Chapter 3:

Watershed Plan Goals, Benefits, Implementation and Monitoring

3.1 Watershed Plan Goals, Objectives and Actions

The *Middle Potomac Watersheds Management Plan* will be implemented over the next 25 years. The intent of the plan is to protect Bull Neck Run, Scotts Run, Dead Run, Turkey Run and Pimmit Run from future degradation and promote watershed-wide management actions that work to restore the streams to a healthy ecosystem.

The goals for the *Middle Potomac Watersheds Management Plan* were derived from the issues identified by the community and the project team based on their analysis of the watersheds' condition. The issues driving each goal are explained in greater detail below, as are the supporting reasons for the goal.

GOAL A: Reduce stormwater impacts to protect human health, safety and property.

The increased volume of stormwater runoff from development is the primary cause of the stormwater problems in the Middle Potomac Watersheds. The watersheds have an average 24 percent imperviousness with approximately 1,979 acres of developed land not controlled by any stormwater management facility (e.g. dry detention). Prior to 1972, the county did not require stormwater quantity reduction from development and prior to July 1993, the county did not require water quality treatment of runoff. Because so much of the Middle Potomac Watersheds area was developed before stormwater controls were required, only 12 percent of the watersheds' developed land is controlled by stormwater management facilities.

Stormwater runoff from development has had considerable impacts on the watersheds. Stream channels have eroded and widened to accommodate the increased peak flow rates and volume of stormwater runoff. Properties and possibly structures are impacted when the stream bank erodes and the stream becomes wider. In some cases, the existing storm drain infrastructure does not have the capacity to handle the amount of increased runoff, which causes certain areas to flood. Flooding of roadways and houses can put people's safety at risk and decrease property values because of yard flooding. Human health can be affected by pollutants, such as fecal coliform bacteria and toxic substances, in stormwater that is discharged to the streams.

This goal seeks to reduce stormwater impacts to help protect human health, safety and property. The objectives and actions that are recommended to meet this goal will help to reduce stormwater velocities, volumes, flooding, and pollutants by implementing projects such as constructing new stormwater management facilities, retrofitting existing stormwater management facilities, improving storm drain infrastructure, and removing stream obstructions. These actions will help provide safer and healthier watersheds for the future.

GOAL B: Protect and improve habitat and water quality to sustain native animals and plants.

Development in the watersheds has caused poor water quality and degraded stream habitat which creates an unsustainable environment for animals and plants. The habitat quality is rated as fair for the majority of the streams in the Middle Potomac Watersheds. According to the Stream Physical Assessment (SPA), which is discussed in Section 2.5.10, there are approximately 25 miles of degraded buffers and 2.8 miles of eroded stream banks at least two feet high in the watersheds, most likely caused by increased stormwater runoff volumes. In the SPA, stream bank heights had to be at least two feet high to be considered eroded. Some of the streams have been paved and/or straightened and there are hardened stream bank areas with little or no buffer vegetation, both of which decrease the available habitat in the watersheds. Clearing for development is destroying some wetlands and the increased stormwater runoff and pollution from development is degrading the remaining wetlands which would otherwise provide water quality benefits and habitat for fish, animal, and plant populations. In order to provide a sustainable environment for animals and plants, the buffer areas, wetlands, and natural stream channels will need to be restored after the stormwater runoff volumes and pollutants from existing development are reduced.

The environment section of the county's Policy Plan states under Objective 2, "Protect and restore the ecological integrity of streams in Fairfax County" and "Prevent and reduce pollution of surface and groundwater resources." The objective and actions for this goal will help support the county's Policy Plan by improving habitat areas with poor condition and improving the water quality in order to increase the diversity of animals and plants. This goal will also help protect native biodiversity which includes animal and plants, as well as other components of the watershed ecosystems, such as soil microbes, fungi, and algae. The actions for this goal include protecting and restoring streams and stream buffer areas including removal of invasive plants, protecting and restoring wetlands, promoting wildlife corridors, constructing new stormwater management facilities, and retrofitting existing stormwater management facilities. The restoration of habitat and the increased diversity of animals and plants will provide healthier watersheds for the public to enjoy.

GOAL C: Provide for long term stewardship of the Middle Potomac Watersheds by building awareness of the importance of watershed protection and providing opportunities for enjoyment of streams.

Long term stewardship of the Middle Potomac Watersheds will help to achieve the other goals in the plan by making the public aware of the watershed issues and getting them involved in the implementation of watershed management plan actions. The community has been involved in the development of the *Middle Potomac Watersheds Management Plan* and continued involvement will help to achieve the long-term vision for the watersheds. Creating educational information such as brochures, notices, and signs to distribute throughout the watersheds are a few of the plan actions that will increase awareness and understanding of watershed issues and challenges. Reaching out to the community by providing workshops, training programs, and implementing community service projects will foster a deeper appreciation of the

watersheds which will inspire the community to take responsibility for their preservation and restoration. This goal is important for community involvement in implementing plan actions, communicating successes, and monitoring progress to modify the plan as necessary to adapt to changing conditions and ensure future success.

The objectives below provide direction on how to achieve each of these goals, while the actions describe the strategy for accomplishing each objective. The actions and strategies identified by the project team and the community were revised to address the comments from the steering committee and public workshop participants. The proposed strategies were also reviewed by the county to help clarify and refine the approach for implementation as part of the watershed plan review process. The following tracks have been identified for the implementation of watershed management plan recommendations throughout the county:

1. Structural and non-structural projects:
    - County-initiated projects via the capital improvement program
    - Developer-initiated projects as waiver conditions or via the zoning approval process through proffers or development conditions
    - Volunteer group implementation
2. Policy recommendations

Structural and non-structural recommendations are described in this chapter and policy recommendations are described in Chapter 9. The policy recommendations include proposals that would typically involve amendments to the county code and other supporting documents such as the *Public Facilities Manual*. These recommendations will need to be further evaluated in light of their countywide implications. The current planned approach for processing the policy recommendations from the *Middle Potomac Watersheds Management Plan* is to integrate these recommendations with similar recommendations developed as part of watershed management plans that were recently completed. Specific ordinance amendments would then be drafted in light of other county initiatives and address the common ground that can be established between the various policy recommendations.

One question frequently asked by the public during the watershed plan review process was, "How will the county pay for the actions recommended in the plan?" Possible funding sources for the proposed actions in this plan include the general fund, bond issue, grants, cost-sharing, proffers from developers, or establishment of a stormwater utility. Annual general fund stormwater allocations have ranged from $760,000 to $2.2 million over the past three years. The last stormwater bond referendum to be approved was in 1988 in the amount of $12 million (subject to cash flow restrictions). Currently, $3.7 million of the stormwater bond amount is allocated to existing projects. Examples of current grant and cost-sharing opportunities include the Chesapeake Bay Small Watershed Grant Program, Five Star Restoration Challenge Grants, Federal Watershed Initiative and Environmental Education Grants, Fairfax County's Land Preservation Fund, Chesapeake Bay Restoration Fund, and the US Army Corps of Engineers Section 319 and 206 Grants. The most recent stormwater grants awarded in the county include watershed protection, monitoring of a Reston pond, and creation of wetlands. The county will

maintain a list of projects in the plan that are suitable for proffer by developers to facilitate the construction of the recommended projects.

Since the mid-1990s, the county has been considering the feasibility of a stormwater user fee or utility. For the Stormwater Needs Assessment Project, the *Stormwater Advisory Committee Recommendations to the Fairfax County Board of Supervisors and Consultant Recommendations to Fairfax County,* March 28, 2005, provided support for a long-term dedicated source of funding for the county's stormwater management program. Starting with the FY 2006 budget, the Fairfax County Board of Supervisors approved the dedication of one cent of the real estate tax rate for stormwater management projects focusing primarily on project implementation and infrastructure maintenance. Other funding approaches may be considered by the county for the future.

The following sections describe the objectives and recommended actions that will help to achieve the goals for the Middle Potomac Watersheds.

3.1.1 Goal A Objectives and Actions

GOAL A: Reduce stormwater impacts to protect human health, safety and property.

3.1.1.1 Objective A1

Objective A1: Reduce stormwater volumes and velocities to minimize stream bank erosion.

Action A1.1: Retrofit existing stormwater management facilities and BMPs.

Strategy to Achieve Action: Retrofit suitable existing stormwater management facilities and BMPs to make them more effective at decreasing the peak flows and capturing pollutants. Retrofitting stormwater management facilities will allow them to exceed the original performance criteria or standards that were used to design each facility.

The existing stormwater management (SWM) facilities and BMPs could be structurally retrofitted by various means. For example, increasing the area draining to the facility would increase the area mitigated by the stormwater management facility. This retrofit would require the existing storm drain system to be modified or a new storm drain system to be constructed to redirect and convey the additional runoff to the facility. One of the goals of retrofitting a stormwater management facility would be to have a greater reduction in peak runoff downstream of the facility. Retrofits could also be performed to enhance water quality treatment.

These capital projects may be publicized by the county to developers as items appropriate for proffers in rezoning cases. Although future rezoning in the Middle Potomac Watersheds may be limited, having a list of potential proffers is a good first step towards having developers undertake these voluntary projects. It should be noted that if these capital projects were undertaken as proffers it would be in addition to meeting on-site stormwater management requirements.

Retrofit options that may be suitable for implementation include:

1. Increasing detention storage with additional excavation and/or grading. Some of the stormwater management facilities in these watersheds have very little area for additional grading to enlarge the facility; therefore, adding additional depth through excavation may be an alternative method of increasing storage volume.
2. Modifying or replacing the existing riser structures and outlet controls to further reduce the discharge rate from the stormwater management facility. Due to constructability considerations, such as the dimensions and configuration of the riser and inverts and dimensions of the outlet pipe, most outlet control structures will require replacement with newly designed structures. This option should result in the facility being able to provide the necessary routed storage for the one-year storm event with an extended detention release rate over 24 hours. Reducing peak flows by means of one-year extended detention over a 24-hour period will help to reduce downstream erosion by controlling the more frequent, smaller storms and will also provide volume control benefits for the larger, less frequent storms.
3. Adding infiltration features such as trenches or bioretention to promote greater peak flow reduction and groundwater recharge, and to improve water quality treatment. Some dry detention basins have a concrete flow channel that may need to be removed. At some wet ponds, channels draining to the pond may be converted to infiltration facilities. An evaluation of the soil properties at an existing facility will be required to verify that infiltration features will be suitable.
4. Modifying basins that are currently "short circuiting" (i.e., having length to width ratios less than 2:1 or have inflow points in close proximity to basin outlets). These basins can be modified by adding baffles or meandering low flow channels, which will also help to reduce peak flows for smaller storm events.
5. Redirecting runoff from additional drainage area to an existing stormwater management facility to provide water quantity control and water quality treatment to a greater area. Modifications to the existing stormwater conveyance system or construction of a new drainage system may be required to redirect runoff from the additional drainage area. The capacity of the existing facility will need to be evaluated to determine if additional flows can be discharged to the facility and if modifications to the outlet structure are needed.
6. Adding water quality treatment to facilities that currently provide only water quantity control by installing a new water quality opening or adding a wetland bench. Adding vegetation to the bottom of dry ponds will help improve sediment capture and removal of pollutants.
7. Planting buffer vegetation around the perimeter and banks of facilities to filter runoff, provide habitat for animals, and improve aesthetics.

Locations of existing stormwater management facilities and BMPs that may be suitable for retrofit projects are described in Chapters 4 through 8 and are shown on Maps 4.3, 5.5, 5.6, 6.3, 7.3, 8.7, 8.8, and 8.9. The retrofit locations are grouped by subwatershed and ownership (public or private).

Watershed Benefit: The recommended retrofit projects will benefit the watersheds by reducing the peak flows delivered to the streams and helping to improve water quality by increasing pollutant removal (depending on the type of retrofits that are made). Reducing the peak flows will help reduce the amount of bank erosion that is taking place in each watershed. Retrofit locations were chosen because they are in highly developed areas, are located at the upstream

end of streams, or were identified as needing modification or repair. The water quantity control benefit and pollutant removal benefit have been calculated for some of the projects and this information is provided in Tables 4.7, 5.7, 6.7, 7.6, and 8.7. This action will also help to meet the objectives of Action B1.1

Action A1.2: Construct new BMPs including Low Impact Development (LID) practices.

