Section II

Green Infrastructure Plan: A Countywide Functional Master Plan

Green Infrastructure Plan: A Countywide Functional Master Plan

Percentage of strategies implemented in the 2005 Green Infrastructure Plan: **87%**

Percentage of the County covered by forests and trees: **52%**

Annual values of canopy coverage in stormwater dollars:

$12.8 billion

Percentage of watersheds in 2005 with poor or very poor water quality: **93%**

Resource Conservation Plan

Our Vision for the Future

Plan 2035 contains a broad vision for our future. The following vision statement reflects how the implementation of the 2017 Green Infrastructure Plan could shape the future in support of the healthy, vibrant, connected communities envisioned in Plan 2035.

In 2035, Prince George's County is distinguished as having clean air, clean water, abundant and accessible open and green spaces, and thriving communities supported by local green jobs.

Prince George's County is the community of choice for families, businesses, and workers in the region because of our healthy green communities and our thriving green economy.

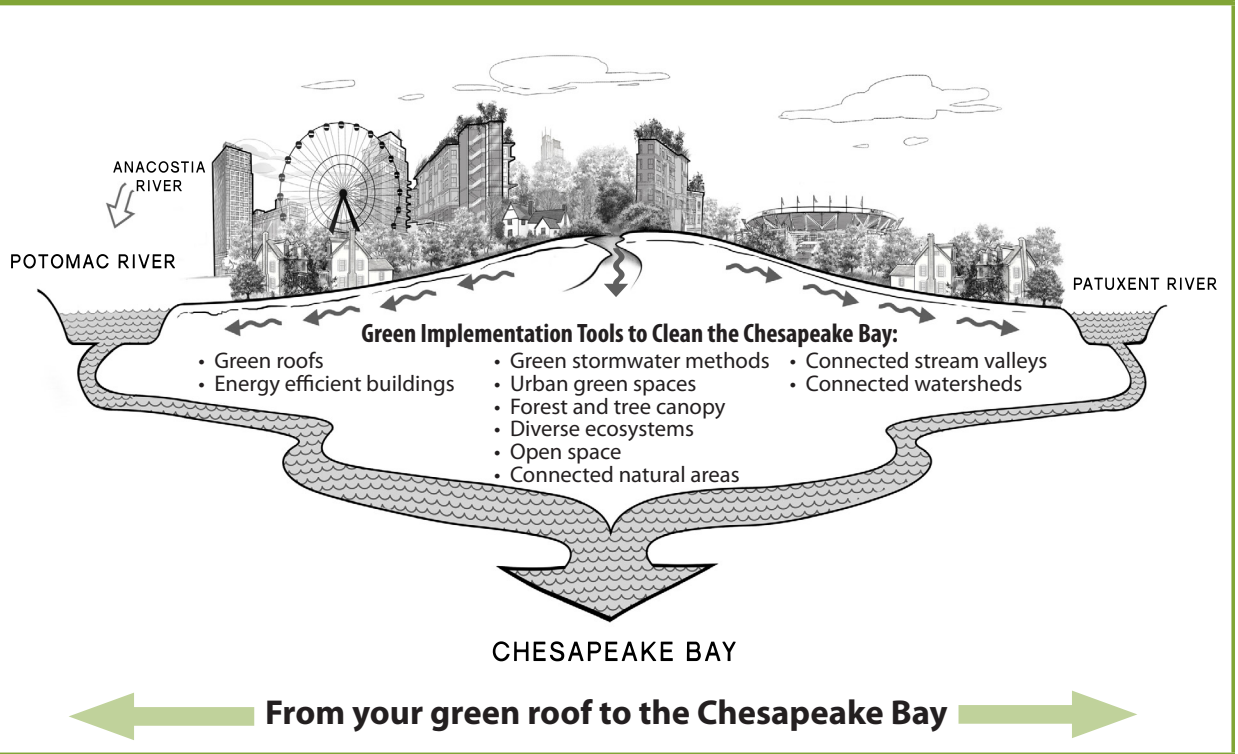
TABLE OF CONTENTS

BACKGROUND

In 2005, Prince George's County adopted and approved the 2005 *Approved Countywide Green Infrastructure Plan* (2005 Green Infrastructure Plan or GI Plan) to protect the integrity of ecological features of countywide significance through the planning, land acquisition, and land development processes. The 2005 GI Plan was driven by the direction provided in the County's 2002 *Prince George's County Approved General Plan* (2002 General Plan). It has helped guide County decision-making to ensure ecological connectivity, reduce forest fragmentation, improve water quality, and direct limited resources to priority areas for over a decade.

The term Green Infrastructure was introduced in the mid-1990s to describe and place value on the interconnected natural areas benefitting wildlife and humans. In more recent years, the meaning of the term has been expanded to include green stormwater solutions that use plants or mimic natural systems to clean polluted runoff.

Figure 2. Elements Included in the Definition of Green Infrastructure



Elements included in the definition of Green Infrastructure for this plan start where the rain falls on our green roofs, flows into bioretention areas, through natural areas, into streams and rivers, and into the Chesapeake Bay.

The definition of Green Infrastructure is being expanded from the definition used in 2005 (strictly an ecological approach) to one that embraces the full spectrum of the definition of Green Infrastructure as illustrated above.

The purpose of the GI Plan is to provide broad countywide strategies and recommendations as a tool to guide future development activity and preservation, and to provide a foundation to achieve its stated goals. It should not be construed as superseding, or conflicting with, codified criteria for development.

Analysis of 2005 Green Infrastructure Plan Implementation To-date

During the preplanning phase of this plan, the 2005 GI Plan policies and strategies were analyzed to determine which ones have been implemented and to provide recommendations for updated policies and strategies. The analysis showed that a majority of the strategies in the 2005 GI Plan have been implemented, resulting in the need for a plan update. The results of this analysis are summarized in Table 1 below.

Table 1. 2005 Green Infrastructure Plan Strategy Implementation Status

Total Strategies	**92**
Completed	26
Completed and ongoing	11
Ongoing	43
Not started	12
TOTAL IMPLEMENTED	80
PERCENT IMPLEMENTED	87

The analysis showed that of the 92 strategies in the 2005 plan, 80 have either been completed or are completed and ongoing in their implementation. This includes the preparation of key environmental legislation updates such as the stormwater management ordinance, woodland conservation ordinance, and the Chesapeake Bay Critical Area ordinance. The analysis document can be found in the RCP Technical Summary.

This plan builds on the policies and strategies of the 2005 GI Plan to achieve the County's long-term vision of an interconnected network of significant countywide environmental features that retains ecological functions, maintains or improves water quality and habitat, and supports the desired development pattern of the general plan. This plan expands the definition of green infrastructure to include elements that green the built environment.

Conservation of Green Infrastructure

Each plan within the RCP provides a more detailed definition of conservation as appropriate for that plan. Because this plan uses a broad definition of green infrastructure, the definition of conservation is equally broad—conservation of natural resources, energy resources, and human resources are included.

Figure 3. Definition of Conservation in the 2017 Green Infrastructure Plan

As noted in Section I: Overview, the word **conservation** can be defined as:

The action of conserving something, in particular:

- Preservation, protection or restoration of the natural environment, natural ecosystems, vegetation, and wildlife.
- Preservation, repair, and prevention of deterioration of archeological, historic, and cultural sites and artifacts.

The Green Infrastructure Plan seeks to conserve and connect the remaining significant ecological resources in the County and restore lost connections where appropriate while implementing the desired development pattern of Plan 2035. It also provides guidance on greening the built environment, reducing energy consumption to conserve global resources, and providing residents with healthier, more connected places to live.

The 2017 *Green Infrastructure Plan: A Countywide Functional Master Plan* (Green Infrastructure Plan or GI Plan) is written to function in concert with the other two elements of the RCP—the *Agriculture Conservation Plan: A Countywide Functional Master Plan* (ACP) and the *Rural Character Conservation Plan: A Countywide Functional Master Plan* (RCCP). It aligns with the goals of these plans through strategies to address green and open spaces and to preserve irreplaceable elements in our landscapes such as the designated Special Conservation Areas. Together, these three plan elements will help to guide growth appropriately throughout the County, ensuring that significant environmental features are conserved and green elements are incorporated into all communities in support of a green economy.

This plan amends the related policies and strategies of previously approved plans, in particular the following:

- Plan 2035
- 2005 Green Infrastructure Plan
- 2010 Water Resources Plan

Summary of Community Input

The 2005 GI Plan built upon the public input and direction provided by the 2002 General Plan. This sequencing is being repeated as the 2005 GI Plan is being updated after the approval of Plan 2035 in 2014. As noted in the Overview section, the public input process consisted of three community input sessions where participants were asked what they wanted to see more of and less of in the three subject areas covered in the plan: green infrastructure, agriculture, and rural character. These sessions were followed by an open forum where a summary of the input to-date was provided and an opportunity was given to comment on draft maps. An input session was also held to focus on the issues of interest to municipalities.

For most participants, issues of interest relevant to the GI Plan included:

- Prioritize restoration and protection of ecological green infrastructure inside the Capital Beltway.
- Acknowledge the importance of connecting wildlife corridors in urban areas to improve ecosystem services.
- Provide larger riparian buffers and shoreline protections.
- Don't build green stormwater infrastructure in places that are forested (don't sacrifice forests for a stormwater management structure).
- Preserve and/or restore stream health and functions.
- Require that trees transplanted be native, supportive of habitat, and planted in such a way to ensure their longevity.
- Remove invasive plants.
- Adopt restrictions on hydraulic fracturing and other unsustainable energy sources.
- Require public projects to meet environmental requirements.
- Grant fewer exemptions from the Tree Canopy Coverage Ordinance requirements.
- Consider addressing the causes of climate change/sea level rise/extreme weather events.

Public agencies also came together during the development of the RCP to discuss the plan contents and future implementation. Each agency saw how their work is reflected in the plan and sought ways to participate in its implementation. Just as the implementation of Plan 2035 will involve the coordinated efforts of everyone, the RCP must involve public agencies and nonprofits, places of worship and educational institutions, and businesses and volunteers in its implementation. The GI Plan's implementation is particularly dependent upon interagency and nonprofit coordination because there are so many people working toward the same environmental goals. The County's Watershed Implementation Plan (WIP) is one example of an ongoing, multiagency project where a coordinated effort is necessary.

For a summary of the public input provided for all three elements of the RCP, refer to the Section I: Overview. Full summaries of all of the public input sessions are available in the RCP Technical Summary.

PLAN GOALS

The goals of the 2017 GI Plan are to support the desired development pattern of Plan 2035 by:

- Preserving, enhancing, and/or restoring an interconnected network of significant countywide environmental features that retains ecological functions and improves water quality.
- Increasing connectivity of built and natural green spaces.
- Improving wildlife habitat.
- Addressing energy efficiency and the need for green buildings and jobs.
- Improving overall human health by providing equitable access to connected open and green spaces throughout the County.

The GI Plan provides guidance for decision-making at all levels of government, businesses, developers, nonprofits, and associated organizations; provides the framework for conservation of natural areas; and supports the creation of thriving, energy efficient communities.

MEASURABLE OBJECTIVES

The 2005 GI Plan contained eight measurable objectives. Technology changes and a lack of trend data rendered the eight measurable objectives difficult to track. The 2017 GI Plan narrows the focus of its measurable objectives to two policy areas that provide the most tangible and measurable benefits to human health—water quality and forest and tree canopy coverage.

Objective One:

In 2035, water quality in the majority of the County's watersheds will be improved.

The water quality analysis results in the RCP Technical Summary, based on water quality sampling between 1999 and 2013, show that there has been no statistical improvement in water quality in the County's watersheds. The analysis provides several reasons for the lack of improvement. The most important reason is that it takes a very long time and a significant amount of effort to improve water quality in any particular watershed.

The County's WIP provides a full spectrum of strategies and approaches to improve water quality. The WIP is the County's blueprint moving forward and should be supported in all aspects of land use decision-making. From land acquisition for conservation, to the approaches to stormwater management on new development projects, everything needs to support the improvement of water quality.

"In order to turn around the effects on our streams of decades of untreated, polluted runoff, and improve our water quality, we need:

everyone, doing everything, everywhere."

–Adam Ortiz, November 2, 2015, Director, Department of the Environment

This objective will be measured as part of the WIP. Continued water quality sampling should be supported in order to report on the future progress of this objective. The strategies contained in this plan support reaching this objective.

Objective Two:

In 2035, there will be 52 percent forest and tree canopy coverage countywide.

An advanced forest mapping tool used with geographic information system (GIS) map layers became available in recent years to measure countywide forest and tree canopy coverage more accurately. The results showed that 52 percent of the County was covered in forest and tree canopy in 2009. The 2009 data were further evaluated to determine that, of that 52 percent forest and tree canopy coverage, 44 percent is considered forest canopy and 8 percent is tree canopy. As shown in Figure 3, while 52 percent of the County was covered by forest and tree canopy in 2009, an additional 39 percent of the County was identified as being able to accommodate canopy coverage (identified as possible tree canopy or TC vegetation and impervious areas that are not buildings, roads, and parking). The areas of possible tree canopy are areas where trees could be planted to increase canopy coverage, especially in built areas where the canopy coverage will provide multiple benefits related to human health such as reduced temperatures and improved water quality.

Maintaining the 52 percent goal in 2035 will require a variety of strategies to improve preservation and increase planting. Tree planting alone will not result in the maintenance of this percentage because the focus of development has not yet shifted away from clearing forests for development. What will be needed is a concerted effort to implement the development patterns proposed in Plan 2035 and move away from suburban sprawl development on forested and undeveloped sites and onto more urban sites where the necessary infrastructure for development already exists. Combining these efforts with an improved Tree Canopy Coverage Ordinance should result in the conservation of sufficient forests and the planting of a sufficient number of trees to meet the goal of 52 percent in 2035. For more information and analysis regarding canopy goals, see the 2010 *Forest Canopy Assessment Study* in the RCP Technical Summary.

