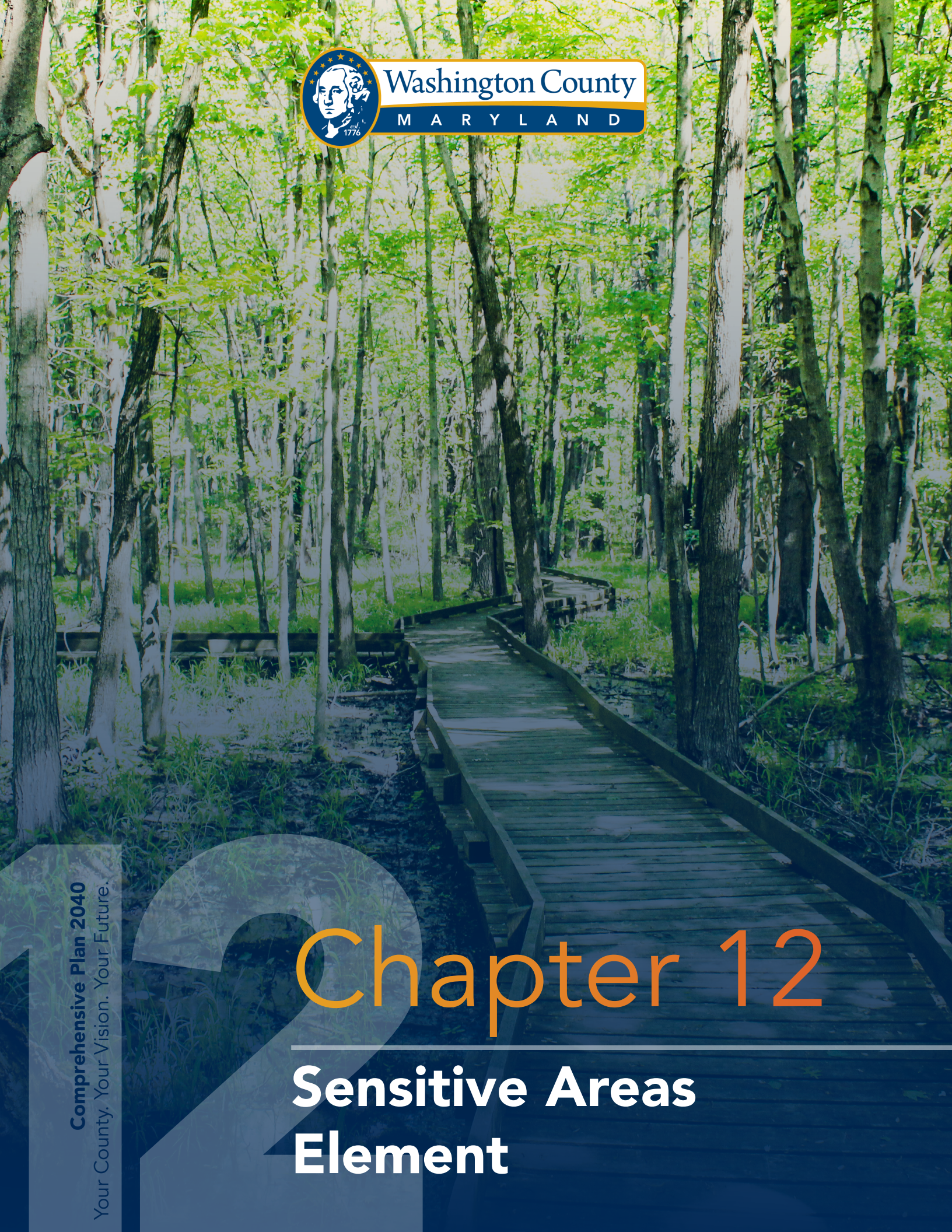

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MARYLAND

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Chapter 12

Sensitive Areas Element

SENSITIVE Areas

Introduction

Sensitive Areas are environmental resources which provide integral ecological functions that are necessary for the sustainable coexistence of human and natural communities. The primary objective of the Sensitive Areas element is "to integrate environmental protection into comprehensively planned growth and economic development in Plan-designated growth areas."[1]

Maryland's Economic Growth, Resource Protection and Planning Act of 1992 required local governments to adopt a Sensitive Areas element within the framework of their Comprehensive Plans. The 1992 Planning Act named four (4) overarching categories of Sensitive Areas to be considered for protection as a part of comprehensive planning: streams and their buffers, 100-year floodplains, habitats of threatened and endangered species, and steep slopes. County Subdivision and Zoning Ordinance amendments were adopted in 1996 to implement sensitive area protection for these four (4) natural resource types.

To provide further guidance to local governments in protecting sensitive environmental resources, twenty (20) additional Sensitive Areas were specified for consideration in the Maryland Department of Planning's Models and Guidelines #18: Sensitive Areas, Volume II publication associated with the 1992 legislation. These additional categories expanded the range of environmental resources found throughout Maryland's varied landscapes that could be considered for protection by local jurisdictions.

Accordingly, this chapter principally covers the four (4) main Sensitive Area resource types. Within these four (4) overarching categories, related sub-resource types such as forest buffers, wetlands, hydrogeomorphic features, wildlife corridors and greenways are also discussed. Some of the additional Sensitive Area types which directly affect County water resources, such as groundwater and wellhead protection areas, are discussed in passing in this chapter, but are given greater attention in the Water Resources Element of the Comprehensive Plan.

By broadly defining a range of Sensitive Areas to be examined in local long-range plans, opportunities are created to establish overlapping policies, land use controls and regulations at various levels of government that serve to ensure their long-term protection. The key for local jurisdictions is to find a balance between planned growth and the protection of sensitive environmental resources in order to achieve a sustainable form of development over time.

1 Maryland Office of Planning and Maryland Department of Natural Resources. Managing Maryland's Growth: Models and Guidelines Volume 1. (Baltimore: Maryland Office of Planning), 1993, p.1.

Streams and their Buffers

Streams serve many purposes in Washington County. Aside from their essential function as habitat for aquatic and riparian communities, County residents rely on their waters for many vital functions of daily life including recreational pursuits, usage as drinking water and to serve the operational needs of farms, businesses and industry. The protection of streams in Washington County is particularly important, as they are tributaries of the Potomac River, which is the primary source of water for the majority of County residents, particularly those living in urban areas.

Forest Buffer - Source: Chesapeake Bay

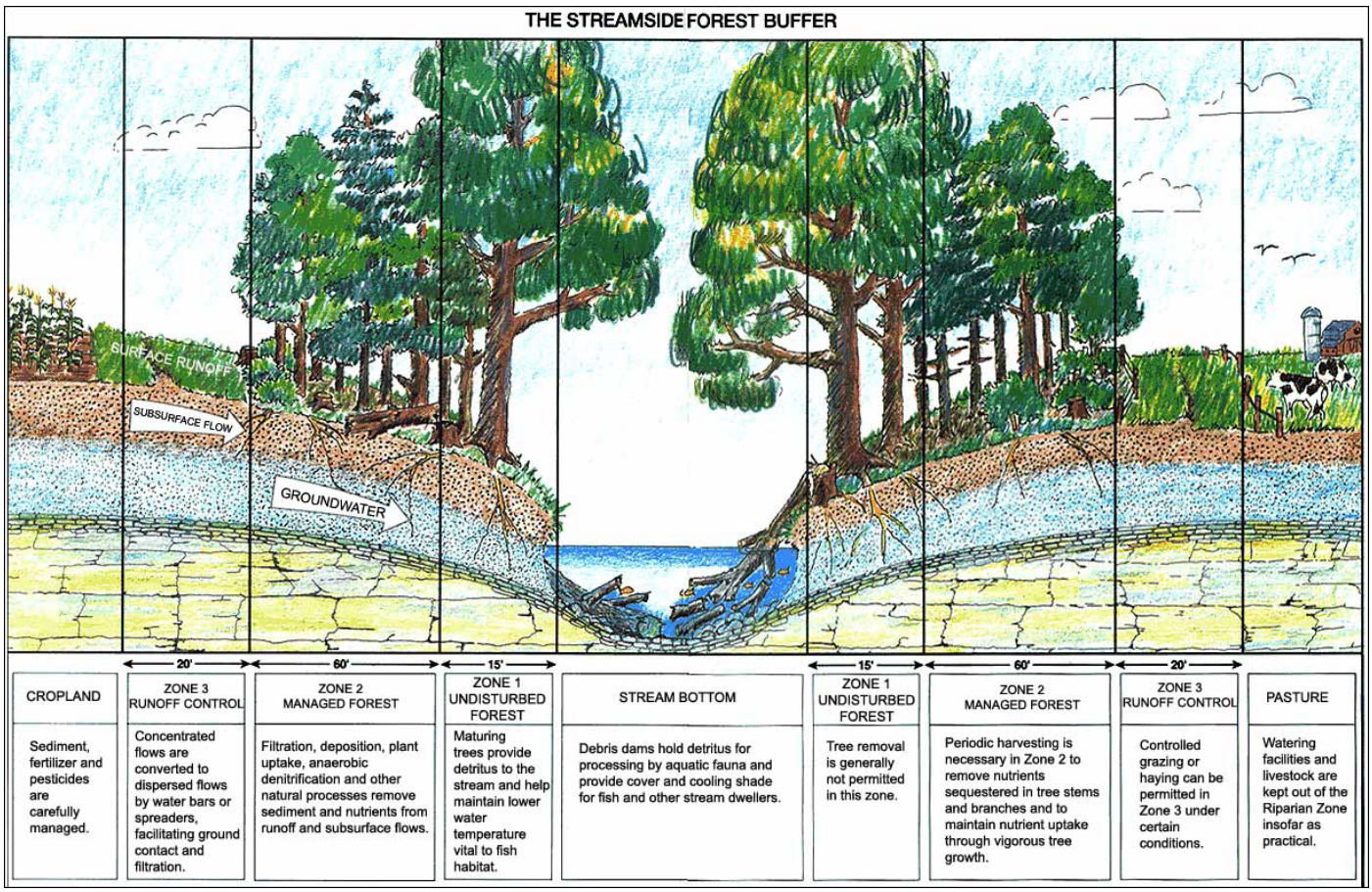
We tend to think of streams within the confines of the channel itself, but stream health is strongly influenced by land use activities at a much wider scale. At the macro scale, overall land use patterns throughout the entire watershed have significant effects on the integrity of the waterway due to the myriad impacts of development on water quality and quantity. Individual watersheds are, of course, part of much larger drainage basins that encompass thousands of miles of land area, crossing State lines and making evident the effects of differing land use regulations on water resources. Maryland's position at the mouth of the Chesapeake Bay further magnifies the importance of efforts to protect stream health because it receives the downstream impacts from six (6) different states that jointly encompass the approximately 64,000 square mile Chesapeake Bay Watershed.

At the same time, while stream health does depend heavily on macro scale watershed health, a large measure of protection for surface waters can be provided simply by ensuring the integrity of the stream's adjoining natural areas – particularly floodplains, wetlands, steep slopes and riparian forests. These combined elements comprise the streamside buffer that, ideally, should be protected or restored to minimize stream damage. Each potential element within the stream buffer offers complementary and sometimes overlapping roles in achieving this protection, including:

- **Floodplains** where most stream wetlands are located and where energy dissipation, natural filtration, and floodwater storage occur.
- **Stream banks and adjoining steep slopes** that help to prevent erosion from clogging the streambed when intact and provide habitat for plants and animals.
- **Streamside forests,** which provide habitat, stabilize banks, provide shading, control temperatures, filter pollutants and produce leaf-litter, which supports a variety of aquatic organisms.

The width of an effective buffer is a complex calculation that is based on factors such as soil types, degree of slope, vegetation type and the presence of floodplains, wetlands or stormwater management (SWM) facilities. Ideally, not only should floodplains, wetlands, riparian forests, and upland steep slopes be included within the buffer, but land managers should also consider what uses should be permitted within the buffer. Some land uses, such as passive recreation or open space uses, cause little or no ground disturbance and can be permitted without additional controls. Other land uses, such as active recreational areas (e.g. - campgrounds), can be acceptable with mitigation. Still other activities, like intensive agricultural operations, are inappropriate under any circumstances within the buffer zone. The figure below shows a sample stream buffer cross section, with corresponding ecological functions and appropriate land use practices assigned to 3 specific vegetative zones within the buffer area bordering the stream.