Strategy to Achieve Action: Construct new BMPs including LID practices to detain the runoff from existing surrounding developments that do not currently have stormwater management controls. Conventional BMP options that may be suitable for implementation include wet retention ponds, dry detention basins, shallow wetlands, pond and wetland combinations, infiltration basins and sand filters. LID projects may include installing bioretention, porous pavement, green roofs, manufactured BMPs, vegetative methods, and groundwater recharge. These LID options are described in more detail below:

1. Bioretention methods such as rain gardens may be installed in low lying open areas and near disconnected downspouts. Bioswales, grassed swales, and infiltration trenches can be installed to replace shallow eroding ditch depressions that normally carry stormwater. Many of the schools and parks in the watersheds have eroding ditches along the outskirts of the properties and around the fields.
2. Porous pavement is a permeable pavement surface that allows infiltration of runoff through its surface. The ideal location for porous pavement is in overflow or outer edge parking areas where usage is limited.
3. Green roofs consist of a lightweight growing medium planted with tolerant forms of vegetation that may be installed on the roofs of buildings. They allow rainfall to be captured in the planting media and used by the plants, averaging at least a 50 percent reduction in runoff. Green roofs can be an aesthetic benefit, reduce building heating and cooling costs, and increase the life of the waterproof membrane by three times.
4. Manufactured BMPs are different types of water quality inlets that help remove pollutants by filtering or settling runoff. One type of manufactured BMP, called a Filterra, uses a shrub or tree placed in filtering media to help remove pollutants. This can also be called a tree box filter. Another type of manufactured BMP is a StormCeptor, which is a compact unit that treats and removes pollutants based on gravity separation. Other types include the Downstream Defender, StormFilter, and the StormTreat System. Most manufactured BMPs can be placed underground in parking areas and typically treat runoff from small drainage areas. They are ideally designed to remove suspended solids, oil, and grease and are usually capable of removing larger debris. Regular maintenance is required to keep them operating as designed.
5. Vegetative methods use plants to help filter pollutants from runoff and can be used adjacent to parking lots, building landscaped areas, and buffer areas adjacent to streams.
6. Groundwater recharge and stormwater detention can be accomplished by methods such as rain barrels that capture runoff from roofs and release it into the ground at a slower rate after the rain event.

LID methods may be installed in conjunction with traditional BMPs at some of the proposed sites. The type of BMP selected for construction will depend on a detailed assessment of site conditions and will be decided in conjunction with public input during the design process. Property owners and stakeholders such as homeowners associations, the Fairfax County Park

Authority, the Fairfax County School Board, and community members will be contacted prior to designing these projects in order to receive approval for the use of the land and to receive input and gain support during the design process. Some of the recommended new BMP projects may be implemented through proffered commitments offered by developers during the rezoning process.

The new BMP projects have been grouped by ownership (public or privately owned land) and type (conventional BMPs or LID methods). The proposed new BMP locations are described in Chapters 4 through 8 and are shown on Maps 4.3, 5.5, 5.6, 6.3, 7.3, 8.7, 8.8, and 8.9.

Public BMP and LID Projects

School properties were targeted for BMP or LID projects because, with the exception of the Potomac School and the Saint Luke School, the properties are owned by the county, usually have large impervious areas, often have no existing stormwater controls, and the projects are ideally situated to help educate the students on watershed issues. Conventional BMPs suitable for school properties include dry detention basins, shallow wetlands, and infiltration basins. The most likely LID methods for schools include adding buffers along parking areas, installing rain gardens and bioretention areas near buildings, and planting vegetation along ditches, streams and property boundaries. Manufactured BMPs can be placed underneath parking lots to treat the runoff. Plans to construct new buildings or renovate existing buildings should consider green roofs as an option. If artificial turf is installed in athletic fields, environmentally safe artificial turf should be used and the fields should be designed to store and treat stormwater runoff from nearby parking lots and buildings.

Parks were also targeted for BMP or LID projects because the land is owned by the Park Authority and county facilities should be examples of environmentally friendly design. BMP or LID projects at parks will help educate the public about ways to remove pollutants from runoff. Conventional BMPs suitable for park properties include wet retention ponds, dry detention basins, shallow wetlands, and pond and wetland combinations. The most likely LID methods for parks include adding porous pavement to outlying parking areas, installing buffer strips adjacent to parking areas, installing bioretention areas, and using vegetative methods to treat runoff from impervious areas. Manufactured BMPs may be used in parking lots to treat runoff from small areas. Educational signs should be placed near LID projects at schools and parks to explain the purpose and benefits of the LID methods.

Private BMP and LID Projects

BMP and LID projects were recommended for privately owned commercial properties, multi-family residential developments, and places of worship as listed in Chapters 4 through 8. These project sites were chosen because they have large impervious areas and do not have existing stormwater management controls. Conventional BMPs suitable for private properties will depend on the available area and the flow characteristics of the site. The most likely LID retrofits for the multi-family residential, commercial, and church/temple sites include installing buffers adjacent to the parking areas, installing bioretention in the landscape areas near buildings and in parking lots, and planting vegetation at the edges of the property especially near ditches and streams. Manufactured BMPs may be installed underneath parking lots to treat the runoff from small drainage areas. Porous pavement may be an option for parking areas that are used infrequently. Since maintenance of these facilities is essential to their success, the property owners should be trained in proper maintenance techniques and/or requirements. Projects on private lands will be evaluated to determine a means for cost-sharing by land owners. Fairfax County should set up a program to monitor the maintenance of these private facilities.

Watershed Benefit: The majority of the streams in the Middle Potomac Watersheds are actively widening because of the increased stormwater runoff from surrounding developed areas. The new BMP locations were chosen because they can treat runoff from highly developed areas that do not have existing stormwater management controls in place. Targeting these areas for new BMPs will help to reduce peak flows in the streams and remove pollutants from the runoff which will help to improve water quality. Reducing the runoff delivered to the streams will reduce the amount of stream bank erosion, increasing the likelihood of success for stream restoration projects downstream. The water quantity control benefit and pollutant removal benefit have been calculated for some of the new BMPs described above and this information is provided in Tables 5.8, 6.8, 7.7, and 8.8

Cooperating with volunteers when installing LID practices such as rain gardens is a great way to get the community involved and spread information about the benefits of reducing runoff and improving water quality. Organizations such as the Northern Virginia Soil and Water Conservation District and the Virginia Department of Forestry currently help communities install rain gardens in Fairfax County. The county will work with these and other organizations to encourage volunteer participation in the planting and maintenance of rain gardens. Educational signs about the LID projects should be installed to provide information about the purpose and benefits of each project. This action will also help to meet the objectives of Action B1.2.

Action A1.3: Construct LID practices in neighborhoods in the public rights-of-way and encourage LID practices on private property.

Strategy to Achieve Action: The neighborhoods selected as Neighborhood Stormwater Improvement Areas do not have existing stormwater management controls and the runoff from these neighborhoods contributes to downstream erosion problems. These neighborhoods are typically medium density residential areas and have a greater amount of imperviousness than low density residential areas. Extensive infill development and mansionization of existing

homes in the targeted neighborhoods have also caused increased peak flows. Targeting these neighborhoods for LID measures will help to mitigate the effects of the impervious surfaces and to improve the effectiveness of stream restoration projects downstream.

The residents of the neighborhoods, Fairfax County Department of Transportation (FCDOT), and VDOT will need to be involved in the planning and design process for these LID projects. Education of and outreach to individual property owners will need to be performed to encourage the voluntary installation of LID practices on private property. County staff should encourage the use of LID practices to meet stormwater management requirements for infill and redevelopment sites.

LID techniques for the neighborhoods include installing rain gardens, porous pavers, rain barrels, manufactured BMPs, vegetative measures, and redirecting downspouts away from driveways. The type of LID practices selected for construction will depend on the detailed site conditions in the neighborhoods and on public input received during the design process. The areas targeted as Neighborhood Stormwater Improvement Areas are shown on Maps 5.5, 5.6, 6.3, 8.7, and 8.8.

Watershed Benefit: The majority of the streams in the Middle Potomac Watersheds are actively widening due to the amount of runoff they receive, and installing LID practices in these neighborhoods will help to reduce peak flows and erosion. These neighborhoods have large amounts of impervious surface and the majority of the areas do not have stormwater management controls. Installing rain barrels and rain gardens is a great way to get the community involved and spread information about the benefits of reducing runoff and improving water quality. Educational signs about the LID projects should be placed in common areas in the targeted neighborhoods to provide information about the purpose and the benefits of LID practices. These neighborhood LID projects will help to promote the use of LID methods by showing developers how LID methods could be successfully incorporated into subdivision design. This action will also help to meet objectives of Action B1.2.

Action A1.4: Reconnect the floodplains to stream channels to provide floodwater storage and treatment.

Strategy to Achieve Action: Reconnecting the stream channels to the floodplains involves removing any existing concrete channel or regrading the stream banks to allow stream flows to spread through the natural floodplain area. Channel bank height may need to be reduced in areas where the stream banks are higher than the floodplains and flows cannot reach the floodplains. The floodplain reconnection projects will be performed in conjunction with stream restoration projects.

Watershed Benefit: Reconnecting the stream channels to the floodplains will give the stream overflow a chance to spread out, which will help slow down the velocity and reduce the volume of flow in the downstream channel. Reducing the peak flow in the channel will reduce the effects of erosion and downcutting in the channel.

Action A1.5: Remove detrimental channel obstructions.

Strategy to Achieve Action: Channel obstructions that block stream flow should be removed if they are endangering a structure or causing flooding or severe erosion. Channel obstructions are constantly changing and will be assessed in the field before removal. A program should be established to identify and address future blockages on a regular basis.

Watershed Benefit: Removing the obstructions will help to restore the capacity of the stream and prevent erosion of the banks caused by the blockages.

Action A1.6: Stabilize eroding stream banks using bioengineering methods.

Strategy to Achieve Action: The county stream physical assessment identified many stream segments in the Middle Potomac Watersheds with eroded banks that would be good candidates for stream restoration projects. Public access to the streams should be included as part of the stream restoration projects where feasible. In areas where the stream velocities are high, a variety of stream restoration techniques will be needed to reduce velocities and achieve the desired results of reducing erosion and improving aquatic habitat. These stream restoration techniques include J-hook vanes, cross vanes, and W-weirs. Also, the use of stream restoration bank protection techniques such as root wad revetments, boulder revetments, or riprap to protect and stabilize the banks will be needed where the stream velocities remain high. Some reaches of the streams may tolerate higher velocities and more detailed geotechnical information will need to be collected during the design process to determine the allowable erosive velocities in each stream reach.

Stream restoration activities may include riparian vegetation plantings, removal of invasive species with limited use of herbicides, physical removal of unstable trees, modification of culverts, floodplain creation, channel reconfiguration, bioengineering of stream banks, selective placement of in-stream habitat structures, and trash/debris removal. These activities have been divided into two different categories – restoration of the riparian corridor and modifications to the stream channel – and are discussed in more detail in Appendix B of this plan. Activities associated with restoration of the riparian corridor and modifications to the stream channels are shown on Maps 4.3, 5.5, 5.6, 6.3, 7.3, 8.7, 8.8, and 8.9. More detailed information will need to be collected prior to stream restoration design to determine the constraints and evaluate what stream restoration techniques will be feasible. The goals of the stream restoration for each reach may need to be modified based on the additional information collected prior to the stream restoration design.

Restoring the streams to stabilize the banks will also help protect the properties located adjacent to the streams. Stabilizing eroding stream banks will help protect land owners' property and ensure their safety. The projects for this action will also help to achieve Goal B and are described under Action B5.1.

Watershed Benefit: The impacts of these projects were not modeled for this watershed management plan because their impacts cannot be accurately calculated without further study.

However, the general benefits of projects such as these are reduced stream erosion, improved aquatic habitat, protection of land owner property, and public safety. Typically, stream restoration projects help stop erosion by reducing flow velocities to levels that are not erosive. The point at which flow velocities begin to erode stream banks depends on local soil conditions.

Policy Actions A1.7 and A1.8 regarding road widening projects and infill development are discussed in Chapter 9.

3.1.1.2 Objective A2

Objective A2: Reduce stormwater flooding and the potential damage from stormwater flooding.

Action A2.1: Improve the existing stormwater infrastructure to prevent flooding of roadways and property.

Strategy to Achieve Action: The problematic storm drainage structures will need to be evaluated for modification or replacement. The goal of improving the storm drain infrastructure is to reduce flooding to surrounding areas.

Storm drain improvement options that may be suitable for implementation in the watersheds include:

1. Modifying or replacing the existing headwalls and curtain walls of culvert outlets. Due to constructability considerations, such as dimensions and configuration, most of the headwalls and curtain walls will require replacement with newly designed structures.
2. Replacing the existing culvert with a properly sized culvert or installing two parallel culverts to help mitigate flooding.
3. Installing an energy dissipater or stilling basin at the outfall end of the culvert in order to prevent stream bank erosion.
4. Rehabilitating or replacing storm drainage pipes, inlets, and outlets that are failing or need repair because of age or inadequate capacity.
5. Increasing the capacity and stability of ditches that are severely eroding and are causing flooding in surrounding areas.

