



## 7. Recommendations for Future Actions

Consistent with the Columbia Association (CA) commitment to developing a long-term, far-reaching strategy to protect and restore the waters of Columbia, we close this Columbia Watershed Management Plan (CWMP) with recommendations for future actions. Foremost among our recommendations are the following key statements:

- 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. 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). In addition to identifying stormwater retrofits, physical stream restoration should be investigated for streams that continue to erode after retrofits have been implemented. 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 human 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.

**Watershed Program and Policy.** The most important recommendations of the CWMP are the creation of a watershed program to ensure implementation of the plan and a policy to ensure that future CA operations incorporate watershed goals. The watershed policy should be crafted by the



WAC and adopted by CA when the CWMP is approved. The creation of a watershed program should begin with the designation of a full-time watershed manager who would be charged with implementing the CWMP and institutionalizing the watershed policy.

**Stakeholder Involvement.** Community acceptance and stakeholder enthusiasm for implementing the CWMP depends on continuing current, and expanding future, stewardship educational initiatives. Ideally, the watershed program manager would also be responsible for ensuring ongoing stewardship education year-round. Too often, jurisdictions fall into the practice of conducting outreach and education only during Earth Month. Implementation of the stewardship education activities outlined in the April 2009 Messaging Strategy will increase the amount of watershed information available to stakeholders throughout the year; however, it should not be considered a stopping point. Continuing outreach to the Village Boards, homeowner associations, and other stakeholders is particularly important. Specific stakeholder involvement activities that should be ongoing include the following:

- Continual use and updating of [www.columbiawatershed.org](http://www.columbiawatershed.org)
- Training for residents to conduct neighborhood source assessments
- Conduct of those assessments one year from now (spring 2010)
- Regular inclusion of watershed tips in all community newsletters (many jurisdictions use a weekly newspaper page to accomplish this)
- Creation of a twitter on watershed stewardship
- Creation of a self-guided tour podcast to visit all early action sites and all restoration sites on public land or that are visible from public land
- Implementation of a stewardship award program
- Inclusion of stewardship training in recreation programs curriculum (e.g., community classes on how to create a rain garden)
- Regular offerings of community stewardship events (e.g., invasive plant removal on public land, tree plantings)

**Phase 1.** This CWMP directly addresses the stormwater impacts from impervious surfaces that are the dominant problem facing Columbia's watersheds. It does this by identifying and developing conceptual plans for restoration projects and community actions to reduce stormwater flows and pollution in six priority subwatersheds, and to an extent watershed-wide. The concept espoused in this plan is the two-pronged approach of

- *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
- *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 restoration projects with concept plans completed for Phase 1 total 18 new SWM ponds, existing SWM pond retrofits, LID bioretention areas, and step-pool/streambank stabilization stream restorations in the Lake Elkhorn subwatershed. There are also several restoration projects on CA property in the Wilde Lake subwatershed developed by Howard County. CA should move all these projects to construction as soon as possible. Because the Little Patuxent Restoration Partners (Howard County, CA, and GGP) proposal was awarded 2010 Trust Fund monies for this fiscal year (with additional funds expecting in future years), matching funds from the state will be available for some of these projects. The 18 restoration projects developed for Lake Elkhorn are estimated to cost \$1.7 million and should result in a measurable improvement in stream conditions, but not a complete control of all impervious surfaces. More quantification of the expected improvement will require modeling and monitoring that are proposed for future phases.

**Phase 2.** In addition to the 18 concept plans in the Elkhorn subwatershed, 66 potential restoration sites (with field RRIs) and 116 candidate sites (using only map information) were identified in the six priority subwatersheds for Phase 1. This indicates that to achieve the improvement expected for the Lake Elkhorn subwatershed throughout the other five priority subwatersheds approximately 80 more restoration projects would need to be implemented.

In addition, all or parts of seven other subwatersheds have or will have watershed plans prepared by Howard County or GGP. These plans can be expected to produce another 100 restoration projects. Lastly, there remain all or parts of eight other subwatersheds in the CWMP study area (primarily in the Middle Patuxent watershed) that still need to be investigated. It can be expected that these subwatersheds would produce another 100 candidate sites. Even though all of these approximately 300 candidate sites would fall on CA or public land, it is unknown how many of these restoration projects would ultimately be feasible to construct.

