Chapter 4:
Plan Strategy

4.1 Watershed Plan Vision

Little Hunting Creek and its tributaries provide a diverse set of valuable resources to the community. The Little Hunting Creek Watershed Management Plan offers a vision for the watershed with strategies to work towards achieving the goals and objectives that support the vision.

> "The vision of the Little Hunting Creek Watershed Management Plan is to integrate environmental management, natural resource protection, and community goals to minimize runoff, reduce pollution, and restore the quality of Little Hunting Creek for the community's benefit."

The watershed plan's vision is consistent with Fairfax County's Policy Plan (the countywide element of the county's comprehensive plan), within which the board of supervisors' adopted goals can be found. The board of supervisors' goal for environmental protection states,

> "The amount and distribution of population density and land uses in Fairfax County should be consistent with environmental constraints inherent in the need to preserve natural resources and to meet or exceed federal, state, and local standards for water quality, ambient air quality, and other environmental standards. Development in Fairfax County should be sensitive to the natural setting to prevent degradation of the county's natural environment."

The county policy document also notes that,

> "The protection and restoration of the ecological quality of streams is important to the conservation of ecological resources in Fairfax County. Therefore, efforts to minimize adverse impacts of land use and development on the county's streams should be pursued."

This watershed management plan is intended to complement and supplement the county's policies and comprehensive plans over the next 25 years and support its commitment to the Clean Water Act as well as Virginia's commitment to the Chesapeake Bay Act. The county

(encompassing all county government entities) and other stakeholders of the Little Hunting Creek Watershed are committed to protecting Little Hunting Creek from future degradation and promoting watershed-wide management actions that work to restore the creek and other watershed areas to an environmentally healthy ecosystem. This commitment emphasizes the importance of protecting the county's valuable natural resources (including surface waters) and supports the sustainability and improvement of the environment which has a direct impact on the quality of life of the county's residents. Current stream conditions throughout the watershed are generally poor, and this plan proposes a comprehensive strategy for improving these conditions. The plan was written to manage future changes in the watershed to protect the creek so it can be enjoyed by future generations. The objectives of the plan will also help the county meet or exceed federal, state, and local regulatory water quality requirements.

The planning process initiated by Fairfax County for development of this watershed management plan included the participation and recommendations of a watershed steering committee. The Little Hunting Creek Steering Committee was convened as an advisory committee for the Little Hunting Creek Watershed Management Plan project team, and the committee members served as liaisons between their respective communities or organizations and the project team. Several public workshops were held to receive input from the community regarding the watershed issues and possible solutions. The project team used this information to help evaluate the watershed and provide recommendations for addressing the issues.

The Little Hunting Creek Steering Committee developed the following guiding principles to aid in formulating the actions and strategies for implementing the objectives of the plan:

- Seek solutions that can be implemented at the local level and reality-test all ideas.
- Individuals are key players, but not the only ones. Review policies, history, land use management, and other factors that have led to the watershed's current condition and address solutions to those factors.
- Prioritize actions and investments based on those that are anticipated to have high returns.
- Integrate the watershed plan with existing plans (e.g., the Richmond Highway realignment) and with new opportunities to establish early cooperation at the conceptual stage.
- Scale solutions so they can be implemented at multiple levels—from individuals to neighborhoods to the entire watershed.
- Use best management practices (BMPs) that provide multiple benefits and values such as economic cost savings, aesthetics, and environmental quality.
- Provide opportunities for environmental education at different levels—from elementary school children to adults.
- Address problems as close to the source as possible rather than treating multiple problems at one site or downstream.
- What is done for the Little Hunting Creek Watershed should be a model for all the other watersheds.

It is understood that some local solutions may require state- or national- level action. In order to reality-test ideas, they should be reviewed from a realistic implementation perspective and perhaps implemented in an appropriate pilot area. These guiding principles provide a set of guidelines for implementing the goals and objectives.

4.2 Goals, Objectives, and Actions

The goals of the Little Hunting Creek Watershed Management Plan were derived from the issues identified by the community and the county's consultants based on their analysis of the watershed condition. The issues driving each goal are explained in greater detail with the supporting reasons for the goal. Objectives for the goals provide direction on how to achieve the goals, and the rationale for each objective describes why it is important to the plan. The actions for each objective describe the strategy for accomplishing the objective.

The actions and strategies identified by the consultant and the community were revised according to the comments from the steering committee and public workshop. 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
3. Land use recommendations

Structural and non-structural recommendations are described in this chapter. Policy and/or land use recommendations are described in Chapter 5. 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 current planned approach for processing the policy recommendations from the Little Hunting Creek Watershed Management Plan is to integrate these recommendations with similar recommendations developed with the Popes Head Creek, Cameron Run, Cub Run, and Difficult Run Watershed management plans over the next few years. 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. Land use recommendations are grouped with the policy actions and will be further evaluated as part of the county's comprehensive plan area plan review (APR) process. Land use recommendations adopted through the APR process would become part of the comprehensive plan.

One of the frequent questions 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 stormwater environmental utility fee. 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 opportu-

nities 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 wetlands. Since the mid-1990s, the county has been considering the feasibility of a stormwater user fee. In the July 2004 preliminary report prepared for the county, Watershed Community Needs Assessment and Funding Options, various alternatives to support an enhanced countywide stormwater program, including a stormwater environmental utility fee, were evaluated. In this report, program costs starting at $28 million per year and increasing to $52 million per year within five years were recommended. Through the input of a board-appointed stormwater advisory committee, the report will be finalized in 2005. The county will also maintain a list of all projects in the plan that is suitable for proffer by developers to facilitate the construction of the recommended projects.

Goal A: Reduce stormwater impacts on the Little Hunting Creek Watershed from impervious areas to help restore and protect the streams.

The increased volume of polluted stormwater runoff from impervious surfaces is the primary cause of most of the problems in the watershed. The watershed has 25% imperviousness with approximately 6,245 acres of developed land not controlled by any stormwater management facilities (e.g. dry detention ponds). The primary reason for this is that the Little Hunting Creek Watershed was developed before the Clean Water Act's stormwater management requirements were enacted. Only 12% of the watershed's developed land is controlled by stormwater management facilities. The result of the increased peak rates and volume of stormwater runoff is the alteration of the stream channel by erosion of stream banks and deepening of stream bottoms to accommodate the increased flow. The channel degrades as increased storm flows lead to stream bank instability and subsequent collapse of riparian trees. Sediment from eroded banks is deposited in the streambed and carried downstream, destroying aquatic habitat for insects and fish. Properties may be damaged if the eroding stream bank is close to structures. This goal seeks to reduce the impact of the increased peak rates and volume of stormwater runoff to help in reducing the amount of erosion and habitat degradation in the streams.

Objectives A1 and A2: See Chapter 5

Objective A3: Increase the effectiveness and use of BMPs to reduce impacts from impervious areas.

Rationale: Existing privately owned stormwater basins (both dry and wet) may not function as intended because of inadequate design and/or maintenance. For example, the stormwater basin next to Gold's Gym at 7770 Richmond Highway is nonfunctional and in disrepair. In addition, the county has identified the need to increase the number and type of BMPs on its list of approved practices (see Industry Letter 01-11). The environment section of the county's Policy Plan, Objective 2, Policy "b" states, "Update Best Management Practice requirements as newer, more effective strategies become available." Policy "f" under Objective 2 also relates to BMP effectiveness, stating, "Where practical and feasible, retrofit older stormwater management facilities to perform water quality functions to better protect downstream areas from degradation."

Action A3.6: Retrofit suitable existing stormwater management facilities and BMPs to make them more effective. Retrofitting these facilities is intended to meet the goals and objectives of this plan which will exceed the performance criteria or standards that were used to design the facility.

Strategy to Achieve Action: The existing stormwater management facilities and BMPs could be structurally retrofitted by various means. Increasing the area draining to the facility may also be desirable to increase the overall area mitigated by a 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 constructed to redirect and convey runoff to the existing facility. The stormwater facility would likely need to be enlarged if more runoff is directed to the facility. One of the goals of retrofitting a stormwater management facility would be to reduce peak runoff downstream of the facility. Retrofits could also be performed to enhance water quality treatment; these retrofits are discussed in Action C2.2. These capital projects should be offered by the county to developers as items appropriate for proffers. This would allow the county to take a more programmed approach, by way of using proffers, to address stormwater management in the watershed instead of requiring onsite mitigation for each project. Any retrofit projects constructed by the county or others should minimize the disturbance to adjacent properties to the maximum extent practical and restore the landscaping of the affected properties to pre-construction conditions. The disturbance of existing trees should also be minimized.

Retrofit options that may be suitable for implementation include:

1. Increase detention storage by means of additional excavation and grading. The majority of the stormwater management facilities in this watershed have very little room for additional grading; therefore, these improvements will limit expanding facility width and focus on adding additional depth through excavation. Any additional storage volume should be obtained within the limits of the existing facility or its easement, if possible, and there should be no increase in dam height.
2. Modify or replace 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.
3. Add infiltration features such as trenches or bioretention to promote greater peak flow reduction and groundwater recharge and improve water quality treatment. A soil survey of the existing facility would be required to verify that this retrofit is suitable.
4. Modify basins that are currently "short circuiting" (i.e., having length-to-width ratios less than 2:1 or inflow points in close proximity to basin outlets). These basins can be modified by adding baffles or meandering low-flow channels that also help reduce peak flows for smaller storm events.
5. Redirect additional drainage areas to an existing stormwater management facility to provide water quantity control and water quality treatment to a greater area. Improvements to the existing stormwater conveyance system will be required to redirect additional drainage areas. This would consist of relocating existing storm drains and ditches and redirecting existing outfalls to drain to the retrofit facilities.
6. Providing water quality improvements to facilities that currently provide only water quantity control. These facilities could be retrofitted to provide water quality treatment by installing a new water quality opening or adding a wetlands bench.

