CHAPTER EIGHT

NATURAL RESOURCE LAND CONSERVATION

8.1 Overview

Baltimore County utilizes a wide range of tools to protect the natural environment and preserve natural resources and environmentally sensitive areas. These tools include both laws and regulations, and programs and policies. The County's proximity to the Chesapeake Bay emphasizes the need for Baltimore County to be a stalwart defender of the Bay and its watershed, from its coastal resources, to the forests, wetlands, streams, rivers, reservoirs and groundwater.

The Baltimore County Urban-Rural Demarcation Line (URDL) was one of the first growth management tools to be employed within the State of Maryland, and has long served as the County's dividing line between areas where growth would be most concentrated, and where growth would be more limited in order to protect and preserve the rural character of the County. Many means for protecting and preserving natural resources apply both within the urban and rural area including environmental regulations such as those associated with stormwater management, protecting streams and wetlands through forest buffer requirements.

Other protections are more closely associated with one area or the other. For instance, agricultural land preservation efforts are almost entirely concentrated within the rural portions of the County, whereas the majority of capital resources for parks and other public infrastructure (public utilities, fire and police service, senior centers, libraries, etc.) are directed to the urban portions of the County where the majority of the population resides. Land use zoning is one of the most effective tools utilized by the County to maintain the separation of the urban and rural parts of the County. Within the urban area, residential zones tend to allow for a larger number of residential units per acre of land, resulting in higher residential density than the majority of lands in the rural parts of the County. The urban area also features the majority of commercially and industrially-zoned lands. Meanwhile, the rural lands outside of the URDL feature areas of resource conservation zoning that greatly limits permitted uses and ensures that the rural character is preserved. Commercial and industrial areas are very limited within the rural area and residential density is intentionally low.

Since 1987, Baltimore County has had a nationally recognized watershed improvement program that supports natural resource land conservation through stream restoration, shoreline enhancement and stabilization, reforestation, stormwater runoff and best management projects. Baltimore County has completed 80 stream restoration projects, 31 shoreline stabilization and enhancement projects, and converted 146 stormwater management ponds. In addition, 30 waterways have been dredged and the FY 18-20 budget included $4.5 million for the dredging of Bird River. Over 848 acres of non-mitigation reforestations were planted, with many such planting projects taking place at the County's parks. Challenges to this program include strengthening the protection of high-function forest cover and increasing environmental education and engagement efforts to reach Baltimore County residents.

Natural resource lands in the County and throughout the State of Maryland not only conserve and protect the environment, but provide invaluable natural resource-based recreational opportunities. Such opportunities are a hallmark of the State's park system, where the public is offered opportunities to enjoy such nature-focused activities as camping, hiking, mountain biking, picnicking, swimming, fishing, and hunting. DNR's Dundee Creek Marina in the Chase area of eastern Baltimore County likewise provides boating opportunities. A number of these same activities are supported at the City-owned, but County-situated, reservoir watershed properties. Numerous Baltimore County parks supplement these natural resource-based opportunities, at sites ranging from nature centers and parks (e.g., Marshy Point Park, Cromwell Valley Park, Oregon Ridge Park, Lake Roland) to the waterfront parks with boat ramps providing access to the Bay and its tributaries. Such parks and recreational opportunities support numerous natural resource conservation goals, implementation programs, policies, and initiatives.

8.2 Inventory of Protected Natural Resource Lands

Targeted growth and conservation areas are identified by Baltimore County with Growth Tiers and by the State of Maryland with Targeted Ecological areas.

The Sustainable Growth and Agricultural Preservation Act of 2012 protects natural resources—specifically water resources and the Bay. The Act mandated the establishment of "growth tiers" that dictate where public sewer service is appropriate and permissible, versus where the use of septic systems is permitted. The County's associated implementation program is heavily based on the URDL, which corresponds closely to Baltimore County's public water and sewer service area mapping. The Chesapeake Bay Critical Area and associated regulations and policies also impact growth management policy along the County's shorelines.

Targeted Ecological Areas are lands and watershed identified by the Maryland Department of Natural Resources as having high ecological value for natural resource protection. They are preferred for conservation funding through the Stateside Program Open Space.

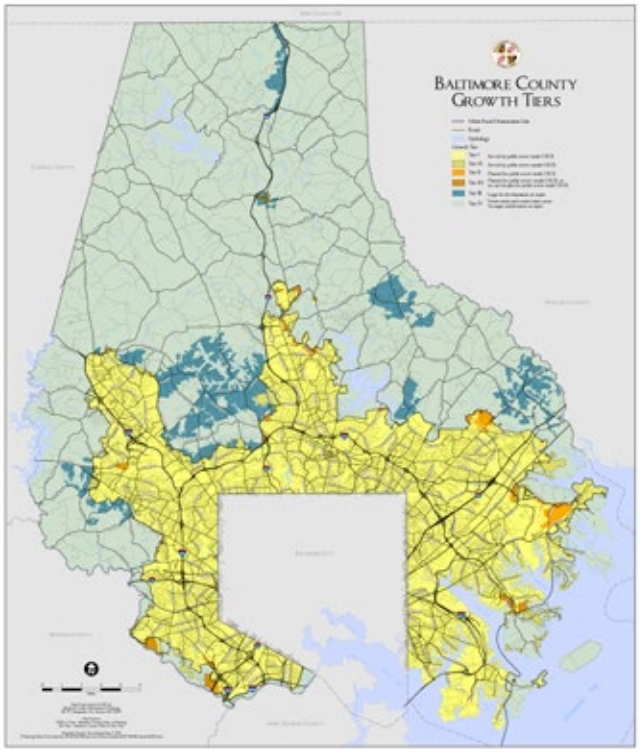

Figure 117. Baltimore County Growth Tiers

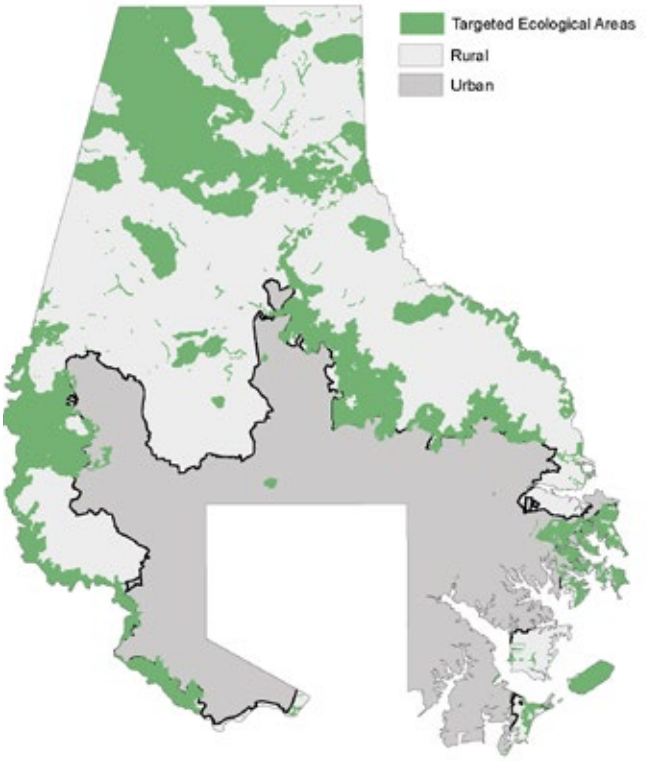

Figure 118. Targeted Ecological Areas

Conservation easements limit the use of property in order to protect the natural resource and agricultural value of the land. These are used in Baltimore County, with easements made to the County, the Federal and State Governments, and Non-Governmental Organizations, which are typically Land Trusts. In Baltimore County, some of the land trusts holding easements are the Manor Conservancy, the Long Green Valley Conservancy, the Gunpowder Valley Conservancy, the Land Preservation Trust, and the Maryland Environmental Trust.

