

HOWARD COUNTY GREEN INFRASTRUCTURE NETWORK PLAN

December 2012

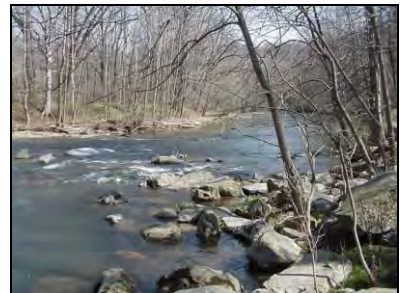
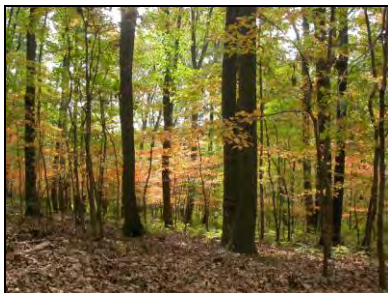


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Executive Summary

Green Infrastructure is a network of interconnected waterways, wetlands, forests, meadows and other natural areas. Green Infrastructure helps support native plant and animal species, maintain natural ecological processes, sustain air and water resources, and contribute to the health and quality of life for communities.

Typically, the basic building blocks of a green infrastructure network are hubs and corridors.

- **Hubs** anchor green infrastructure networks and are large, ecologically significant natural areas that provide habitat for wildlife. They may include protected areas, such as State and County parks that are managed for natural values; and private lands where natural features and ecological processes are protected and/or restored. Large contiguous blocks of interior forest (forest found at least 300 feet from the forest edge) and large wetland complexes are an essential component of hubs.
- **Corridors** are linear features that tie hubs together. They may include: rivers and streams, narrow sections of forest, and other upland areas that serve as biological conduits for plants and wildlife.

The purpose of Howard County's Green Infrastructure Network Plan (GI Plan) is to define, protect and enhance a green infrastructure network that includes and links the most ecologically significant natural areas in Howard County. The GI Plan will enable planners to consider important natural resources when:

- Preparing the General Plan, the Land Preservation, Recreation and Parks Plan, transportation plans, watershed management plans, and community plans
- Making decisions about zoning and development proposals
- Acquiring land for parks and public facilities
- Obtaining agricultural, environmental and other land preservation easements

The GI Plan offers a comprehensive approach to land and water conservation that also takes into account the County's development plans.

The Howard County GI Plan refines and expands on statewide planning efforts by the Maryland Department of Natural Resources (DNR) to define Maryland's Green Infrastructure, adapting the state methodology to County-scale analysis and planning priorities. The basic criteria for mapping hubs in the Howard County network were to include the following:

- Interior forests of 50 acres and larger, with a 300-foot buffer
- Wetlands of 25 acres and larger, with a 100-foot buffer
- County and State parkland and open space that contain these interior forest and wetland resources
- Forest, parkland and open space adjacent to these interior forest and wetland resources

The Howard County Green Infrastructure Network contains 51 hubs. The hubs contain approximately 22,148 acres or 14% of the total County area, and range in size from 25 to 2,407 acres. The smallest hub is located along the Patapsco River in Elkridge and the largest is located along the upper Patuxent River between MD 97 and MD 94. The hubs include major State and County parks, the Washington Suburban Sanitary Commission reservoirs, Columbia Association properties such as Lake Elkhorn and Lake Kittamaqundi, and privately owned forests and wetlands. Approximately 76% of the land in the hubs is protected in parkland or open space, and 11% is under an agricultural, environmental or historic

easement. The remaining 13% of the land is in a variety of uses and approximately 6% is uncommitted, which is land that still has development potential based on current zoning.

The Green Infrastructure Network defined two minimum corridor widths of 300 and 500 feet, with extensions to include adjacent floodplain, wetlands, parkland and open space. The 500-foot corridor width is the preferred option for the network. However, there are areas within the network where the 300-foot corridor width may be more appropriate. An example would be an upland corridor that crosses actively farmed land, where the farmer prefers to minimize land taken out of production.

There are 48 corridor connections in the network. The 500-foot corridor system contains approximately 6,173 acres or 4% of the total County area. Approximately 26% of this system is protected in parkland or open space, and 26% is under an agricultural or environmental easement. The remaining 48% of the land is in a variety of uses and approximately 11% is uncommitted.

Corridors generally follow rivers and streams. All of the major streams in the County have a combination of hubs and corridors, except for Deep Run, which has only a few hubs along the Anne Arundel County border. Upland corridor connections across watersheds were the most difficult to find, because ridge lines between watersheds are often prime locations for roads and related development, which block safe passage for wildlife. All of the cross watershed corridors are considered potential corridors due to problematic street crossings, the proximity of nearby development and/or concerns about the best path to take when crossing agricultural land. There are 13 corridors that are considered potential connections. Potential corridors need site visits and coordination with property owners to confirm their viability.

The Green Infrastructure Network contains a mosaic of land uses – parkland, open space, farms, residential lots, commercial properties, institutional properties, and properties with historic, environmental or agricultural easements. Protecting and enhancing the network will require efforts from both public and private landowners. Potential tools that could be used to protect and enhance the network include stewardship, financial incentives, regulatory protections, easements and acquisition. These tools can be used individually or in combination. The County should develop a management plan for each hub and corridor that provides an assessment of current habitat conditions and identifies the most appropriate habitat protection and enhancement measures. The management plans should be updated periodically.

The GI Plan contains goals, objectives and prioritized implementation actions to guide efforts to help protect and enhance the network. Indicators will be monitored to measure the success of these actions, so that improvements can be made in implementation. The results of these monitoring efforts will be presented in an Indicators Report that will be prepared each time the network map is updated. The network map will be updated approximately every three years, coinciding with updates of County aerial photography.

Information on the Howard County Green Infrastructure Network Plan, as well as an interactive map, can be found on Green Central Station at:

<http://livegreenhoward.com/land/green-infrastructure/>

Background and Purpose of the Green Infrastructure Network Plan

Definition

Green Infrastructure is a network of interconnected waterways, wetlands, forests, meadows and other natural areas. Green Infrastructure helps support native plant and animal species, maintain natural ecological processes, sustain air and water resources, and contribute to the health and quality of life for communities.

Hubs and Corridors

Typically, the basic building blocks of a green infrastructure network are hubs and corridors.

- **Hubs** anchor green infrastructure networks and are large, ecologically significant natural areas that provide habitat for wildlife. They may include protected areas, such as State and County parks that are managed for natural values; and private lands where natural features and ecological processes are protected and/or restored. Large contiguous blocks of interior forest (forest found at least 300 feet from the forest edge) and large wetland complexes are an essential component of hubs.
- **Corridors** are linear features that tie hubs together. They may include: rivers and streams, narrow sections of forest, and other upland areas that serve as biological conduits for plants and wildlife.

Purpose

The purpose of Howard County's Green Infrastructure Network Plan (GI Plan) is to define, protect and enhance a green infrastructure network that includes and links the most ecologically significant natural areas in Howard County. The GI Plan will enable planners to consider important natural resources when:

- Preparing the General Plan, the Land Preservation, Recreation and Parks Plan, transportation plans, watershed management plans, and community plans
- Making decisions about zoning and development proposals
- Acquiring land for parks and public facilities
- Obtaining agricultural, environmental and other land preservation easements

The GI Plan offers a comprehensive approach to land and water conservation that also takes into account the County's development plans.

The GI Plan refines and expands on statewide planning efforts by the Maryland Department of Natural Resources (DNR) to define Maryland's Green Infrastructure, adapting the state methodology to County-scale analysis and planning priorities. The GI Plan includes a list of potential tools that can be used to protect and enhance the network, including stewardship, financial incentives, regulatory protections, easements and acquisition. State priorities for acquisition of land or easements to protect green infrastructure can serve as a guide for similar action by the County.

Defining the Green Infrastructure Network

The planning process began with a literature review about green infrastructure and a review of best practices nationally and locally. Green infrastructure plans developed by DNR and Anne Arundel, Montgomery and Prince George's Counties were also reviewed. A summary of the purpose and/or goal

and methodology used to define these State and local networks is included in Appendix A. The Maryland and Anne Arundel County green infrastructure networks define a system of hubs and corridors. The Montgomery and Prince George's County networks define a system of regulated areas, evaluation areas and network gaps. The Montgomery County plan is still a draft plan. The Howard County Green Infrastructure Network will define a system of hubs and corridors.

Hubs

The statewide Maryland Green Infrastructure is shown on Map 1 and a close-up view of this green infrastructure within Howard County is shown on Map 2. The Maryland Green Infrastructure generally defines hubs as: interior forests or large wetland complexes of at least 250 acres; other important plant and animal habitats of at least 100 acres, such as migratory bird habitat and pristine river segments with adjacent forests and wetlands; and protected natural resource lands that contain these habitats. Maryland Green Infrastructure hubs in Howard County include the Patuxent River and Patapsco State Parks, the Middle Patuxent Environmental Area, David Force Park and the Gorman Natural Resource Area.

Larger habitat patches generally provide higher quality habitat and support a wider variety of wildlife species. Forest interior birds are often used as an indicator species to establish size minimums for habitat patches, because habitat that will support these species will also support a wide variety of other native species. A literature review done by Bushman and Therres (1988), found that 250 acres is the minimum forest size needed to maintain viable breeding populations of seven forest interior bird species of Maryland. Eight species could maintain viable breeding populations in smaller forest patches, and three species required larger forest patches.

In general, the State criteria were used to map hubs in Howard County, but the scale used by the State was reduced so that more areas of countywide ecological importance were included. These smaller areas can still provide valuable habitat. A study by Jones et al (2000) found that forest interior dwelling bird habitat can be present in: forests of at least 50 acres with forest interior habitat of at least 10 acres; and riparian forests of at least 50 acres with an average width of at least 300 feet.