Retrofit options should be implemented at most of the existing stormwater management facilities located in the watershed. These improvements should result in the facilities being able to provide the necessary routed storage for the one-year storm for 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 reduce downstream erosion by controlling frequent, small storms and provide volume control benefits for larger, less-frequent storms. Possible locations of existing stormwater management facilities and BMPs that may be suitable for retrofit projects are described as follows and shown on Map 4.1.

North Little Hunting Creek

- Privately owned dry detention basin located adjacent to Gold's Gym at 7770 Richmond Highway (Map No. NLHC2). Implementation Period: FY 2020 - FY 2024, Capital Cost: $90,000
- Privately owned dry detention basin located at the Bethlehem Baptist Church at 7836 Fordson Road, northwest of the Sherwood Hall Lane and Fordson Road intersection (Map No. NLHC3). Implementation Period: FY 2025 - FY 2029, Capital Cost: $60,000
- Privately owned dry detention basin located at 3115 Sherwood Hall Lane, east of the Sherwood Hall Lane and Kingland Road intersection (Map No. NLHC4). Implementation Period: FY 2010 - FY 2014, Capital Cost: $30,000
- Publicly owned dry detention basin located at 7851 Gum Springs Village Drive (Map No. NLHC5). Implementation Period: FY 2020 - FY 2024, Capital Cost: $110,000
- Publicly owned dry detention basin located opposite of 3910 Buckman Road, southeast of Buckman Road and Roxbury Place (Map No. NLHC6). Implementation Period: FY 2010 - FY 2014, Capital Cost: $70,000

South Little Hunting Creek

- Publicly owned dry detention BMP located opposite of 3301 Woodland Lane (Map No. SLHC16). Implementation Period: FY 2025 - FY 2029, Capital Cost: $60,000

Paul Spring Branch

- Publicly owned dry detention basin located at 7001 Bryant Towne Court, northeast of the Bryant Towne Court and Popkins Lane intersection (Map No. PSB3). Implementation Period: FY 2020 - FY 2024, Capital Cost: $50,000
- Publicly owned dry detention basin located at 7628 Essex Manor Place, southwest of the Admiral Drive and Essex Manor Place intersection (Map No. PSB4). Implementation Period: FY 2008 - FY 2009, Capital Cost: $110,000
- Privately owned dry detention basin located near the intersection of Memorial Heights and Preston Avenue (Map No. PSB5). Implementation Period: FY 2020 - FY 2024, Capital Cost: $60,000
- Privately owned dry detention basin located at 6733 Richmond Highway, northeast of the Richmond Highway and Schooley Drive intersection (Map No. PSB6). Implementation Period: FY 2020 - FY 2024, Capital Cost: $70,000
- Privately owned dry detention basin located at 7116 Fort Hunt Road, northwest of the Paul Spring Road and Fort Hunt Road intersection (Map No. PSB7). Implementation Period: FY 2009 - FY 2010, Capital Cost: $110,000
- Privately owned dry detention basin located at 1909 Windmill Lane, north of Mason Hill Drive and south of Windmill Lane (Map No. PSB8). Implementation Period: FY 2005 - FY 2007, Capital Cost: $60,000

- Publicly owned dry detention basin located at 2004 Windmill Lane, northwest of the intersection of Windmill Lane and Windmill Court (Map No. PSB23). Implementation Period: FY 2025 - FY 2029, Capital Cost: $80,000 (This project should also include the investigation of localized ponding in the vicinity of the BMP and surrounding properties.)

North Branch

- Publicly owned dry detention basins located opposite of 7920 Holland Road, southeast of the Sherwood Hall Lane and Holland Road intersection (Map No. NB2). Implementation Period: FY 2010 - FY 2014, Capital Cost: $250,000
- Publicly owned dry detention basin located at 8306 Rampart Court (Map No. NB3). Implementation Period: FY 2015 - FY 2019, Capital Cost: $60,000
- Publicly owned extended dry detention basin located at 8306 Marble Dale Court (Map No. NB4). Implementation Period: FY 2020 - FY 2024, Capital Cost: $80,000
- Publicly owned extended dry detention basin located at 8313 Riverton Lane (Map No. NB5). Implementation Period: FY 2020 - FY 2024, Capital Cost: $90,000
- Publicly owned extended dry detention basin located at 8225 Stacey Road (Map No. NB9). Implementation Period: FY 2015 - FY 2019, Capital Cost: $90,000
- Publicly owned extended dry detention basin located at 1614 Noral Place (Map No. NB10). Implementation Period: FY 2020 - FY 2024, Capital Cost: $30,000

Existing stormwater management facilities, such as infiltration trenches and underground storage facilities, were not considered for retrofits due to constructability issues and small benefits with great construction costs.

Table 4.1 summarizes the quantified two-year peak flow reduction benefit for the recommended retrofit options. The retrofit option numbers correspond to directly to the numbered options listed above. The storage volumes to be added to the existing BMPs and the drainage areas contributing to the BMPs are shown in Table 4.1. The peak flow reduction benefits for this action are included in the total peak flow reductions shown on Map 4.2.

Table 4.1 Benefits of Stormwater Management Facility and BMP Retrofits

Map No./ Project ID	Subbasin	Retrofit Options	Additional Storage Volume (cy)	Proposed Drainage Area (acres)	Peak Flow Reduction (cfs)
North Little Hunting Creek					
NLHC2	LH-LH-0004	1,2,3,5,6	650	7.5	1.9
NLHC3	LH-LH-0004	1,2,3,6	400	4.7	1.2
NLHC4	LH-LH-0001	1,2,3,6	150	1.8	13.0
NLHC5	LH-LH-0004	1,2,3,5,6	850	10.3	2.6
NLHC6	LH-LH-0003	1,2,3,5	450	9.0	5.0
			Subtotal	33.3	
South Little Hunting Creek					
SLHC16	LH-LH-0013	1,2,3,5	250	4.9	1.0
			Subtotal	4.9	
Paul Spring Branch					
PSB3	LH-PS-0007	1,2,3,4,6	100	1.6	1.6
PSB4	LH-PS-0003	1,2,3,5,6	700	13.6	12.3
PSB5	LH-PS-0007	1,2,3,6	100	1.7	1.6
PSB6	LH-PS-0007	1,2,3,5,6	150	1.5	1.6
PSB7	LH-PS-0004	1,2,3,5,6	950	21.1	20.3
PSB8	LH-PS-0002	1,2,3,6	400	4.5	4.1
PSB23	LH-PS-0004	1,2,3,5,6	450	8.7	9.8
			Subtotal	52.7	
North Branch					
NB2	LH-NB-0003	1,2,3,5,6	2600	31.7	6.0
NB3	LH-NB-0006	1,2,3,5,6	450	8.9	2.2
NB4	LH-NB-0004	1,2,3,5	550	10.5	0.5
NB5	LH-NB-0004	1,2,3,5,6	650	12.9	0.5
NB9	LH-NB-0006	1,2,3,5,6	700	13.7	3.4
NB10	LH-NB-0006	1,2,3	50	0.6	0.2
			Subtotal	78.3	
Total Little Hunting Creek				169.2	

Responsible Party: Fairfax County
Implementation Period: See above descriptions
Capital Cost: See above descriptions
Staff: 0.05 staff year equivalent (SYE)

Action A3.7: Construct new public BMPs, including LID practices, to detain the runoff from existing surrounding development that does not currently have stormwater management controls.

Strategy to Achieve Action: This strategy includes projects that may be offered by the county to the development community as items suitable for implementation as proffers that may help in constructing these projects. Property owners and home owner associations should be contacted prior to designing these projects for input and support. The suggested demonstration projects are meant to be a model for others, such as developers, to imitate and should be adequately maintained by the county.

New public BMP options that may be suitable for implementation include wet ponds, dry ponds, shallow wetlands, pond and wetland combinations, infiltration basins, sand filters, bioretention, or manufactured BMP systems. The type of BMP selected for construction will depend on the detailed site conditions and will be decided in conjunction with public input during the design process. The construction of any new BMP should be done to minimize disturbance to surrounding properties and existing stands of mature trees. Potential locations for new public BMPs are described as follows and shown on Map 4.1.