In Baltimore County, there are 1,149 parcels with conservation easements, totaling 67,801 acres.

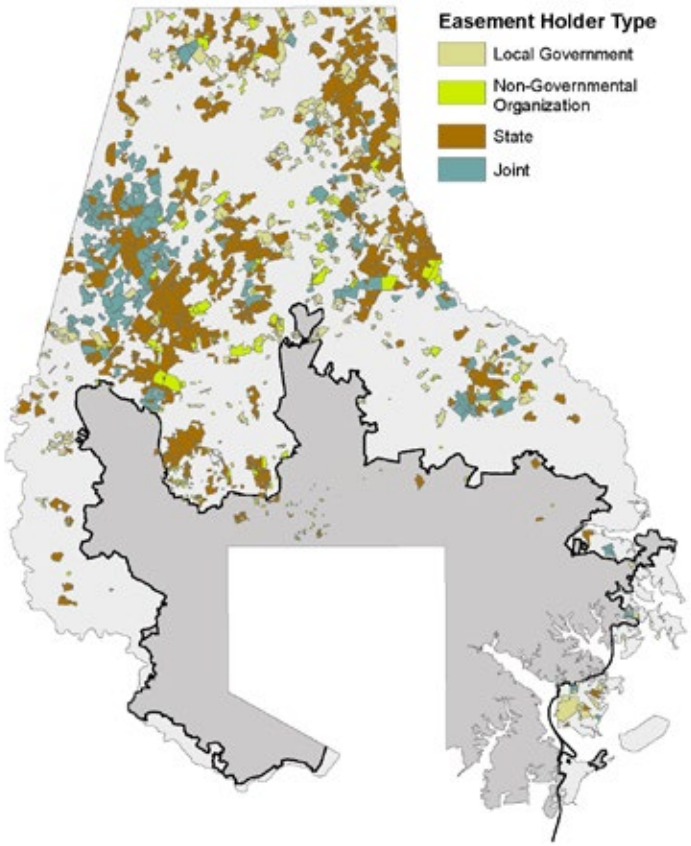

Figure 119. Baltimore County Conservation Easement Holders

Table 10. Easement Holders by Category

Easement Holder Type	Parcel Count	Acres
Local Government	173	10,263
Non-Governmental Organization	274	5,697
State	544	38,330
Joint	158	13,511
Sum	**1,149**	**67,801**

Additional information about protected natural resources lands throughout the Maryland is maintained by the State of Maryland Department of Natural Resources (DNR). GIS datasets can be downloaded from the DNR Geospatial Data Center or the Maryland GIS Data Catalog. The datasets include:

- State protected public lands (DNR owned lands and conservation easements)
- Campgrounds on DNR lands
- General points of interest on DNR lands -includes playgrounds, picnic areas, scenic vistas/views
- Public parking areas at DNR lands, including trailhead parking
- Maintained structures on DNR lands such as restrooms, shelters and pavilions
- Maintained roads on DNR lands
- Public land and water trails
- Public water access locations (boat ramps and canoe/kayak launches)
- Public hunting areas on DNR lands
- Public fishing sites

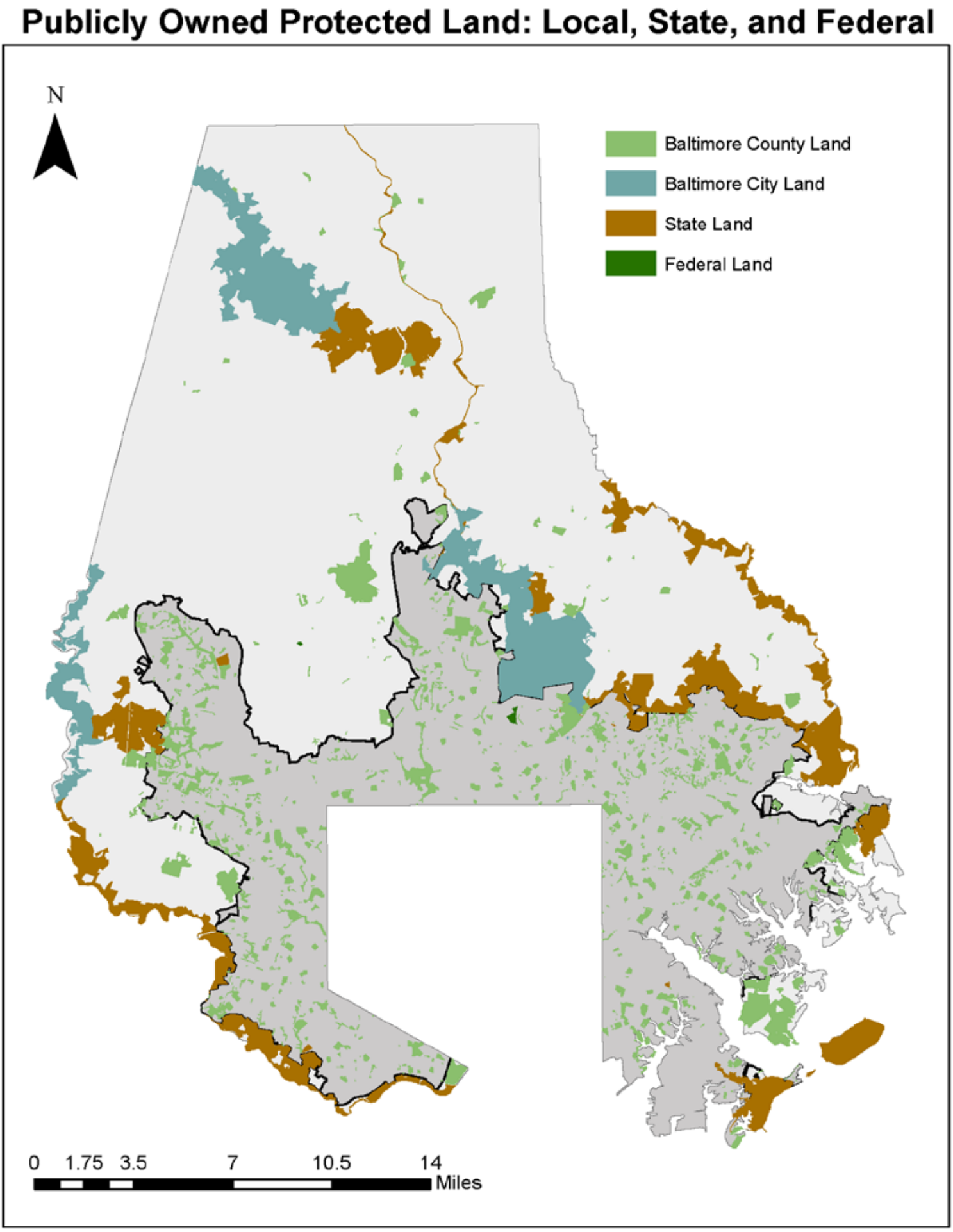

Figure 120. Publicly Owned Protected Land: Local, State, and Federal

8.3 Implementation Programs

Following are descriptions of the majority of the County's natural resource conservation implementation programs, summarized by topic, followed by various program evaluations.

Protection, Restoration, and Management of Tree Canopy and Forest Resources

Roughly 43.4% (169,400 acres) of Baltimore County are within forested areas or under tree canopy. Of the forested land within the County, about 25% is under public ownership. The largest forest blocks are located in the three Baltimore City-owned drinking water reservoir reservations, the Gunpowder Falls and Patapsco State Parks, Soldiers Delight Natural Environment Area, Lake Roland, Oregon Ridge, Dundee Saltpeter Parks, and Back River Neck. The remaining forest acreage is privately owned in smaller forest patches. This is significant from an ecosystem function standpoint because larger forest patches are more resistant to environmental and human-made stresses than smaller forest fragments.