Watershed Benefit: The locations presented in Chapters 4 through 8 were targeted for infrastructure improvements because of flooding complaints. The flooding is occurring because of failing or inadequate storm drain systems. Replacing or rehabilitating the infrastructure will help to alleviate the flooding.

Action A2.2: Improve the existing stormwater infrastructure to prevent negative impacts to the stream.

Strategy to Achieve Action: Locations targeted for improvement may be causing erosion of the streams and are therefore recommended for infrastructure improvements.

Watershed Benefit: The locations presented in Chapters 4 through 8 were targeted for

infrastructure improvement because they are impacting the streams in a negative way. Modifying them will help to prevent erosion of the streams.

Action A2.3: Protect structures located in the 100-year flood limit from flooding.

Strategy to Achieve Action: Flood protection may include floodproofing, building a floodwall, or a home buyout program.

Floodproofing involves retrofitting a structure so that water cannot enter the building or damage HVAC equipment. Some methods of floodproofing may include:

- Applying a waterproof coating or membrane to the exterior walls of the building.
- Installing watertight shields over doors, windows, and other openings.
- Anchoring the building as necessary so that it can resist floatation.
- Installing backflow valves in sanitary and storm sewer lines.
- Raising utility system components, HVAC machinery, and other pieces of equipment so that they are above the expected flood level.
- Installing a sump pump and foundation drain system.
- Strengthening walls so that they can withstand the pressures of flood waters and the impact of flood borne debris.

Tables 5.10, 6.10 and 8.10 list the number of properties in the Middle Potomac Watersheds that are located in the 100-year flood limit and/or have been recommended for flood protection.

Watershed Benefit: Flood protection will mitigate or prevent flood damage to structures from the 100-year storm event and possibly from more frequent storms as well.

3.1.1.3 Objective A3

Objective A3: Reduce pollutants in stormwater runoff to protect human health.

Action A3.1: Identify the sources of fecal coliform bacteria in the watersheds and seek to reduce controllable sources.

Strategy to Achieve Action: Collaborate with Virginia Department of Environmental Quality and Department of Conservation and Recreation to perform studies to identify the sources of fecal coliform bacteria in the Middle Potomac Watersheds and prepare an action plan that describes how the controllable sources, especially human sources, will be reduced.

Watershed Benefit: Scotts Run and Pimmit Run have been identified by the Virginia Department of Environmental Quality as impaired streams due to high levels of bacteria; Bull Neck Run could be also added to the list due to its poor water quality. The proposed studies will allow the evaluation and identification of the sources of fecal coliform bacteria in the watersheds. The studies would also allow a baseline to be established against which progress toward reducing fecal coliform bacteria in the stream can be measured. The ultimate goal of the study action plan would be to remove these streams from Virginia's list of impaired waters. If the studies show that the source of fecal coliform bacteria is poorly functioning septic

systems, it may be possible to connect areas with on-site septic systems to the county's centralized wastewater treatment system if the areas are within the county's Approved Sewer Service Area.

3.1.2 Goal B Objectives and Actions

GOAL B: Protect and improve habitat and water quality to sustain native animals and plants.

3.1.2.1 Objective B1

Objective B1: Reduce pollutants in stormwater runoff to protect fish and other aquatic life.

Action B1.1: Retrofit existing stormwater management facilities and BMPs.

Strategy to Achieve Action: The existing stormwater management (SWM) facilities and BMPs could be structurally retrofitted by increasing the detention storage area, modifying the outlet structure to reduce the rate of discharge, providing infiltration features, creating a wetland bench, or planting a vegetated buffer. Increasing the area draining to the facility may also be desired to increase the overall area treated by the stormwater management facility. Increasing the area draining to the facility would require the existing storm drain system to be modified or a new storm drain system to be constructed to redirect and convey the additional runoff to the facility. One of the goals of retrofitting a stormwater management facility would be to increase water quality treatment and to have a greater reduction in peak flows downstream of the facility.

These capital projects may be proffered by developers in rezoning cases in addition to satisfying on-site stormwater management requirements. Locations of existing stormwater management facilities and BMPs that may be suitable for retrofit projects are described in Action A1.1 and are shown on Maps 4.3, 5.5, 5.6, 6.3, 7.3, 8.7, 8.8, and 8.9.

Watershed Benefit: The recommended retrofit projects will benefit the watersheds by reducing the peak flows delivered to the streams and helping to improve water quality by increasing pollutant removal. Reducing the peak flows will help reduce the amount of bank erosion that is taking place in the streams and prevent excessive sediment from polluting the stream which will improve both water quality and habitat. Improving water quality is necessary in order to ensure that animals and plants can survive and flourish.

The retrofit locations were chosen because they are in highly developed areas, are located in the headwaters of streams, or were identified as being in need of modification or repair. The benefits of the projects that will be implemented first have been calculated and this information is provided in Tables 4.7, 5.7, 6.7, 7.6, and 8.7.

Action B1.2: Construct new BMPs including LID methods.

Strategy to Achieve Action: Conventional BMP options that may be suitable for implementation include wet retention ponds, dry detention basins, shallow wetlands, pond and wetland

combinations, infiltration basins and sand filters. LID projects may include installing bioretention, porous pavement, green roofs, manufactured BMPs, vegetative methods, and groundwater recharge. LID methods may be installed in conjunction with traditional BMPs at some of the proposed sites. The type of BMP selected for construction will depend on a detailed assessment of site conditions and will be decided in conjunction with public input during the design process. Property owners and stakeholders such as homeowners associations, the Fairfax County Park Authority, the Fairfax County School Board, and community members will be contacted prior to designing these projects in order to receive approval for the use of the land and to receive input and gain support during the design process. The recommended new BMP projects may be used as proffers offered by developers during the rezoning process.

The proposed new BMP and LID projects are described in Chapters 4 through 8. The proposed new BMP locations are shown on Maps 5.5, 6.3, 8.7, and 8.8.

Watershed Benefit: The Middle Potomac streams are actively losing habitat and wildlife because of the increased stormwater runoff and associated pollutants from surrounding developed areas. The new BMP locations were chosen because they can treat runoff from highly developed areas that do not have existing stormwater management controls in place. Targeting these areas for new BMPs will help to reduce peak flows in the streams and remove pollutants from the runoff which will help to improve water quality. Reducing the peak flow will increase the likelihood of success for stream restoration projects downstream, which will in turn help to improve water quality, allowing the aquatic life to survive and flourish. The benefits of the LID and BMP projects that will be implemented first have been calculated and this information is provided in Tables 4.8, 5.8, 6.8, 7.7, and 8.8.

3.1.2.2 Objective B2

Objective B2: Increase the use of LID for all development projects to reduce runoff and improve water quality.

Policy Actions B2.1 through B2.5, which address various developments, including the Tysons Corner Stormwater Strategy, are discussed in Chapter 9 under Objective B2.

3.1.2.3 Objective B3

Objective B3: Restore and protect vegetated stream buffers to filter pollutants from runoff, to provide erosion control, and to provide habitat for animals.

Action B3.1: Restore vegetated buffers along streams especially at public sites such as schools, parks, and municipal facilities.

Riparian buffers are needed to support watershed health by filtering runoff from adjacent land, controlling erosion, and providing habitat for native plants and animals. The county's Chesapeake Bay Preservation Ordinance protects riparian buffers along perennial streams from being disturbed or developed. Objective 10 of the environment section of the county's Comprehensive Plan states: "Conserve and restore tree cover on developed and developing sites. Provide tree cover on sites where it is absent prior to development." The watershed plan objective for restoring and managing riparian buffers helps to meet this comprehensive plan objective.

Strategy to Achieve Action: Restoring riparian buffers on public property should be the first step. The need for easements on private property will have to be determined to facilitate the restoration of riparian buffers in these areas. In most cases, the removal of invasive species and the restoration of native species should be included in buffer restoration projects. If invasive species are removed, the use of herbicides should be limited and other methods, such as manual removal, employed where possible. Appropriate buffer materials and species mixes should be selected based on the restoration goals for each area. The deficient buffer locations, described in Chapters 4 through 8, were found during the 2002 Stream Physical Assessment and are potential locations for buffer restoration projects. The locations are shown on Maps 4.2, 5.3, 5.4, 6.2, 7.2, 8.4, 8.5, and 8.6.

Watershed Benefit: The restoration of riparian buffers will increase the amount of habitat area, protect floodplain areas from erosion, protect properties from damage due to lateral stream movement, decrease stormwater runoff, and help filter pollutants from runoff. The pollutant removal rates for buffers vary depending on buffer width, soil types, buffer vegetation types, and runoff amounts and are not easily quantified. Therefore, the pollutant removal quantity for the buffer restoration projects has not been calculated for this plan.

Action B3.2: Provide landowner education about the importance of stream buffers and how to manage and protect them (through coordination, brochures, and workshops).

Strategy to Achieve Action: Coordinate with community groups to provide technical assistance and suitable educational materials for planting and maintaining healthy buffers. The county and community groups should provide educational and technical assistance to property owners with land adjacent to streams to help them manage existing buffers. Technical and educational assistance may include information about the benefits of riparian buffers, planting of native vegetation, identification and removal of invasive species, healthy pruning, limited use and correct application of fertilizers and herbicides, pet waste disposal, and proper disposal of leaves and grass clippings. It will also be important to educate utilities, such as power and sewer companies, which may use vegetation management techniques that are harmful to stream buffers adjacent to utilities. This is a problem in the Pimmit Run Watershed in particular.

Watershed Benefit: This action will help in maintaining and restoring buffers that will provide stream bank and shoreline protection, provide habitat area, and help to filter pollutants from runoff.

Action B3.3: Increase enforcement of stream buffer violations.

Strategy to Achieve Action: Evaluate the current enforcement of the Chesapeake Bay Preservation Ordinance to determine the best way to prevent the destruction of buffer vegetation. The county may need to hire more staff to increase the enforcement of buffer violations. Ongoing stream physical assessments will help to determine the amount of buffer being lost or gained. The Fairfax County Park Authority should be a key part of the enforcement effort.

Watershed Benefit: Increasing enforcement of buffer violations will help to prevent the removal of sensitive buffer vegetation and to restore the buffer in those areas where vegetation was removed. Buffers provide filtering of pollutants from stormwater runoff, erosion control, and habitat for wildlife.

Action B3.4: Remove invasive species from stream buffer areas and replant with native plants.

Strategy to Achieve Action: In most cases, invasive species should be removed from stream buffers and the buffers should be replanted with native plants. All projects will be field-evaluated prior to implementation to prioritize them based on the severity of the problem and the benefit of the project. In general, areas that have a functioning buffer of non-native vegetation will be lower priority than those that have a deficient buffer or no buffer.

Watershed Benefit: This action will allow native vegetation to flourish and provide a food source and habitat for native species. It will also help in creating more sustainable buffers, which will provide stream bank and shoreline protection, habitat area, and filtering of pollutants from runoff.

Action B3.5: Protect stream buffer areas from development.

Strategy to Achieve Action: The county should coordinate with property owners of large undeveloped parcels adjacent to streams to protect stream buffer areas from development.

Watershed Benefit: Protecting stream buffers from development will help to prevent increases of runoff from development and ensure the stream habitat and water quality do not become more degraded in the future.

Policy Actions B3.6 and B3.7, which address trail design and wildlife corridors, are discussed in Chapter 9.

3.1.2.4 Objective B4

Objective B4: Protect and restore wetlands to provide habitat and improve water quality.

Action B4.1: Conduct a detailed inventory of existing wetlands in order to identify areas for protection or restoration.

Strategy to Achieve Action: A wetlands functions and values survey should be performed, either by county staff or a contractor. This wetlands survey will provide a baseline condition and mapping of the wetlands in the watersheds and help the county and watershed stakeholders make decisions regarding priority wetland conservation and preservation areas. Areas identified as having the greatest potential for conservation and restoration should be given the highest priority. The county should seek funding from the Virginia Department of Game and Inland Fisheries and the Virginia Department of Conservation and Recreation to support this effort.

Watershed Benefit: The amount of wetlands in the watersheds is certainly less than what

existed in the past but the magnitude of the decline and the location and extent of remaining wetlands are not known. This study will help to identify important information related to wetlands, such as habitat, flood control, and wildlife nursery benefits, and will establish a baseline condition against which future actions and priorities can be measured. In addition to providing habitat for fish, animal, and plant populations, wetlands can serve as areas where the public can observe wildlife. Wetlands will also benefit water quality by filtering pollutants from stormwater runoff and reducing peak flows by acting as a detention area for stormwater runoff. Wetlands typically remove over 70% of suspended solids, 40% of phosphorous, and 20% of nitrogen from the water that is stored in and flows through them.