Initially, a draft Green Infrastructure Network was prepared that presented three options for defining the hubs. These options ranged from conservative to expansive in the habitat included in the hub. For example, the hubs in the conservative option contained only forest patches with interior forests of 75 acres and larger, while the hubs in the most expansive option contained forest patches with interior forests of 50 acres and larger plus any adjacent forest. These options were presented for public review and the most expansive option was chosen for the final Green Infrastructure Network. The basic criteria for mapping hubs in the network were to include the following:

- Interior forests of 50 acres and larger, with a 300-foot buffer
- Wetlands of 25 acres and larger, with a 100-foot buffer
- County and State parkland and open space that contain these interior forest and wetland resources
- Forest, parkland and open space adjacent to these interior forest and wetland resources

Additional detail on mapping criteria for the hubs can be found in Table 1: Mapping Criteria for Hubs.

Corridors

The Maryland Green Infrastructure defines corridors as having a minimum width of 1,100 feet. This provides a 500-foot interior travel corridor with a 300-foot transition zone on each side. Maryland Green

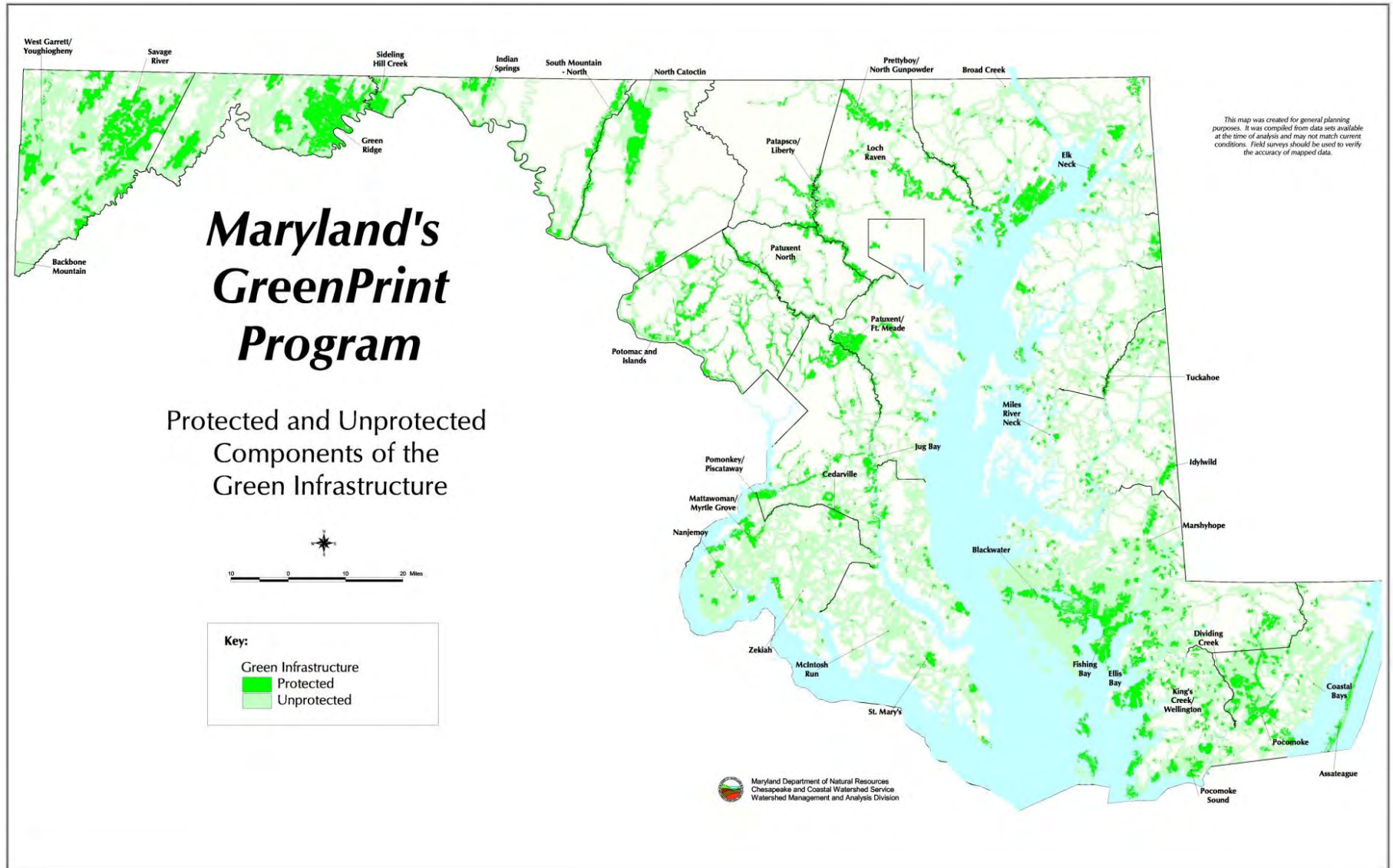
Infrastructure corridors in Howard County include major stream valleys as well as overland routes that provide cross watershed connections.

Literature research was conducted by DNR on corridor mapping criteria that considered water quality protection, habitat for reptiles, amphibians and birds, and forest health. In general, wider corridors provide better water quality and habitat value. Recommended minimums for stream and wetland buffers ranged from 100 feet to provide adequate water quality, up to 450 - 550 feet to provide adequate habitat for reptiles and amphibians. Preferred corridor widths for birds ranged from 150 to 650 feet, with wider corridors providing cover for a wider range of species and limiting mammalian nest predation. Wider corridor widths for forest limited invasive exotic species. Forest widths less than 150 feet were sometimes dominated by invasive exotic species, while forest widths greater than 650 feet generally had less than 10% invasive exotic species.

The draft Green Infrastructure Network defined two minimum corridor widths of 300 and 500 feet, with extensions to include adjacent floodplain, wetlands, parkland and open space. These options were presented for public review and the 500-foot corridor width was the preferred option for the network. However, there are areas within the network where the 300-foot corridor width may be more appropriate. An example would be an upland corridor that crosses actively farmed land, where the farmer prefers to minimize land taken out of production. In these areas, the final corridor width is still to be determined. For this reason, both corridor widths are shown on more detailed maps of the network.

Ideally, corridors should provide connections along the best ecological or natural route, and have habitat similar to the habitat in the hubs being connected (for example, forested corridors should be used to connect forested hubs). Corridors should end at another corridor or hub, and not dead end. Additional detail on mapping criteria for corridors can be found in Table 2: Mapping Criteria for Corridors.