North Little Hunting Creek

- Construct a new, one-year, extended-detention BMP on the county-owned land located between the 7200 and 7300 blocks of Richmond Highway at the northeast corner of the Richmond Highway and Lockheed Boulevard intersection. The BMP should be designed to treat the runoff from the surrounding commercial and high-density residential areas and be an attractive, landscaped amenity for the community (Map No. NLHC1). Implementation Period: FY 2006 - FY 2007, Capital Cost: $430,000
- Reduce runoff from the existing commercial and high-density residential areas along Richmond Highway such as the Mount Vernon Plaza, Hybla Valley Plaza, Multiplex Cinema, and Audubon Estates Mobile Home Park with new LID techniques such as bioretention (including Filterra or similar units), vegetated buffer strips, porous pavement, and disconnected roof drains. This area is likely to be redeveloped to include new buildings and a main street style layout. This could be an opportunity to collectively improve the existing storm drain system as well as have developers install BMPs as proffers (Map No. NLHC9). Implementation Period: FY 2007 - FY 2009, Capital Cost: $590,000
- Construct a new, one-year, extended-detention BMP on the vacant parcel behind the commercial property on the 7000 block of Fordson Road. This facility would reduce runoff from the surrounding commercial areas (Map No. NLHC16). Implementation Period: FY 2006 - FY 2008, Capital Cost: $130,000
- Construct a new, one-year, extended-detention BMP behind the commercial property on the 3500 block of Lockheed Boulevard. This facility may consist of bermed construction to minimize tree loss, and tree removal should be limited to the embankment area. This facility would reduce runoff from the adjacent commercial property (Map No. NLHC17). Implementation Period: FY 2006 - FY 2008, Capital Cost: $110,000
- Construct a new, one-year, extended-detention BMP at the headwaters of North Little Hunting Creek at the storm drain outfall at the end of the 7400 block of Fairchild Drive. Tree removal should only occur at the embankment area. This facility would reduce runoff from the residential properties immediately upstream (Map No. NLHC19). Implementation Period: FY 2010 - FY 2014, Capital Cost: $210,000
- Construct a new, one-year, extended-detention BMP behind the 2600 block of Arlington Drive. The existing storm drain system would need to be modified and possibly a low-flow diversion constructed for this facility to function properly. This facility would reduce runoff from the surrounding residential areas (Map No. NLHC20). Implementation Period: FY 2006 - FY 2007, Capital Cost: $260,000

- Construct a new, one-year, extended-detention BMP at the north end of the 2400 block of Windbreak Drive. Tree removal should only occur at the embankment area. This facility would reduce runoff from the surrounding residential properties (Map No. NLHC23). Implementation Period: FY 2006 - FY 2008, Capital Cost: $110,000
- Construct a multi-stage bioretention system behind the high-density residential properties south of Windbreak Drive. The bioretention areas would be constructed at each yard inlet to reduce runoff from the surrounding commercial properties (Map No. NLHC24). Implementation Period: FY 2009 - FY 2010, Capital Cost: $170,000

Paul Spring Branch

- Create a demonstration project of LID technologies such as green rooftops, porous pavements, buffer strips, and bioretention areas for Beacon Mall (Map No. PSB1). Implementation Period: FY 2005 - FY 2007, Capital Cost: $610,000
- Replace conventional pavement in parking lots with porous pavement for churches (estimate seven in the subwatershed) (Map No. PSB2). Implementation Period: FY 2006 - FY 2009, Capital Cost: $520,000
- Construct a new, one-year, extended-detention BMP at the intersection of Lenclair Street and 6700 Tower Road. The new facility would consist of dual basins on either side of Tower Road with an equalizer pipe to reduce runoff from the property and associated parking areas to the north (Map No. PSB24). Implementation Period: FY 2006 - FY 2007, Capital Cost: $240,000
- Construct a multi-stage bioretention system behind the residential properties between the 3300 and 3400 blocks of Groveton Street and Clayborne Avenue. The bioretention areas would be constructed at each yard inlet to reduce runoff from the surrounding residential properties (Map No. PSB25). Implementation Period: FY 2005 - FY 2006, Capital Cost: $240,000
- Construct a new, one-year, extended-detention BMP south of the Lutheran Church on the 2500 block of Beacon Hill Road. This facility would reduce runoff from the surrounding residential properties and adjacent commercial property (Map No. PSB26). Implementation Period: FY 2008 - FY 2009, Capital Cost: $150,000
- Construct a new, one-year, extended-detention BMP near the headwaters of Paul Spring Branch at the downstream end of the culvert crossing at 2500 Mary Baldwin Drive. The facility would detain low flows by means of a diversion and reduce runoff from the surrounding residential properties (Map No. PSB27). Implementation Period: FY 2015 - FY 2019, Capital Cost: $100,000
- Construct a new, one-year, extended-detention BMP behind the residential properties along the 2500 block of Ross Street. This facility should be laid out and constructed to minimize the disturbance of existing trees. This facility would reduce runoff from the surrounding residential properties (Map No. PSB28). Implementation Period: FY 2015 - FY 2019, Capital Cost: $70,000
- Construct two new, one-year, extended-detention BMPs at the upstream ends of the culverts along the 1900 and 200 blocks of Paul Spring Road. The entrance of the existing culverts could be modified with a weir wall in lieu of a more traditional riser structure. These facilities would reduce runoff from the surrounding residential properties. The existing culvert at the intersection of Stafford Road and Paul Spring Road should also be evaluated for adequacy during the preliminary engineering phase for this project (Map No. PSB29). Implementation Period: FY 2007 - FY 2009, Capital Cost: $260,000
- Construct a new, one-year, extended-detention BMP in the available open area at the headwaters of the unnamed tributary to Paul Spring Branch, south of the 1200 block of Belle Vista Drive. Tree removal should only occur at the embankment area. This facility would

reduce discharges from the residential areas to the north before they enter the unnamed tributary (Map No. PSB30). Implementation Period: FY 2008 - FY 2010, Capital Cost: $210,000

- Construct a new, one-year, extended-detention stormwater management facility in the open space behind the 2300 block of Beacon Hill Road. The existing storm drain system would need to be modified and possibly a low-flow diversion constructed for this facility to function properly. This facility would reduce runoff from the surrounding residential areas (Map No. PSB31). Implementation Period: FY 2006 - FY 2008, Capital Cost: $140,000
- Construct a new, one-year, extended-detention BMP and a new underground storage facility south of the Jemal/Metrocall building at 6910 Richmond Highway and install porous pavement along the parking lot perimeter. The facilities would reduce runoff from the surrounding residential properties and adjacent commercial property. Alternatively, or as a means to gain additional detention storage, the existing underground detention facility beneath the parking lot could be enhanced. This existing condition of the facility should be evaluated for suitability during the preliminary engineering phase (Map No. PSB32). Implementation Period: FY 2006 - FY 2007, Capital Cost: $600,000

North Branch

- Construct a new, one-year, extended-detention BMP behind the 7600 block of Elba Road. The existing storm drain system would need to be modified and possibly a low-flow diversion constructed for this facility to function properly. This facility would reduce runoff from the surrounding residential areas (Map No. NB11). Implementation Period: FY 2005 - FY 2006, Capital Cost: $240,000
- Construct a new, one-year, extended-detention BMP near the end of the 2500 block of Woodlawn Terrace, just south of the parking area. This facility would reduce runoff from the surrounding residential areas (Map No. NB12). Implementation Period: FY 2008 - FY 2009, Capital Cost: $200,000
- Construct a new, one-year, extended-detention BMP behind Whitman Middle School. The existing storm drain system would need to be modified and possibly a low-flow diversion constructed for this facility to function properly. This facility would reduce runoff from the surrounding areas (Map No. NB13). Implementation Period: FY 2010 - FY 2014, Capital Cost: $150,000
- Construct a new, one-year, extended-detention BMP behind the residential properties along the 8200 block of Fort Hunt Road. The existing storm drain system would need to be modified and possibly a low-flow diversion constructed for this facility to function properly. This facility would reduce runoff from the surrounding residential areas (Map No. NB14). Implementation Period: FY 2007 - FY 2008, Capital Cost: $160,000

Other locations were evaluated but not considered feasible for constructing small detention ponds with drainage areas less than 100 acres because of location and construction limitations. Large regional stormwater management facilities were not considered for this watershed because they would likely require the acquisition of private property, mainly in residential areas, which is not considered desirable or practical with respect to the goals of this plan.

Table 4.2 summarizes the quantified two-year peak flow reduction benefit provided by each new BMP project and the peak flow reduction benefits for this action are included in the total peak flow reductions shown on Map 4.2.

Table 4.2 Benefits of New BMPs

Map No./ Project ID	Subbasin	Approx. Storage Volume (cy)	Dam Height (ft)	Proposed Drainage Area (acres)	Water Quantity Reduction (cfs)
North Little Hunting Creek					
NLHC1	LH-LH-0008	3500	5.0	31.1	29.7
NLHC9	LH-LH-0004 and 0005	N/A[1]	N/A[1]	137.7	89.2
NLHC16	LH-LH-0009	850	5.0	10.1	9.6
NLHC17	LH-LH-0006	650	5.0	7.6	4.8
NLHC19	LH-LH-0005	1550	5.0	32.1	20.2
NLHC20	LH-LH-0008	2050	6.0	41.8	39.9
NLHC23	LH-LH-0007	650	7.0	10.8	5.2
NLHC24	LH-LH-0007	400	4.5	14.7	13.5
			Subtotal	285.9	
Paul Spring Branch					
PSB1	LH-PS-007	N/A[1]	N/A[1]	29.1	30.1
PSB2	LH-PS-001, 002, 005, 006, and 007	N/A[1]	N/A[1]	12.1	11.9
PSB24	LH-PS-0007	1700	5.0	20.6	19.0
PSB25	LH-PS-0007	1050	6.0	20.9	18.0
PSB26	LH-PS-0006	1200	5.0	18.2	19.3
PSB27	LH-PS-0006	1750	7.0	18.9	20.0
PSB28	LH-PS-0005	650	5.5	13.3	11.3
PSB29	LH-PS-0004	2900	7.0	59.7	67.0
PSB30	LH-PS-0003	1400	9.5	28.6	25.7
PSB31	LH-PS-0006	850	4.5	16.7	17.7
PSB32	LH-PS-0007	1600	9.5	47.9	49.0
			Subtotal	286.0	
North Branch					
NB11	LH-NB-0011	2400	6.0	49.0	37.8
NB12	LH-NB-0011	1100	8.5	21.7	16.6
NB13	LH-NB-0005	850	6.0	10.0	12.3
NB14	LH-NB-0008	900	4.5	18.6	26.0
			Subtotal	99.3	
Total Little Hunting Creek				671.2	

[1]Commercial LID projects that do not include new ponds.

Responsible Party: Fairfax County
Implementation Period: See above descriptions
Capital Costs: See above descriptions
Staff: 0.10 SYE

Action A3.8: Construct LID demonstration projects at publicly owned locations such as schools, parks, and other county properties. This action has been incorporated into the plan at the request of citizens as part of the Community Watershed Forum process.