An early historical pattern of clearing forests for agriculture and development, coupled with massive cutting for fuel wood and timber, made significant changes in both the amount of forest area (from 95% to as low as 15% in the region by 1870) and the health and vigor of the remaining forest patches. Although forest regeneration has increased the overall forest cover in the county, forest health and the sustainability of ecosystem functions is threatened by a pattern of parcelization of wooded properties and the subsequent fragmentation of the remaining forest patches by new developments and roads.

Forests provide a range of free ecological services and socio-economic benefits. In forested watersheds, trees play a major role in moisture and nutrient recycling, while the entire forest ecosystem controls flooding and soil erosion. These functions, which protect both aquatic and terrestrial habitats for forest-dependent plants and animals from degradation, also maintain water quality and stream stability. They likewise provide the social benefits of peaceful open spaces in which to walk and observe wildlife, and support the range of forest products available for the needs of the human community.

Forest fragmentation has made conditions favorable for the proliferation of deer and the incursion of exotic, invasive plant species into forest patches. Climate change, specifically changes in temperature and precipitation, is expected to have wide-ranging effects on our forests, impacting tree growth, seedling establishment, and other forest processes that depend on adequate soil moisture. Potential changes to our forest ecosystems from climate change include shifts in the spatial distribution, abundance, and productivity of tree species. In addition, like fragmentation, climate change could increase the severity of forest insect pest, invasive plant species, and wildfires (Butler-Leopold et al., 2018).

EPS recognizes the need to broadly assess the current health and condition of the County's forest patches, to assess the types and degree of stresses on the forests. To that end, EPS continues to work cooperatively with state and federal agencies and environmental organizations.

Program Actions:

1. Continue to implement the local Forest Conservation Act as required by the Maryland Forest Conservation Act of 1991
2. Continue efforts to assess the health of forests and tree canopy within the county
3. Develop and ensure inclusion of reforestation policies in community plans and community conservation efforts
4. Continue to implement tree planting and reforestation projects in support of the County's water quality mandates and tree canopy goals by conducting GIS analysis of planting opportunities throughout the County to increase the County's green infrastructure. The analysis pinpoints specific properties where reforestation can help connect existing green infrastructure and restore and improve water quality and wildlife habitat.

Forest Cover

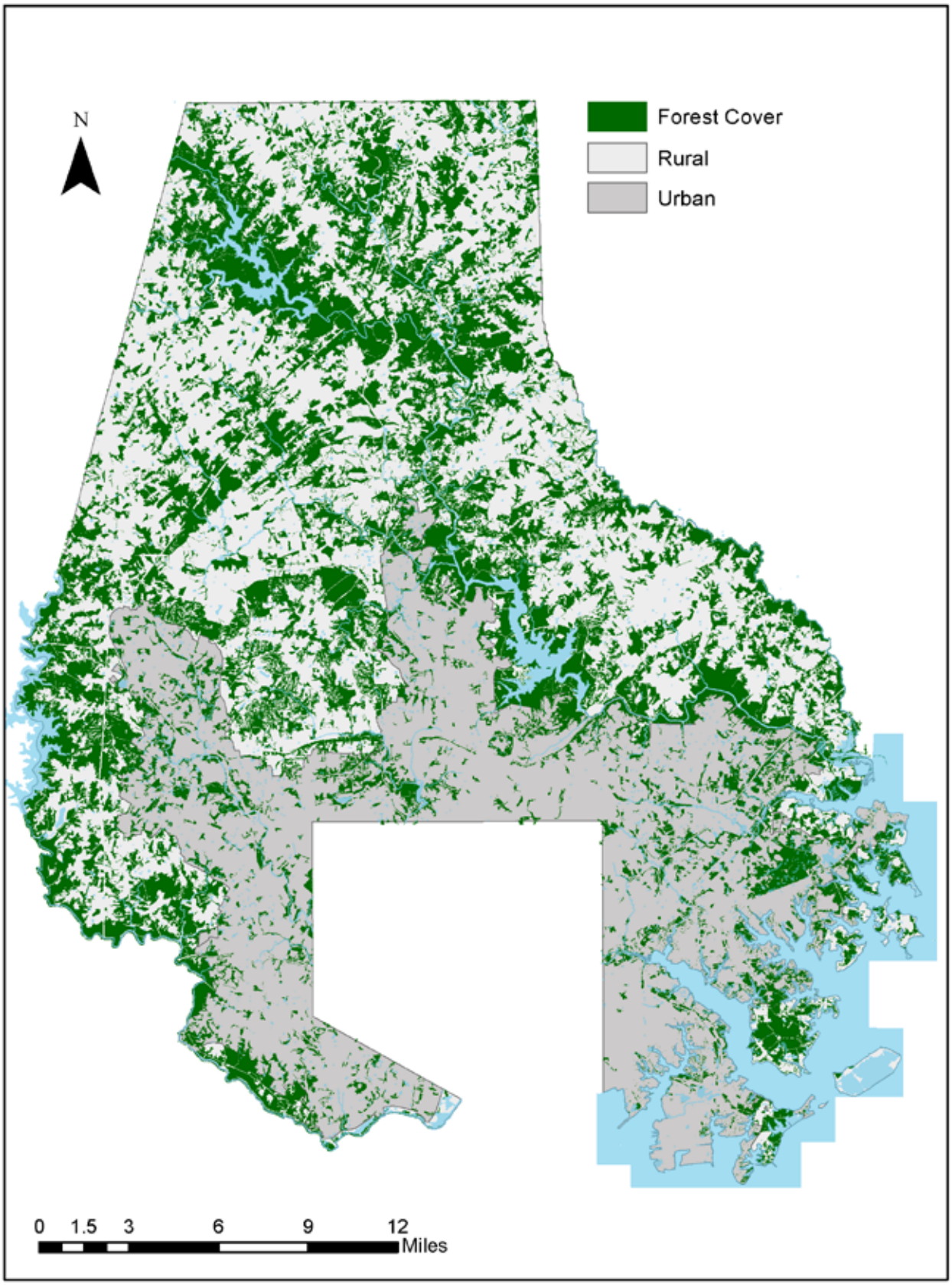

Figure 121. Forest Cover

Protection of Plant and Animal Habitats (Biological Diversity)

Many of the issues related to protecting plant and animal habitats have been discussed as important components of stream and forest preservation. Traditionally, another important habitat issue is the protection of rare, threatened, or endangered plant and animal species. EPS takes a broad view in habitat protection, including not only the safeguarding of rare or significant species, but also ecological processes and functions that sustain habitats for upland, forest, riparian, wetland and aquatic plants and animals. This broader concept includes all ecosystem processes in the conservation of biological diversity.

EPS has worked with the Maryland Department of Natural Resources to verify the presence of the limited number of threatened or endangered species and their habitats that exist in the County. Many of the habitats for these sensitive species are protected through public ownership of wild lands and other environmental management areas such as Soldiers Delight, and through the public drinking water reservoir reservations and large state-owned lands along the Patapsco River and Gunpowder Falls systems. Any threats to sensitive plant or animal species elsewhere from land development are addressed through regulatory protection of the stream systems and priority forest retention areas.

Program Actions:

1. Continue to ensure that significant habitats are identified on development plans and continue to seek cooperation in protecting them through modification of site designs.
2. Seek to increase plant and animal habitat in conjunction with capital improvement projects for shore erosion control, stream restoration, wetland creation, and reforestation.
3. Work in cooperation with governmental and non-profit agencies to assess, protect, restore, and create habitats.