Figure 12-1: Riparian Forest Buffer



Source: USDA Forest Service

Stream Health

The amount of impervious surface cover in a watershed plays a large role in determining overall aquatic system health because of the cascading effects on water quality and hydrology that result from changes to the headwaters drainage basin. High amounts of impervious surface in watersheds have been shown to alter stream flows, degrade physical habitat, increase stream temperatures, speed up erosional processes, produce higher magnitude floods and result in waterways carrying higher pollutant and nutrient loads due to increased runoff and reduced ground infiltration of precipitation. As noted in the Water Resources Element, impairment of surface waters is likely to occur when greater than ten (10) percent of the total watershed acreage has been covered in impervious surface. For sensitive native species such as brook trout, populations are eliminated from streams with impervious surface coverages above four (4) percent.[1]

Comprehensive statewide stream surveys conducted by various Federal, State and local entities support these water quality concerns. Using biological indicators such as the health of fish and aquatic insects, the study concluded that 46% of Maryland's non-tidal stream miles were in poor condition, 42% were rated fair, and just 12% were rated as good according to surveys conducted throughout the State between 1995 and 1997.[2] Improvements in farm practices, cleaner energy sources and stream buffering have made noticeable improvements in lessening nutrient runoff and acid deposition throughout the State. The most recent surface water quality assessment reported by the State however, in 2022, found that 42.99 percent of all 1st through 4th order (which are headwater or medium sized streams) non-tidal wadable streams in MD were still found to be in non-attainment, based on both biological and conventional measures for water quality.[3]

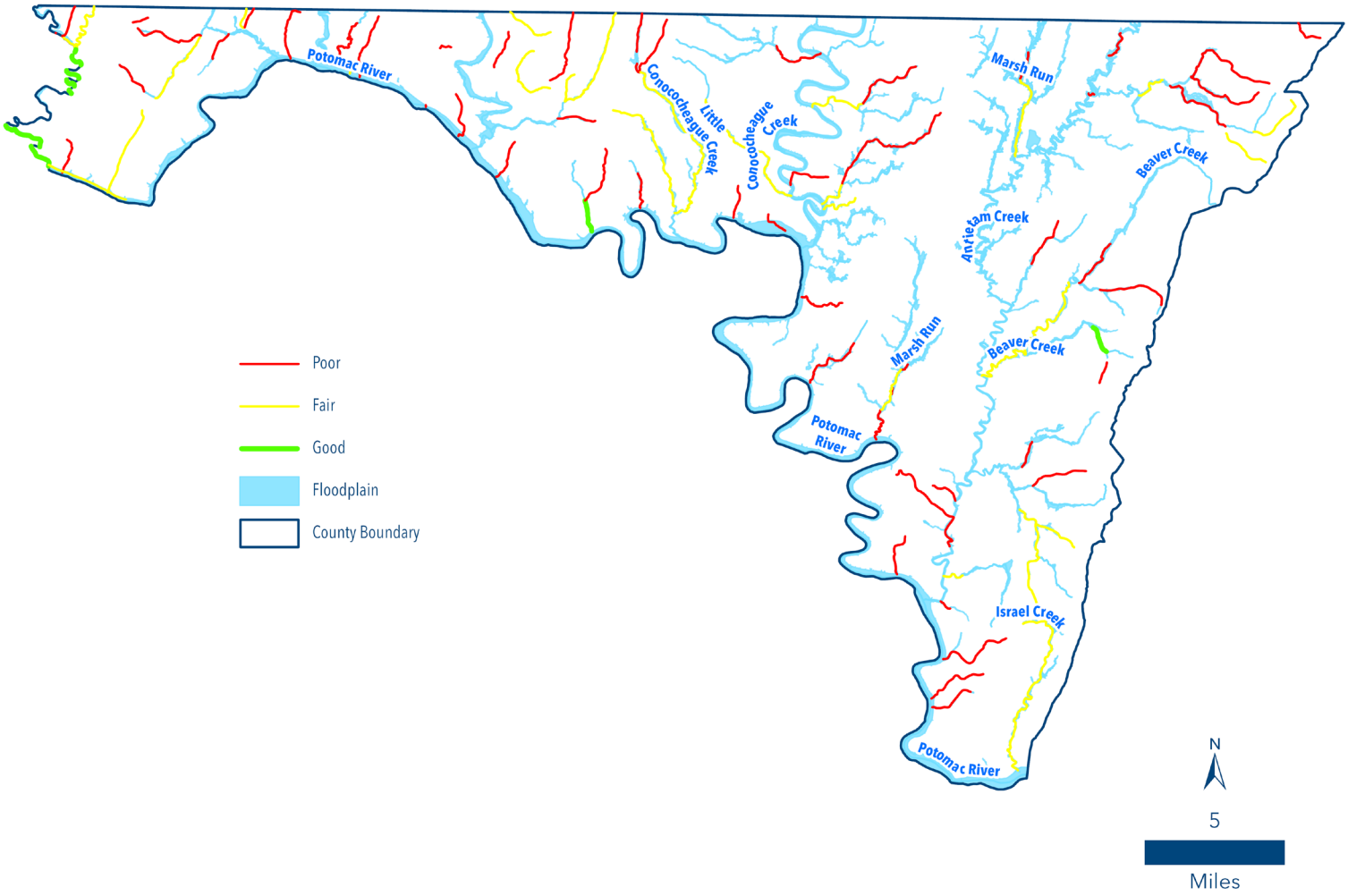
A snapshot of Washington County's current stream health, taken from the Maryland Biological Stream Survey (MBSS), echo the results of the State's recent water quality assessment in Map 12-1. MBSS uses the same Combined Index of Biotic Integrity (CIBI) that looks at fish and aquatic health used in the 1990s stream study noted above. The numerical average generated from these two measures produces the CIBI, which classifies streams as Good, Fair or Poor. Streams have been color coded according to their health with those in red in poor condition; those in yellow are in fair condition, and streams in green classified as being in good condition.

Not all stream miles occurring in Washington County have been sampled as a part of MBSS surveys, but Map 12-1 is a representative cross-section of County stream health between 1995 and 2020. Out of 169 collection sites sampled over this twenty-five-year period, 51% were rated as poor, 43% were judged Fair, and 6% were rated as good.

The map shows that, generally, streams of all health grades are distributed throughout the County. Notably however, 2 of the 4 streams in good condition are found on the western border of the County, where there is a great deal of contiguous protected land, governed by the State of Maryland in various Wildlife Management Areas.

1 Maryland Department of Natural Resources. Maryland Brook Trout Fisheries Management Plan, (Baltimore, MD: MDNR Fisheries Service), 2006, p.27.
2 Daniel Boward, Paul Kazyak et al., From the Mountains to the Sea: The State of Maryland's Freshwater Streams, (Washington D.C.: U.S. Environmental Protection Agency, 1999, p.37.
3 Maryland Department of the Environment, Maryland's Final Combined 2020-2022 Integrated Report of Surface Water Quality. (Baltimore: Maryland Department of the Environment), 2022, p.72.

Map 12-1: Stream Health (1996-2020)



Source: Maryland Biological Stream Survey

Forested Buffer Status

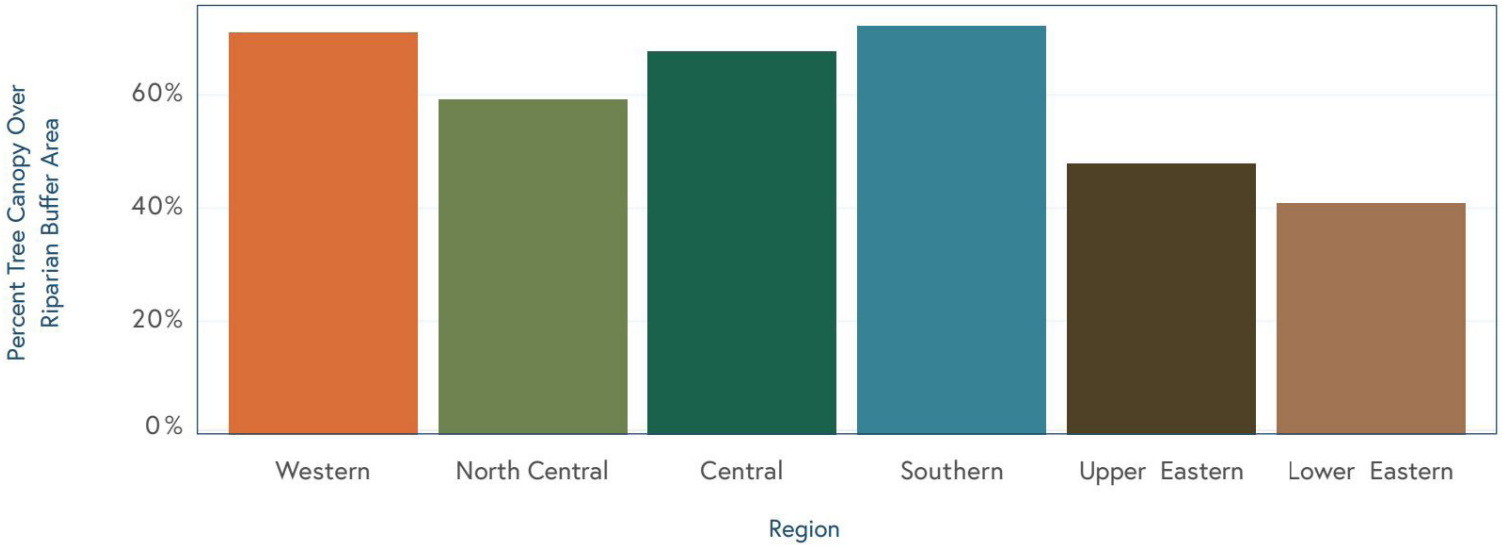
The importance of forested buffers as a best management practice (BMP) to improve stream health has been highlighted in the information presented above. Therefore, it is useful to examine the current status of forest buffers along Washington County streams.

Signatories of the 2014 Chesapeake Bay Watershed Agreement agreed to the goal of replanting and restoring riparian areas until 70% of riparian areas are forested watershed wide. As of 2018, 58% of Maryland's riparian habitats were covered by tree canopy. Riparian forests are unevenly distributed throughout the State, with only one-third (33%) of counties (8) having 70% riparian forest coverage.[1] Riparian buffers are most prevalent in Maryland's western and southern regions, and lowest in the Eastern region, as detailed on Chart 12-1 on the following page.

1 BCT Design Group, Technical Study on Changes in Forest Cover and Tree Canopy in Maryland, 2022, P.40.

Variation in forested buffers among regions is due to a variety of factors beyond just the level development, as noted in the study. Riparian buffers along waterways in Eastern Shore Counties are often characterized by low vegetation and wetlands instead of forests, for example. Recently planted trees also may not be picked up by aerial imagery used in the study until the saplings reach greater maturity, despite significant advances in satellite imagery in recent years.

Chart 12-1: Percent of Riparian Buffer Zones That Are Covered by Tree Canopy, By Region



Source: Maryland Forest Techinical Study (2022)

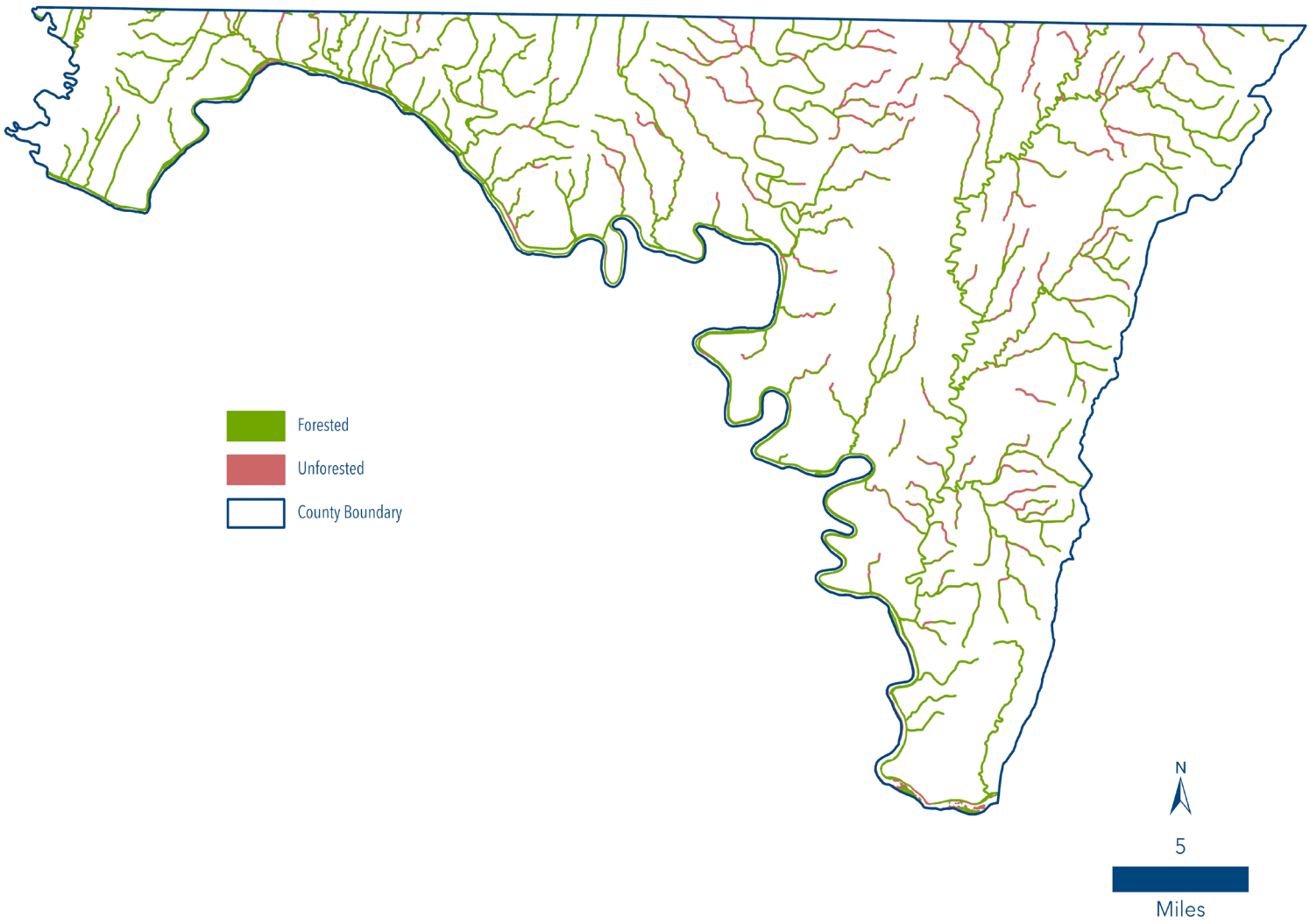
Map 12-2, displays the status of forested buffers along select stream miles in Washington County. Of the total acreage depicted within this map, 62% of stream miles are forested (38% unforested). This calculation should not be taken as an absolute measure of forest cover along all stream miles in Washington County, however, as the following caveats should be considered.

