



## Executive Summary

### Goals and Objectives

The Columbia Association (CA) has developed a Columbia Watershed Management Plan (CWMP or Plan) that outlines a long-term, far-reaching strategy to protect and restore the Little and Middle Patuxent Rivers and adjacent waters. The CWMP will support ongoing efforts and provide a sustainable pathway to effectively manage these Columbia watersheds going forward. Ultimate success in meeting the goals for the Columbia watersheds will require that CA create and maintain a continuing watershed management program (including dedicated funding and a full-time watershed manager) to implement the CWMP.

At the direction of the CA President, the CWMP was carried out by the CA Watershed Team staff in coordination with the citizen Watershed Advisory Committee (WAC). The WAC consists of 11 volunteers with special expertise, representing all of Columbia's villages. Sean Harbaugh of CA Open Space is the CWMP project manager and staff liaison to the WAC. Chick Rhodehamel is Vice President of CA and Division Director of Open Space. Steve Sattler is the staff liaison to the CA External Relations Committee that provides oversight for the Board of Directors. Jan Clark of CA Open Space is directing implementation of the CWMP reforestation projects. Diana Kelley of CA Open Space is contract administrator. Versar, Inc., is the consultant retained to complete the CWMP.

In consultation with the WAC, the CWMP Team adopted the following vision statement—*Protecting and restoring the waters of Columbia*. The WAC and CWMP Team developed the following goals specifically for the CWMP:

- Reduce stormwater impacts on the Columbia watersheds from impervious areas to help restore and protect the streams
- Preserve, maintain, and improve watershed habitats to support appropriate native flora and fauna
- Preserve, maintain, and improve the water quality of the streams to benefit humans, wildlife, and aquatic life
- Improve stream-based quality of life and environmentally friendly recreational opportunities for residents of and visitors to the Columbia watersheds

These goals recognize that Columbia is typical of urban and suburban areas that were developed prior to modern stormwater management and therefore have streams severely degraded by stormwater runoff. The primary factors causing stormwater impacts are impervious surfaces (e.g., buildings and roads) that drain directly to streams through pipes and storm drains without the benefit of infiltration into the ground that would naturally slow and clean the water. Without restoration, these streams will continue to contribute to degradation of the Patuxent River and Chesapeake Bay.

### Technical Approach and Work Plan

The CWMP comprises a two-pronged approach that relies equally on



1. *Restoration projects* (or retrofits), such as bioretention facilities, that can be constructed to restore the natural drainage (predevelopment hydrology) by retaining and infiltrating stormwater that is currently going directly into streams through storm drains and pipes
2. *Community actions* that individual residents or businesses can undertake to reduce their contribution to stormwater runoff and associated pollutants, such as redirecting down spouts and reducing fertilizer use

The Plan includes priority lists of restoration projects that the CA and its partners will undertake as funding is available, including early action projects. The Plan also includes public education and stakeholder involvement to foster community actions. It is important to understand that the Plan is only the structure for an ongoing program of watershed management that has already begun and that will continue into the future. The specific projects included in this report only constitute Phase 1 of the CWMP; future phases will be required to meet the CWMP goals.

## **Condition of the Columbia Watersheds and Priorities for Restoration**

The project began with the CWMP Team compiling and reviewing existing information on the condition of the Columbia watersheds to identify areas where additional investigations were needed. The objective was to determine (1) where watershed planning was already complete or underway by others, (2) which subwatersheds should be addressed by CA in Phase 1, and (3) which subwatersheds should be addressed in future phases.

### **Status of Watershed Planning in Columbia**

The CWMP study area comprises the 20 subwatersheds that drain lands within New Town Zoning (Figure ES-1). Nineteen of these subwatersheds fall within the Middle Patuxent, Little Patuxent, and Dorsey Run watersheds, in which Howard County conducted biological assessments in 2007, 2006, and 2008, respectively. The 20<sup>th</sup> subwatershed falls in the Patapsco River watershed.

### **Condition of Columbia Watersheds**

After identifying which subwatersheds in Columbia have completed or in-progress watershed plans, the next step was to evaluate the condition of the remaining subwatersheds to determine which subwatersheds should have plans developed for them in Phase 1 of the CWMP. We looked at two kinds of data: (1) the biological condition of streams throughout the Columbia watersheds (using fish and benthic macroinvertebrate indicators) and (2) specific problems found in individual subwatersheds (using Stream Corridor Assessment (SCA) results).

