

A Sustainable Chesapeake

BETTER MODELS FOR CONSERVATION

Edited by David G. Burke and Joel E. Dunn

THE CONSERVATION FUND



The case study you have downloaded is highlighted below. Other case studies from this Chapter of *A Sustainable Chesapeake: Better Models for Conservation* can be individually downloaded. The editors encourage readers to explore the entire Chapter to understand the context and sustainability principles involved with this and other featured case studies. The full publication contains 6 Chapters in total: Climate Change Solutions, Stream Restoration, Green Infrastructure, Incentive Driven Conservation, Watershed Protection and Stewardship.

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A Green Infrastructure Functional Master Plan

Countywide Green Infrastructure Planning and Implementation in Prince George's County, Maryland

Prince George's County adopted a Green Infrastructure Plan that guides development through the development review process, which protects the integrity of ecological features of countywide significance.

CASE STUDY SUMMARY

The Prince George's County Green Infrastructure Plan is the first of its kind in the Chesapeake Bay watershed. Prepared as a "functional master plan," it is a guide to county government and decision makers for future comprehensive planning, land acquisition and development decisions. Since the plan was adopted, numerous important green infrastructure resources have been protected or enhanced. The plan has helped to reduce woodland fragmentation, preserve wildlife habitat and improve water quality.

It is now standard practice for the county to prepare functional master plans for vital topic areas in the jurisdiction, such as transportation, public safety, and historic sites and districts. The Green Infrastructure Plan is the county's first environmentally focused master plan and was approved by the County Council in 2005.

Green infrastructure is the county's natural life-support system, which is composed of an interconnected network of natural areas and other

open spaces that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and wildlife.¹ The plan identifies sensitive ecological resources across the county in an effort to ensure their protection, restoration and enhancement. It also helps direct growth to existing communities,

which reduces impacts to forestlands and other sensitive natural resource areas and reduces "gray" infrastructure costs. Gray infrastructure is composed of man-made systems that support communities, such as roads and utilities.

Like most of the county's master plans, the Green Infrastructure Plan contains goals, measurable



objectives, policies and strategies. What makes it unique is that the strategy statements are action oriented and lay out a work program for implementation. By wording the strategies in this manner, the plan is not static and implementation began the day of approval. By creating and implementing a green infrastructure plan, Prince George's County has shown its resolve to preserve important ecological features determined to be of countywide significance.

RESOURCE MANAGEMENT CHALLENGE

Prince George's County covers approximately 500 square miles in Maryland and has a population of over 800,000 people. The county is located within the coastal plain physiographic region and is characterized by a diverse array of plant species, wide floodplains, and extensive wetlands and woodlands. From 1990 to 2000, construction and land development within the county substantially expanded, which resulted in fragmented forests, destruction of sensitive ecological habitats, reduction in wildlife and degradation of water quality. Development pressure has always been strong due to the county's close proximity to Washington, D.C., and demographic projections indicate total population will continue to grow in the coming decades.

The county has lost a substantial amount of freshwater wetlands and their associated uplands, which negatively impacts water quality and wildlife. The U.S. Fish and Wildlife Service's National Wetlands Inventory of 1988-89 identified 19,470 acres of wetlands representing 6.2% of the county. Palustrine forested wetlands were the dominant type. Between 1981 and 1989 the county lost about 229 acres of vegetated wetland, with roughly 123 acres converted

to upland. The principal causes of wetland conversions were road and highway construction, commercial and industrial development and sand and gravel pit operation.² Although the Green Infrastructure Plan does not directly address wetland loss, it does provide implementation strategies aimed at expanding minimum stream buffer widths to protect more wetlands and their associated drainage areas.

Construction and development has fragmented the forest in the county into noncontiguous patches of various sizes, in some instances with great distance between patches. County staff recently assessed existing woodland cover and projected losses by comparing aerial photos from 1938, 1965 and 2000. In 1938, the county contained nearly the same amount of woodland cover that existed in 2000. The big difference was the size and contiguity of the wooded areas. In 1938, the county had large tracts of woodlands and connecting corridors that facilitated wildlife movement. In 2000, the woodlands were extremely fragmented and confined mainly to public lands and private lands zoned for low density residential uses. The findings raised concerns that further efforts would be needed to maintain sustainable and livable communities for future generations.