- The stream forest cover data consists of a 100-foot buffer around major streams in the County, which then have their forest cover analyzed.
- The total area for the buffer in the County is more than 15,000 acres. Of that total acreage, 62% is forested.
- It is important to note that the stream forest cover data examines only around 50% of the total stream miles for the County.
- When looking at the stream miles for the County, there are a total of more than 2,200 stream miles of varying orders.

As one might expect, forested buffers are most prevalent along waterways in western Washington County, where land is less developed, less suitable for agriculture and there is a large amount of permanently protected State and federal lands. Forested buffers are less consistent throughout the Hagerstown Valley in eastern and central Washington County where concentrated urban and agricultural land uses have removed notable forest cover over time.

Notably in this region, however, the Counties two largest watersheds - Conococheague and Antietam Creeks - show mostly intact forest buffers along their main stems. Tributaries feeding these two major streams, however, show a much higher absence of forested buffers. This offers insight into where forest buffer planting programs could be undertaken by the County to improve stream health and water quality through various land conservation and easement programs it participates in.

Map 12-2: County Riparian Forest Buffers



Source: Maryland Biological Stream Survey

Stream buffer protections have been in place in Washington County since 1997. County regulatory ordinances provide consistent definitions for streams and buffers, including both perennial and intermittent streams identified in the most current County soil survey. They are required to be identified on development plans, have specific width requirements based on slope and must be maintained with vegetative cover at all times. Sediment and erosion control plans and permits are required for any soil disturbance greater than or equal to 5,000 sq. ft. of area and greater than or equal to 100 c.y. of cut/fill. Permanent structures and septic systems or reserve areas are prohibited in the buffer. Water quality improvement structures or access limitations are permitted.

The Subdivision Ordinance requires that stream buffers "... be measured from and perpendicular to the top of the stream bank. The buffer shall be expanded to include any floodplain determined according to the Floodplain Management Ordinance, any non-tidal wetland areas identified on the Maryland Department of Natural Resources Non-Tidal Wetlands Guidance Maps and field verified and/or any area of steep slope as defined in this Ordinance." Buffer widths may be varied with Planning Commission approval in cases of undue hardship where the requirements severely limit the buildable lot area. The County's slope-based stream buffer guidelines, with slope percentages and buffer widths combined from what is displayed in the Ordinance to condense the information, are shown in the table below. For each categorical increase in slope percentage, the buffer width likewise increases by at least four (4) feet. The width applies to each side of the stream. Development is restricted on slopes steeper than 25%, or on highly erodible soils (greater than .35 K factor).

Table 12-1: Washington County Stream Buffer Guidelines

Slope (%)	Buffer Width
0-6	24 feet
7-10	18-40 feet
11-15	44-60 feet
6-20	64-80 feet
21-25	84-100 feet
26-30	104-120 feet
31-35	124-140 feet
36+	140 feet

Source: Washington County Subdivision Ordinance

Outside of the development process, additional programs protect stream buffers on private lands through the establishment of permanent easements of various types. Rural Legacy easements award additional monetary value to landowners' easements which establish permanent 100-foot-wide buffers adjacent to streams, rivers and springs. The Conservation Reserve Enhancement Program (CREP) offers another agricultural land preservation program to establish riparian forest buffers. Enrolled landowners create buffers on highly erodible land, next to a waterway or take steps to restore natural wetlands. Easement values are determined by the amount of acreage in the program and the current buffer width.

Besides agricultural land preservation programs, the County has a Memorandum of Understanding with the Washington County Soil Conservation District (SCD) to create forest easements on private lands using funds collected from developers who cannot meet their Forest Conservation Act requirements through other means. Easement purchases of existing forest or the planting of new forest is focused on priority lands such as those along streams, on steep slopes, containing sensitive wildlife habitat or those conferring other significant environmental benefits. The SCD locates willing landowners, then manages the various stages of forest establishment and monitoring for 20 years after the success of the initial planting is achieved. The County maintains a dedicated Forest Conservation Fund where accrued funds paid by developers are tapped to implement these projects.

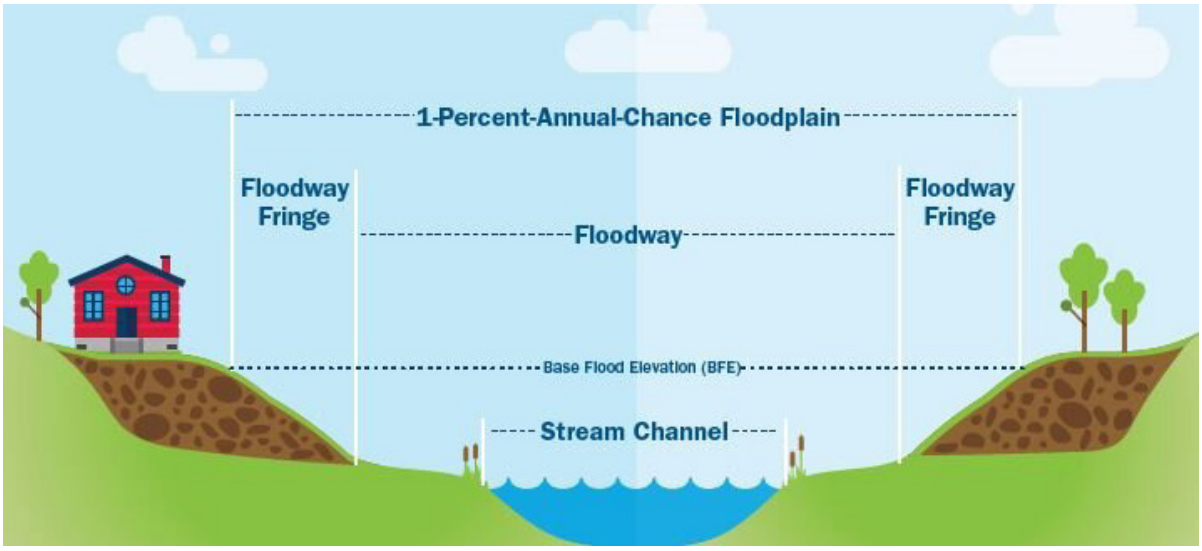
100-Year Floodplain

The 100-year floodplain is the portion of the landscape adjacent to streams and rivers with ground surface elevations that have a 1% chance of inundation by a flood event in any given year due to upland rainfall or runoff. Floodplains are generally composed of rich alluvial soils formed by many years of deposition of soil, gravel, sand, rock, leaves, twigs, animal and other plant materials caused by the continual ebb and flow of water in and out of the stream or river channel. Antietam, Conococheague, Licking and Little Tonoloway Creeks and the Potomac River all have extensively mapped 100-year floodplains. There are many other areas associated with unnamed streams that are also prone to flooding.

Floodplains are a natural part of the aquatic environment and contain diverse ecosystems. A key function of floodplains is to hold excess water and allow a slow release into groundwater and back to the waterway. Streams and rivers carry higher suspended sediment during flood events; the floodplain acts as a 'sink', trapping and settling these particles. The soil microbial community is active in floodplains, processing and cycling nutrients. Unique plants that can tolerate episodic high water are present in floodplains along with a variety of animal species that contribute to high biodiversity.

Floodplains have distinct components that are important to understand as they relate to flooding events and, by extension, floodplain regulations. These components, defined in Washington County's Floodplain Management Ordinance (FMO), are illustrated and described below:

Figure 12-2: Floodplain Components



Source: Tulsa Engineering & Planning

- **Floodplain -** defined above, encompasses both the floodway and floodway fringe
- **Floodway -** the channel of a river or stream and the parts of the floodplain adjoining the channel that are reasonably expected to efficiently carry and discharge the flood water of a watercourse
- **Floodway Fringe -** portion of the floodplain outside the floodway

Floodplain management typically regulates the location and intensity of land uses that fall within the 100-year floodplain, which is also known as the Base Flood zone. The Federal Emergency Management Agency (FEMA) maps 100-year floodplains as well as other hazard areas on its Flood Insurance Rate Map (FIRM). The FIRM maps are most specific about the base flood line in places where detailed engineering studies have been performed. The line is more approximate where such studies have not been carried out.

The 100-year flood depicted on the FIRM map depicts a statistical average, not a precise interval of years that will elapse before a flood of that magnitude will occur. The average is based on historic and present data about the watercourse in question, such as rainfall and stream stage. Real-time factors affect the actual probability that a significant rainfall event will produce a "100-year flood," such as the soil saturation before the storm, the extent of rainfall in the watershed, and the relationship between watershed size and storm duration (e.g. - runoff occurs more rapidly in smaller watersheds).

Development activities have the ability to significantly alter the flood regime of a waterway. As noted previously, large amounts of impervious cover upstream or adjacent to a waterway can increase both the amount of precipitation that runs off into the water body and the rate at which water travels to reach said waterway. Unnatural changes in stream morphology, such as the placement of fill in the flood fringe, the use of dams, or channelization can reduce the capacity of the floodway to carry floodwaters. The effects can be catastrophic to downstream communities if proper mitigation devices such as stormwater facilities or stream buffers are not utilized to safeguard these locations from these anticipated hazards. Improper floodplain development can also result in less physically damaging but equally costly effects such as contaminated water and long-term impacts to the integrity of aquatic and riparian stream communities.

Floodplain Regulation

Washington County has recognized these potential hazards and addressed the protection of floodplains through its FMO. While the FMO does not entirely restrict new development in the floodplain, it does substantially limit the number of permitted uses. The Ordinance excludes all new development from the floodway, outside of roads, bridges and essential utilities. New development in the flood fringe is generally limited to water dependent activities (e.g. – marina), or small, uninhabited accessory structures of limited use (e.g. - garages). These flood fringe structures must be elevated above the level of the 100-year flood (called the Flood Protection Elevation) and be equipped with water equalizing vents.

Existing structures in the floodway must also meet certain safety requirements. Existing structures in the floodway generally cannot be improved beyond their current footprint and must be relocated out of the floodplain in the event of substantial damage. Permitted but restricted new construction in the floodway fringe generally has anchoring and material specification requirements. Variances are granted only in cases where the applicant has demonstrated exceptional hardship. The County's Subdivision and Zoning Ordinances require that 100-year floodplains must be identified during development review.

These regulatory requirements are on par with what is required by FEMA's National Flood Insurance Program (NFIP), which also permits limited development in the floodplain with implementation of certain flood protection measures.

The adoption and enforcement of a FMO are two of the major requirements that allow the County to participate in the NFIP, which provides flood insurance to property owners, renters and businesses. Homes and businesses in high-risk flood areas with mortgages from government-backed lenders are required to have flood insurance. Having this coverage helps speed up recovery efforts once floodwaters recede.

The State of Maryland in conjunction with FEMA has been systematically updating Flood Insurance Rate Maps (FIRMs) for communities over the past several years. The current paper flood maps are being converted to a digital format that is GIS compatible called Digital Flood Insurance Rate Maps (DFIRMs). The improvements in spatial accuracy provided by the new base map, and the availability of electronic floodplain information should greatly enhance the ability to use the maps for planning, permitting, and insurance applications.

Non-Tidal Wetlands

Wetlands are defined by U.S. Fish and Wildlife Service as transitional lands between terrestrial and aquatic habitats where the water table is usually at or near the surface or the land is covered by shallow water. They are generally identified based on the degree of flooding, the existence of unique plant communities, and by special soil characteristics. Wetlands may be permanently flooded by shallow water, permanently saturated by groundwater, or periodically inundated for periods during the wet season.

Wetlands are broadly classified as either tidal or non-tidal, where the primary distinction is salinity versus freshwater habitats. Non-tidal, freshwater wetlands which occur in Washington County can be further classified generally as palustrine (isolated) or lacustrine (associated with lakes or reservoirs). According to GIS analysis using data provided by the Maryland Department of Natural Resources and the U.S. Fish and Wildlife Service's National Wetlands Inventory, Washington County contains 2,297 acres of wetlands, the vast majority of which are classified as palustrine. Non-tidal wetlands are found throughout Washington County, generally isolated from one another, but also in closer proximity along streams and the Potomac River.