### **List of Phase 1 Subwatersheds**

Determining the restoration potential within a subwatershed is both art and science. The state of the practice has focused on analyses that compare watersheds or sites using a standard set of metrics. Specifically, the relative restoration potential of a subwatershed can be described with quantitative metrics (such a percentage of impervious surface), but the selection and combination of metrics is subjective. For that reason, a rationale for the “restoration potential equation” is essential.

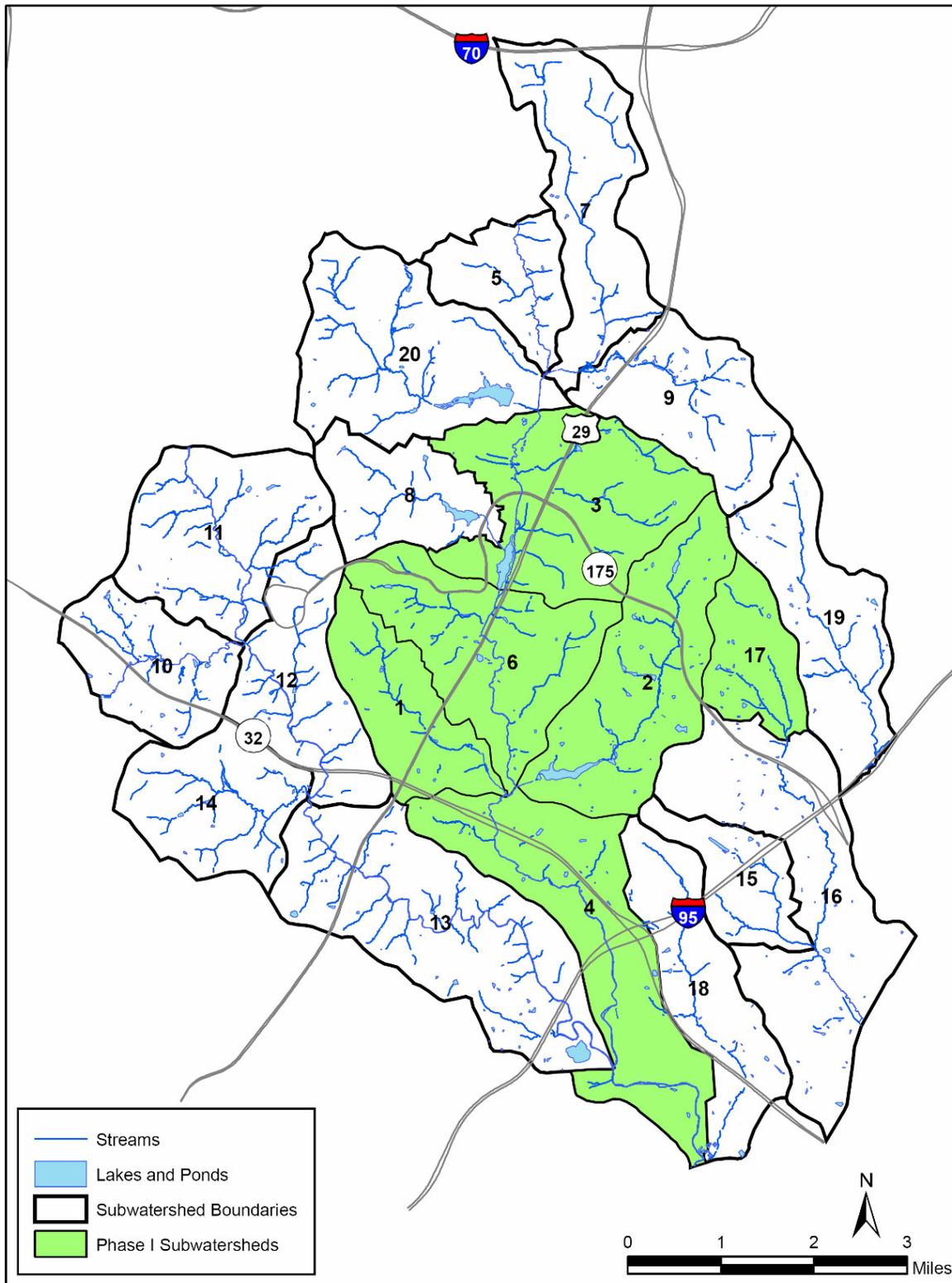


Figure ES-1. CWMP study area comprising 20 subwatersheds with the 6 subwatersheds selected for more intensive analysis in Phase 1