Map 1: Maryland Green Infrastructure



Map 2: Maryland Green Infrastructure in Howard County

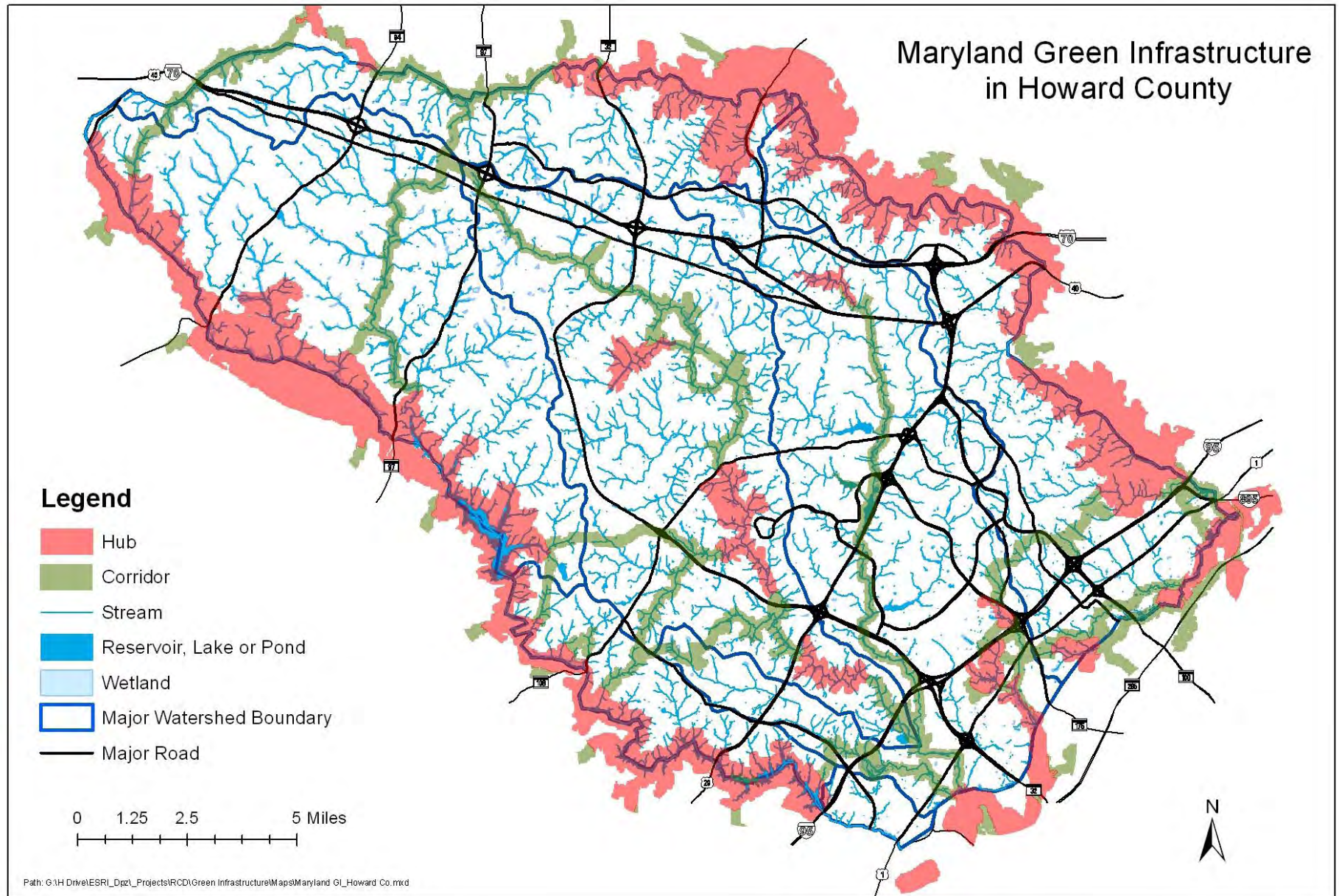


Table 1: Mapping Criteria for Hubs

| Resource | Mapping Criteria | Notes |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interior forest | 50 acres and larger with 300' buffer | |
| Adjacent forest | Include forest patch that contains the interior forest and adjacent forest | Forest extensions less than 650' in width will not be included. Forest conservation easements that meet the minimum size criteria for protected lands of being 300' or wider will be included. |
| Wetlands | 25 acres and larger with 100' buffer and a minimum width of 500' | Narrow wetlands confined to stream corridors may be more appropriate in corridors; ponds and lakes meeting size criteria will be included regardless of shape. |
| 100-year floodplain | | Floodplains will not be mapped as hubs but can be used to expand hubs when adjacent. |
| Tier II streams and other high quality waters | | These waters will be prioritized for corridors, where feasible, and implementation actions. |
| Sensitive Species Project Review Areas (SSPRAs) | Include if interior forest and wetland resources listed above are present | SSPRAs contain habitat for rare, threatened and endangered species. SSPRAs not in hubs will be considered for corridors. |
| Protected lands with a minimum width of 300' | Include WSSC, State and County parkland and open space that contains the resource as well as adjacent County, CA & HOA park & open space | Small, isolated DNR parcels will be considered for corridors rather than hubs. Small, narrow projections of protected land will not be included. |
| Targeted Ecological Areas (TEAs) | Include if interior forest and wetland resources listed above are present | TEAs are State priority preservation areas within the Maryland Green Infrastructure. TEAs not in hubs will be considered for corridors. |
| State Hubs and adjacent County Hubs | | State hubs that don't meet the criteria for a County hub will be evaluated for inclusion. Adjacent County networks will be considered when mapping hubs and corridors. |
| Existing buildings, parking lots, roads, railroad tracks | Exclude as much as possible | Some of these land uses will be included incidentally, especially when located on State or County parkland. |

Notes:

- Hubs should have high interior to edge ratios, so small, narrow projections of forest, protected lands, etc. are usually excluded.
- Hubs are assigned names to give an indication of their predominant resource and/or location within Howard County. For example, the Gorman Park Hub contains Gorman Park, and the Folly Quarter Forest is a forested hub in the Folly Quarter area of the County.

Table 2: Mapping Criteria for Corridors

| Resource | Mapping Criteria | Notes |
|----------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General | Minimum width of 300' or 500' | 300' is the recommended minimum width for birds and to limit invasive species. |
| Forest | Expand to include forest conservation easements | Minimize narrow (less than 300' wide) projections from corridors. |
| Wetlands | Expand to include adjacent wetlands and 25' buffer | |
| 100-year Floodplain | Expand to include adjacent floodplain | |
| Tier II streams and other high quality waters | Prioritize for corridors where feasible | Isolated streams may not fit well in the network. |
| Sensitive Species Project Review Areas (SSPRAs) | Include where feasible | SSPRAs contain habitat for rare, threatened and endangered species. Most are included in hubs. A few small, isolated areas may not fit well in the network. |
| Protected Lands | Expand to include adjacent parkland and open space | Minimize narrow (less than 300') projections from corridors. Try to locate upland corridors in agricultural or environmental easements, where feasible. |
| Targeted Ecological Areas (TEAs) | Include where feasible | TEAs are State priority preservation areas within the Maryland Green Infrastructure. |
| Existing buildings, parking lots, roads, railroad tracks | Exclude as much as possible | Corridors may cross roads if there is still the potential for wildlife passage. Generally try to keep 50' away from homes when on private lots. |

Notes:

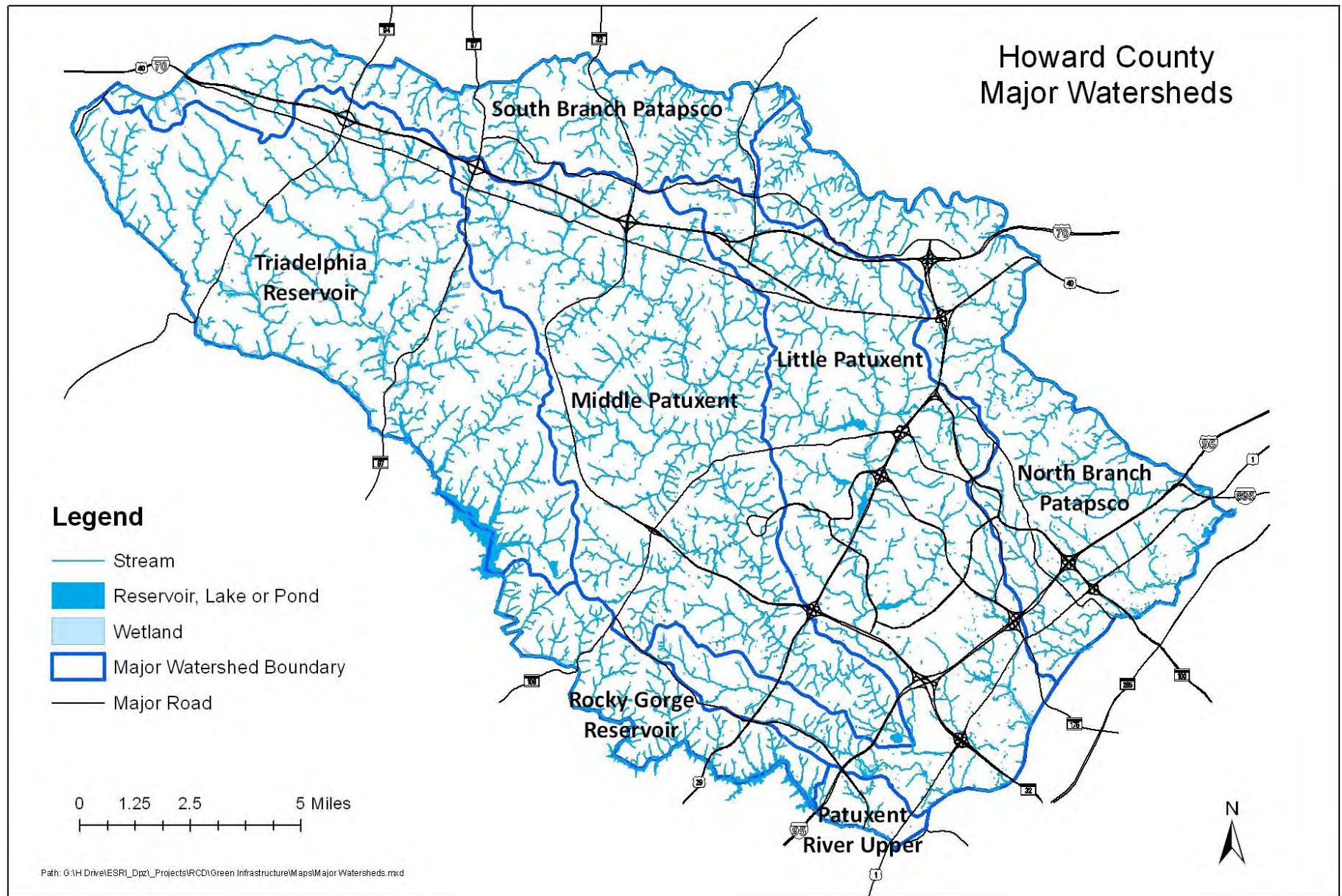
- Corridors should connect hubs along the best ecological or natural route, and provide habitat similar to the hubs being connected (forest to forest, aquatic to aquatic), where feasible. Most corridors will be centered on streams. Corridors should end at another corridor or hub, and not dead end.
- Corridors are named for the hubs and corridors they connect. For example, the Lake Kit – Savage Corridor connects the Lake Kittamaquindi Hub with the Savage Park Hub, and the South Patapsco – Friendship Corridor connects a corridor along the South Branch Patapsco River with the Friendship Forest Hub.

A list of the environmental and development layers that were used for mapping and analyzing the Green Infrastructure Network can be found in Appendix B.

Analysis of the Green Infrastructure Network

The following presents an analysis of the environmental resources and land uses found within the hubs and corridors of Howard County’s Green Infrastructure Network. A comparison is also given between Howard County’s and Maryland’s Green Infrastructure. Since hubs and corridors are generally oriented to the major rivers and streams in Howard County, Map 3 shows the major watersheds in Howard County.

Map 3: Major Watersheds in Howard County



Hubs

The Howard County Green Infrastructure Network contains 51 hubs, as shown on Maps 4 and 5. The environmental resources and land uses contained within the hubs are summarized in Tables 3 and 5, respectively. Additional environmental resource analysis is presented in the section on Sensitive Resources.