Versar recommends that CA begin developing concept plans for an additional 32 sites from Phase 1 and 50 sites from later phases, for a total of 100 concept plans. These plans would be added to another approximately 50 plans developed by Howard County in the Columbia watersheds, for a total of 150 high-priority restoration projects. Special attention should be given to enhancing existing SWM facilities as these provide the greatest benefit for the cost. We recommend that CA initiate Phase 2 of the CWMP by developing these additional restoration projects as soon as possible.

The CWMP envisions that these 150 projects, with perhaps another 100-200 undertaken by Howard County or others, would address the areas of greatest stormwater pollution and stream degradation. Versar recommends conducting watershed modeling to determine what percentage of impervious surface will remain untreated after the implementation of these projects. The modeling should also incorporate the treatment of stormwater that will be provided by the many small community actions (such as individual rain barrels and rain gardens) that Columbia residents and businesses will undertake. These actions would be drawn from those described in the neighborhood source assessments of the CWMP.

This modeling will also serve the important purpose of determining when stormwater quantity control is sufficient for the protection of stream channels (i.e., retention of the 1-year storm flow or 2.6 inches of rain). Versar recommends delaying large-scale restoration of stream



morphology until stream flows in the upstream catchment have been stabilized. Such stream restoration projects can then be designed to accommodate long-term flows.

The costs of restoring Columbia's watersheds are hard to determine. Extending the estimated cost for the restoration projects in the Lake Elkhorn subwatershed (\$1.7 million) to the other Columbia subwatersheds results in a total cost of approximately \$30 million. The addition of major stream restoration projects could easily increase the cost by another \$10 million. Fortunately, CA, as part of the Little Patuxent Restoration Partners (LPRP), has already been awarded funds from the 2010 Trust Fund. The LPRP proposal included a projection of funding needs through FY18 of \$99 million (70% state funds and 30% local match) for the area of the Little Patuxent watershed that includes some watersheds north of Columbia, but does not include the part of Columbia draining the Middle Patuxent watershed. Versar recommends that CA allocate \$2 million per year for operations and capital expenditures for the watershed management program, while continuing to work with Howard County and the State of Maryland to obtain other funding for restoration efforts throughout Columbia.

**Future Development.** While the watershed planning in the CWMP primarily addresses the legacy problems of stormwater pollution from development in Columbia prior to adequate stormwater management, it is important to also address any additional development or redevelopment expected in Columbia. The proposed redevelopment of Downtown Columbia by GGP should be of special interest to CA, because it has the potential to dramatically increase or decrease stormwater impacts from impervious surfaces. Special attention should be paid to CA amenities in Downtown such as Symphony Woods and the Lakefront. The impacts of other development and infrastructure projects should also be addressed. In all cases, the CA watershed policy can be the basis for evaluating these projects. We recommend that the CA watershed management program manager have a lead role in all of these issues.

**High Value Areas.** As described above, there are areas within Columbia's watersheds (in or near the New Town Zoning) that provide a disproportionate benefit to Columbia, both ecologically and recreationally. Specifically, the area north of Lake Kittamaqundi is an Ecologically Significant Area. There are also Ecologically Significant Areas outside New Town Zoning at the confluence of the Middle and Little Patuxent River at the Gorman Area, along the southeastern boundary of the Dorsey Run watershed, and on three tributaries from the west into the Middle Patuxent River. We recommend that Phase 2 of the CWMP include detailed investigations of these and other candidate areas for potential enhancement of flora and fauna, through invasive species removal, new plantings, and hydrological modifications (e.g., creating vernal pools). By including this initiative, the CWMP will be addressing the goals of habitat restoration and passive recreation opportunities, in addition to the goals of reducing stormwater impacts and improving water quality.