We valued all CWMP goals and incorporated them into the restoration potential equation. Specifically, we undertook a balanced approach to identifying restoration potential that focused on the presence of the following three critical factors in each subwatershed:

- Evidence of a problem that needs to be remedied
- Presence of ecological values that would increase the restoration benefit
- Factors affecting the opportunities for restoration

We selected metrics that best represented these critical factors: current impervious cover, extent of streambank erosion and lack of riparian buffer, Clean Water Act 303d listings as impaired waters (designated by the Maryland Department of the Environment), green infrastructure and ecologically significant areas (designated by the Maryland Department of Natural Resources as connected and sensitive habitat areas, respectively), New Town Zoning land, publicly owned land, available stream corridor area, stormwater pond density, and green infrastructure gaps.

The Wilde Lake subwatershed (no. 8) already has an adequate plan prepared by Howard County. In addition, Howard County is preparing a plan for the Upper Little Patuxent watershed that includes the Little Patuxent below Font Hill (no. 5), Plumtree Branch (no. 7), and Red Hill Branch (no. 9) subwatersheds. Therefore, the following six subwatersheds with the highest restoration potential scores, which are not already under study, were selected for further analysis in Phase 1:

- Upper Dorsey Run subwatershed (no. 17)
- Little Patuxent below Lake Elkhorn subwatershed (no. 4)
- Lake Kittamaqundi subwatershed (no. 3)
- Lake Elkhorn subwatershed (no. 2)
- Beaver Run subwatershed (no. 1)
- Little Patuxent below Lake Kittamaqundi subwatershed (no. 6)

## **Phase 1 Restoration in Priority Subwatersheds**

Phase 1 of the CWMP involves CA undertaking immediate early action projects, including facilitating the adoption of community actions by residents and businesses, throughout Columbia's 20 subwatersheds. In addition, Phase 1 includes identifying, developing, designing, permitting, and ultimately constructing restoration projects (retrofits) in the six priority subwatersheds.

### **List of Retrofit Projects**

The objective of this task was to develop an inventory of restoration projects, or retrofits, within the six priority subwatersheds. Retrofits are targeted practices that have the potential to retain and infiltrate concentrated stormwater runoff and, therefore, may lead to improvements in streams most severely affected by a lack of effective stormwater management. It should be noted that significant reductions in stormwater impacts usually require implementing several retrofits in each area and stream recovery may take years after the retrofits are constructed.

The first step was to use SCA and other geographic information system (GIS) map data to identify potential sites for Restoration Retrofit Investigations (RRIs) in the field. Areas for RRI were



located near pipe outfalls (noted either during the SCA or using Howard County’s Stormnet database), where the SCA recorded moderate or severe bank erosion. This GIS analysis resulted in the identification of 116 candidate problem sites within the six priority subwatersheds (Table ES-1). The final step was selecting 18 potential restoration projects (retrofits) for concept plan development from among the candidate sites. The number of concept plans completed in Phase 1 was limited by the available funds. Using the RRI information, several factors were evaluated for each site, including benefit, feasibility, and cost. The result of this evaluation was that the benefit and feasibility of all candidate sites were similar; therefore, the geographic location of the sites was considered. At this point, the WAC recommended that concentrating the 18 restoration projects in one watershed would provide the greatest benefit ecologically and programmatically.