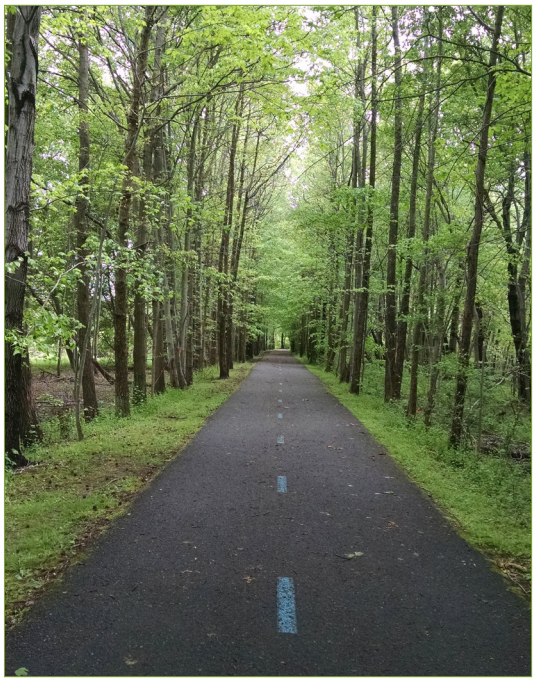
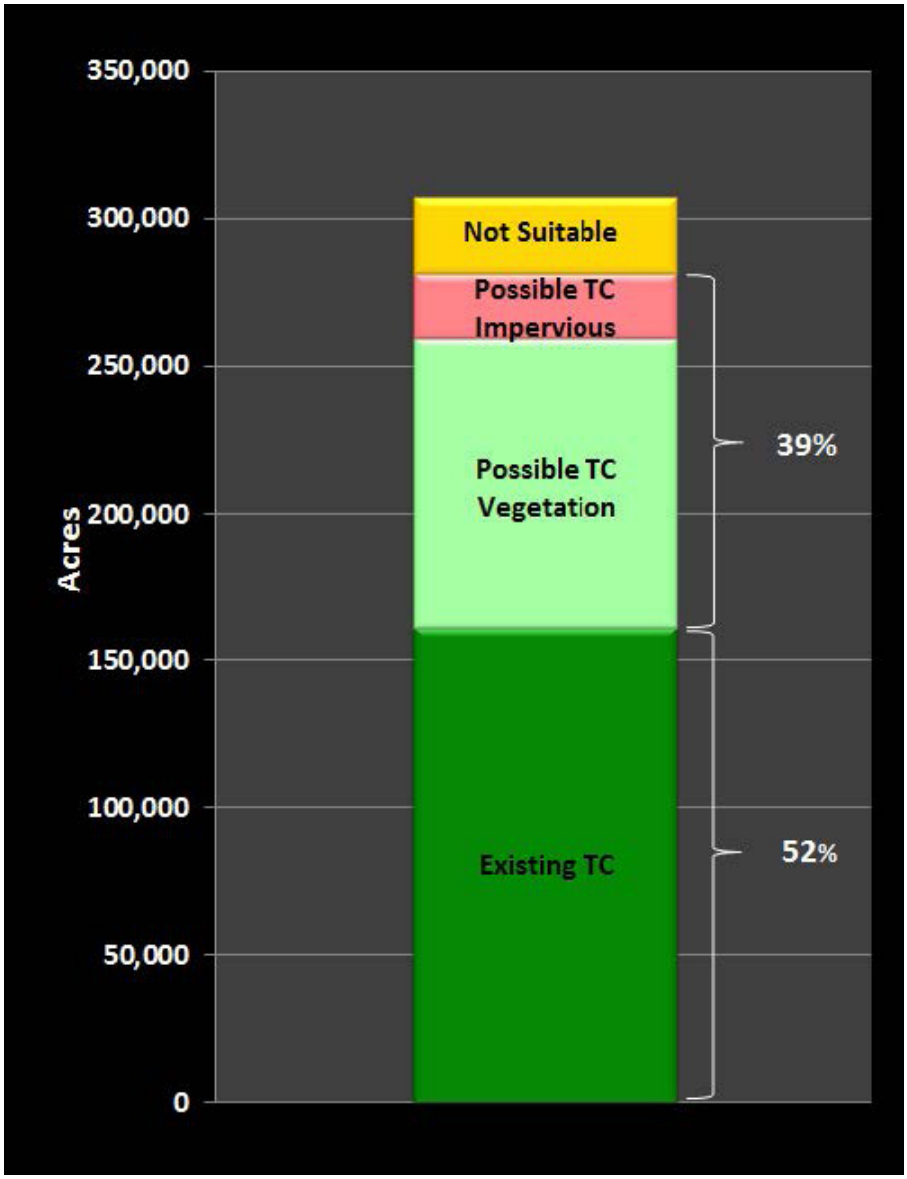


Figure 4. Existing and Possible Forest and Tree Canopy Coverage



In the same manner as the technological advances that occurred from 2000 to 2009 resulted in vastly improved data for mapping the green infrastructure network, and certain difficulties in comparing land-based features over time, in the future the method of measuring forest and tree canopy may advance again. When this measurable objective is evaluated using the 2009 data as the baseline, the advances in technology should be acknowledged and appropriately accommodated.

Objective Three:

In 2035, 90 percent of the strategies under Greening the Built Environment will be implemented.

Building greener has multiple benefits to the environment and to people. Green spaces are essential to urban dwellers, providing places to gather and interact with nature. Green buildings are healthier and use fewer resources. They focus on building methods and siting that consider natural and passive energy use, limited impacts on natural resources, and conserving and reusing stormwater. Their interiors have fewer impacts on human health in the form of off-gases from materials and improved air circulation. While the Leadership in Energy and Environmental Design (LEED) standards have been used extensively, other standards for site work and neighborhood design are being developed and should be considered as the science and technology evolves.

Purpose and Need for the Plan

Since 2005, the GI Plan has provided guidance for land use decision-making that has resulted in meaningful progress toward conservation and connectivity of natural areas in the County, while supporting the desired development pattern of the 2002 General Plan. There are many reasons that the 2005 GI Plan needs to be updated. The five primary reasons are:

1. Plan 2035 provides direction for the preparation of an updated green infrastructure plan.
2. The GI network map needs to be updated to reflect the current delineation of Regulated Areas as defined in the County Code (updated in 2010 as recommended by the 2005 GI Plan) and Evaluation Areas as necessitated by poor water quality and changes in state priorities for conservation.
3. State and federal regulations require addressing water quality at the county level. The policies and strategies in the updated GI Plan will address water quality.
4. Green buildings, energy conservation, and the generation of clean energy need to be addressed in a land use master plan.
5. The vast majority of the strategies in the 2005 GI Plan have been implemented (87 percent).

Success in creating an interconnected network of ecological features requires a concerted effort that includes the following activities:

Preserving resources in place and ensuring that the changes around them do not inhibit their ability to survive.

Enhancing the existing ecosystem. This includes such actions as removal of invasive plants and planting of native plants.

Connecting the physical attributes on the ground that exist today and creating connections where they do not currently exist. Connections could be created through preserving or planting of green corridors or simply providing a row of street trees to connect pollinators to green spaces.

Restoring ecosystem elements that may have been lost or restoring lost ecosystem services.

Protecting resources through a variety of mechanisms such as placing an easement over the land or placing it in public protection where appropriate.

Maintaining the natural and constructed elements of the green infrastructure network to ensure they will function properly over time.

POLICY AREAS

Preserving, Enhancing, and Restoring a Green Infrastructure Network

Land use plans typically direct growth and describe a desired development pattern for a given area. Plan 2035 envisions growth occurring where existing gray infrastructure such as roads and public utilities exist, and growing less in the greenfields areas of the County where this infrastructure does not exist or is less prepared to absorb new growth. The green infrastructure network also provides guidance on where and how to grow by mapping sensitive natural resources and helping to shape development that occurs.

Placing of land within the network does not prohibit development. The purpose of the network is to shape development in a way that allows the natural resources to continue to be connected and functioning after the development occurs. The network is not used for analysis unless an application is made to the County for disturbances, or in other words, it has no effect unless or until a property owner submits an application.

While green buildings, energy efficiency, and renewable energy are part of the 2017 GI Plan, they are not intended to be placed within the network. As constructed elements, they should be placed outside the network wherever possible to support the preservation of the natural environment.

The 2017 Countywide Green Infrastructure Network Map (Map 1) is conceptual in nature and illustrates a generalized pattern for ecological green infrastructure conservation in the County. It is envisioned as an assessment tool that is used to evaluate the role of a specific location within a larger ecological system. The map should be viewed as a guide to decision-making that demonstrates a vision of interconnected natural areas that also includes community forests and local tree canopy coverage. The network map should also be used as a guide when Network Gaps are identified during the preparation of master and sector plans and during the review of land development applications. Because the map was created using GIS layers that do not provide site-specific information, it should not be used at the site scale for taking measurements or to assess exact acreages of a property within the network.

The network identified on Map 1 is not precisely comparable to the network identified in 2005 because the technology has advanced to the degree that an equal comparison is not possible. Generally speaking, the 2017 network map covers more land area than the 2005 network. There are two reasons for the land area increase. First, the technology used for the 2017 map captures a finer grain of detail when mapping streams and other natural elements than was possible in 2005. Secondly, the updated network incorporates community canopy coverage areas within the Evaluation Area because of the need to address the urgent countywide issue of water quality (see Figure 4).

Map 1. 2017 Countywide Green Infrastructure Network

Regulated Areas represent a conceptual delineation of connected regulated environmental features including streams, wetlands and their buffers, the 100-year floodplain, and their adjacent steep slopes. The features shown are the known locations of regulated features at a large scale. This delineation should not be used for land development purposes. Approval of a Natural Resource Inventory is required to confirm the locations of regulated environmental features (streams, wetlands, floodplains).

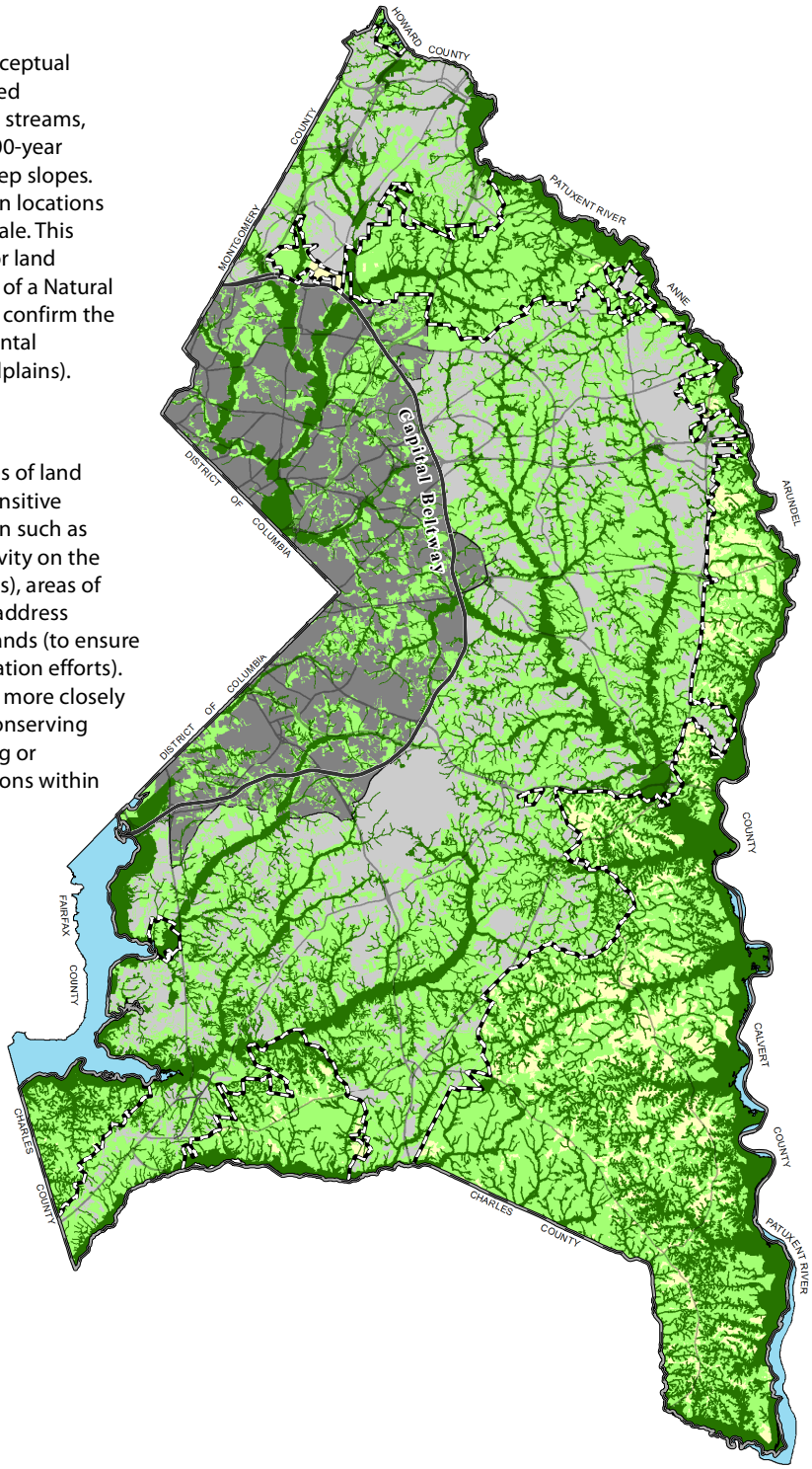
Evaluation Areas include patches of land known to contain one or more sensitive environmental features of concern such as interior forests (to focus connectivity on the largest remaining blocks of forests), areas of predicted wetland migration (to address climate change), and protected lands (to ensure connectivity to previous conservation efforts). Evaluation Areas are used to look more closely at the role the location plays in conserving sensitive resources and preserving or establishing land-based connections within the network.

