identified by DNR as those areas where protection and restoration of natural habitats has the greatest potential to reduce coastal hazards such as shoreline erosion.

The Living Shorelines Protection Act was passed during the 2008 Legislative Session requiring marsh creation or other nonstructural shoreline stabilization measures to protect against shoreline erosion and preserve the natural environment. In Dorchester County, approximately XXX linear feet/miles of nonstructural shoreline erosion control has been permitted by MDE and USACE.

Strategies:

- Require best management practices as a requirement for any public assistance with shore erosion costs.
- Continue to provide incentives to property owners to install appropriate shore erosion protection measures.
- Restrict the construction of structural erosion control measures in areas mapped as suitable for non-structural measures, wetland mitigation, and natural shore erosion control.
- Encourage replacement of engineered shoreline structures with adaptive, resilient shoreline stabilization measures such as living shorelines, marsh edging, living breakwaters
- Preserve High Priority shoreline reaches, particularly forested and natural marsh habitat
- Limit the placement of new structures immediately adjacent to High Priority shoreline reaches to preserve forested and marsh habitat and to allow adequate space for natural marsh retreat
- Expand the Critical Area buffer width in areas experiencing greater than 2 feet of erosion per year.

Natural Resource Conservation Programs

Many of the ecologically important lands discussed above are protected through wildlife refuges, estuarine reserves, private conservation lands, and agricultural preservation. In addition to substantial land acquisitions by State and Federal agencies for land conservation, several resource conservation programs are at work in Dorchester County,

[9] *Estimated using "Maryland Physical Boundaries - County Boundaries (Detailed)" and Maryland Waterbodies - Rivers and Streams (Detailed) GIS datasets.*

helping to conserve natural resources. See Map 4.8 - Conservation Programs. The following provides a description and goals of the programs, go and, where applicable, accomplishments to date.

Agriculture Land Preservation Programs

Key to preserving agriculture is maintaining an adequate land base to support the industry and related industries, e.g., machinery dealers, agriculture inputs (seed, fertilizers), etc. Preserving agriculture land has the double benefit of preserving natural resources and supporting an important natural resource-based industry. The following discusses programs intended to preserve the agriculture land base.

Priority Preservation Areas

The Agricultural Stewardship Act of 2006 authorizes counties to include Priority Preservation Areas (PPA) in their comprehensive plan, and the requirements are mandatory for counties with State-certified programs.

Maryland Agricultural Land Preservation Foundation Program

The Maryland Agricultural Land Preservation Foundation (MALPF) was established by the Maryland General Assembly in 1977 and is part of the Maryland Department of Agriculture. The Foundation works with County governments and private citizens to create Agricultural Land Preservation Districts. Many of the landowners within these districts subsequently sell their development rights to the Maryland Agricultural Land Preservation Foundation. Such easements prohibit or limit development to insure opportunity for continued farming.

At the end of FY 2017/2018, the program has permanently preserved land in each of Maryland's 23 counties, representing 2,302 properties, about 312,800 acres, and a public investment of over $728 million. [10] In Dorchester County, as of June 30, 2018, MALPF has acquired 91 easements totaling 14,476 acres. The County's Planning and Zoning Department ongoingly works with landowners throughout the application process and after they have easements established. The Maryland Agricultural Land Preservation Program is one of the most successful programs of its kind in the nation. Maryland has preserved in perpetuity more agricultural land than any other state in the country

Maryland Rural Legacy Program

The Maryland Rural Legacy Program was created in 1997 and provides funding to land trusts and local governments to preserve large, contiguous tracts of Maryland's most precious cultural and natural resource lands. The programs goals are to enhance natural resource, agricultural, forestry and environmental protection while supporting a sustainable land base for natural resource-based industries. There is at least one Rural Legacy Area in every county of the state and the total acreage designated in all Rural Legacy Areas is 920,694 acres. Maryland's Rural Legacy Program has dedicated over $305.6 million to preserve 86,103 acres of valuable farmland, forests, and natural areas.[11]

Funding from the state helps protect land through conservation easements limiting the amount of development on priority properties. The easements, used in conjunction with other protection methods, help create greenbelts with protected forests, wetlands, natural habitats, and farms around waterways and communities.

The Nanticoke Rural Legacy Area, sponsored by the Nature Conservancy and The Conservation Fund, is comprised of 52,396 acres located in the Nanticoke watershed in Dorchester County. [12] This watershed contains over one-third of all the State's wetlands and is one of the most pristine and ecologically significant watershed basins in the Chesapeake Bay region. Because of concerted efforts over time by the Conservancy, the states of Maryland and Delaware, and other public and private partners, a 50-mile corridor exists along the western shoreline of the Nanticoke River, permanently protected from intensive development through conservation easements.[13] The Nanticoke Rural Legacy Area links the Fishing Bay Wildlife Management Area, the USFWS Blackwater Refuge, the State of Delaware's Nanticoke Wildlife Area, and the existing Agriculture Security Corridor – Marshyhope Rural Legacy Area.