No.	Subwatershed	Candidate Sites	RRIs	Concept Plans
1	Beaver Run	19	6	0
2	Lake Elkhorn	41	24	18
3	Lake Kittamaqundi	16	12	0
4	Little Patuxent below Elkhorn	19	13	0
6	Little Patuxent below Lake Kittamaqundi	15	7	0
17	Upper Dorsey Run	6	4	0
	Total	116	66	18

This recommendation was founded on three factors: (1) concentration of projects in a single watershed provides the best chance of attaining true restoration benefit, (2) this concentration will facilitate demonstration of this benefit through monitoring, and (3) the visibility of the restoration effort and benefit will provide the best chance of building the public interest and political will needed to undertake and fund future restoration efforts. Future restoration efforts will be needed if the goals of the CWMP are to be met.

Given the geographic possibilities in the Phase 1 study area, the CWMP Team determined that the restoration projects should be concentrated in the Lake Elkhorn subwatershed. Specifically, the three Columbia lake subwatersheds offer the best opportunities for protecting amenity investment (including reducing the frequency of dredging) and attracting public support. In addition, the Wilde Lake subwatershed already has a list of projects completed by Howard County, and part of the Lake Kittamaqundi subwatershed has projects identified by General Growth Properties (GGP).

**Concept Plans**

As a subcontractor to Versar, McCormick Taylor prepared concept designs for the retrofit sites based on information provided on GIS maps, aerial photos, and county soil surveys. Several of the initial concepts were revised to meet existing conditions and/or the following site constraints:

- Upstream existing stormwater management (SWM) facilities
- Drainage area and amount of impervious cover
- Site topography/slope



- Tree/vegetation impacts
- Utility/storm drain impacts
- Site accessibility for construction and maintenance

The retrofit designs were based on the MDE Guidelines and the 2000 Maryland Stormwater Design Manual. Sites designed for treatment of water quality (i.e., bioretention facilities) were sized to treat 1 inch of runoff. Water quality facilities need to be constructed “off-line” and, therefore, were designed with upstream flow splitters or a proposed bypass channel to direct larger runoff amounts away from the bioretention. All concepts designed for water quality were sized to treat 100% of the water quality volume. Sites designed for water quantity control (protecting stream channels from erosion) were sized for the extended detention of the 1-year, 24-hour storm event. These sites include extended detention ponds and wetlands. The step pool and stream restoration designs were based on design discharges established by regional curve equations. The majority of the sites where these designs were implemented are located downstream of existing SWM facilities.

### **Early Action Projects throughout the Columbia Watersheds**

In addition to identifying the restoration projects (retrofits) that would provide the greatest benefit in Phase 1, the CA Team recognized the critical importance of identifying and implementing projects before the retrofits could be constructed (i.e., early action projects). Two of these early action reforestation projects have already been completed. Among the early action projects that CA will be facilitating are community actions that residents and businesses can undertake.

To identify the most beneficial early action projects and community actions, Versar completed field investigations and prepared recommendations for the following:

- Reforestation opportunities in CA Open Space and other public land
- Stormwater pollution prevention practices and low impact landscaping at CA facilities
- Neighborhood source assessments with recommendations for individual actions

### **Reforestation Opportunities**

Although Columbia has significant forested area and generally maintains forested riparian buffers (especially in CA Open Space), there are significant opportunities for reforestation in the Columbia watersheds. As part of its watershed-wide investigations, Versar reviewed GIS maps (New Town Zoning, CA property, forest cover, streams, buildings and roads) and identified 18 areas on CA property as candidates for reforestation. These areas were greater than 1 acre and generally included the largest available unforested areas and areas bordering the longest length of stream. In consultation with CA, Versar identified local constraints that eliminated some sites and additional candidate sites were selected for field investigation. Attempts were made to find sites in all the Columbia Villages and to include commercial properties as well as residential areas. As part of the priority subwatersheds investigations, Versar identified an additional 12 areas with reforestation opportunities on CA Open Space or other public land for a total of 30 sites. Reforestation sites rated excellent are shown in Table ES-2.