Mapping Criteria for Evaluation Area:
To be included in the Evaluation Area, patches must be:

a. 1 acre or greater in size
b. within 200 feet of another patch inside the Beltway
c. within 600 feet of another patch outside the Beltway

and

d. at least 50 feet wide outside the Beltway and no minimum width inside the Beltway



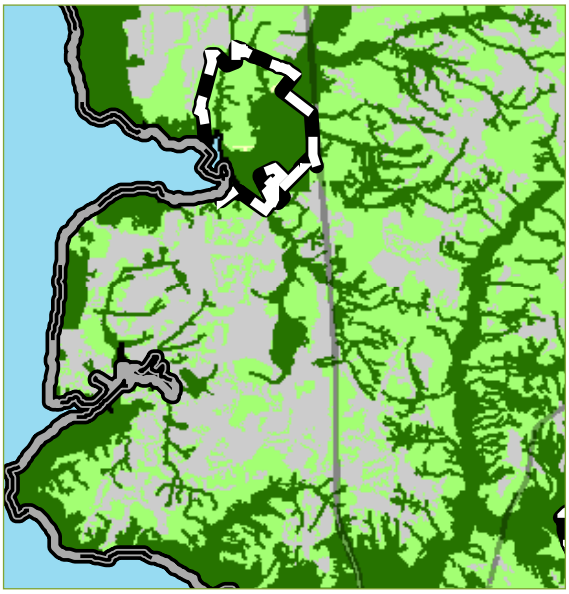
Mapping the Green Infrastructure Network

The designated green infrastructure network is an interconnected map that contains environmental features that are of countywide significance. The network shown in Map 1 was developed using mapping data from 2009 to determine the Regulated Areas of countywide significance, based on the current regulations for protecting sensitive environmental features in the County Code, as amended to reflect the mapping criteria. Evaluation Areas containing current data from various years were added to reflect areas that contain environmental features of concern for conservation. For a summary of the methodology used to create the network map, refer to the RCP Technical Summary.

In general, the Regulated Areas are the combination of the following elements:

- Streams and wetlands and their associated buffers
- One hundred-year floodplains
- Adjacent slopes 15 percent or greater.

Figure 5. Close-up of Green Infrastructure Network



To map the Regulated Areas for the network map, the first step is to map the environmental features listed above countywide. If a segment of stream or wetland and their associated buffers were not connected to the overall network those segments were removed from the Regulated Area mapping. In the 2005 network mapping, in order to remain within the network, a stream corridor had to have associated forested corridors that were at least 200 feet wide outside the Capital Beltway (no limit inside the Beltway). Because our current water quality is so poor, and we are obligated by law to clean up the water, all streams identified in the network are included within the 2017 network countywide whether a forested corridor remained or not (the requirement to have a 200-foot-wide forested corridor was eliminated). This resulted in a Regulated Area portion of the network that includes more stream segments and associated floodplains and slopes than were included in the 2005 plan. This is necessary to protect and improve water quality countywide (see Objective One) and to provide more opportunities for preserving and replanting forests (see Objective Two).

The Evaluation Areas were mapped by combining various environmental data sets including conservation easements, potential forest interior dwelling bird habitat areas, and wetland migration areas. Where features were not connected to the network, or were separated by distances beyond the mapping parameters, features were deemed to not be of countywide significance; however, because these areas are mapped on the countywide data maps, they can be identified during later stages of review and should be considered for inclusion as a designated Network Gap.

While some of the Evaluation Area site features are regulated by the County and/or the state, their exact position on the ground cannot be determined, because many of these layers, especially the layers generated by the state, are conceptual in nature. This results in the need to treat the network map as a conceptual guide to decision-making.

The 2005 green infrastructure network identified Network Gaps in addition to the Evaluation and Regulated Areas. Countywide identification of potential Network Gaps was not performed with the updated network because the network is too complex and the future opportunities for connectivity are too broad to make these important decisions at the countywide scale. As properties are evaluated at a smaller scale, either through the land development or preservation processes or during the master or sector plan process, the identification of Network Gaps and opportunities for connectivity should be explored.

Using the Network

When using digital mapping, a level of detail is implied that does not exist on the ground. For example, a line on a map may be a straight line, or it may be simply connecting two points reporting the same data. The boundaries of the Regulated and Evaluation Areas appear to be straight lines that could be used for specific measurements; however, the data used to create the network map were prepared using differing parameters and datasets, resulting in the need to view the resulting outline as a conceptual line for broad review purposes.

During the land development process the Regulated and Evaluation areas receive different levels of consideration. The Regulated Areas are considered conceptual until their features and their buffers are mapped in greater detail on an approved Natural Resource Inventory (NRI). Streams, wetlands and floodplains that make up the conceptual Regulated Areas are referred to as Regulated Environmental Features in the County Code and their locations are mapped on a plan drawn to scale on the NRI. Impacts to regulated environmental features are recommended for approval only where necessary for construction of road crossings, the installation of necessary public utilities, or the placement of stormwater outfalls when no alternatives are feasible.

The Evaluation Areas will be considered during the review process as areas of high priority for on-site woodland and wildlife habitat conservation and restoration of lost connectivity. These areas should be considered before the use of off-site conservation options. Properties that contain evaluation areas will develop in keeping with the underlying zoning and in conformance with the other regulations of applicable ordinances; however, consideration must be given to the resources that exist and their priority for preservation, restoration, and permanent conservation.

Areas where there are opportunities to make critical connections in the green infrastructure network and/or to restore areas and enhance the ecological functioning of the network should be identified as Network Gaps during the review process.

Mapping Special Conservation Areas

Areas of specific countywide significance in need of special attention have been identified on Map 2. These areas, identified as special conservation areas (SCAs), contain unique environmental features that should be carefully considered when land development proposals are reviewed in the vicinity to ensure that their ecological functions are protected or restored and that critical ecological connections are established and/or maintained to the areas. This is particularly important when Network Gaps are identified. Connections to and around these areas improve the long-term sustainability of the SCAs.

Other wildlife habitat types of countywide significance exist that are unique and in need of conservation. Many of these habitats occur within the network's Evaluation Areas that should be used to determine where Network Gaps need to be identified.

The following are general descriptions of the thirteen Special Conservation Areas. The numbers refer to the designations of each SCA on Map 2.

1. **Beltsville Agricultural Research Center—**The Beltsville Agricultural Research Center (BARC), located in the northern part of the County, is owned by the U.S. Department of Agriculture and includes approximately 6,500 acres. It is among the largest and most diversified agricultural research complexes in the world. BARC has experimental pastures, nurseries, orchards, gardens, fields for cultivated crops, and forested ecosystems. This complex has large areas of open space that provide important ecological and wildlife network connections. The site also contains a wide variety of habitats that provide extensive research opportunities. Its placement in the green infrastructure network's Evaluation Area emphasizes that any future land use of the area should be carefully considered.

2. **Patuxent Research Refuge—**The Patuxent Research Refuge is the nation's only national wildlife refuge established to support wildlife research. The refuge is 12,841 acres in size and is owned by the U.S. Department of Interior, Fish and Wildlife Service; 4,300 acres of the refuge are located in Prince George's County. Throughout decades of change, Patuxent's mission of conserving and protecting the nation's wildlife and habitat through research and wildlife management techniques has remained virtually unchanged. The site also contains the National Wildlife Visitor's Center, providing educational opportunities related to wildlife conservation.

   The land that comprises the Patuxent Research Refuge supports a wide diversity of wildlife in forest, meadow, and wetland habitats. The land is managed to maintain biological diversity for the protection and benefit of native and migratory species. During the fall and spring migrations, many waterfowl species stop to rest and feed. Over 200 species of birds occur on the refuge. A nesting pair of bald eagles has used the refuge since 1989. The Refuge is expanding their investigation of other areas for land conservation efforts in order to ensure a sustainable land base for the wildlife the Refuge supports.

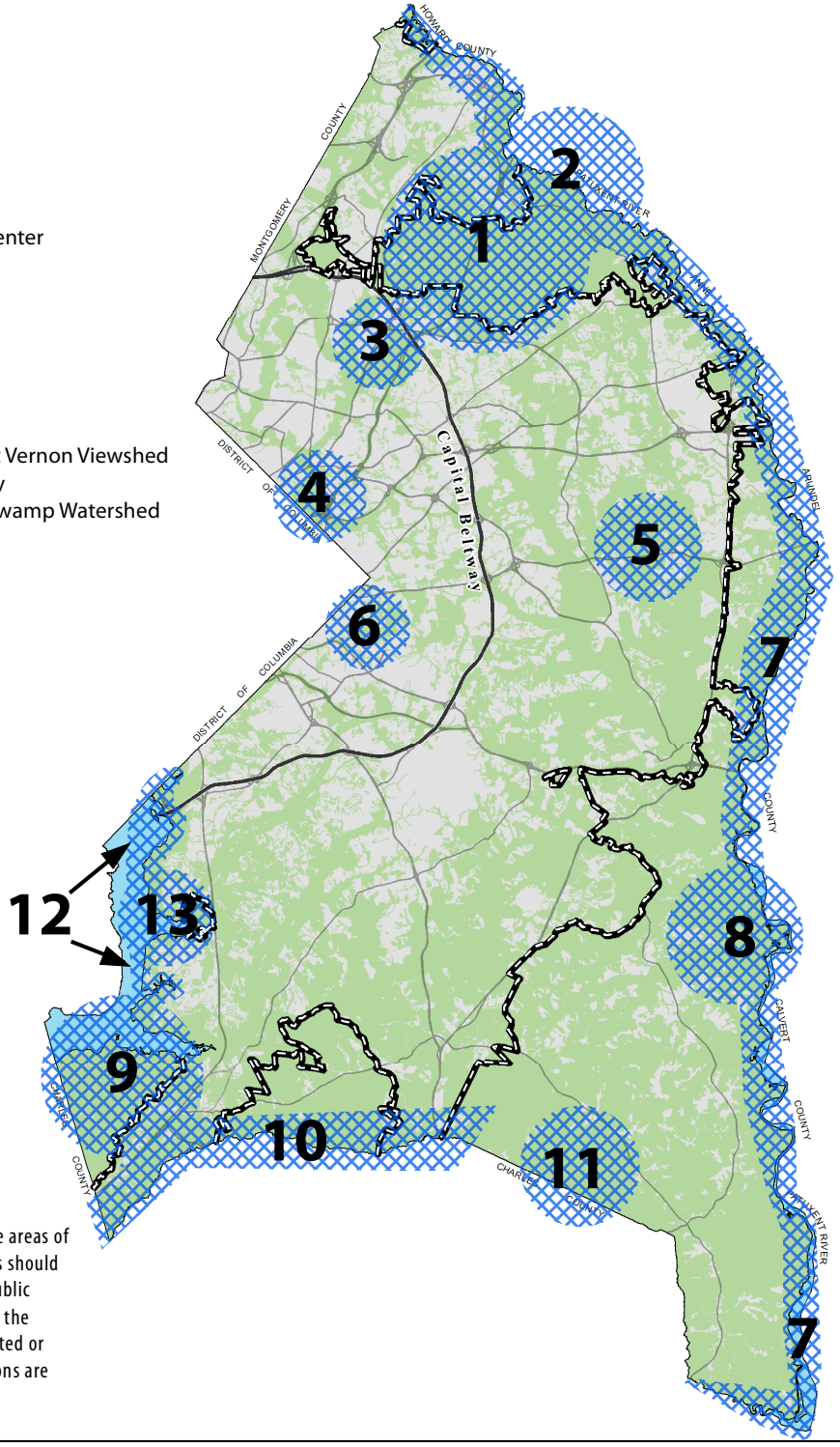
   Particular attention should be given to minimizing forest fragmentation in the area. The refuge is one of the largest forested areas in the mid-Atlantic region and provides critical breeding habitat and an important nesting area for a variety of bird species. Biologists at the refuge have found that increasing forest fragmentation due to urban development has reduced many populations of neotropical migratory birds utilizing the refuge.

3. **Greenbelt National Park—**Greenbelt National Park is one of the largest natural sanctuaries located within the urbanized areas in the region. The mixed evergreen/deciduous forest provides a refreshing escape. The park's 1,100 acres provide facilities for camping, hiking, cycling, picnicking and a variety of other outdoor pursuits. The park is owned and operated by the National Park Service. Greenbelt National Park provides a large area of connectivity within the larger context of the inner-beltway communities. Connections surrounding the park should be maintained and enhanced or restored whenever possible.

Map 2. Special Conservation Areas

Special Conservation Areas

1. Beltsville Agricultural Research Center
2. Patuxent Research Refuge
3. Greenbelt National Park
4. Anacostia River
5. Belt Woods
6. Suitland Bog
7. Patuxent River Corridor
8. Jug Bay Complex
9. Piscataway National Park / Mount Vernon Viewshed
10. Mattawoman Creek Stream Valley
11. Cedarville State Forest / Zekiah Swamp Watershed
12. Potomac River Shoreline
13. Broad Creek



Note: **Special Conservation Areas** comprise areas of significant conservation concern. These areas should be carefully considered when land use and public acquisition decisions are made to ensure that the ecological functions of these areas are protected or restored and that critical ecological connections are established and/or maintained.