Policy Action B4.2, which discusses wetland loss mitigation policy, is discussed in Chapter 9.

3.1.2.5 Objective B5

Objective B5: Restore natural stream channels, banks and beds to provide improved habitat.

Action B5.1: Utilize bioengineering to restore and stabilize stream banks, restore natural stream geometries, and remove concrete from stream banks and beds

Strategy to Achieve Action: Restoring streams and their tributaries will improve the condition of the aquatic habitat and should be carefully coordinated with the objectives of reducing the quantity and improving the quality of runoff in order to prevent further erosion and channel widening.

Stream restoration projects may include replacing concrete channels and gabion lined stream banks with soft structure measures, such as live fascines, vegetated geogrids, and brush mattresses. The locations of proposed stream restoration activities are described in Chapters 4 through 8 and shown on Maps 4.3, 5.5, 5.6, 6.3, 7.3, 8.7, 8.8, and 8.9.

Watershed Benefit: The impacts of these projects were not modeled; however, the general benefits of projects such as these are reduced stream erosion and improved aquatic habitat. Typically, stream restoration projects arrest erosion or reduce erosive velocities to sustainable levels.

3.1.3 Goal C Objectives and Actions

GOAL C: Provide for long term stewardship of the Middle Potomac Watersheds by building awareness of the importance of watershed protection and providing opportunities for enjoyment of streams.

3.1.3.1 Objective C1

Objective C1: Improve education and outreach.

Action C1.1: Establish an on-going relationship with civics and science teachers at middle schools and high schools who need to provide their students with opportunities for service credits or hands-on projects. Students could attend watershed workshops and engage in taking care of LID measures at their schools as well as stream cleanups and other conservation activities. Provide activities and suggestions for student science fair projects.

Strategy to Achieve Action: The Stormwater Planning Division (SWPD) should coordinate with the Fairfax County Public Schools to provide information about educational opportunities. The SWPD staff and volunteer organizations should organize hands-on and community service projects such as stream and dumpsite cleanups, LID site maintenance, rain garden construction, and water quality monitoring projects for students. Educational workshops for students may include topics such as building and maintaining LID sites and water quality monitoring.

Watershed Benefit: An on-going relationship between teachers and SWPD staff will facilitate getting information to students and involving them in implementing some of the plan actions. Providing community service projects throughout the watersheds will allow students to apply lessons learned in the classroom to real life situations and experiences, while helping to restore the watersheds. Having the students maintain LID sites at their schools will provide properly functioning and aesthetically pleasing sites in addition to education.

Action C1.2: Write and distribute a watershed planning fact sheet and lesson plan for teachers that incorporate Standard of Learning 6.7, which deals with watershed protection. Provide specific information about the Middle Potomac Watersheds Management Plan.

Strategy to Achieve Action: A group of county employees, teachers, and citizens who are active stewards of the watersheds should develop watershed planning fact sheets and lesson plans which will provide educational information about watershed protection and the Middle Potomac Watersheds Management Plan. The fact sheets and lesson plans could contain specific information pertaining to the individual watershed where the school is located, such as boundaries, water quality, and habitat. The group should distribute the fact sheets and lesson plans to the teachers and give a presentation to explain the educational materials.

Watershed Benefit: Teaching students about the watersheds will increase the students' awareness and understanding of watershed issues and challenges. Through the fact sheets and lesson plans, the students can learn how their individual actions affect the streams and what they can do to protect and improve the watersheds.

Action C1.3: Consolidate existing educational materials that describe the value of the watersheds and make them accessible through one county contact. Provide downloadable educational materials on the watershed program Web site and create materials that target the following groups with messages that will resonate with each group's interests.

- Homeowners associations (e.g. McLean Citizens Association, existing HOA committees)
- Development community (designers, engineers, contractors and realtors)
- Trail and bicycle groups (Boy Scouts, trails clubs etc.)
- "Friends of" groups (groups organized to protect specific streams)
- Environmental and conservation groups
- Major landowners (the CIA, National Park Service)
- Churches and faith-based groups (also use churches to target immigrant populations)
- Pet owners that use stream side parks (via brochures at vet offices and pet supply stores)

Strategy to Achieve Action: The county should take all of its educational information (event flyers, brochures, and future educational material) and consolidate it on a watershed program Web site. Information pertaining to each group should be categorized under individual sections. This will provide citizens easy access to educational information and current events.

Watershed Benefit: More citizens may get involved in watershed activities and become better informed if the educational material is easy to access on the watershed program Web site.

Action C1.4: Create a watershed planning slide show with watershed basics that can be shown to civic groups, watershed associations, businesses, realtors and other interested groups. Provide the slide show on the Web and on CD. Include explanatory text and timing so that the show can be run automatically.

Strategy to Achieve Action: A watershed planning slide show should be created by county staff and/or a volunteer community organization to explain the watershed concept, existing problems, and proposed future improvements for the watersheds. Meetings should be set up with civic groups, watershed associations, businesses, realtors, etc., to show the slide show and answer any questions.

Watershed Benefit: The slide show will help to educate stakeholder groups by increasing public awareness of the Middle Potomac Watersheds. The stakeholder groups may want to participate in the implementation of certain projects and/or help further educate the public about the watersheds. Educating stakeholder groups will give them a deeper understanding of their watershed and inspire them to take personal responsibility for its preservation and restoration.

3.1.3.2 Objective C2

Objective C2: Improve watershed access and stewardship.

Action C2.1: Encourage voluntary donation of trail and conservation easements.

Strategy to Achieve Action: County staff should meet with the property owners whose land will be affected by the county's future trails plan in order to encourage the donation of trail easements. The donation of conservation easements should also be encouraged as a way to further protect the riparian areas adjacent to the streams. During the meeting, environmentally friendly trail design should be discussed to show homeowners that trails can have a minimal impact on their property.

Watershed Benefit: The donation of trail easements will make it easier for the county to develop new environmentally friendly trails throughout the watersheds. The trails will provide greater access to the streams which will increase public awareness and enjoyment of the streams and build stewardship of watershed resources. Well planned trails in donated easements will also help protect natural areas by limiting trampling and ad hoc trail creation. The donation of conservation easements will guarantee additional protection for the RPA.

Action C2.2: Promote annual or semiannual cleanup projects for streams.

Strategy to Achieve Action: Partner with community groups, such as homeowners associations, and school community service organizations to clean up trash and dumpsites in the watersheds. The county may need to provide assistance to volunteer groups for the removal of bulk trash items. Specific locations were identified by the public and from the stream physical assessment and are described in Chapters 4 through 8.

Watershed Benefit: Removing the trash and debris that pollute the streams will improve stream quality and habitat and avoid chemical contamination and physical threats to safety. This action will help foster a feeling of stewardship in the watersheds and provide a good opportunity for public education and outreach.

Action C2.3: Provide homeowner brochures about proper yard compost practices and damage done to streams by improper disposal of yard wastes. (See also Action C1.1 related to development of educational materials). It would also be helpful to work with the Northern Virginia Soil and Water Conservation District and the Virginia Department of Conservation and Recreation to provide information about appropriate lawn care practices.

Strategy to Achieve Action: Develop brochures that suggest other disposal options for yard waste such as composting, using it as mulch, or incorporating it into the soil. The instructions and benefits for different disposal options can be explained in the brochures. The brochures should also describe the harmful effects of improperly disposing of yard waste such as polluting the streams and blocking their flow.

Watershed Benefit: Educating the homeowners about how to properly dispose of yard waste and the harmful effects of improperly disposing of yard waste may help to lessen the amount

of yard waste delivered to the streams which will improve water quality and habitat.

Action C2.4: Improve enforcement of anti-dumping regulations, e.g., install anti-dumping signage with a phone number for reporting violations.

Strategy to Achieve Action: Investigate methods for increasing the enforcement of illegal dumping regulations in the watersheds, perhaps by hiring more inspectors or a contractor to perform dumpsite monitoring and investigations of potential illegal dumpsites. Installing anti-dumping signs with a phone number for reporting violations at all dumpsite locations will encourage citizens to help the county enforce the regulations.

Watershed Benefit: The benefit to the watersheds will be less pollution in the stream as a result of illegal dumping which will help improve the health of the watersheds (see also Action C2.2).

Action C2.5: If a stormwater utility is established and it entails billings to individual properties, include educational messages about reducing stormwater runoff (and incentives for doing so) in any mailings.

Strategy to Achieve Action: Educational information such as brochures and notices should be sent out with the utility bill in order to educate landowners on stormwater issues and proposed watershed projects. Incentives for reducing stormwater runoff can be included in mailings, for example: obtaining a lower utility fee if LID methods are installed. If this incentive is used to reduce utility fees then the landowner should be required to list that LID measure on their deed in order for the practice to continue under future ownership. Other brochure ideas such as the benefits of LID measures or how to install rain gardens can also be included in the mailings.

Watershed Benefit: Sending information out with a stormwater utility bill would increase public knowledge and consciousness about stormwater issues and proposed projects. Through the brochures and notices, the landowners can gain an understanding of how their individual actions affect the streams and obtain information about what they can do to help protect and improve their watershed.

Action C2.6: Form a volunteer community organization to aid in the stewardship of the Middle Potomac Watersheds and to coordinate watershed plan implementation activities with county staff.

Strategy to Achieve Action: County staff should support the formation of a volunteer community organization of active citizens to aid in the stewardship of the Middle Potomac Watersheds and to help plan implementation activities. The volunteer group can help plan community service projects for students and community members, such as stream clean-ups. They can work with teachers and county staff to develop fact sheets and lesson plans on watershed protection for teachers to integrate into their syllabi. In addition, they can help present the slide show about watersheds (see Action C1.4) and give educational lectures to interested groups.

Watershed Benefit: The volunteer community organization will support and monitor the implementation of the watershed management plan. They can provide information to the community, teachers, and interested groups in order to promote a deeper understanding of the watersheds and inspire others to take greater responsibility for watershed protection and restoration.

Action C2.7: Integrate the watershed management plan with existing state and local government planning efforts such as Capital Improvement Project planning, the County Comprehensive Plan, Area Plans, the Virginia Department of Transportation Six Year Plans, road standards and mitigation projects.

Strategy to Achieve Action: Integrate the watershed management plan with the existing state and local government plans in order to coordinate watershed actions with other planned projects. For example, a proposed new BMP may be located near a road widening project and the BMP may be able to be constructed as part of the road widening project.

Watershed Benefit: Integrating the various plans should make it easier to construct some of the proposed projects and may provide a greater opportunity for earlier implementation of the watershed projects.

Action C2.8: Post signage at stream crossings and watershed divides identifying the waterway to increase public awareness of watershed boundaries.

Strategy to Achieve Action: Install signs throughout the watersheds to convey information such as identification of streams and watershed boundaries. Due to the ethnic and cultural diversity of the citizens in the watersheds, provide signs both in English and in other languages. Also, encourage private BMP owners to post signage at their facilities with contact information for reporting problems at the facility.

Watershed Benefit: Providing information about the streams and watersheds on signs will educate the community and promote awareness about the streams.

3.1.3.3 Objective C3

Objective C3: Promote the implementation and maintenance of low impact development (LID) practices.

Action C3.1: Inspire landowners to use LID measures by demonstrating LID benefits via recognition programs for businesses and neighborhoods that implement LID measures voluntarily. Provide an awards program for businesses that achieve impressive LID applications. Businesses can use this as a marketing tool for clients.

Strategy to Achieve Action: A LID recognition program can be implemented to provide awards to businesses and neighborhoods that voluntarily implement LID measures and that provide exemplary maintenance of LID measures. The awards may include a plaque and recognition in the newspaper and on the county Web site.

Watershed Benefit: A LID recognition program will help promote the implementation and

continued maintenance of the LID measures.

Action C3.2: Demonstrate that LID can increase property values (e.g. a realtor can market the value of an aesthetically pleasing and ecologically beneficial rain garden). Provide case examples of this and publish them. Develop detailed case studies of successful LID projects and provide financial evidence of economic successes (e.g. sold lots for higher prices, sold development parcels faster, spent less on LID than conventional methods.

Strategy to Achieve Action: Research should be performed to determine the extent to which LID measures may increase property values. This information should be published and provided to economic development agencies, real estate agents, and private developers. Local examples of increased property values due to the use of LID methods should be cited in the publication.

Watershed Benefit: Developers will be more likely to implement LID methods if it is known that the LID methods will increase the value of their property. The LID methods will benefit the watersheds by providing greater control and treatment of stormwater runoff especially for areas that do not have existing stormwater controls.