The hubs contain approximately 22,148 acres or 14% of the total County area, and range in size from 25 to 2,407 acres. The smallest hub is located along the Patapsco River in Elkrige and the largest is located along the upper Patuxent River between MD 97 and MD 94. Similar to the State system, County hubs include the Patuxent River and Patapsco State Parks, the Washington Suburban Sanitary Commission (WSSC) reservoirs, the Middle Patuxent Environmental Area, David Force Park and the Gorman Natural Resource Area. The County system also adds hubs for Savage Park, Benson Branch Park, Centennial Lake, Lake Elkhorn, Lake Kittamaquidi and West Friendship Park, and adds other hubs along Cattail Creek, and the Middle and Little Patuxent Rivers. Approximately 76% of the land in the hubs is protected in parkland or open space, and 11% is under an agricultural, environmental or historic easement. The remaining 13% of the land is in a variety of uses and approximately 6% is uncommitted, which is land that still has development potential based on current zoning.

Corridors

There are 48 corridor connections in the network and the corridors generally follow rivers and streams. All of the major streams in the County have a combination of hubs and corridors, except for Deep Run, which has only a few hubs along the Anne Arundel County border. In more developed areas of the County, the 300- and 500-foot corridors often overlap in multiple areas, either because they were constrained by adjacent development or because adjacent protected land allowed a wider corridor.

Upland corridor connections across watersheds were the most difficult to find, because ridge lines between watersheds are often prime locations for roads and related development, which can block safe passage for wildlife. All of the cross watershed corridors are considered potential corridors due to problematic street crossings, the proximity of nearby development and/or concerns about the best path to take when crossing agricultural land. There are 13 corridors that are considered potential connections. Potential corridors need site visits and coordination with property owners to confirm their viability. Appendix C contains information on the issues of concern for each potential corridor.

The environmental resources and land uses contained within the 300- and 500-foot corridor systems are summarized in Tables 4 and 6, respectively. The 300-foot system contains approximately 4,880 acres or 3% of the County. Approximately 32% of this system is protected in parkland or open space, and 24% is under an agricultural or environmental easement. The remaining 44% of the land is in a variety of uses and approximately 10% is uncommitted. The 500-foot system contains approximately 6,173 acres or 4% of the County. Approximately 26% of this system is protected in parkland or open space, and 26% is under an agricultural or environmental easement. The remaining 48% of the land is in a variety of uses and approximately 11% is uncommitted.

Map 5: Howard County Green Infrastructure Network with Protected Land

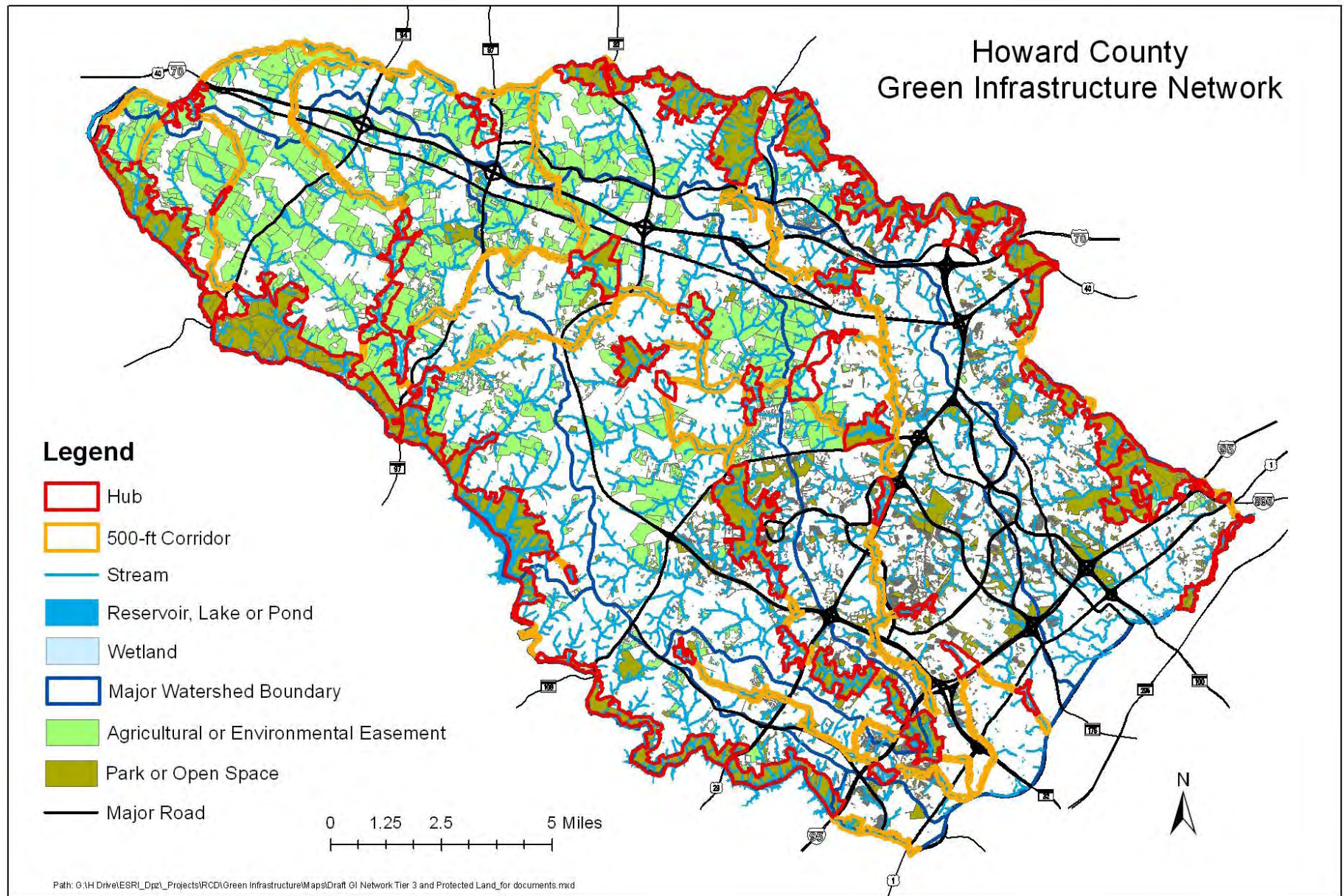


Table 3: Resource Analysis for Hubs

| Resource | Area in County (Acs) | Area in Hubs (Acs) | % of Hubs | % of Resource |
|---------------------------------------------|----------------------|--------------------|-----------|---------------|
| County Acreage | 160,640 | 22,148 | | 13.8 |
| Forest | 45,464 | 17,454 | 78.8 | 38.4 |
| Forest Interior Habitat | 23,151 | 14,932 | 67.4 | 64.5 |
| Forest Interior Habitat of 50 acres or more | 9,455 | 9,421 | 42.5 | 99.6 |
| Wetlands | 4,458 | 2,247 | 10.1 | 50.4 |
| Wetlands of 25 acres or more | 2,060 | 1,861 | 8.4 | 90.3 |

Notes:

- Forest interior habitat acreage includes the 300' buffer.
- Wetland acreage includes lakes and reservoirs.

Table 4: Resource Analysis for Corridors

| Resource | Area in County (Acs) | 300-foot Corridors | | | 500-foot Corridors | | |
|-------------------------|----------------------|--------------------|----------------|---------------|--------------------|----------------|---------------|
| | | Area (Acs) | % of Corridors | % of Resource | Area (Acs) | % of Corridors | % of Resource |
| County Acreage | 160,640 | 4,880 | | 3.0 | 6,173 | | 3.8 |
| Forest | 45,464 | 2,854 | 58.5 | 6.3 | 3,292 | 53.3 | 7.2 |
| Forest Interior Habitat | 23,151 | 1,258 | 25.8 | 5.4 | 1,450 | 23.5 | 6.3 |
| Wetlands | 4,458 | 662 | 13.6 | 14.8 | 671 | 10.9 | 15.1 |

Notes:

- Forest interior habitat acreage includes the 300' buffer.
- Wetland acreage includes lakes and reservoirs.

Table 5: Land Use Analysis for Hubs

| Land Use | Area in County (Acs) | Area in Hubs (Acs) | % of Hub |
|-----------------------------|----------------------|--------------------|----------|
| County Acreage | 160,640 | 22,148 | |
| Natural Resource Open Space | 3,354 | 570 | 2.6 |
| County Parkland | 5,594 | 2,917 | 13.2 |
| DNR & WSSC land | 12,280 | 12,509 | 56.5 |
| HOA Open Space | 2,561 | 179 | 0.8 |
| CA Open Space | 3,774 | 563 | 2.5 |
| Agricultural Easements | 21,524 | 1,407 | 6.4 |
| Environmental Easements | 7,858 | 1,000 | 4.5 |
| Historic Easements | 280 | 55 | 0.2 |
| Residential Uncommitted | 11,849 | 1,170 | 5.3 |
| Industrial Uncommitted | 742 | 93 | 0.4 |
| Commercial Uncommitted | 600 | 43 | 0.2 |
| Mixed Use Uncommitted | 593 | 9 | 0.04 |

Notes:

- The DNR, WSSC land, HOA open space and CA open space acreages are based on the Department of Planning and Zoning land use database as of 8/17/11. This database is still under development. Calculated acreage in the hubs may exceed acreage in the database due to inaccuracies in the database.
- Easement acreage is based on land under easement as of March 15, 2012.
- The historic easements in the hubs are 15 acres at Belmont in the Patapsco Lower North Branch Rockburn Branch Hub, and 40 acres at Duvall's Range in the Triadelphia Cattail Hub.
- The uncommitted parcel information was generated in September 2011.
- The commercial uncommitted land in the hubs is two parcels located within the Middle Patuxent Environmental Area Hub.
- The mixed use uncommitted land in the hubs is within Downtown Columbia on the west side of Lake Kittamaquidi.