**Monitoring for Results.** Lastly, it is important that the CA watershed management program include continuing monitoring to demonstrate improvements and support adaptive management. Such monitoring is a requirement of the 2010 Trust Fund monies that CA is receiving. Specifically, we recommend working with Howard County (which has 2010 Trust Fund and MDE NPDES MS4



monitoring responsibilities as well) to develop an overall strategy for monitoring restoration of Columbia's watersheds that includes one or more of the following indicators:

- Reduction in amount of nutrient and sediment loading downstream in pounds per year
- Improvement in biological condition of streams as measured by increases in biological indicator (i.e., Index of Biotic Integrity or IBI) scores or the number of stream miles with higher IBI scores
- Reduction in the acres of impervious surface without stormwater control
- Number of eroding stream miles that have been stabilized
- Increase in the acres of forest

In addition to the above indicators, which generally respond on longer time scales, there are short-term indicators of progress as follows:

- Number of stakeholders involved
- Number of partnerships created
- Number of projects implemented
- Total funding acquired and spent





## **8. 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.





## 9. References

- Arnold, C. and C. Gibbons. 1996. Impervious surface coverage- emergence of a key environmental indicator. *Journal of the American Planning Association*, 62(2): 243-258.
- Barbour, M.T., J. Gerritsen, and B.D. Snyder and J.B. Stribling. 1999. Rapid bioassessment protocols for use in streams and rivers; periphyton, benthic macroinvertebrates, and fish 2nd edition. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA841-b-99-002.
- Center for Watershed Protection (CWP). 2007. Urban Subwatershed Restoration Manual 3: Urban Stormwater Retrofit Practices. Center for Watershed Protection. Ellicott City, MD. August.
- CWP. 2006. Urban Watershed Forestry Manual Part 3: Urban Tree Planting Guide. Prepared by the Center for Watershed Protection. Prepared for United States Department of Agriculture, Forest Service, Northeastern Area. September.
- CWP. 2005a. Urban Subwatershed Restoration Manual 2: Methods to Develop Restoration Plans for Small Urban Watersheds. Center for Watershed Protection. Ellicott City, MD. August.
- CWP. 2005b. Urban Subwatershed Restoration Manual 8: Pollution Source Control Practices. Version 2.0. Center for Watershed Protection. Ellicott City, MD. February.
- CWP. 2004. Urban Subwatershed Restoration Manual 11: Unified Subwatershed and Site Reconnaissance: A User's Manual. Center for Watershed Protection. Ellicott City, MD. March.
- General Growth Properties (GGP). 2008. Symphony Stream and Lake Kittamaquindi Watershed Assessments for Stormwater Master Planning. Associated with Columbia Town Center. Prepared by: Biohabitats, Inc. for: General Growth Properties, Columbia, MD.
- Howard County Department of Public Works (DPW), Stormwater Management Division (SWMD). 2008a. Upper Little Patuxent River Watershed Management Plan. Presentation at Ellicott City Senior Center on plan being prepared by KCI Technologies, Inc., Hunt Valley, MD for Howard County, Columbia, MD. June 3.
- Howard County DPW/SWMD. 2008b. Stream Corridor Assessment (SCA) data for the Dorsey Run watershed. Howard County, Columbia, MD.
- Howard County DPW/SWMD. 2007. Howard County Biological Monitoring and Assessment, Middle Patuxent – 2007. Prepared by KCI Technologies, Inc., Hunt Valley, MD for Howard County, Columbia, MD. <http://www.co.ho.md.us/DPW/DOCS/2007middlepat.pdf>
- Howard County DPW/SWMD. 2006. Howard County Biological Monitoring and Assessment, Little Patuxent – 2006. Prepared by KCI Technologies, Inc., Hunt Valley, MD for Howard County, Columbia, MD. <http://www.co.ho.md.us/DPW/DOCS/2006littlepat.pdf>