Action C3.3: Provide marketing ideas to showcase properties using extensive LID methods and publicize environmental and social benefits. For example, provide marketing of eco-office parks, healthy landscapes, safer and more environmentally sensitive and attractive developments, and more beautiful environments to attract clients and employees.

Strategy to Achieve Action: Create a marketing package to give to developers of properties who use LID measures extensively. The marketing package will contain examples of brochures and print ads that highlight the environmental benefits of LID measures and describe the aesthetic advantages. The developers can use this information to create marketing materials for their site in order to promote the advantages of developments that use LID practices.

Watershed Benefit: A marketing package will encourage developers to use LID methods on their site which will help control the stormwater runoff and treat the pollutants in the runoff. It will also help raise homeowners' awareness of stormwater controls and alternatives.

Action C3.4: Provide a training and certification program for landscaping companies to learn LID installation and maintenance methods. Provide materials in multiple languages such as English, Spanish, Korean, etc.

Strategy to Achieve Action: County staff should create a training and certification program or endorse an already established program to train landscapers on installation and maintenance of LID practices. Land care companies will benefit from being county certified, making them more likely to be selected by property owners should the county require the use of LID practices to the 'maximum extent practicable' (see Actions B2.2 and B2.3 in Chapter 9).

Watershed Benefit: When LID measures are installed and maintained correctly, they will provide a greater benefit in controlling stormwater and removing pollutants from runoff. This

action may also encourage more widespread use of LID practices due to an increase in landscapers trained in installation and maintenance.

Action C3.5: Contact supply companies that could carry LID materials (such as biofilter soils and plants or pervious pavers) and encourage them to stock those items so that construction companies, landscaping companies and homeowners will have easy access to them. Provide a list of stores that carry LID supplies.

Strategy to Achieve Action: County staff should meet with businesses such as hardware stores, home improvement stores, nurseries, and building material suppliers to explain the benefits of LID methods and encourage them to supply materials used in the construction of LID methods such as rain gardens, pervious pavers, and rain barrels. Providing homeowners and landscaping companies easy access to LID materials will make it more likely that they will construct LID methods. The companies supplying the materials could also supply educational brochures about LID practices to homeowners and contractors. These companies would benefit from free advertising by being on a list of LID material suppliers provided by the county.

Watershed Benefit: Providing easy access to building materials for LID methods will enable homeowners and contractors to construct them more easily and make it more likely that they will be used. LID methods will help to reduce runoff and its associated pollutants.

Action C3.6: Stock educational brochures about LID practices for homeowners at hardware stores, home improvement stores, and nurseries. Consider asking a major store chain to print the brochures.

Strategy to Achieve Action: Develop brochures and distribute them to hardware stores, home improvement stores, and nurseries throughout the watersheds. The brochures should discuss the different LID methods and how to install and maintain them. For example, a brochure might discuss the elements of a rain garden. The county could set up a meeting with the owners and employees of the stores and nurseries to educate them on stormwater runoff problems and the benefits of LID methods. Once the employees and owners have been informed about LID methods, they will be able to explain the brochures and answer questions from customers.

Watershed Benefit: The brochures will increase public knowledge about LID methods which may increase the implementation of LID methods such as rain gardens, rain barrels, and grass swales throughout neighborhoods. The installation of additional LID methods will help reduce the amount of runoff entering the streams and improve their water quality.

Policy Actions C3.7 through C3.9, regarding citizen involvement in implementing LID measures, are discussed in Chapter 9.

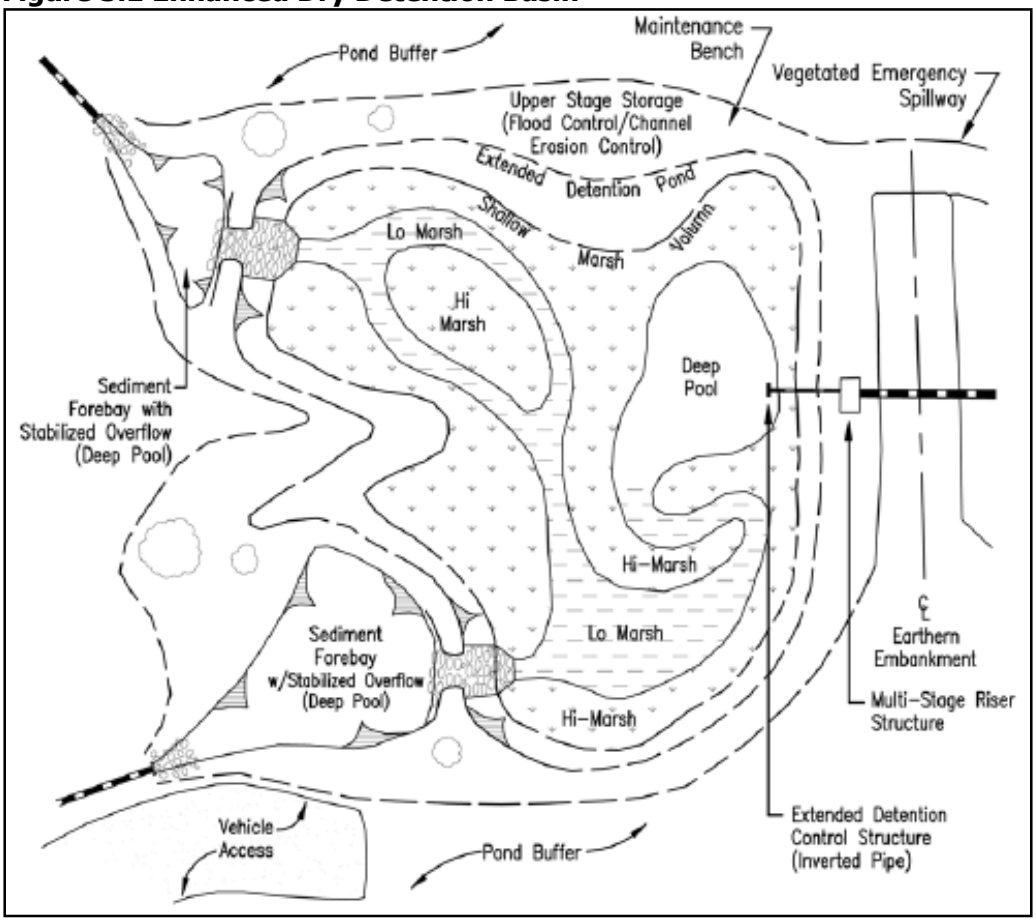
3.2 Watershed Project Types

As described in the previous section, there are many different types of projects proposed for the Middle Potomac Watersheds. This section summarizes the various project types and the project options, if any.

BMP Retrofit

Description: Retrofit suitable existing stormwater management facilities and BMPs to make them more effective at decreasing the peak flows and capturing pollutants. Retrofitting stormwater management facilities will allow them to exceed the original performance criteria or standards that were used to design each facility. A dry detention basin is shown in Figure 3.1 and a wet retention pond is shown in Figure 3.1.

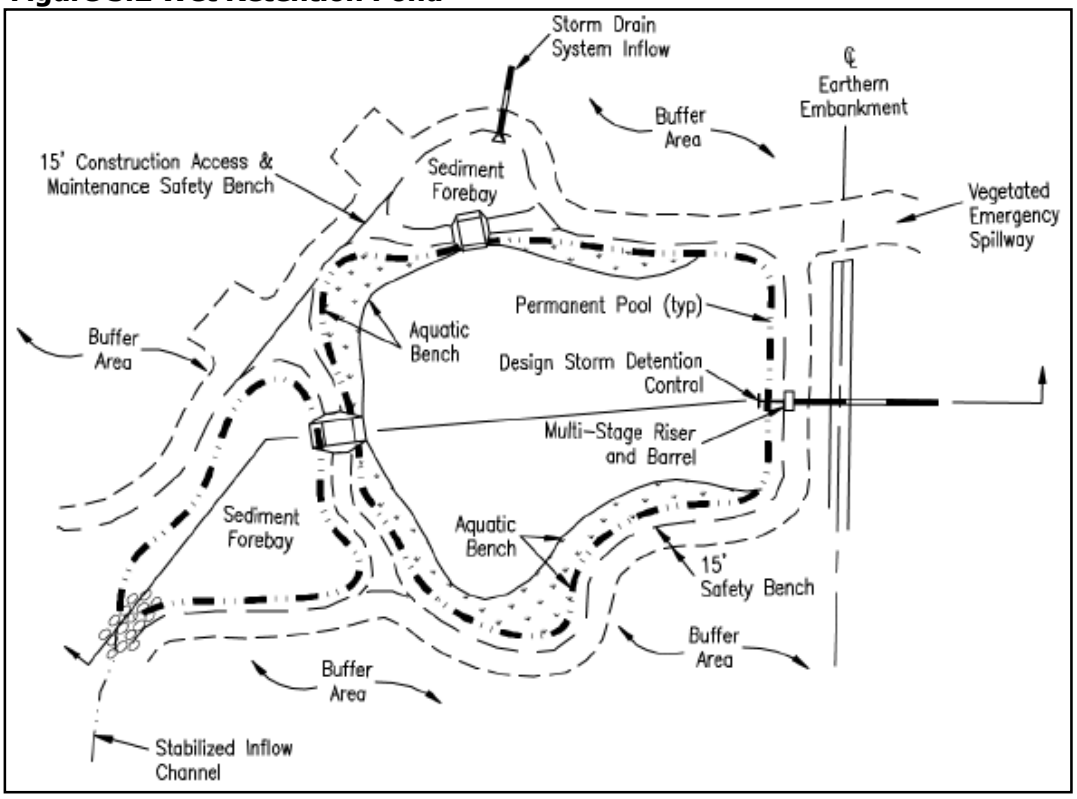
Figure 3.1 Enhanced Dry Detention Basin



Source: Virginia Stormwater Management Handbook, Volume I (1999)

Retrofit Options: There are many options available for retrofitting existing SWM and BMPs. These options include increasing detention storage with excavation, modifying or replacing the existing riser structures and outlet controls, adding infiltration features, modifying basins that are currently "short circuiting", redirecting runoff from additional drainage area, adding water quality treatment, and planting buffer vegetation.

Figure 3.2 Wet Retention Pond

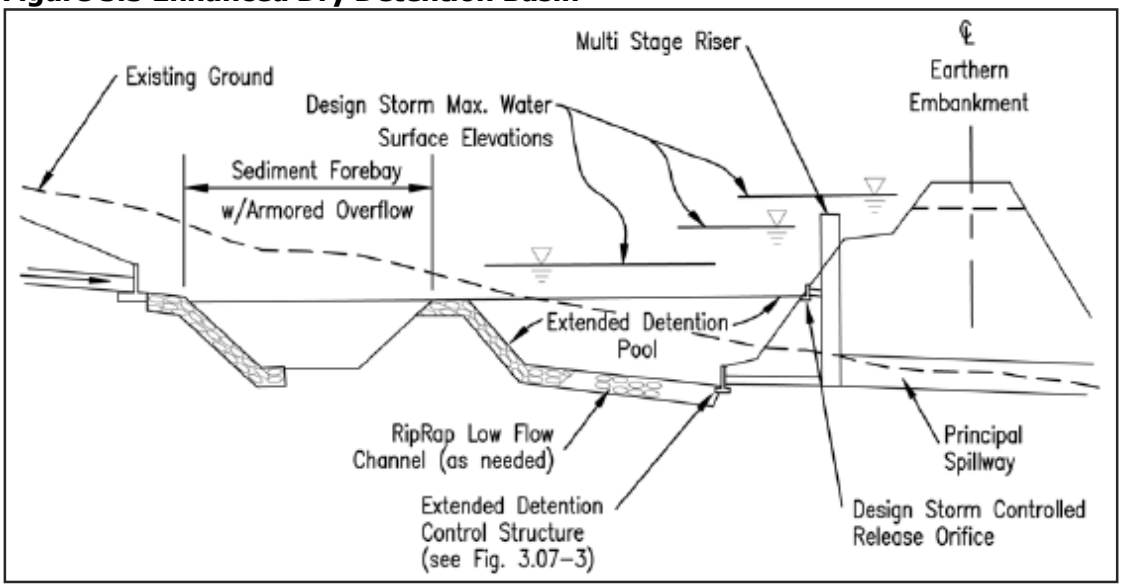


Source: Virginia Stormwater Management Handbook, Volume I (1999)

New BMP

Description: New BMPs are constructed to detain runoff from existing developments that do not currently have stormwater management controls. Locations targeted for new BMPs were parks, schools, privately owned commercial properties, multi-family residential developments, and places of worship. Conventional BMP options that may be suitable for implementation on these properties are wet retention ponds and dry detention basins, shown in Figures 3.3 and 3.4. The BMPs will help to reduce peak flows in the streams and remove pollutants from the runoff which will help to improve water quality.