Legend

- Special Conservation Areas
- Final Green Infrastructure Network
- Plan 2035 Growth Boundary

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4. **Main Stem of the Anacostia River—**The Anacostia River main stem (from the County line to the confluence of the Northeast and Northwest Branches) contains tidal waters that flow landward into one of the farthest points in Prince George's County. This highly manipulated urban waterway is an important historic spawning ground for anadromous fish such as alewife herring, blueback herring, hickory shad, white perch, striped bass, yellow perch, American eel, and sea lamprey. These species spend most of their lives in saltwater but return to fresh water to spawn. For the past thirty years, the Anacostia main stem and the freshwater tributaries immediately upstream have been the focus of efforts to improve the waterways through reducing flooding, removal of stream blockages, improving stream bank stability, replanting lost stream buffers, and improving water quality. The goal is to reopen the historic spawning grounds and to replace important portions of the green infrastructure network that were denuded as the Washington metropolitan region expanded. As development and redevelopment within this watershed occur, lost habitat should be restored and water quality should be improved.

5. **Belt Woods—**Belt Woods is one of the few remaining old-age upland forests in the Atlantic Coastal Plain physiographic province. It is an upland hardwood forest dominated by tulip poplar and white oak, supporting a dense and diverse bird population. The density of birds breeding at Belt Woods is among the highest observed on the East Coast. Critical wildlife connections and wetlands of special state concern support this system and should be maintained and enhanced. Development surrounding this site should be conducted sensitively and should consider the needs of the flora and fauna of this unique community. Belt Woods is owned by the State of Maryland and is managed by the Western Shore Conservancy. It is recognized by the National Park Service as a national natural landmark.

6. **Suitland Bog—**Suitland Bog is one of a few remaining Magnolia Bogs (also known as seepage bogs) that were once much more extensive in the region. Of the 30 or so bogs once known to exist in the Washington area, only a few remain. Suitland Bog is located inside the Beltway and includes approximately 60 acres of unique wetland habitat. The site is owned by The Maryland-National Capital Park and Planning Commission and is known for its rare plant life and a variety of carnivorous plants, as well as rare and threatened plants, that thrive there. The three most important impacts that could affect Suitland Bog are direct encroachment causing habitat loss, sedimentation, and alteration of surface and/or ground water flow patterns. Activities within the Suitland Bog watershed should maintain ground water flow to the bog, limit surface water flooding of the bog, and reduce or eliminate sediment reaching the bog.

7. **Patuxent River Corridor—**Efforts to protect the entire Patuxent watershed began in the 1960s through Maryland's Patuxent River Watershed Act, encouraging the seven counties bordering the river to preserve its natural lands. Today, The Maryland-National Capital Park and Planning Commission owns more than 7,400 acres of marshes, swamps, and woodlands along the river, known collectively as the Patuxent River Park. Together with many thousands of acres owned by the Maryland Department of Natural Resources and other counties, protected lands along the Patuxent compose one of Maryland's premier greenways.

   The preservation of the natural environment and the river's scenic character are priorities along this corridor. To this end, much of the Patuxent River watershed is located in the Rural and Agricultural Area, outside the public water and sewer area. The low-density zoning and the existing and proposed conservation methods of this plan should serve to add to the protection of this river and its tributaries.

8. **Jug Bay Complex—**Jug Bay Natural Area of the Patuxent River Park and the Merkle Wildlife Sanctuary.

   a. **Patuxent River Park/Jug Bay Natural Area—**The Jug Bay Natural Area of the Patuxent River Park, near Upper Marlboro, provides some of the best bird watching opportunities in

Maryland. More than 290 species have been recorded here, more than 100 of those confirmed as nesting, including the least bittern, which is a species in need of conservation. Jug Bay has been designated an Important Birding Area by the National Audubon Society. There is also a companion natural area across the river in Anne Arundel County—Jug Bay Wildlife Sanctuary—and together the complex exceeds 2,000 acres. The marshes here boast one of the largest stands of wild rice in Maryland, attracting large numbers of migrating sora rails and waterfowl in the early fall. Many of the visitors to this area, as well as residents of the surrounding community, enjoy the educational and recreational bird watching opportunities that are provided here. The area has been designated as a component of the Chesapeake Bay National Estuarine Research Reserve system, which encourages long-term research in the area. Jug Bay is often described as a microcosm of the Chesapeake Bay because of its wide range of ecosystems, with marsh and river surrounded by fields and forest. Jug Bay itself is a spectacular expanse of open water, where the Patuxent River slows to loop around high bluffs to the west in Prince George's County and spreads across low-lying areas to the east, forming one of the largest wetland systems on the western shore.

b. Merkle Wildlife Sanctuary—Merkle Wildlife Sanctuary is the only wildlife sanctuary operated by the Maryland Department of Natural Resources as a Natural Resource Management Area (NRMA). It is located adjacent to the Patuxent River Park/Jug Bay NRMA and comprises more than 1,500 acres of marshland, woodlands, farm ponds, and fields along the picturesque Patuxent River. The sanctuary ranks ninth on the Smithsonian Institution's Chesapeake Bay inventory of significant natural areas and contains the largest Canada goose wintering ground on the western shore of the Chesapeake Bay. Flocks of geese spend the winter at the sanctuary, and some remain for the summer to nest on the ponds and nearby marshes. Although the Jug Bay Complex includes a significant amount of land, one threat to its continued existence is water quality degradation. Within the Patuxent River watershed, special attention should be paid to maintaining and improving water quality.

9. Piscataway National Park and Mount Vernon Viewshed—Piscataway National Park was established by Congress in 1961 to preserve the view of the Maryland shore of the Potomac River from George Washington's home in Mount Vernon, Virginia. In his lifetime, George Washington wrote admiringly of the view, but the first written account of the landscape came from Captain John Smith. Smith visited the area in June of 1608, meeting with native inhabitants in a town called Moyaone, the political center of the Piscataway chiefdom. While the written record of the area dates back to Smith, archeological evidence, such as that found at the Accokeek Creek Site, a designated National Historic Landmark, shows occupation of the area for 11,000 years. A recently completed *Indigenous Cultural Landscape Study for the Nanjemoy and Mattawoman Creeks* (National Park Service, November 2015) was undertaken which identifies opportunities for interpretation of native landscapes along the Captain John Smith Trail (CJST), which follows the shoreline of Piscataway Park. The park is approximately 5,000 acres in size (over 1,000 acres within the County) and stretches for six miles along the Potomac River coastline from Piscataway Creek to Marshall Hall. The forests, fields, and wetlands of Piscataway

National Park provide habitat for a wide variety of wildlife and bird species. The number of forest-nesting neotropical migrant birds is especially high, and several warbler species that are sensitive to habitat fragmentation regularly nest in Piscataway Park.

The Mount Vernon Viewshed, also known more broadly as the Area of Primary Concern, delineates the land in Virginia and Maryland that can be viewed from the porch of George Washington's home in Virginia. This viewshed has been delineated using topographic modeling as shown on Map 9 in the RCCP. The conservation of this viewshed provides local benefits to the people of Prince George's County through the protection of rural character and unique habitats, while also providing national benefits through the protection of a nationally-significant viewshed.

Insensitive development of these private lands has the potential for cumulative erosion of the area's environmental quality, rural character and viewshed integrity over time. Forest fragmentation within the Area of Primary Concern, the water quality of the Potomac and its tributaries, and the protection of wildlife and birding habitat are concerns for this SCA.

Piscataway National Park was established mainly to preserve the view of the Maryland shore of the Potomac River from Mount Vernon in Virginia. The park is over 4,600 acres in size and it stretches for six miles along the Potomac River coastline from Piscataway Creek to Marshall Hall. The forests, fields, and wetlands of Piscataway National Park provide habitat for a wide variety of bird species. The number of forest-nesting neotropical migrants is especially high. Several warbler species that regularly nest in Piscataway Park are sensitive to habitat fragmentation, and have become increasingly rare in the Washington, D.C. region. Forest fragmentation outside the park and the water quality of the Potomac and its tributaries are concerns for this SCA. Development surrounding the park should continue to protect the viewshed and protect the water quality of the Potomac.

10. **Mattawoman Creek Stream Valley—**Mattawoman Creek and its tidal and nontidal wetlands are among the most productive finfish spawning and nursery streams in the entire Chesapeake Bay region. The wetland areas support unusually large numbers of fish-eating wildlife, especially great blue herons, great egrets, bald eagles, and blackcrowned night herons. The tidal wetlands contain the largest concentration of nesting wood ducks in Maryland. The quality of the water entering the stream systems in the watershed is of particular concern.

11. **Cedarville State Forest and Zekiah Swamp Watershed**—Cedarville State Forest is an actively managed 3,625-acre forest located at the headwaters of Maryland's largest freshwater swamp, the Zekiah. Most of Cedarville is forested with over 50 species of trees. Wildlife is abundant and forestry management practices have created successional forest habitats that enhance bird habitat. A unique feature of the forest is the Cedarville Bog, which is within the headwaters of the Zekiah Swamp. The bog supports a unique array of plants, such as sphagnum moss and insect-eating plants. The 77,000-acre Zekiah Swamp watershed is a vast complex of extensive hardwood swamp forests intermingled with shrub swamps, wetlands, grass and sedge savannas, open beaver ponds, and shallow pools. Zekiah Swamp Run, designated a wetland of special state concern and considered by the Smithsonian Institution as one of the most ecologically important on the East Coast, flows through the area in a southwesterly direction from Cedarville State Forest on the Prince George's/Charles County boundary to the Wicomico River, one of nine state-designated scenic rivers.

    The Zekiah Swamp is an undisturbed wild area with a densely vegetated interior supporting a diversity of plant and animal life, many of which are classified as rare, threatened or endangered species. Maintenance of water hydrology is of particular concern for this special conservation area.

Because much of the area is in private ownership, the potential exists for changes to the hydrology that may damage its long-term viability. This is an area that should receive protection through public or private conservation investments, and if surrounding areas are developed, the design of the land development proposals should seek to maintain the existing hydrology.

12. **Potomac River Shoreline**—Along the Potomac River shoreline there are a variety of existing and proposed land uses including national parkland, single-family detached homes, marinas, and the National Harbor project. There are many federal, state, local, nonprofit and volunteer efforts underway to protect and restore the Potomac River. The Potomac River shoreline SCA within Prince George's County includes areas supporting the main stem of the Potomac River as well as Piscataway Creek, Swan Creek, Broad Creek, and Oxon Cove. There are several national parks along the shoreline including Piscataway National Park, Fort Foote, Harmony Hall/Broad Creek Historic District, Fort Washington, and Oxon Hill Farm. These areas contain woodlands, wetlands, important plant communities and wildlife habitats, as well as fossil and archeological resources, and they serve as important natural connectors along the river.

    All of the Potomac River shoreline in Prince George's County is located in the Chesapeake Bay Critical Area, which has special regulations to ensure that development and other land uses are sensitive to the health of the Bay. Water quality is of particular concern in this special conservation area, as is the preservation of the natural environment and the river's scenic character. Forest fragmentation should be minimized and ecological connections between existing natural areas should be maintained and/or enhanced when development occurs.

13. **Broad Creek—**The tidal wetlands at the mouth of Broad Creek have been identified as an area important to the overall ecology of the Lower Potomac River Basin. The natural productivity of this area is of great value to resident and migratory fish, waterfowl and marsh birds. For this reason, the tidal wetlands of Broad Creek have been designated as an area of Critical State Concern. Future actions in this watershed should ensure the conservation and preservation of these wetlands.

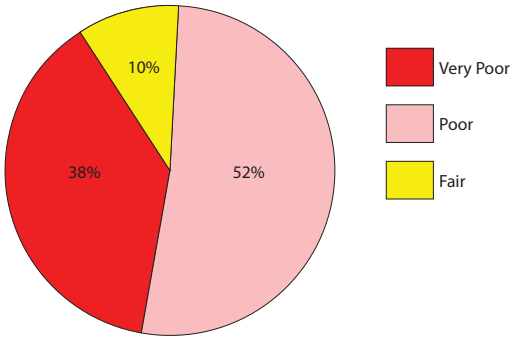
Improving Surface and Ground Water Quality

Prince George's County is home to over 621 miles of known streams within 3 major river basins. The Patuxent River basin covers roughly the eastern half of the County, the Anacostia River basin covers the northwest portions, and the Potomac River basin covers the southwest portions. These streams serve as the network of waterways that receive stormwater runoff from built and natural surfaces. As the stormwater hits the ground and moves toward these streams it picks up dirt, debris, grease, oil, trash, and other pollutants and deposits them into the receiving streams.

The 2002 General Plan contains a measurable objective to address the important issue of water quality:

> *"Protect and enhance water quality in watersheds by, at a minimum, maintaining the 2001 condition ratings of all watersheds countywide."*

Figure 6. Watershed Ratings as Reported in the 2005 Green Infrastructure Plan



These ratings were reported in the 2005 GI Plan and are based on the 1999-2003 biological assessments. Recent studies have shown that no statistical change in water quality has occurred over time. The rating scale includes categories of "good" and "very good" but there were no watersheds with this rating in the County when evaluated at this scale. See Map 3 for an analysis of water quality at a larger watershed scale.

Subsequently, the 2005 GI Plan contained two measurable objectives (numbered 5 and 6 in the GI Plan) addressing the need to improve the quality of the water in receiving streams:

> *"By the year 2025, improve stream habitat in each major watershed to elevate the Benthic Index of Biological Integrity (IBI) rating [or habitat rating for objective 6] of the watershed by at least one category using as a baseline the 1999-2003 biological assessment of the streams and watersheds of Prince George's County completed by the Department of Environmental Resources."*

The plan acknowledges that future sampling would be needed to measure the change in biological integrity or habitat over time:

> "**Tracking this objective:** The County has just completed its first round of five-year sampling covering all watersheds. As the rotating sampling efforts are completed in the future, the Benthic Index of Biotic Integrity [or habitat] rating will be compared to the previous rating to determine if the rating is higher, lower, or the same."

