

8. NATURAL RESOURCES

Introduction

Natural resources and sensitive areas including streams, coastal bays, wetlands and their buffers, floodplains, habitats of threatened or endangered species, agricultural and forested lands, and many other protected areas and resources are important to the County to promote tourism, support forestry, agricultural, and fishing industries, and are essential to the County's quality of life and appeal for residents and visitors alike. However, these sensitive areas can be vulnerable to adverse impacts from development activities, residential and tourist use, and sea level rise. This Environmental Resources and Sensitive Areas chapter provides information and guidance on protecting these natural resources and sensitive areas. This chapter has been prepared considering the State of Maryland's Twelve Planning Visions, particularly the visions related to environmental protection, resource conservation, quality of life, and sustainability.

Goals and Objectives

Worcester County recognizes the importance of protecting its natural resources and will continue to do so by establishing and strengthening regulations and preparing for the future as climate change becomes an increasing threat. The County has developed several goals and recommendations that are discussed in more detail below:

- 1. Implement resource protection, conservation, and preservation strategies that promote high water quality and protect aquatic life and ecological function throughout Worcester County.**
 - *Action Item 8.1.1:* Continue to monitor state and federal regulation changes with respect to natural resources protection and update the County code, as necessary.
 - *Action Item 8.1.2:* Continue the County's participation as a partner working within the Maryland Coastal Bays Program's Comprehensive Conservation and Management Plan (CCMP) for the restoration and protection of the Atlantic Coastal Bays.
 - *Action Item 8.1.3:* Adopt updated critical area map and continue to implement the Critical Area Program to minimize adverse effects of human activities on water quality and natural habitat and allow for development in a sensitive manner.
 - *Action Item 8.1.4:* Support State programs for the protection and the restoration of wetlands and consider a no net loss policy.
- 2. Undertake land preservation and other efforts to preserve and expand open space, forests and other "greenways" to protect habitat diversity, create biodiversity corridors, and provide contiguous areas for safe movement of people and animals throughout the County.**
 - *Action Item 8.2.1:* Use codes and plan reviews to ensure native, non-invasive vegetation is preserved and/or planted along waterways, and within parks, open spaces, and public rights-of-way to the extent practicable.
 - *Action Item 8.2.2:* Establish and implement an invasive species removal program and focus on planting native species within natural areas and forest lands.

8. NATURAL RESOURCES

- *Action Item 8.2.3:* Support the continued implementation of the Forest Mitigation Plan and Accounting Procedure.
- *Action Item 8.2.4:* Consider establishing a specific no net loss of forest policy for the County within the requirements of the revised state Forest Conservation Act (FCA) law.
- *Action Item 8.2.5:* Permanently preserve agricultural land capable of supporting agricultural production.
- *Action Item 8.2.6:* Protect natural, forestry, and historic resources and the rural character of the landscape associated with farmland.
- *Action Item 8.2.7:* To the greatest degree possible, concentrate preserved land in large, contiguous blocks to effectively support long-term protection of resources and resource-based industries.

3. Prepare for and protect against impacts to natural resources, people, and infrastructure from Climate Change and sea level rise.

- *Action Item 8.3.1:* To accommodate storm surges, nuisance flooding, rising sea levels, and climate change, prevent development in mapped flood zones and evaluate the appropriateness of going beyond FEMA requirements to consider additional restrictions based on projected sea level rise.
- *Action Item 8.3.2:* Adopt local mitigation, floodplain management, and outreach activities that exceed the minimum National Flood Insurance Program (NFIP) and allow for the application for Community Rating System (CRS) participation through the Federal Emergency Management Agency (FEMA).
- *Action Item 8.3.3:* Review the CoastSmart CS-CRAB boundary and ensure projects that are regulated under CoastSmart apply the correct horizontal limits of floodplains for consideration during design.
- *Action Item 8.3.4:* Complete an updated inventory of eroding shorelines and consider stabilization methods to mitigate erosion for the most critical areas, with nonstructural or living shoreline approaches preferred.
- *Action Item 8.3.5:* Complete an inventory and assess vulnerability of older commercial and residential structures to prepare for the anticipated higher frequency of heavy rainfall events and sea level rise.
- *Action Item 8.3.6:* Direct concentrated growth away from vulnerable areas to planned growth areas to protect environmental resource and take advantage of adequate and adjacent water and infrastructure to accommodate residential and commercial expansion in an orderly, cost-effective and environmentally sustainable manner.
- *Action Item 8.3.7:* Educate public on Maryland's new requirements for energy usage performance reporting.
- *Action Item 8.3.8:* Educate residents on how to deal with heat waves and erratic weather to help prepare for such events and prevent the dangers of high temperatures.

8. NATURAL RESOURCES

Guiding Principles and Legislation

The guiding principles set forth in this plan help to foster protection, preservation, and conservation of natural resources and sensitive areas. Adhering to these principles provides for management of existing and future development in a way that sustains current and future populations, the environment, and the county's economic vitality. These guiding principles include:

- Careful management of natural resources and sensitive areas with goals of restoring and maintaining healthy natural systems.
- Focusing future growth within existing growth areas to ensure protection of natural resources and sensitive areas and to create resilient communities.
- Leveraging existing environmental programs and establishing new initiatives that foster universal stewardship of natural resources and sensitive areas, resulting in sustainable communities and protection of the environment.
- Collaboration with government, businesses, and residents for creation and maintenance of hazard-resilient communities that balance sustainable growth and resource protection.
- Encouraging opportunities with respect to the County's tourism and resource-based economy.

Legislation and Policies

The State's Land Use Article, which incorporates the provisions of the 1992 Economic Growth, Resource Protection, and Planning Act, requires local governments to include a "Sensitive Areas" element in their Comprehensive Plans. This element must include goals, objectives, principles, policies, and standards designed to protect the following sensitive areas from the adverse impacts of development:

- Streams or wetlands and their buffers
- Floodplains
- Habitats of threatened or endangered species
- Steep Slopes
- Agriculture or forest lands intended for resource protection or conservation
- Other areas in need of special protection

Maryland Land Use Article also requires comprehensive plans to include a Mineral Resources Element. The element must incorporate land use policies and recommendations for regulation necessary:

- To balance mineral resource extraction with other land uses.
- To the extent feasible, prevent the preemption of mineral resource extraction by other uses.

The County has a comprehensive program in place to protect natural resources and sensitive areas, including adherence to State and federal regulations and protections within the County ordinances and the development code. The County will monitor State and federal regulation changes with resource to natural resources and sensitive areas protection and will update ordinances, as necessary.

8. NATURAL RESOURCES

Federal and State Regulations

- **Clean Water Act, Section 404.** The US Army Corps of Engineers (USACE) regulates the discharge of dredged or fill material into wetlands. The USACE district office determines whether various activities such as placement of fill material, levee and dike construction, mechanized land clearing, land leveling, transportation infrastructure construction, and dam construction require a permit.
- **Endangered Species Act.** The primary purpose of this Act is to protect wildlife, fish, and plants that are listed as threatened or endangered species by prohibiting their import or export and by preparing plans for their recovery.
- **Maryland Department of the Environment, Land Management Administration (LMA).** The LMA is responsible for licensing and permitting processes associated with mining activities, sewage sludge utilization, refuse disposal, groundwater discharge permits for rubble landfills, and other related permitting to protect the environment.
- **Maryland Forest Conservation Act.** The main purpose of this Act is to minimize the loss of Maryland's forest resources during land development by making the identification and protection of forests and other sensitive areas an integral part of the site planning process. Depending on the type or size of proposed development, Forest Stand Delineations and Forest Conservation Plans may be required.
- **Maryland Non-tidal Wetlands Protection Act.** The Maryland Department of the Environment (MDE), Nontidal Wetlands and Waterways Division ensures there is no overall net loss of non-tidal wetland acreage and reviews the following construction activities: grading or filling, excavating or dredging, changing the existing drainage pattern, disturbance of water levels or water table, or destroying or removing vegetation. Permits are required for activities that alter a non-tidal wetland or wetland buffer.
- **Chesapeake Bays and Coastal Bays Critical Areas Program.** The Maryland General Assembly passed the Chesapeake Bay Critical Area Protection Program legislation in 1984 due to the decline of certain Chesapeake Bay natural resources. The Act was amended in 2002 to include the Maryland Atlantic Coastal Bays. The Critical Area includes all land within 1,000 feet of Maryland's tidal waters and tidal wetlands. It also includes the waters of the Chesapeake Bay, the Atlantic Coastal Bays, their tidal tributaries, and the lands underneath these tidal areas. As a result, each Maryland county and municipality fronting the Bay or its tributaries had to adopt a local Critical Area Plan and development ordinances, based on criteria established by the Critical Area Commission, which required that new development within the Critical Area minimize impacts on the Bay's water quality and plant, fish, and wildlife habitat.
- **Maryland Tidal Wetlands Act.** MDE manages tidal wetlands and provides resource protection for the activities such as filling open water and vegetated wetlands, construction of piers, bulkheads, revetments, dredging, and marsh establishment.
- **Maryland's Stormwater Management Act of 2007.** These regulations, effective May 4, 2009, require Environmental Site Design (ESD) through the use of nonstructural best management practices and other better site design techniques to be implemented to the maximum extent practicable.
- **Policy for Nutrient Cap Management & Trading.** MDE has developed this policy to support restoration of the Chesapeake Bay watershed while accommodating expected population growth.

8. NATURAL RESOURCES

While the trading regulations presently apply only to the Chesapeake Bay basin, Worcester County has requested the extension of nutrient trading regulations to the Atlantic Coastal Bays watershed.

- **Water Quality Infrastructure Program.** This program, administered by MDE, provides grants and loans for sewage treatment and drinking water system upgrades through the State's Biological Nutrient Removal (BNR) Cost-Share Grants Program, Supplemental Assistance Program, and State Revolving Loan Fund (SRF).
- **Living Shorelines Protection Act.** The Living Shorelines Protection Act of 2008 requires Maryland shoreline property owners to use natural materials to prevent erosion, except in areas where it can be demonstrated that these measures are not feasible. In making feasibility determinations, MDE considers areas of excessive erosion, areas subject to heavy tides, and areas too narrow for effective use of nonstructural measures. The goal of the act is to help communities become more resilient to climate change.
- **Robert T. Stafford Disaster Relief & Emergency Assistance Act.** In 2000, the Stafford Act enacted the Disaster Mitigation Act and, by FEMA's Interim Final Rule published in 2002, established in the Maryland Code that each Maryland jurisdiction adopt and maintain a Hazard Mitigation Plan (HMP). The HMP ensures eligibility for funding and technical assistance from State and federal hazard mitigation programs. It addresses natural hazards determined to be of high and moderate risk as defined by the updated results of the local hazard, risk, and vulnerability summary. Natural hazards continue to be evaluated during 5-year update cycles and include sea level rise and coastal resiliency planning priorities.
- **Chesapeake Bay Restoration Act.** This Act and subsequent policies, programs, and regulations address Bay restoration. This Act established the Chesapeake Bay Restoration Fund administered by MDE for upgrading the 66 largest wastewater treatment plants to Enhanced Nutrient Reduction (ENR) standards. This Act established the Septic Upgrade Program to remove nitrogen, and the fee paid by onsite sewage disposal system (OSDS) or septic users to fund the upgrade of septic systems with nitrogen-reducing technologies through the Septic Upgrade Program as well as connections of septic systems to sewers.
- **Maryland Model Floodplain Management Ordinance (FPMO).** MDE prepared the Maryland Model FPMO (January 2018) in response to the requirement that local jurisdictions adopt regulations that are fully compliant with the requirements of the National Floodplain Insurance Program (NFIP). For most communities, the requirement to update regulations is triggered by revisions to the Flood Insurance Rate Maps (FIRMs) and associated Flood Insurance Study (FIS).
- **Maryland Coastal Bays Program.** The Maryland Coastal Bays Program is one of the 28 National Estuary Programs receiving EPA funding for the restoration and protection of "estuaries of National significance." This grassroots, multi-stakeholder program collaborates to restore and protect the Maryland Coastal Bays watershed, which supports abundant wildlife, aquatic resources, and serves as a unique opportunity for tourists and residents to relax and recreate (the watersheds are both rural and urban). The towns of Ocean City and Berlin cooperate with the National Park Service, Worcester County, the EPA, and the Maryland Departments of Natural Resources, Agriculture and Environment and Planning to establish and implement a comprehensive plan (CCMP) for management of this sensitive resource.

8. NATURAL RESOURCES

- **Rural Legacy Program.** The Rural Legacy Program was created to discourage sprawl development and protect areas, designated by local government, for future generations to enjoy. Under the program, landowners sell or donate their development rights as an alternative to developing or subdividing their land or selling their property to developers. This option provides farmers and landowners the ability to retain ownership to continue growing crops, harvest timber or limited raising of livestock (similar to the MALPF program). Purchasing and placing perpetual easements also helps to protect natural resources in areas identified as particularly important to conserve, therefore supporting protection of water quality and habitat through additional protections including vegetated buffers and limitations on impervious surface. In Worcester County specifically, these easements provide habitat and water quality benefits to the Coastal and Chesapeake Bays and the local watersheds. This program is funded through DNR Project Open Space Funds and State general obligation bonds. Worcester County has developed three Rural Legacy Areas (RLAs): The Coastal Bays (Chincoteague Bay Watershed) RLA, established in 1999, The Dividing Creek RLA, established in 2008, and the Bishopville-Showell RLA, established in 2024. To date, the County has protected over 13,300 acres of farmland and forests. The county has a goal of protecting an additional 2,000 acres within each Rural Legacy Area within the next 10 years.
- **Watershed Planning.** Watershed restoration plans (WRAS) have been completed for the Isle of Wight, Newport and Sinepuxent Bay subwatersheds. These documents provided a strategy for watershed protection and improvement, and outline locations and priorities for land use, best management practices (BMPs) and restoration of wetlands, habitats, and waterways. The WRAS program in Maryland has been molded into the WIP Phase III program for Chesapeake Bay watershed, and as part of the combined Coastal Bays Watershed Plan prepared in 2019 for the Atlantic Coastal Bays Watersheds for TMDL compliance as there was no comparable plan enacted for WIPs for the Coastal Bays. The Assawoman Watershed component of that plan has received plan approval from MDE and the EPA, making it eligible for Section 319 grant funding.
- **Maryland Environmental Trust.** The Maryland Environmental Trust (MET) was created in 1967 to protect Maryland's natural environment and is the state's primary recipient of donated conservation easements. MET is affiliated with the Maryland Department of Natural Resources (DNR) and governed by a citizen board of trustees. It is one of the oldest and largest land trusts in the country and has protected over 129,000 acres of scenic open space, primarily with donated conservation easements. It seeks to protect farms and forest lands, wildlife habitat, waterfront acreage, natural areas, historic sites, and valuable scenic features. MET and its cooperating local land trusts prefer to accept donations on lands greater than 25 acres, though there is no fixed minimum parcel size. Donations are accepted throughout the year. A property owner may benefit from a donated conservation easement by the federal income tax deduction, the Maryland property tax credit, the Maryland income tax credit, and through estate tax savings. MET promotes the protection of natural, historic and scenic resources through its Land Conservation Program, Stewardship Program and Land Trust Assistance Program and provides grants to non-profit organizations for environmental education projects through its Keep Maryland Beautiful Program. In Worcester County, most easements held by MET are co-held by the Lower Shore Land Trust.
- **Maryland Agricultural Land Preservation Foundation.** The Maryland Agricultural Land Preservation Foundation (MALPF) purchases agricultural preservation easements that forever restrict

8. NATURAL RESOURCES

development on prime farmland and woodland. Worcester County continues to have a “certified” agricultural land preservation program (as of July 1, 2004). This allows the county to retain additional transfer tax and access additional state funding match for purchase of agricultural easements through MALPF.