- Howard County DPW/SWMD. 2005. Centennial and Wilde Lake Watershed Restoration Plan. Prepared by the Center for Watershed Protection and Tetra Tech, Inc. for the Howard County, Columbia, MD. September. <http://www.howardcountymd.gov/DPW/wras.htm>
- Howard County DPW/SWMD. 2004. Biological Assessment of the Rocky Gorge, Hammond Branch, and Dorsey Run Watersheds, Howard County, Maryland. Prepared by Tetra Tech, Inc., Owings Mills, MD for Howard County, Columbia, MD. <http://www.howardcountymd.gov/DPW/DOCS/rockygorge3.pdf>
- Karrh, R., W. Romano, R. Raves-Golden, P. Tango, S. Garrison, B. Michael, J. Baldizar, C. Trumbauer, M. Hall, B. Cole, C. Aadland, M. Trice, K. Coyle, D. Reynolds, B. Ebersole, and L. Karrh. 2007. Maryland Tributary Strategy Patuxent River Basin Summary Report for 1985-2005 Data. Prepared by: Maryland Department of Natural Resources Tidewater Ecosystem Assessment. Annapolis, MD. August. <http://dnr.maryland.gov/bay/pdfs/PxtBasinSum8505FINAL07.pdf>
- Kazyak, P.F. A. Brindley, and M.T. Southerland. 2005. Maryland Biological Stream Survey 2000-2004 Volume 8: County Results. Monitoring and Non-Tidal Assessment Division, Maryland Department of Natural Resources, Annapolis. DNR-12-0305-0107 EA-05-5. [http://dnrweb.dnr.state.md.us/streams/pubs/ea05-5\\_county.pdf](http://dnrweb.dnr.state.md.us/streams/pubs/ea05-5_county.pdf)
- Lowrance, R., L. Altier, J. Newbold, R. Schnabel, R. Groffman, J. Denver, D. Correll, J. Gilliam, J. Robinson, R. Brinsfield, K. Staver, W. Lucas, and A. Todd. 1997. Water quality functions of riparian forest buffers in Chesapeake Bay watersheds. *Environmental Management* 21(5):687-712.
- Maryland Department of the Environment (MDE). 2008. The 2008 Integrated Report of Surface Water Quality in Maryland. Submitted in Accordance with Sections 303(d), 305(b) and 314 of the Clean Water Act. Baltimore, MD. [http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/Maryland%20303%20dlist/2008\\_Final\\_303d\\_list.asp](http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/Maryland%20303%20dlist/2008_Final_303d_list.asp)
- MDE 2000. 2000 Maryland Stormwater Design Manual. Volumes I and II. Prepared by Center for Watershed Protection and the Maryland Department of the Environment. [http://www.mde.state.md.us/Programs/WaterPrograms/SedimentandStormwater/stormwater\\_design/index.asp](http://www.mde.state.md.us/Programs/WaterPrograms/SedimentandStormwater/stormwater_design/index.asp)
- Maryland Department of Natural Resources (DNR). 2009. Green Infrastructure and GreenPrint, Defining and Preserving our Natural Legacy. The Maryland Natural Resource, Winter 2009. Volume 12, No.1. DNR Office for a Sustainable Future, Annapolis, MD. <http://dnr.maryland.gov/naturalresource/winter2009/green.pdf>
- Maryland DNR. 2007. Fact Sheet: Rare Species Habitat. Prepared by Wildlife and Heritage Service, Natural Heritage Program, Annapolis, MD. November.
- Maryland DNR. 2001. Stream Corridor Assessment Survey of the Little Patuxent River in Howard County. Prepared by Maryland Department of Natural Resources, Watershed Restoration Division, for Howard County, Columbia, MD. September. [http://www.dnr.state.md.us/watersheds/surf/proj/lpat\\_sca.html](http://www.dnr.state.md.us/watersheds/surf/proj/lpat_sca.html)



National Research Council. 2008. Urban Stormwater Management in the United States. Committee on Reducing Stormwater Discharge Contributions to Water Pollution, National Research Council. The National Academies Press, Washington, DC.

Paul, M.J. and J.L. Meyer, 2001. Streams in the urban landscape. 2001. *Annual Review of Ecology and Systematics* 32:333-365.

Schueler, T. 1994. The importance of imperviousness. *Watershed Protection Techniques*, 1(3), 100-111. Center for Watershed Protection, Ellicott City, MD.

Southerland, M.T., G.M. Rogers, M.J. Kline, R.P. Morgan, D.M. Boward, P.F. Kazyak, R.J. Klauda, and S.A. Stranko. 2007. Improving Biological Indicators to Better Assess the Condition of Streams. *Ecological Indicators* 7:751-767.

Wenger, S. 1999 (March 5). A Review of the Scientific Literature on Riparian Buffer Width, Extent and Vegetation. Institute of Ecology, University of Georgia, Athens, GA.