The water quality in the County's streams has been deteriorating over time, but prior to the use of biological stream survey studies, a reliable and replicable method for measuring long-term stream and subwatershed health had not been established at the County level. To measure water quality over time, the County and M-NCPPC funded countywide water quality sampling in two rounds between 1999 and 2013 that have been summarized in the report *Water Quality: Summary of Bioassessments 1999–2013*. There have been several difficulties in tracking water quality conditions over time as summarized in the report such as the scale of the watersheds for reporting (previous data had been reported for 41 small watersheds, WIP data are reported for nine larger watersheds) and the low number of samples taken per small watershed. The report shows that there has been no statistical difference in the water quality sampled over this time period. Moving forward, there needs to be consistent and concerted effort to measure and report

countywide water quality, using the same scale of reporting that is used by the Maryland Department of the Environment for reporting measures taken to address the WIP. Map 3 shows water quality ratings for watersheds at the scale that is used for reporting on the WIP (eight-digit watersheds).

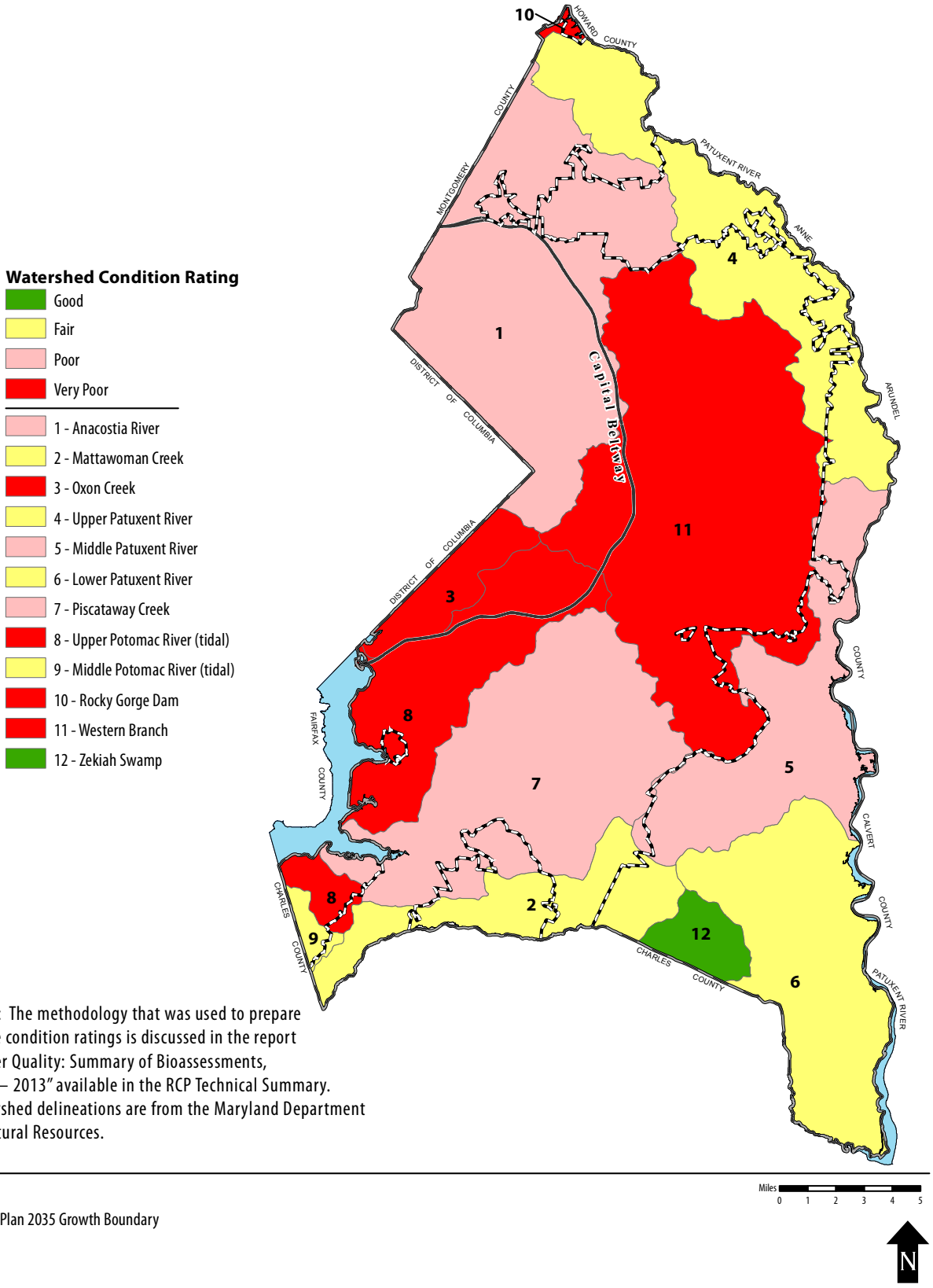
The implementation of the policies and strategies contained in this plan, when coupled with the County's efforts to implement the WIP and Plan 2035's desired development pattern, should result in significantly improved water quality by 2035.

Protecting Potable Water Sources

The majority of the County's public water supply is the responsibility of the Washington Suburban Sanitary Commission. Most of the County's public drinking water supply is sourced from the Patuxent River, up-river from where the Patuxent flows through Prince George's County. There are a few public wells and many private wells throughout the County. Private wells are primarily located in the Plan 2035 designated Rural and Agricultural Areas, which are outside the public sewer envelope. The Washington Suburban Sanitary Commission monitors and provides the treatment of the County's public drinking water to ensure its quality.

The Water Resources Functional Master Plan addresses land use policies for potable water and should be reviewed for guidance on drinking water supply issues. The 2017 GI Plan updates the plan with respect to supporting regional environmental planning efforts to protect the Patuxent River watershed up-river, monitoring available private well information, and continuing to prohibit hydraulic fracturing to protect ground water.

Map 3. Watershed Condition Ratings



Note: The methodology that was used to prepare these condition ratings is discussed in the report "Water Quality: Summary of Bioassessments, 1999 – 2013" available in the RCP Technical Summary. Watershed delineations are from the Maryland Department of Natural Resources.

The State of Maryland identifies several types of waterways as being an important focus of water quality protection efforts. They are called Stronghold Watersheds and Tier II waters. Stronghold watersheds are defined as places where rare, threatened, or endangered species of fish, amphibians, reptiles, or mussels have the highest numbers and thus are the watersheds most important for the protection of Maryland's biodiversity. Tier II waters are those stream segments whose water quality exceeds the minimum standards to support the existing or designated uses and, in the event of an anticipated amendment to the County's water and sewer plan or issuance of a discharge permit, will be subject to an antidegradation review. These waterways are not mapped as part of this plan because both the names and locations of these features could change over time. They are noted here and in the plan strategies under the designation of "state-designated priority waterways" to capture these areas of special concern during evaluation of land development proposals and other aspects of land use decision-making.

Addressing water quality at the site scale includes an evaluation of the condition of the watershed within which the development is occurring. The health of the stream(s) that are to receive the runoff from the development should be assessed and methods proposed to address current conditions through enhancement and/or establishment of forested buffers and/or the restoration of lost ecological functions. The on-site methods proposed to address water quality and water quantity controls must be designed to reduce or eliminate impacts on receiving streams. Combining efforts to reduce forest clearing, with reduced and cleaner stormwater runoff, should result in improved water quality over time.

Preserving, Enhancing and Restoring Canopy Coverage

Plan 2035 set a 20-year no-net-loss goal of maintaining the existing forest and tree canopy coverage at 52 percent. This is compatible with the state's overall no-net-loss goal of 40 percent statewide. Strategies need to be in place to ensure that this goal is met.

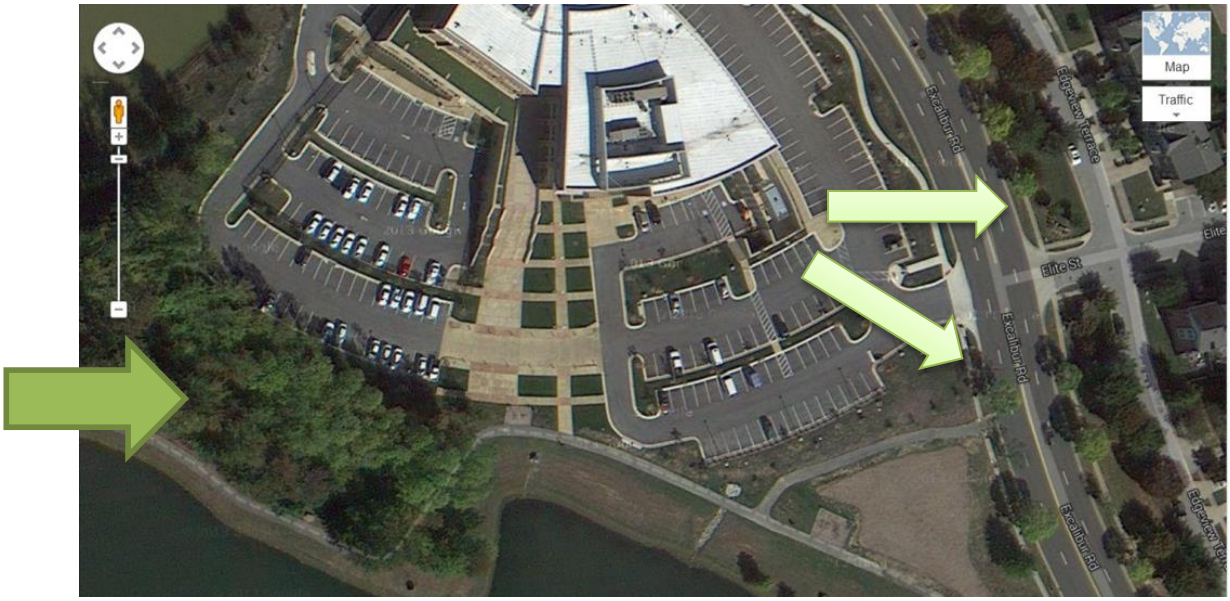
Plan 2035 recommends the creation of a Forest and Tree Canopy Strategy to address how this goal will be met. This strategy is provided in this plan by addressing the four main components of forest and tree canopy conservation:

- Preserving existing forests
- Addressing forest health
- Planting more trees
- Planting trees where they will survive

These four components, and the supporting policies and strategies provided in this plan, comprise the Forest and Tree Canopy Strategy for Prince George's County. The four components of the strategy are addressed in more detail below.

Before discussing the strategy, the terms forest canopy and tree canopy need to be defined to provide a better picture of how to address them together and separately. See Figure 7 for an illustration of forest canopy and tree canopy.

Figure 7. Forest and Tree Canopy Defined



Bowie City Hall—forest canopy on the left and tree canopy on the right.

Forests are generally defined as areas dominated by trees and other woody or herbaceous plants covering a land area of 10,000 square feet or greater.
Forest functions include stabilizing soil; managing stormwater; providing wildlife habitat and forest products; and cleaning the air and water.

Tree canopy is generally defined as the area of land under single tree or small groups of trees that does not meet the definition of a forest.

Tree canopy functions include intercepting stormwater; controlling microclimate; and cleaning the air and water.

Preserving Existing Forests

The main focus of the 2005 GI Plan was on the conservation of significant remaining ecosystems using the existing stream network and connected forests as the framework.

Large landscape-scale conservation efforts have long been a part of the Chesapeake Bay region. Concentrated efforts to save the Chesapeake Bay have been ongoing for more than three decades; however, several large-scale forest preservation and connectivity efforts are just beginning (See text box.) Implementation of the GI Plan should seek to support these larger efforts by ensuring that ecological connections are maintained and restored where possible.

Examples of regional land conservation efforts that should inform local decisions regarding connectivity:

- Baltimore-Washington Partnership for Forest Stewardship
- Greater Baltimore Wilderness Coalition
- Patuxent Research Refuge Land Conservation Design Project

As noted in the report *The Economic Values of Nature: An Assessment of the Ecosystem Services of Forest and Tree Canopy*, the annual economic benefits of the County's forest and tree canopy include:

- Providing $430 million in benefits by cleaning the air.
- Providing $12.8 billion in benefits by cleaning the water.
- Reducing temperatures in canopied communities by 9 to 13 degrees.

Ongoing challenges to forest health:

- Increasing fragmentation.
- Increasing percentage of forest edges.
- Shifts in plant and animal species and reductions in diversity.
- Forest pests such as the Emerald Ash Borer and the Asian Longhorn Beetle.
- Human actions such as planting invasive plants, removing the understory, and over mulching.
- Deer browse.

Addressing Forest Health

While measuring the total acreage of forests countywide has value and is needed to evaluate the goal over time, a more meaningful measure of sustainability is forest health. The technology is not currently available to measure forest health on a large scale, so this issue needs to be addressed as opportunities arise, giving preference to healthier forests over less healthy forests when making land use decisions.

Several Maryland publications have been providing updates on the health of the state's forests. The issues of greatest concern remain forest loss and fragmentation, a shift in species composition from climate change and changes to the overall landscape, increases in the percentage of invasive plants, and increasing concerns about insect pests such as the Asian longhorn beetle and emerald ash borer. Other forest pests being monitored include the gypsy moth and the forest tent caterpillar. Invasive plants are a concern because they provide few benefits to the ecosystem and humans and they occupy precious space in natural areas where native plants could be providing increased benefits to humans and wildlife.

It is difficult to measure and monitor forest health at the County scale; however, several forest management techniques can provide ways to improve forest health and avoid potential health issues in the future.