Pollution from stormwater runoff and the loss of forest buffers and wetlands resulted in low water quality in some areas of the county. A recent water quality analysis, conducted by the county's Department of Environmental Resources, measured two broadly accepted water quality measures: the quality of stream buffer habitat and the presence of benthic invertebrates.³ County watersheds were rated on a scale that used ratings of very good, good, fair, poor and very poor (see Habitat Water Quality

of Major Watersheds 1999-2003 Biological Assessments). None of the county's watersheds received a "good" or "very good" rating. Of the 42 watersheds surveyed, four received a "fair" rating for benthic invertebrates and seven received a "fair" rating for habitat. The remaining watersheds were rated "poor" or "very poor." With the county aware of these conservation challenges they set forth a bold vision for conservation planning.

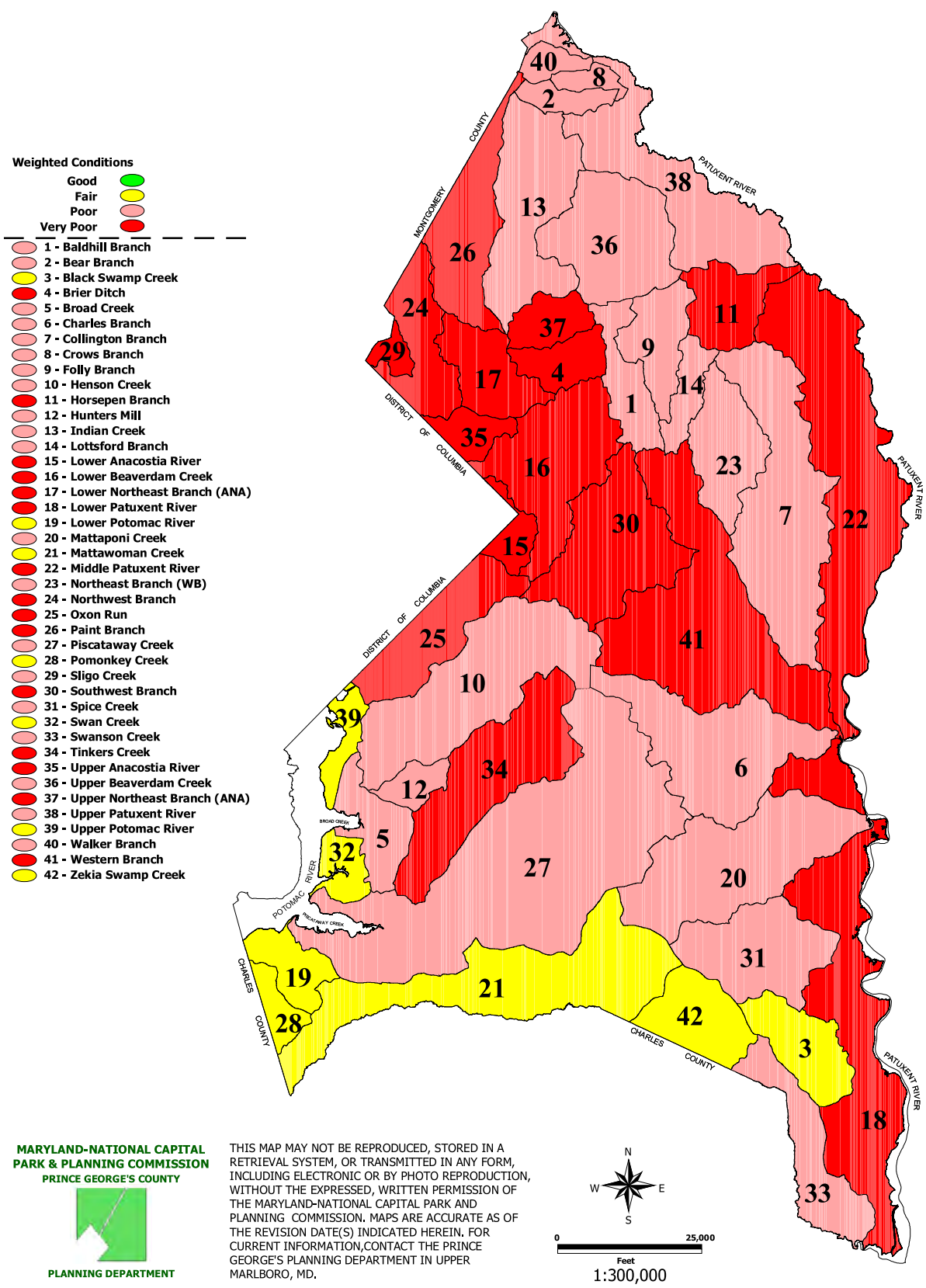
CONSERVATION VISION

The county's 2002 "General Plan" for development included an environmental goal to preserve, enhance, and restore the natural environment and its ecological functions as the basic component of a sustainable development pattern.⁴ It also contained measureable environmental objectives that address the preservation, enhancement and/or restoration of a designated green infrastructure network; the improvement of water quality; the attainment of long-term tree canopy goals; and the promotion