Local Non-Tidal Wetlands Regulation

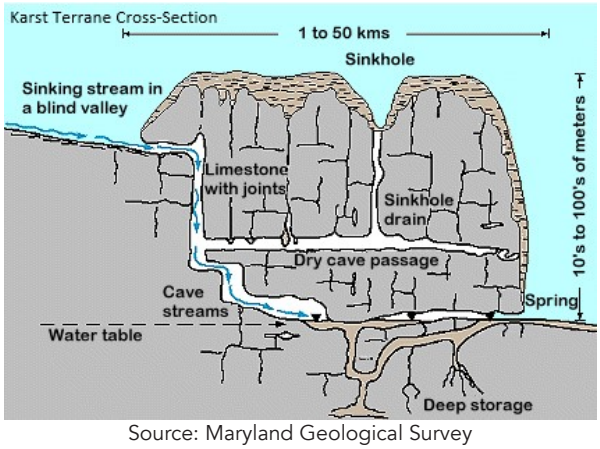
In addition to the considerable number of Federal and State Laws protecting wetlands as a result of historic losses throughout the nation, non-tidal wetlands are recognized within a number of local ordinances. The County's Forest Conservation Ordinance requires their identification on forest stand delineations, which are the first plan submission required for most development projects, and direction for their identification is described. The Subdivision Ordinance also requires that wetlands be included in mandated stream buffers, expanding buffer distances for their inclusion if necessary. Finally, the County's Floodplain Management Ordinance states that "encroachment by development into wetlands is not allowed without State and Federal permits." Typically, even if a permit is granted, the project is required to provide mitigation by constructing additional wetlands on or offsite.

Hydrogeomorphic Features

Hydrogeomorphology is the study of landforms created by the action of water. Work at the intersection of hydrology and geomorphology is increasingly common and useful for identifying hazards and understanding the impacts of land use, among other natural and man-made hazards on the landscape. The intersection of these fields of study is useful in Washington County where a unique set of geologic features has influenced its settlement patterns and are a notable factor to be considered during development processes, particularly as it relates to water resources. These features are introduced briefly in this chapter and expanded upon in greater detail in both the Water Resources Element of the Comprehensive Plan, as well as the County's adopted Water and Sewerage Plan.

Karst Topgraphy

Notable portions of Washington County are characterized by an underlying Karst geology, particularly in the Hagerstown Valley where most of its population is concentrated. 89% of the Hagerstown Valley is underlain by carbonate rock types characteristic of karst terrane.[1] Karst landscapes reflect the result of chemical weathering and erosion processes by water on bedrock such as limestone and dolomite. Caves, sinkholes, sinking streams, rocky outcrops, springs and other unusual surface and subsurface features are common features found in locations characterized by this geology.



Source: Maryland Geological Survey

Due to the interconnection of surface features, bedrock and the subsurface water table, karst environments offer significant challenges to development, the provision of water supplies and environmental protection. Examples of these challenges include:

- Land instability in such areas can result from the formation of sinkholes and/or due to pinnacled weathering patterns of exposed bedrock. These weathering patterns result in uneven ground surface conditions from which to anchor roads and structures.

- Karst aquifers are highly complex because of the broken and folded nature of the bedrock which also facilitates rapid infiltration of surface water. Correspondingly, wells drilled in these environments are not always successful and those which do produce high yields may be directly connected to sources of contamination.

- Due to lack of public knowledge, features such as sinkholes have historically been used for waste disposal by landowners, even though they are often significant points of ground-water recharge.

- Groundwater discharged at springs, streams or in caves in karst terrain has the potential to negatively affect aquatic and terrestrial ecosystems if contaminated.

1 Mark Duigon, Karst Hydrogeology of the Hagerstown Valley, Maryland, 2001, p.1.

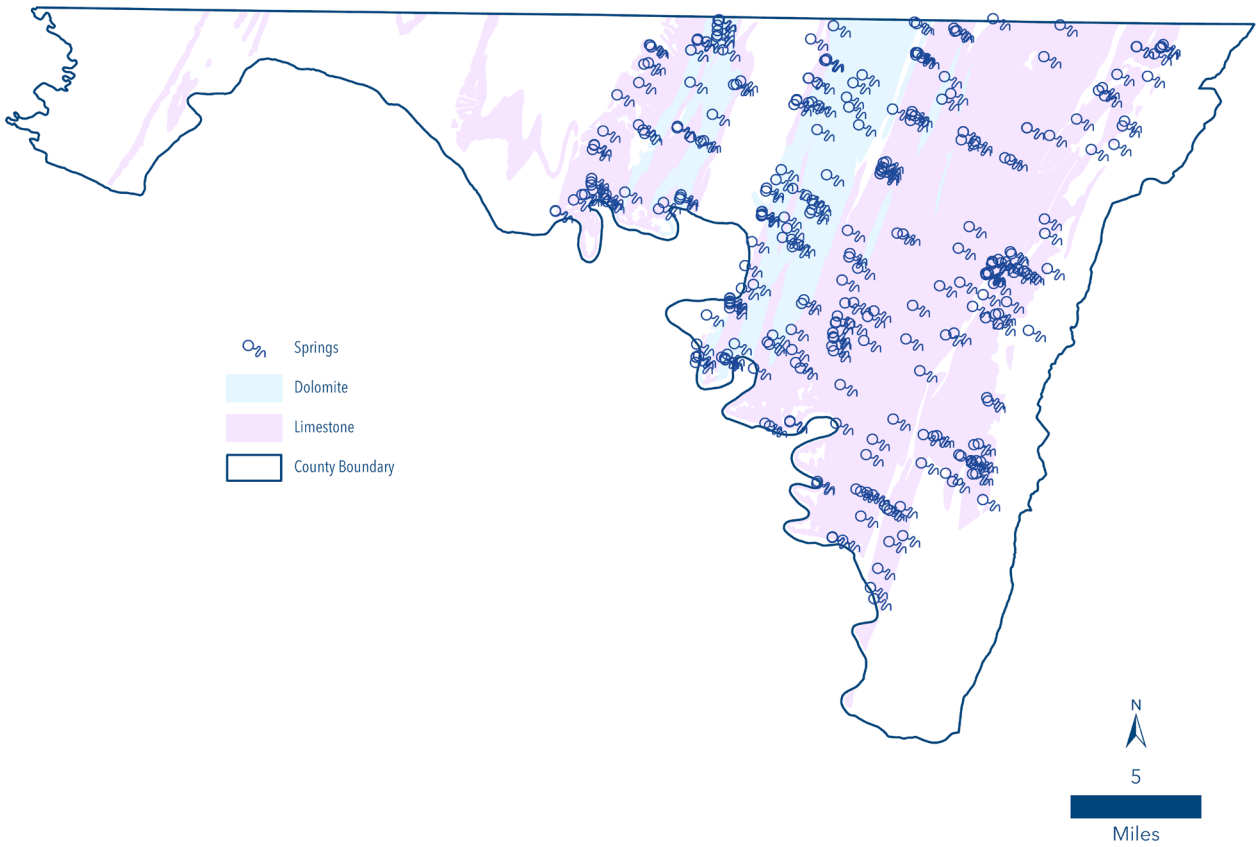
- Runoff, reduced groundwater availability and increased sinkhole formation are all post-development concerns if SWM systems have not been properly designed, implemented and maintained.

Springs and Seeps

Springs and seepage areas are locations where water flows from a confined aquifer to the earth's surface. Typically, this results from precipitation infiltrating the ground, whereupon it travels through subsurface geology as groundwater and exits to the surface at a lower elevation location where an impermeable rock layer prevents deeper penetration. Springs feed surface waters through smaller tributary streams that, in turn, aid in maintaining base flows of larger streams.

Springs occur throughout Washington County, producing anywhere from a few gallons per minute to several thousand gallons, depending on a variety of factors. According to the County's 2009 Water and Sewerage Plan, the most productive springs occur in the eastern part of the county, near the base South Mountain and Elk Ridge. Springs are generally less productive as one travels west through the county. The greatest number of springs occur in the Hagerstown Valley. There are 191 known springs in the Hagerstown Valley where the porous and permeable karst terrain creates a hydrologic regime that is constantly evolving.[1] In this region, while the output is more uncertain due to subsurface conditions, production rates can reach 2,000 to 3,000 gallons per minute. The location of springs in the Hagerstown Valley is depicted on the map below.

Map 12-3: Springs and Karst Formations



1 Mark Duigon, Karst Hydrogeology of the Hagerstown Valley, Maryland, 2001, p.1.

Springs provide sources of potable water which, historically, helped spur settlement of the region. While no longer relied upon as heavily as in the past, springs are still utilized by both private and public entities in the County for a variety of purposes. Fort Ritchie and the Boonsboro-Keedysville water system are examples of local jurisdictions which still rely heavily on springs to supply their water systems. Additionally, the Albert Powell State Fish Hatchery relies on a large nearby spring to feed its operations.


Brook Trout - Source: MD DNR

From the perspective of wildlife, springs provide both habitat for sensitive plant and animal species, some of which are limited in number or geographical distribution. The bog turtle, rock vole, and pearl dace are examples of Maryland species that are associated with spring or seepage-fed habitats.[1] Contributions to surface waters from cool springs are also part of the reason why the County can support native brook trout populations

Hydrogeomorphic Regulation

Maryland has extensive SWM and water quality regulations that govern development procedures in karst environments to safeguard the interconnected surface and subsurface features of these landscapes, including springs. These Statewide regulations, design guidelines and best management practices then are typically implemented by local jurisdictions through development review procedures, and backed by enforcement mechanisms that may be carried out by State and/or local governments.

From the SWM perspective, Maryland's Stormwater Design Manual (2000) contains an entire section in its appendix devoted to Geotechnical Methods for Karst Feasibility Testing. Geotechnical analysis, conducted prior to site development in karst areas, is intended to identify subsurface voids, cavities, fractures, or other discontinuities which could pose an environmental concern or a construction hazard to an existing or proposed SWM facility. Methods include soil borings and various geophysical investigation techniques undertaken in the field which are then sent for further laboratory analysis.

Washington County's Stormwater Management, Grading, Soil Erosion and Sediment Control Ordinance mandates geotechnical investigations for projects proposing Environmental Site Design (ESD) planning techniques and practices or structural SWM measures that entail infiltration, filtration, detention and/or retention that are suspected of being located within a karst area. For structural SWM measures proposed in areas of karst geology, dry and wet ponds, infiltration and filtration practices are required to be lined with a natural or man-made liner in accordance with the Design Manual, as well as the latest adopted version of the Washington County Standards and Specifications for Public Works Construction.

Maryland has also undertaken source water assessments to determine the vulnerability to contamination of all public drinking water sources Statewide. In Washington County, assessments have been completed for public water sources utilized by the incorporated municipalities and several other community water systems affiliated with large institutions, multi-family developments or mobile-home parks.

1 Maryland Office of Planning and Maryland Department of Natural Resources. Managing Maryland's Growth: Models and Guidelines Volume II (Baltimore: Maryland Office of Planning), 1998, p.54-55.

Transient non-community water supplies for individual properties have also been evaluated. Using these assessments, local governments and water suppliers can work with the Maryland Department of the Environment (MDE) and other agencies to develop source water protection initiatives, such as wellhead protection programs, to improve the safety of their water supply.

The County's adopted Water and Sewerage Plan is the authoritative policy document governing water and sewer service locally. It functions primarily as a land use document which establishes service area boundaries for the phased extension of public water and sewer services in accordance with projected development. While mostly a policy document, the Plan does provide generalized guidance on well construction and septic location for lots located in karst environments in Chapter II:24-25.

Habitats of Threatened and Endangered Species

Volume One of Models and Guidelines from the 1992 Planning Act defines a habitat of a threatened or endangered species as:

"An area which, due to its physical or biological features, provides important elements for the maintenance, expansion and long-term survival of threatened and endangered species. This area may include breeding, feeding, resting, migratory, or overwintering areas. This area may need special management or protection because of its importance to conservation of the threatened or endangered species."

Human activities have, both currently and historically, had an undeniable impact on species habitat globally and locally. In Maryland, over 200 species have been documented as being extinguished over the past 350 years.[1] Fundamentally, the resiliency of an ecosystem is dependent on protecting its species biodiversity. Biodiversity is a direct outcome of habitat protection and the maintenance of the core ecological processes which provide the conditions for habitation in general.

Photo: Antietam Water Trail, MIllers Church

1 Maryland Office of Planning and Maryland Department of Natural Resources. Managing Maryland's Growth: Models and Guidelines Volume 1, 36.

Threatened and Endangered Species Regulation


Indiana Bat - fws.gov

As an issue of Statewide or national significance, regulation and protection of threatened and endangered species stems primarily from Federal or State laws. In Maryland, endangered species regulations were enacted in the State through the Maryland Endangered Species Act of 1971.