<b>Table ES-2. Sites rated excellent for reforestation opportunities in the Columbia watersheds (listed in order of total acres of forest planting)</b>			
<b>Site</b>	<b>Total Forest Planting Opportunities (acres)</b>	<b>Rating (Excellent, Good, Moderate, Limited, None)</b>	<b>Comments</b>
Sand Chain Road A and B	4.5	Excellent	Excellent planting opportunities in two nearly adjacent open lawn areas. Site A is very dry and could be planted with upland species. Site B is partially wetland and could be planted with hydrophytic species. Some invasive species removal is needed in both areas.
Dorsey Hall	4.0	Excellent	Mixture of open, flat lawn areas. Small wetland swale could be expanded upon with hydrophytic species. Large existing marsh around Red Hill Branch would benefit from project.
Footed Ridge	3.0	Excellent	Large open mowed lawn; much of it is wetlands. Good access. Some invasive species would need to be removed from edges.
Patriot Pond	3.0	Excellent	Large open lawn area; much of it is wetlands. Easy access all the way down to the stream. Could also expand riparian buffer to 10-12 feet wide along parts of the stream.
Black Star	3.0	Excellent	NE part of site is about 1 acre of oldfield that could be planted adjacent to stream. There is also about 2 acres of lawn that could be planted. Both of these areas present excellent ecologically-important planting opportunities.
Burnt Mountain	3.0	Excellent	Excellent planting opportunity on large area of open, mowed lawn and along unforested areas adjacent to paved CA paths. Note power auger may be useful for planting in the somewhat rocky sub-soils (especially for planting larger stock).
Woodblock	3.0	Excellent	Excellent planting opportunities on this large, relatively flat site. Most of site is now open lawn, but some areas along the CA paved path could be planted up to the existing forest line.

### **Stormwater Management and Landscaping at CA Facilities**

Enhancements to stormwater management and landscaping at current CA facilities were also identified as early action projects for inclusion in the CWMP. Not only would these enhancements have immediate benefits for the watershed, but they would serve as demonstration projects for future actions. The objective was to review current CA practices and develop specific recommendations to



prevent pollution and improve stormwater management at CA facilities and for CA operations as a whole. The following five CA facilities were chosen as representative early action projects:

- Columbia Association Maintenance Facility
- Columbia Athletic Club with Indoor Tennis
- Hobbit's Glen Golf Course Maintenance Facility
- Steven's Forest Neighborhood Center and Pool
- Supreme Sports Club

After this review of current practices, Versar performed Hotspot Site Investigations (HSIs) at these five CA facilities and made stormwater pollution prevention recommendations for each. Hotspots are facilities that contribute contaminated stormwater runoff. Three of the sites had virtually no pollution sources (HSI scores of 2) and were not considered hotspots. The Hobbit's Glen Golf Course Maintenance Facility scored 9.5 and was considered a potential hotspot. The Columbia Association Maintenance Facility scored 14.5 and was considered a severe hotspot.

### **Neighborhood Actions**

The objective of this effort was to identify stormwater control, pollution prevention, and other watershed restoration activities that can be undertaken by individual landowners. To accomplish this, Versar performed investigations to assess neighborhood stewardship, stormwater hotspots, areas of excessive erosion and sedimentation, and upland reforestation opportunities in the six priority subwatersheds. The following general recommendations, in order of importance, are provided to help neighborhoods reduce stormwater impacts and improve watershed conditions:

- Reestablishing stream buffers in neighborhoods with inadequate buffers
- Downspout disconnection into pervious areas, installation of rainbarrels, sustainable landscaping ("bayscaping"), and/or raingarden retrofits for additional volume control and infiltration where space is available
- Tree planting in neighborhoods with available space
- Lawn care/fertilizer-use education and pet waste management (i.e., nutrient management) in all neighborhoods which could include
  - Creation of neighborhood composting centers for yard waste
  - Educational signage at the existing dog parks
  - Installation of pet waste management where applicable
- Stormdrain stenciling, whenever absent, and particularly in areas with heavy foot traffic

### **Stakeholder Involvement**

As a subcontractor to Versar, Capuco Consulting Services, worked closely with CA throughout the CWMP project to design and implement each element of the stakeholder involvement work plan.

## Stakeholder Involvement Planning

For the CWMP, stakeholder involvement was intended to be an education component to enhance public understanding of the project and to encourage early and continued participation in selecting, designing, and implementing watershed improvements.