Figure 3.3 Enhanced Dry Detention Basin

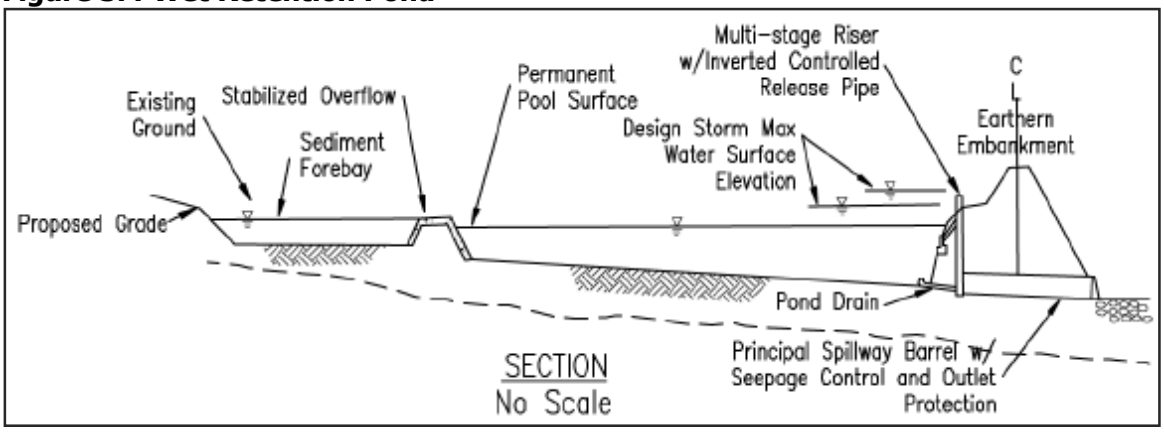


Source: Virginia Stormwater Management Handbook, Volume I (1999)

Options: Based on the project area characteristics, either wet retention ponds or dry detention ponds could be used. A dry detention pond basin incorporates a shallow wetland in its bottom. The shallow wetland provides pollutant removal through wetland plant uptake, absorption, physical filtration, and decomposition.

Through gravitational settling, high removal rates of particulate and soluble pollutants can be achieved in retention basins. When an even higher degree of pollutant removal efficiency is required, the basin can be enhanced by using various modifications relating to the size and design of the permanent pool.

Figure 3.4 Wet Retention Pond



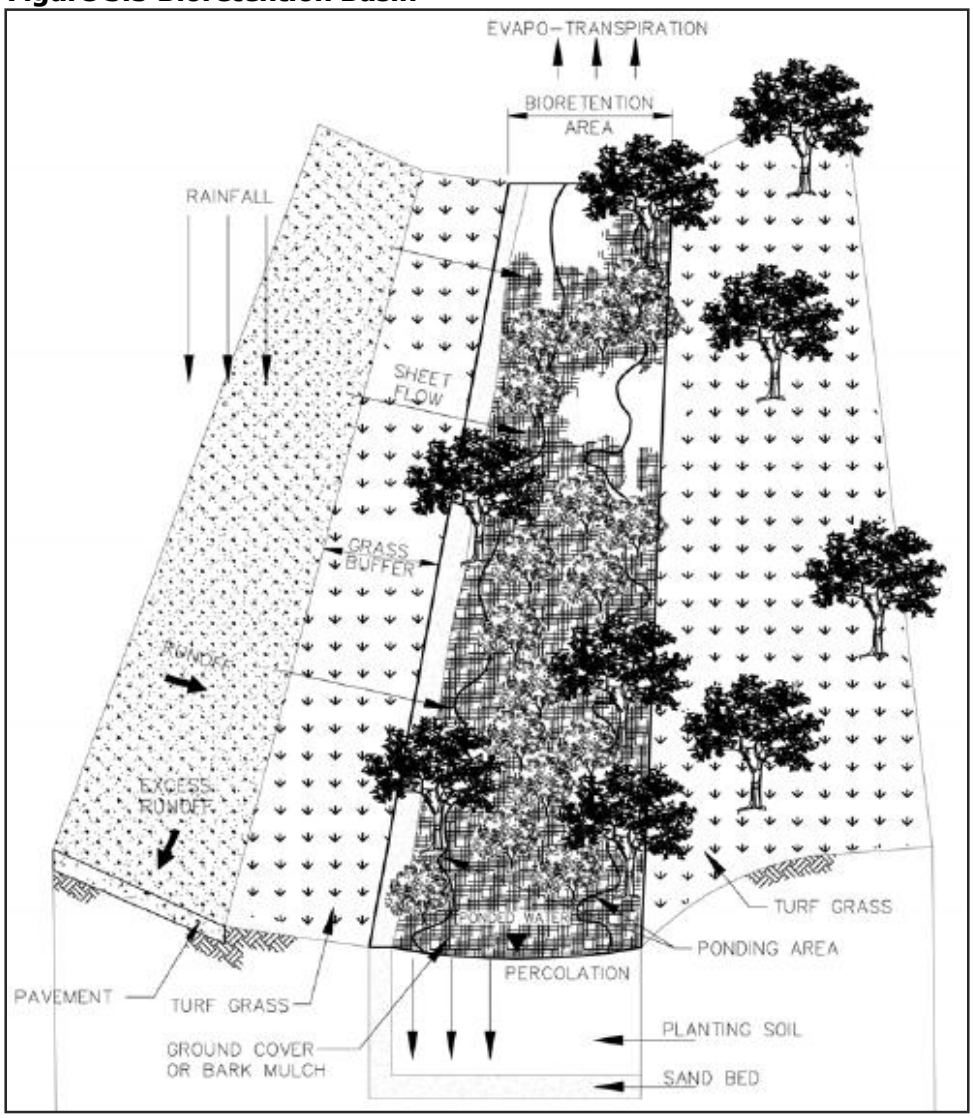
Source: Virginia Stormwater Management Handbook, Volume I (1999)

New LID

Description: Low Impact Development (LID) methods are used to detain runoff from existing properties that do not currently have stormwater management controls. The LID methods provide runoff reduction as well as a reduction in phosphorus and other pollutants. LID projects

may include bioretention areas (also known as rain gardens), porous pavement, green roofs, manufactured BMPs (such as Filterras), vegetative methods, and groundwater recharge. A schematic of a bioretention basin is shown in Figure 3.5.

Figure 3.5 Bioretention Basin



Source: Virginia Stormwater Management Handbook, Volume I (1999)

LID Options: Bioretention methods such as rain gardens may be installed in low lying open areas and near disconnected downspouts. Bioswales, grassed swales, and infiltration trenches can be installed to replace shallow eroding ditch depressions that normally carry stormwater. Porous pavement could be installed at outer edge parking areas where usage is limited. Green roofs may be installed on the roofs of buildings which will allow rainfall to be captured in the planting media and used by the plants. Tree box filters, which treat runoff from small drainage areas, can be placed around parking areas. Vegetative methods use plants to help filter pollutants from runoff and can be used adjacent to parking lots, building landscaped areas, and buffer areas adjacent to streams. Groundwater recharge and stormwater detention can

be accomplished using rain barrels that capture runoff from roofs and release it into the ground at a slow rate after the rain event.

Neighborhood Stormwater Improvement Area

Description: The neighborhoods selected as Neighborhood Stormwater Improvement Areas (NSIAs) do not have existing stormwater management controls and the runoff from these neighborhoods contribute to downstream erosion problems. These neighborhoods have a greater amount of imperviousness due to extensive infill development and mansionization of existing homes which has caused increased peak flows. Targeting these neighborhoods for LID measures will help to mitigate the effects of the impervious surfaces and to improve the effectiveness of stream restoration projects downstream.

Options: LID techniques for the NSIAs include installing rain gardens, porous pavers, rain barrels, manufactured BMPs, vegetative measures, and redirecting downspouts away from driveways.

Stream Restoration

Description: The restoration of an environmentally degraded stream involves modifications to many different physical, chemical, and biological components of the stream ecosystem. The restoration of the riparian corridor is the most common technique used in stream restoration. In areas where the stream velocities are high, a variety of stream restoration techniques will be needed to reduce velocities and achieve the desired results of reducing erosion and improving aquatic habitat. Restoring the streams to stabilize the banks will also help protect the properties located adjacent to the streams. Stabilizing eroding stream banks will help protect land owners' property and ensure their safety.

Options: Stream restoration activities may include riparian vegetation plantings, removal of invasive species, physical removal of unstable trees, modification of culverts, floodplain creation, channel reconfiguration, bioengineering of stream banks, selective placement of in-stream habitat structures, and trash/debris removal. Stream restoration is discussed in more detail in Appendix B of this plan.

Buffer Restoration

Description: Riparian buffers are needed to support watershed health by filtering runoff from adjacent land, controlling erosion, and providing habitat for native plants and animals. The restoration of riparian buffers will increase the amount of habitat area, protect floodplain areas from erosion, protect properties from damage due to lateral stream movement, decrease stormwater runoff, and help filter pollutants from runoff.

Options: Restoring riparian buffers on public property should be the first step. The need for easements on private property will have to be determined to facilitate the restoration of riparian buffers in these areas. In most cases, the removal of invasive species and the restoration of native species should be included in buffer restoration projects. If invasive species are removed, the use of herbicides should be limited and other methods, such as manual removal, employed where possible. Appropriate buffer materials and species mixes

should be selected based on the restoration goals for each area.

Floodplain Restoration
Description: Reconnecting the stream channels to the floodplains will give the stream overflow a chance to spread out, which will help slow down the velocity and reduce the volume of flow in the downstream channel. Reducing the peak flow in the channel will reduce the effects of erosion and down-cutting in the channel.

Options: Floodplain restoration may involve removing existing concrete channel or re-grading the stream banks to allow stream flows to spread through the natural floodplain area. Channel bank height may need to be reduced in areas where the stream banks are higher than the floodplains and where flows cannot reach the floodplains. Floodplain reconnection projects should be performed in conjunction with stream restoration projects.

Flood Protection
Description: Flood protection will mitigate or prevent flood damage to structures from the 100-year storm event and possibly from more frequent storms as well. Flood protection may include floodproofing, building a floodwall, or a home buyout program.

Options: Floodproofing involves retrofitting a structure so that water cannot enter the building or damage HVAC equipment. Some methods of floodproofing includes applying a waterproof coating or membrane to the exterior walls of the building, installing watertight shields over doors, windows, and other openings, anchoring the building as necessary so that it can resist floatation, installing backflow valves in sanitary and storm sewer lines, raising utility system components, HVAC machinery, and other pieces of equipment so that they are above the expected flood level, installing a sump pump and foundation drain system and strengthening walls so that they can withstand the pressures of flood waters and the impact of flood borne debris.

Infrastructure Improvement
Description: The goal of improving the storm drain infrastructure is to reduce flooding to surrounding areas. The flooding occurs due to failing or inadequate storm drain systems. Replacing or rehabilitating the infrastructure will help to alleviate the flooding

Options: Storm drain improvement options that may be suitable for implementation in the watersheds include modifying or replacing existing culverts with a properly sized culverts, rehabilitating or replacing storm drainage pipes, inlets, and outlets that are failing or need repair because of age or inadequate capacity and increasing the capacity and stability of ditches that are severely eroding and are causing flooding in surrounding areas.

Project Numbering
Projects are identified using a numbering convention (XX9YZZ) where:

XX is the watershed code. The two letter watershed codes are as follows:
Bull Neck Run – BN

Scotts Run – SC
Dead Run – DE
Turkey Run – TR
Pimmit Run – PM

Y is the project category:
0 – Not used
1 – BMP Projects
2 – Stream Restoration Projects
3 – Buffer Restoration and Floodplain Restoration Projects
4 – Infrastructure Improvement Projects
5 – Not used
6 – Flood Protection Projects
7 – Fecal Coliform Projects
8 – LID Projects
9 – Dumpsite/Obstruction and Policy Projects

ZZ is the unique ID number for projects in each watershed. So Project DE9438 is in the Dead Run Watershed, is an Infrastructure Improvement Project, and was the 38th project created in the Dead Run Watershed.

3.3 Benefits of Plan Actions

Water quality models were used to quantify the benefits of the plan's proposed structural alternatives, including BMP Retrofits, New BMPs, New LID Projects and Neighborhood Stormwater Improvement Areas. Non-structural alternatives, such as public education projects, are also part of the watershed plan; however, due to the difficulty in quantifying the benefits of these projects, these alternatives were not modeled.

As explained in Section 2.6, modeling guidelines were provided by Fairfax County. Design storms were used in the models to quantify reductions in peak flow rates for the two-, ten-, and 100-year storm events, while a continuous simulation was utilized to approximate annual pollutant load reductions between the future and future proposed conditions.