of environmental education and stewardship. Most importantly, the General Plan provided the county staff with a formal mandate to prepare a Green Infrastructure Plan based on functional master planning—a well understood and established process in the county.

The county staff established guiding principles for the preparation of a Green Infrastructure Plan, including:

- Identify a contiguous network of environmentally important areas
- Recommend strategies to preserve, protect, enhance, and restore the network
- Support the desired development pattern of the General Plan
- Recommend effective implementation mechanisms

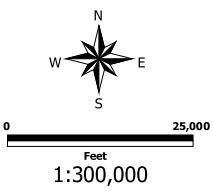
Habitat Water Quality of Major Watersheds 1999 - 2003 Biological Assessments



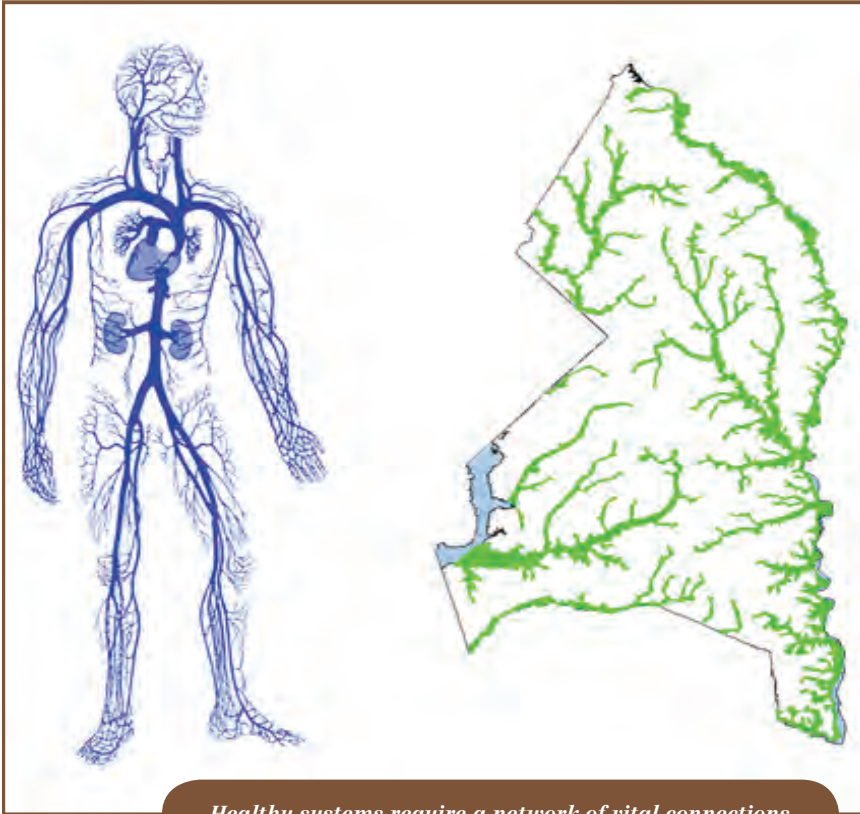
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PRINCE GEORGE'S COUNTY

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► Vital Connections



Healthy systems require a network of vital connections.

- Support the county's Livable Communities Initiative
- Ensure meaningful public participation

To better communicate the conservation vision and need for an inter-connected green infrastructure system that performs vital natural functions, county staff equated this need with highway network planning and human biological systems. All three systems rely on interconnected networks that must function together properly to produce the desired results (see Vital Connections graphic).