Strategy to Achieve Action: The following locations may serve as potential LID demonstration sites and are shown on Map 4.1; however, further coordination with Fairfax County Public Schools will be required during the design phase:

- Construct LID demonstration projects at Bryant Adult Alternative High School and Hybla Valley Elementary School with rain gardens, porous pavement, buffer strips, and Filterra or similar types of drop inlets (Map No. NLHC21). Implementation Period: FY 2006 - FY 2008, Capital Cost: $250,000
- Create rain gardens with student volunteers and install manufactured BMPs at Fort Hunt Elementary School (Map No. SLHC3). Implementation Period: FY 2015 - FY 2019, Capital Cost: $270,000
- Create rain gardens and install rain barrels and cisterns at Bucknell Elementary School (Map No. PSB2). Implementation Period: FY 2006 - FY 2009, Capital Cost: $520,000
- Construct LID demonstration projects at Sherwood Hall Library, Carl Sandburg Middle School, Stratford Landing Elementary School, Whitman Middle School, and Hollin Meadows Elementary School with porous pavement, bioretention, buffer strips, and Filterra or similar types of drop inlets (Map No. NB1). Implementation Period: FY 2007 - FY 2008, Capital Cost: $580,000
- Construct a LID demonstration project at Waynewood Elementary School (Map No. PR3). Implementation Period: FY 2015 - FY 2019. Capital Cost: $80,000

An excellent example of a rain garden successfully installed at a large community facility is at the Presbyterian Church in Paul Springs Branch subwatershed. This site might serve as an example for these and other proposed projects. This strategy includes projects that may be offered by the county to the development community as items suitable for implementation as proffers, which may help in constructing these projects.

Table 4.3 summarizes the two-year peak flow reduction benefit provided by implementing these projects, and the peak flow reduction benefits for this action are included in the total peak flow reductions shown on Map 4.2.

Table 4.3 Benefits of LID Projects at Schools

Map No./ Project ID	Subbasin	Proposed Drainage Area (acres)	Water Quantity Reduction (cfs)
NB1	LH-NB-0004	66.0	46.3
NLHC21	LH-LH-0006 and 0008	32.0	22.2
SLHC3	LH-SB-0001	12.2	11.0
PR3	LH-PO-0002	8.6	4.0
Total =		118.8	

Note: Project PSB2 is included in Table 4.2.

Responsible Party: Fairfax County
Implementation Period: See above descriptions
Capital Costs: See above descriptions
Staff: 0.03 SYE

The final draft plan included "Action A3.12," which consisted of house flood-proofing and/or flood mitigation for dwellings located in the 100-year flooding limits as identified by the modeling effort for the plan. At the request of the Little Hunting Creek Steering Committee, this recommendation has been removed from the watershed plan; however, the flood mitigation project will be designated as part of the county's broader stormwater control program. The total plan implementation cost has been reduced to reflect the removal of this project. The total project estimate for this recommendation was $4,880,000.

Objective A4: Increase the participation of residents in decreasing the amount of stormwater runoff from impervious surfaces in residential areas.

Rationale: The majority of the existing land use in the watershed is residential and contributes to 48% of the total impervious area in the watershed. Reducing the runoff from residential areas will help promote individual stakeholder involvement in improving the condition of the streams.

Action A4.1: Facilitate and provide technical assistance for the construction of LID practices, such as rain gardens, cisterns, and rain barrels, throughout the watershed, initially targeting areas near the headwaters of streams to detain the runoff from residential developments without existing stormwater management controls.

Strategy to Achieve Action: Determine and fund a pilot neighborhood area to test the implementation and success of the rain barrels, cisterns, and rain gardens. An implementation schedule can be developed for the rest of the targeted neighborhoods that are shown on Map 4.1, if implementing this action in the pilot neighborhood area is successful. Provide technical assistance to homeowners who wish to install these practices on their property through a proposed Community Watershed Services Support program. This program will provide to the community education on rain barrels, cisterns, rain gardens, tree planting, natural landscaping, and native plants as well as technical support by distributing educational materials on these topics and adding similar content to the county website. To increase the chance for success for this action, the Community Watershed Services Support program should address any concerns pilot area homeowners might have with their new rain barrel, rain garden, or cistern. The Community Watershed Services Support program will also support proposed actions A4.1, B1.2, and D3.1 and provide technical assistance and conduct educational outreach to neighborhood groups and organizations. The capital projects described in this action may be offered by the county to developers as suitable for implementation as proffers. The county may also contact and collaborate with local home improvement stores to provide materials or other support for these projects.

Watershed Benefit: By constructing rain gardens and installing rain barrels and cisterns in residential areas in the headwaters, the peak runoff flows will be reduced. This benefit was modeled using an assumed average neighborhood implementation rate of 10% for the rain

barrels, cisterns, and rain gardens. The two-year peak flow reduction benefits for this action are included in the total peak flow reductions shown on Map 4.2.

Responsible Party: Fairfax County
Implementation Period: FY 2005 - FY 2029
Capital Cost: $170,000
Staff: 0.03 SYE and 0.03 SYE for the Community Watershed Services Support project = 0.06 SYE

The cost of this action is based upon the proposed targeted coverage areas shown on Map 4.1, with an average 10% implementation rate and four rain barrels or cisterns or one rain garden at each participating property.

Action A4.2: Implement a watershed-wide rain barrel sale project.

Strategy to Achieve Action: Distribute rain barrels to the public annually at a designated location such as the South County Government Center or Sherwood Regional Library. The time and place for the distribution should be broadly advertised throughout the watershed. This action could be promoted as a fundraiser to support the restoration of the watershed or to support community groups with similar interests in the watershed.

Watershed Benefit: Because rain barrels would be available to the public throughout the watershed, it is not possible to accurately quantify this action's benefit. However, if rain barrels were installed on a typical residence with a 2,000-square-foot roof, they would produce an approximate 83-cubic-foot reduction in runoff, assuming they detained the first half-inch of runoff.

Responsible Party: Fairfax County
Implementation Period: FY 2005 - FY 2029
Capital Cost: $10,000 per year for 25 years = $250,000
(LH9972 Community Watershed Support Services Project)
Staff: 0.03 SYE per year

Goal B: Preserve, maintain, and improve watershed habitats to support native flora and fauna.

The habitat quality is rated poor for the majority of the streams in the Little Hunting Creek watershed, with approximately 10 miles of degraded buffers and eroded stream banks. The creek and streams have manmade alterations such as paved and straightened channels and hardened shorelines that decrease the available habitat in the watershed. The increased quantity and poor quality of the stormwater runoff also impacts the habitat by eroding the stream bed and banks and polluting the water. The environment section of the county's Policy Plan states under Objective 2, "…Protect and restore the ecological integrity of streams in Fairfax County." The actions under this goal will strive to maintain the existing quality habitat areas in good condition and improve those habitat areas in poor condition.

Objective B1: Preserve, restore, and manage riparian buffers to benefit native flora and fauna.

Rationale: The condition of the existing riparian buffers is poor for 52% of the assessed bank length as found in the stream physical assessment. Riparian buffers are needed to support watershed habitats by filtering runoff from adjacent lands and providing a place for native plants and animals to live. The county's Chesapeake Bay Preservation ordinance requires that riparian buffers not be disturbed for perennial streams. The environment section of the county's Policy Plan, Objective 10 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.

Action B1.1: Plant buffers using native vegetation and trees adjacent to the stream for areas identified as good candidates for buffer restoration.

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. The removal of invasive species and the restoration of native species should be performed for all of buffer restoration projects. When removing invasive species, the use of herbicides should be limited and other methods, such as manual removal, employed where possible. Appropriate buffer material and species mix should be selected based on the restoration goal for each area. The following deficient buffer locations were found during the 2002 stream physical assessment and are potential locations for buffer restoration projects (locations are shown on Map 4.1):

North Little Hunting Creek

- Add buffer vegetation at the top of the bank along the paved channels at Audubon Estates Mobile Home Park near Janna Lee Avenue and north of Woodlawn Trail to help slow runoff. Line the bottom of the paved channels with grouted riprap (Map No. NLHC11). Implementation Period: FY 2010 - FY 2014, Capital Cost: $400,000

South Little Hunting Creek

- Establish additional buffer vegetation along the top of bank of the paved channel in the Wessynton subdivision. (Map No. SLHC6). Implementation Period: FY 2015 - FY 2019, Capital Cost: $20,000
- Restore the buffer adjacent to the paved channels located along the south branch of South Branch between Linton Lane and Vernon View Drive and acquire conservation easements for the land adjacent to the stream (Map No. SLHC7). Implementation Period: FY 2015 - FY 2019, Capital Cost: $40,000
- Mitigate the effects of the paved channels by removing them and installing bioengineered stream stabilization to slow flow velocities (Map No. SLHC8). Implementation Period: FY 2025 - FY 2029, Capital Cost: $150,000

Paul Spring Branch

- Restore the buffer vegetation at homes located adjacent to the stream near Schooley Drive, Memorial Street, and East Side Drive (Map No. PSB12), Implementation Period: FY 2025 - FY 2029, Capital Cost: $20,000
- Restore the buffer vegetation along the stream located south of Admiral Drive (Map No. PSB14). Implementation Period: FY 2015 - FY 2019, Capital Cost: $30,000

The projects listed under this action may be suitable for the county to offer to developers as items for implementation as proffers. The county has also initiated a partnership with the Virginia Department of Forestry to implement buffer restoration projects utilizing volunteers.