County Regulations

The following is a list of key County code sections that pertain to natural resources and sensitive areas:

- **NR 1-III: Agricultural Land Preservation.** Agricultural land preservation program that protects agricultural land and woodland from development. This program allows owners of qualifying land to sell easements to the state, permanently protecting their land for agricultural use. Efforts to preserve agricultural land also leads to the protection of wildlife and the environmental quality of the Chesapeake and Coastal Bays and their many valuable tributaries.
- **NR 1-IV: Forest Conservation.** The Worcester County Forest Conservation Law was enacted under the Maryland Forest Conservation Act, which requires all county governments to adopt local forest conservation programs. The purpose of the Worcester County Forest Conservation Program is to “preserve, protect, and establish forest areas in conjunction with certain land development activities.”
- **NR 2-I: Shoreline Construction.** The Natural Resources Division of the Department of Environmental Programs is responsible for all aspects of the Shoreline Construction process. These responsibilities include the intake, review, and approval of applications during the beginning stages of the project and also subsequent permitting and inspections duties that occur during the construction and/or installation of improvements to ensure they are completed in accordance with their approved plan and building standards.
- **NR 3-I: Coastal Bays Critical Area.** The County completed a comprehensive update of the Critical Areas ordinance in July 2024 with Bill No. 24-05. This update included all state regulatory changes relevant to the Critical Areas law and combined the Atlantic Coastal Bays and Chesapeake Bay codes into a single ordinance.
- **BR 2-III: Floodplain Management.** The purpose of this Chapter is to protect human life, health, and welfare; encourage utilization of construction practices to prevent or minimize future flood damage; minimize flooding of water supply and sanitary sewage disposal systems; maintain natural drainage; reduce financial burdens by discouraging unwise design and construction in areas subject to flooding; minimize need for rescue and relief efforts associated with flooding; minimize prolonged business interruptions; minimize damage to public facilities and utilities; reinforce those building in and occupying special flood hazard areas should assume responsibility for their actions; minimize impact of development on adjacent property within and near flood prone areas; provide and maintain flood storage and conveyance functions; minimize development impact on the natural and beneficial functions of floodplains; prevent floodplain uses that are hazardous or environmentally incompatible; and meet participation requirements of the National Flood Insurance Program (NFIP).

8. NATURAL RESOURCES

Significant Updates Since the 2006 Comprehensive Plan

Since the adoption of the 2006 Comprehensive Plan, Worcester County has adopted and passed multiple environmental resolutions and bills. These include:

- **The 2006 Comprehensive Plan Amendments.** The 2006 Comprehensive Plan was amended in 2009 to add a Priority Preservation Areas Element (PPA) to identify specific areas of the county where agricultural land preservation is highest priority, to institutionalize the County's certified Agricultural Preservation Program and further the county's conservation objectives to ensure the long-term viability of agricultural and forestry resources in the County. The plan was also amended in 2011 to add a Water Resources Element (WRE) which detailed examinations on suitability of water and water resources that will be adequate for the needs of existing and future development proposed in the Land Use Element of the Comprehensive Plan.
- **Resolution 12-7 Adopting 2012 Land Preservation, Parks and Recreation Plan.** The County updated and replaced the 2006 Plan, which identifies specific actions for improving parks, recreation, and open space preservations in Worcester County. Plans were also adopted in 2017 and 2023.
- **Resolution 14-22 Adopting 2014 Hazard Mitigation Plan Update.** The County updated and replaced the 2006 Hazard Mitigation Plan to include new data, mapping, HAZUS Level 2 Analysis, status of 2006 recommendations and new Mitigation Strategies and Actions.
- **Resolution 18-6 Adopting 2017 Land Preservation, Parks, and Recreation Plan.** The County updated and replaced the 2012 Plan.
- **Resolution 18-10 Adoption of Hurricane Evacuation Zone Maps Under FEMA's Know Your Zone Program.** Developed and adopted Hurricane Evacuation Zone Maps in support of the Know Your Zone Program to help educate the public on knowing when to evacuate a specific area in the event of a hurricane or other critical emergency.
- **Resolution 19-4 Adopting Revisions to 2017 Worcester County Land Preservation, Parks and Recreation Plan.** The County adopted proposed revisions to the 2017 Plan, including an updated total acreage of land protected by Lower Shore Land Trust.
- **Resolution 20-31 Adopting the 2020 Worcester County Hazard Mitigation and Resilience Plan.** The County adopted the 2020 Worcester County Hazard Mitigation and Resilience Plan, which identifies various hazard types, associated risks, and ways to address vulnerabilities.
- **Resolution 22-3 Modifying the Land Classification Designation for a Single Property in the Atlantic Coastal Bays Critical Area to Correct a Mapping Error.** The County amended a mapping area for a property in the Coastal Bays Critical Area. The land use classification for this property was amended from Resource Conservation Area (RCA) to Limited Development Area (LDA).
- **Bill 20-3 Natural Resources – Special Events in Resource Conservation Areas.** Establishes certain standards for events within Resource Conservation Areas of the Atlantic Coastal Bays Critical Area, including: activities must generally occur outside of the buffer area, and requiring compliance with and protection of Habitat Protection Areas.
- **Bill 20-4 Natural Resources – Forest Conservation Law.** Repealed and reenacted a subsection of the Worcester County Forest Conservation Law regarding the amount of payment in lieu of afforestation and reforestation to require a person subject to this law to demonstrate to the satisfaction of the

8. NATURAL RESOURCES

Department that they are unable to accomplish afforestation or reforestation onsite or offsite and appropriate credits generated by a forest mitigation bank in the County or in the same watershed are not available, before they shall be permitted to contribute money into the Forest Conservation Fund. Also established a rate of thirty and one half (30.5) cents per square foot for payments in lieu of afforestation and reforestation for projects located within a priority funding area, and 120 percent of the aforesaid rate for projects located outside a priority funding area, and provided that said rate may be adjusted annually for inflation.

- **Bill 21-8 Natural Resources – Critical Area Law.** Various changes were made to the Critical Area Law as written in the Worcester County Annotated Code, primarily to update it to reflect current State regulations.
- **Bill 23-09 – LRPRP Update.** This update reflected MDOT bikeways grant for 611 and the shared use path network along with new analysis and goals discussion and a revised Capital Improvements Program (CIP) that includes information from municipalities. The update also summarized public feedback on recreational/open space needs, updated parks and recreation inventory, and provides a level of service, proximity analysis and equity analysis to identify deficiencies and support the CIP.
- **Bill 24-05 Natural Resources – Worcester County Critical Area Law.** Amended the Worcester County Chesapeake and Atlantic Coastal Bays Critical Area Law to update and combine the Chesapeake and Atlantic Coastal Bays and their tributaries to comply with State law.

Physiography

Worcester County is part of the Delmarva Peninsula, the three-state region named for the states of Delaware, Maryland, and Virginia. This peninsula is the largest on the East Coast at 170 miles in length and 70 miles in width. Worcester County is the seventh largest County in Maryland with a land area of 490 square miles. Adjacent to the Atlantic Ocean, Worcester County provides Maryland's only ocean beach frontage with 31 miles of beach. The County's Coastal Bays afford protection for aquatic resources, support abundant wildlife, and offer recreational benefits for tourists and residents. In the western portion of the County, the Pocomoke River serves as a navigable waterway connecting to the Chesapeake Bay.

The County is in the Atlantic Coastal Plain geophysical region of the State of Maryland. The Atlantic Coastal Plain is the largest physiographic province in Maryland and is underlain by a wedge of unconsolidated sediments including gravel, silt, sand and clay (**Map 8-1 Geology**). This wedge thickens as you travel eastward to the Atlantic coastline. Mineral resources are mainly sand and gravel, which are often used by the construction industry as aggregate materials. The landforms of the Coastal Plain have an important effect upon the retention and infiltration of rainfall, the hindrance of runoff, and the discharge of groundwater by evapotranspiration.

Land elevation in the County ranges from sea level to approximately sixty feet. The topography is level to gently rolling, with most of the land lying between twenty- and forty- feet above sea level. Coastal Bay tributaries in the east provide surface drainage with the St. Martin's River provides drainage for the northernmost party of the County, and the Pocomoke River and its tributaries drain the remaining two-thirds of the County.

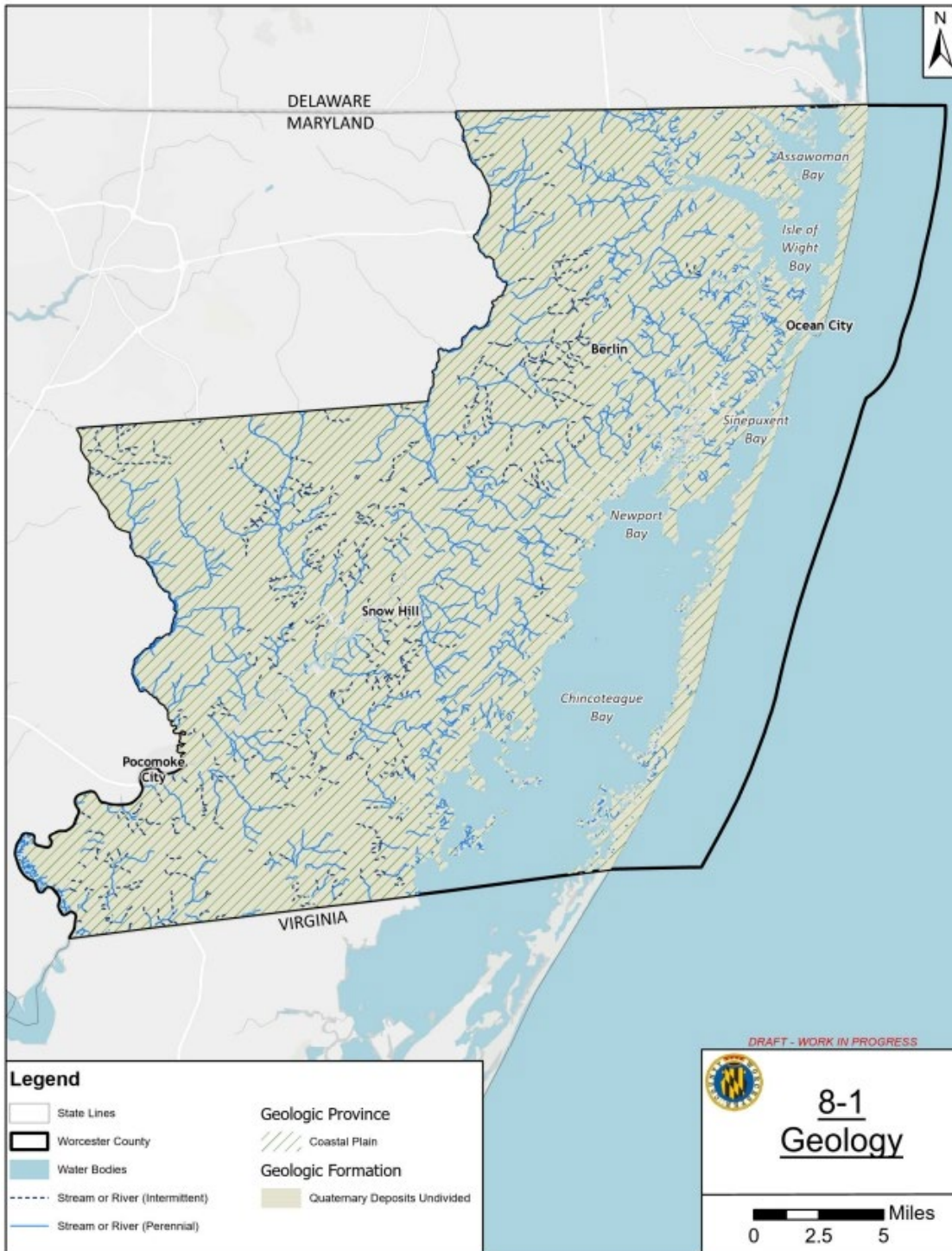
8. NATURAL RESOURCES

The Coastal Bays and their tributaries cut across a number of different historical geologic formations. The primary formations – the Omar, Ironshire, and Sinepuxent formations – were deposited and eroded as sea level rose and fell during the glacial and intervening interglacial episodes of the Pleistocene. The most recent Quaternary deposits represent tidal marshes that developed during the most recent sea level rise or transgression, which began approximately 18,000 years ago. All these formations have one thing in common: they are composed of unconsolidated sediments, such as gravel, sand, silt and clay. While the sediments are compacted, they have not been lithified or turned into rock and are therefore easily eroded.

The Coastal Bays are bordered on the east by two barrier islands, Fenwick, and Assateague, which serve as major tourist attractions. These barrier islands enclose five bays: Assawoman Bay, Isle of Wight Bay, Sinepuxent Bay, Newport Bay, and Chincoteague Bay. Coastal processes operating along the barrier islands, particularly episodic storms that move sediment from the ocean side to the bay side of the islands or that open inlets through the islands, affect the present-day geology of the Bays.

8. NATURAL RESOURCES

Map 8-1: Geology



Source: MD iMAP, Worcester County

8. NATURAL RESOURCES

Soils

The most current soil survey data is a product of the National Cooperative Soil Survey (NCSS), a joint effort of the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), other federal and State agencies, and local partnerships. The soil survey data identifies specific soil types and their limitations, which is important in determining whether they can support development. Examples of constraining factors can include steep slopes, wetness, depth to bedrock, frost action, shrink/swell, erosion factors, and flooding.

All seven recognized classes of natural soil drainage are represented in the County: excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. General definitions for each drainage class and the percent of soils in the County associated with each drainage class, as defined by the USDA, are below:

Excessively drained (3 percent): Water is removed very rapidly. The occurrence of internal free water commonly is very rare or very deep.

Somewhat excessively drained (3 percent): Water is removed from the soil rapidly. Internal free water occurrence commonly is very rare or very deep.

Well drained (11 percent): Water is removed from the soil readily but not rapidly. Internal free water occurrence commonly is deep or very deep; annual duration is not specified. Water is available to plants throughout most of the growing season in humid regions. Wetness does not inhibit growth of roots for significant periods during most growing seasons.

Moderately well drained (10 percent): Water is removed from the soil somewhat slowly during some periods of the year. Internal free water occurrence commonly is moderately deep and transitory through permanent rock. The soils are wet for only a short time within the rooting depth during the growing season, but long enough that most terrestrial plants that are not adapted to particularly wet conditions are affected.

Somewhat poorly drained (2 percent): Water is removed so slowly that the soil is wet at a shallow depth for significant periods during the growing season. The occurrence of internal free water commonly is shallow to moderately deep and transitory to permanent. Most terrestrial plants that are not adapted to particularly wet conditions have restricted growth unless artificial drainage is provided. The soils commonly have one or more of the following characteristics: low or very low saturated hydraulic conductivity, a high-water table, additional water from seepage, or nearly continuous rainfall.

Poorly drained (27 percent): Water is removed so slowly that the soil is wet at shallow depths periodically during the growing season or remains wet for long periods. Most terrestrial plants that are not adapted to particularly wet conditions cannot be grown unless soil is artificially drained. The occurrence of internal free water is shallow or very shallow and common or persistent. The soil, however, is not continuously wet directly below plow-depth.

Very poorly drained (22 percent): Water is removed from the soil so slowly that free water remains at or very near the ground surface during much of the growing season. The occurrence of internal free water

8. NATURAL RESOURCES

is very shallow and persistent or permanent. Most terrestrial plants that are not adapted to particularly wet conditions cannot be grown unless soil is artificially drained. The soils are commonly level or depressed and frequently ponded.

The remainder of the land (22 percent) is not classified by drainage class, as it is water, developed land, or subaqueous.

Table 8-1: Worcester County Soils, groups soil descriptions by their drainage class, which refers to the frequency and duration of wet periods under conditions like those that were present when the soil formed (**See Map 8-2, Soils**). Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil.