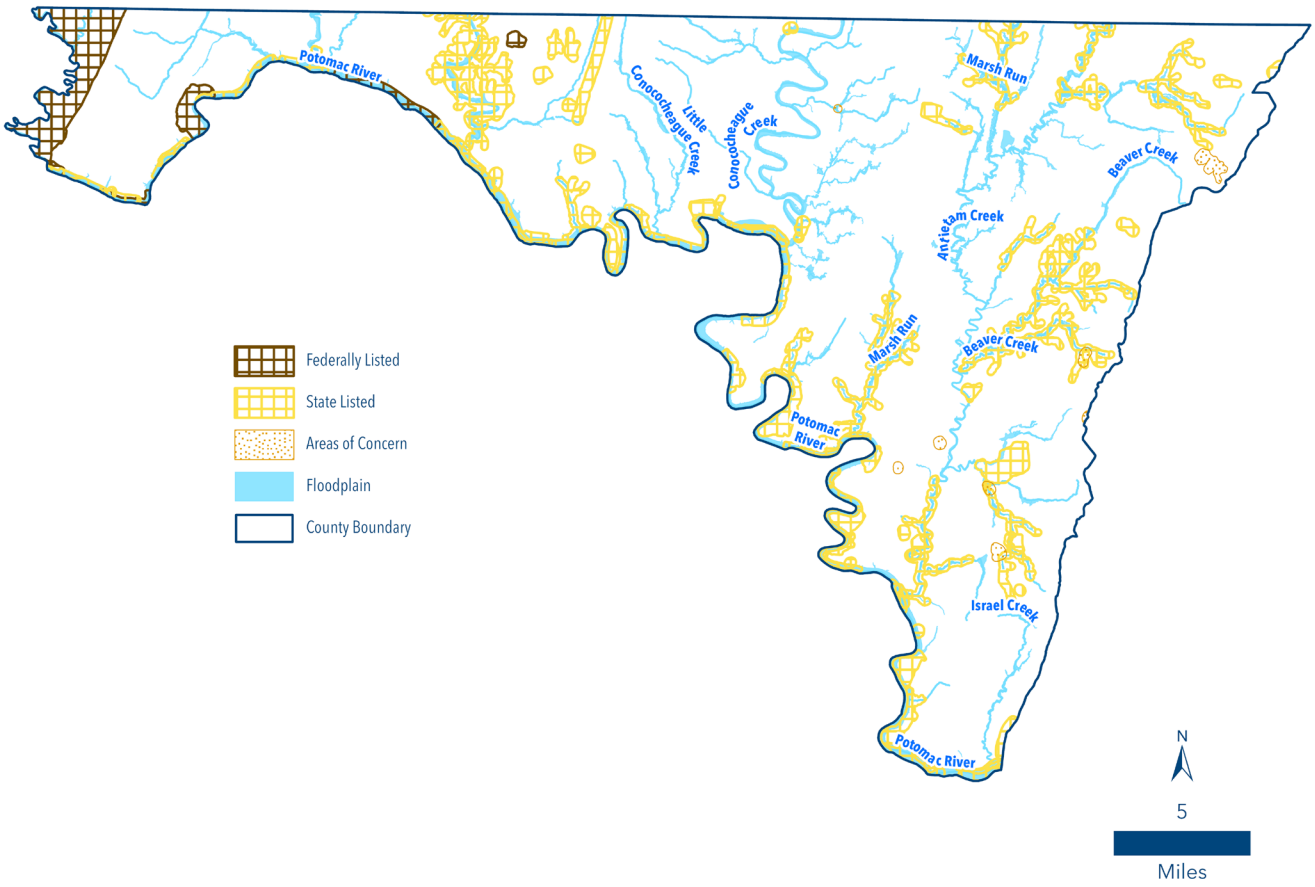
This Act prohibited the taking, transportation, possession, processing, or sale within the State of Maryland of any wildlife appearing on the Federal lists of endangered, foreign or native fish and wildlife. Secondly, it mandated the Department of Natural Resources (DNR) to develop a list of fish and wildlife deemed to be threatened with Statewide extinction in Maryland. The DNR list includes all of the Federally listed species and lists of species which are threatened or endangered within their range in Maryland.

In 1979, the State of Maryland established the Natural Heritage Areas Program, to fulfill the second requirement of the 1971 legislation. This program is responsible for identifying, ranking, protecting and managing Rare, Threatened and Endangered (RTE) species throughout the State. The Maryland DNR restores degraded habitats, conducts field surveys, performs research, and conducts public outreach and education efforts in service of its responsibilities for the Natural Heritage Areas Program.

The Natural Heritage Areas Program has established review areas throughout the State. Whenever there are proposed development projects within these review areas, DNR will examine the proposal to ensure that they do not negatively affect sensitive plant and animal species habitat. In some cases, the Program will cooperate with outside organizations to acquire land that encompasses RTE species habitat.

The Wildlife and Heritage Service Natural Heritage Program tracks the status of over 1,250 native plants and animals that are among the rarest in Maryland and most in need of conservation efforts as elements of our State's natural diversity. The Maryland DNR lists 60 animal and 167 plant species in its Current and Historical Rare, Threatened, and Endangered Species for Washington County as of 2021. This list includes three (3) Federally listed threatened or endangered species (one animal and two plant species). Habitats that may support rare, threatened or endangered species in Washington County are shown on the map 12-4.

Map 12-4: Habitats of Rare, Threatened or Endangered Species



The primary State law that presently governs the listing of endangered species is the Nongame and Endangered Species Conservation Act. This Act is supported by COMAR regulations which contain the official State Threatened and Endangered Species list. DNR's Fisheries Service maintains an official list of game and commercial fish species that are designated as threatened or endangered in Maryland.

At the County level, habitat of RTE species is required to be identified at the earliest stage of development, typically beginning with the submission of a forest stand delineation (FSD) under the County's Forest Conservation Ordinance. At this stage, projects taking place on lands that fall within the regions mapped above will be sent to DNR for their review. Review comments provided in the letter received from DNR will then be included on the FSD, as well as on any subsequent plans affiliated with the development that affect land disturbance. Typically, these involve voluntary protection measures involving sediment and erosion control best management practices (BMP) during grading and construction, or guidance on limiting the extent or timing of clearing forest or other existing vegetative cover. The County also tracks, by parcel, the confirmed existence of RTE species habitats in its permitting system (Accela Automation) following reviews conducted by DNR. This makes the presence of RTE species habitat known beyond the scope of a single project, to all County employees involved in land development and permitting.

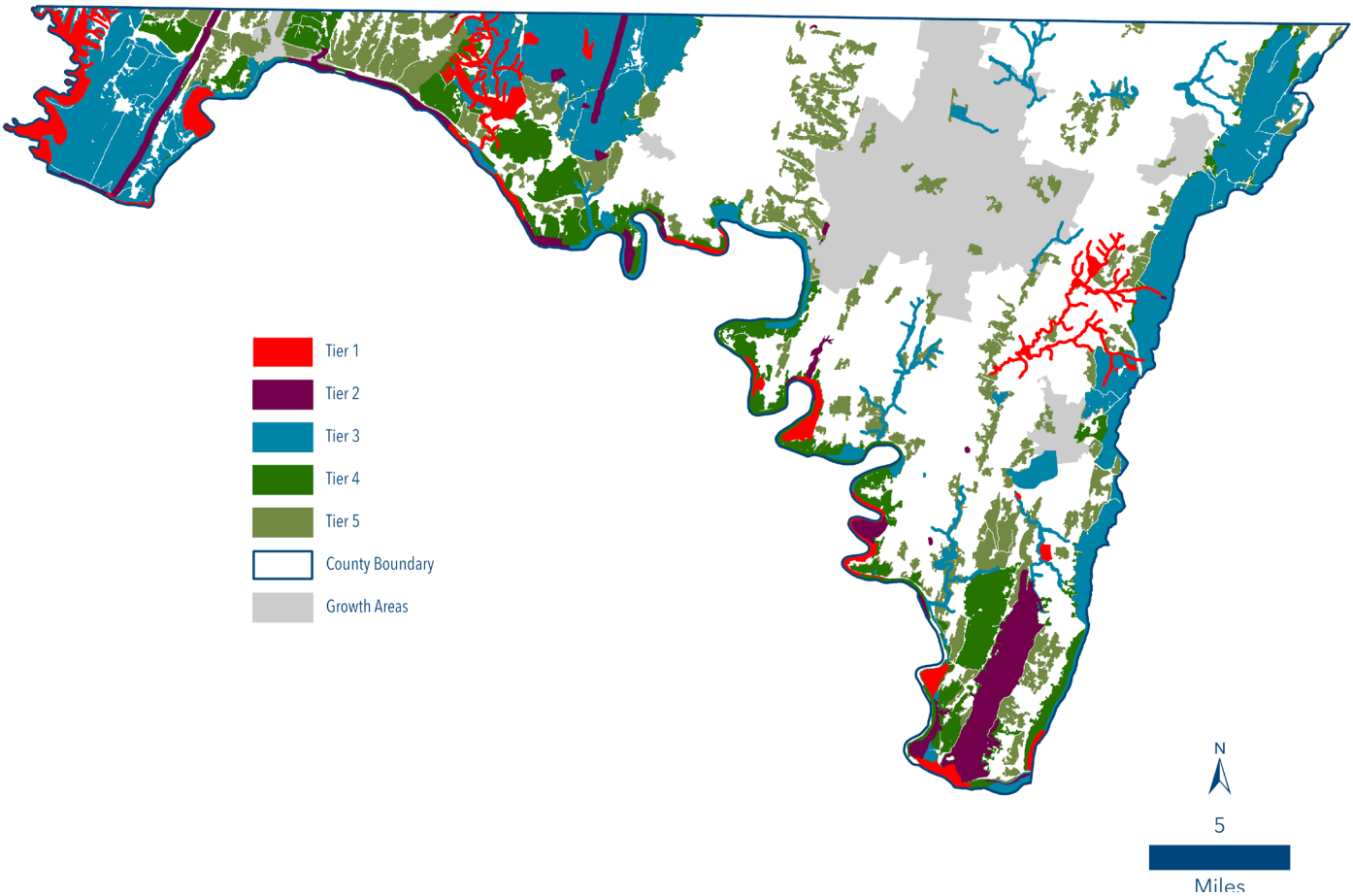
Bionet

A significant GIS mapping effort conducted by the DNR to comprehensively identify priority lands for threatened and endangered species conservation is the Biodiversity Conservation Network (BioNet). BioNet is a GIS data layer that was developed primarily to aid DNR, other government agencies, and non-profit conservation organizations determine where conservation efforts are most needed. This layer can be used to help focus a wide array of conservation activities, such as land acquisition and easements, land planning, and management actions.

Prioritization criteria are based on the relative rarity and conservation value of the species and habitats present: the most critically significant areas contain the rarest habitats and species, as well as the largest concentrations of these, Statewide. These lands include State Natural Heritage Areas, Critical Area Habitat Protection Areas, Ecologically Significant Areas, and Sensitive Species Project Review Areas. The areas are prioritized into a 5-tiered system, with Tiers I and II being the most significant for biodiversity conservation. Ranking criteria focuses on both the most irreplaceable species and habitats, as well as on the habitats that concentrate large numbers of rare species.

Washington County has 27,168 acres of Tier I and II lands, and 147,907 acres of Tier III through V, according to the GIS data contained within the BioNet layer. Cumulatively, these lands cover more than 50% of Washington County's roughly 300,000 total acres. Many of these Tier I and II lands are concentrated along select stream and river corridors dispersed through the County, outside of the Urban and Town Growth Areas where development has been intentionally concentrated. All BioNet designated habitats within Washington County are shown on the map below.

Map 12-5 Washington County Bionet



Wildlife Corridors and Greenways

Wildlife corridors are defined in Models and Guidelines #18 as "undeveloped linear stretches of land connecting larger patches of wildlife habitat." Wildlife corridors can occur in many settings both natural (such as rivers, riparian forests, along undeveloped ridgelines) and manmade (e.g. - along power lines or railroads). The importance of these corridors to people and nature has gradually become clearer to both scientists and urban planners over time. From a natural perspective, conservation biologists and other experts have begun to view plant and wildlife preservation from a systems perspective. What has come into clearer focus is the need for contiguously connected habitat parcels that allow wildlife to fully meet their fundamental needs of obtaining food, water, shelter, and for raising offspring. Isolated and disconnected protected lands are often insufficient to maintain genetic diversity among species, particularly among those that migrate or range widely throughout their life history. Accordingly, wildlife corridors serve to enable both common and threatened or endangered species to obtain the full range of resources that they need to maintain their populations by allowing free movement.

At the same time, it is not just wildlife that benefits from protecting contiguous pieces of land. Greenways are an urban planning and land conservation tool that seeks to protect these contiguous, linear open spaces in order to provide recreational opportunities and water quality benefits, in addition to setting aside land for sensitive species. Greenways are often targeted by land use planners as places to provide long-distance multi-use paths. In urban areas, such corridors provide a buffer from the stress of the city and facilitate contact with open spaces that feel wilder than a typical urban park. In this way, local residents as well as visitors can gain respite from the stresses of modern life, and sensitive land and aquatic species are given more room to roam.