IMPLEMENTATION RESOURCES

The green infrastructure planning effort was led by The Maryland-National Capital Park and Planning Commission's (M-NCPPC or the Commission) Prince George's

County Planning Department. The Department was assisted by an interdisciplinary team which included representatives from the Department of Parks and Recreation within the Commission; the county Department of Public Works and Transportation; the county Department of Environmental Resources; and the bi-county Washington Suburban Sanitary Commission. M-NCPPC is a bi-county agency, created by the General Assembly of Maryland in 1927. The Commission's geographic authority extends to the majority of Montgomery and Prince George's Counties in Maryland and was created to provide planning, parks and recreation functions for the two counties located next to Washington, D.C. The Green Infrastructure planning effort took a little over two years to complete with one project planner full-time and one project manager part-time. For a

period of approximately six months, a GIS Technician worked on the project almost full-time.

CONSERVATION STRATEGY

Three elements were required to produce a plan to identify and protect the county's green infrastructure network. The first was an on-going public outreach element; the second focused on green infrastructure network development driven by GIS analysis, scenario building and by determinations of "countywide significance"; and the third addressed implementation mechanisms needed to protect the network.

Public Outreach: The county made a significant effort to involve the public in the green infrastructure planning process. They believed that a plan developed in concert with the public would be more accurate and receive stronger support from citizens, elected officials and non-profit partners. Their outreach efforts included citizen focus groups to provide input before the plan was developed, a citizen review group to review a draft plan, and a formal public hearing and testimony on the final plan. The county also produced a website where meeting locations, dates and results were posted along with public presentation materials.

Focus groups: Focus groups were established for several interest groups, including: municipalities and large civic associations; agriculture and forestry; citizens and environmental advocacy; business and industry; and interagency groups and neighboring jurisdictions. Each focus group was provided a separate forum to voice their concerns before the plan preparation stage began. Providing separate meetings was purposeful to allow the parties to voice opinions in an open and unbridled way so that the input was as uncensored as



In many instances, the Prince George's County green infrastructure network enhances stream and riparian corridor protection. This stream is buffered by a mature beech forest in Rosaryville State Park.

possible. The input received from the focus groups was posted on the project website.

Citizen review group: The second major component of the public input portion of the project was a citizen group meeting to review several possible scenarios for the green infrastructure plan. All of the participants of the focus groups were invited as well as any other interested parties. The attendees were purposefully divided into specific breakout groups so that the various interests were represented on each breakout group. During the breakout sessions, each group was asked to come to consensus on what was to be “in” the plan and what was to be “out.” There was healthy debate and eventual ownership of the results.

Overall there was general consensus to include more, not less, in the network, include some specific areas of concern, and ensure that the final network is science-based. Interestingly, there was no consensus on whether or not the approved subdivisions should be deleted from the network. Using this feedback, the team prepared a preliminary version of the plan for public comment.

Green infrastructure Network Development:

GIS analysis: To develop the final designated network (see Green Infrastructure Network - Interim Map),

all relevant GIS layers available for both Prince George's and adjacent counties were used. The focus of the GIS analysis was on several environmental factors, including: streams and wetlands and their associated buffers; 100-year floodplains; topography; and state information regarding rare, threatened and endangered species habitat. There were many other layers that were used for the analysis; an entire list is provided in the plan.⁵

Scenarios: After the input was received from the focus groups, county staff used GIS to prepare six scenarios to illustrate various options for the designation of the green infrastructure network. The scenarios started with a baseline of only the existing regulated areas which include:

- perennial and intermittent streams and a minimum 50-foot buffer on each side;
- the 100-year floodplain;
- wetlands and a minimum 25 foot buffer on all sides;
- Wetlands of Special State Concern and a 100 foot buffer on all sides and slopes 25% or greater adjacent to these features.

It should be noted that slopes from 15 to 25% on highly erodible soils are also regulated. However, because a soils layer was not available in GIS, these slopes were not included in

the analysis. When the soils layer becomes available, the network will be updated.