Future development conditions without any alternatives (future) were compared to future development conditions with the proposed alternatives (proposed) to evaluate the effect of the proposed alternatives in the watersheds.

The benefits of the proposed structural alternatives are:

1. Reductions in peak stormwater discharges resulting in

    - Reductions in road, house, and yard flooding
    - Reductions in stream velocities and potential stream erosion

2. Reductions in pollutant loads resulting in improved stream water quality

Table 3.1 shown below presents the reductions in peak discharges and pollutant loadings in the nine Middle Potomac subwatersheds. As the table indicates, implementation of the proposed alternatives provides a reduction from the future to the proposed conditions in the ten-year peak flow as well as a reduction in pollutant loadings for total suspended solids (TSS), total phosphorus (TP), and total nitrogen (TN). These results are also shown on Maps 3.1 through 3.4.

Table 3.1 Pollutant Loadings and Reductions

Subwatershed	Drainage Area (ac)	Scenario	Runoff Volume (in/yr)	10-Year Peak Flow (cfs/ac)	TSS (lb/ac /yr)	TP (lb/ac /yr)	TN (lb/ac /yr)
Bull Neck Run	1,559	Existing	3.42	0.97	39.9	0.31	2.46
		Future	4.42	1.03	48.1	0.43	3.23
		Proposed	4.31	0.95	40.4	0.39	3.00
		% Load Reduction	-2%	-8%	-16%	-9%	-7%
Upper Scotts Run	1,982	Existing	11.18	1.56	213.3	0.88	8.12
		Future	12.16	1.60	231.4	0.95	8.95
		Proposed	12.01	1.39	160.2	0.82	8.05
		% Load Reduction	-1%	-13%	-31%	-14%	-10%
Lower Scotts Run	1,878	Existing	3.74	1.73	30.8	0.33	2.40
		Future	4.05	1.78	36.4	0.38	2.76
		Proposed	4.03	1.51	35.5	0.38	2.79
		% Load Reduction	0%	-15%	-2%	0%	1%
Dead Run	1,922	Existing	4.36	0.38	70.8	0.49	3.82
		Future	4.81	0.41	76.6	0.53	4.15
		Proposed	4.53	0.34	63.8	0.47	3.71
		% Load Reduction	-6%	-17%	-17%	-11%	-11%
Turkey Run	1,248	Existing	5.91	0.88	110.6	0.47	4.09
		Future	6.09	0.90	113.7	0.49	4.25
		Proposed	5.90	0.85	108.6	0.46	4.02
		% Load Reduction	-3%	-6%	-4%	-6%	-5%
Upper Pimmit Run	2,702	Existing	2.89	0.50	83.5	0.49	4.00
		Future	3.96	0.53	91.0	0.53	4.36
		Proposed	3.28	0.19	70.2	0.44	3.62
		% Load Reduction	-17%	-64%	-23%	-17%	-17%
Middle Pimmit Run	2,803	Existing	2.91	0.72	53.3	0.37	2.90
		Future	3.27	0.75	61.7	0.43	3.35
		Proposed	3.02	0.49	56.9	0.40	3.13
		% Load Reduction	-8%	-35%	-8%	-7%	-7%
Lower Pimmit Run	802	Existing	5.34	3.60	51.5	0.42	3.21
		Future	5.41	3.72	55.1	0.45	3.40
		Proposed	5.41	2.96	55.2	0.45	3.40
		% Load Reduction	0%	-20%	0%	0%	0%
Little Pimmit Run	1,776	Existing	7.19	0.45	60.8	0.44	3.40
		Future	7.41	0.46	63.2	0.46	3.56
		Proposed	7.28	0.45	60.9	0.45	3.48

Subwatershed	Drainage Area (ac)	Scenario	Runoff Volume (in/yr)	10-Year Peak Flow (cfs/ac)	TSS (lb/ac /yr)	TP (lb/ac /yr)	TN (lb/ac /yr)
		% Load Reduction	-2%	-2%	-4%	-2%	-2%
TOTAL	16,672	Existing	46.94	1.00	80.5	0.47	3.86
		Future	51.57	1.04	88.0	0.52	4.29
		Proposed	49.78	0.83	72.4	0.47	3.93
		% Load Reduction	-3%	-20%	-18%	-10%	-8%

The runoff volume shown in the table indicates the inches of water that will run off from each subwatershed area every year. Higher runoff amounts indicate a more urbanized subwatershed, with a greater imperviousness. Since the proposed model uses the same land use conditions as the future model, an overall difference in runoff volume of zero percent was expected in the subwatersheds.

The peak flows shown in the table are the highest flows expected during the ten-year storm, spread out over the area of each subwatershed. The Upper and Middle Pimmit Run Subwatersheds have the greatest reduction in peak flows, over 30 percent, for the ten-year storm. The total reduction in peak flows over the entire Middle Potomac Watersheds area is 19 percent for the ten-year storm. This reduction in flow will provide significant benefits downstream through lower water surface elevations and decreased stream bank erosion.

The pollutant loadings shown in Table 3.1 represent the pounds of pollutants per acre which discharge from the subwatersheds every year. These pollutants flow into the Potomac River, and then into the Chesapeake Bay, contributing to its deterioration. The implementation of the proposed alternatives will reduce the amount of pollutants released into the bay and help Fairfax County meet the requirements of the Chesapeake 2000 agreement.

The total reduction in TSS for the watersheds is greater than the reduction in TN and TP because TSS is more easily removed by the settling that takes place within BMP and LID projects. Since some of the TP and TN are dissolved, removing these pollutants is much harder than removing the TSS. The Upper Pimmit and Upper Scotts Run subwatersheds have the greatest reductions in pollutants due to the large number of proposed alternatives in these watersheds.

The increased infiltration in the new BMP and LID projects reduces the peak flows, which also reduces the amount of pollutants in the downstream subwatersheds. The cumulative stream flow reductions in the watersheds from the proposed alternatives are shown on Map 3.5.

3.4 Implementation of Plan Actions

The actions recommended in this plan will be implemented over the 25-year life of the *Middle Potomac Watersheds Management Plan*. This plan should serve as guidance for all county agencies and officials in helping to steer and determine development and redevelopment within the watersheds. The plan should also be implemented as a living document and the implementation schedule should be updated to reflect plan changes. The initial implementation schedule was first developed using the prioritization criteria provided by the county and modified to consider other relevant factors. The proposed policy actions (Chapter 9) were not prioritized because they will be evaluated with the policy recommendations from the other county watershed management plans.

The proposed projects were first prioritized using a weighted set of five categories. The actions in the plan were assigned an impact score from 1 to 5 for each of the prioritization categories with 5 as the best score and 1 as the worst score. The information used to determine the scores included subbasin condition rankings, geographic location (upstream, downstream); parcel ownership (public, private), and existing water quantity or water quality controls (stormwater management pond, best management practice pond). Structural and non-structural capital projects were prioritized using the same categories. The categories and the weight associated with each category are indicated below. The evaluation factors for each category are listed in descending importance.

1. Fairfax County Board of Supervisors-Adopted Stormwater Control Project Prioritization Categories (40%)

Evaluation Factors
a. Projects that are mandated by state or federal regulations for immediate implementation and projects that address critical/emergency dam safety issues
b. Projects that alleviate structures from damage by floodwaters or by being undermined by severe erosion
c. Projects that achieve stormwater quality improvement in specific conformance with the county's obligation under the Chesapeake Bay initiatives and/or the VPDES permit for storm sewer system discharges
d. Projects that alleviate severe stream bank and channel erosion
e. Projects that alleviate moderate and minor stream bank and channel erosion
f. Projects that alleviate yard flooding
g. Projects that alleviate road flooding

2. Direct Regulatory Contribution (10%)

Evaluation Factors
a. Hybrid projects that accomplish multiple objectives
b. Projects that contribute directly to MS4 and Virginia Tributary Strategies compliance
c. Projects that contribute to TMDL compliance only
d. Projects that have indirect water quality benefits
e. Projects that mitigate flooding

3. Public Support (10%)

Evaluation Factors
a. Projects supported by the advisory committee based on the acceptability of the project in the community
b. Projects supported by the affected residents only. Includes projects that address issues on individual properties such as floodproofing or yard flooding.

4. Effectiveness/Location (25%)

Evaluation Factors
a. Quantity control projects in headwaters areas that lack stormwater management controls
b. Quality control projects in areas that have only quantity controls
c. Projects with greater benefit to cost ratios, such as higher pollutant reduction efficiency, increased retrofit area, etc
d. Stream restorations that require upstream runoff quantity reductions through retrofit or new ponds. These should be targeted for 10+ years from watershed plan completion
e. Projects with low benefit to cost ratios

5. Ease of Implementation (15%)

Evaluation Factors
a. Less complex projects and projects without land acquisition requirements will be easier to implement. This includes: • tree buffer restoration • debris/trash removal • SWM retrofits in county maintained facilities where no additional land rights are required • stream restorations that do not require upstream runoff quantity reductions and are proposed on sites with significant land owner support • LID retrofits at schools and other county facilities • non-structural projects that do not require policy changes or ordinance amendments • other priority projects that have significant land owner support
b. Study projects, wetland surveys, monitoring projects
c. Other pond and LID retrofits, other stream restorations that do not require upstream runoff quantity reductions
d. All other projects

The total score for each project was calculated by adding the corresponding weighted scores from each category. Based on the total scores, the projects were then ranked from the highest score (high priority) to the lowest score (low priority) within each watershed.

The proposed projects located in subbasins with the poorest existing conditions, subbasins with the greatest increase in future imperviousness, or subbasins with the highest likelihood of improvement or preservation received higher scores based on their ability to improve and

maintain the overall quality of subbasin area. The proposed projects in the headwaters of each watershed received higher scores than projects in the downstream portions due to the impact of the projects in the headwaters on a greater portion of the streams. The projects located on public parcels received higher scores when compared to the projects on private parcels due to their greater ease of implementation and perceived public support. The projects which typically have a higher priority include new BMP projects, BMP retrofits, and new LID practices. For BMP retrofit projects, the stormwater management (SWM) ponds with only water quantity controls received a higher score when compared to BMPs which have both water quantity controls and water quality treatment. This is due to the fact that SWM ponds can be easily retrofitted with water quality treatment features while the improvement of existing water quality treatment features is more difficult.

The 25 year implementation period for the Middle Potomac Watersheds Management Plan has been divided into five-year timeframes with the following designations:

Group A	0 to 5 years
Group B	5 to 10 years
Group C	10 to 15 years
Group D	15 to 20 years
Group E	20 to 25 years

The project prioritization is a tool to help in developing the implementation sequencing for the proposed watershed plan projects. The projects with the top prioritization rankings were typically assigned to Group A (0 to 5 years) or Group B (5 to 10 years) implementation timeframes. However, other factors were also considered when assigning the implementation timeframes such as promoting projects that have high visibility and low costs but that may not have received a high priority score. These types of projects include buffer restoration and obstruction removal projects which were assigned to Group A or B. The projects were also grouped based on distributing the costs throughout the 25-year implementation period. Sequencing and geographic location were also considered so that the successful implementation of Group A or B projects will reduce stormwater impacts in a specific subbasin and make it possible to implement other projects in the later timeframes. For example, a new BMP pond constructed in the first five years would help to reduce the stormwater peak flows to the receiving stream making it more feasible to perform a stream restoration project at a later time.

The public education, community outreach, LID promotion, and the enforcement enhancement capital projects were not ranked because they are intended to start within the first five years and continue to be implemented throughout the 25-year plan period. Hence, these projects are designated as Group A*. The tables in Sections 4.4, 5.4, 6.4, 7.4, and 8.4 show the implementation timeframes for the proposed capital projects in each watershed.

6. Other Considerations

Following adoption of the second watershed management plan to be completed in the county, the Fairfax County Board of Supervisors (Board) issued a written statement reaffirming its long history of environmental vigilance, endorsed by its adoption of the Environmental Agenda, which calls for the need to complete the watershed management planning process. The Board stated that the watershed management plans represent a menu of options and concepts that require an additional level of fiscal scrutiny. As a result, it is anticipated that the structural and non-structural projects presented in this plan will be implemented through the following means:

- County-initiated projects via the capital improvement program
- Developer-initiated projects as waiver conditions or via the zoning approval process through proffers or development conditions
- Partnerships with volunteer groups and other organizations such as the Northern Virginia Soil and Water Conservation District

The policy recommendations include proposals that would typically involve amendments to the County Code and other supporting documents such as the Public Facilities Manual. These recommendations will need to be further evaluated by the county in light of their countywide implications. The planned approach for processing the policy recommendations is to integrate Middle Potomac recommendations with those developed for the other completed plans starting in 2008.