[10] MALPF FY 2018 Annual Report

[11] https://dnr.maryland.gov/land/Pages/RuralLegacy/home.aspx

[12] https://dnr.maryland.gov/land/Pages/RuralLegacy/All-Rural-Legacy-Areas.aspx

[13] The Nature Conservancy, https://www.nature.org/en-us/about-us/where-we-work/united-states/maryland-dc/stories-in-maryland-dc/nanticoke-river-watershed/

The Marshyhope Rural Legacy Area located in the northwestern corner of the County, is one of three focus areas that comprise a 43,674-acre Agriculture Security Corridor that spans Caroline, Cecil, Dorchester, Kent, and Talbot Counties. The corridor concept was developed in 1994 to focus local, regional, and national efforts on one of the largest, contiguous blocks of highly productive farmland in the rapidly developing mid-Atlantic. The Marshyhope area is defined by an important river corridor, prime farms soils, a concentration of stable farm support businesses and an extensive public investment in farm preservation easements. As part of the Agriculture Security Corridor, it serves as an anchor for agricultural production and investment, and buffering and enhancing the region's natural, cultural, and open space priorities.

Maryland Environmental Trust

The Maryland Environmental Trust (MET) is a statewide local land trust governed by a citizen Board of Trustees. MET's goal is the preservation of open land, such as farmland, forest land, and significant natural resources. The primary tool for doing this is the conservation easement, a voluntary agreement between a landowner and MET that is often coordinated through local land trusts such as Chesapeake Wildlife Heritage or the Eastern Shore Land Conservancy. A conservation easement is an effective tool for landowners to protect natural resources and preserve scenic open space. The landowner who gives an easement limits the right to develop and subdivide the land, now and in the future, but remains the owner. The organization accepting the easement agrees to monitor it forever to ensure compliance with its terms. No public access is required by a conservation easement.

As of May 2019, MET preserved a total of 13,376 acres in Dorchester County through donated and purchased conservation easements, protecting woodland habitat, farmland, scenic views and tidal wetlands.

Conservation Reserve Enhancement Program

The U.S. Department of Agriculture (USDA) and the State of Maryland have partnered in implementing a voluntary Conservation Reserve Enhancement Program (CREP) to enroll up to 100,000 acres of agricultural land situated in Maryland. With CREP, high-priority conservation goals are identified by the state, and then federal funds are supplemented with non-federal funds to achieve those goals. Through the Maryland Chesapeake Bay CREP, federal and state resources are made available to program participants to voluntarily enroll in CRP for 10-year to 15-year contracts. Participants remove cropland and marginal pastureland from agricultural production and convert the land to native grasses, trees and other vegetation or restore wetlands. This will improve water quality by reducing soil runoff, increasing ground water absorption and reducing stream sedimentation and nutrient loading from crop fields entering the Bay. It will also enhance and restore plant and wildlife habitats. In addition to keeping farmable crop and pastureland available to farmers, participating landowners receive rental payment based on the land offered and the practice installed. Participation also makes the landowner eligible to receive other benefits. To be eligible, land must be in the project area and be either cropland or marginal pastureland. Cropland must meet cropping history criteria and be physically and legally capable of being planted in a normal manner to an agricultural commodity. Marginal pastureland along streams may also be eligible for enrollment. Land adjacent to channelized intermittent streams and infield constructed drainage ditches may also be eligible if devoted to a grass filter strip.

Coastal & Estuarine Land Conservation Program

The Coastal & Estuarine Land Conservation Program (CELCP) is a nationally-competitive land conservation program through NOAA that was established to protect important coastal and estuarine areas that have significant conservation, recreation, ecological, historical or aesthetic values. Each year, Maryland's Chesapeake & Coastal Program can submit up to three project proposals each with a requested funding of $3,000,000 per project and 1:1 match. Project proposals support coastal land conservation goals outlined in the state's CELCP plan. Since 2008, Maryland has received approximately $16,482,100 from CELCP. Maryland is using CELCP funding to protect important coastal and estuarine areas with significant conservation, recreation, ecological, historical, or aesthetic values that may be vulnerable to conversion.

Coastal Communities Initiative

The Coastal Communities Initiative provides federal funding through NOAA Coastal Zone management Program, administered by MD DNR Coastal and Watershed Services Division. This initiative provides financial and technical assistance to local governments to promote the incorporation of natural resources and/or coastal management issues into local planning and permitting activities.

Program Implementation Strategies

The County should support the efforts of State, Federal and non-profit organizations to preserve natural resources, including productive agricultural land. Of special importance is the Marshy Hope Rural Legacy Focus area (part of the

Maryland Eastern Shore Agriculture Security Corridor) as this area contains some of the best agriculture land in the County and produces high yield crops.