Table 6: Land Use Analysis for Corridors

| Land Use | Area in County (Acs) | 300-foot Corridors | | 500-foot Corridors | |
|-----------------------------|----------------------|--------------------|----------------|--------------------|----------------|
| | | Acres | % of Corridors | Acres | % of Corridors |
| County Acreage | 160,640 | 4,880 | | 6,173 | |
| Natural Resource Open Space | 3,354 | 585 | 12.0 | 590 | 9.6 |
| County Parkland | 5,594 | 426 | 8.7 | 427 | 6.9 |
| DNR & WSSC Land | 12,280 | 3 | 0.1 | 3 | 0.1 |
| HOA Open Space | 2,561 | 70 | 1.4 | 80 | 1.3 |
| CA Open Space | 3,774 | 483 | 9.9 | 485 | 7.9 |
| Agricultural Easements | 21,524 | 680 | 13.9 | 1,010 | 16.4 |
| Environmental Easements | 7,858 | 473 | 9.7 | 604 | 9.8 |
| Historic Easements | 280 | 0 | 0 | 0 | 0 |
| Residential Uncommitted | 11,849 | 403 | 8.3 | 572 | 9.3 |
| Industrial Uncommitted | 742 | 29 | 0.6 | 42 | 0.7 |
| Commercial Uncommitted | 600 | 8 | 0.2 | 17 | 0.3 |
| Mixed Use Uncommitted | 593 | 26 | 0.5 | 26 | 0.4 |

Notes:

- The DNR, WSSC land, HOA open space and CA open space acreages are based on the Department of Planning and Zoning land use database as of 8/17/11. This database is still under development. Calculated acreage in the hubs may exceed acreage in the database due to inaccuracies in the database.
- Easement acreage is based on land under easement as of March 15, 2012.
- The uncommitted parcel information was generated in September 2011.
- The uncommitted mixed use land in the corridors is 12 acres of woods in Laurel Park Station and 14 acres of woods in Downtown Columbia along the Little Patuxent River south of Lake Kittamaqundi.

Sensitive Resources

Wetlands

There are 1,760 wetlands mapped in Howard County, but only 30 of these wetlands are 25 acres or larger in size, including lakes and reservoirs. The network contains all wetlands of 25 acres or larger.

Wetlands of Special State Concern

Wetlands of Special State Concern (WoSSC) are designated by the State for special protection, because they have unique habitat or habitat for rare, threatened and endangered species. WoSSC in Howard County include wetlands and stream segments, and the network contains a majority of these WoSSC. One small wetland near the intersection of I-95 and MD 32 in the Guilford Branch subwatershed is excluded, because it is isolated and does not fit in the network. In addition, the Benson Branch Hub and its connecting corridor contain most of the segment of Benson Branch and its tributaries that are designated as WoSSC, but exclude two small segments that are isolated by development.

Tier II Stream Segments

Tier II waters are designated by the State for special protection, because their water quality is significantly better than that required by water quality standards. There are six Tier II stream segments in Howard County and all are located in western Howard County. The network contains one of these stream segments in a corridor along the South Branch Patapsco River. A portion of another stream segment, a tributary to Cattail Creek, is contained in a corridor that connects hubs on Cattail Creek with the hub at West Friendship Park. The remaining stream segments are isolated and do not fit within the network.

Stronghold Watersheds

Stronghold Watersheds are designated by the State for special protection, because they contain high numbers of rare, threatened and endangered fish, amphibians, reptiles or mussel species. Howard County lies within three Stronghold Watersheds that extend into adjacent counties. One watershed is located in the North Branch Patapsco River watershed and it extends into Baltimore County. The other two watersheds are in the Little Patuxent River watershed and they extend into Anne Arundel County. The network does not contain all of the County land within these Stronghold Watersheds, but it does contain areas of significant habitat within these watersheds. In the North Branch Patapsco River watershed, the network contains a series of hubs along the North Branch Patapsco River. However, in the Little Patuxent River watershed, the network contains only the Dorsey Run Wetland Hub, along with a potential corridor connecting this hub to the nearby Guilford Branch Forest Hub.

Sensitive Species Project Review Areas

Sensitive Species Project Review Areas (SSPRAs) are designated by the State for special protection, because they contain habitat for rare, threatened and endangered species. There are 31 SSPRAs in Howard County and the network contains 26 of these areas. The remaining five areas are small and isolated, and do not fit within the network.

Forest Interior Habitat

Certain plant and animal species require forest habitat that can only be found in the forest interior. Forest interior habitat is generally defined as forest found at least 300 feet from the forest edge. Forest interior habitat is a higher quality forest habitat, because it is generally more isolated, with a closed canopy that creates moist, shaded growing conditions, with less predation by edge species and fewer invasive species. Forest interior habitat is a more rare forest environment, because development has fragmented our remaining forest into smaller forest patches.

There are approximately 45,464 acres of forest cover in the County, but only 7,716 acres of forest interior habitat, which expands to 23,151 acres when the necessary 300-foot buffer is included. There are 1,454 forest patches in Howard County, which range in size from less than one acre to 1,443 acres. The largest forest patch is located primarily within Patapsco Valley State Park, but it also extends into the surrounding residential area. Even though there are 99 forest patches of 100 acres or larger, there are only 39 forest interior habitat areas of 50 acres or larger. The network (including the 500' corridor system) contains approximately 20,746 acres or 46% of the forest in the County, and 16,382 acres or 71% of the forest interior habitat, including the 300-foot buffer.

Targeted Ecological Areas

Maryland's Greenprint is a program to identify Maryland's most ecologically significant lands and to target them for preservation. These Targeted Ecological Areas (TEAs) include large blocks of forests and wetlands, rare species habitats, aquatic biodiversity hotspots and areas important for protecting water

quality. According to the Greenprint web site (<http://www.greenprint.maryland.gov/>), the State identified 8,616 acres of TEAs in Howard County (only 5.4% of the County). Of this acreage, 5,583 acres (64.8% of the TEAs) are protected, leaving 3,033 acres still to be protected. Unprotected TEAs are mainly located along Patapsco Valley State Park, the Middle Patuxent River and tributaries of the Patuxent River between the reservoirs.

There are nine Targeted Ecological Areas in the County, with three of these extending beyond the County boundaries. All of the TEAs in Howard County are contained within the Maryland Green Infrastructure, except for a small portion of one that lies predominantly within Anne Arundel County. The Howard County Green Infrastructure Network contains five TEAs. Three of the TEAs not included in the network are corridors within the State Green Infrastructure system, and they are discussed below. The fourth TEA not included is the one that lies predominantly within Anne Arundel County, because the small portion in Howard County is fully developed.

Green Infrastructure in Adjacent Counties

The network provides connections to the Anne Arundel County Green Infrastructure through the hubs in Patapsco Valley State Park to the south of Elkridge, and through the corridors along Hammond Branch, the Little Patuxent River, Guilford Branch and Dorsey Run. The network provides connections to the Prince George’s County Green Infrastructure along the Rocky Gorge Reservoir Hub and the Patuxent River corridor.

Comparison with Maryland Green Infrastructure

State Hubs

The Howard County Green Infrastructure Network contains all but three of the hubs identified within the County by the Maryland Green Infrastructure system. The three hubs that are not included are described below. The State system was mapped using data from 1990 to 2000. Development has occurred in many areas of the County since this data was created and the remaining resources in these State hubs do not meet the criteria to qualify as a County hub. The State is currently working on an update to the Maryland Green Infrastructure system.

| State Hub Number | Location | Reason for Exclusion |
|-------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 284 | Columbia Gateway | Development has occurred in this area and the remaining resources do not meet the criteria for a County hub. |
| 290 | South of Deep Run at the Anne Arundel (AA) County border, extending into AA County | This is an industrial area and the resources in this area do not meet the criteria for a County hub. |
| 291 | Between the Guilford Branch Forest and Dorsey Wetland Hubs | This is the Chase Quarry that is being actively mined. The resources in this area do not meet the criteria for a County hub; however, a potential corridor has been mapped here to connect the two hubs nearby. |

The County hubs are drawn at a more refined scale and with more up-to-date information than the State hubs. In a few cases, the County system may contain a series of hubs and corridors rather than the one large hub in the State system, as noted below.

| State Hub Number | Location | Modification |
|-------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 218 | Patapsco River along the border with Baltimore County near Woodbine Road | Only a small portion of this hub is within Howard County, and this portion is included in the County system as a corridor. |
| 253 | Patapsco River between Ellicott City and Elkrige | The County system is two hubs and a corridor. |
| 258 | Triadelphia Reservoir | This hub extends south to the next hub containing Rocky Gorge, but the County system uses a corridor to connect the two reservoir hubs. |
| 299 | Dorsey Run at Anne Arundel County border | The County system is a hub and corridor. |

State Corridors

There are several areas where State corridors were not included in the County system. These are upland corridors and development in the upland areas blocks wildlife passage, as described below.

| State Corridor Location | Reason for Exclusion |
|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cattail Creek, Middle Patuxent River and South Branch Patapsco River | Development blocks wildlife passage. |
| Benson Branch Park and Middle Patuxent Forests | Large lot residential development blocks wildlife passage along the western corridor. Residential development along Folly Quarter Road blocks wildlife passage along the eastern corridor and there is no stream crossing to provide safe passage at Folly Quarter Road. |
| Triadelphia Reservoir to Middle Patuxent River (part of this corridor is a TEA) | The corridor goes through the intersection at MD 108 and MD 32 with no safe passage for wildlife. Upland connections for wildlife passage between streams in each watershed are blocked by large lot residential development. |
| Triadelphia Reservoir to Patuxent River (also a TEA) | Wildlife passage is blocked by large lot residential development. |
| Rocky Gorge Reservoir to Hammond Branch (north) and Middle Patuxent (part of this corridor is a TEA) | Wildlife passage is blocked by development along MD 216. |
| Hammond Branch to Middle Patuxent River | Wildlife passage is blocked by residential development. |
| Rocky Gorge Reservoir to Hammond Branch (south) | Wildlife passage is blocked by residential development. |
| Little Patuxent River to Lower North Branch Patapsco River (in the vicinity of Dorsey Run and Deep Run) | Wildlife passage is blocked by development. |

One other difference in the State corridor system is that the Little Patuxent River corridor includes an extension to contain Wilde Lake. The County system does not include Wilde Lake because it doesn't meet the minimum 25-acre wetland size criteria for a hub.