Forest Health Guiding Principles

- **Larger and wider is better.** As decisions are made to disturb existing forests, deference should be given to creating forest patches that are as large and wide as possible. Forest patches that are more than 200 feet wide provide precious Core Forest interiors that are necessary for some plants and animals to survive. Patches more than 600 feet wide provide interior forest habitat that is critical to the survival of certain bird species called Forest Interior Dwelling species or FIDS.
- **Connected is better.** The more that a forest and its inhabitants can share genetic material with a larger breeding population, the healthier everyone will be. Connectivity also provides wildlife with opportunities to move around and connect to other populations and areas with greater diversity.

- **Keep and improve existing forest edges.** When a new forest edge is created the disturbance often results in invasive plants moving in that take the place of native plants that could be restoring a healthy forest edge. It takes decades to restore new forest edges to a healthy condition and, in the meantime, the invasive plants, especially aggressive ones like kudzu, can overtake an area to the point where restoration is difficult. New forest edges should not be created when development occurs, and if edges are created, they should be planted with shade trees and other plants to reduce the impacts of invasive plants and other impacts of new forest edges.

According to the study *Forest Fragmentation*, in 2009 Prince George's County had more Edge Forests (51 percent of the forests) than Core Forests (49 percent of forests), reflecting a tipping point for forest health.

Edge Forests are those within 100 feet of a forest edge and often contain invasive plants that do not contribute to the overall system like native plants do. Core Forests are critically important to overall forest health and to providing necessary wildlife habitat.

- **Conserve diverse landscapes.** One of the difficulties in conserving a diversity of landscapes and diverse species communities is the tendency for conservation to focus only on those areas where humans cannot (or should not) build such as streams, wetlands, and floodplains. In order to provide both humans and wildlife with the ongoing benefits of green spaces, more attention needs to be paid to the contribution that each landscape makes to the overall green infrastructure network and what benefits the landscape may make to the whole.

Forests become fragmented from each other as a result of a variety of human actions. Under the definition of Green Infrastructure used in this plan, there is a need to address more than just a network of ecological areas, but also a broader view of the ways that the environment supports human health. The study *The Economic Values of Nature: An Assessment of the Ecosystem Services of Forest and Tree Canopy* found that the County's existing 52 percent forest and tree canopy provides benefits to humans through cleaner air, cleaner water, and reduced temperatures. These annual benefits include reduced or eliminated health care costs and the infrastructure costs to construct facilities that would provide the same benefits.

The 2010 *Forest Canopy Assessment* showed predicted losses of forest canopy coverage based on approved tree conservation plans. The study concluded that, with the implementation of the updated environmental regulations enacted in 2010, it should be possible to meet the Plan 2035 goal of maintaining the County's 52 percent forest and tree canopy coverage.

It is estimated that if every single-family detached property in the County planted one shade tree, in 10 years that canopy coverage would amount to approximately 100 acres of new tree canopy coverage.

Even though the economic recession resulted in the slowing of development activity and a corresponding slowing of the annual forest acreage loss, the annual loss figures demonstrate that to maintain the County's current 52 percent forest and tree canopy coverage, the planting of new trees will not be enough. The conservation of existing forests, in connected communities, that are healthy and can survive long-term are needed.

Focusing only on the total acres of forests conserved does not provide a complete picture. To be sustainable over time, forests need to be healthy. While some of the issues are more of a challenge to control than others, the shape and configuration of these forests could be improved to ensure their long-term sustainability.

Planting More Trees

Plant more trees; this is one aspect of the Forest and Tree Canopy Strategy that is fairly obvious. This can be a challenge in a variety of ways. In natural settings, when trying to grow a forest from scratch (afforestation), or where a forest existed until recently (reforestation), there are two main challenges: the poor health of the soil and the size of the local white-tailed deer population who forage on seedlings planted for these purposes.

Soil issues can be addressed by the incorporation of organic matter; however, compacted soils are difficult to recover. Care must be taken to prevent soil compaction where planting is to take place. Vegetation management can also be a challenge because of the need to control competing vegetation as the new trees become established. One of the best ways to address this issue is to plant larger caliper trees, especially along the edges of the areas being planted to delineate them. Tree tubes have been used in some areas with success where the deer populations are especially high.

Planting more trees in urban settings can be difficult because of the competition for limited space outside of buildings, parking lots, and roads. Moving forward, it will be important to carefully plan green spaces, streets, and open spaces to allow for adequate root and canopy space for trees.

Planting Trees Where They Will Survive

Plan 2035 envisions a shift from building more suburban communities to growing in ways that are more sustainable, where compact and efficient development serves the needs of more people. To ensure that these new communities are livable places that provide clean air, clean water, and moderated temperatures, and that are pleasant, welcoming, vibrant, and healthy, the provision of green spaces and tree canopy coverage are critical design elements.

The current Zoning Ordinance, Landscape Manual, and Road Code were originally written with a suburban growth model in mind

and are currently being updated. As we move forward into a different way of growing that serves more people more equitably, new design standards are needed to ensure that planted trees survive long enough to provide more robust benefits.

Planting trees in more constructed environments is a challenge because the spaces left for planting trees are often too small than the soil used in urban settings. Street trees in particular are often not provided the rooting or canopy space needed to survive. With regard to reforesting with tree seedlings, the remaining soil in reforestation areas are not adequate to support the long-term survival of the planted trees because it is compacted and devoid of organic matter. In order to harness the canopy benefits from planting more trees, more viable spaces, with adequate and appropriate soils, are needed.

Design standards for urban tree spaces need to address:

- Providing adequate soil amendments, root space, and soil volume for both preserving and planting trees.
- Using appropriate soil amendments for robust root growth.
- Selecting tree species that can withstand the conditions.
- Providing multiple functions for open and green spaces such as gathering, wayfinding, stormwater management, parks, open space requirements, and tree canopy requirements.

Greening the Built Environment

The vision of Plan 2035 is for Prince George's County to provide "…strong, green, healthy communities… [with] quality open space; restored ecosystems; and iconic destinations." One aspect of green and healthy communities is providing built environments that are welcoming and where people want to spend time. This means they need to have green and open spaces for people to congregate and they need buildings that are healthy and have fewer impacts on the environment.

There are two types of green roofs, **intensive,** which are thicker and contain more plant types, and **extensive** green roofs, which are shallow and contain fewer plant types—mainly low-growing succulents.

The average 5,000-square-foot **extensive** green roof provides benefits to communities through cleaner air and reduced temperatures at the rate of:

$190,000 over 50 years

= $3,800 per year in

community benefits for one green roof!

Green buildings are those that incorporate sustainable practices throughout the design, construction, and operation stages such as reducing waste of materials during construction, using locally-sourced materials, and providing interior spaces that are healthy. Other green building tools include living architecture such as living walls and structures, green roofs that absorb rainwater and regulate interior building temperatures, and rainwater collection of all types. Green buildings and infrastructure reduce the demand for energy and cost less over the life cycle of the structure than traditional building methods.

One of the economic development strategies in the County is to increase the number of County-based jobs. Increasing the number of green buildings creates demand for green and locally-sourced building materials and local expertise for design and construction. Creating local demand for these products and

skills could result in a surge in green jobs in related industries. The County is also well positioned to develop this market because of the amount of available warehouse and industrial spaces that could be converted to production of green building materials.

There are also potential opportunities within the County to increase use of renewable energy sources; however, the installation of supporting infrastructure for power derived from these sources should be done in such a way that other valuable assets, such as agricultural land and clean water, are not lost. Practices which are employed to generate power but can leave ground water sources contaminated, such as hydraulic fracking, should continue to be banned.

There are many benefits to greening the built environment. Incorporating green building features into new development and redevelopment projects can improve indoor air quality, water quality, and energy efficiency; promote the adoption of renewable energy and water conservation; and reduce stormwater, the use of toxins, and waste. All of these factors contribute to the Plan 2035 goal of improving the health of our residents and workers.

Climate Change and Sea Level Rise

Climate change and sea level rise will impact the built environment and the natural environment. In Prince George's County, these changes will primarily impact three areas:

- Increases in the level of mean high tide in areas of tidal waters (along the Potomac shoreline, portions of the Anacostia River, and the Patuxent River north to approximately Queen Anne Road).
- Increases in the impacts of severe weather events that include periodic flooding events and the creation of new wetlands both in tidal areas and inland areas where they do not currently exist.
- Changes in vegetation over time because of increasing temperatures and changes in the cycles of seasons.

Table 2 provides a description of the areas impacted by each climate change threat and options for how to address it. These are not intended to be exhaustive lists and are focused on environmental land use solutions.

Table 2. Possible Solutions to Climate Change Threats

Climate Change Threat	Areas Impacted	How to address?
Tidal changes	All of the Potomac shoreline and portions of the Anacostia and Patuxent Rivers	These areas are subject to the Chesapeake and Coastal Bays regulations at the state level that are regulated in the County through the County Code in Subtitle 5B and other subtitles as the Chesapeake Bay Critical Area. It is located within 1,000 feet of mean high tide. This line was updated in 2015 and will likely need to be updated periodically as tide levels change. Future infrastructure decisions in these areas should be carefully considered and planned for predicted levels of tides and severe weather events.

Climate Change Threat	Areas Impacted	How to address?
Impacts of severe weather events and drought	Flooding: FEMA flood maps have been updated	In 2016, the Federal Emergency Management Agency flood maps were updated to reflect current conditions. These maps provide the County and property owners with necessary information for decision-making moving forward and result in cost savings to homeowners seeking flood insurance.
	Wetlands: Areas important for climate change adaptation were mapped by Maryland DNR	The DNR mapped Wetland Adaptation Areas were included in the Evaluation Area mapping as part of the green infrastructure designated network.
	Countywide	The primary impact of drought is usually on domestic water supplies. Because Prince George's County obtains most of its public drinking water supply from the Patuxent River, efforts to protect and conserve this watershed should be ongoing. Forests, trees, and landscape plants also suffer during a drought. Planting more resilient species will help green spaces to tolerate changing conditions.
Changes in vegetation types	Existing and planted vegetation countywide	The increasing pressures of climate change emphasize the need for redoubled efforts to remove invasive plants and restore healthy forests and landscapes. As new vegetation is planted, species should be selected that can tolerate the conditions of today and the future. Native, resilient species should be chosen, using "right plant/right place principles" and minimizing the use of cultivars. Trees selected for urban conditions must be able to tolerate the potentially harsh microclimates and support stormwater management for both quality and quantity.

Climate Action Plan

In 2012, the County completed a draft climate action plan (CAP) that identifies three broad categories of activities to reduce greenhouse gas emissions that intersect with this plan including transportation, land use, and government operations. The draft CAP promotion of connectivity to facilitate bicycle and pedestrian trails is consistent with this plan's policies to increase the connectivity of built and natural green spaces. Tree planting figures prominently under land use in the draft CAP. Trees reduce the urban heat island effect and extract carbon dioxide from the air. In this way, tree canopy goals, including planting and preservation, advance both the goals of this plan and those of the draft CAP. By adopting a broader definition of green that includes energy goals, the GI Plan and the draft CAP are aligned in commitments to promote and achieve renewable portfolios. This includes solar installations on government properties, energy efficiency retrofits, conservation strategies, and the use of power purchasing agreements.

Hazard Mitigation Plan

The Prince George's County Hazard Mitigation Plan aims to reduce the vulnerability of citizens and the built environment to flood and fire impacts. The 2017 GI Plan supports this aim by calling for the conservation of natural areas, including flood hazard areas. The preservation of natural areas identified as flood hazard areas during the development process and the land conservation strategies proposed in the 2017 GI plan significantly advance hazard mitigation goals. Additionally, the goal to reduce forest fragmentation by contiguous preservation supports the long-term survival of native plants thus decreasing local fire vulnerability.

Stewardship, Outreach, and Education

Stewardship Ideas:

- Lead by example
- Award excellence
- Support existing organizations

People are more aware of their environment than in the past and unfortunately are more disconnected from it. With our attention being paid to electronic devices instead of to our surroundings, it is difficult to engage people in doing the work needed to conserve natural resources and spaces. Through stewardship, outreach, and education people's connection to the outdoors can be restored.

Public agencies who are land managers can provide a good example for citizens regarding how to care for and manage natural resources. By maintaining public lands in sustainable ways—reducing the use of chemicals, reducing mowing (and the burning of fossil fuels), and restoring lost habitat where possible—public land managers can demonstrate to County citizens and workers how they should manage their land.

One method to promote land stewardship is to provide a land conservation awards program where positive and example-setting projects can be publicly recognized. This type of program can motivate people to adopt more green practices. Another method to promote both stewardship and education is the establishment of an environmental advisory committee that can provide County elected and appointed officials with advice on environmental matters.

Outreach and education have been strong elements of the Watershed Implementation Plan's implementation in the County. These efforts should be continued, and expanded where possible, to address a variety of environmental issues countywide. Partnerships with organizations who are already doing outreach efforts are also a valuable tool to expand the message to more people.

IMPLEMENTATION

The following policies and strategies, in addition to those found in other plans, provide the decision-making framework for land use decisions countywide. They are grouped by the policy areas described above and provide guidance for County agencies and commissions, residents, nonprofits, and businesses.

Preserving, Enhancing, Connecting, Restoring, Protecting, and Maintaining a Green Infrastructure Network

POLICY 1: Preserve, enhance and restore the green infrastructure network and its ecological functions while supporting the desired development pattern of Plan Prince George's 2035.