8. NATURAL RESOURCES

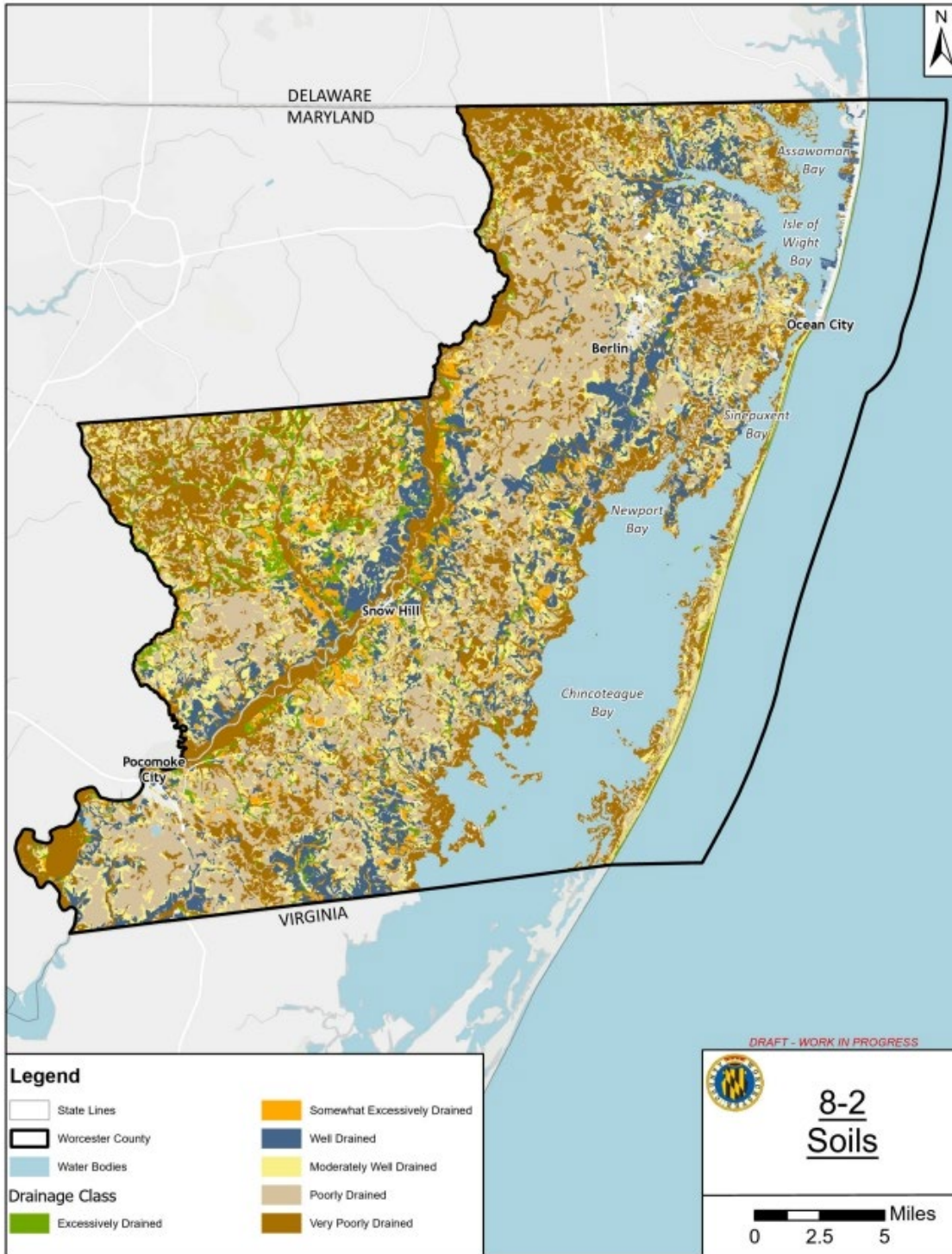
Table 8-1: Worcester County Soils

Drainage Class	Soil Name
Excessively Drained	Acquango sand, 5 to 10 percent slopes, occasionally flooded; Evesboro loamy sand, 0 to 2, 2 to 5, and 5-15 percent slopes; Runclint loamy sand, 0 to 2 and 2 to 5 percent slopes
Somewhat Excessively Drained	Cedartown-Rosedale complex, 0 to 2 and 2 to 5 percent slopes; Galestown loamy sand, 0 to 2, 2 to 5, and 1 to 10 percent slopes
Well Drained	Fort Mott loamy sand, 0 to 2 and 2 to 5 percent slopes; Hambrook sandy loam, 0 to 2 and 2 to 5 percent slopes; Matapeake fine sandy loam, 0 to 2 and 2 to 5 percent slopes; Matapeake silt loam, 0 to 2 and 2 to 5 percent slopes; Nassawango fine sandy loam, 0 to 2 and 2 to 5 percent slopes; Nassawango silt loam, 0 to 2 and 2 to 5 percent slopes; Rosedale loamy sand, 0 to 2 and 2 to 5 percent slopes; Sassafra sandy loam, 0 to 2, 2 to 5, and 5 to 10 percent slopes, Northern Tidewater Area; Udorthents, loamy, 0 to 5 percent slopes
Moderately Well Drained	Brockatonorton sand, 0 to 2 and 2 to 5 percent slopes, occasionally flooded; Hammonton loamy sand, 0 to 2 percent slopes, Northern Tidewater Area; Hammonton loamy sand, 2 to 5 percent slopes; Mattapex fine sandy loam, 0 to 2 and 2 to 5 percent slopes; Mattapex silt loam, 0 to 2 and 2 to 5 percent slopes, Northern Tidewater Area; Woodstown sandy loam, 0 to 2 and 2 to 5 percent slopes, Northern Tidewater Area
Somewhat Poorly Drained	Klej loamy sand, 0 to 2 and 2 to 5 percent slopes
Poorly Drained	Askecksy loamy sand, 0 to 2 percent slopes; Elkton sandy loam, 0 to 2 percent slopes; Elkton silt loam, 0 to 2 percent slopes; Fallsington sandy loams, 0 to 2 percent slopes, Northern Tidewater Area; Fox Hill sand, 0 to 2 percent slopes, frequently flooded; Hurlock loamy sand, 0 to 2 percent slopes; Othello silt loams, 0 to 2 percent slopes, Northern Tidewater Area; Zekiah sandy loam, frequently flooded
Very Poorly Drained	Beaches, very frequently flooded; Berryland mucky loamy sand, 0 to 2 percent slopes; Broadkill mucky silt loam, 0 to 1 percent slopes, very frequently flooded, tidal; Boxiron and Broadkill soils, 0 to 2 percent slopes, very frequently flooded, tidal; Chicone mucky silt loam, frequently flooded; Kentucky silt loam; Longmarsh and Indiantown soils, 0 to 1 percent slopes, frequently flooded; Manahawkin muck, 0 to 2 percent slopes, frequently flooded, Northern Tidewater Area; Mullica-Berryland complex, 0 to 2 percent slopes; Nanticoke and Mannington soils, 0 to 1 percent slopes, very frequently flooded, tidal; Puckum muck, 0 to 2 percent slopes, frequently flooded, occasionally ponded; Purnell peat, 0 to 1 percent slopes, very frequently flooded, tidal; Sunken mucky silt loam, 0 to 2 percent slopes, occasionally flooded, tidal; Transquaking and Mispillion soils, 0 to 1 percent slopes, very frequently flooded, tidal

Source: NCSS Web Soil Survey

8. NATURAL RESOURCES

Map 8-2: Soils



Source: Worcester County

8. NATURAL RESOURCES

Mineral Resources

Sand and, to a lesser extent, gravel are the County's only mineral resources. These resources are mined and used for road fill and other construction uses. As of 2024, there were 24 active surface mines in the County.

Surface mining is defined as the breaking of the soil surface to extract or remove minerals. This includes all parts of the extraction or removal process of minerals from their original location, the processing of minerals at the site of extraction, as well as the extraction of sand, gravel, rock, stone, earth or fill from borrow pits for highway construction purposes or other facilities. Surface mining operation permits are issued by MDE. Periodically, site inspections of permitted areas occur to ensure the conditions of the permit, and the accompanying Reclamation Plan, are being fulfilled.

All discontinued surface mining operations are required to be reclaimed per MDE standards. In some cases, discontinued extraction areas transition into wetlands, ponds, and other habitats. Some discontinued areas are actively reused for extraction of dried spoils for wetland and shoreline restoration projects.

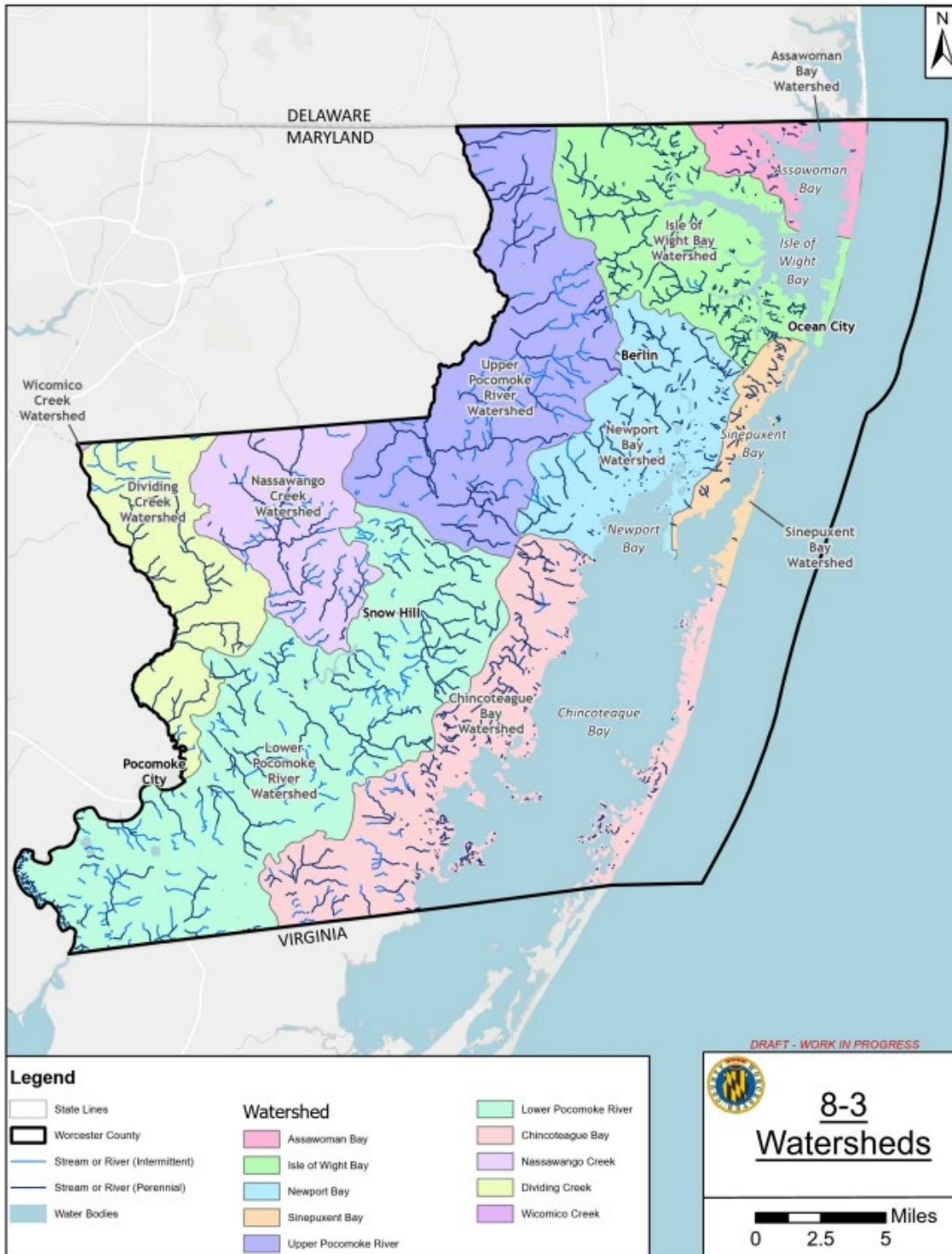
New surface mining operations are permitted within the Critical Area if identification of appropriate post-excavation uses for this land such as recreation, habitat restoration, open space, or development are accomplished according to the appropriate land management classification and other applicable County and State codes and ordinances. New surface mining operations are not permitted in the Critical Area where: important natural resources occur; highly erodible soils exist; the use of renewable resource lands would result in the substantial loss of long-range productivity of forest and agriculture, or would result in a degrading of water quality or a loss of vital habitat; lands are within 100 feet of the mean high water line of tidal waters, tidal wetlands, or the edge of streams. More information on the Critical Area can be found in the **Critical Area** section of this Chapter.

Streams and Stream Buffers

Worcester County contains ten 8-digit watersheds: Assawoman Bay Watershed, Isle of Wight Bay Watershed, Newport Bay Watershed, Sinepuxent Bay Watershed, Upper Pocomoke Bay Watershed, Nassawango Creek Watershed, Wicomico Creek Watershed, Dividing Creek Watershed, Lower Pocomoke River Watershed, and Chincoteague Bay Watershed. These watersheds contain a network of streams, tributaries, and creeks that are used for irrigation, provide important spawning grounds for fish and shellfish, help support other kinds of wildlife, support commercial and recreational fishing and attract outdoor enthusiasts. **Map 8-3: Watersheds** shows the ten watersheds in the County while **Map 8-4: Environmental Features** shows the network of waterways throughout the County.