Protection of Forest Buffers

One of the County's most important regulatory programs is the comprehensive stream buffer regulation. Baltimore County's stream buffer requirements date back to the Water Quality Policy of 1986, which required 50-foot stream buffers. More protective buffers were recommended by the County's Water Quality Steering Committee in 1988. In June 1989, an Executive Order was issued that began a pilot for the revised buffer code that was adopted by the County Council in 1991. The County's regulations have been cited by the State of Maryland and the Chesapeake Bay Program as a model for local stream protection. Features of the stream buffer regulations include that they (1) apply to all land development projects; (2) apply to all perennial and intermittent streams (field determined stream limits); (3) have variable widths, including minimum 75' for non-trout waters and 100' for trout streams, or 25' beyond greater extent of 100-year floodplains, non-tidal wetlands, or steep/erodible slopes within 150' of the stream; (4) are surveyed and recorded on Record Plats; and (5) require restrictive covenants designed to prevent disturbance of vegetation.

Protection of Reservoirs

The regional reservoir system, including Prettyboy, Liberty, and Loch Raven Reservoirs, provides a dependable drinking water supply for 1.8 million people served by the municipal water system in the Baltimore metropolitan region. A multi-jurisdictional watershed agreement was signed in 2005. While Baltimore City owns and maintains the reservoirs and drinking water system, Baltimore County has a responsibility for the protection of the reservoir watersheds, two-thirds of which are located in Baltimore County. Baltimore City manages 17,200 acres of land surrounding the reservoirs, but this land comprises only 6% of the reservoir watershed.

Protection of drinking water quality is the primary purpose of these publicly-owned reservations; however, limited active recreational use is also accommodated, including fishing, boating, golf, a shooting range, hiking, and biking. Public concern about impacts of recreational use on water quality have resulted in the formation of public and citizen advisory groups and revised regulations governing recreational use. Careful management of the entire watershed area for the three reservoirs is important for maintaining the water quality of the reservoirs.

Both Baltimore County and the City of Baltimore conduct routine water quality monitoring on the reservoir waters. The City monitors the impoundment and the County monitors its tributaries. The reservoirs continue to be impacted by nutrient over-enrichment. In particular, phosphorus from sewage treatment plants, agriculture, and urban development is contributing to excessive growth of nuisance algae. The monitoring program is under review for improvements. All three reservoirs have Total Maximum Daily Loads (TMDLs) for phosphorus. Loch Raven and Liberty reservoirs have TMDLs for sediment. There are also TMDLs for bacteria in the tributary streams of all three reservoirs.

The County participates in the Reservoir Technical Group of the Baltimore Metropolitan Council to provide technical oversight and tracking for the implementation of water quality programs to control phosphorus and sediment loading to the reservoirs. These activities are part of an adopted Action Strategy, revised in 2019, developed in conjunction with the Reservoir Watershed Management Agreement of 2005. Substantial progress has been made to protect the regional reservoirs, as documented in the Progress Report for 2016-2017. The Agreement also contains several zoning policies to maintain agricultural and conservation zoning and to not increase urban development zoning in the reservoir watersheds. Baltimore County has continued to honor its commitments to the Agreement, especially during the quadrennial Comprehensive Zoning Map Process, wherein zoning changes can be proposed by residents.

Program Actions:

1. Continue to participate with other area jurisdictions in the cooperative regional Reservoir Watershed Management Program, including participation in the Reservoir Technical Group for coordination of program implementation under the adopted Action Strategies and preparation of progress reports.
2. Continue commitments to restrict development in the reservoir watersheds.
3. Continue to implement non-point pollution control, stream restoration projects, and sewerage improvements.
4. Continue to prioritize implementation of projects to establish riparian forest buffers along stream systems in the reservoir watersheds in cooperation with private organizations and other public agencies.

Implementing Agricultural Best Management Practices

It is critical that farmers implement best management practices (BMPs) on the lands they farm, whether owned or leased. Landowners with properties within various conservation easement programs are required to have plans, as are farms within the Critical Areas. Through the use of BMPs they can reduce soil erosion and protect the water quality of the County's streams and groundwater. The County will continue to assist the agricultural industry through the Baltimore County Soil Conservation District in implementing soil conservation and water quality that protect the soil and water resources of the County. The County and Land Trusts will continue to monitor conservation easements to assure that landowners have required plans. The Maryland Department of Agriculture requires and enforces that all farms in the County must have a Nutrient Management Plan, if they meet agriculture income and animal unit thresholds.

Storm Drain Inlet Cleaning

The Department of Public Works and Transportation conducts storm drain inlet cleaning across the urbanized areas of the County. This is accomplished with the use of three large-capacity vacuum trucks. EPS determines the amount of nutrients, sediment, and trash removed through this maintenance. Because road surfaces typically contain the highest concentrations of water pollutants, the program contributes significantly to water quality, which is important to aesthetic and recreation uses of streams.

Street Sweeping

The Department of Public Works and Transportation conducts street sweeping across the urbanized areas of the County. This is accomplished with the use of eight mechanical street sweepers that have been in service since 2000. Beginning in 2022, two regenerative sweepers will be added to the fleet as replacement equipment. This new technology is proven to be more effective at removing the very fine particulate matter. EPS determines the amount of nutrients, sediment, and trash removed through this maintenance. This program contributes to improve water quality by reducing the amount of nutrients such as nitrogen and phosphorus and reduce sediment from entering the storm drain system.

Education and Outreach

EPS has developed several public awareness initiatives for water pollution control and has worked with non-profit organizations, schools, and watershed associations to foster environmental stewardship and involve residents in restoration activities. EPS works with a contractor to develop and target its environmental awareness messaging and measure behavioral change. Further information on education and outreach is available in the County's National Pollutant Discharge Elimination System (NPDES) Annual Report.

Maryland Water Monitoring Council

Serves as a statewide collaborative body for public agencies and private sector organizations to help achieve effective collection, interpretation, and dissemination of environmental data related to issues, policies, and resource management involving physical, chemical, and biological water monitoring.

Chesapeake and Atlantic Coastal Bays Critical Area Program

Land development proposals are reviewed for compliance with the Chesapeake and Atlantic Coastal Bays Critical Area Program. Baltimore County's program was enacted in 1988, following the passage of the Maryland Chesapeake Bay Critical Area Act in 1984 and the publishing of the regulations in 1986. This program encompasses all of the land within 1,000 feet of tidal waters and most of the southeastern peninsulas. Development and redevelopment of properties within these areas must address the amount of lot coverage permitted on the site, the amount of trees and forest on the property, and the controls on storm water runoff. Tidal and nontidal wetlands are required to have naturally vegetated buffers, which filter the sediments and nutrients in runoff. A Modified Buffer Area Program, adopted by the County and updated in 2015 to include non-residential areas, allows the continuation of maintenance activities and limited improvements within the first 100 feet of shoreline, known as the Critical Area Buffer, in mapped Modified Buffer Areas. This has relieved property owners of the burden of obtaining variances from the Critical Area criteria for minor development and redevelopment proposals. A map of the County's Critical Area appears on the following page.

Managing Groundwater

In Baltimore County, favorable geological conditions and plentiful precipitation combine to provide a valuable supply of quality groundwater that is used for agricultural, residential, commercial, and industrial uses. About 10% of the County's population relies on groundwater as the primary source of drinking water. Approximately 36,000 wells are used to withdraw water for this use. In addition, there are currently 9 community well supplies in the County that each serves 25 or more users. The agricultural community also relies heavily on groundwater for domestic, livestock, and irrigation purposes. Industrial and commercial uses depend on groundwater to a more limited extent.