Strategies

1.1 Ensure that areas of connectivity and ecological functions are maintained, restored and/or established by:

a. Using the designated green infrastructure network as a guide to decision-making and using it as an amenity in the site design and development review processes.

b. Protecting plant, fish, and wildlife habitats and maximizing the retention and/or restoration of the ecological potential of the landscape by prioritizing healthy, connected ecosystems for conservation.

c. Protecting existing resources when constructing stormwater management features and when providing mitigation for impacts.

d. Recognizing the ecosystem services provided by diverse land uses, such as woodlands, wetlands, meadows, urban forests, farms and grasslands within the green infrastructure network and work toward maintaining or restoring connections between these landscapes.

e. Coordinating implementation between County agencies, with adjoining jurisdictions and municipalities, and other regional green infrastructure efforts.

f. Targeting land acquisition and ecological restoration activities within state-designated priority waterways such as stronghold watersheds and Tier II waters.

1.2 Ensure that Sensitive Species Project Review Areas and Special Conservation Areas (SCAs), and the critical ecological systems supporting them, are preserved, enhanced, connected, restored and protected.

a. Identify critical ecological systems and ensure they are preserved and/or protected during the site design and development review processes.

b. Prioritize use of public funds to preserve, enhance, connect, restore and protect critical ecological systems.

1.3 Integrate into the work programs of all County agencies the priority status of the designated green infrastructure network as the County's highest priority areas for preservation, restoration and enhancement of natural resources.

POLICY 2: Support implementation of the 2017 GI Plan throughout the planning process.

2.1 Identify opportunities for implementation of the 2017 GI Plan as new master and sector plans are prepared by reviewing the local green infrastructure network boundaries with respect to:

a. Areas of local significance.

b. Opportunities for connectivity through the designation of Network Gaps.

c. Areas designated in local green infrastructure or sustainability plans that are in need of conservation.

d. Historic properties with environmental significance.

e. Specific areas in need of mitigation or restoration.

2.2 Revise applicable ordinances to allow the use of flexible design standards to: minimize impervious surfaces; reduce fragmentation of existing forests and habitats; establish new linkages through planting and/or restoration; and minimize ecological impacts.

a. Prepare and adopt flexible design standards to allow alternative designs in areas where development is encouraged, such as the Plan 2035 designated Downtowns, Regional Transit Districts, the Innovation Corridor, and Local Centers.

b. When flexible design standards are allowed:

(1) Ensure that the standards result in equitable and accessible green and open spaces.

(2) Ensure that the public has physical and/or visual access to the green and open spaces, where appropriate, through the provision of access and views from an existing or proposed sidewalk, trail or roadway.

(3) Continue to support the ability of projects to build to the desired pattern and density of Plan 2035 by allowing limited and necessary impacts to regulated environmental features where necessary for stormwater features.

(4) Provide options for the design of impervious surfaces such as the use of permeable pavement for areas of occasional vehicle access.

2.3 Strengthen regulations where environmental conditions warrant and provide greater flexibility where development is targeted.

a. Strictly limit development impacts to regulated environmental features to activities such as those that are absolutely necessary and unavoidable for construction of road crossings, the installation of necessary public utilities, or the placement of stormwater outfalls when no alternatives are feasible.

b. Allow impacts to regulated environmental features as appropriate to accommodate new development and redevelopment within designated Downtowns, Regional Transit Districts, the Innovation Corridor, and Local Centers and where needed to accommodate planned development on constrained sites. Mitigation for these impacts should be provided as close to the area of impact as possible.

c. Evaluate streamlining the woodland and landscaping requirements for urban redevelopment and infill development projects by revising the existing requirements regarding open/green spaces, woodland conservation, and tree canopy coverage into a comprehensive Green Area Ratio requirement.

2.4 Identify Network Gaps when reviewing land development applications and determine the best method to bridge the gap: preservation of existing forests, vegetation, and/or landscape features, and/or planting of a new corridor with reforestation, landscaping and/or street trees.

2.5 Continue to require mitigation during the development review process for impacts to regulated environmental features, with preference given to locations on-site, within the same watershed as the development creating the impact, and within the green infrastructure network.

2.6 Strategically locate off-site mitigation to restore, enhance and/or protect the green infrastructure network and protect existing resources while providing mitigation.

POLICY 3: Ensure public expenditures for staffing, programs, and infrastructure support the implementation of the 2017 GI Plan.

3.1 Continue public acquisition of land and easements in stream valleys designated in the Land Preservation Parks and Recreation Plan.

a. Seek additional funding sources for acquisition and conservation easements. Coordinate and strategize the acquisition of public lands with the Parks and Recreation Foundation.

b. Identify ways to coordinate with and provide support to land trusts to achieve plan goals.

c. Evaluate public land acquisition processes to ensure that the natural resources present on properties that are unique and in need of conservation are considered as part the acquisition process.

3.2 Ensure that immediate and future impacts to the green infrastructure network are minimized, if not avoided, when public facilities and infrastructure are constructed.

a. Strategically plan and fund public infrastructure, such as stormwater management facilities and sewer and water lines, to support the desired development pattern of Plan 2035 and concentrate growth outside of the green infrastructure network in so far as possible.

b. Consider modifying the review process for public facility and infrastructure projects to prioritize those that have a reduced impact on the environment or that include ecological restoration as a key element.

c. Ensure that public facilities and infrastructure consider the impacts of sea level rise and extreme weather events in their designs.

d. Minimize forest and ecosystem fragmentation when public facilities are built in the green infrastructure network and maintain ecological functions of the network.

e. Colocate utilities in urban settings to reduce or minimize the impact on the green infrastructure network. Consider establishing a framework to hold regular/annual meetings with utilities in order to coordinate planning investment and development needs.

3.3 Design transportation systems to minimize fragmentation and maintain the ecological functioning of the green infrastructure network.

a. Provide wildlife and water-based fauna with safe passage under or across roads, sidewalks, and trails as appropriate. Consider the use of arched or bottomless culverts or bridges when existing structures are replaced or new roads are constructed.

b. Locate trail systems outside the regulated environmental features and their buffers to the fullest extent possible. Where trails must be located within a regulated buffer they must be designed to minimize clearing and grading and to use low impact surfaces.

3.4 Ensure full compliance with and enforcement of all existing regulations including the Chesapeake Bay Critical Area and the Woodland and Wildlife Conservation Ordinance.

a. Evaluate the existing enforcement process for meeting the regulatory requirements and penalties for noncompliance to determine how enforcement measures can be improved.

b. Enhance enforcement efforts associated with state-mandated tree conservation and CBCA plans.

c. Improve enforcement efforts on sites with state oversight to ensure conformance with County approved grading permits and tree conservation and CBCA plans.

3.5 Encourage interior forest restoration and preservation by creating exclusion or limited use areas where forest interior dwelling bird species (FIDS) habitat is present on public lands.

POLICY 4: Provide the necessary tools for implementation of the 2017 GI Plan.

4.1 Prepare and adopt landscape design standards that provide a menu of scored landscape element options to create flexible development regulations in support of Plan 2035's desired shift in focus from greenfield development to infill and redevelopment.

4.2 Continue to require the placement of conservation easements over areas of regulated environmental features, preserved or planted forests, appropriate portions of land contributing to Special Conservation Areas, and other lands containing sensitive features.

4.3 Create a catalog of targeted mitigation sites.

a. Coordinate County agencies to create a countywide, cross-referenced database for the identification and tracking of off-site mitigation projects for woodland conservation; stream, wetland, and ecological function restoration; potential environmental mitigation sites identified; and stormwater management mitigation areas.

b. Coordinate contributions of data for possible mitigation sites from all sources (e.g., County, state and federal agencies, citizens, nonprofits, etc.).

c. Conduct stream corridor assessment surveys of major waterways periodically and enter data into the countywide database.

d. Include information collected during the preparation of existing conditions reports for master and sector plans into the countywide database.

4.4 Prepare an action plan for recommendations contained in this plan to identify:

a. Who is responsible for implementing the strategies.

b. What tasks need to be accomplished.

c. Time frames for implementation.

d. Resources needed for implementation.

e. How progress will be monitored and evaluated.

4.5 Periodically assess the progress of meeting the objectives of the 2017 GI Plan and update the action plan as necessary to ensure successful implementation.

4.6 Provide incentives to encourage nonregulatory compliance with plan strategies.

a. Continue to evaluate options for transference of development rights from places where development is not desired to places where development is encouraged by Plan 2035.

b. Evaluate how density bonuses could maximize on-site preservation of natural resources.

Improving Surface and Ground Water Quality

POLICY 5: Improve water quality through stream restoration, stormwater management, water resource protection, and strategic conservation of natural lands.

Strategies

5.1 Continue to coordinate efforts across County agencies to implement and meet the State and Federal pollution reduction requirements of current and future phases of the County's Watershed Implementation Plan for Chesapeake Bay Total Maximum Daily Load (TMDL) and state stormwater permit requirements.

5.2 Continue to utilize the local stormwater utility fees to fund projects and programs to meet the stormwater pollutant load reductions mandated under Federal and State laws and to improve the water quality of local streams and the Chesapeake Bay.

5.3 Strategically select projects for implementation that improve water quality by ensuring that projects that provide the greatest ecosystem services and the highest immediate benefit are given priority.

5.4 Prioritize stormwater restoration projects that will support the future land use pattern of Plan 2035. Designated Downtowns, Regional Transit Districts, the Innovation Corridor, and Local Centers should be given priority for stormwater retrofits, especially environmental site design practices and projects that address water quantity controls and address flooding.

5.5 Continue the comprehensive and coordinated tracking program being used to monitor implementation of WIP projects and routinely share this information with other County agencies.

5.6 Continue to monitor water quality at the eight-digit watershed scale and report progress as appropriate over time.

5.7 Continue to include in master and sector plans an analysis of the existing issues related to stormwater runoff, identify possible solutions, and share the results with County agencies.

5.8 Limit the placement of stormwater structures within the boundaries of regulated environmental

features and their buffers to outfall pipes or other features that cannot be located elsewhere.

5.9 Prioritize the preservation and replanting of vegetation along streams and wetlands to create and expand forested stream buffers to improve water quality.

5.10 Identify strategies to reduce impervious surfaces by amending the County Code and coordinating with County agencies. Include in this discussion the reduction of parking requirements, use of shared drive aisles and driveways, and the sizes of roadways.

5.11 Develop a program to utilize vacant land (both publicly and privately owned) for stormwater management. Acquire land where appropriate to serve the dual purpose of stormwater management and recreational open space.

5.12 Continue to coordinate with the State of Maryland on the proposed nutrient trading program and on policies to reduce nonpoint source pollution to meet the requirements of the Watershed Implementation Plan.

5.13 Implement the remaining policies and strategies of the 2010 *Approved Water Resources Functional Master Plan* (Water Resources Plan). Continue to evaluate master plans, planning studies, and development review applications for opportunities to implement the Water Resources Plan.

Protecting Potable Water Supplies

POLICY 6: Coordinate environmental efforts to ensure a sustainable water supply for residents and businesses.

6.1 Participate in regional environmental planning efforts such as the Patuxent River Commission and the Greater Baltimore Wilderness Coalition to protect water quality in the Patuxent River.

6.2 Monitor available private well information to recognize and address trends in well water quality.

6.3 Continue to prohibit the extraction of natural resources such as gas and oil using hydraulic fracturing or similar methods that impact groundwater sources.

6.4 Revise the Building Code to allow appropriate water reuse systems and support requests from applicants who seek to include this feature.

Preserving, Enhancing and Restoring Canopy Coverage

POLICY 7: Preserve, enhance, connect, restore and preserve forest and tree canopy coverage.

General Strategies for Increasing Forest and Tree Canopy Coverage

7.1 Continue to maximize on-site woodland conservation and limit the use of off-site banking and the use of fee-in-lieu.

7.2 Protect, restore and require the use of native plants. Prioritize the use of species with higher ecological values and plant species that are adaptable to climate change.

7.3 Improve the success rate of removal of invasive plant projects by providing standards for the initial removal and maintenance standards to ensure long-term eradication. Resources need to be allocated and partnerships with volunteer or other organizations are needed to ensure invasive plant removal projects are successful long-term.

7.4 Ensure that trees that are preserved or planted are provided appropriate soils and adequate canopy and root space to continue growth and reach maturity. Where appropriate, ensure that soil treatments and/or amendments are used.

7.5 Provide universal planting standards Countywide and a single tree list that includes recommended trees for various uses such as reforestation, stream restoration, street trees, ornamental uses, and trees for stormwater and plants considered invasive or undesirable.

7.6 Establish robust and enforceable maintenance standards for tree preservation and planting.

7.7 Update the process and criteria for using the Woodland Conservation Fund and the funds collected within the Chesapeake Bay Critical Area to increase planting.

7.8 Continue to track forest and tree canopy coverage countywide through the use of mapping technology, using 2009 as the baseline year for comparison.

7.9 Annually evaluate tree canopy and woodland conservation metrics. This includes data on fee-in-lieu, off-site tree plantings, and mitigation. Report findings to the Prince George's County Planning Board, County agencies, and elected officials.

Forest Canopy Strategies

7.10 Continue to focus conservation efforts on preserving existing forests and ensuring sustainable connectivity between forest patches.

7.11 Improve the success of afforestation and reforestation efforts by requiring that the plantings be: conducted in uncompacted soils with adequate organic matter, planted with planting of stock larger than seedlings, and provided protections from and management of competing vegetation.

7.12 Discourage the creation of new forest edges by requiring edge treatments such as the planting of shade trees in areas where new forest edges are proposed to reduce the growth of invasive plants.

7.13 Continue to prioritize the protection and maintenance of connected, closed canopy forests during the development review process, especially in areas where FIDS habitat is present or within Sensitive Species Project Review Areas.

7.14 Use available state data and regional planning efforts to identify forest patches and other sensitive ecosystems that are critical to regional forest and ecosystem connectivity.

Tree Canopy Strategies

7.15 Provide standards for the preparation of tree preservation plans for the conservation of individual existing trees and small forest patches. Include penalties for improper tree preservation plan implementation and incorporate all requirements into the approved tree conservation or landscape plan.