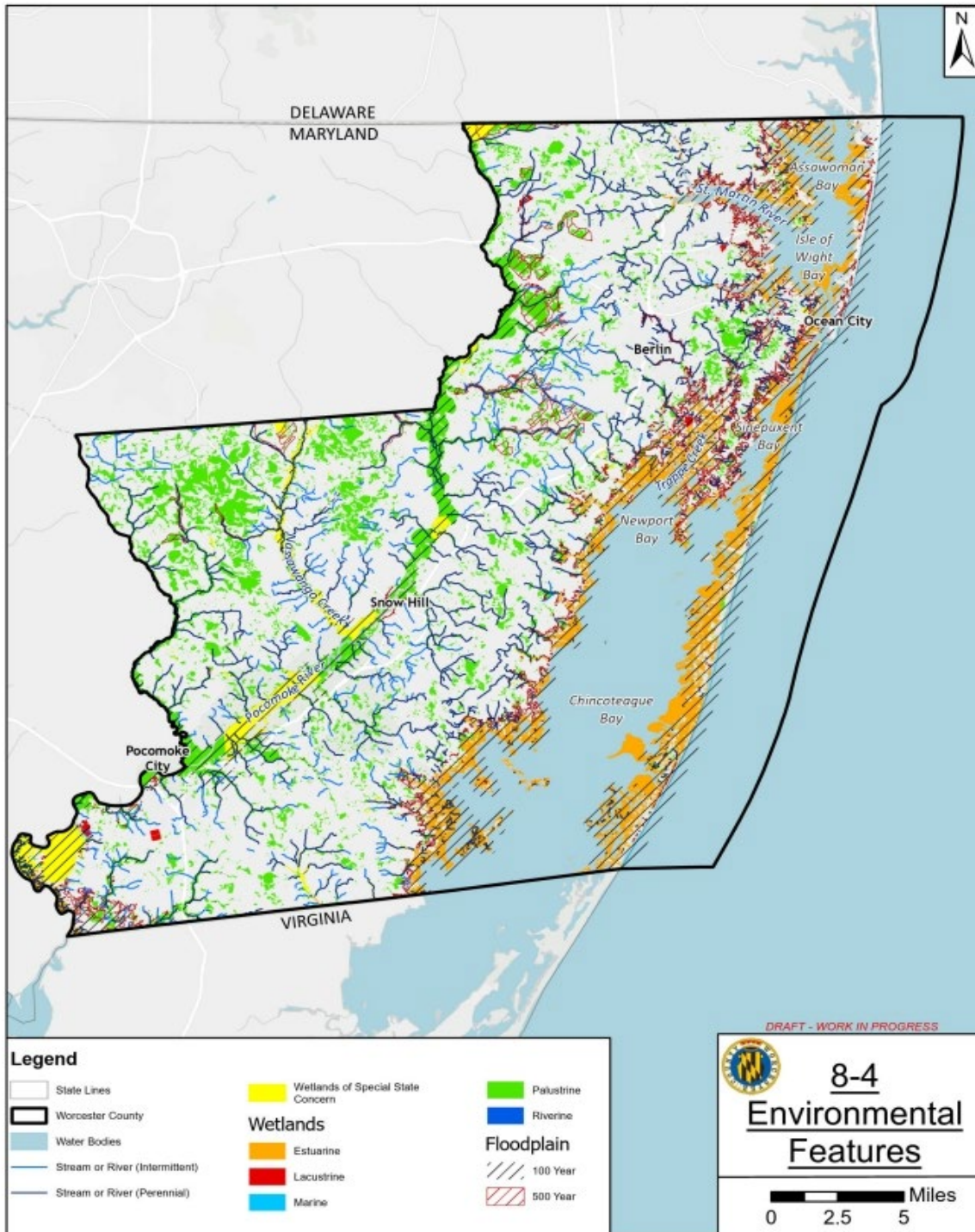
8. NATURAL RESOURCES

Map 8-3: Watersheds



8. NATURAL RESOURCES

Map 8-4: Environmental Features



8. NATURAL RESOURCES

The Pocomoke River is the main tributary of County's portion of the Chesapeake Bay Watershed. Important tributaries to the Pocomoke River include the Nassawango Creek and Dividing Creek. Associated with the upper Coastal Bays are large tidal tributaries such as the St. Martin River, Turville, and Herring Creeks, and Trappe Creek is a large tidal tributary associated with the lower Coastal Bays. Significant smaller tributaries include Manklin Creek, Greys Creek, Marshall Creek, and Roy Creek. These vital waterbodies are vulnerable to adverse impacts from development activities and certain types of agricultural practices, and their protection and regulation is a vital aspect of County plans.

Streams are categorized by the USACE based on the balance and timing of the stormflow and base flow components. Stormflow refers to streamflow that is influenced by precipitation events, such as rain and snow/snowmelt, while base flow refers to the streamflow that is sustained between those precipitation events. 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 groundwater into the channel.

Stream buffers are areas along the lengths of stream banks established to protect streams from human disturbances. They are defined by the State as an existing, naturally vegetated area or an area established in vegetation and managed to protect aquatic, wetlands, shoreline, and terrestrial environments from man-made disturbances (COMAR 27.02.05).

Stream buffers are a best management technique to reduce sediment, nitrogen, phosphorus and other runoff pollutants by acting as a filter, thus minimizing damage to streams. A healthy stream buffer will hold soil in place, filters stormwater runoff pollutants, can provide a refuge area for threatened animals and plants, hide predators from prey, and keep streams shaded and cool. The effectiveness of a buffer depends on the width and other factors such as soil erodibility, steep slopes, and wetlands. Ideal stream buffers include:

- Stream banks and steep slopes, which should remain intact to prevent erosion from clogging the stream bed and provide habitat for plants and animals.
- Streamside forests and other vegetation to provide habitat and shading, stabilize banks, and produce leaf litter to support microscopic shredders, filter feeders and decomposers that form the base of a healthy stream food chain.
- Floodplains, where most streamside wetlands are formed and where energy dissipation, natural filtration, food storage, and water storage occur.

Worcester County currently does not have a defined width for stream buffers that are not within the County's Chesapeake Bay Critical Area or Coastal Bays Critical Area but will be established with the adoption of the model floodplain ordinance. These programs generally require a minimum 100-foot vegetated buffer extending landward from the tidal water's mean high water line, tidal wetlands and

8. NATURAL RESOURCES

tributary streams. It is recommended that the County establish a standard stream buffer of 100 feet for perennial streams and 50 feet for intermittent streams outside of the Critical Area.

Groundwater is a major source of the County's existing and future water supply. The land area that overlays the aquifers that contribute water to the public water supply well is defined as the County's Wellhead Protection Area. The aquifer systems providing the community water supply and the wellhead protection area are integrally connected to many surface waters and streams, making protection of both groundwater and surface waters critical for ensuring public health, safety, and welfare. The designation of Wellhead Protection Area and careful regulation of activities within these districts ensures a future supply of safe and healthy drinking water. For more information on Wellhead Protection Area, see **Chapter 11 – Water Resources**.

Critical Areas

Both Chesapeake Bay Critical Area and Atlantic Coastal Bays Critical Area are found in Worcester County. The Chesapeake Bay Critical Area was established by the Maryland General Assembly in 1984 due to concern about the decline of water quality and natural resources of the Chesapeake Bay. The Critical Area is denoted as the area of land that exists within 1,000 feet of the mean high-water line of tidal waters of the landward edge of tidal wetlands, and all waters of and lands under the Chesapeake Bay and its tributaries. Worcester County Chesapeake Bay Critical Area begins 1,000 feet beyond the head of the tide at Whiton Crossing and includes about 10,000 acres of the County that lie within the Pocomoke River Watershed. Chesapeake Bay Critical Area maps were initially based on the 1972 State Wetland Inventory maps, with updates made in each jurisdiction by the Critical Area Commission. Current tax maps showing the Chesapeake Bay Critical Area were adopted by the Worcester County Commission in September 2003, but updates have been initiated with DNR.

In 2002, Maryland's General Assembly formally recognized the five Coastal Bays unique to Worcester County and their ecological value. Over the last quarter century, these bodies of water had felt the effects of significant growth along the County's shoreline and needed protection. Like the Chesapeake Bay Critical Area, the Atlantic Coastal Bays Critical Area is denoted as the area of land that exists within 1,000 feet of the head of the tide or tidal wetlands. Current tax maps showing the Atlantic Coastal Bays Critical Area were adopted by the Worcester County Commission in November 2002, but updates are currently underway with DNR. Both the Chesapeake Bay Critical Area and Atlantic Coastal Bays Critical Area will be referred to simply as "Critical Area" for the remainder of this document.

Critical Area is broken up into different designations. These designations are classified by the land's predominant use and intensity of development and is one of the following:

- RCA—Resource Conservation Area. An area characterized by nature-dominated environments including wetlands, forests, abandoned fields, and resource-utilization activities (e.g., agriculture, forestry, fisheries activities, aquaculture).
- LDA—Limited Development Area. An area that is currently developed with low- or moderate intensity uses, which contains areas of natural plant and animal habitats and where the quality of runoff has not been substantially altered or impaired.

8. NATURAL RESOURCES

- IDA—Intensely Developed Area. An area where residential, commercial, institutional, or industrial land uses are predominant and where relatively little natural habitat, if any, occurs.

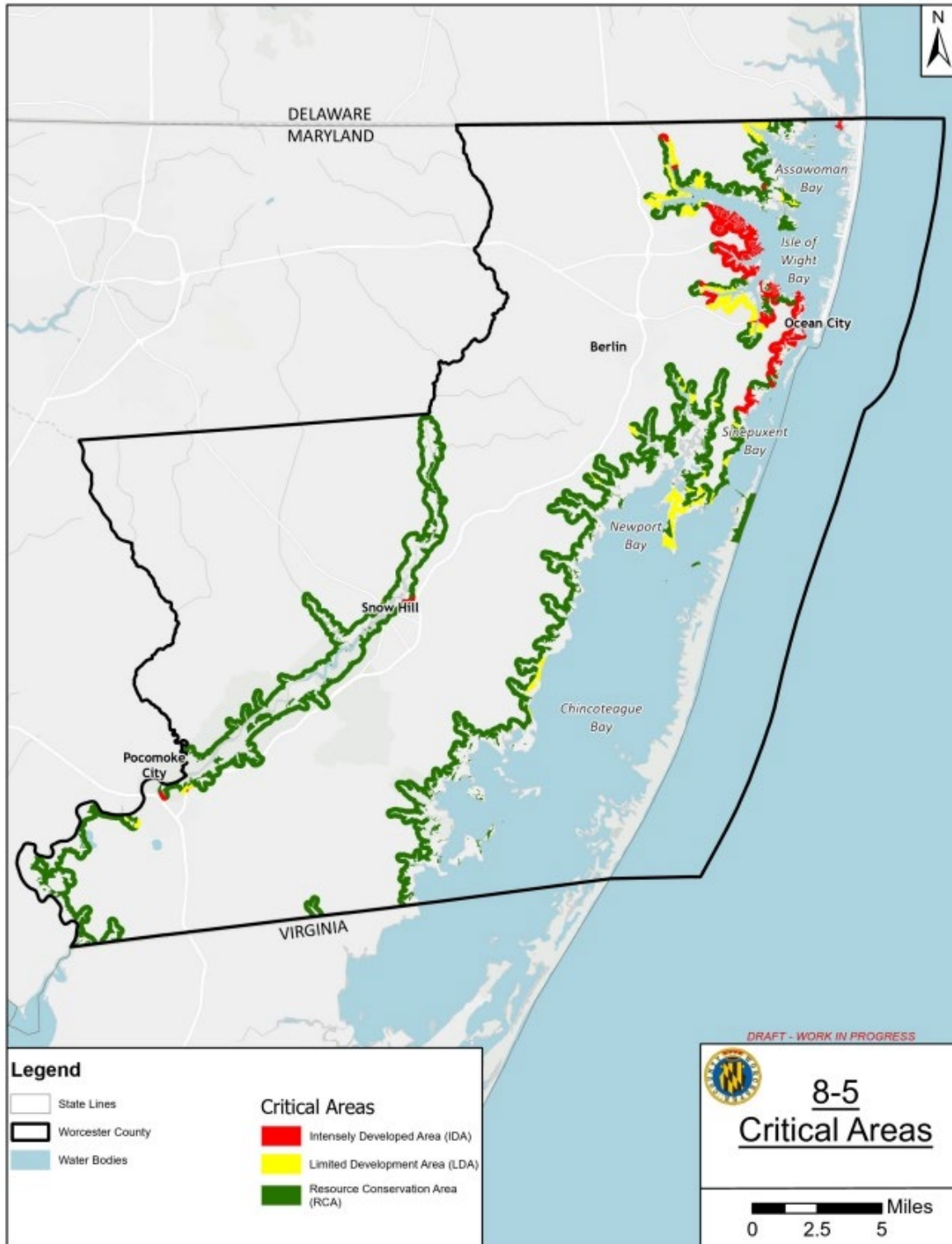
Approximately 57,671 acres of land in the County fall within the Critical Area. While development is not prohibited within the Critical Areas, it is reviewed for compliance with the appropriate designation. The most restrictive is the RCA, which limits densities to no greater than one dwelling unit per 20 acres and limits lot coverage generally to a maximum of 15% of the lot area. These areas are usually undeveloped areas characterized by agricultural use, forests, or other natural resources. Approximately 26,429 acres of the County's land area are designated as RCA.

The density and intensity of use in the LDA and IDA are established by using the underlying zoning classifications. Lot coverage in the LDA is generally limited to a maximum of 15% of the lot area. There are no lot coverage limits within the IDA, but it is required to minimize the destruction of forest and woodland vegetation and to control sediment, reduce runoff, and remove nutrients. Properties within the IDA are subject to water quality improvement requirements to offset an increased lot coverage. Approximately 3,094 acres of land are designated LDA within the County, and approximately 3,603 acres are designated as IDA.

On all waterfront properties or properties that border tidal wetlands, there is a 100-foot buffer that is measured from mean high water, the most landward extent of tidal wetlands, or the bank of tributary streams. In this area there are greater restrictions on what can legally occur relative to clearing, cutting, structures or general disturbance. In some areas, however, the restrictions are reduced. These less restrictive buffer areas are known as buffer management areas. **Map 8-5: Critical Areas** show the extent of Critical Areas throughout the County.

8. NATURAL RESOURCES

Map 8-5: Critical Areas



Source: Worcester County

8. NATURAL RESOURCES

Wetlands

Wetlands are defined by wetland hydrology, hydric soils, and hydrophytic vegetation (i.e., plants adapted to wet conditions). Wetlands help to reduce or mitigate flooding impacts, provide erosion control, maintain and improve water quality, support groundwater recharge, and provide habitat for various plants and animal species. Wetlands are categorized as nontidal or tidal. Nontidal wetlands are defined by the MDE as inland, freshwater areas not subject to tidal influence and are usually covered or saturated with water for long periods during the growing season. Tidal wetlands include saltwater and brackish areas as well as some freshwater habitats. These wetlands may be permanently, irregularly, or seasonally flooded.

Map 8-4: Environmental Features, shows that approximately 76,672 acres (approximately 18 percent of the County) are covered in tidal and nontidal wetlands. This map is a guidance map and likely only represents minimums. These wetlands are classified as palustrine, lacustrine, estuarine, and riverine. The most abundant type is palustrine or freshwater wetlands, which may be either tidal or nontidal, which represent 68 percent of the County's total wetlands (51,877 acres). Estuarine wetlands (salt and brackish wetlands) represent 31 percent of the County's total wetlands (24,119 acres). There is a very small percentage of lacustrine wetlands (less than 1 percent of total wetlands or 288 acres), riverine wetlands (less than 1 percent of total wetlands or 7 acres), and marine wetlands (less than 1 percent or 380 acres). Additionally, 8,026 acres or 10 percent of the wetlands in Worcester County are designated as Wetlands of Special State Concern, primarily located along the Pocomoke River and Nassawango Creek. These wetlands are considered the best examples of Maryland's nontidal wetland habitats and are designated for special protection under the State's nontidal wetlands regulations.

There are Tier II waters in Worcester, which are streams and rivers where water quality exceeds the state minimum standards and biological communities are healthy, robust, and diverse. These waterbodies have extra review and protective measures for development within their watershed areas. MDE has designated Little Mill, Nassawango, and Dividing Creek as Tier II waters. MDE divides up Tier II waters according to their ability to maintain ecological integrity. Waters with "assimilative capacity remaining" can withstand proposed landcover changes. Those classified as "no assimilative capacity remaining" require a more in-depth analysis of the potential impacts from proposed landcover changes and may need impact mitigation.

While the United States Geological Survey (USGS) and the Maryland Department of Natural Resources (DNR) both provide generalized mapping of wetland areas, the specific location and extent of wetlands require a site-by-site analysis. Final delineation of wetland locations is required as part of the development review process.

The USACE and MDE jointly regulate the wetland activities in the 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. MDE also regulates shoreline activities under the Living Shorelines Protection Act, with authorization from MDE and a permit from the local government required prior to starting a project.

8. NATURAL RESOURCES

Sea level rise, subsidence, erosion, and development remain the largest threats to the County's wetlands. The County has measures in place to protect wetlands, such as zoning the Pocomoke River Corridor and much of the Chincoteague Bay shoreline and shorelines of its tributaries as "RP" Resource Protection District. Currently, the total amount of RP zoned land is 86,737 acres. Additionally, much of the Nassawango Creek corridor is owned and protected by the Nature Conservancy. 7,500+ acres of the southeastern portion of the Chincoteague Bay watershed are permanently protected from development with Rural Legacy easements and approximately 1,000 acres of this area is wetlands. There are also established Rural Legacy Easements in the Lower Pocomoke River watershed and the Dividing Creek watershed. More information on efforts to preserve wetlands in the County can be found in the **Conservation Lands** section of this chapter.