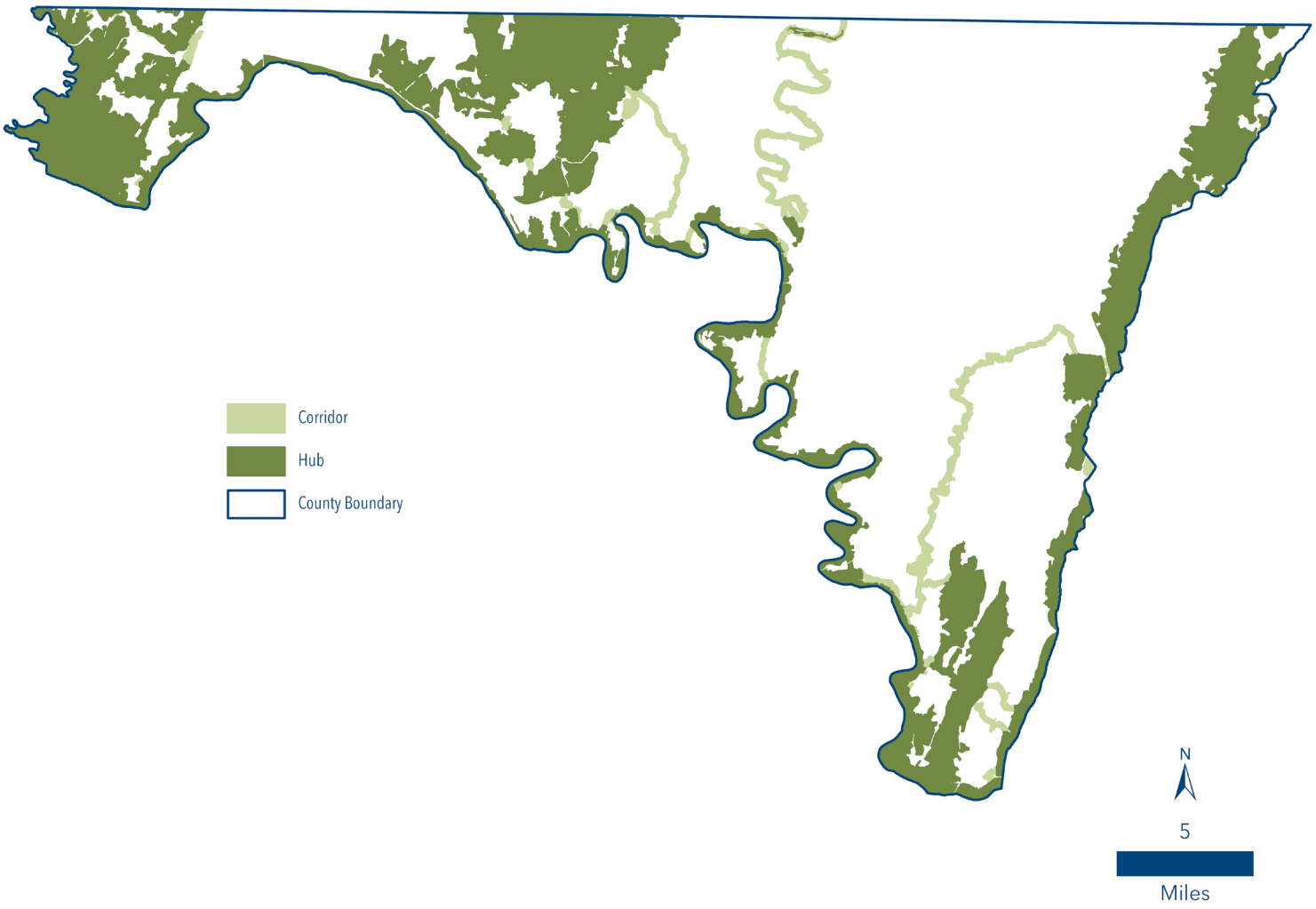
In order to be effective for either purpose however, these corridors or greenways must be of an adequate width to provide their intended benefits. As with stream buffers, there is no exact distance that automatically fits the definition of a perfect corridor. Instead, the width of the corridor needs to take into account the needs of the wildlife species residing within it as well as human factors such as adjacent land use patterns. For conservation purposes in general, corridors should be wide enough to provide for the needs of both edge species (i.e. - crows, raccoons, jays) and forest interior species (i.e. - reptiles, amphibians). Corridors that are too narrow are often too bright, dry or open and contain insufficient cover from predators to allow interior species to survive in large numbers. A wider buffer may also be necessary to mitigate stormwater runoff, and to prevent pollutants from entering ground or surface water systems in urban areas, thereby ensuring increased water quality benefits to people. Professional ecologists and urban planners should work collaboratively to determine both the size and location needed to make such corridors effective for their intended purposes.

DNR's GreenPrint is an example of a tool that can be used for proactive land conservation planning for ecological and recreation purposes. GreenPrint identifies Targeted Ecological Areas which represent lands and watersheds of high ecological value that have been identified as conservation priorities by the DNR. This Green Infrastructure Network of priority lands consists of ecological *hubs and corridors*.

- **Hubs -** are large, ecologically significant, natural areas that provide habitat for native plants and wildlife. They may include protected areas such as County, State, or National parks that are managed for preservation purposes as well as private lands where natural features and ecological processes are protected or restored.

- **Corridors -** are linear features that tie the hubs together and serve as biological conduits for native plants and wildlife. They often follow streams and their adjacent upland areas, which provide cross watershed connections. Greenway is a term often used interchangeably with corridors, within this model of ecological preservation. These lands represent contiguous areas in the County worth considering for new or additional sensitive resource protection in the future.

Map 12-6: Washington County GreenPrint



As noted in the Agriculture and Forestry chapter, Washington County has done an excellent job to date in preserving contiguous corridors of land and water. Collectively, between its various agricultural land preservation programs and forest conservation lands, nearly 39,000 acres have been permanently set aside by the County. Additionally, another 33,000 acres[1] are held in various Federal, State and local parklands throughout the County. In total, these protected lands comprise approximately 24 percent of the County's total acreage (299,522 acres), a substantial figure by any measure.

1 Acreage total does not include Public School Facilities

Thus, with so much land protected already, the County's focus going forward should be to identify opportunities to connect these preserved lands contiguously to an even greater degree in areas where development offers more costs than benefits.

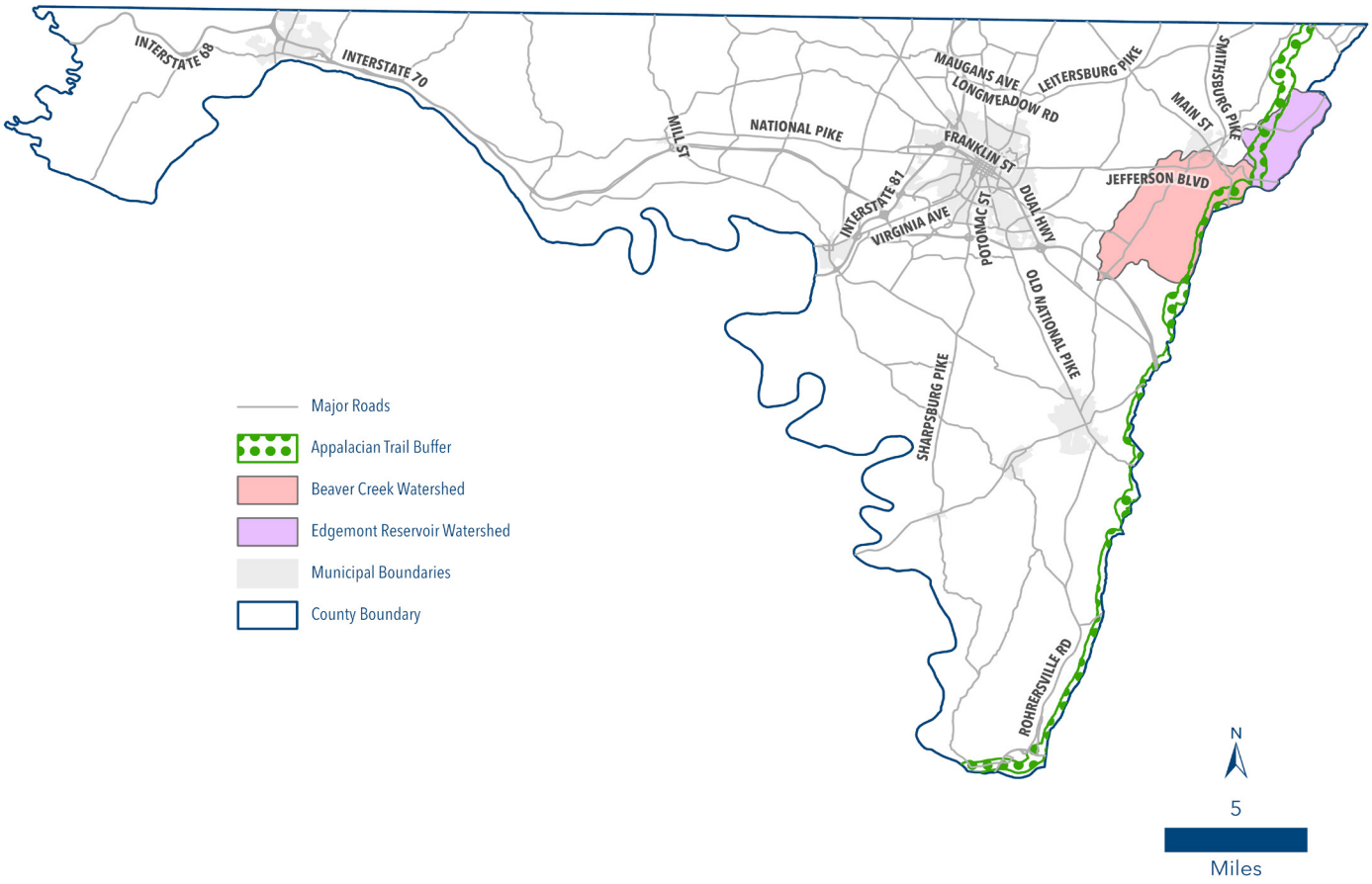
For planning purposes, the County may wish to adapt DNR's GreenPrint and BioNet tools to its own ends to create a natural resource inventory that would help guide its land preservation efforts for the protection of sensitive environmental lands in contiguous, protected hubs and corridors. The presence of many sensitive features is noted before and during development review already, which could supplement broad-scale data resources such as those displayed and analyzed in Geographic Information Systems.

Special Planning Areas

Photo: Robert Powell Hatchery Source: DNR

As noted in the introduction of this chapter, the 1992 Maryland Planning Act permitted and encouraged local jurisdictions to identify additional sensitive areas that were unique and locally important beyond the original four (4) types noted in the legislation. Washington County accomplished this through the identification of Special Planning Areas (SPA). SPAs are geographic areas of unusual or significant importance for which definitions, special policies and land use techniques were needed to ensure their protection. SPAs were first identified by the County in the 1981 update to its Comprehensive Plan. They include the Upper Beaver Creek Basin and Beaver Creek (Albert M. Powell) Trout Hatchery, Edgemont and Smithsburg Reservoir watersheds and the Appalachian Trail Corridor. SPAs were then formally adopted through amendments to the Comprehensive Plan, followed by the Subdivision and Zoning Ordinances, between 1995 and 1997. The County's SPAs are shown on Map 12-7 on the next page.

Map 12-7: Existing Special Planning Areas

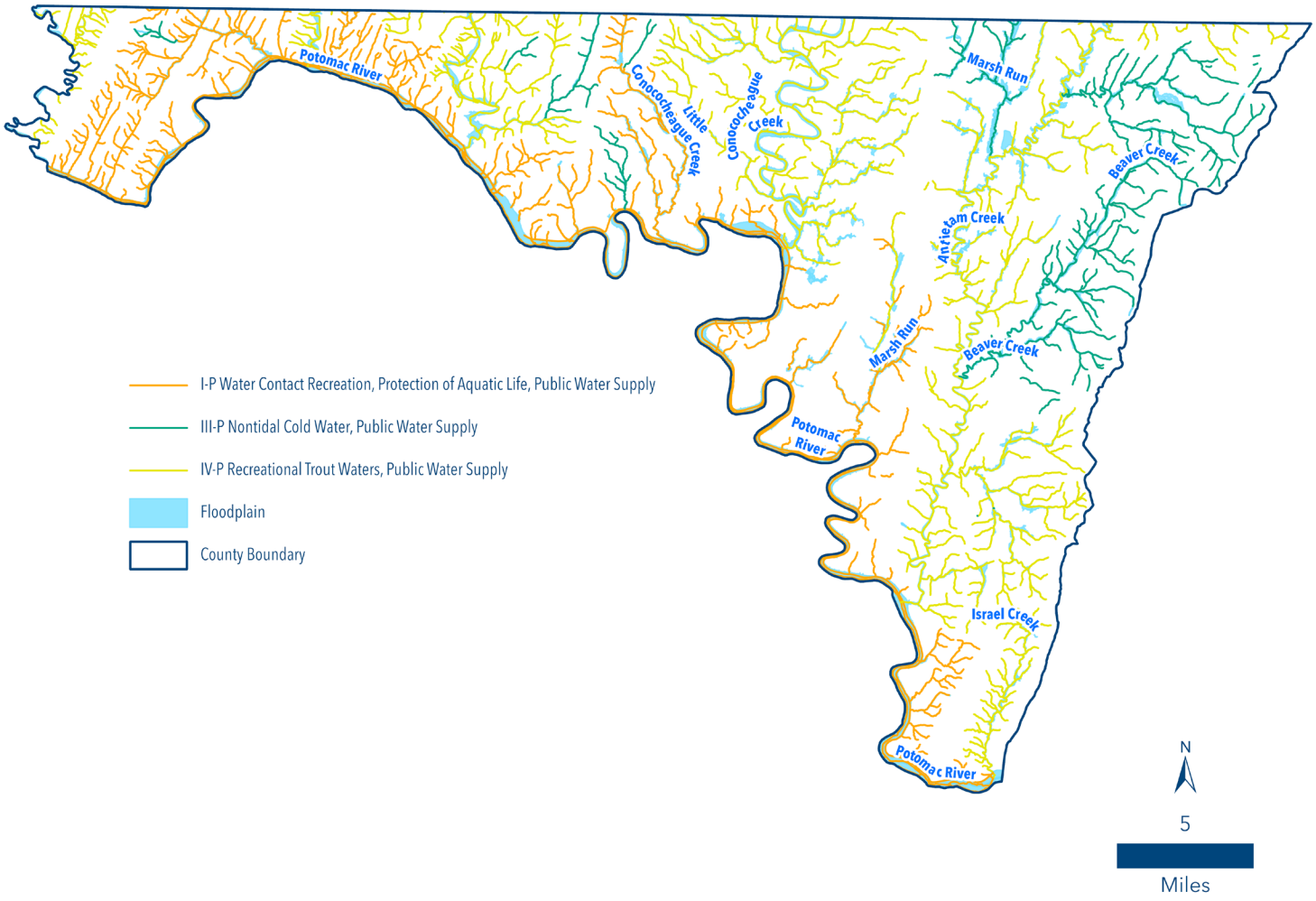


Trout Stream Watersheds/Upper Beaver Creek Watershed

Maryland's water quality standards have three (3) components: designated uses, water quality criteria and antidegradation policy. Of these three components, designated uses have the most direct application to the Sensitive Areas element for Trout Stream Watersheds as well as the Upper Beaver Creek Special Planning Area. Designated uses are goals for water quality based on a particular intended use for humans or aquatic life which have been organized into four (4) classes. These uses generally include recreation, shellfish harvesting, water supply and/or aquatic life habitat. The Use Class designations are defined below and shown in Map 12-8.