Watershed Benefit: The benefits of restoring riparian buffers in the watershed were not modeled. However, the 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. A typical 50-foot riparian buffer can reduce over 90% of suspended solids, 60% of phosphorous, and 70% of nitrogen from stormwater runoff that flows through the buffer area.

Responsible Party: Fairfax County and community groups
Implementation Period: See descriptions above
Capital Cost: See descriptions above
Staff: 0.03 SYE

Action B1.2: The county and community groups should provide educational and technical assistance to property owners with tidal shoreline and 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, limiting the use and correct application of fertilizers and herbicides, pet waste management, waste disposal, and proper disposal of leaves and grass clippings.

Strategy to Achieve Action: Coordinate with community groups to provide technical assistance and suitable educational materials for planting and maintaining healthy buffers. This effort should also be supported by the Community Watershed Services Support program, which should provide educational and technical assistance to property owners.

Watershed Benefit: The benefit of this action was not quantified; however, when implemented, this action will help in maintaining and perhaps restoring buffers that will provide stream bank and shoreline protection, provide habitat area, and filter pollutants from runoff. Typical quantified benefits for buffers are discussed in Action B1.1.

Responsible Party: Fairfax County and community groups
Implementation Period: FY 2005 - FY 2029
Capital Cost: $10,000 per year for 25 years = $250,000
(LH9972 Community Watershed Support Services Project)
Staff: 0.03 SYE

Action B1.3: Monitor the condition of restored and existing riparian buffer with annual stream walks to evaluate the condition and areas needing improvement.

Strategy to Achieve Action: The county may be able to use volunteers to perform annual stream walks to collect information about the condition of the buffer. The stream physical assessment update (to be performed by the county every five years as proposed in Action B2.2) will help to verify the information collected by the volunteers.

Watershed Benefit: This action will benefit the watershed by providing a way to monitor the success or failure of protecting existing and restored riparian buffers.

Responsible Party: Fairfax County
Implementation Period: FY 2007- FY 2029
Capital Cost: $15,000 per year for 23 years = $345,000
Staff: 0.03 SYE

Objective B2: Preserve, restore, and manage stream bank and in-stream habitat to benefit native flora and fauna.

Rationale: The existing stream habitat is considered poor for 58% and very poor for 15% of the assessed stream length in the watershed. Restoring the streams will improve the condition of the aquatic habitat and must be performed in conjunction with the previously stated objectives of reducing the amount of runoff from existing impervious areas to help prevent further erosion and channel widening. Restoring the streams to stabilize the banks will help protect properties located adjacent to the streams.

Action B2.1: The county and community groups should perform stream restoration projects in the areas identified as good candidates for these types of projects.

Strategy to Achieve Action: The 2002 county stream physical assessment located many streams in the watershed with poor habitats and 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 result 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.

This action identifies the stream sections that need restoration and the recommended stream restoration activity for 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, which are discussed in more detail in Appendix D of this plan. Activities associated with restoration of the riparian corridor and modifications to the stream channel are shown on Maps 4.6, 4.7, 4.8, and 4.9. More stream information will need to be collected in the future 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.

North Little Hunting Creek

- Restore the stream (LHLH003 and LHLH006) located north of Mount Vernon Plaza and replace the culvert at Fordson Road near Mount Vernon Plaza. The culvert replacement project is on county's drainage master plan project list (LH431). Proposed activities include removal/modification of culverts, channel reconfiguration, floodplain creation, riparian vegetation planting, and removal of invasive species (Map No. NLHC12). Implementation Period: FY 2015 - FY 2019, Capital Cost: $800,000
- Restore the stream located east of Huntley Meadows Park and south of the new subdivision (The Grove at Huntley Meadows) to mitigate the impact from increased runoff at the culvert crossing. Proposed activities include selected placement of in-stream habitat structure, channel reconfiguration, and riparian vegetation plantings (Map No. NLHC13). Implementation Period: FY 2025 - FY 2029, Capital Cost: $150,000
- Perform stream restoration of the channel (LHLH007) located south of Beech Craft Drive and west of Fordson Road. Proposed activities include channel reconfiguration, floodplain creation, bioengineering of stream banks, selective placement of in-stream habitat structures, and removal of unstable trees (Map No. NLHC14). Implementation Period: FY 2010 - FY 2014, Capital Cost: $350,000
- Perform stream restoration and add buffer vegetation to the channel (LHLH002 and part of LHLH001) from north of Audubon Estates Mobile Home Park near Audubon Avenue to 600 feet south of Richmond Highway. Install an animal passageway under Richmond Highway. Proposed activities include removal/modification of culverts, riparian vegetation planting, removal of invasive species, selected placement of in-stream habitat structures, channel reconfiguration, and trash/debris removal. Additional opportunities for restoration should be evaluated downstream to the confluence with the main stem of Little Hunting Creek during the preliminary evaluation and design phase of this project (Map No. NLHC15). Implementation Period: FY 2020 - FY 2024, Capital Cost: $820,000

South Little Hunting Creek

- Perform stream restoration for the tributary (LHLH011) located near Brady Street. Proposed activities include riparian vegetation planting, removal of invasive species, selected placement of in-stream habitat structures, and trash /debris removal (Map No. SLHC4). Implementation Period: FY 2025 - FY 2029, Capital Cost: $200,000
- Perform stream restoration for South Branch near Fort Hunt Park and Fort Hunt Elementary School. Acquire conservation easements for the private land located adjacent to the stream. Proposed activities include channel reconfiguration, selective placement of in-stream habitat structures, riparian vegetation planting, removal of invasive species, and trash/debris removal (Map No. SLHC5). Implementation Period: FY 2020 - FY 2024, Capital Cost: $560,000
- Restore the stream located south of George Washington Memorial Parkway on the west side of South Little Hunting Creek. Coordinate this work with the National Park Service. Proposed activities include selective placement of in-stream habitat structures, riparian vegetation planting, and removal of invasive species (Map No. SLHC9). Implementation Period: FY 2020 - FY 2024, Capital Cost: $230,000

Paul Spring Branch

- Perform stream restoration in conjunction with culvert replacements at Morningside Lane, Woodcliff Drive, Lyndale Drive, Admiral Road, and Fort Hunt Road. The actual size and type of culvert replacements will be verified during the development of the stream restoration projects. Proposed activities include removal/modification of culverts, channel reconfiguration, riparian vegetation planting, and removal of invasive species. The culvert replacement projects and stream restoration activities are included on the county's drainage

master plan project list. This project incorporates former county projects LH244, LH245, and LH442 (Map No. PSB13). Implementation Period: FY 2025 - FY 2029, Capital Cost: $1,370,000

- Perform stream restoration and bank stabilization in phases in conjunction with culvert replacements at Mary Baldwin Drive and Paul Spring Road along Paul Spring Branch, and culvert improvements at Stafford Road from the headwaters to Mason Hill Drive. The county's drainage master plan project list includes improvement projects for Paul Spring Road (LH 451 and X00073) which will be superseded by this project. The actual size and type of the culvert replacements will be verified during the development of the stream restoration projects, as well as any other drainage improvements such as improving the surrounding conveyances. Proposed activities include riparian vegetative planting, removal of invasive species, removal of unstable trees, selective placement of in-stream habitat structures, bioengineering of stream banks, channel reconfiguration, floodplain creation, and trash/debris removal (Map No. PSB15). Implementation Period: FY 2010 - FY 2024, Capital Cost: $2,620,000
- Prior to commencing stream restoration activities along Paul Spring Branch near Paul Spring Road, a study should be performed to determine an adequate size drainage structure for the Paul Spring Road crossing, and the existing structure should be replaced (Map No. PSB15). Implementation Period: FY 2010 - FY 2011, Capital Cost: Included in PSB15 cost above.
- Perform bank stabilization to mitigate the impact from increased runoff at the two, four-foot diameter corrugated metal pipes crossing Mary Baldwin Drive. The runoff discharged from the pipes has caused severe erosion of the bed and banks on the downstream side with six-foot-high bank erosion. Proposed activities include channel reconfiguration and the selective placement of in-stream habitat structures, riparian vegetative planting, and removal of invasive species (Map No. PSB16). Implementation Period: FY 2025 - FY 2029, Capital Cost: $100,000
- Perform bank stabilization to mitigate four-foot-high bank erosion located adjacent to the four, 10-foot by six-foot concrete box culverts at Sherwood Hall Lane. Proposed activities include channel reconfiguration and the selective placement of in-stream habitat structures, riparian vegetative planting, and removal of invasive species (Map No. PSB17). Implementation Period: FY 2025 - FY 2029, Capital Cost: $40,000
- Perform bank stabilization to mitigate severe erosion from increased runoff at the pipe outfall at Wellington Road. Proposed activities include channel reconfiguration and the selective placement of in-stream habitat structures, riparian vegetative planting, and removal of invasive species (Map No. PSB18). Implementation Period: FY 2025 - FY 2029, Capital Cost: $100,000
- Perform bank stabilization to mitigate severe erosion from increased runoff at the pipe outfall at University Drive. Proposed activities include channel reconfiguration and the selective placement of in-stream habitat structures, riparian vegetative planting, and removal of invasive species (Map No. PSB19). Implementation Period: FY 2025 - FY 2029, Capital Cost: $100,000
- Perform bank stabilization to mitigate moderate erosion from increased runoff at the pipe outfall at Devonshire Road. Proposed activities include channel reconfiguration and the selective placement of in-stream habitat structures, riparian vegetative planting, and removal of invasive species (Map No. PSB20). Implementation Period: FY 2025 - FY 2029, Capital Cost: $100,000

North Branch

- Restore the stream for a distance of 1,500 feet upstream of Sherwood Hall Lane and for 1,000 feet downstream of Sherwood Hall Lane. This project incorporates former county projects LH441 and LH242. Proposed activities include riparian vegetation planting, removal

of invasive species, removal of unstable trees, channel reconfiguration, selective placement of in-stream habitat structures, and trash/debris removal (Map No. NB7). Implementation Period: FY 2015 - FY 2019, Capital Cost: $390,000

- Restore the stream for 700 feet downstream of the Collingwood Road crossing located east of Shenandoah Road at the Williamsburg Manor Park. Proposed activities include riparian vegetation planting, removal of invasive species, selective placement of in-stream habitat structures, and trash/debris removal (Map No. NB8). Implementation Period: FY 2020 - FY 2024, Capital Cost: $110,000

The projects listed for this action may be offered by the county to developers as items suitable for implementation as proffers.