The criteria for “countywide significance” was applied to the baseline scenario, which was then modified to create scenarios with other land-based features added such as land within the state green infrastructure assessment and known sensitive habitat areas. Other scenarios were developed that added these features but subtracted areas of approved subdivisions that had not yet been built. This subtraction reduced the amount of land within the network as an acknowledgement that at least some portions of these subdivisions had been approved for clearing. The six scenarios were then printed on large boards and 11 x 17 inch maps for use in the citizen review group meeting process. Using this method, participants could see the results of a series of possible decisions and provide feedback regarding whether or not they agreed with the decisions proposed.

Countywide significance criteria:

In order for land features to remain within the network, three criteria for countywide significance must be met:

1. **Remaining woodlands** - In developing and rural growth areas, the land must contain woodlands at least 200 feet wide to be considered of countywide significance. The 200

PRINCE GEORGE'S COUNTY CITIZENS SUPPORT CONSERVATION

A one-page survey was prepared by Prince George's County staff to gauge interest in the planning process and preservation of natural resources. Over 100 surveys were returned and the results were compiled. Two of the key findings were:

- 94% indicated that natural areas are important and/or very important to them.
- 93% indicated that all communities should include natural areas.

foot width is based on wildlife requirements for interior forest. This measure also relates to ensuring that if a stream is part of a corridor that the stream itself is shaded. Within the designated "developed areas," forest of any width qualified as significant as did any regulated area.

- 2. Connectivity** - In an effort to prioritize areas of woodlands that were more closely connected, woodland patches with a gap of more than 600 feet from another patch were deleted from the network. This criterion is based on wildlife and insect movement data that shows that gaps larger than 600 feet are difficult barriers for movement.
- 3. Contiguity** - In order to remain in the network, areas needed to be connected to downstream corridors, open bodies of water or designated network or open space areas of adjacent jurisdictions.

Implementation Mechanisms:

The Green Infrastructure Plan is implemented through a variety of mechanisms.

Land development application process: Some categories of development applications, such as subdivisions, must conform to the Green Infrastructure Plan in order to gain approval. As a result, applicants are aware of the plan and the designated green infrastructure network influences the size and shape

of development proposals. To date, only one application has been disapproved for lack of conformance with the plan. For applications outside the network, more flexibility is provided to maximize densities as an incentive to develop outside the designated network.

Land conservation incentives: County approval of legislation allowing the use of conservation subdivision techniques provided an incentive for preservation by allowing smaller lots without rezoning the property and requiring minimum percentages of open space preservation. In addition, the plan proposes that regulations be strengthened where environmental conditions warrant and provide greater flexibility where development is targeted. This policy seeks to provide incentives to build in areas where gray infrastructure already exists and provides a disincentive to build within the green infrastructure network.

Purchase of development rights: In 2008, a purchase of development rights (PDR) program was approved and funded in the county. Funds from this program can be used to purchase perpetual conservation easements.

Legislative proposals: The plan recommends a variety of legislative changes to better protect the designated resources. These include widening minimum stream buffers,

reducing forest fragmentation, and prioritizing the resources within the network for preservation and restoration.

Use of public funds: The plan proposes that public infrastructure expenditures be strategically planned to help concentrate growth outside the green infrastructure network and that public funds for land acquisition for preservation be focused inside the network.

Local green infrastructure network refinement: As more detailed land use plans are prepared for segments of the county, called master plans or sector plans, the network is refined to include areas of local significance. This process allows stakeholders to shape the countywide network based on more detailed local information.

Monitoring of plan objectives: The county established eight clearly defined and measurable plan objectives. They include measures of how much of the network continues to meet the criteria for countywide significance (i.e. 75% by 2025); measures of net losses of woodland cover within the network (i.e. less than 25%) and several measures related to water quality and mitigation for impacts to regulated areas. These objectives will be evaluated every five years to determine if course corrections are needed. Because the plan was approved in 2005, the first five-year analysis is due in 2010.