- **Class I:** Water Contact Recreation and Protection of Non-tidal Warm-water Aquatic Life
- **Class II:** Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting
- **Class III:** Non-tidal Cold Water
- **Class IV:** Recreational Trout Waters
- **P:** Public Water Supply – can be applied to all Use Classes

Map 12-8: Waterway Designated Use Classifications



While all except Class II Uses apply to waters within Washington County, it is Classes III and IV that apply specifically to the Beaver Creek Watershed Special Planning Area. The main stem of Beaver Creek within the Antietam Creek Watershed is a Class III stream. Marsh Run and Little Antietam Creek (north), also within the Antietam Creek Watershed, is are Washington County's only other Class III streams. Beaver Creek originates on the western slope of South Mountain and supports habitat for brook trout, the only native species of trout in the Eastern United States. Wild trout are an indicator species for water quality and overall watershed health. They have strict water temperature requirements and are highly susceptible to habitat degradation. Therefore, upstream disturbance from human activities must be kept to a minimum to continue supporting a self-sustaining population of brook trout.

Beaver Creek is also the site of the Albert Powell Fish Hatchery. This Hatchery raises rainbow trout which are used for stocking Class IV waterways throughout the State of Maryland and to supplement other State hatchery operations. Sideling Hill, Tonoloway, Licking and Conococheague Creeks are the other Class IV streams within Washington County that receive stock from the Hatchery. The facility is fed by a nearby spring, whose waters it is able to recirculate when use exceeds output. The spring feeds both hatchery operation and the baseflow of Beaver Creek itself. The Hatchery, therefore, represents an important operation economically and biologically for both the County and the State.


Photo: Albert M. Powell State Fish Hatchery Source: DNR

Attention is given to the Upper Beaver Creek Drainage Basin in both the County's Subdivision and Zoning Ordinances because of their identification as Special Planning Areas. The Subdivision Ordinance requires that new development located in the Upper Beaver Creek Basin that is subject to a preliminary consultation and proposes the use of on-site wells and septic systems may be required to provide a hydrogeologic study prior to the submission of a preliminary plat. The goal of the hydrogeologic study is to evaluate potential impacts to ground and surface water resources from the proposed development. The study must also address the karst specific features which may have a direct relationship to groundwater quality such as caves, sinkholes, double terminating drainage reaches and contact between specific geologic formations. Residential density has been limited within the Watershed through amendments made to the Zoning Ordinance in 2005.

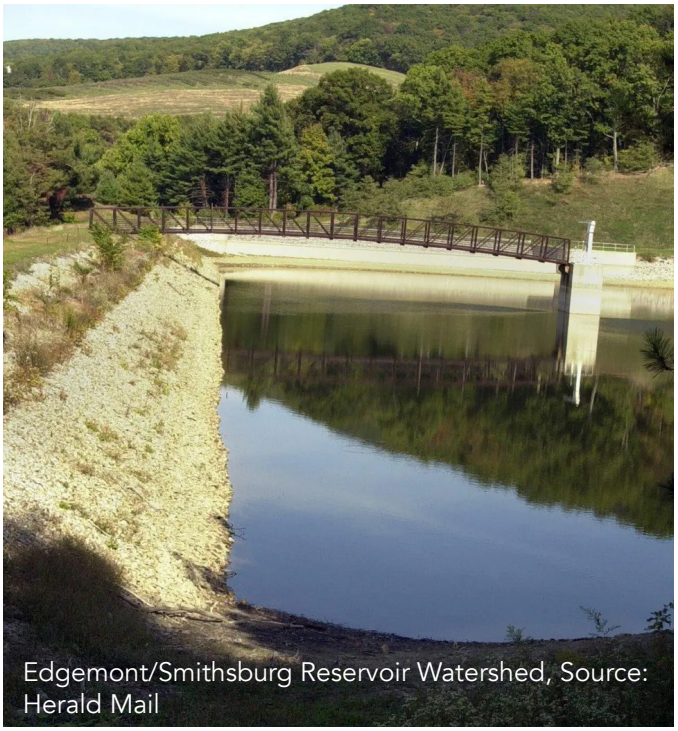
The Washington County Soil Conservation District has been the lead agency in the Beaver Creek-Antietam Creek targeted watershed project. In 1992, Little Antietam Creek and Marsh Run sub-watersheds were selected to be in this program which was expanded in 1996 to include the Beaver Creek watershed. A Soil Conservation Planner was hired to complete a watershed assessment and to begin educational efforts in the targeted sub-watersheds. This was funded by an Environmental Protection Agency (EPA) Nonpoint Source grant from Section 319 of the Clean Water Act and was obtained through the Maryland Department of Agriculture. A conservation technician was hired to help install Best Management Practices (BMP) identified by the planner in Soil and Water Conservation Programs. This program has continued in the Beaver Creek and Marsh Run sub-watersheds. These documents require a comprehensive review of development and its impacts on local resources, and in some cases, mechanisms to reduce negative impacts such as setbacks, easements, and tree planting.

Best Management Practices encouraged by the DNR in Class III tributaries to protect aquatic habitat include protection of stream buffers, restriction of development on steep slopes, stormwater infiltration devices, minimization of impervious surfaces, stormwater detention basins that don't hold water longer than 12 hours and the use of watering troughs for livestock on pastureland. Many of these practices are already in use in Washington County to safeguard stream and watershed health.

Edgemont/Smithsburg Reservoir Watershed

The Edgemont Reservoir is located along the eastern slope of South Mountain, a few miles above the Town of Smithsburg, near the Washington and Frederick County border. The reservoir collects water from a watershed that is approximately 6 square miles of mixed forested and agricultural land, potentially supplying up to 750,000 gallons of water per day. The Smithsburg Reservoir, built in 1881 and located in Smithsburg, was the original source water supply for the City of Hagerstown. A dam, fed by Little Antietam Creek, was constructed in 1902 to create Edgemont Reservoir to supplement the Smithsburg Reservoir during seasonal shortages.

The use of both reservoirs was curtailed in 1987 after passage of the Safe Drinking Water Act required filtration in addition to the chlorination already done at the plant. Improvements were made to the dam and spillway in 1992-93. In 1997, the William Breichner Water Treatment Plant was constructed on the site of the Smithsburg Reservoir to treat water from the Edgemont Reservoir and again became a second drinking water source for the City of Hagerstown. The Edgemont Reservoir, along with the Potomac River, serves 75,000 people in Hagerstown, Smithsburg, Funkstown, and Williamsport. Accordingly, the County treats both the reservoir and the overall health of the watershed as a Special Planning Area.


Edgemont/Smithsburg Reservoir Watershed, Source: Herald Mail

The use of the Edgemont Reservoir as a backup water source is currently on hold. An inspection of the reservoir performed by MDE on May 19, 2015, found that the condition of the dam was considered to be unacceptable due to ongoing seepage issues, which had the potential to lead to dam failure. The reservoir was drained in April 2016 in response to MDE's concerns. At this juncture, the City of Hagerstown is weighing its options for the Reservoir with input from MDE, including dam repair, dam removal and drilling for groundwater at the site. The City does still have two water storage tanks on the west end of Hagerstown that are filled with water from the Potomac River to use as a backup water source.[1]

Appalachian Trail


Annapolis Rock on the Appalachian Trail in Washington County
Source: Shutterstock

The Appalachian Trail (AT) is a Federally managed National Scenic Trail that stretches more than 2,100 miles through the Appalachian Mountains from Maine to Georgia. 40 miles of the AT run through Maryland between the Potomac River and the Pennsylvania State line, all of them inside Washington County. From a management perspective, the Trail is unique in that a variety of entities from Federal, State and local governments, non-governmental organizations and volunteers cooperatively work together to ensure the trail's upkeep.

1 Dave McMillion, Edgemont Reservoir Drained As Hagerstown Explores Water Issue, Herald-Mail Media, Retrieved from: https://www.heraldmailmedia.com/story/news/local/2016/07/24/edgemont-reservoir-drained-as-hagerstown-explores-water-issue/116932982/. July 24, 2016.

As one of those partners, Washington County's role is to consider the appropriate arrangement of land uses surrounding the Trail corridor so that the Trail is buffered from incompatible development and viewsheds are preserved for Trail users. The County has achieved this objective through regulation within both the Zoning and Subdivision Ordinances. The Subdivision Ordinance (Section 411) requires a minimum buffer of 300 feet from the Trail for all new development adjacent to the Trail. The Trail buffer is in addition to building setbacks required by the Zoning Ordinance. The Planning Commission may approve a planted buffer as a substitute for the 300-foot setback where it can be demonstrated that maintaining the 300-foot setback will cause the subdivision to be in non-compliance with other subdivision design requirements or where it can be demonstrated that a permitted use could not be established anywhere on the new lot in conformance with the 300 foot setback. The Zoning Ordinance (Article 4.21) also reiterates the Subdivision Ordinance requirement that the location of the Appalachian Trail must be shown on all applications subject to its requirements that are within 500 feet of the Trail boundary.

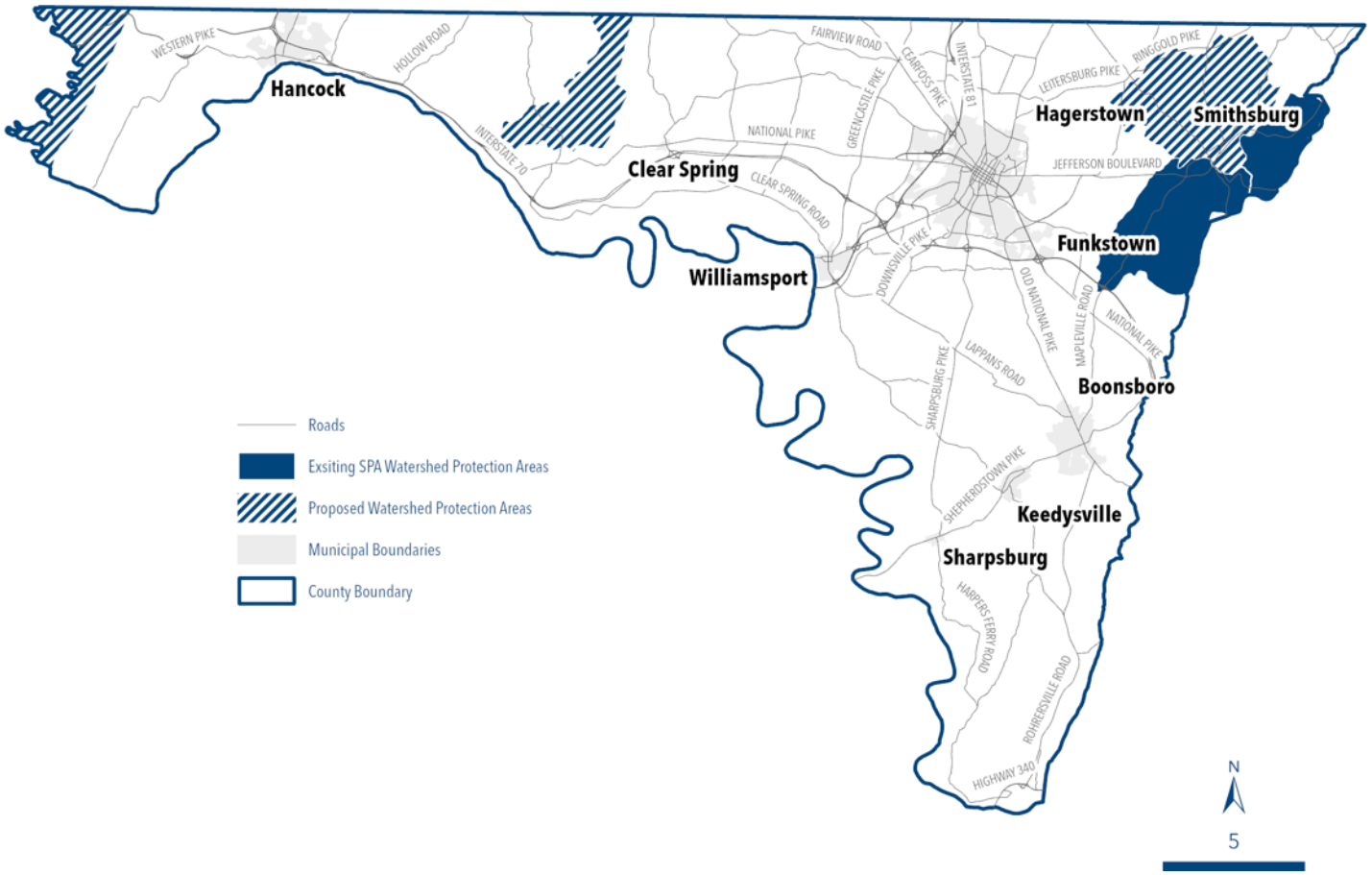
Special Planning Area Recommendations

Based upon analyses contained within the Water Resources Element (see Chapter 13) and in consideration of feedback received during the public review of the draft Plan, it is proposed that a new Special Planning Area be created which offers broader consideration for water quality protection in high quality County watersheds beyond the Upper Beaver Creek and Edgemont/Smithsburg Reservoir watersheds. Instead, planning for these areas should be considered as part of creation of three larger Watershed Protection Special Planning Areas discussed further below.