Watershed Benefit: The benefits of projects such as these are reduced stream erosion and improved aquatic habitat. Streams naturally cause some erosion and transport sediment; however, excessive velocities produce increased and detrimental erosion. By decreasing in-stream velocities to levels consistent with the stream's natural conditions, the volume of suspended solids may be reduced and the stream will no longer be impaired by this condition. This would result in the stream's sediment levels being more in line with those that occur naturally and achieve the goals of the Chesapeake Bay tributary strategy. The typical benefits of restoring riparian buffers are quantified in Action B1.1.

Responsible Party: Fairfax County
Implementation Period: See descriptions above
Capital Cost: See descriptions above
Staff: 0.03 SYE

Action B2.2: Monitor the condition of the streams by performing a stream physical assessment every five years in the future to track the improvement or degradation of streams from the baseline condition.

Strategy to Achieve Action: In the future, update the stream physical assessment data to provide information to evaluate the success of the Little Hunting Creek Watershed Management Plan strategies. Data such as habitat condition, buffer deficiencies, and erosion should be collected for some of the smaller streams not included in the 2002 stream physical assessment as shown by PR1 on Map 4.1.

Watershed Benefit: The benefit of this action cannot be directly quantified, but its implementation will allow for the quantitative evaluation of other proposed watershed management plan actions. This action is necessary to objectively evaluate the effectiveness of these actions and to continuously monitor the success of other implemented plan actions.

Responsible Party: Fairfax County
Implementation Period: FY 2007 - FY 2029
Total Capital Cost: $200,000
Staff: 0.03 SYE per year

Action B2.3: Facilitate the acquisition and donation of conservation easements by community groups for riparian buffer and stream protection and public/private open space for the environmental quality corridors described in the Fairfax County Comprehensive Plan.

Strategy to Achieve Action: In the county's comprehensive plan, the North Little Hunting Creek, Paul Spring Branch, and North Branch stream corridors are recommended to be public park/open space or private open space. Other tributaries in the watershed may need to be considered for future conservation easements. This plan recommends two locations for easement acquisition as shown on Map 4.1 and designated as NLHC22 and PSB21. The other portions of Paul Spring Branch and North Branch stream corridors are already designated as existing open space. Conservation easements should be obtained for the undeveloped parcels located next to the creek along Stockton Parkway. Other locations for conservation easements should be evaluated and considered by the county during the comprehensive planning process or as opportunities are presented. These opportunities could include when property owners with land adjacent to the creek would like to put their land in a conservation easement in perpetuity.

Watershed Benefit: Although the benefit of this action is not directly quantifiable, its implementation will directly benefit the watershed by protecting land adjacent to the stream from future development. The benefits of conserving land adjacent to the stream include protecting existing riparian buffers for wildlife habitat, reducing stream and property erosion, and filtering pollutants from runoff. Typical benefits of riparian buffers are quantified in Actions B1.1.

Responsible Party: Fairfax County and the Northern Virginia Conservation Trust
Implementation Period: FY 2007 - FY 2011
Capital Cost: $40,000 per year = $200,000
Staff: 0.03 SYE

Objective B3: Preserve, restore, and manage wetlands to benefit native flora and fauna.

Rationale: The amount of wetlands in the watershed is less than what existed in the past; however, it is not known how much wetlands have been destroyed from development in the watershed. The objective is to increase the amount of wetlands to provide additional habitat for fish, animal, and plant populations and have areas where the public can observe wildlife. Wetlands will provide a benefit to the water quality by filtering pollutants from stormwater runoff and acting as a detention area for stormwater runoff.

Action B3.1: Perform a wetlands function and value survey to identify the location, size, owner, type, and quality of existing wetlands in the watershed to determine the baseline information.

Strategy to Achieve Action: A contractor should be hired by the county to perform a wetlands function and value survey. This survey will provide a baseline condition and mapping of the wetlands in the watershed and help the county and the stakeholders in making decisions regarding priority wetland conservation and preservation areas. Areas should be identified which have the greatest potential for conservation, and restoration should be given the highest priority. The results of this survey, along with some background information on the importance and role of wetlands in the watershed, should be made available to the public through Action C2.5. 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: Since much of the information regarding wetlands is unknown throughout the watershed, this action will help identify important information related to wetlands, such as habitat, flood control, and nursery benefits, and establish a baseline condition from which future actions and priorities can be established. Wetlands typically remove over 70% of suspended solids, 40% of phosphorous, and 20% of nitrogen.

Responsible Party: Fairfax County
Implementation Period: FY 2007 - FY 2008
Capital Cost: $320,000
Staff: 0.03 SYE

Action B3.2: Construct and restore wetlands at suitable locations in the watershed as identified by the wetlands function and value survey in Action B3.1.

Strategy to Achieve Action: Potential wetland restoration areas may include the shoreline area at Martin Luther King Jr. Park (Map No. SLHC11), which is owned by the county, and areas along the George Washington Memorial Parkway near the Potomac River (Map No. PR2), which are owned by the National Park Service. The purpose of the wetland project (SLHC17) in the main stem portion of Little Hunting Creek will be to plant sub-aquatic vegetation and aquatic grasses in areas currently missing aquatic vegetation. The restoration of these wetlands should not block public access to this portion of the creek. A series of linear-constructed stormwater wetland BMPs may be placed along Paul Spring Branch (Map No. PSB9) to help detain the peak runoff and treat the stormwater runoff from developed areas. The primary function of this wetland project will be to provide extended detention of low flows of stormwater runoff, but inherently, it will provide wetland habitat. More detailed site information and public input will be obtained for all of the projects before starting the design process.

Other potential sites for constructed wetlands BMPs include the area northeast of the intersection of Paul Spring Road and Rippon Road (Map No. PSB10) and the portion of White Oak Park that borders Paul Spring Branch (Map No. PSB9). These projects could be constructed on existing county property or easements. The design process for these sites will include a thorough evaluation of the site to prevent unintended and potentially harmful effects on existing flora. The property owner should monitor and maintain any constructed or restored wetlands for at least five years. Coordination with the National Park Service will be required where appropriate, such as the areas located within the George Washington Memorial Parkway. Additional locations identified in the wetland function and value survey in Action B3.1 should be considered for constructing wetlands. The restoration and construction of wetlands will help to achieve Objectives A3 and C2 by reducing the impacts of increased stormwater runoff and removing pollutants from the runoff.

Watershed Benefit: The quantified benefit of this action should be established after action B3.1 has been completed and a plan for constructing and restoring wetlands has been established. Additionally, these constructed wetlands may possibly be banked to generate revenue for other BMPs in the watershed.

Responsible Party: Fairfax County and the National Park Service for the project located along the George Washington Memorial Parkway
Implementation Period: FY 2010 - FY 2024
Capital Cost: $1,250,000
Staff: 0.03 SYE

Action B3.3: Purchase private land, designate public land, or acquire easements for land conservation of critical wetland habitat areas as identified in the wetlands function and value survey in Action B3.1.

Strategy to Achieve Action: The future wetlands function and value assessment in Action B3.1 will describe the locations of sensitive wetland areas that should be preserved. The county should work with community groups to decide the priority wetland areas and the best way to preserve the wetlands for the future. One of the locations already identified by the community is at the former sewage treatment plant site near the intersection of Thomas J. Stockton Parkway and Londonderry Road as shown on Map 4.1 at SLHC10. This area could be targeted for tidal wetland restoration along the shoreline and riparian buffer restoration in conjunction with its redevelopment into a public nature park area with creek access for canoes and kayaks.

Watershed Benefit: The quantified benefit of this action should be established after action B3.1 has been completed and a plan for the preservation of existing wetlands has been established.

Responsible Party: Fairfax County and the Northern Virginia Conservation Trust
Implementation Period: FY 2007 - FY 2011
Capital Cost: Included in action B2.3
Staff: Included in action B2.3

Action B3.5: Create and distribute a brochure or other materials that inform the public about the value and benefit of wetlands.

Strategy to Achieve Action: Prepare a brochure or other material that will educate the public on the value and benefits of wetlands. The county could either develop this material itself, possibly using already available materials and tailoring them to the county's needs, or the county could hire a contractor to develop these materials. Materials should be distributed to the public through displays at county facilities and published on the county website.

Watershed Benefit: This information will provide the public with a better understanding of the importance of wetlands, including their function, benefit, and value to their environment. This should also prompt watershed residents to take a more active interest in preserving wetlands and replacing wetlands that have been destroyed.

Responsible Party: Fairfax County
Implementation Period: FY 2006 - FY 2029
Capital Cost: Included in Action C2.5
Staff: 0.03 SYE

Goal C: Preserve, maintain, and improve the water quality of the streams to benefit humans and aquatic life.