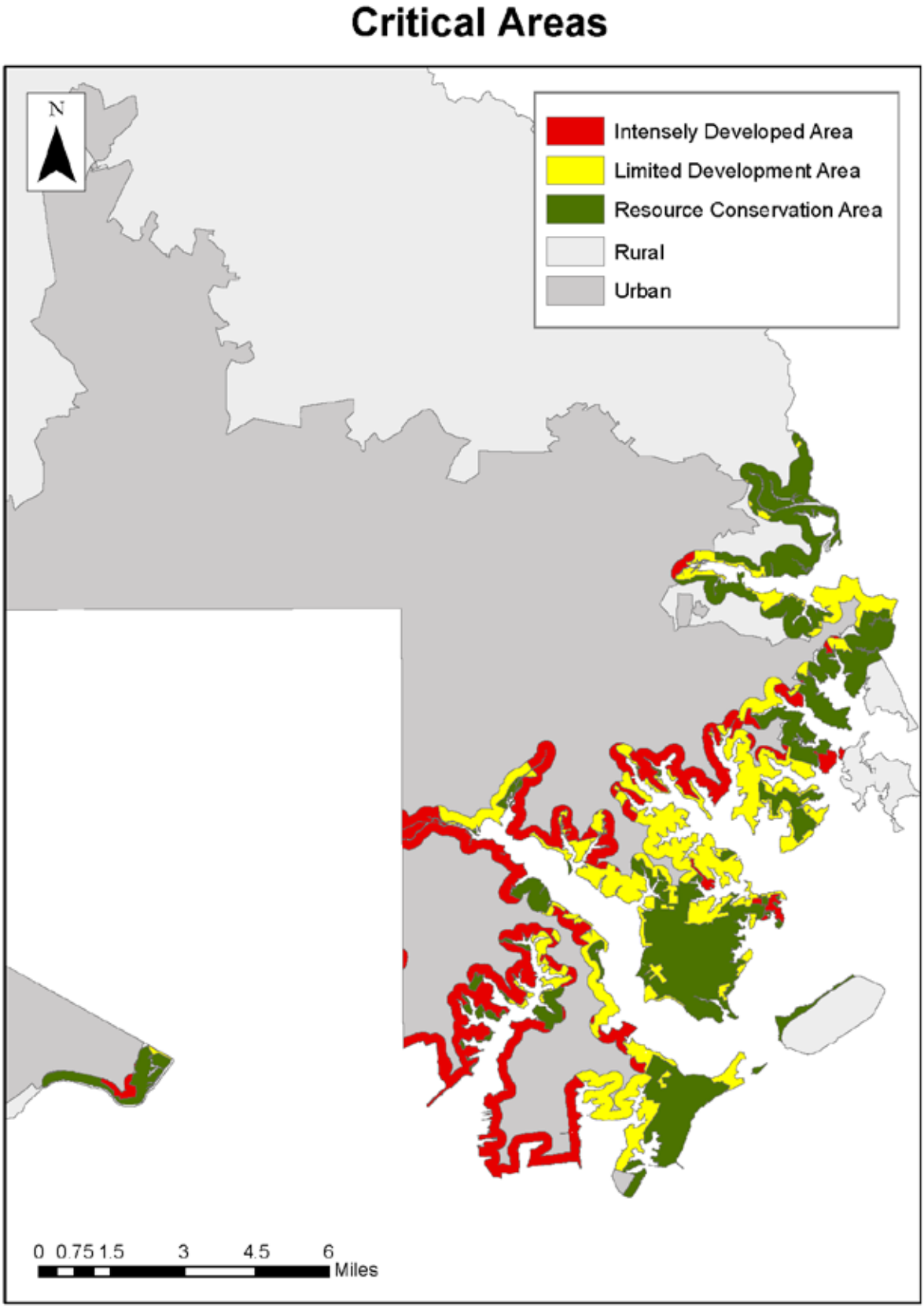

Figure 122. Chesapeake Bay Critical Areas

Demand for groundwater by well users occurs mainly in the northern half of the County in areas beyond the service area of the metropolitan water supply system. In order to protect the public health, it is essential to protect groundwater resources from contamination by petroleum products, septic systems, fertilizers, pesticides, road salts, and industrial wastes. Under state regulations, the County is responsible for review of all well permits for residential, commercial and institutional construction. Standards exist to assure that all proposed drinking water wells provide a sufficient quantity of water and are below thresholds for bacterial and nitrate contamination. Proposed on-site sewage disposal systems are regulated to assure that wastes will be adequately remediated in the soil and that they are located at appropriate distances from wells.

The current standards for drinking water wells and on-site sewage disposal systems are considered to be effective in protecting public health and groundwater resources. Failing septic systems occur primarily in areas that were developed prior to the establishment of these standards. In such cases, the County conducts sanitary surveys; if community health threats are documented in areas that are accessible to the metropolitan district, extension of public water and/or sewerage is provided on a long-term financing basis. In areas that cannot access the water and sewer service area, problems with private water and sewage disposal in small communities are hard to correct. Many rural areas, including the rural commercial centers of Hereford, Kingsville and Jacksonville, have limitations such as marginal soil conditions, small property sizes, area requirements for stormwater management, and zoning issues that impede improvements of sanitary facilities. Other groundwater contamination problems involve specific point sources of contamination, such as petroleum spills from gas stations. Federal regulations have resulted in a program whereby all service stations have replaced older tanks with new tanks that have enhanced protection and containment.

In 1998, Maryland Geological Survey (MGS) completed a comprehensive study of Piedmont groundwater quality in Baltimore County. A follow-up supplemental groundwater quality study was completed by MGS in 2002. These reports indicate that, overall, water quality in Baltimore County is generally of good quality. Although pesticides were detected at 70% of the tested sites, with 75% of the sites containing two or more pesticides, all pesticides were at very low levels and were not considered to present any health concerns. Chloride levels in drinking water wells were found to be elevated above background levels in many wells, with chloride levels commonly exceeding maximum contaminant level in wells that were in close proximity to paved surfaces treated with road salt. Most of the trace elements with known adverse health effects (arsenic, antimony, cadmium, and cyanide) were not detected. Elevated nitrate levels were attributed mostly to agricultural sources such as fertilizers and manure. Elevated levels of naturally occurring radionoclides (primarily radium) above drinking water standards have been detected in approximately 10% of the wells tested in the Baltimore, Setters and Slaughterhouse Gneiss formations. Baltimore County requires that new wells being put into domestic use in these areas be tested for radionuclide.

Program Actions:

1. Continue review of development proposals to assure the proper siting of drinking water wells and the location of on-site sewage disposal systems in accordance with the Code of Maryland Regulations.
2. Continue implementation of the 1993 Ground Water Management and Protection Strategy.

Waterway Improvement Program

Since 1987, Baltimore County has implemented a Waterway Improvement Program (WIP), a multifaceted initiative to protect and enhance surface waters in adherence to the directives of the Clean Water Act. Within the WIP are initiatives dedicated to Watershed Management and Monitoring, Watershed Restoration and Forestry Management. Each of these initiatives provide unique functions that collectively work to protect and enhance the County's waterways and associated landscapes.

This program is supported through the six year Capital Improvement Budget. Further information is available within the County's National Pollutant Discharge Elimination System (NPDES) Annual Report.

Watershed Restoration

The primary function of the Watershed Restoration section is to design and construct projects including: stormwater management facility retrofitting, best management practice implementation, stream restoration, shoreline erosion control, and dredging of navigable waters to protect and ensure resource quality of coastal and stream-side communities, and ultimately the Chesapeake Bay. These efforts are accomplished by reestablishing stream corridors, upland areas and shorelines with techniques that produce results similar to the function of natural ecosystems in order to reduce sediment, attenuate pollutants, and protect against erosive forces.

Surface water quality is a product of the water flowing in stream channels, surrounding land-use practices, and existing plant and animal communities. Surface water quality is affected by both non-point (pollutants carried by runoff, particularly from impervious surfaces) and point (direct discharges) sources. Non-point source pollution is varied and includes anything on the land that can be carried away by runoff: nutrients, sediments, metals, pesticides, oil and grease, salts, and other particulate and dissolved matter. Point-source pollution, such as from wastewater treatment plants, industries, and other sources with a direct, piped discharge, is regulated by the state.