Throughout the watershed management planning process, stakeholders were engaged through the Columbia Association's network of newsletters, web sites, and meetings, including the following:

- Monthly meetings of the WAC
- Watershed web site requests for information
- Meetings with the Howard County Chamber of Commerce and Howard County Environmental Sustainability Board
- Public Meeting on January 26, 2009

## Community Stewardship Strategy

The stewardship strategy was designed to begin in July 2008 with a series of messages on ways to be stewards of the watershed. A variety of delivery tools were used to reach many different audiences. In all, seven messaging strategies were developed to be implemented over a 14-month period.

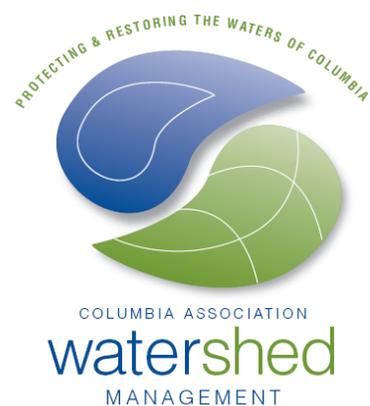
The first step taken was to develop a brand for all stewardship messages and communications relating to the CWMP. The logo was designed for use on all CWMP products and to be easily recognized by all stakeholder groups.

The most powerful stewardship education tool has been the development of the watershed web site at [www.columbiawatershed.org](http://www.columbiawatershed.org), where stakeholders can find information on numerous activities to help protect and restore the watershed. The web site includes links to other resources that provide more in-depth information. There are also sections with activities for kids and an interactive map for pinpointing which stream is nearest to your home. There are links to this website on all other CA websites.

## Recommendations for Future Actions

Consistent with the CA commitment to develop a long-term, far-reaching strategy to protect and restore the waters of Columbia, this CWMP recommends the following future actions:

- The CWMP will only succeed if CA has a watershed management “program” to implement it. This program needs to include a long-term commitment, adequate funding, and monitoring from CA. It is best accomplished by designating a full-time watershed program manager for CA.





- A CA watershed policy should also be developed and immediately adopted to ensure that ongoing and future activities of CA further the goal of protecting and restoring the waters of Columbia. This should include a mechanism for following up on watershed improvement ideas that are identified by CA staff and the public.
- Stakeholder involvement and early action projects should continue to be implemented throughout future years to maintain the momentum achieved with the preparation of the CWMP. This will help build the public interest and political will needed to maintain the CA watershed management program.
- The concept plans for the 18 restoration projects identified in Phase 1 of the CWMP should move to design and construction as soon as possible, using CA, 2010 Trust Fund, or other funding. The estimated cost for these 18 projects is \$1.7 million. Additional concept plans for Phase 1 projects should also be developed and funded on an expedited schedule.
- CA should undertake a Phase 2 of the CWMP to identify additional restoration projects in subwatersheds not investigated in detail in Phase 1 (this should be coordinated with Howard County to ensure that all subwatersheds are investigated without duplicating effort). Based on the 116 candidate restoration sites identified in the six priority subwatersheds, approximately 300 total restoration projects should be implemented throughout Columbia, at an estimated cost of \$30 million. Special attention should be given to enhancing existing SWM facilities as these provide the greatest benefit for the cost. In addition to identifying these stormwater retrofits, physical stream restoration should be investigated for streams that continue to erode after retrofits have been implemented; such stream restoration may cost another \$10 million. Modeling of the total amount of impervious surfaces controlled should be completed to target additional water quantity controls, where needed. Monitoring should be an essential component of the CWMP so that restoration projects can be adapted to ensure success.
- To meet the CWMP goals of improving natural habitats and providing recreation, CA should include in its watershed program, activities to enhance the highest quality environments (such as green infrastructure and ecologically significant areas) in Columbia. These areas provide a disproportionate benefit to Columbia, both ecologically and recreationally, and should receive as much attention as watershed-wide stormwater management.

## Conclusions

As the steward of Columbia's open space and keeper of Rouse's vision of a community that respects the land, CA is undertaking the restoration of Columbia's watersheds. CA recognizes that this is a long-term responsibility and is working to involve the public and create the partnerships needed to succeed. This CWMP is the first step. Together the restoration projects, community actions, and early action projects included in the CWMP will significantly restore the condition of Columbia's watersheds, improving stormwater management, habitats for flora and fauna, water quality, passive recreation of residents and visitors, and ultimately the health of the Patuxent River and Chesapeake Bay.