The existing water quality of the creek and streams is poor based on the information from the county's stream quality monitoring and Virginia DEQ's monitoring data regarding fecal coliform, nutrients such as nitrogen and phosphorous, chlordane, and PCBs. Sedimentation caused by stream bed and bank erosion and land disturbances in the watershed have caused silting of streams and the creek. There is a direct relationship between the upstream volume of runoff and velocities and the amount of sediment deposited downstream. To reduce the amount of degradation of the streams and sediments transported downstream, upstream runoff volumes and velocities must be reduced. This goal is consistent with the environment section of the county's Policy Plan as stated in Objective 2, "Prevent and reduce pollution of surface and groundwater resources."

Objective C1: Reduce and mitigate effects of sedimentation to the creek.

Rationale: The stream physical assessment observed areas of sedimentation in the non-tidal portions of the streams, and residents have observed sedimentation of the tidal portion of Little Hunting Creek. The primary source of sedimentation is from stream bank and bed erosion caused by excessive velocities from increased stormwater runoff. The actions under Goal A will help in reducing the amount of stormwater runoff and stream bank and bed erosion. This objective relates to mitigating the effects of past sedimentation.

Action C1.1: Perform a hydrographic survey in the future to determine the existing depths in South Little Hunting Creek and initiate a study to determine where dredging may be feasible to restore the navigation channel in the tidal portion of the creek and access from the shoreline.

Strategy to Achieve Action: Hire a contractor to perform a hydrographic survey of South Little Hunting Creek and evaluate, by means of a comprehensive study, the feasibility of dredging in the shallow areas of the creek. As part of this survey and study, a comprehensive environmental assessment should also be performed and include the impact of the placement of dredging spoil and the possibility of the re-suspension of contaminates. The U.S. Army Corps of Engineers should be involved in the dredging feasibility study because they will need to issue any future permits for dredging. The results of the environmental assessment and impacts of the dredging will need to be considered as a significant component of the dredging feasibility evaluation. This action is shown as SLHC1 on Map 4.1. It should be noted that private citizens or groups could undertake the dredging of South Little Hunting Creek; however, they would need to follow the same process and meet the same standards as the county, and this endeavor would be extremely expensive.

Watershed Benefit: This action will establish a baseline to evaluate and quantify the benefit or detriment from a dredging project. If dredging is performed in the future, it will help public recreation activities by improving boat access. Dredging the bottom will harm the existing aquatic habitat of the creek and may re-suspend existing contaminated sediments.

Responsible Party: Fairfax County and U.S. Army Corps of Engineers
Implementation Period: FY 2010 - FY 2014
Capital Cost: $510,000
Staff: 0.03 SYE

Action C1.2: The county, community groups, and commercial property owners should sweep up sand used for traction control on Richmond Highway and other major streets and parking areas in the watershed during the winter to prevent it from reaching the creek. Limit the use of certain de-icing materials, especially those that greatly impair water quality.

Strategy to Achieve Action: Coordinate with VDOT to limit the use of certain de-icing materials and minimize the amount of sand used for traction control in the winter. The county, community groups, and commercial property owners could pay a contractor to sweep the streets and parking lots. VDOT has a program to accept the swept sand for future reuse or disposal. Evaluate the benefit of sweeping of sand from private and public parking lots and improvement of water quality by limiting the use of de-icing materials.

Watershed Benefit: Because of the varied implementation of this action, it is difficult to quantify its benefit. The general benefit of this action to the watershed would be the reduction of pollutants, mostly TSS, in the areas where this action is implemented.

Responsible Party: Fairfax County and community groups
Implementation Period: FY 2007 - FY 2029
Capital Cost: $20,000 per year = $460,000
Staff: 0.03 SYE

Objective C2: Reduce the amount of pollutants such as fecal coliform bacteria, phosphorous, and nitrogen in stormwater runoff.

Rationale: The majority of the pollution in the stormwater runoff comes from the existing land uses in the watershed. The fecal coliform bacteria concentrations in the watershed exceed the state water quality standards. The concentration of nitrogen and phosphorous in the water has caused algal blooms which cause the creek to be listed by the Virginia DEQ as nutrient impaired. The purpose of this objective is to mitigate the sources of manmade pollution to Little Hunting Creek to the maximum extent practical.

Action C2.1: Expand existing county monitoring programs to identify the sources of fecal coliform in the watershed that may be from humans, domesticated animals, or wildlife, and prepare an action plan to address the reduction of fecal coliform bacteria contamination.

Strategy to Achieve Action: Perform a future study of the sources of fecal coliform bacteria to Little Hunting Creek and prepare an action plan that will be a separate document from this watershed management plan.

Watershed Benefit: This action would allow for the evaluation and quantification of fecal coliform bacteria impacts to the watershed. This would then allow a baseline to be established to implement an action plan for the reduction of fecal coliform bacteria.

Responsible Party: Fairfax County
Implementation Period: FY 2007 - FY 2009
Capital Cost: $320,000
Staff: 0.03 SYE

Action C2.2: Install BMPs or enhance the performance of existing BMPs at selected locations to reduce the nitrogen and phosphorous pollutant loading from existing developments that currently have no water quality treatment. This action should be performed in conjunction with actions identified under Objectives A3 and A4.

Strategy to Achieve Action: The structural BMP options for this action are described under Actions A3.6, A3.7, A3.8, and A4.1. Retrofitting existing stormwater management facilities and BMPs in the watershed to provide a greater pollutant removal benefit may be accomplished by creating wetlands in the bottom of existing dry detention facilities or detaining water for a longer time in the detention facilities. The county will not have to obtain an easement for retrofitting existing public stormwater management facilities unless additional areas around facilities are needed. The cost is minimal to create a wetland in the bottom of an existing dry detention facility and/or reconfigure the outlet structure. A new wetland constructed in the bottom or fringe of an existing facility may increase the pollutant removal efficiency by 10% to 15%. The outfall structure of an existing facility could be modified to store water longer in the BMP, or perhaps more drainage area could be directed to the existing BMP. Since most residential areas in the watershed do not have existing BMPs, the new BMP facilities described in Action A3.7 will provide treatment of the stormwater runoff.

Watershed Benefit: The pollutant reduction from the proposed BMP retrofits and new BMPs was quantified in the watershed model. The pollutant removal percentages for all of the proposed actions are shown for total suspended solids (TSS), total phosphorous (TP), and total nitrogen (TN) in Table 4.5.

Responsible Party: Fairfax County
Implementation Period: See the descriptions for Actions A3.6, A3.7, A3.8, and A4.1.
Capital Costs: See the descriptions for Actions A3.6, A3.7, A3.8, and A4.1.
Staff: Included in Actions A3.6, A3.7, A3.8, and A4.1.

Action C2.3: Perform additional water quality monitoring and conduct a macroinvertebrate and aquatic plant survey of South Little Hunting Creek, such as where it discharges into the Potomac and other locations in the main stem of Little Hunting Creek, in the future to get more information concerning the water quality in the tidal portion of the creek.

Strategy to Achieve Action: Work with the Virginia DEQ to perform additional water quality monitoring of South Little Hunting Creek (Map No. SLHC13), including the inflow points of the major tributaries of North Little Hunting Creek and North Branch. Monitoring data should be collected on a frequent and regular basis to evaluate the levels of fecal coliform bacteria, nutrients such as nitrogen and phosphorous, dissolved oxygen, and sediment. A macroinvertebrate and aquatic plant study will help to determine the quality of the aquatic habitat in the tidal portion of the creek. Volunteer stream monitors who are properly trained in the correct protocols may also help collect data in the tidal portion of the creek. Potential partners or sources of grant funding for the macroinvertebrate study may include the U.S. Environmental Protection Agency, Chesapeake Bay Foundation, U.S. Army Corps of Engineers, Virginia Department of Game and Inland Fisheries, and Virginia Marine Resources Commission.

Watershed Benefit: This action would allow for the evaluation and quantification of the quality of water and aquatic habitat in the watershed. This would then allow a baseline to be established to implement an action plan for the improvement of water quality and aquatic habitat. After the baseline has been established, the additional monitoring data can be used to help evaluate the health of the streams and track the progress being made by other proposed actions in the plan.

Responsible Party: Fairfax County and the Virginia Department of Environmental Quality
Implementation Period: FY 2007 - FY 2029
Capital Cost: Included in Action B2.2
Staff: 0.03 SYE

Action C2.4: Identify and investigate locations of possible illicit discharges from commercial and residential activities such as car repair and painting. Take enforcement actions to stop the identified illicit discharges.

Strategy to Achieve Action: As part of the VPDES MS-4 permit compliance activities, investigate the locations of possible illicit discharges to the streams. These locations include the area where Paul Spring Branch crosses Memorial Street (Map No. PSB22) and the potential illegal dumpsite adjacent to the Martin Luther King, Jr. Park (Map No. SLHC15). The county's Stormwater Planning Division is considered the permittee and follows up on any illicit discharges as part of its ongoing efforts to detect the presence of illicit connections and improper discharges to the storm drain system.

Watershed Benefit: This action's benefit will help reduce the current amount of pollutants resulting from illicit discharges. Stopping illicit discharges will have a direct benefit to the watershed by eliminating hazardous pollutants reaching the streams.

Responsible Party: Fairfax County
Implementation Period: Start date is unknown
Capital Cost: $1,920,000 (LH9976 Enforcement Enhancement Project includes Action D1.3)
Staff: 0.1 SYE

Action C2.5: The county and community groups should educate the public on ways to reduce the amount of pollutants in stormwater runoff.

Strategy to Achieve Action: The county and community groups should partner with state and federal agencies such as the Virginia Department of Conservation and Recreation and U.S. Environmental Protection Agency to provide educational and technical assistance to residential and commercial property owners and landscape services regarding ways to reduce pollutants in stormwater runoff. Relevant information should be posted on the county website, with references to appropriate printed material. One area that could be focused on is the application of fertilizers with information for homeowners that could be made available through local retailers. Property owners with large areas of grass should be targeted with information concerning reducing the use of herbicides, pesticides, and fertilizer.