Stormwater Management and Water Quality Improvement Initiatives

Stormwater management regulations are in place to control impacts that development has on the County's landscape and surface water. In recent years, increased attention has been directed to the impact of stormwater management on stream systems. These regulations are updated periodically to reflect the improved understanding of the effects of urbanization on the environment and the need for greater protection from the impacts of development. Created initially to protect downstream areas from flooding as a result of uncontrolled runoff, stormwater management can also erode stream channels when the stored runoff volume is discharged at a specific rate over a period of time. Solutions to this problem include:

- Planned revisions to the state's storm water management regulations to manage the discharge of more frequent storm events and provide better protection to stream channels
- Re-incorporation of the natural flood function into stream restoration projects where access to floodplains for the river are possible and where no downstream areas are susceptible to flooding damage
- Low Impact Development approaches wherein development is designed to increase the travel time and infiltration of runoff and to reduce the amount of impervious surfaces

Baltimore County maintains approximately 1,605 stormwater management facilities, many of which were constructed prior to current stormwater management regulations. Watershed Restoration section staff combat the pressures of urbanization on the County's waterways by identifying, designing and implementing retrofit projects that improve water quality within existing stormwater management facilities and at the end-of-pipe of storm drain infrastructure. These initiatives include converting dry ponds to extended detention facilities, creating baffling within stormwater management facilities, incorporating vegetation, and installing Best Management Practices. These practices attenuate pollution and improve water quality by:

- Increasing retention time and allowing more contaminants and sediment to settle out of the water column
- Mitigating nutrients by vegetative uptake,
- Regulating flows to downstream receiving waters which reduces volume and velocity that degrade natural stream channels

To date, EPS has completed 43 stormwater management retrofit facilities (installed ponds were previously none existed) and converted another 146 stormwater management facilities to improve ecological function.

Streams and Non-Tidal Wetlands

Natural streams are being degraded by land use changes in their surrounding watersheds. Baltimore County has more than 2,100 miles of non-tidal streams and rivers, including more than 1,000 miles of streams that flow into three reservoirs that supply the Baltimore Metropolitan area with drinking water. Additionally, the County has rivers and streams such as the Gunpowder Falls and its tributaries that are recognized as among the highest quality recreational fishery resources in the eastern United States. These streams and waterways are being degraded by increasing impervious surface due to urbanization, decreases in vegetation, channelization, building of infrastructure within the stream valley, floodplain encroachment, draining and filling of wetlands, removal of riparian vegetation, and development and agricultural practices such as regrading landscapes and forest clearing.

Over the past 30 years, Watershed Restoration section staff have developed expertise in the restoration of degrading stream channels. While generally unable to return a stream to its historical, unaltered condition, Watershed Restoration section implements projects that stabilize the system and improve ecological functionality and water quality within the riparian corridor. This is accomplished by evaluating the existing conditions within the drainage area, and developing a design plan that conveys a range of channel flows while reducing erosive forces and maintaining aquatic habitat. Strategically placed structures made of natural materials and native vegetation may be utilized to stabilize streambed and streambanks, and protect infrastructure. Reconstruction of channels employing the concept of natural channel stability and/or floodplain reconnection is a cost-effective and sustainable way to achieve physical stability, ecological function, and improved habitat to degraded riparian corridors. The County has completed 80 projects to date with an additional 16 projects currently under design.

A stream system consists of a stream and its associated floodplain, wetlands, and springs. Streamside non-tidal wetlands and riparian areas are essential to the maintenance of stream flow, the removal of pollutants, and the quality of aquatic and terrestrial habitat. Riparian vegetation plays an essential role in the natural functioning of a stream system, including maintaining base flow, regulating water temperature, attenuating pollution, and providing habitat. Other recreational uses of stream and wetland systems include nature activities such as camping, hiking, bird-watching, and photography. Not only does the County need to protect the good-quality streams, it is imperative that degraded systems are restored to an ecologically-functional resource.

Figure 123. Scotts Level Branch, before and after one of the County's stream restoration projects

Tidal Areas

The County's waterfront includes several large tributaries to the Chesapeake Bay, including the Patapsco River, Back River, Middle River, Gunpowder River, and Bird River. The County's waterfront includes 26 County-owned and two State-owned waterfront parks. Some of the County's oldest communities are located along the shoreline; historical patterns of development resulted in the shoreline being divided into multiple, small acreage lots. Most of the County's Chesapeake Bay shoreline is privately owned. This limits bay access to individual lot owners and impacts the shoreline with a non-cohesive assortment of piers, bulkheads, and other structures. The desire for access to the Bay is continuing and has increased development pressures along the shoreline.

Baltimore County implements shore erosion control projects, which stabilize eroding shoreline with vegetated marshes and/or structural protection measures to attenuate erosive wave energy. With the use of natural vegetation for stabilization, the County is demonstrating to citizens an alternative shoreline protection measure from the typical "hard" practices such as rock armoring or wood bulkheads. This technique requires minimal maintenance and performs better as time progresses and vegetation multiples, therefore it tends to provide a long-term, ecologically functional solution. The County has completed 31 shore erosion control projects to date, including many located in waterfront parks. An additional six projects are in planning and design stages.

Recreational boating contributes over $200 million a year to the County's economy. The County recognizes the importance of boating and is committed to providing a safe and clean environment. One component is a dredging program for the maintenance of existing boat channels in creeks and boat access "spurs" from these channels to individual waterfront properties. Baltimore County encourages the use of group piers as an alternative to private piers. A single point of access to the water can serve multiple households, thereby minimizing disruption of the shoreline.

Dredging permits require that the County implement controls to help prevent future runoff of sediment and nutrients to the dredged channels. Because submerged aquatic vegetation (SAV) is considered a key indicator of the general health of a waterway, Baltimore County collects SAV data for all creeks that have been dredged. SAV growth has rebounded in many of the County's waterways; the County has been documenting and mapping these trends since 1989. This data provides necessary information to satisfy State and Federal permit requirements and to better understand SAV growth and limiting factors.

Climate Resilience

Maryland DNR describes resilience as "the ability to adapt to changing conditions and withstand— and rapidly recover from— disruption due to emergencies. This ability to overcome is a concept that applies to individuals, to communities large and small, to our infrastructure, and to the environment." Much attention is being given to climate resilience, which pertains to preparing for and addressing potentially damaging situations and scenarios brought about by general climatological changes and natural disasters. A particular segment of climate resilience is coastal resilience, which is of special significance to jurisdictions such as Baltimore County that have extensive shorelines and coastal areas. Hurricanes, tropical storms, nor'easters, and storm surges experienced over the past fifty years have provided reminders of the vulnerability of low-lying coastal areas along the County's shorelines.

There are myriad complexities associated with climate resilience, and a multi-tier approach is required to protect lives, livelihoods, and both public and private property. Regulatory mechanisms, such as those associated with the Chesapeake Bay Critical Area, restrictive zoning, growth tiers, forest and wetland buffers, stormwater management, forest conservation, and flood zone construction requirements, help to ensure that the built environment is constructed/developed in a manner that makes it less vulnerable to natural disasters. Additionally, numerous County capital programs associated with infrastructure have been created to enhance climate and coastal resilience, including stream and shoreline restoration, storm drain, stormwater management and general drainage, sanitary retrofit, and reforestation/afforestation programs. Preservation efforts within the County's Coastal Rural Legacy Area have protected vast areas of natural resources and the forest ecosystems that play an invaluable role in water filtration and drainage. Finally, Baltimore County has crafted an updated Hazards Mitigation Plan and Emergency Operations Plan in order to most effectively respond to various types of adverse situations including natural disasters.

8.4 Evaluation of Implementation Programs

Following is a general evaluation of the various implementation programs.