7.16 Consider legislation to require mitigation for the removal of individual trees when infill development occurs in Existing Communities as designated in Plan 2035 and for the removal of specimen and champion trees countywide. Include penalties for tree preservation efforts that fail as a result of construction.

7.17 Evaluate the exemptions from the Tree Canopy Coverage Ordinance to determine how the regulations can apply to more types of applications and explore options for meeting portions of the canopy requirement by using such methods as green roofs and green stormwater features.

7.18 Ensure that new, more compact developments contain an appropriate percentage of green and open spaces that serve multiple functions such as reducing urban temperatures, providing open space, and stormwater management.

Greening the Built Environment

POLICY 8: Implement green building techniques and green neighborhood design methods to reduce energy use, stormwater runoff, and the heat island effect; improve air and water quality; and increase opportunities to reduce, reuse, and recycle previously used resources.

Strategies

8.1 Create a green building code that supports the use of green building methods and materials.

8.2 Evaluate the County's various regulatory codes and manuals to assess how to comprehensively provide green and open space. Consider the use of a method such as a Green Area Ratio so that built environments are greener and provide multifunctional landscapes.

8.3 Revise the tax code or other appropriate regulations to provide developer incentives for green building certifications such as LEED® Silver, Gold, and Platinum certifications for residential and commercial buildings and neighborhoods. Incentives should be commensurate with achieved levels.

8.4 Revise and update the Zoning Ordinance and Subdivision Regulations to require green building features consistent with Plan 2035 to help fulfill the requirements of the WIP and the CAP (when finalized), as well as other relevant plans.

8.5 Redevelop brownfield and superfund sites in priority growth locations.

8.6 Study and implement methods to increase the amount of construction and demolition waste that is diverted as part of solid waste recycling in the County. Possible methods include tax incentives and reduced permitting fees.

POLICY 9: Require the use of sustainable development practices in the construction, renovation, and expansion of public facilities to reduce operational and maintenance costs, environmental impacts, and enhance occupant health and productivity.

Strategies

9.1 Require public buildings to be constructed to a minimum certification at the LEED® Gold (or equivalent standards) level or set appropriate targets for energy reduction, water reuse, or waste diversion.

9.2 Monitor the use of, and report on, sustainable practices in public facilities in order to document environment, health, and safety benefits, as well as cost-effectiveness.

POLICY 10: Assess land use decisions for potential climate change impacts.

Strategies

10.1 Ensure infrastructure decisions address predicted sea level rise elevations and the impacts of extreme weather events.

10.2 Periodically perform a flooding and sea level rise analysis for the County. Prioritize climate adaptation upgrades to at-risk areas with the greatest population impacts and include implementable actions and policy.

10.3 Include more detailed hazard information related to climate adaptation and mitigation strategies when updating the County's Hazard Mitigation Plan. This plan should utilize the information obtained in the sea level rise and flooding analysis, and should also include implementable actions for areas at high risk for flooding.

10.4 Create a countywide standard for reviewing infrastructure installation, upgrades, and maintenance projects against projected climate change impacts.

10.5 Locate major road, transit, electrical, wastewater treatment, stormwater, and other infrastructure out of high-risk areas. Where relocation is not feasible, incorporate climate-resilient technologies and practices in upgrades to existing infrastructure.

10.6 Identify climate mitigation strategies related to land use. Integrate climate action strategies into the County Code as appropriate.

10.7 Implement the County's Hazard Mitigation Plan and identify strategies related to land use. Integrate appropriate strategies into County codes as appropriate.

POLICY 11: Reduce overall sky glow, minimize the spill-over of light from one property to the next and into sensitive environmental areas, and reduce glare from light fixtures.

Strategies

11.1 Amend the County Code to include lighting standards for appropriate development activities.

11.2 Evaluate lighting design standards and practices for public buildings and spaces to ensure that safety, energy conservation, and light spillover are addressed.

11.3 Review and amend the County Code and Road Code to ensure that new roadway lighting meets the guidelines for minimization of light spill-over and sky glow, provides lighting in the appropriate spectrums, and relies wherever possible on low-energy light sources such as LED or solar-powered street lights.

POLICY 12: Provide adequate protection and screening from noise and vibration.

Strategies

12.1 Evaluate and revise the County Code to establish noise and vibration standards. Use the current State of Maryland noise standards as guidelines for noise, and industry accepted standards for vibration, and identify uses and activities that require additional restrictions.

12.2 Ensure new development is designed so that dwellings or other places where people sleep are located outside designated noise corridors. Alternatively, mitigation in the form of earthen berms, plant materials, fencing, or building construction methods and materials may be used.

POLICY 13: Promote the efficient use of energy resources by providing education, outreach, and technical assistance to residents and businesses.

Strategies

13.1 Develop a Sustainable Energy Education and Outreach Strategy to inform residents and businesses about the benefits of reducing energy consumption and carbon emissions.

13.2 Create an Energy Savers Volunteer Roundtable to assist with the implementation of education and outreach initiatives.

13.3 Encourage the use of energy management tools, such as the Environmental Protection Agency's Portfolio Manager—a free energy management tool that allows businesses to track, assess, and disclose their buildings' energy and water performance.

POLICY 14: Encourage investment in energy infrastructure, renewable energy, and the use of smart grid technologies to improve the efficiency, reliability, affordability, and sustainability of energy production and distribution.

Strategies

14.1 Promote the use of innovative energy financing mechanisms such as on-bill financing, property-assessed clean energy, energy performance contracting, power purchase agreements, and home energy loan programs for moderate- to low-income residents.

14.2 Encourage the installation of the latest smart-grid/metering technology by offering incentives and technical assistance.

14.3 Create an energy assurance framework to assess strategies for enhancing energy security and community resiliency.

14.4 Participate in regional efforts to support the deployment of electric vehicles (EVs) and EV charging infrastructure.

14.5 Partner with local energy providers to develop alternative fueling stations for compressed natural gas, liquefied propane, biofuels, and electric vehicles.

POLICY 15: Encourage the generation of low-carbon and clean, renewable energy sources.

Strategies

15.1 Promote the development of Energy Positive homes and buildings that generate more energy than what is used in the production, construction, and operation of the home or building through the application of geothermal, solar, and wind technology.

15.2 Utilize solar panels or similar technology to reduce the amount of electricity consumed through the use of outdoor lighting for streets, parking lots, parks, and/or signage and other outdoor areas.

15.3 Evaluate and modernize, as warranted, the regulations in the Zoning Ordinance that impact the location, size, and design of solar, wind, and alternative energy production facilities. Include options for streamlining development review of permit procedures.

15.4 Develop a range of incentives to encourage the adoption of solar facilities on roofs, parking lots and structures, and unused open spaces.

15.5 Revise and update the Zoning Ordinance and Subdivision Regulations to include standards and criteria for siting renewable energy facilities at different scales.

Stewardship, Outreach and Education

POLICY 16: Promote environmental stewardship, outreach and education as important elements of the overall success of the GI Plan.

Strategies

16.1 Lead by example on public lands by demonstrating environmental stewardship and protections for environmental features, especially within the green infrastructure network.

16.2 Create an environmental advisory committee at the County level to address additional opportunities for stewardship, outreach, and education.

16.3 Publicly recognize private efforts to support the preservation, restoration, and/or enhancement of the green infrastructure network.

a. Develop a local awards program to recognize development projects that use environmentally sensitive and/or energy efficient designs.

b. Coordinate with municipalities to ensure their participation in stewardship and awards programs.

16.4 Continue education and outreach efforts related to implementation of the WIP and other County efforts.

16.5 Partner with organizations that are conducting outreach and education sessions and recognizing stewardship efforts.

APPENDICES

Appendix A: Documents Supporting the 2017 Green Infrastructure Plan

This list contains the plans, studies, and documents that provided direction for the preparation of the 2017 GI Plan.

Year	Document name	Document Summary
2002	2002 Approved General Plan	Established the need for the first green infrastructure plan and set forth the vision for its implementation. Provided the first Environmental Infrastructure Chapter in a general plan addressing the need for environmental protections.
2005	2005 *Approved Countywide Green Infrastructure Plan*	Provided a countywide network of ecological lands that included working lands in rural areas. Policies and strategies support the appropriate use of natural resources.
2014	Plan Prince George's 2035	The most recent General Plan for the County specifically calls for an update to the 2005 *Approved Countywide Green Infrastructure Plan* and the preparation of a Forest and Tree Canopy Strategy. The 2017 GI Plan implements these recommendations and supports the desired development pattern envisioned in Plan 2035. Plan 2035's growth policies focus on directing development to established communities, especially designated Local Centers and Regional Transit Districts, and away from greenfields (areas currently in a natural state).
Various dates	Prince George's County Code	Sections of the County Code that address green infrastructure include but are not limited to the Woodland and Wildlife Habitat Conservation Ordinance in Subtitle 25, the Water Resources Protection and Grading Code in Subtitle 32, the Subdivision Regulations in Subtitle 24, the Zoning Ordinance in Subtitle 27, and the Building Code in Subtitle 4.
2016	Resource Conservation Plan Technical Summary	The Technical Summary contains the research studies and reports that support the recommendations of the RCP. The majority of the summary's contents focus on research related to the elements of the GI Plan.

Appendix B: Green Infrastructure Network Mapping Methodology

Background

Mapping of the green infrastructure network for the 2017 *Green Infrastructure Plan: A Countywide Functional Master Plan* followed the same basic methodology as the network mapping for the 2005 plan. In summary, the Regulated Areas were mapped first and then evaluated for connectivity. The proposed Evaluation Areas are then added to the connected RA network and again, the network is evaluated for connectivity. To determine connectivity, patches that were 50 feet or farther apart were deleted from the network.

The mapping of the Regulated Areas used 2009 data; the mapping of the Evaluation Areas used the best available data from various years. Aerial photographs from various years were used to evaluate existing conditions. The 2005 network was used to inform the 2017 network. Network Gaps were not identified for the 2017 network because of the complexity of the network and the desire to provide the opportunity for future gap identification at a scale closer to the ground.

All of the work on the network mapping was completed using ArcGIS version 10.3.

Step 1: Establish the Regulated Areas

The Regulated Areas (RAs) establish the framework for the network map.

Using the streams (hydro) layer as the framework, the following data were added:

- Stream buffers as follows: Developing Tier: 60 feet on each side; Developing Tier: 75 feet on each side; and Rural Tier: 100 feet on each side (note: while the growth policy tier designations were revised prior to creation of the 2017 network, the three levels of stream buffer delineations remain in the County Code).
- Nontidal wetlands with a 25-foot-wide buffer on all sides.
- Wetlands of Special State Concern with a 100-foot-wide buffer on all sides.
- 100-year FEMA floodplain (2005).
- Slopes that are 15 percent or greater within 20 feet of any of the features described above.
- Chesapeake Bay Critical Area (as of December 2014).

After the rough RA is established, it was refined by clipping out un-connected fragments and eliminating non-contributing slopes (only those slopes that contribute to the related environmental feature were included in the RA buffers). The 2005 GI network was used as a guide during this step to determine whether a fragment of the network should remain. Aerials from various years were used to evaluate the presence or absence of connected features.

Step 2: Establish the Evaluation Areas

Step 2A: Creation of the draft EA

The Evaluation Area (EA) layer was created to ensure that critical resources and previously protected lands are considered when land use decisions are made. The County-level data sources focus on previously protected lands (so that critical connections to and between these properties can be maintained or restored) and other elements of countywide importance including the existing forest and tree canopy coverage. Critical resources included in the EA were primarily identified by the Maryland Department of Natural Resources (MDNR). The data layers that make up the Evaluation Area layer were combined into one layer and then evaluated for connectivity to determine countywide significance. If patches of land that were designated as part of the EA were separated by a gap of 50 feet or more, the unconnected patch was deleted.

The County-sourced data layers that are part of the EA include:

- Platted Easements layer that includes these easement types captured from recorded plats: cemeteries, conservation, floodplains, historic, landscape, landscape buffer, scenic, storm drain, storm water management, wetland, and woodland conservation).
- Protected Lands layer that includes easements through the Maryland Agricultural Land Preservation Foundation (MALPH), the Historic Agricultural Resource Preservation Program (HARPP), and the Maryland Environmental Trust (MET).
- Forest and Tree Canopy, 2009.
- Historic Environmental Settings.
- Private Conservation Properties.

The MDNR data layers that are part of the EA include:

- National Wetland Inventory (U.S. Fish and Wildlife Service)
- Sensitive Species Project Review Areas
- Green Infrastructure Hubs and Corridors V5
- Forests Important for Water Quality
- Natural Heritage Areas
- Wildlife and Rare Species Habitat
- Wetland Adaptation Areas
- Coastal Wetland Adaptation Areas
- Sea level rise predicted area
- Areas Important for Climate Change
- Potential Forest Interior Dwelling Species Habitat

Step 2B: Establishing the Final Draft EA

During the community input portion of the plan, three scenarios were developed. The three network options, labeled A, B, and C, were presented showing the same RA configuration and differing parameters for mapping the EA as described below. The "inside" and "outside" descriptors apply to the Capital Beltway in order to ensure that there is sufficient EA within the Beltway.

Option	Maximum Gap Between Patches	Minimum Patch Size	Minimum Patch Width
A	25 feet inside	5.0 acres	50 feet wide inside and outside Beltway
	50 feet outside		
B	50 feet inside	2.0 acres	50 feet wide inside and outside Beltway
	100 feet outside		
C	200 feet inside	1.0 acre	50 feet wide inside and outside Beltway
	600 feet outside		

Community participants were asked to provide input on which option they favored. The majority of participants favored Option C which showed the largest amount of EA. This scenario was chosen as the final network delineation and the final draft map was prepared.

Acknowledgements

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