Floodplains and Flood Hazards

The National Weather Service classifies flooding as "the inundation of normally dry areas due to increased water levels in an established watercourse." Floods threaten life, safety, and health and causes damage to property and infrastructure. Flooding can occur during any season of the year from a variety of sources. Riverine floodplains and coastal areas tend to be the most susceptible to flooding, however flooding can occur in other areas due to unusually long periods of heavy rainfall. There are multiple flood types, including:

- **Riverine Flooding:** Originates from a body of water, typically a river, creek, or stream, as water levels rise onto normally dry land. Water from snowmelt, rainfall, freezing streams, ice flows, or a combination thereof, causes the river or stream to overflow its banks into adjacent floodplains.
- **Flash Flooding:** Occurs when a large volume of water flows or melts over a short period, usually from slow moving thunderstorms or rapid snowmelt. These types of floods occur rapidly with significant impacts, and due to their localized nature do not have well-defined hazard areas.
- **Urban Flooding:** This type of flooding occurs due to development and the ground's decreased ability to absorb excess water without adequate drainage systems in place. This type of flooding typically occurs when land uses change from fields or woodlands to roads and parking lots. When the amount of water generated from rainfall and runoff exceeds a storm water system's ability to remove it, developed areas may flood.
- **Nuisance Flooding:** This type of flooding is associated with high tides that flow back through the stormwater system, increasing or raising the level of groundwater, and overtopping the banks and edge of waterways. The occurrence of nuisance flooding is an indicator of rising water levels in the Atlantic Ocean, Chesapeake Bay and Coastal Bays, and associated tributaries. Areas that were previously dry now flood during high tide events since the water elevation is high enough to crest the banks of waterways through outfalls that were previously high enough to prevent backflow while also allowing outflow. A Nuisance Flooding Plan was prepared in 2020 and is scheduled to be updated in 2025 and will be incorporated as a chapter within the updated *Worcester County Hazard Mitigation and Resilience Plan*.

The National Flood Insurance Program (NFIP) produces Flood Insurance Rate Maps (FIRMs) nationwide, which are a community's official map where the Federal Emergency Management Agency (FEMA) has

8. NATURAL RESOURCES

delineated both the special hazard areas and the risk premium zones applicable to the community. The NFIP underwrites flood insurance coverage using the information from the FIRM and the associated Flood Insurance Study (FIS). Communities that adopt and enforce regulations that meet or exceed NFIP criteria are eligible for flood insurance. Buildings built to these regulations have lower flood risk and insurance rates.

The County participates in the NFIP with an effective date of its FIRM and FIS of July 16, 2015. The Town of Berlin, Ocean City, Pocomoke City, and the Town of Snow Hill also participate in the NFIP.

The County is prone to various forms of flooding, and FEMA's Digital Flood Insurance Rate Map (DFIRM) shows flood inundation areas that are depicted as flood zones. These flood zones include A, AE, AO, VE and X (shaded and un-shaded). Floodplains are shown on **Map 8-4: Environmental Features**.

In 2018, the MDE prepared the Maryland Model Floodplain Management Ordinance (FPMO) in response to the requirement that local jurisdictions adopt regulations that are fully compliant with the requirements of the NFIP. For most communities, the requirement to update regulations is triggered by revisions to the Flood Insurance Rate Maps (FIRMs) and associated FIS.

8. NATURAL RESOURCES

Table 8-2: FEMA Special Hazard Flood Areas (SHFA) Risk Areas

Flood Zone	Description
A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
AE	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.
AO	River or stream flood hazard area, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1-3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage.
Moderate Risk Areas	
X (Shaded) 0.2% or 500-Year	Moderate flood area(s), shaded area(s) shown on FIRM, are the areas between the limits of the base flood and the 0.2% annual chance (or 500-year) flood.
Minimum Risk Areas	
X (Unshaded)	The areas of minimal flood hazard, which are areas outside the SFHA and higher than the elevation of the 0.2% annual chance flood, are labeled Zone X (unshaded).

Source: FEMA

There are 88,319 acres of FEMA-mapped 100-year flood zone in the County, which equates to approximately 20 percent of the County's total land area. There are 11,123 acres of FEMA-mapped 500-year flood zones, which equates to approximately 3 percent of the County's total land area.

Undisturbed floodplains are important for moderating storm floodwaters, absorbing wave energy, and reducing erosion and sedimentation. Additional resources within floodplains, such as wetlands and stream buffers, also help to maintain water quality, provide recharge groundwater, protect fisheries, and provide habitat and natural corridors for wildlife. By protecting floodplains from development, downstream communities benefit from reduced risks and costs associated with loss of life and property.

It is important to note that FIRMs provide an analysis of flood scenarios based on past events and data. They indicate areas of high, moderate, and low risk. Future conditions are not considered. FEMA FIRMs do not account for:

- Shoreline erosion, wetland loss, subsidence, or relative sea rise
- Upland development or topographic changes
- Degradation or settlement of levees and floodwalls
- Changes in storm frequency and severity
- Effects of multiple storm events

While some of these factors do not impact the County directly, or have as great an impact as others, it is important to be aware that approximately 25 percent of flood damages nationally occur to structures

8. NATURAL RESOURCES

that are outside of FEMA mapped flood hazard areas and that few, if any, standards exist nationwide for development in the areas immediately adjacent to the floodplain or outside of mapped floodplain areas.

To help the County review proposed developments, developers are required to provide detailed base flood elevation information to the County. The County then provides this information to FEMA and request revisions to floodplain maps with more accurate data as needed.

In 2000, the Stafford Act enacted the Disaster Mitigation Act and, by FEMA's Interim Final Rule published in 2002, established in the Maryland Code that each Maryland jurisdiction adopt and maintain a Hazard Mitigation Plan (HMP). The HMP ensures eligibility for funding and technical assistance from State and federal hazard mitigation programs. It addresses natural hazards determined to be of high and moderate risk as defined by the updated results of the local hazard, risk, and vulnerability summary. Natural hazards continue to be evaluated during five-year update cycles and include sea level rise and coastal resiliency planning priorities. The County's latest version of this plan is the 2020 Worcester County Hazard Mitigation and Resilience Plan.

Community Rating System (CRS)

Worcester County is not currently participating in the FEMA Community Rating System (CRS). The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed NFIP requirements. As an incentive, flood insurance premium rates are discounted to reflect reduced risk. Additional benefits of the CRS include:

- Increased opportunities for citizens and property owners to learn about risk, evaluate their individual vulnerabilities, and take action to protect themselves as well as their homes and businesses;
- Adoption of floodplain management activities that enhance public safety, reduce damage to property and public infrastructure, and avoid economic disruption and loss;
- Opportunities for communities to evaluate the effectiveness of their flood programs against a nationally recognized benchmark;
- Availability of free technical assistance for community officials in designing and implementing some activities; and
- Incentives for communities to maintain and improve their flood programs over time.

The three goals of the CRS include:

1. Reducing and avoiding flood damage to insurable property
2. Strengthening and supporting the insurance aspects of the NFIP
3. Fostering comprehensive floodplain management

These goals can be reached by implementing higher regulatory standards, establishing a robust public outreach initiative, preserving open space to reduce flooding risk and increase resiliency, and creating an emergency preparedness plan.

8. NATURAL RESOURCES

It is recommended that the County consider applying for participation in the CRS as many of the activities that are awarded points in the rating system are already underway. These activities include, but are not limited to, open space preservation and establishing a Hazard Mitigation and Resilience Plan.

Coastal Bays

Atlantic Coastal Bay resources in Maryland only occur in Worcester County. There are five Coastal Bays: Newport Bay, Assawoman Bay, Chincoteague Bay, Isle of Wight Bay, and Sinepuxent Bay (see **Map 8-4: Environmental Features**). In total, these bays boast 248 miles of shoreline and nearly 35,000 acres of wetlands. They are home to a variety of wildlife, including 360 different types of birds as well as more than 108 rare, threatened and endangered species. These five bays receive drainage from approximately half of Worcester County and have felt the effects of the significant growth along the County's shoreline over the last quarter century and area in need of protection. Because sea level rise is eroding tidal wetlands and shorelines in all the Coastal Bays in the County, each faces its own challenges and ecosystem threats based on various factors such as geography, land use, and environmental influences.

Multiple restoration projects have been completed by the Maryland Coastal Bays Program in partnership with various entities who have helped both fund and maintain efforts. These various entities include Worcester County, the Maryland Department of Transportation State Highway Administration (SHA), The Lower Shore Land Trust, the Coastal and Estuarine Land Conservation Program, the National Estuary Program, DNR, and other private partners. These projects include living shorelines, establishment of nature parks, wetland restoration, dam removal, establishment of a kayak launch, and various other efforts to preserve ecological function of sensitive resources and provide educational and recreational spaces for residents and tourists to enjoy.

The 2023 Maryland Coastal Bays Report card gave the Coastal Bays an overall score of a "B-", which is the highest score the Coastal Bays have ever received since the annual report card began in 2008. Coastal Bay health is defined by four water quality indicators – nitrogen, phosphorus, chlorophyll *a*, and dissolved oxygen – and two biotic indicators – seagrass and hard clam – toward scientifically derived ecological thresholds or goals. More information on each Bay and their 2023 ratings is below.

Newport Bay

In 2023, Newport Bay received a "C minus" on the Maryland Coastal Bays report card. Intact natural shorelines, high wetland coverage, and low impervious surfaces were balanced by degraded water quality, low densities of hard clams, and poor seagrass coverage. This resulted in Newport Bay's overall ecosystem health grade ranking as last in the Coastal Bays. Newport Bay, one of the smallest of the Coastal Bays, sports wide and productive marshes on both banks. The Bay's many tributaries come together in a vast complex of wetlands, channels, ponds, and uplands. However, extensive mosquito ditches are also present in these marshes, which compromise natural drainage.

With 42% forested land, Newport Bay has the second-highest proportion of land covered with woodland of any subwatershed of the Coastal Bays. Add to this the watershed's diverse hardwood forests and lack of loblolly pine monocultures, and the area emerges as one of the most important forest hubs in the Coastal Bays watershed. While Berlin anchors the watershed's northern side, the expansive tidal guts,

8. NATURAL RESOURCES

marshes, and forests on Newport Bay's southern side help it rival Chincoteague Bay in wildlife diversity. Like its southern cousin, its expansive marshes and riparian forest provide critical habitat for birds, reptiles, amphibians, and rare plants. Extensive hardwood forested wetland on the watershed's northeastern and southeastern sides is important for maintaining water quality and also for forest interior dwelling birds. About 325 ha (800 acres) of forest (7% of the total forestland) are currently protected in the 11,000-ha (27,400-acre) watershed.

Assawoman Bay

The Assawoman Bay watershed includes both Worcester County and Sussex County in Delaware. The northern half of Ocean City drains into Assawoman Bay; over 40% of the overall drainage is from Delaware. This area is largely planned for agriculture, other than existing developed areas and Ocean City. In 2023, Assawoman Bay received a "B minus" on the Maryland Coastal Bays report card, which is its highest recorded rating. Assawoman Bay is directly connected to Little Assawoman Bay in Delaware through a channel known as 'The Ditch.' The extent of exchange between these two waterbodies is unknown, but wind and tides are thought to play an important role. Preliminary monitoring results suggest that Greys and Roys Creeks, as well as the Ditch, may contribute negatively to the water quality in the northern end of Assawoman Bay. Additionally, substantial loss of tidal marsh occurred in Assawoman Bay prior to implementation of wetlands protection laws in the 1970s. Only small parcels of tidal marsh remain today on the bay shore of Fenwick Island. However, substantial areas of tidal marsh still survive along the mainland shoreline. The remaining marshes of this area are probably highly vulnerable to loss in association with rising sea level.

Chincoteague Bay

The Chincoteague Bay watershed is the largest of the five Coastal Bay watersheds, with both Worcester County in Maryland and Accomack County in Virginia contributing to the drainage area. The drainage area contains extensive marshes, farms, and forest, with forested areas accounting for nearly half of the land cover. There are twelve wetlands of special state concern in the watershed. In 2021, Chincoteague Bay received a "B minus" on the Maryland Coastal Bays report card. In recent years there has been an increase in nutrients and phytoplankton in the bay, which is a threat to seagrass coverage. Many bay islands are also being lost to erosion and sea level rise. These islands provide essential habitat for numerous waterbird species as well as other organisms. Like the other Coastal Bay watersheds, agricultural activities contribute to nutrient pollution in the bay.

Isle of Wight Bay

The Isle of Wight Bay watershed is the second largest of the five Coastal Bay watersheds, with both Worcester County in Maryland and Sussex County in Delaware contributing to the drainage area, with headwaters near Selbyville, Delaware. This watershed contains Ocean City, Ocean Pines, some of West Ocean City, and most of the Route 50 commercial corridor. This area has been a receiver of population growth and development. In 2023, Isle of Wight Bay received a "B minus" on the Maryland Coastal Bays report card.

8. NATURAL RESOURCES

Isle of Wight Bay and its watershed are the most heavily used of the Coastal Bays. Bounded on the east by densely developed Ocean City, it is also bounded on the west by very dense residential development. The north boundary is Route 90 with two in-line bridge spans leading from the mainland to Cape Isle of Wight and then to north Ocean City. The south boundary is the Route 50 bridge, bringing traffic into south Ocean City. Flowing into Isle of Wight Bay are waters from Herring Creek, Turville Creek, and St. Martin River, all with increasing residential development.

There are at least 111 canals adjacent to the Coastal Bays, 59 of which are in Isle of Wight Bay. Most of these canals were built between 1960 and 1980 by development projects that dug the canals to create residential waterfront lots. Dead-end canals are problematic for several reasons. They usually have only one opening. Most were dug through wetlands with the material being side-cast to build elevation. The canals were often dug deeper than their receiving waters, creating lower bottom elevation and poor flushing. This causes canal water to stagnate and become depleted of dissolved oxygen, which is essential for organisms to survive. The canals receive pollutants from stormwater runoff. The Ocean Pines community alone, located in both Isle of Wight Bay and St. Martin River watersheds, has 322 km (200 mi) of ditches, mostly draining into 19 km (12 mi) of canals that serve to remove stormwater from 8,300 properties.

While the amount of waterfront has increased dramatically by this development, the result is that non-point source pollution from all residences has increased as well. Additionally, the loss of wetlands associated with this development has meant a decreased ability to filter out nutrients and pollution before reaching the bays. Animal waste, lawn trimmings, fertilizers, fishing waste (scraps and bait), and trash are all major sources of pollution.

Sinepuxent Bay

Sinepuxent Bay ranked first in the Coastal Bays for estuarine health and second for watershed health, receiving a “B plus” on the 2023 Maryland Coastal Bay Report card. It had the best water quality, highest density of hard clams, and greatest seagrass coverage—likely due to its small, relatively undeveloped watershed and good oceanic flushing through the Ocean City Inlet. This resulted in Sinepuxent Bay’s overall ecosystem health ranking as the best of the Coastal Bays. Sinepuxent Bay’s long, thin dimensions give its recreational qualities a dichotomous feel.

On its northern end, near the Ocean City Inlet, yachts and commercial fishing boats depart for sea from the sprawling West Ocean City Harbor. A public boat ramp there also brings jet skiers and recreational boaters from around the East Coast. Good fishing in the inlet and the northern half of the bay makes for crowded conditions in July and August north of Assateague Road. South of there, campgrounds, shallow water, and limited development change the scene to a rural one. On the eastern border of Sinepuxent Bay lies one of the East Coast’s true gems— Assateague Island National Seashore. The barrier island, known for its wild horses, is a refuge for both wildlife and the two million people who visit the island every year.

8. NATURAL RESOURCES

Sinepuxent Bay’s small, relatively undeveloped shoreline and flushing from the Ocean City Inlet give it the best water quality among the Coastal Bays. With the lowest nitrogen levels, Sinepuxent Bay enjoys healthy fisheries and abundant seagrass.