Goals and Objectives to Protect and Enhance the Network

The purpose of Howard County's Green Infrastructure Network Plan (GI Plan) is to define, protect and enhance a green infrastructure network that includes and links the most ecologically significant natural areas in Howard County. To guide efforts to help protect and enhance the network, the following goals and objectives have been established for habitat and stewardship.

Goal: Protect, enhance and restore the habitat and natural areas within the Green Infrastructure Network to support a diversity of plant and animal life.

Objectives:

- Retain, enhance and restore forests, interior forests and wetlands.
- Increase the habitat value of ponds, lakes and reservoirs.
- Enhance and restore stream habitat.
- Manage wildlife to support healthy and diverse populations of native species.

Goal: Promote stewardship of the Green Infrastructure Network among individuals, community organizations, businesses, schools and others.

Objectives:

- Increase awareness and personal involvement.
- Encourage participation in land preservation programs.
- Promote land management practices that conserve resources, reduce pollution and enhance habitat.

Tools to Protect and Enhance the Network

The network contains a mosaic of land uses – parkland, open space, farms, residential lots, commercial properties, institutional properties, and properties with historic, environmental or agricultural easements. A small percentage of properties are uncommitted and still retain development potential under current zoning. These different land uses provide a varying level of protection for the sensitive resources located within the network, which may be subject to degradation or removal.

In general, sensitive resources face the greatest threat from degradation or removal during development. County requirements for sediment and erosion control, stormwater management, non-disturbance of the floodplain, and protective buffers for streams and wetlands reduce impacts to water resources during development. However, many properties in the network were developed prior to these requirements, so stream and wetland resources may have been degraded as a result. In addition, current stream and wetland buffer requirements do not provide the large buffers that are desired for the network. Water resources also face degradation from pollution and invasive species.

Forest resources are usually protected from removal on parkland and open space, but are vulnerable to clearing on all other properties, unless protected by a forest conservation easement or an environmental easement that specifies protection. However, forest conservation easements still allow timber harvesting. In addition to threats from development, forest resources also face degradation from invasive species and over browsing by deer.

Potential tools that could be used to protect and enhance the resources contained within the network include stewardship, financial incentives, regulatory protections, easements and acquisition. These tools can be used individually or in combination. The County should develop a management plan for each hub

and corridor that provides an assessment of current habitat conditions and identifies the most appropriate habitat protection and enhancement measures. The management plans should be updated periodically. The County may wish to prioritize the development of management plans for hubs and corridors that are primarily privately owned, as publicly owned lands may already have resource management plans.

Stewardship

Stewardship is an applicable tool for all properties within the network. Stewardship on privately owned residential and commercial properties can be encouraged through outreach and education to inform property owners about best management practices to protect and enhance habitat. Stewardship on publicly owned properties can be guided by resource management plans tailored to the property. Best management practices can include: trash removal; invasive species control; limiting forest clearing; planting forested buffers along streams, wetlands and other water bodies; supplemental planting for meadows, wetlands and forests; fencing livestock out of streams; and stream and wetland restoration.

The County should develop an outreach program targeted to property owners within the network. This program should educate property owners about the value of their property within the network, measures that could be taken to protect and enhance the habitat value of their property, and programs available for assistance. Examples of programs that could be used to provide private property owners with assistance include the following.

- The Howard County Sustainable HOA program.
- The Howard County Stream ReLeaf Program, which provides free trees for stream buffer plantings.
- The Woods in Your Backyard, a State program that teaches forest management techniques to property owners with small forest acreage.
- Wildlife habitat certification programs such as DNR'S Wild Acres, the National Wildlife Federation and the Wildlife Habitat Council, which work with residential, school and commercial property owners.
- The Maryland Landowner Incentive Program, which provides competitive grant funding for cost share to cover 75% of the cost for habitat conservation practices on private properties that contain habitat for species-at-risk.
- Federal and State cost share programs for habitat improvements on agricultural properties.

The County could develop an online self-reporting mechanism to track habitat protection and enhancement measures that are implemented on private property.

Financial Incentives

The County could institute a cost share program and/or property tax credits for the implementation of best management practices to improve water quality and habitat, especially for those practices that are more expensive, such as stream and wetland restoration. These types of projects would also help the County achieve pollutant reduction targets under the Chesapeake Bay Watershed Implementation Plan.

Regulatory protection

The County should ensure developers, consultants and County staff are informed about the Green Infrastructure Network. When properties are developed, the network can be used as a guide for designing forest conservation easements and open space to help complete and expand the network. In addition, the County could adopt standards for road construction in the network, to ensure new roads are built and existing roads are reconstructed to accommodate wildlife movement.

The County could also strengthen existing regulations and offer incentives to improve sensitive resource protection when properties located within the network are developed or redeveloped. This could include increasing stream and wetland buffer requirements; requiring compliance with the Forest Conservation Act through on-site retention and/or planting; and providing incentives to remove existing development to create wider stream and wetland buffers.

Easements

Easements provide a way to protect sensitive resources while keeping properties in private ownership. Efforts to acquire easements through acquisition or donation could be directed toward parcels with existing development as well as uncommitted parcels. Easements could be especially useful when a property already has some development and only a portion of the property is within the network.

Protective easements can include forest conservation easements and environmental easements tailored to protect specific resources. However, forest conservation easements to protect existing forest resources may only be placed on properties with development potential. Potential easement programs include the following:

- The Howard County Conservancy will accept donated environmental easements, and currently has grant funding from the County to cover the costs for processing donated easements on small properties (less than 50 acres).
- The Howard County Private Forest Conservation Easement Program will establish and plant forest conservation easements on private properties.
- The cluster subdivision process and the density sending option in the Rural West create environmental or agricultural easements on the preservation parcel or sending parcel. Preservation and sending parcels created within the network could be encouraged or required to establish environmental easements that protect specific resources within the network.
- The County could establish an easement purchase program specifically to protect sensitive resources within the network.

The Private Forest Conservation Easement Program has been most successful on properties that already have an agricultural or environmental easement. However, properties protected by a County or State agricultural easement may only establish forest conservation easements in the following areas, so as not to displace active agricultural functions:

- Stream buffers - a maximum of 100 feet on either side of the stream bank.
- Wetland buffers - a maximum of 50 feet from the edge of the wetland.
- Slopes - 25% or greater.

The County could amend this policy to allow wider forest conservation easements along streams and wetlands within the network, and to allow forest planting in upland areas within corridors.

Acquisition

Land acquisition by the State or County allows public management of the resource and would most likely be focused on uncommitted parcels. Land acquisition could be most useful when a majority of the property lies within the network. Resources for acquisition include State and County open space funds, however, these funds have been quite limited in recent years.

Uncommitted parcels in the network will be assessed and prioritized for easement or acquisition, based on a number of factors, as listed below.

Hubs

- **Location** – Prioritize parcels within State Targeted Ecological Areas; within Stronghold Watersheds; and adjacent to parkland and open space, including WSSC land.
- **Acreage within the hub** – Prioritize parcels that have a larger acreage within the hub, and clusters of parcels that together create a large area within the hub.
- **Resources on the parcel** (wetlands, streams, floodplain, forest, interior forest, habitat for rare, threatened and endangered (RTE) species) – Water resources and habitat for RTE species are generally already protected under current regulations, so prioritize parcels with the more vulnerable resource of forest, especially forest interior habitat. Also prioritize completing protection for interior forest that is largely already protected through publicly owned land.
- **Hub completeness** – Most hubs are well protected by easements or public ownership; targeting large uncommitted parcels within the hub will help address those that are not.
- **Zoning** – Prioritize nonresidential parcels and residential parcels within the Planned Service Area, since these are more likely to be developed. Also, sensitive resources on nonresidential land are generally not as well protected through the subdivision regulations as on residential land.

Corridors

- **Location** – Prioritize parcels within State Targeted Ecological Areas; within Stronghold Watersheds; and adjacent to parkland and open space, including WSSC land.
- **Acreage within the corridor** – Prioritize parcels that have a larger acreage within the corridor.
- **Resources within the parcel** (wetlands, streams, floodplain, forest, interior forest, habitat for RTE species) – Water resources and habitat for RTE species are generally already protected under current regulations. Most corridors follow rivers and streams, and current stream buffer requirements will establish a protected area for the corridor, but this area will not be wide enough to meet the minimum corridor width criteria. If the stream has a wide floodplain, however, this will establish a wider protected area for the corridor. Forest adjacent to the stream will also be protected if it is located in the stream buffer or floodplain. Corridor connections across watershed boundaries will not have a stream to establish a minimum protected area for the corridor, so prioritize parcels within these upland areas.
- **Corridor completeness** – Most corridors are a mix of public land, easements and privately owned land. Prioritizing parcels in upland connections will help complete corridors that are not based on a stream.
- **Zoning** – Prioritize nonresidential parcels and residential parcels within the Planned Service Area, since these are more likely to be developed. Also, sensitive resources on nonresidential land are generally not as well protected through the subdivision regulations as on residential land.

Implementation

Actions to achieve the goals and objectives for the Green Infrastructure Network will be implemented over time and will be a long-term, ongoing effort. Indicators will be used to monitor the success of these efforts, so that improvements can be made in implementation.