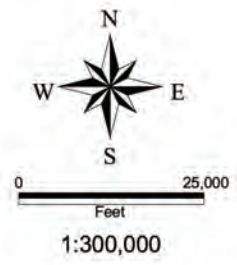
RESULTS








Land Development: Since the approval of the plan in June of 2005, there have been dozens of development proposals approved that contain some portion of the designated network. For each application, the regulated areas were refined with field delineations and the evaluation areas of the network were analyzed for environmental features in need of

Green Infrastructure Network (Interim Map)

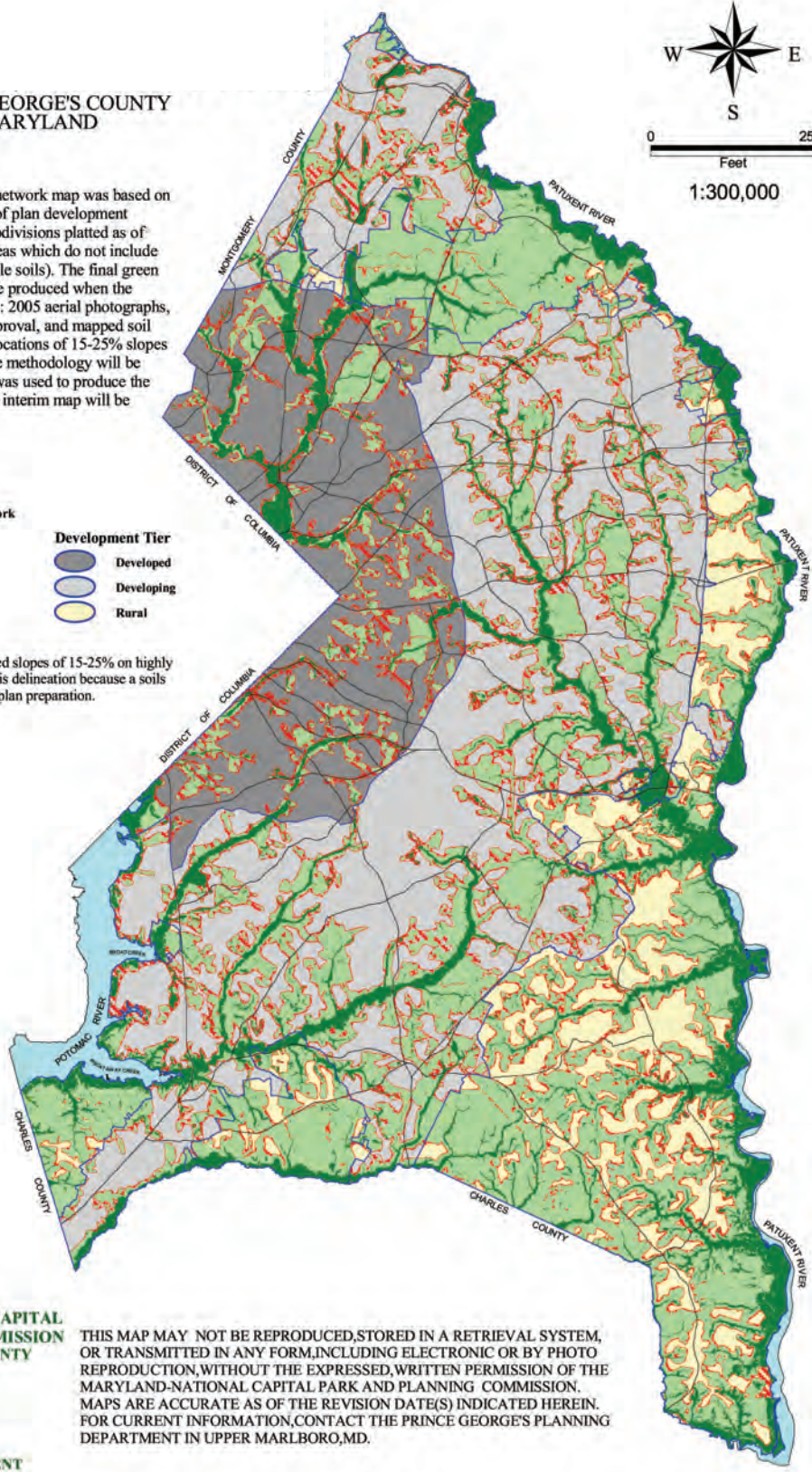
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This interim green infrastructure network map was based on information available at the time of plan development (i.e., 2000 aerial photography, subdivisions platted as of March 31, 2004, and regulated areas which do not include 15%-25% slopes on highly erodible soils). The final green infrastructure network map will be produced when the following information is available: 2005 aerial photographs, platted subdivisions as of plan approval, and mapped soil series to determine approximate locations of 15-25% slopes on highly erodible soils. The same methodology will be used to produce the final map as was used to produce the interim map. In the meantime, the interim map will be used for implementation.