Hazard Mitigation

Hazard mitigation involves reducing the risks of natural hazards and their associated damage to people and property. The County developed a *2020 Worcester County Hazard Mitigation and Resilience Plan* that addresses all natural hazards that are most likely to affect Worcester County. The natural hazards identified in the County include coastal hazards (flooding, storms, sea level rise, and erosion), riverine flooding, wildfire, wind, drought, thunderstorms, tornados, winter storms, and hazardous materials. These were ranked to provide structure and prioritize mitigation goals and actions. Table 7-3 shows the overall risk potential identified in the 2020 plan for each hazard. For more information on these hazards, please see the *2020 Worcester County Hazard Mitigation Plan*.

Table 8-3: Worcester County Hazard Identification and Risk Assessment

Identified Hazard	Type of Events	2020 Worcester Hazard Identification and Risk Assessment
Coastal	Coastal Flooding; Coastal Storms; Storm Surge; Hurricane/Tropical Storm; Nor’easter; Potential Sea Level Rise; Shoreline Erosion	High
Flood	Riverine Flood	Medium-High
Wildfire	Wildfire; Brush Fire; Conflagration	Medium-High
Wind	Thunderstorm winds; non-thunderstorm wind	Medium-High
Drought	Drought; Extreme Heat	Medium
Thunderstorm	Thunderstorm; Lightning; Hail	Medium
Tornado	Tornado	Medium
Winter Storm	Winter Storm; Extreme Cold; Nor’easter (Snowfall)	Medium-Low
HazMat	Toxic Chemicals	Medium-Low

Source: 2020 Worcester County Hazard Mitigation and Resilience Plan

Climate Change

Climate change refers to the long-term change in the average weather patterns and temperatures. Worcester County is susceptible to climate change, facing pressing issues such as sea level rise, heavy precipitation events, and increasing temperatures. Adaptation of infrastructure in the face of climate change and mitigation of the effects on the County is an important part of what will shape Worcester County in the coming years.

The *2015 Maryland Commission on Climate Change (MCCC) Act* required the MCCC and its participating agencies to develop an action plan and firm timetable for mitigation of and adaptation to the likely consequences and impacts of climate change in Maryland. In February 2021, MDE released the *2030*

8. NATURAL RESOURCES

Greenhouse Gas Reduction Act (GGRA) Plan, which is a comprehensive plan that sets a clear and unifying path for the State to dramatically reduce greenhouse gas emissions that contribute to climate change.

In 2020, the County prepared their *2020 Worcester County Hazard Mitigation and Resilience Plan*, which received a 'satisfactory' rating from FEMA. The plan "seeks to eliminate or reduce hazard related human, economic, and environmental losses" and includes unincorporated areas of the County as well as the towns of Berlin, Pocomoke, and Snow Hill. Ocean City has its own plan, the *2017 Ocean City, Maryland Hazard Mitigation Plan*. While the County's Hazard Mitigation and Resilience plan mostly addresses current impacts of hazards for a five-year span (2020-2025), it also identifies and addresses the anticipated role of climate change for hazards such as flooding, extreme weather events, extreme heat, and coastal erosion.

Sea Level Rise

The rising and spreading of water over normally dry land is referred to as inundation. Scientists use models to develop maps showing the possible impacts of inundation based on various Sea Level Rise (SLR) scenarios for state's waterways and the land that surrounds them (watersheds). These maps reflect the filling of these watersheds at constant elevations, also referred to as bathtub modeling. In other words, the maps show the water levels rising in the watersheds similar to the filling of a bathtub.

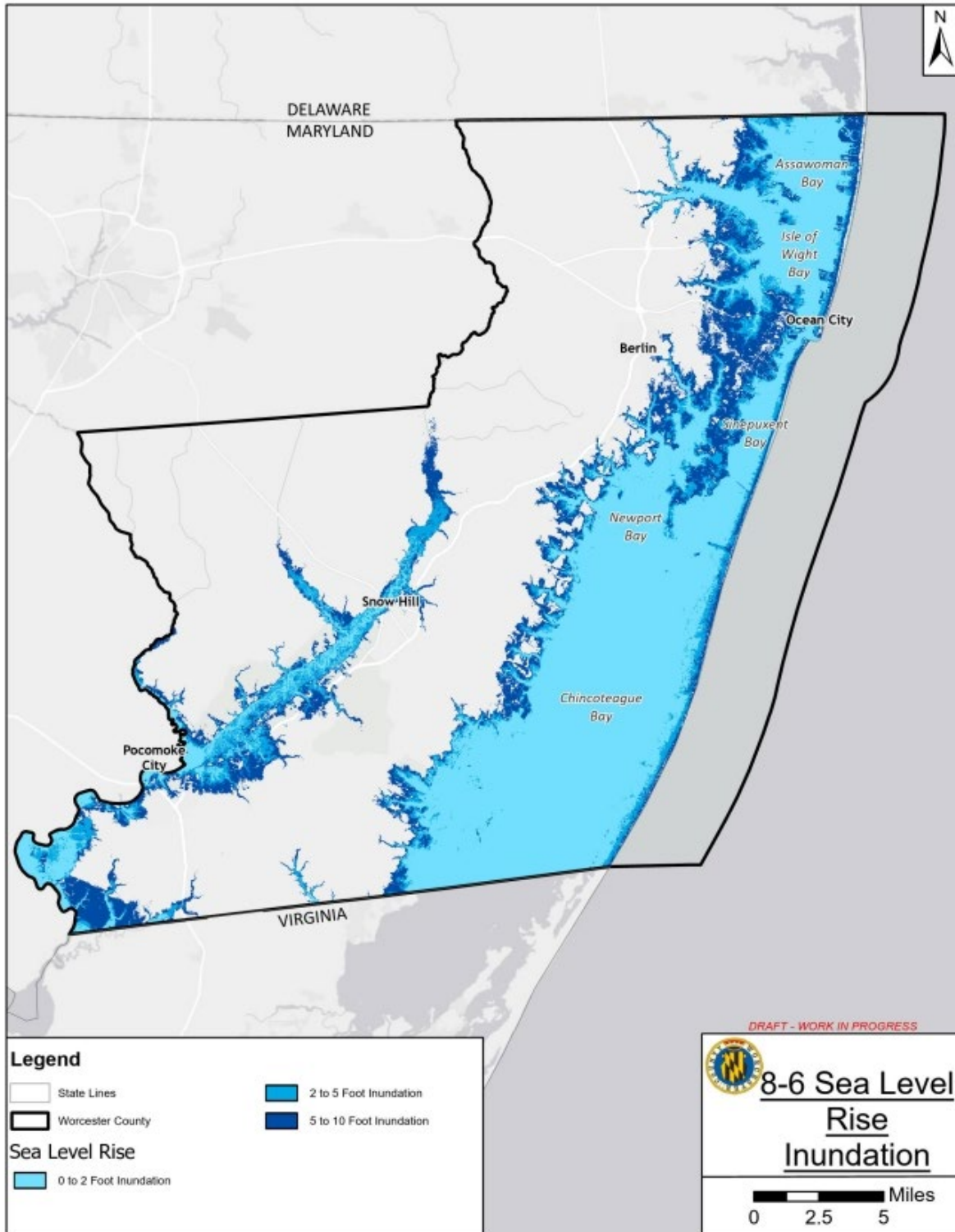
Worcester County boasts 774 miles of coastline, which are important for the County's economy and quality of life. Due to its location, low elevations, and dependence on the coast, the County is particularly vulnerable to the effects of SLR. Changes in sea level have the potential to impact existing infrastructure and natural resources in the short-term and also the durability of future development with long-term design life.

The impacts of 2-, 5-, and 10-foot SLR are shown in **Map 8-6: Sea Level Rise Inundation**. With many areas of the County susceptible to SLR, it is important to consider potential associated impacts, which include coastal erosion, flooding and loss of wetlands, saltwater intrusion, and expansion of flood-prone areas. Long-range planning and accounting for changes in sea level that may be expected in the County will help lead to informed decisions for public and private investments by minimizing risk potential for damage to both existing and future resources.

The Maryland CoastSmart Council was established in 2014 by the Maryland General Assembly for the purpose of adopting specific Coast Smart siting and design criteria to address impacts associated with sea level rise and coastal flooding on future capital projects. Per the Maryland CoastSmart regulations, state construction projects and projects in coastal areas that receive more than \$500,000 in state funding must apply the horizontal limits of a floodplain corresponding to a Design Flood Elevation (DFE) with 3 feet of freeboard. This will show wider inundation areas. MDE, DNR, and other state agencies developed the CoastSmart – Climate Ready Action Boundary (CS-CRAB) for the Maryland CoastSmart Council, which shows these updated horizontal limits that account for these wider inundation areas consistent with projected Maryland sea level rise. This boundary is shown on **Map 8-7: CS-CRAB**.

8. NATURAL RESOURCES

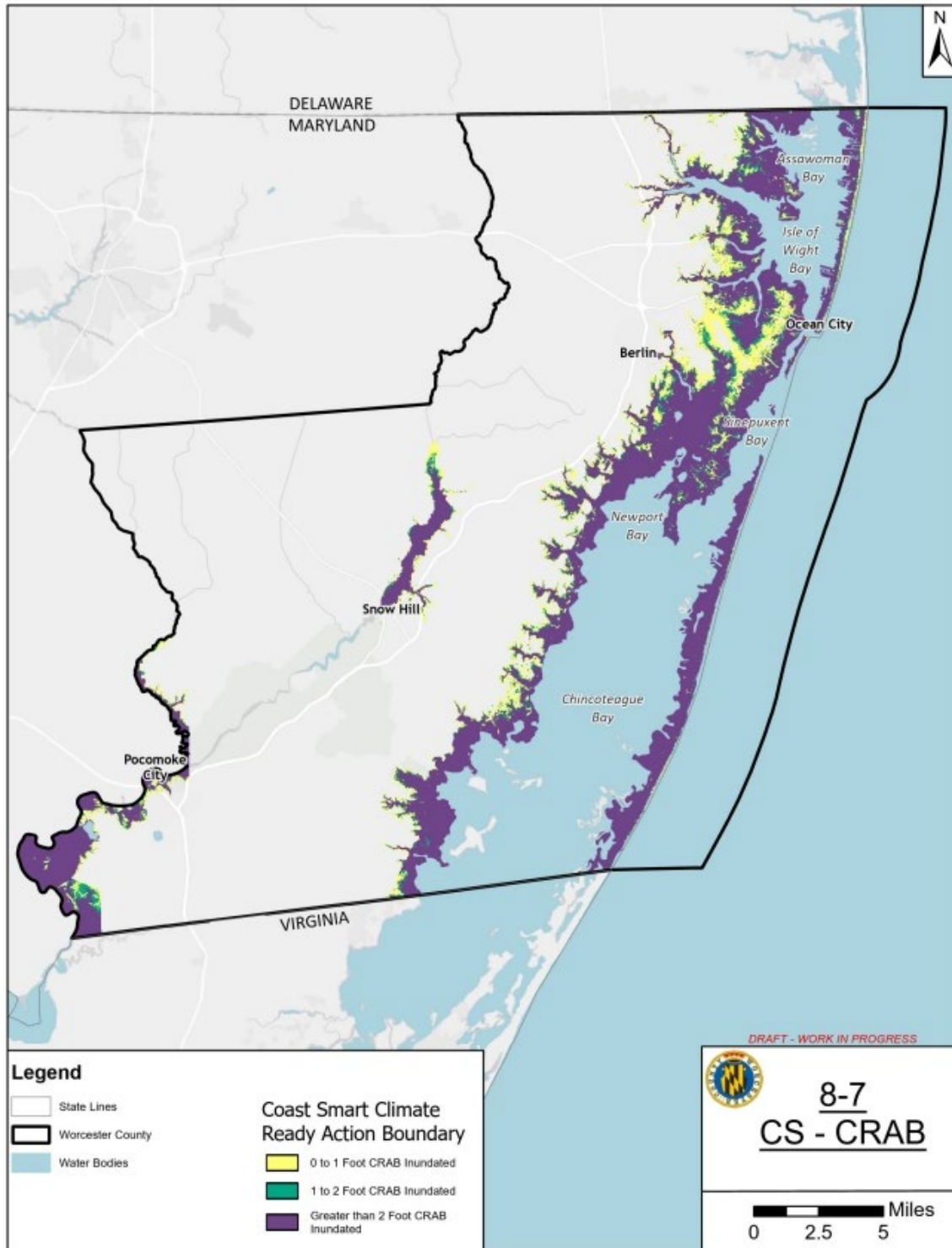
Map 8-6: Sea Level Rise



Source: Worcester County, MD iMap

8. NATURAL RESOURCES

Map 8-7: CS-CRAB



Source: Worcester County, MD iMap

8. NATURAL RESOURCES

In 2008, a document was prepared for the County titled *Sea Level Response Strategy* which presented several scenarios to assess the impacts of sea level rise on Worcester County over the next century. The document also provided a prioritization of response options to determine which options would be useful despite uncertainties in the rate and range of sea level rise. The *2020 Worcester County Hazard Mitigation and Resilience Plan* indicates that the Seaside area of Worcester County ranks “very high” on the SLR Hazard Ranking, while the Bayside area ranks “low.”

One of the expected impacts of sea level rise is coastal erosion, which causes loss of land and habitat, damage to infrastructure, increase vulnerability to hazards, and economic impacts especially for areas that rely on coastlines for recreational industries and tourism.

Shoreline erosion is not a serious threat to human life; however, it is a slow and ongoing geological process that could lead to significant economic, property and infrastructure loss. The *2008 Sea Level Rise Response Strategy, Worcester County, Maryland*, notes that approximately 56% of the county’s shoreline is receding, with 4% eroding at over 4 feet per year. These eroding areas are candidates for nonstructural or living shoreline stabilization approaches to mitigate erosion.

The *2020 Nuisance Flood Plan* was prepared to document the County’s response and monitoring of these conditions. Worcester County, Maryland is experiencing nuisance flooding in mapped floodplains that is occurring on a more frequent basis, including urban flooding in the towns of Pocomoke City and Snow Hill. This has County and town responders busy responding to these events. These challenges are exacerbated by the increase in frequency and intensity of storms caused by higher global temperatures creating more favorable conditions for heavier and more frequent participation. Citing one useful tool for reported nuisance flooding events, the County has logged 158 events reported to the *MyCoast* reporting application, with the majority occurring within the Town of Ocean City, which has their own nuisance flooding plan. Worcester County has approximately 92 roads that were identified in the *Hazard Mitigation and Resilience Plan* as being potentially flooded during an event with 33 roads identified as impacted by tidal flooding, which is frequently referred to as “sunny day” or high tide flooding.

The *2020 Worcester County Hazard Mitigation and Resilience Plan* notes that the Virginia Institute of Marine Science inventoried a large portion of the Coastal Bays and found that approximately 26% of the shoreline was armored or contained some form of erosion control structures. However, these erosion control measures often cause erosion to nearby unarmored shores. It is recommended that the County complete an updated inventory of eroding shorelines and consider stabilization methods to mitigate erosion for the most critical areas, with nonstructural or living shoreline approaches preferred.

Another impact of sea level rise is saltwater intrusion. As sea level rises, the extent of tidal, brackish surface waters within the Chesapeake Bay, Coastal Bays, and Atlantic Ocean expands both upstream and landward above and below the ground, which in turn increases saltwater intrusion into aquifers. Saltwater intrusion is discussed further in the Water Resources section.

Heavy Precipitation Events

Climate change is expected to result in more frequent heavy precipitation events. This can lead to flooding, especially in areas with inadequately sized drainage infrastructure. This flooding can result in

8. NATURAL RESOURCES

safety hazards, inaccessible roadways, travel delays, and damage to buildings or other infrastructure. The County's infrastructure and its ability to handle such events plays a contributing role in how effectively the area can be evacuated and how it can prevent damage from these events. Planning for these events determine how successful the County and emergency services can respond to these events. An assessment of the vulnerability of older commercial and residential structures would be helpful to prepare for the anticipated higher frequency of heavy rainfall events.