The following provisions address the funding and implementation of projects, programs, and policy recommendations in the Middle Potomac Watersheds Management Plan:

i. Projects and Programs (both structural and non-structural) as well as Policy items in this plan will first undergo appropriate review by county staff and the Board (please see iii below) prior to implementation. Board adoption of the watershed plan will not set into motion automatic implementation of projects, programs, initiatives or policy recommendations that have not first been subject to sufficient scrutiny to ensure that the projects that are funded give the county the greatest environmental benefit for the cost.

ii. Road projects not related to protection of streambeds or banks or water quality will not be funded out of the stormwater and watershed budget.

iii. The watershed plan provides a conceptual master-list of structural capital projects and a list of potential non-structural projects for the watersheds. Staff will, on a fiscal year basis, prepare and submit to the Board a detailed spending plan to include a description of proposed projects and an explanation of their ranking, based on yet to be established, specific criteria. Criteria used to assemble this list will include, but are not limited to, cost-effectiveness as compared to alternative projects, a clear public benefit, a need to protect public or private lands from erosion or flooding, a need to meet a

specific watershed or water quality goal and implementable within same fiscal year that funding is provided. Staff also intends to track the progress of implementation and report back to the Board periodically.

iv. Each project on the annual list of structural projects will be evaluated using basic value-engineering cost effectiveness principles before implementation and the consideration of alternative structural and non-structural means for accomplishing the purposes of the project will be considered before implementation. This process will ensure the county's commitment to being a fiscally responsible public entity.

v. Obstruction removal projects on private lands will be evaluated on a case-by-case basis for referral to the Zoning Administrator and/or County Attorney for action as public nuisances; and otherwise to determine appropriate cost-sharing by any parties responsible for the obstructions.

vi. Stream restoration projects on private lands will be evaluated to determine means for cost-sharing by land owners directly responsible for degradation due to their land uses.

Beginning in Fiscal Year 2006, the Board of Supervisors dedicated the approximate value of one penny from the County's Real Estate tax to support the growing needs and regulatory requirements in the stormwater program. This program consists of: Regulatory Compliance, Dam Safety, Infrastructure Reinvestment, Project Implementation and Watershed Planning.

Stormwater Management generates an annual work plan that prioritizes projects from all of the completed watershed management plans. The project prioritization within each plan is taken into consideration when selecting projects for the annual work plan. Cost and benefits, feasibility, and land ownership are also considered when selecting and prioritizing projects across all of the watersheds. For example, the 2008 fiscal year work plan included approximately ten million dollars for implementation of watershed plan projects. Projects were identified from each of the adopted six watershed plans and included in the annual work program. In addition to the projects identified specifically as Watershed Project Implementation, many of the other projects include the practices identified in the watershed plans. For example, many of the dam safety projects include retrofitting a standard dry pond to include BMPs such as additional storage, forebay and a wetlands feature.

The currently adopted five-year Capital Improvement Program (CIP) provides over $22,000,000 per year for Stormwater Management and specifically identifies $500,000 per year for each approved watershed management plan for project implementation. There is an additional $3.5 million included for projects from watershed management plans that are still in progress. In addition to CIP funding, projects may be funded through the pro-rata program, or be constructed as part of a development project, or in conjunction with another county project.

Projects are evaluated on an annual basis as part of the county's budget process and development of the Stormwater Management annual work plan. As the next round of

watershed management plans are completed and approved by the Board of Supervisors, the annual work plan will be developed to include the new projects that are identified in the respective watershed plans. The project selection processes described above, combined with the annual budgetary process, are the factors used in determining projects to implement.

3.5 Monitoring of Plan Actions

This section describes the monitoring actions and targets for determining the success or failure of the future structural and non-structural plan actions. The monitoring will help to determine if the plan actions should be modified in the future to improve their effectiveness or to address changing watershed conditions.

Action A1.1: Retrofit existing stormwater management facilities and BMPs.

- **Monitor:** Number of projects completed.
- **Target:** 100% of projects completed within implementation year group.

Action A1.2: Construct new BMPs including Low Impact Development (LID) practices.

- **Monitor:** Number of projects designed and completed.
- **Target:** 100% of projects completed within implementation year group.

Action A1.3: Construct LID practices in neighborhoods in the public rights-of-way and encourage LID practices on private property.

- **Monitor:** Number of projects designed and completed.
- **Target:** 100% of projects completed within implementation year group.

Action A1.4: Reconnect the floodplains to stream channels to provide floodwater storage and treatment.

- **Monitor:** Number of projects designed and completed.
- **Target:** 100% of projects completed within implementation year group.

Action A1.5: Remove detrimental channel obstructions.

- **Monitor:** Number of projects completed.
- **Target:** 100% of projects completed within implementation year group.

Action A1.6: Stabilize eroding stream banks using bioengineering methods.

- **Monitor:** Number of projects designed and completed.

- **Target:** 100% of projects completed within designated implementation year group.

Action A2.1: Improve the existing stormwater infrastructure to prevent flooding of roadways and property.

- **Monitor:** Number of projects designed and completed.
- **Target:** 100% of projects completed within implementation year group.

Action A2.2: Improve the existing stormwater infrastructure to prevent negative impacts to the stream.

- **Monitor:** Number of projects designed and completed.
- **Target:** 100% of projects completed within implementation year group.

Action A2.3: Protect structures located in the 100-yr flood limit from flooding.

- **Monitor:** Number of projects designed and completed.
- **Target:** 100% of projects completed within implementation year group.

Action A3.1: Identify sources of fecal coliform bacteria in the watershed and seek to reduce controllable sources.

- **Monitor:** Watershed outfalls for fecal coliform bacteria.
- **Target:** Monitor representative number of county outfalls each year for fecal coliform bacteria and track and eliminate illicit discharges if found.

Action B1.1: Retrofit existing stormwater management facilities and BMPs.

- **Monitor:** Number of projects designed and completed.
- **Target:** 100% of projects completed within implementation year group.

Action B1.2: Construct new BMPs including LID methods.

- **Monitor:** Number of projects designed and completed.
- **Target:** 100% of projects completed within implementation year group.

Action B3.1: Restore vegetated buffers along streams especially at public sites such as schools, parks, and municipal facilities.

- **Monitor:** Number of projects completed.
- **Target:** 100% of projects completed within implementation year group.

Action B3.2: Provide landowner education about the importance of stream buffers and how to manage and protect them.

- **Monitor:** Number of workshops held, number of brochures distributed.
- **Target:** Distribute "Got Buffer?" brochure to 5% of property owners each year.

Action B3.3: Increase enforcement of stream buffer violations.

- Monitor: Number of violations enforced.
- Target: Implement a buffer monitoring and assessment program to be included in the county's current stream monitoring efforts.

Action B3.4: Remove invasive species from stream buffer areas and replant with native plants.

- **Monitor:** Number of stream miles that have been surveyed and invasive plants replaced.
- **Target:** Encourage volunteer invasive management programs like the Fairfax County Park Authority's Invasive Management Area program. Remove invasives during stream and buffer restoration projects where feasible.

Action B3.5: Protect stream buffer areas from development.

- **Monitor:** Miles of Resource Protection Area (RPA) restored. Number and acreage of new riparian conservation easements.
- **Target:** Protect existing buffer and restore deficient buffers in RPAs. Conservation easements on all stream corridors and creek buffer areas.

Action B4.1: Conduct a detailed inventory of existing wetlands in order to identify areas for protection or restoration.

- **Monitor:** Performance of wetlands function and value survey.
- **Target:** Identify the location, size, owner, type, and quality of existing wetlands of in the watershed. Catalog the wetlands with the greatest potential for restoration.

Action B5.1: Utilize bioengineering to restore and stabilize stream banks, restore natural stream geometrics, and remove concrete from stream banks and beds.

- **Monitor:** Number of projects designed and completed.
- **Target:** 100% of projects completed within implementation year group.

Action C1.1: Establish an on-going relationship with civics and science teachers at middle and high schools who need to provide students with either opportunities for serve credits or hands-on projects.

- **Monitor:** Number of students participating in stormwater improvement projects. Number of ideas for student activities generated.

- **Target:** Develop educational material. Distribute educational information to the schools in the watersheds each year for the next 5 years.

Action C1.2: Write and distribute a watershed planning fact sheet and lesson plan to teachers.

- **Monitor:** Number of fact sheets and lesson plans distributed.

- **Target:** Develop and distribute brochures and lesson plans to all schools in the watershed. Update and repeat on a yearly basis.

Action C1.3: Consolidate existing educational materials that describe the value of the watersheds and make the materials accessible through one county contact.

- **Monitor:** Creation of county Public Information Officer position in Stormwater Management.

- **Target:** Create position by 2010.

Action C1.4: A watershed planning slide show should be created by county staff and/or volunteer community organization to explain the watershed concept, existing problems, and proposed future improvements for the watersheds.

- **Monitor:** Number of slide shows presented.

- **Target:** Create and present slide show to the applicable businesses in the watershed.

Action C2.1: Encourage voluntary donation of trail and conservation easements.

- **Monitor:** Number and acreage of easements donated.

- **Target:** Solicit voluntary donations from the homeowners along streams in the watersheds, beginning in the highest priority subbasins.

Action C2.2: Promote annual or semiannual cleanup projects for streams.

- **Monitor:** Number of linear feet of streams cleaned and number of people participating in cleanup activities each year.

- **Target:** Clean-up of increasing number of linear feet of streams each year.

Action C2.3: Provide homeowner brochures about proper yard compost practices and damage done to streams by improper disposal of yard wastes.

- **Monitor:** Number of brochures distributed.
- **Target:** Develop and distribute brochures to the homeowners in the watershed, beginning in the subbasins with the worst conditions.

Action C2.4: Improve enforcement of anti-dumping regulations.

- **Monitor:** Number of anti-dumping enforcements.
- **Target:** Reduce dump site complaints.

Action C2.5: If a stormwater utility is established and it entails billings to individual properties, include educational messages about reducing stormwater runoff (and incentives for doing so) in any mailings.

- **Monitor:** Amount of educational materials distributed.
- **Target:** Distribute brochures to the homeowners in the watershed, beginning in the subbasins with the worst conditions.

Action C2.6: Form a volunteer community organization to aid in the stewardship of the Middle Potomac Watersheds and to coordinate watershed plan implementation activities with county staff.

- **Monitor:** Support the formation of a volunteer organization.
- **Target:** Formation of community organization.

Action C2.7: Integrate the watershed management plan with existing state and local government planning efforts such as Capital Improvement Project planning, the County Comprehensive Plan, Area Plans, the Virginia Department of Transportation Six Year Plans, road standards and mitigation projects.

- **Monitor:** Whether or not the plan has been integrated in other government planning efforts.
- **Target:** Integrate watershed plan into all government planning efforts beginning in 2009.

Action C2.8: Post signage at stream crossings and watershed divides identifying the waterway to increase public awareness of watershed boundaries.

- **Monitor:** Number of signs posted.

- **Target:** Place signs in the watersheds each year for the next 5 years, beginning in the highest priority subbasins.

Action C3.1: Recognize businesses and neighborhoods that implement LID measures voluntarily.

- **Monitor:** Development and implementation of recognition program.
- **Target:** Develop and implement recognition program for the watershed.

Action C3.2: Demonstrate that LID can increase property values (e.g. a realtor can market the value of an aesthetically pleasing and ecologically beneficial rain garden).

- **Monitor:** Number of case studies developed.
- **Target:** Several case studies should be developed per year starting in 2010.

Action C3.3: Provide marketing ideas to showcase properties using extensive LID methods and publicize environmental and social benefits.

- **Monitor:** Number of brochures distributed.
- **Target:** Distribute brochures to the businesses in the watershed each year, beginning in the highest priority subbasins.

Action C3.4: Provide a training and certification program for landscaping companies to learn LID installation and maintenance methods.

- **Monitor:** Development and implementation of training and certification program through the county's Engineers and Surveyors Institute (ESI) training program.
- **Target:** Landscaping employees are trained and certified through the county's ESI training program.

Action C3.5: Contact supply companies that could carry LID materials (such as biofilter soils and plants or pervious pavers) and encourage them to stock those items so that construction companies, landscaping companies and homeowners will have easy access to them. Provide a list of stores that carry LID supplies.

- **Monitor:** Number of LID material suppliers contacted.
- **Target:** Contact all potential LID material suppliers in county.

Action C3.6: Stock educational brochures about LID practices for homeowners at hardware stores, home improvement stores, and nurseries. Consider asking a major store chain to print the brochures.

- **Monitor:** Number of stores where brochures have been distributed.
- **Target:** Distribute brochures to the applicable businesses in the county each year.