As shown on Map 12-9, the three areas primarily encompass Beaver Creek, Licking Creek and Sideling Hill Creek, moving from east to west. The easternmost of the three SPAs also contains portions of various other tributaries of Antietam Creek, besides Beaver Creek, in addition to the area which includes the Edgemont/Smithsburg Reservoir Watersheds. MDP Water Quality Protection guidance factors such as: 1) Stronghold watersheds, 2) Location Within a Chesapeake Healthy Watersheds Assessment, 3) Drinking source water protection areas for both surface and groundwater sources, 4) Coldwater Resources, 5) Within Sensitive Species Project Review Areas, 6) Streams with significant freshwater mussel populations, 7) Anadromous fish spawning habitat were analyzed using GIS data provided by various State agencies to provide each watershed with a score based on the occurrence of the data in that watershed. Each criterion was given equal weight in the analysis and those areas where there appeared to be several criteria present were delineated as areas of high priority for protection efforts.

These three Watershed Protection Areas each show strong indicators for cold water benthic macroinvertebrates, wild trout habitat and sensitive species. The County currently has policies in place within its Subdivision Ordinance which provide for additional review in some of these areas such as those within the Beaver Creek and Edgemont/Smithsburg Reservoir Watershed Special Planning Areas. It should also be noted that a large portion of these identified watersheds is already under State ownership for recreation purposes. Protection is also enhanced by the Environmental Conservation zoning designation over the majority of these areas, which limits residential density to one dwelling unit per 20 acres of land.

Map 12-9: Proposed Watershed Protection Special Planning Areas



As part of the recommended creation of these Watershed Protection Special Planning Areas, the County should examine standards and requirements within various regulatory Ordinances, including those mentioned above, to determine how these new SPAs can be best supported during the development review process. Mitigation methods such as increased stream buffers or measure to reduce impervious surface impacts could be considered in these areas. If such measures are warranted after further study, Ordinance amendments will likely be necessary to encompass additional review of development applications that fall within the broader geographical areas identified within the map above.

Given the overlap between the existing Beaver Creek and Edgemont/Smithsburg Reservoir Watershed Special Planning Areas and the newly proposed Watershed Protection Special Planning Areas a determination should be made as part of a future study as to whether these three overlapping areas should be combined into one overall SPA with uniform land use regulations, or if they should remain as discrete sub-areas with separate regulations. Though overall aims of water quality protection and riparian and/or aquatic habitat conservation are sought uniformly across all new and proposed planning areas, specific characteristics of some individual watersheds and the development pressures faced in each may warrant regulations tailored to specific drainage areas.

Steep Slopes

Steep slopes are defined as having an incline of 25% or greater. The behavior of steep slopes when it comes to the impact of development is very much influenced by the underlying geology, the type of soil produced by that parent material, the magnitude of the disturbance, and the overall severity (or lack thereof) of the prevailing topography.

The modification of a steep slope by clearing and/or grading land often produces a ripple effect on the downslope and potentially downstream communities from the area of disturbance. Slopes barren from the removal of vegetation can expose soils to repeated erosion and movement from rainfall. Rainfall carries the sediment into the nearest waterway, altering stream behavior and character, ultimately resulting in a wider and shallower watercourse. Over time, sedimentation into both natural waterways and into man-made water diversion devices such as culverts reduces their capacity to carry floodwaters and the results can be catastrophic.

Sedimentation into waterways also alters the delicate balance of streamflow, sunlight, temperature, and oxygen that sustains habitats of aquatic communities. As a result of sedimentation, water becomes turbid, blocking out sunlight and decreasing the amount of dissolved oxygen available as algal blooms form. This process, known as eutrophication, can often lead to conditions which make it nearly impossible for fish and other aquatic vertebrates to survive.

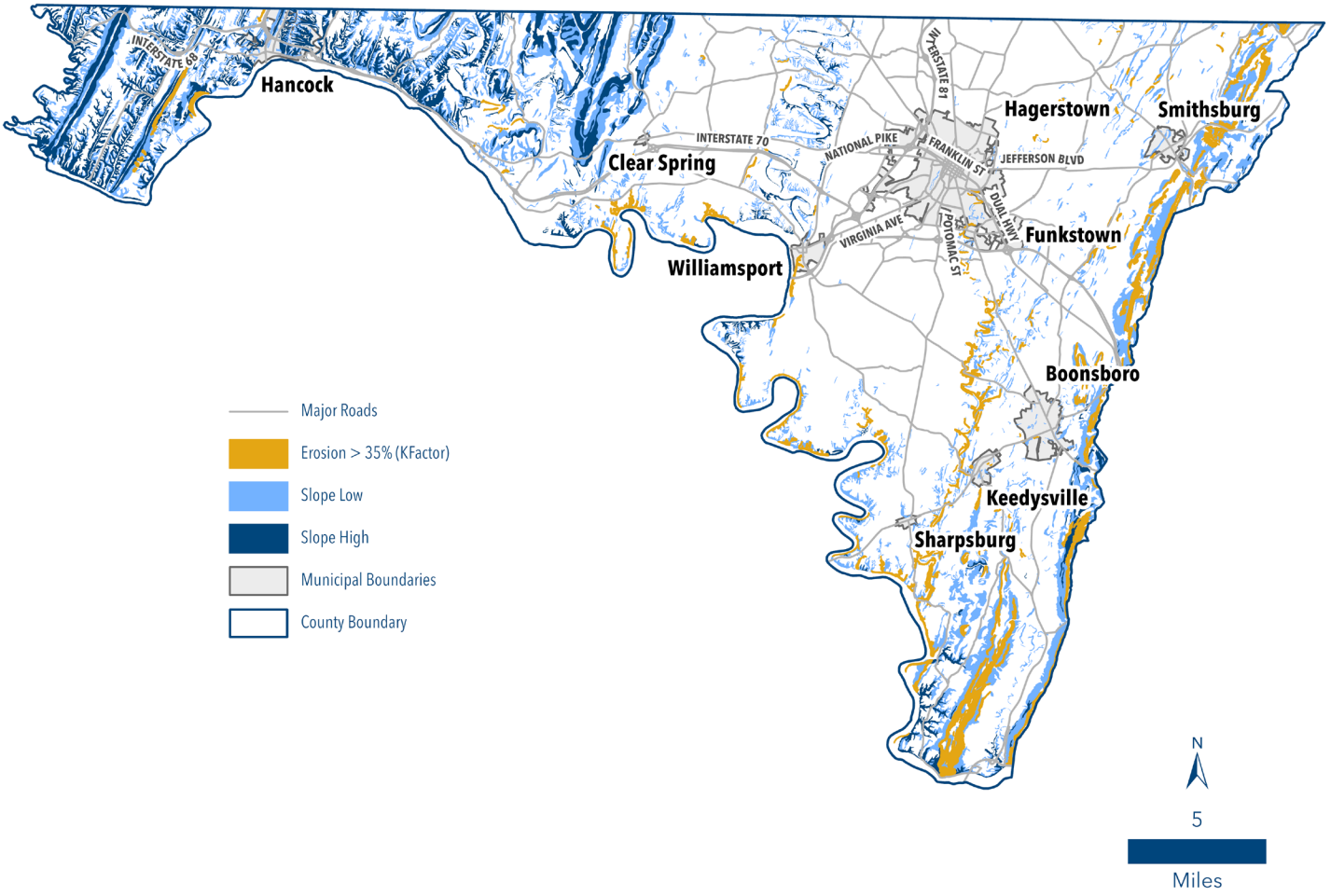
In addition to the environmental impacts of disturbing steep slope areas, there are physical hazards that can occur. Slope failure, a process more commonly known as a landslide, is a potential threat to public safety often resulting from improper development on steep slopes. Natural and human factors can contribute to potential slope failure. Natural risk factors include: water (soil saturation), slope (the steeper the slope, the more susceptible it is to failure), and geology (underlying rock types). Man-made factors that can cause landslides include: changes in slope (such as from road building), excess loading (construction or filling land), changes in vegetative cover, and shocks and vibrations.

Due to the severity of the topography and the nature of the underlying geology, Washington County has a reasonably high potential for slope failure. Relatively low population densities in the areas where steep slopes occur in Washington County mean that the incidence of significant property damages or bodily injury resulting from landslides is much lower than the potential. The drainage capacity of the soils underlying developed parts of the County also aids in lowering the incidence of losses due to landslides.

Steep slopes are also places that support biodiversity by creating a range of unique microhabitats that don't occur in more uniform terrain. Some of these species may have been protected from past disturbance due specifically to the severity of the terrain, allowing rare species to survive and perhaps even thrive to a degree that wouldn't be possible in a habitat with a greater incidence of disturbance. The protection of steep slope areas is, therefore, potentially instrumental in preserving the habitat of rare, threatened or endangered species.

Steep slopes are located in the Ridge and Valley Physiographic Province in the western part of Washington County as well as in the vicinity of major creeks such as the Conococheague, Licking, and Antietam Creeks, and along parts of the Potomac River. There are also steeply sloped areas in the Blue Ridge Province along South Mountain and Elk Ridge. The map below shows the location of steep slopes throughout the County.

Map 12-10: Steep Slopes



Steep Slope Regulation

Steep slopes are defined in multiple County Ordinances, including the Subdivision, Zoning and Forest Conservation Ordinances. Steep slopes as defined as those which are greater than 25%, or greater than 15% where the erodibility coefficient (K Value) is greater than 0.35. The Subdivision and Zoning Ordinances prohibit the location of septic systems or septic reserve areas on steep slopes and in Forest Conservation easements. BMPs recommended by the Soil Conservation District may be required by the Planning Commission for any development in steep slope environments under these Ordinances. The Forest Conservation Ordinance (Article 8) specifically targets steep slopes as priority locations for the retention or planting of forest cover, including in the establishment of new forest banks.

Restricting intense land use on steep slopes is often unnecessary due to the impracticality and high costs associated with engineering and construction in such an environment. Such projects require elaborate design for stable structures and often dictate a move to a more friendly terrain. Still there are uses that can overcome the limitations or occasions where the slope is an advantage for aesthetic reasons. These land uses should provide for the protection of the slope against damage during and after construction.

SENSITIVE AREAS RECOMMENDATIONS

- ★ Create linkages between priority natural resource lands to create a comprehensive system of protected lands that offer greater benefits than can be achieved with the protection of isolated parcels.
  - ➢ Link developed areas to natural resource lands for purposes of tourism, community health, environmental protection.
  - ➢ Maximize the use of existing land preservation programs that offer natural resource land protection (i.e. - CREP, Rural Legacy, Forest Conservation Fund spending, etc.) to achieve conservation goals.
  - ➢ Consider permitting overlapping land preservation easements where easements protect different natural resources (i.e. - agricultural easements that do not protect forest cover). CREP contract, MALPF, Rural Legacy and Program Open Space lands are examples of where this could occur after preliminary consultation with State or federal partners.
  - ➢ Investigate the creation of a weighted ranking system to develop a priority list of lands where multiple sensitive areas overlap to identify where to focus protection efforts.

- ★ Continue to pursue a multifaceted approach to enhance water quality throughout the County. Opportunities include:

  - ➢ Inventory County owned lands for their potential use to satisfy stormwater or forest conservation mitigation requirements for County development projects.

  - ➢ In addition to current efforts to create forested stream buffers along the Antietam and Conococheague Creeks, target use of Forest Conservation Fund spending for the protection of existing forest, or creation of new forest in the Upper Beaver Creek Watershed to support native brook trout habitat. Forest banking offers another potential method of creating or retaining forest cover in this watershed.

  - ➢ Investigate opportunities to designate additional wellhead protection areas, particularly in areas underlain by Karst topography, to protect drinking water supplies.

- ★ Utilize undeveloped portions of park lands for natural resource enhancement or protection.

  - ➢ Many parks contain open areas which are available to visitor use, but do not contain facilities or amenities for visitors to use. Such areas should be considered tree planting or wildlife habitat restoration projects if they are located in sections of parks that are unlikely to be developed in the future (i.e. – distant to access points, unsuitable topography, etc.). Regional scale parks, or public lands along waterways should be strongly considered.

- ★ Review the current list of Special Planning Areas and determine whether updates are needed to either the areas being included for protection or the regulations that govern them.

  - ➢ Recommend creation of Watershed Protection Special Planning Areas, as identified in this chapter, to provide broader water quality protection and conservation of riparian and aquatic habitats in high quality County watersheds. Further study of these new areas should define regulatory standards for new SPAs while examining their relationship to the existing Upper Beaver Creek and Smithsburg/Edgemont Reservoir Watershed SPAs. Ordinance changes may be warranted after further study.

- ★ Utilize Federal and state level programs such as Environmental Site Assessments, Rural Legacy Program and others to enhance sensitive area protection.