-  Green Infrastructure Network
- Green Infrastructure Plan**
 -  Regulated Area *
 -  Evaluation Area
 -  Gap
- Development Tier**
 -  Developed
 -  Developing
 -  Rural

* Information regarding the regulated slopes of 15-25% on highly erodible soils is not included in this delineation because a soils layer was not available at time of plan preparation.



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► Subdivision Approval Process and Green Infrastructure Conservation



1

2



3



The sequence above graphically illustrates how resources within the green infrastructure network are conserved during a typical subdivision review process. Number 1 depicts the subdivision parcel in relation to Prince George's County's mapped green infrastructure network and stream and floodplain features to the left. Number 2 represents the proposed subdivision and number 3 shows the approved subdivision. The proposed subdivision had 22 lots, and conserved only 0.48 acres of land within the green infrastructure network (required floodplain conservation acreage not included). The subdivision review process took into account detailed information derived from on-site surveys and reduced the number of lots in the final plan to 18 while conserving 1.81 acres of land within the green infrastructure network - a three-fold increase compared to the original proposed plan.



conservation. The applications were then shaped to ensure the maximum preservation of the resources while allowing the development of the properties within the requirements of the existing zoning (see Subdivision Approval Process and Green Infrastructure Conservation).

Land Conservation: In addition to influencing new developments to conserve land within the green infrastructure network, the plan has facilitated the acquisition of land for conservation purposes. A recent example is the preservation of 43 acres in the ecologically significant transition zone between the coastal plain and Piedmont physiographic province. The protection of this land and 50+ acres of adjacent land in Montgomery County to the west contain forest cover types not found elsewhere in either county. The designation of the area as being of countywide significance in the green infrastructure network provided significant support to the acquisition of this land in Prince George's County.

KEYS TO SUCCESS

- **Guiding principles:** Before the public input process started, the team developed a set of guiding principles to direct the work on the plan. In the public forums, buy-in was requested and received. This resulted in an agreement among the team and stakeholders regarding the direction of the plan and helped people see common ground.
- **Best available information technology:** County staff use of GIS allowed participants to make decisions regarding what should be in and out of the network, and see the results of their decisions on various scenarios. As a result, participants felt more connected to the resulting network map. This method also provided a defensible network because it was based

➤ Green Infrastructure Photo Collage



- solely on GIS parameters, making it objective instead of subjective.
- **Connections to water quality:** One of the driving forces behind the preparation and approval of the Green Infrastructure Plan was the need to address water quality concerns. Much of the western portions of the county were developed without the benefit of stormwater management. This has resulted in reduced water quality in these areas. The water quality maps illustrated the need for better protection in a simple, easily interpreted format.
- **Champion:** A former elected official was a champion for the concept of green infrastructure planning through the General Plan process and the green infrastructure preparation and approval process. He understood the issues of green infrastructure planning and could communicate the process and potential outcomes to others.
- **Leadership:** All elected and appointed officials provided leadership in support of the planning process and subsequent green infrastructure plan. The Prince George's County Planning Board took a leadership role in the project by supporting this effort with financing and enthusiastic input. The County Executive had been recently elected on a platform emphasizing "Livable Communities," so green infrastructure planning and preservation meshed well with his subsequent initiatives. The County Council received multiple briefings during the preparation of the plan and were engaged and supportive throughout.
- **Accessibility:** Through the use of some simple graphics, the plan became more comprehensible to the average citizen. The Green Infrastructure Photo Collage (above) became almost iconic throughout the process and assisted people in recognizing the

project amid many other planning efforts underway at the time.

PHOTOS AND FIGURES

All figures by Prince George's County; except page 89, Burke Environmental Associates/The Conservation Fund
Page 89: Photo, David W. Krankowski
Page 93: Photo, Ted Weber

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FOR MORE INFORMATION

Project Contact:

CJ. Lammers
Supervisor, Environmental Planning
Prince George's County Planning Department
14741 Governor Oden Bowie Drive, Upper Marlboro, MD 20772
Phone: (301) 952-3026 | Email: CJ.Lammers@ppd.mncppc.org