Temperature Rise

Another key issue surrounding climate change is a steady rise in temperature. Rising temperatures will result in a longer growing season, heat waves, and more consecutive days where it does not cool off at night. This has many implications for infrastructure and human health. Air conditioning systems in buildings may not be sized appropriately for increasing temperatures and shorter, milder winters can mean residents are dealing with more ticks and mosquitoes. Of particular concern are vulnerable populations who may not have access to air conditioning in the summer. Although temperature is not something that can be controlled, there are ways for the County to prepare for a possible increase. Tree planting and shade contribute greatly to heat dispersion. Making sure buildings are up to code for cooling systems will also mitigate the effects of long-term temperature changes. Educating people on how to deal with heat waves and erratic weather also helps prepare the population for such events and can be a successful way to prevent the dangers of high temperatures.

Habitats of Rare, Threatened, and Endangered Species

The Federal Endangered Species Act of 1973 requires a list of endangered and threatened species and the protection of those species and their ecosystems. The primary State law that allows and governs the listing of endangered species is the Nongame and Endangered Species Conservation Act (Md. Natural Resources Code Ann. §10-2A). This Act is supported by regulations that contain the official State Rare, Threatened, and Endangered Species list.

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 it an attractive place to live.
- An abundance of animal and plant species support outdoor recreational activities such as hunting, boating, wildlife viewing, and hiking.

Habitats of rare, threatened, and endangered species are defined as areas that, due to physical or biological features, provide important elements for the maintenance, expansion, and long-term survival of threatened and endangered species. This area may include breeding, feeding, resting, migratory, or overwintering areas. Physical or biological features include (but are not limited to) the structure and composition of the vegetation, faunal community, soils, water chemistry, and quality; and geologic, hydrologic, and microclimatic factors.

The DNR's Wildlife and Heritage Service Natural Heritage Program (WHS) tracks over 1,250 native plants and animals that are among the rarest in Maryland and most in need of conservation efforts as elements

8. NATURAL RESOURCES

of the State’s natural diversity. Lists of rare, threatened, and endangered animals and plants, including federally listed species are maintained by the WHS, statewide, which officially recognizes 566 species and subspecies as endangered, threatened, in need of conservation, or endangered extirpated:

- **Endangered.** A species whose continued existence as a viable component of Maryland’s flora or fauna is determined to be in jeopardy.
- **Threatened.** A species that appears likely, within the foreseeable future, to become endangered in Maryland.
- **In Need of Conservation.** A species whose population is limited or declining in Maryland, such that it may become threatened in the foreseeable future if current trends or conditions exist.
- **Endangered Extirpated.** A species that was once a viable component of the flora or fauna of Maryland, but for which no naturally occurring populations are known to exist.

As of November 2021, within the County, 28 animals and 97 plants are listed (see **Table 8-4**). Of these, 3 animals and 1 plant species are listed as endangered under the federal *Endangered Species Act*, which include the Leatherback Sea Turtle, the Red-cockaded Woodpecker, the Roseate Tern, and Chaffseed.

Table 8-4: Listed Species in Worcester County

Category	Plants	Animals
Endangered	66	20
Threatened	22	3
In Need of Conservation	0	2
Endangered Extirpated	9	3
Total	97	28

Source: Maryland Department of Natural Resources

Populations of many island and marsh nesting birds in the Coastal Bays are in decline, including the common tern (state-endangered and facing 90% decline), seaside sparrow, salt marsh sparrow (projected for extinction by 2060), and black skimmer (near extirpation). All of Maryland’s breeding royal terns and black skimmers nest in the Coastal Bays and the salt marsh sparrow only lives in salt marshes. Erosion of islands and decline in salt marsh habitat in the bays is a significant reason for the decline.

Multiple projects are underway to combat loss of habitat and subsequent population decline for island and marsh nesting birds. The Maryland Coastal Bays Program and DNR have deployed a raft to serve as habitat for common terns as a stop gap measure until more island habitat can be restored. Additionally, Marshes for Tomorrow, an effort with Audubon and Maryland Coastal Bays Program, is working to restore marsh at a landscape scale in Maryland, including the Coastal Bays, which will provide critical habitat for the salt marsh sparrow.

To assist in identifying the potential habitats for these species areas, DNR designates Sensitive Species Project Review Areas (SSPRAs). SSPRAs represent the general location of documented rare, threatened, and endangered species, and other areas of concern including Critical Areas, Natural Heritage Areas, Listed Species Sites, and Nontidal Wetlands of Special State Concern.

8. NATURAL RESOURCES

Forest Interior Dwelling Species (FIDS) are those species that require large blocks of forests to survive and maintain sustainable populations. FIDS include a diverse group of birds such as tanagers, warblers, and vireo, as well as short-distance migratory birds such as woodpeckers, hawks, and owls. Many factors have contributed to the decline of FIDS; however, the loss and fragmentation of forests on the breeding grounds is a major contributor to this decline. In general, FIDS are not well adapted to compete with species that evolved along forest edges and openings. The fragmentation of large forest tracts largely through land development threatens the habitat needed for long-term survival of these species and exposes them to predators or competing species.

When forests are under extreme stress, individual species and their habitats become threatened, thereby endangering the health of the forest. The plants, animals, and forests are essential to maintaining biological diversity in this region. The distance between blocks of forests influences the abundance of many FIDS. Some species can survive in smaller forests if they are connected to other areas via corridors.

Aquatic habitats are another vital resource—they not only protect waterways and their biodiversity, but also help with the County’s resiliency efforts in the face of climate change. Submerged aquatic vegetation (SAV, i.e. bay grasses) serves as important food, nursery, and habitat for many species of fish and fowl. Its health is a good indicator for measuring Chesapeake Bay and Coastal Bay restoration progress as the health of these grasses are closely linked to water quality. They provide essential food and habitat for many important species of waterfowl, fish, shellfish, and invertebrates; remove suspended solids from the water; protect shorelines from erosion; and oxygenate the water. Shellfish beds are both an economic and a natural resource—the bottom (benthic) community provides food for bottom feeding fish.

Within Worcester County, portions of the Upper Pocomoke River watershed, Dividing Creek watershed, Lower Pocomoke River watershed and the entire Nassawango Creek watershed are identified as stronghold watersheds by DNR. These watersheds are considered to be the most important for the protection of Maryland’s freshwater stream biodiversity and are places where greatest conservation need species of stream-dwelling fish, amphibians, reptiles, or mussels have the highest abundance or diversity. These species are generally most sensitive to environmental degradation, with a small change in watershed or stream health able to permanently eliminate one or more of these sensitive species. Maintaining the health of these watersheds is critical for sustaining these species and the vital ecosystem services they provide.

The County contains three State designated Natural Heritage Areas. These include Lower Nassawango Creek, Mattaponi, and North Sinexent Bay Dunes. Natural Heritage Areas are within legally protected lands, such as parks or state wildlife management areas. They must contain one or more threatened or endangered species or wildlife species in need of conservation, must be a unique blend of geological, hydrological, climatological, or biological features, and must be considered to be among the best Statewide examples of its kind.

In the late 1990s, DNR began an effort to identify ecologically important lands in Maryland. The result of this effort is a mapped network of large blocks of intact forest and wetlands called “hubs” linked

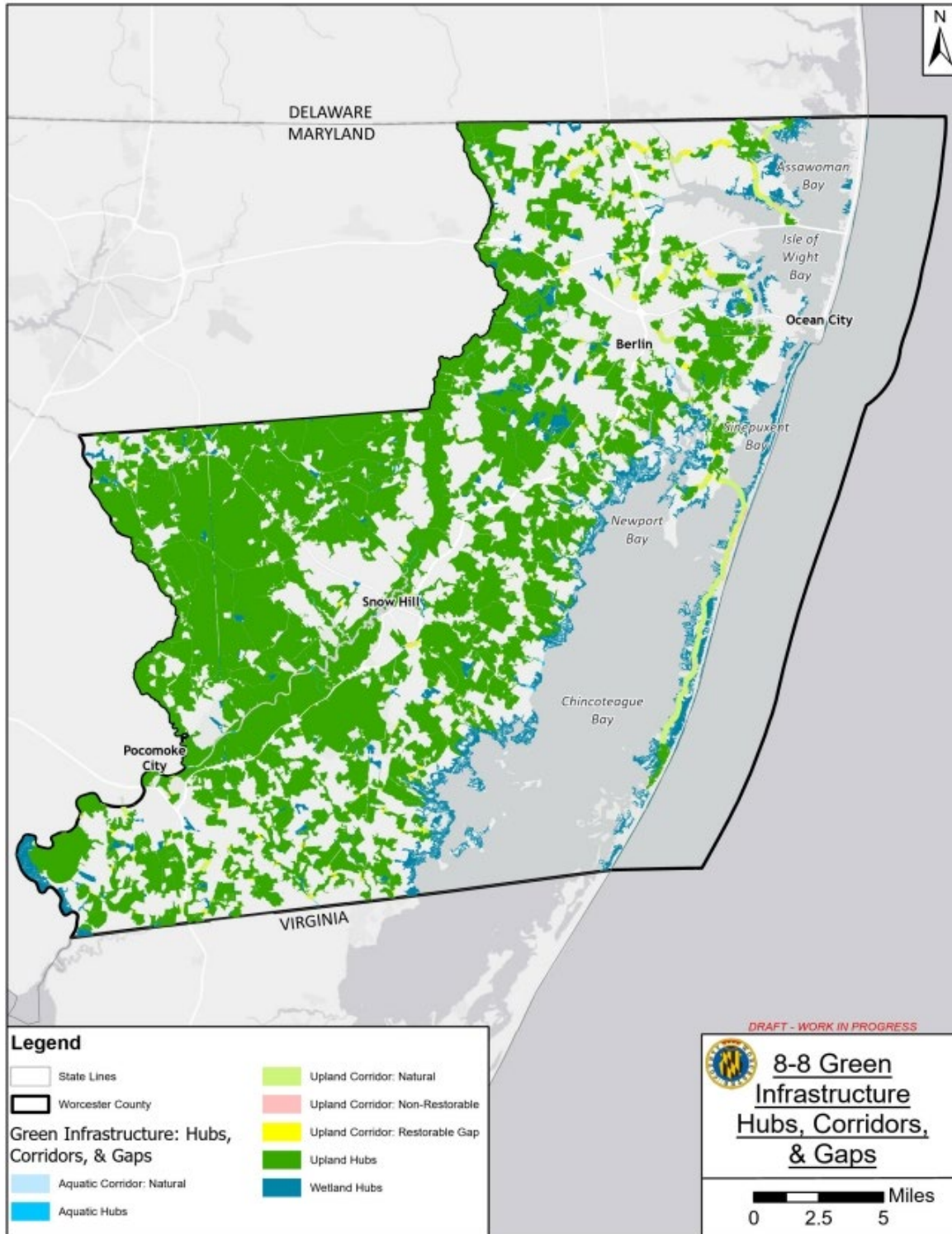
8. NATURAL RESOURCES

together by linear features such as forested stream valleys, ridgelines, or other natural areas called “corridors.” **Map 8-8: Green Infrastructure, Hubs, Corridors and Gaps**, shows the location of these hubs and corridors, which are vital to maintaining healthy wildlife populations across the state, while also providing a number of ecosystem services to the citizens of Maryland, including clean water, clean air, carbon sequestration, and climate resilience. In August 2024, DNR and the Chesapeake Conservancy partnered to update mapping of these hubs and corridors, calling it Maryland’s Habitat Connectivity Network. The updated mapping helps the state understand where the most important natural habitat areas in the state are currently located, how these areas are connected, and how these areas have changed in the past two decades. These data will also provide essential information to help target and prioritize lands for protection or restoration.

Map 8-9: Ecological Areas includes significant wildlife assessment areas in the County including SSPRAs, Targeted Ecological Areas, and FIDS habitats. These areas may need special management or protection because of their importance to conservation of threatened or endangered species. The County should continue to pursue all efforts to protect habitats of threatened and endangered species by adopting regulations protecting these species from habitat loss. Further protection of woodlands or forested lands will have a positive impact on targeted ecological areas and wildlife habitats, will contribute to ecological balance, and offer sustained recreational opportunities for residents. Development in these areas should be discouraged and if development does occur, techniques to reduce impacts on targeted ecological areas and wildlife habitats should be utilized. Control of non-native invasive species within ecological areas will further protect wildlife and habitats from degradation. The County may consider establishing and implementing an invasive species removal program and focus on the planting of native species within open lands, ecological areas, natural areas, and forest lands.