Evaluation of Forest Resources

The County prepares annual reports to the State Department of Natural Resources that evaluates the implementation of the Forest Conservation Regulations. Results of the most recently available report for Fiscal Year 2020 indicated that development projects encompassed 165.9 acres of forest, 25% of the forest was retained and protected in Forest Conservation Easements. In cases where forest was not retained, no afforestation was required and 0.6 acres of mitigation banking were required. On 23 developments, fees-in-lieu were required totaling $286,691.21. Fees-in-lieu are used to plant and maintain mitigation reforestations throughout the County, typically on public land. This information was examined and evaluated through the County's Forest Conservation Annual Report submitted to DNR.

Evaluation of Watershed Management Strategy

Baltimore County shall continue the systematic assessment of land use and water quality within all of its watersheds. As part of this process, the County shall prioritize restoration projects, such as stream restorations and stormwater management facility upgrades, in watersheds having water quality impairments and opportunities for measurable water quality improvement exist. Nutrient, sediment and other pollutant removals resulting from projects are tracked and credited toward current requirements. The details of this program are contained in the NPDES-MS4 Annual Report.

Evaluation of Education and Outreach

Baltimore County has developed environmental outreach messaging for water quality, especially targeting human-behavior pollutants such as litter and pet waste. Effectiveness of outreach efforts on pollutant reduction remains challenging to quantify. The programs are being evaluated using water quality monitoring data, as available/appropriate, and limited surveys of residents. EPS is exploring other options for measuring effectiveness and is pursuing a contract to assist.

Evaluation of Stormwater Protection Strategies

Baltimore County operates a comprehensive stormwater management program. EPS has always taken a firm stand on requiring water quality treatment even when quantity management was not required. With the implementation of the new stormwater regulations EPS continues to require all projects to explore and implement methods for water quality treatment. It is more fully described and evaluated in the NPDES Municipal Stormwater Discharge Permit Annual Report.

Evaluation of Other Regulatory/ Management Strategies

Protection of Forest Buffers: The County has three people dedicated to investigate citizen complaints, complete inspections, and monitor Forest Buffers. The staff has created a tracking database in order to better protect the protected resources. While it is clear that this program is highly successful in keeping development out of the most critical areas adjacent to waterways, additional staff and better tracking and monitoring of these buffers will provide data to better evaluate the program.

Protecting the Reservoirs: The U.S. Environmental Protection Agency presented the 2005 Source Water Protection award to Baltimore County. The award was for consistently demonstrating commitment to leadership and innovation in drinking water protection. The county's aggressive land preservation programs, restrictive zoning, educational outreach, and water quality monitoring and enforcement programs were all elements in receiving this distinction.

Implementing Agricultural Best Management Practices: The Baltimore County Soil Conservation District in cooperation with Baltimore County is evaluating the effectiveness of its programs in providing conservation planning to the landowners in the County.

This effort is ongoing. Preliminary results have indicated a significant backlog in the development and updating of conservation plans, trend for more non-commodity farm operations (small equine operations) with special needs. With respect to the evaluation of the implementation of nutrient management plans, University of Maryland Extension, private consultants and farm operators primarily develop the plans. This effort is supported by one field person and training assistance from the University of Maryland Cooperative Extension, Baltimore County. Deadlines have been set for either having a plan or having a letter of intent.

Chesapeake and Atlantic Coastal Bays Critical Area Program: The County prepares semi-annual reports to the Critical Area Commission for the Chesapeake and Atlantic Coastal Bays on the evaluation of the Critical Area regulations. These reports are available at EPS.

Storm Drain Inlet Cleaning: See NPDES - Municipal Stormwater Discharge Permit, Annual Report.

Stormwater Management Facilities: See NPDES - Municipal Stormwater Discharge Permit, Annual Report.

Illicit Discharge, Detection and Elimination: See NPDES - Municipal Stormwater Discharge Permit, Annual Report.

8.5 Natural Resource Conservation Goals

The State of Maryland's natural resource conservation goals are:

- Identify, protect and restore lands and waterways in Maryland that support important aquatic and terrestrial natural resources and ecological functions, through combined use of the following techniques:
  - Public land acquisition and stewardship;
  - Private land conservation easements and stewardship practices through purchased or donated easement programs;
  - Local land use management plans and procedures that conserve natural resources and environmentally sensitive areas and minimize impacts to resource lands when development occurs;
  - Incentives for resource-based economies that increase the retention of forests, wetlands or agricultural lands;
  - Avoidance of impacts on natural resources by publicly funded infrastructure development projects; and
  - Appropriate mitigation response, commensurate with the value of the affected resource.
- Focus conservation and restoration activities on priority areas, according to a strategic framework such as the Targeted Ecological Areas (TEAs) in GreenPrint (which is not to be confused with the former easement program also called GreenPrint).
- Conserve and restore species of concern and important habitat types that may fall outside of designated green infrastructure (examples include: rock outcrops, karst systems, caves, shale barren communities, grasslands, shoreline beach and dune systems, mud flats, non-forested islands, etc.)
- Develop a more comprehensive inventory of natural resource lands and environmentally sensitive areas to assist state and local implementation programs.
- Establish measurable objectives for natural resource conservation and an integrated state/local strategy to achieve them through state and local implementation programs.
- Assess the combined ability of state and local programs to achieve the following:
  - Expand and connect forests, farmland and other natural lands as a network of contiguous green infrastructure;
  - Protect critical terrestrial and aquatic habitats, biological communities and populations;
  - Manage watersheds in ways that protect, conserve and restore stream corridors, riparian forest buffers, wetlands, floodplains and aquifer recharge areas and their associated hydrologic and water quality functions;
  - Adopt coordinated land and watershed management strategies that recognize the critical links between growth management and aquatic biodiversity and fisheries production; and
  - Support a productive forestland base and forest resource industry, emphasizing the economic viability of privately owned forestland.

The County's Master Plan 2020 established the following more generalized environmental goals for Baltimore County:

- Protect the County's remaining natural resources and promote the conservation of biological diversity,
- Restore lost or degraded ecosystem functions, particularly those related to watersheds and reservoirs,
- Foster environmental stewardship among county residents, and within the region.

These policies are implemented through programs of multiple County agencies, including the Department of Environmental Protection and Sustainability (EPS), Department of Public Works and Transportation (DPWT), and Department of Recreation and Parks (DRP).

8.6 Progress Toward Goals

Baltimore County has natural resource conservation goals that complement the State of Maryland's goals by protecting waterways, forests, habitats, and species of concern. For example, Baltimore County's goal, below, to restrict development in reservoir watersheds, directly contributes to the State goal of using land use management plans and procedures to conserve natural resources and environmentally sensitive areas. Protected land within Baltimore County contributes to a statewide network that improves ecological and public health. Following are updates on the progress that has been achieved in the various areas of natural resource conservation. In some instances the goals have been revised to better reflect current policies and practices.

Protecting Plant and Animal Habitats

GOAL: Cooperate with nonprofits and agencies to assess, protect, restore, and create habitats.
PROGRESS: Since adoption of its Policy and Guidelines for Community Tree Planting Projects in fall, 2012, the Forest Management section of EPS worked with citizen organizations to review and approve dozens of proposals for planting trees on County-owned land. The Guidelines help assure that projects are well designed and maintained to assure long-term survival and to provide meaningful ecosystem and community benefits.

GOAL: Identify significant habitats on development plans and protect through modification of site designs.
PROGRESS: This is an ongoing task. The Environmental Impact Review Section continues to evaluate development plans and require modifications, where necessary, to protect significant plant and wildlife habitats.

Managing Baltimore County's Watersheds

GOAL: Participate in the cooperative regional Reservoir Watershed Management Program that coordinates implementation of the adopted Action Strategies and preparation of progress reports.
PROGRESS: The Department of Environmental Protection and Sustainability continued to participate in the regional reservoir protection program. A new Action Strategy was approved in 2019 to update water quality efforts being continued and new actions to be taken.