Implementation Priorities

The following presents recommended actions to protect and enhance the network. These actions are organized by initiation times as short (1 to 3 years), mid (3 to 5 years) and long term (5 years and

beyond) implementation priorities. The primary agencies that will be responsible for initiating these actions are also indicated.

| Action | Responsible Party |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Short Term (1 to 3 years) | |
| Integrate the Green Infrastructure Network Plan into County planning efforts, including the development review process, watershed management planning, the capital improvement program, and park and open space acquisition planning. | DPZ, DRP and DPW |
| Set priorities for easement and land acquisition; use existing programs to begin acquisitions. | DPZ, DRP and OES |
| Develop management plans for each hub and corridor; include confirmation of the viability and location of potential corridors. | DPZ, DRP and HSCD |
| Use existing and new outreach programs to encourage and aide stewardship. | DPZ, DRP, HSCD and OES |
| Develop protocols to monitor changes in the network. | DPZ |
| Mid Term (3 to 5 years) | |
| Establish a new easement/land acquisition program. | DPZ, DRP and OES |
| Amend development regulations and design standards to increase protection of sensitive resources. | DPZ |
| Institute financial incentives such as a property tax credit or cost share program for more costly best management practices on private property. | DPZ and DPW |
| Update the network map on a regular basis and prepare an Indicators Report. | DPZ |
| Long Term (5 or more years) | |
| Review and update management plans on a regular basis. | DPZ, DRP and HSCD |
| Conduct periodic reviews of regulations and programs for any needed adjustments to ensure protection and enhancement of the network. | DPZ |

Notes:

- DPZ – Howard County Department of Planning and Zoning
- DRP – Howard County Department of Recreation and Parks
- DPW – Howard County Department of Public Works
- OES – Office of Environmental Sustainability
- HSCD – Howard Soil Conservation District

Indicators

The following presents indicators that will be monitored to measure the success of efforts to complete, protect and enhance the network. Methods that can be used to track the indicators are also given. The results of these monitoring efforts will be presented in an Indicators Report that will be prepared each time the network map is updated. The network map will be updated approximately every three years, coinciding with updates of County aerial photography.

Sensitive Resources

Acreage for sensitive resources (streams, wetlands, floodplain, forest, interior forest, and rare, threatened and endangered species habitat) should be maintained and increased where possible. Stream miles and floodplain acreage are assumed to remain unchanged, because these resources have regulatory protections and there are no programs to actively increase either resource.

| Indicator | Tracking |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Forest and interior forest | New forest clearing and forest conservation easements created by development subject to the Forest Conservation Act can be tracked through the development review process. The acreage of forest and forest interior can also be tracked through periodic updates of the network map. |
| Wetland | It is assumed that wetland acreage will not decrease, because of regulatory protections, but increases in acreage may occur. Wetland creation efforts can be tracked through HSCD (for agricultural land) and the development review process. |
| Rare, threatened and endangered species habitat | It is assumed that habitat acreage will not decrease, because of regulatory protections, but increases in acreage may occur through restoration efforts. This habitat primarily occurs in wetlands and forest, and increases in these resources can be tracked as stated above. |

Protected Land

The acreage of protected land should be maintained and increased where possible.

| Indicator | Tracking |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Parkland and open space | Acreage can be tracked through County, State and WSSC acquisitions, and the development review process. |
| Agricultural and environmental easements | Acreage can be tracked through land trust reporting and the development review process. |
| Forest conservation easements | Acreage can be tracked through the development review process and the Private Forest Conservation Easement Program. |

Habitat Quality

Habitat quality should be maintained and improved where needed. Ideally, habitat quality would be tracked through periodic updates of the hub and corridor management plans, which would show improvements as a result of plan implementation. However, since these plans will take time to develop, implement and update, substitute indicators can be used to gauge progress.

| Indicator | Tracking |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stewardship activities | Activities that receive tax credits and/or cost share funds can be tracked through the associated program. Other activities could be tracked through an online self-reporting mechanism. |
| Streams, wetlands and other water bodies with forested buffers | Changes in forest buffers can be tracked through periodic updates of the network map. |
| Stream restoration | Miles of stream restored can be tracked through the development review process. |
| Wetland restoration | Acres of wetland restored can be tracked through HSCD (for agricultural land) and the development review process. |
| Wildlife friendly road crossings | New crossings can be tracked through the development review process. |

Summary

Ideally, green infrastructure should be identified and set aside for protection before development occurs. Much of Howard County has already been developed, but significant natural areas still remain throughout the County. Implementing the Green Infrastructure Network Plan will require a cooperative effort among private landowners and County and State agencies. Protecting and enhancing the forests, wetlands, lakes and streams within Howard County's Green Infrastructure Network will help support native plant and animal species, contribute to clean air and water, and enhance the quality of life for those living, working and playing in Howard County.

Information on the Howard County Green Infrastructure Network Plan, as well as an interactive map, can be found on Green Central Station at:

<http://livegreenhoward.com/land/green-infrastructure/>

Appendix A – Methodology for Maryland and Other Local Green Infrastructure Plans

The following summarizes the purpose and/or goal and methodology used to define the green infrastructure networks in the green infrastructure plans developed by the State and Anne Arundel, Montgomery and Prince George’s County.

Maryland Green Infrastructure

<http://dnr.maryland.gov/greenways/gi/gi.html>

The Maryland Green Infrastructure network attempts to identify the best remaining ecological lands in Maryland as well as potential restoration areas. The **purpose** of this work is to:

- Systematically identify and protect ecologically important lands.
- Address problems of forest fragmentation, habitat degradation and water quality.
- Emphasize the role of a given place as part of a larger interconnected ecological system.
- Consider natural resource and ecosystem integrity in the context of existing and potential human impacts to the landscape.
- Maximize the influence and effectiveness of public and private conservation investments.
- Promote shared responsibilities for land conservation between public and private sectors.
- Guide and encourage compatible uses and land management practices.

Hubs contain one or more of the following:

- Important plant and animal habitats of at least 100 acres, including: rare, threatened and endangered species locations; unique ecological communities; and migratory bird habitats.
- Large blocks of contiguous interior forest (at least 250 acres, plus a 300-foot transition zone).
- Large wetland complexes with at least 250 acres of unmodified wetlands.
- Relatively pristine stream and river segments (which, when considered with their associated riparian forests and wetlands are at least 100 acres). Such stream and river segments have:
 - Aquatic species of concern,
 - Representative populations of the full suite of native fish, amphibians and reptiles,
 - Rare coldwater or blackwater ecosystems, or
 - Importance for anadromous fish.
- Conservation areas already protected by public and private organizations that contain one or more of the above.

Areas with these features were mapped and combined. Areas with intensive human land uses (development, agriculture and quarries) and major roads were excluded, natural areas less than 100 contiguous acres were excluded, adjacent forest and wetlands were added, and the edges of the hubs were smoothed. Buffers of up to 550 feet were added around potential migration paths, wetlands, streams and shorelines. Many buffer extensions contain intensive human land uses and would benefit from restoration.

Corridors:

- Generally at least 1,100 feet wide. This provides a 500-foot interior travel corridor with a 300-foot transition zone on each side.

- Where corridors follow streams, the corridor provides a 550-foot buffer on each side of the stream. If the stream floodplain exceeds 550 feet, the corridor is defined by the floodplain up to a maximum of 1,000 feet, or by ridge to ridge distance if there is no floodplain data.
- Corridors were extended to include compatible adjacent land uses such as forest or wetlands.
- Corridors generally connect hubs of similar types (forest to forest or wetland to wetland) and follow the best ecological or most natural routes between hubs.
- In addition to streams, other good corridors include ridge lines, valleys or forested areas.

Hubs and corridors were assessed for a wide variety of ecological parameters and then ranked within their physiographic region. They were also examined for their level of protection, management status and risk of development. Gaps in the Green Infrastructure were evaluated for their potential restoration to forest, wetland or riparian buffers.

[Anne Arundel County Greenways Master Plan](http://www.aacounty.org/PlanZone/MasterPlans/Greenways/Index.cfm)

<http://www.aacounty.org/PlanZone/MasterPlans/Greenways/Index.cfm>

The **purpose** of the plan is to provide an identification, decision making, implementation and management tool for the County's future greenways network. The **goal** for the network is to create an interconnected network of greenways that protects ecologically valuable lands for present and future generations and provides open space, recreational, and transportation benefits and opportunities for people. The plan does not identify which greenways should or should not have public use.

Anne Arundel County evaluated the habitat requirements for three indicator species – the downy woodpecker, bobcat and red-spotted newt – to develop selection criteria for the greenways. Habitat requirements for these species were defined by habitat suitability index models developed by the US Fish and Wildlife Service. A list of habitat suitability index models is available at: http://el.erdc.usace.army.mil/emrrp/emris/emrishelp3/list_of_habitat_suitability_index_hsi_models_pac.htm

Hubs:

- Ecologically significant natural areas, a minimum of 250 acres in size with a high ratio of interior verses edge habitat.

Corridors:

- Natural areas with a minimum width of 200 feet, but wider where possible.
- Corridors should end at another corridor or hub and not be dead end.

Additional criteria for the network:

- Riparian forested areas provide the basic structure of the network.
- If adjacent land includes upland forest, non-forested riparian areas, agricultural land, disturbed land (mined, barren) and golf courses, it is added to the hub or corridor.
- Developed areas are avoided unless they are at a critical connection. A critical connection has only one location where two corridors connect and if this connection is not made the functionality of the greenway will be significantly reduced.
- Because this is a 50-year plan, areas that might currently have little habitat value such as mined or barren lands, school sites and developed parks were considered as potential greenways because of their long range potential for inclusion.

- The network also includes two proposed national trails that will intersect in the County – the East Coast Greenway and the American Discovery Trail. These trails will be mainly paved or hard surface trails connecting towns and cities and are designed primarily for recreation.