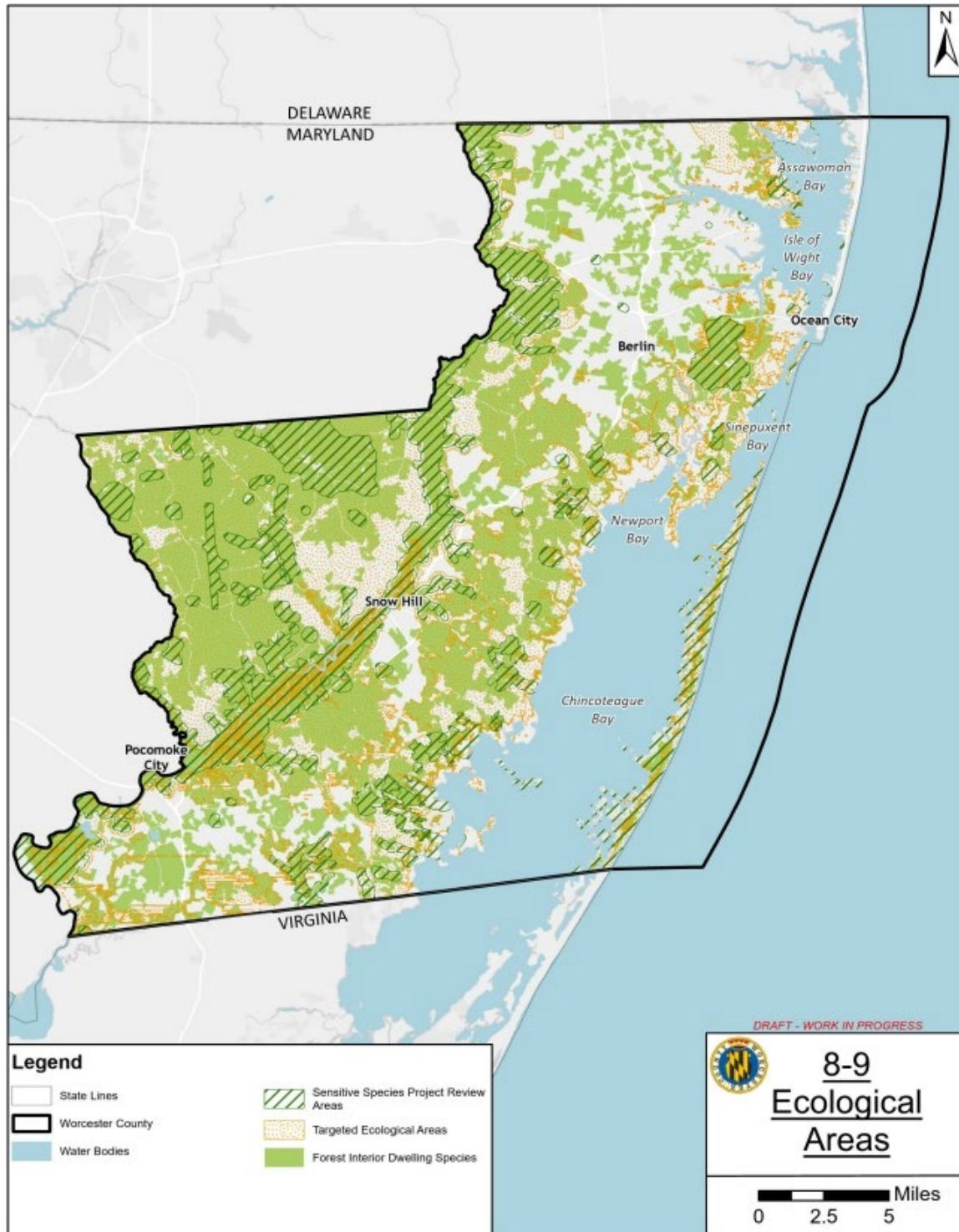
8. NATURAL RESOURCES

Map 8-8: Green Infrastructure, Hubs, Corridors, and Gaps



8. NATURAL RESOURCES

Map 8-9: Ecological Areas



Source: MD iMAP, Worcester County

8. NATURAL RESOURCES

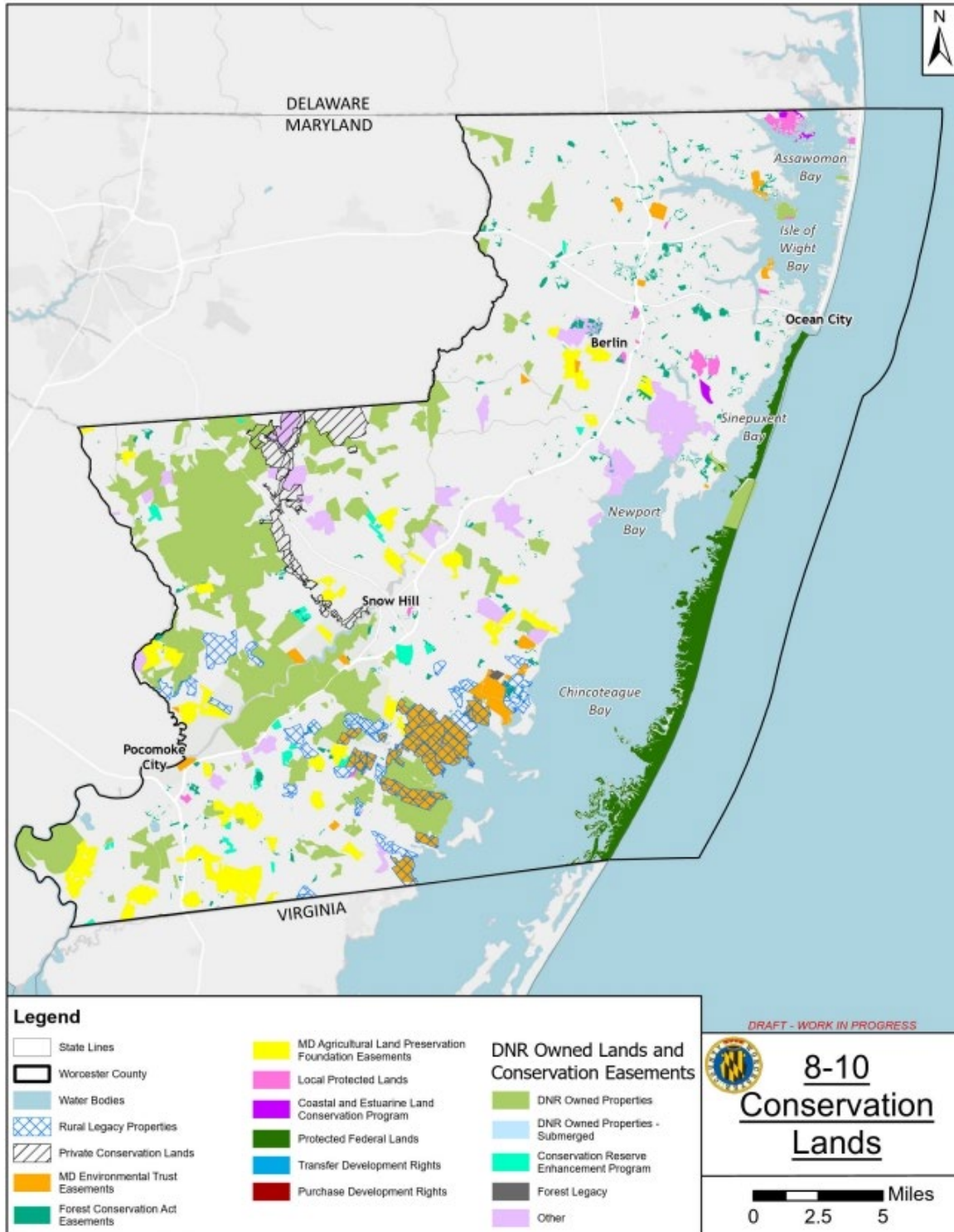
Conservation Lands

Map 8-10: Conservation Lands identifies areas of conservation lands based on the status of properties through a variety of federal, State and County preservation and conservation programs. These include:

- Maryland Agricultural Land Preservation Foundation (MALPF) Easements
- Maryland Environmental Trust (MET)
- DNR Owned Lands and Conservation Easements
- Forest Conservation Act Easements
- Rural Legacy Easements and Areas
- Coastal and Estuarine Land Conservation Program (CELCP)
- Conservation Reserve Enhancement Program (CREP) including the Permanent Easement Program
- Maryland Coastal Bays Program's (MCB) Comprehensive Conservation and Management Plan (CCMP)
- Private Conservation
- Protected Lands – local and federal
- Transfer of Development Rights (TDR) Areas
- Purchase Development Rights

8. NATURAL RESOURCES

Map 8-10: Conservation Lands



Source: MD iMAP, Worcester County

8. NATURAL RESOURCES

As of 2025, a total of 32.8% of County lands are protected with easements or with state ownership; this is 26% of the Coastal Bays watershed. A few of the conservation programs and achievements in the County are highlighted in this section.

The MALPF program, in existence since 1977, is one of the most successful farm preservation programs in the country. It strives to preserve sufficient agricultural land to maintain a viable base of food and fiber production. The pace of land protection increased significantly since 2017. From 2017 to 2024, approximately 3,696 acres (25 properties) were protected with MALPF easements, or about 462 acres protected annually. Over 10,700 acres in Worcester County have been permanently protected by the Maryland Agricultural Land Preservation Foundation (MALPF) Program as of 2025.

The Program consists of two basic steps: the application process and the purchase of perpetual agricultural conservation easements. MALPF's "round 2" funding cycle prioritizes bargain sales, and Worcester County landowners have increasingly received "round 2" offers due to its competitive bid process. Worcester County also provides cash match from the agricultural land transfer tax, revenue allocated by the county, as well as funds allocated from the county general fund. These funds are matched by MALPF on a 60/40 basis. This has allowed for additional MALPF easement purchases and has been necessary for the county to meet minimum acreage protection goals. The county should continue to provide an annual cash match to MALPF.

In order to protect natural resources, the County has established three Rural Legacy Areas (RLAs): the Coastal Bays RLA (1999) the Dividing Creek RLA (2008) and the Bishopville-Showell RLA (2024). To date, Worcester County's Coastal Bays Rural Legacy Area, which includes the entire Chincoteague Bay shoreline and watershed, lower Pocomoke River watershed, and connects the Chincoteague Bay to the Pocomoke State Forest with a permanent "greenway" is approximately 45,945 acres (expanded in FY2019). 17,711 acres and counting are permanently protected as of January 2025, either by state ownership or privately owned under land conservation easement in this Rural Legacy Area.

The 2024 Coastal Bays Rural Legacy application stated a goal of protecting an additional 2,500 acres by FY34. 9,900 acres are protected with a Coastal Bays Rural Legacy easement as of end of 2025. Dividing Creek RLA was created in 2008 In partnership with Somerset County, The Nature Conservancy, and Lower Shore Land Trust. The boundary was expanded in 2019 in both counties. In Worcester County, it was expanded to include the entire Dividing Creek watershed, portions of the Nassawango Creek watershed, and upper Pocomoke River shoreline and watershed. The Dividing Creek and Nassawango Creek watersheds are an area of Maryland recognized by The Nature Conservancy as high in biodiversity. The Dividing Creek RLA is also an area with productive and contiguous farmland. The area is 55,526 acres in size, including both counties. Protection of the first Dividing Creek RLA easement in Worcester County occurred in 2009. Thirteen (13) properties have been protected in Worcester County to date (6 since 2017, totaling approximately 3,472 acres. FFY26 Dividing Creek RLA application stated a goal of protecting an additional 4,500 acres by FY36.

The Bishopville-Showell Rural Legacy Area was established in 2024. The Area is 11,743 acres and contains important farmland under significant development pressure. Many of the farms are small, so unable to participate in MALPF, which requires a minimum of 50 acres to enroll.

8. NATURAL RESOURCES

Worcester County has partnered with, and plans to continue to work with, the state and the Coastal and Estuarine Land Conservation Program (CELCP) (NOAA) and the Coastal Wetlands Program (USFWS), two federal programs that protect coastal resources through purchase of conservation easements or fee simple purchase for passive parks. The Greys Creek Nature Park and Ilia Fehrer Nature Preserve were both purchased with CELCP funding.

The State acquired the Greys Creek Nature Park and transferred the property to the County in 2006. This property is 517 acres and contains extensive tidal marsh, nontidal wetlands, and woodlands which provide habitat and water quality benefits. This property is jointly managed by the County and the Maryland Coastal Bays program. The park functions as a passive recreational outlet while also providing educational opportunities to learn about the ecology of wetlands, marsh lands, and coastal woodlands.

The Ilia Fehrer Nature Preserve was acquired by Worcester County in 2011 and is managed by MCBP for conservation purposes. The property is a 437-acre wetland preserve and is part of the larger Holy Grove Swamp Area within the Newport Bay Watershed. The west parcel of the property consists of open scrub and shrubland while the east parcel is characterized by older growth hardwood stands and a large loblolly pine stand between the two parcels of the property. A primitive loop trail was established by the MCBP on the west parcel for access to water level meters and was improved and mapped during the winter of 2023. During fall of 2022 MCBP began developing a series of trails on the east parcel. While there is no parking area at the west parcel, visitors may access the east parcel and its trails from a parking lot located off Sinepuxent Road. MCBP is working to connect the two trail systems to afford visitors the opportunity to visit the west parcel.

In 2023, DNR in partnership with the Lower Shore Land Trust purchased the former Bay Club near Berlin. This former golf club site helps conserve 672 acres of land in the headwaters of the Pocomoke River watershed, which restores wetlands, fosters reforestation, and provides public access.

Assateague State Park is located on Assateague Island and is bordered by the Assateague National Seashore to the north and south. The State Park is managed by DNR, whereas the National Seashore is managed by the National Park Service. These protected lands provide recreational activities such as swimming, beachcombing, camping, kayaking, and fishing, and also provide habitat to a variety of wildlife including deer, waterfowl and feral horses.

It is the county's intent to protect and promote private farming and forestry by accommodating inevitable population growth through appropriate planning and zoning, and by taking advantage of every program available to landowners to voluntarily protect open space. Specifically, the county is committed to continuing to seek and/or provide additional funds for the purchase of both Rural Legacy and Maryland Agricultural Land Preservation Fund (MALPF) easements, to pursue other agricultural land conservation programs, and to maintain State certification for the county's agricultural land preservation program, which allows access to additional agricultural transfer tax funds that are collected in the county.

The county also promotes restoration projects on private lands through watershed planning efforts and other programs. Local, state and federal programs available include Wetland Reserve Program and other

8. NATURAL RESOURCES

U.S. Department of Agriculture Programs, Conservation Reserve Enhancement Program (CREP), various State Forest Service programs, and the county Forest Conservation Fund and Critical Area fee-in lieu programs. The county has also pursued funding for restoration and resiliency projects as part of its TMDL compliance program.

The county also takes part in the Maryland Coastal Bays Program's (MCB) Comprehensive Conservation and Management Plan (CCMP) which is a blueprint to guide future decisions and addresses a wide range of environmental protection issues, including: water quality, habitat, fish and wildlife, pathogens, land used, resiliency, and introduced species. Each CCMP is based on a scientific characterization of the estuary and is developed and approved by a broad coalition of stakeholders. A National Estuary Program, the Maryland Coastal Bays Program is a cooperative effort between Worcester County, Berlin, and Ocean City which have come together to produce successive 10-year management plans for the coastal bays with the next update due for adoption in 2025. Established in 1987 under the Clean Water Act, the National Estuary Program was developed to protect economically and environmentally sensitive estuaries across the United States by engaging all user groups. The Maryland Coastal Bays Program is one of only 28 such programs nationwide.

Worcester County's 2006 comprehensive plan, which was revised with adoption of the Priority Preservation Element in 2010, recommended the goal of 1,000 acres of agricultural land protection per year (800 acres within the PPA annually). The Priority Preservation Element identifies a Priority Preservation Area (PPA) of 195,000 acres, 64% of the county's land area. The long-term goal is to protect 100,000 acres within this area for agricultural and forestry. These goals are re-articulated in the county's Agricultural Land Preservation Re-certification report, which was last updated in 2023. It should be noted that to remain certified, the PPA should be updated to include the Bishopville Showell RLA and it should be reviewed by the Agricultural Preservation Advisory Board.

Forest and Woodlands

A forest is defined in the Maryland Code as a biological community dominated by trees and other woody plants covering a land area of 10,000 square feet or greater. A forest includes areas that have at least 100 live trees per acre, with at least 50% of those trees having a two-inch or greater diameter at 4.5 feet above the ground. A forest also includes areas that have been cut but not cleared. A forest does not include orchards.

According to the County's 2010 Land Use/Land Cover classifications, Worcester contains approximately 155,021 acres of forest coverage, which represents roughly 51% of the County's land mass. In addition to enhancing the County's rural character, some of the forested lands are owned and operated by timber companies practicing silviculture (the growing of trees), an integral part of industry. Due to 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.

The County implements its Forest Conservation Law which is in full compliance with the Maryland Forest Conservation Act. The main purpose of this Act is to minimize the loss of Maryland's forest resources during land development by making the identification and protection of forests and other sensitive areas

8. NATURAL RESOURCES

an integral part of the site planning process. The County specifies that activities that require an application for any public or private subdivision plan, site plan approval, or grading and sediment control permit on areas 40,000 square feet or greater must comply with the Forest Conservation Law.

In 2013, the Maryland General Assembly clarified that it is the policy of the State to achieve “no net loss of forest,” meaning at least 40% of all land in Maryland is to be covered by tree canopy. In 2003, the Governor signed a bill which outlines the State’s plan for no-net forest cover loss. Each County was given the option to establish its own plan by July 1, 2024, or default to the state requirements. The “no net loss” policy is being replaced on July 1, 2026, with a net canopy growth policy which requires measurement every four years. There are also policy measures underway at the state level regarding mitigation banking under the new FCA that have yet to be clarified with the counties. One big change is that qualified conservation of existing forests is now creditable again. The new state forestry manual is being updated and has yet to be delivered to the counties. DNR anticipates updating the local model ordinance by July 1, 2025, and adopt new regulation by July 1, 2026.

In October 2019, the State enacted legislation that updated the Natural Resources Article §5-1610, Forest Conservation Fund, which required all Counties to implement a Forest Mitigation Plan and Accounting Procedure. This Plan prioritizes a plan of action to maintain a viable Forest Conservation program by exploring land acquisition, forest banking, GIS tracking, and an increased forest conservation fee in lieu rate. In 2010, in response to this legislation, the County enacted changes under Bill No 20-4 by incorporating the Forestry Policy Act of 2009 which reduced clearing thresholds, addressed the reporting of easement information in GIS layers, and made changes to inter-family exemptions for transfers. It was again amended in 2020, under Bill 20-4, for changes including: demonstration of unavailability of forest mitigation bank credits, procedures and assurances of mitigation, and an update to fee in lieu rates.