GOAL: Continue commitments to restrict development in the reservoir watersheds.
PROGRESS: County agencies generally support zoning that provides the greatest opportunity for limiting or reducing pollutant loadings to local waterways during the Comprehensive Zoning Map Process (CZMP).

GOAL: Continue to implement non-point pollution control, restoration projects, and sewerage improvements.
PROGRESS: The County continues to implement urban non-point controls and restoration projects as reported in the NPDES - MS4 Annual Report in Section 10. Agricultural non-point source controls are reported through the State Department of Agriculture. Baltimore County continues to comply with the Sanitary Sewer System Consent Decree.

GOAL: Develop Implementation Plans for Total Maximum Daily Loads (TMDLs) and track progress, ensuring recreational opportunities protected by the US Clean Water Act (fishable and swimmable) are available in Baltimore County.
PROGRESS: Baltimore County develops implementation plans for all new TMDLs within one year of issuance. They provide the road map for meeting TMDL reduction requirements, protecting Tier II waters (high quality), and meeting local water quality goals. Implementation Plans are updated periodically to reflect modifications to the Chesapeake Bay Model and implementation progress. Progress is reported in the NPDES - MS4 Annual Report in Section 10.

GOAL: Track pollution reduction for all pollution types, including nutrients, sediment, toxics, litter and bacteria, to measure progress on fishable and swimmable water quality protection and restoration.
PROGRESS: The County has developed pollution reduction-tracking processes for each of the pollution reduction types. These are detailed in the annual NPDES - MS4 report in Section 9.

GOAL: Monitor and control upland sources of sediment and other water pollutants carried to waterways as storm water runoff.
PROGRESS: Baltimore County maintains a water quality monitoring program to meet compliance with NPDES - MS4 Permit requirements. Stormwater control and restoration practices are tracked. For Monitoring see Section 10, for SWM practices see Section 3 and for restoration Section 9 of the NPDES - MS4 Annual Report. In addition, compliance is maintained on County industrial sites under Maryland's General Permit for Discharges of Stormwater Associated with Industrial Activity; sites include highway shops and school bus lots among others. See Section 7 of the NPDES – MS4 Annual Report.

GOAL: Expand public education and outreach to protect and improve water quality.
PROGRESS: Baltimore County has been developing targeted environmental messaging to various audiences. Pilot programs for anti-litter and proper pet waste disposal are yielding results and setting the stage for broader implementation.

GOAL: Continue to work with Baltimore County community organizations to promote watershed awareness and environmental stewardship.
PROGRESS: Baltimore County EPS provides financial and technical assistance to community organizations through its Watershed Association Restoration, Planning and Implementation Grant program. Grantees provide hands-on educational opportunities to residents, such as tree plantings, rain barrel workshops, and stream cleanups.

Waterway Improvement and Stream Restoration

GOAL: Continue to use watershed based approach to restore degraded stream systems to improve morphology, ecological function, water quality and aquatic habitat.
PROGRESS: 80 stream restoration projects have been completed to date.

GOAL: Continue efforts to protect shorelines from erosion, improve the water quality and improve habitat value of tidal wetlands.
PROGRESS: 31 shoreline stabilization and enhancement projects have been completed to date.

GOAL: Implement BMPs in the County's watersheds to meet local and Chesapeake Bay TMDLs.
PROGRESS: 29 BMPs have been planned to date.

GOAL: Initiate condition surveys to monitor the County's navigation channels and apply for dredging grants accordingly.
PROGRESS: 30 waterways have been dredged to date.

GOAL: Continue to monitor submerged aquatic vegetation.
PROGRESS: 33 waterways are surveyed biannually.

GOAL: Implement stormwater management pond conversions, retrofits and repairs to meet local and Chesapeake Bay TMDLs.
PROGRESS: 146 stormwater management ponds have been converted to date.

GOAL: Continue marsh monitoring/maintenance and examine potential tidal marsh restoration/creation projects.
PROGRESS: 3 tidal marshes are monitored and maintained.

GOAL: Explore beneficial uses of dredge spoil disposal including shoreline stabilization projects and tidal marsh creation.
PROGRESS: This effort is ongoing.

GOAL: Improve implementation procedures of the Chesapeake and Atlantic Coastal Bays Program while maintaining the high level of water quality and habitat standards.
PROGRESS: This effort is ongoing.

GOAL: Survey the tidal creeks and rivers of the County and remove hazards to navigation and waterway debris from the shorelines and shallow waters from May to October.
PROGRESS: This effort is ongoing, with removal of hazards and debris when reported or following surveys of the waterways.

Managing Groundwater

GOAL: Continue review of development proposals to assure the proper siting of drinking water wells and the location of on-site sewage disposal systems.
PROGRESS: Ongoing as part of the County's development review process.

GOAL: Continue implementation of the 1993 Ground Water Management and Protection Strategy.
PROGRESS: This effort is ongoing.

GOAL: Administering the Bay Restoration Fund grant program to upgrade septic systems to Best Available Technology (BAT) and connecting existing houses on septic to sewer when feasible.
PROGRESS: As of November 2021, over 570 septic systems have been equipped or upgraded with BATs and over 165 public sewer connections have been made for buildings previously on septic systems.

8.7 Natural Resources Recommendations

Following are recommended steps for improving the County's natural resource conservation program.

Green Infrastructure

- Improve the differentiation between the procedures for the protection of environmental greenways versus recreational greenways.
- Review the State Green Infrastructure Plan and identify any deficiencies in the ability of programs and program funding to provide the level of protection sought.
- Determine a system of evaluation for the progress of the program. Consider use of techniques used for evaluating the success of the Agricultural Preservation Program.
- Integration of the data from different programs that protect green infrastructure.
- Assist in efforts to identify green infrastructure priorities through the Greater Baltimore Wilderness Coalition, a voluntary alliance of public agencies, non-governmental organizations, professional associations, and conservation coalitions that supports the vision of expanding a connected and protected green infrastructure network in populous central Maryland from the Chesapeake Bay to the Piedmont.

Forest Resources

- Evaluate and update forested acreage within Baltimore County and determine the vulnerability of existing forest resources to conversion (non-forest cover).
- Continue to track the change in tree canopy cover to determine implication for the County's tree canopy goals and regulatory program for Chesapeake Bay restoration. The last mapping for tree canopy was done in 2016.
- Strengthen the protection of high-function forest cover through existing conservation easement programs.
- Continue existing and innovative programs to increase forested areas and tree canopy through reforestation on public and private lands.
- Continue development of cooperative watershed stewardship models for reforestation and forest health management.

Watershed Management

- Using Adaptive Management, review SWAPs and TMDL Implementation Plans as needed to incorporate new science and new regulation, and determine the effectiveness of the actions.
- Expand watershed awareness and outreach messaging throughout the County, especially anti-litter and proper pet waste disposal.
- Implement PCB source tracking program to protect recreational fisheries.
- Implement bacteria source tracking program to protect water recreation in streams and rivers.

Other Regulatory/Management Programs

Protecting the Reservoirs:

- Ensure adequate funding for land preservation programs

Implementing Agricultural Best Management Practices: Improvements needed for the best management practices are:

- Increase effort in developing and updating conservation plans to ensure effectiveness of the program,
- Assure standards and specifications are identified and details provided for Agricultural Exemptions granted by the District,
- Modify the program so that it can fulfill the needs of all agricultural land owners,
- Increase the support in the program so that it can be used to aid with the protection of the County's agricultural resources.

Education and Outreach Programs

- Measure the effectiveness of environmental education and outreach efforts in changing behavior and reducing pollution,
- Expand outreach efforts throughout the County.