Montgomery County Green Infrastructure Plan

http://www.montgomeryplanning.org/green_infrastructure/index.shtm

Montgomery County’s plan is still in development, so this summarizes material in the August 2009 draft plan.

The **goal** of the plan is to create and protect a sustainable network of functioning natural systems that preserves biodiversity, provides opportunities for new park and trail connections, and provides a healthy environment for present and future generations.

The Green Infrastructure Network does not define areas as hubs or corridors; instead the network is divided into three areas:

- **Regulated Areas** – Environmentally sensitive areas that are protected by current development regulations.
- **Evaluation Areas** – Environmentally sensitive features such as interior forests, upland forest and unique habitats that are not protected by current development regulations. These areas must be examined during the development review process to determine if resources need protection or mitigation.
- **Network Gaps** – Areas that present opportunities to connect or expand the network.

Montgomery County is divided into five regions for general planning purposes: the Urban Ring, the Corridor, the Suburban Communities, the Residential Wedge and the Agricultural Wedge. The minimum network size is defined differently based on the region of the County, with baseline criteria for the Rural/Agricultural Areas being modified to be more inclusive in the more developed areas. The maximum allowable gap between natural areas is defined as 600 feet or less for all regions. This is based on research, primarily for birds, that supports 600 feet as a maximum linear gap for minimal connectivity value.

Rural/Agricultural Reserve Areas

- The Green Infrastructure is at least 200 feet wide. This is based on a minimum 100-foot water quality buffer on each side of a stream, but 200-foot corridors are also generally adequate for reptiles and amphibians, and support a good number of mammals and birds.
- Forest blocks are at least 50 acres in size with 10 acres of interior forest. This is based on studies that document isolated forest stands of 40 to 55 acres as a minimum size to support moderately sensitive forest birds.

Suburban/Corridor Areas

- The Green Infrastructure is at least 100 feet wide.
- Forest blocks are at least 25 acres with at least 3 acres of interior forest.

Urban Areas

- No minimum width for the Green Infrastructure.
- Forest blocks with at least one acre of interior forest.

Prince George's County Green Infrastructure Plan

http://www.pgplanning.org/Resources/Publications/Green_Infrastructure_Publication.htm

The **purpose** of the plan is to guide land development, green space protection and mitigation activities, and to implement a long-range vision for preserving, protecting, enhancing and/or restoring a contiguous network of environmentally important areas in the County by the year 2025. The **goal** of the plan is to preserve, enhance and/or restore an interconnected network of countywide significant environmental features that retains ecological functions; maintains or improves water quality and habitat; and supports the desired development pattern of the General Plan.

Prince George's County is divided into three Tiers for general planning purposes – Developed, Developing and Rural. These areas generally form concentric rings around the District of Columbia, with the Developed Tier being the innermost ring.

Similar to Montgomery County, the Green Infrastructure Network does not define areas as hubs or corridors; instead the network is divided into three areas:

- **Regulated Areas** – Environmentally sensitive areas that are protected by current development regulations.
- **Evaluation Areas** – Environmentally sensitive features such as interior forests, colonial waterbird nesting sites and unique habitats that are not protected by current development regulations.
- **Network Gaps** – Areas that are critical to the connection of the Regulated and Evaluation Areas and are targeted for restoration.

The Regulated and Evaluation Areas, including Green Infrastructure areas in the State system, were mapped and combined. Developed areas and platted subdivisions with lots less than four acres were subtracted. The maps were then refined to include only those areas of countywide significance, which are defined as the following:

- Corridors 200 feet wide or wider in the Rural and Developing Tiers.
- Corridors of any width in the Developed Tier.
- Gaps of 600 feet or less.
- Areas contiguous with downstream corridors, open bodies of water or designated open space of adjacent jurisdictions.

The plan identifies 13 special conservation areas within the network.

Appendix B – Mapped Features

The following is a list of the environmental and development layers used for mapping and analyzing the Howard County Green Infrastructure Network. A brief description of the layer and any improvements made to the layer are also included. Unless otherwise noted, Howard County is the source of the layer.

- **Reservoirs, ponds, lakes, streams and their buffers.** The water body layer was generated from the 2007 aerials. LiDAR maps were used to complete the stream layer to include hidden stream segments such as those hidden under roads and bridges, and to include headwater streams. The stream buffer layers of 100', 150' and 250' were then generated.
- **High quality waters.** The State's Tier II stream segments and Stronghold Watersheds.
- **Wetlands and their buffers.** The State's wetlands information with a generated 100' buffer.
- **100-year floodplains.** The 100-year floodplain has been mapped for the major streams in Howard County, but not for many of the smaller tributaries.
- **Watersheds.** Boundaries are mapped for all major watersheds and subwatersheds.
- **Steep slopes.** Slopes of 15-25%, 25-45% and 45-60% have been mapped using LiDAR. Steep slopes were not considered during the mapping, because only areas greater than 20,000 sq ft have regulatory protection and this is measured on a parcel specific basis.
- **Forest.** County data was updated and quality controlled, based on the 2007 aerials.
- **Forest Conservation Easements.** These easements are created for compliance with the Forest Conservation Act and may contain existing forest and/or be forest planting areas.
- **Interior forest habitat.** Forest interior habitat with a 300' buffer was generated from the forest layer.
- **Rare, threatened and endangered species habitats.** The State's information on the generalized area of habitat for rare, threatened and endangered species.
- **Maryland Green Infrastructure.** The State's information on Maryland's Green Infrastructure hubs and corridors.
- **Targeted Ecological Areas.** The State's information on Targeted Ecological Areas.
- **Parkland and Open Space.** County and State parkland, WSSC land, and open space owned by the County, the Columbia Association or other homeowners associations.
- **Buildings, parking lots, roadways, railroads, and major gas and electric utility easements.** Information generated from the 2007 planimetric layer.
- **Aerial Photographs.** The 2007 aerials were used to confirm information in other layers and land use in adjacent jurisdictions near the County boundary.
- **Green Infrastructure in surrounding jurisdictions.** Green infrastructure from Anne Arundel and Prince George's County.
- **Easements.** Agricultural, environmental and historic easements.
- **Subdivisions in Process.** Information on current subdivision activity.
- **Site Development Plans.** Information on current development activity.
- **Uncommitted land.** Lands with development potential, last updated in September 2011, however, still a draft.

Appendix C – Potential Corridors

There are 13 corridors that are considered potential corridors, because they may not provide safe passage for wildlife. Safe passage for wildlife is a concern if there is no stream crossing at a road, because the tunnel, culvert or bridge at a stream crossing can provide a travel path for wildlife along the stream that avoids traffic. Safe passage is also a concern if agricultural activity or development is too close to the corridor. In addition, there are concerns about the best path to take when crossing agricultural land, so as to minimize impacts to the agricultural operation. Potential corridors need site visits and coordination with property owners to confirm their viability. The potential corridors are listed in the following table, from west to east and north to south, with a description of their concerns.

| Corridor | Issues/Concerns |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Headwaters Pax – S Patapsco West | Crosses Penn Shop Road without a stream crossing and the corridor runs through agricultural easements on both sides of the road. The corridor is partially located in forest on the southern easement and parallels a hedgerow on the northern easement, but otherwise is in open field. |
| Headwaters Pax – S Patapsco – East | Crosses Penn Shop Road without a stream crossing and the corridor runs through agricultural easements on both sides of the road. The corridor crosses open field on both easements. The corridor is partially wooded on the north side, but this is an adjacent parcel that is not under easement. |
| Headwaters S Patapsco – Cabin Br | Crosses Long Corner Road without an obvious stream crossing, even though there is a pond on one side of the street and a stream on the other. There is open field at both sides of this crossing. |
| S Patapsco – Carrs Mill – West | Crosses Hardy Road without a stream crossing and there are agricultural easements on both sides of the road that are in open field. |
| Pax Headwaters – Cattail | This short (about 2,000') corridor parallels Jennings Chapel Road before crossing without a stream crossing. This corridor is located in a wooded area on an agricultural easement. |
| Cattail Creek – Friendship – North | Follows a tributary to Cattail Creek that runs close to the east side of MD 97 for a significant distance. The upland crossing goes through forest and open field in a large lot residential/farming area. |

| | |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cattail Creek – Friendship – South | Follows a Middle Patuxent tributary that crosses MD 32, Ten Oaks Road and Ivory Road in quick succession, which may prevent safe wildlife passage. The upland connection is just to the south of Burntwoods Road and is made through a residential area with woods that are partially within Forest Conservation Easements. |
| S Patapsco – Friendship | Follows a Middle Patuxent tributary that may cross I-70, since there is a headwater pond immediately north of the highway. The upland crossing is through wooded areas on two agricultural easements. |
| HenrytonB – David Force Park | Crosses Old Frederick Road without a stream crossing, then traverses open field before connecting with Patapsco State Park. |
| Middle Pax – Doughoregan Forest | Follows a tributary to the Middle Patuxent through a forested area on an agricultural easement with an upland crossing at Manor Road through open field. |
| Hammond – Savage | The upland crossing is in a scrubby area just to the west of Gorman Crossing Elementary School and Murray Hill Middle School. |
| Guilford – Dorsey | Follows a tributary to Dorsey Branch around the Chase Quarry, which is being actively mined. Also crosses I-95 without a stream crossing, although the nearby railroad track may have potential for a safe crossing. |
| Guilford – LPax | Follows a stream that is located in the back or front yards of residential lots and is very close to the existing homes for a significant portion of the corridor. |

Note: Corridors are named for the hubs and corridors they connect. For example, the Headwaters Pax – South Patapsco – West Corridor provides a western connection between the Patuxent Headwaters Hub and a corridor along the South Branch Patapsco River, and the HenrytonB – David Force Park Corridor provides a connection between the Patapsco South Branch Henryton Road Hub and the David Force Park Hub.



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