Watershed Benefit: The potential resulting benefit would be improved water quality as a result of the community reducing pollutants in stormwater runoff.

Responsible Party: Fairfax County and community groups
Implementation Period: FY 2006 - FY 2029
Capital Cost: $60,000 per year = $1,440,000
Staff: 0.03 SYE

Objective C3: Mitigate the effects of past pollution in the watershed from pollutants such as chlordane and PCBs.

Rationale: Past pollution of the tidal portion of Little Hunting Creek with chlordane and PCBs is still apparent today. The source of this pollution is not known; however, it is not new. Little Hunting Creek is considered an impaired waterbody by Virginia DEQ due to PCBs in fish exceeding the water quality limit. Sediment samples taken in the tidal portion of the creek have had chlordane concentrations exceeding the criteria for aquatic life.

Action C3.1: The county and community should engage the U.S. Army Corps of Engineers, Virginia Marine Resources Commission, and Virginia DEQ to investigate the extent and concentrations of chlordane and PCB contamination and to aid in the restoration of water quality for the tidal portions of Little Hunting Creek (Map No. SLHC14). The feasibility of remediation will be evaluated, and at a minimum, activities that may suspend the contaminants will be restricted.

Strategy to Achieve Action: The county and community should establish partnerships with U.S. Army Corps of Engineers, Virginia Marine Resources Commission, and Virginia DEQ to perform a future evaluation of the extent of the chlordane and PCB contamination in the tidal portions of Little Hunting Creek. The potential human health risks from the existing contamination and feasibility of remediation should be evaluated. This action should be coordinated with the dredging feasibility study in Action C1.1. Post signs in prominent locations advising the public of the Virginia DEQ's health advisory for fish consumption.

Watershed Benefit: This action is required to determine the amount, extent, and impact of chlordane and PCB contamination. Establishing the amount and impact of contamination will help to determine if remediation is necessary, and if remediation is necessary, what actions would be appropriate.

Responsible Party: Fairfax County
Implementation Period: FY 2007 - FY 2008
Capital Cost: $30,000
Staff: 0.03 SYE

Goal D: Provide a means for increasing community involvement for long-term watershed stewardship.

Education and involvement in watershed issues will help drive the actions for all of the goals of this plan. The community has been involved in the process to develop the Little Hunting Creek Watershed Management Plan, and continued involvement will help improve the state of the watershed. The county will also facilitate this goal through its Community Watershed Services Support project. This program will support strategies to achieve actions A4.1, B1.2, and D3.1 by distributing educational materials to the public, providing technical assistance to the com-

munity, and assisting in conducting outreach to neighborhood groups and associations. 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.

Objective D1: Reduce the amount of trash and dumpsites in the watershed to help protect and improve the streams.

Rationale: Trash and dumpsites located in the watershed are highly visible indicators of the lack of watershed stewardship. Creating an educational campaign on the problems of trash and dumping and establishing regular volunteer cleanups will help promote a feeling of ownership of the streams.

Action D1.1: The county and community groups should partner to clean up trash, woody debris that impairs stream flow, and dumpsites at several locations in the watershed.

Strategy to Achieve Action: Partner with community groups, such as home owner associations, to clean up trash, woody debris, fallen trees, and dumpsites at several locations in the watershed. The county may need to provide assistance to volunteer groups for the removal of bulk trash items. Cleanup locations are shown on Map 4.1 at NLHC18, PSB11, and NB6.

Watershed Benefit: The benefit to the watershed for this action will be the removal of trash and debris that pollute streams; clean streams will help foster a feeling of stewardship in the watershed. This action will also provide a good opportunity for public education and outreach.

Responsible Party: Fairfax County and community groups
Implementation Period: FY 2005 - FY 2009
Capital Cost: $40,000 per year = $200,000
Staff: 0.03 SYE

Action D1.2: Conduct a vigorous public information campaign including installing signs throughout the watershed and coordinating with community groups to deter littering and trash dumping. Signs could indicate stream names, watershed boundaries, public access areas to creeks, and areas where dumping is prohibited. They should also encourage and support recycling and storm drain stenciling. The information campaign should also inform the public on the proper disposal of litter and trash and consequences of violating county ordinances.

Strategy to Achieve Action: Enhance existing public education programs on the prevention of littering and trash dumping. Information about the county's current procedures for reporting illegal dumping can be found at www.fairfax.va.us/gov/dpwes/publications/urbanfor.htm.

Install signs throughout the watershed to convey desired information, such as locations of major stream crossings. Encourage community groups to undertake storm drain stenciling projects by supplying appropriate stencils to increase the awareness of where stormwater discharges. Due to the ethnic and cultural diversity of the watershed citizens, provide public education materials and no dumping signs in languages other than English.

Watershed Benefit: This action will raise public awareness regarding the watershed and help promote a sense of responsibility and good stewardship. The benefit to the watershed will be decreased amounts of trash and debris throughout the watershed.

Responsible Party: Fairfax County
Implementation Period: FY 2006 - FY 2029
Capital Cost: Included in Action C2.5
Staff: Included in Action C2.5

Objective D2: Coordinate and enhance the efforts of state, local, and neighborhood organizations in watershed education and volunteer activities.

Rationale: Existing state, local, and neighborhood organizations participate in a variety of existing volunteer activities such as stream monitoring, stream cleanup, and education. Coordinating activities among existing organizations may help in combining resources or creating new opportunities for watershed activities.

Action D2.1: Create and administer a new small grant program to sponsor volunteer community groups in watershed stewardship and restoration activities.

Strategy to Achieve Action: Evaluate the types of groups and watershed activities that will be eligible for the small grant program and write the guidelines and evaluation criteria for the grants. Grant amounts may be in the range of $5,000 or less for volunteer watershed activities such as educational activities, buffer planting, stream cleanup, or wetland restoration. A grant coordinator should be designated within the county.

Watershed Benefit: This action will help promote positive community activities that will directly benefit the watershed.

Responsible Party: Fairfax County
Implementation Period: FY 2007 - FY 2029
Capital Cost: $20,000 per year = $460,000
Staff: 0.03 SYE per year

Action D2.2: Create and distribute brochures to describe the Little Hunting Creek Watershed Management Plan and explain what homeowners and businesses in the watershed can do to improve the streams in the watershed.

Strategy to Achieve Action: Write brochures with input from the stakeholders in the watershed and distribute them throughout the watershed. Brochures targeting residents should be prepared in other languages in addition to English to reach all residents in the watershed. One brochure should clearly describe what each individual resident can do to improve the streams in the watershed. Other brochures should be developed for homeowners to serve as informational guides and help disseminate information. An example of this type of brochure would be to discuss the benefits of geogrid and other porous pavements. An additional brochure should be developed for commercial property owners and developers. This brochure would explain the benefits of how several property owners could work together for the benefit of the watershed, such as collectively managing runoff from their properties.

Watershed Benefit: This action will help educate the stakeholders and promote activities that will directly benefit the watershed.

Responsible Party: Community groups
Implementation Period: FY 2006 - FY 2029
Capital Cost: Included in Action C2.5
Staff: Included in Action C2.5

Action D2.3: Establish a county liaison to help coordinate watershed education in schools and encourage school participation in developing and caring for county restoration projects.

Strategy to Achieve Action: A member of the county education administration should be designated as a watershed education liaison to help coordinate watershed education efforts. This individual could be a resource for teachers developing lesson plans, student conservation projects, and school participation in county-supported restoration activities. This liaison could be further supported and assisted by the Community Watershed Services Support Project.

Watershed Benefit: This action will help promote grass roots education and involvement in watershed stewardship and positive community activities that will directly benefit the watershed.

Responsible Party: Fairfax County
Implementation Period: FY 2006 - FY 2029
Capital Cost: Included in Action C2.5
Staff: Included in Action C2.5

Objective D3: Support the formation of a volunteer community organization to aid in the stewardship of the Little Hunting Creek Watershed.

Rationale: A volunteer community organization can lead the way in supporting the implementation of the Little Hunting Creek Watershed Management Plan by generating and maintaining social and political momentum for restoring Little Hunting Creek.

Action D3.1: The Little Hunting Creek Steering Committee should help in forming a community organization for the Little Hunting Creek Watershed.

Strategy to Achieve Action: The Little Hunting Creek Steering Committee should seek grants and community sponsors, such as home owner associations, to help in the formation of a volunteer community organization. The county's Community Watershed Services Support Program should also help form the community organization and could later provide support to the new organization to ensure its success. The community organization will promote stewardship of the watershed by organizing watershed activities, overseeing implementation of the watershed management plan, helping monitor the success of the plan, and creating partnerships with businesses and other organizations in the watershed, such as local schools and churches. The organization should seek to work with other existing community groups and associations and help establish representatives in areas where there are none. A funding committee within the watershed organization should also be established to coordinate grant

opportunities and seek other funding sources. One of the key steps will be to hire a part-time watershed coordinator to organize the volunteer effort.

Watershed Benefit: This action is essential to the success of the watershed management plan. The community organization will be responsible for keeping the momentum of previous efforts going and ensuring that the intent of this plan is carried out.

Responsible Party: Little Hunting Creek Steering Committee
Implementation Period: FY 2005 - FY 2029
Capital Cost: $20,000 per year for 25 years = $500,000
(LH9972 Community Watershed Support Services Project)
Staff: 0.03 SYE

4.3 Benefits of Plan Actions

Hydrologic, hydraulic, and water quality models were created for the Little Hunting Creek Watershed to quantify the benefit of the plan's proposed alternatives. As a separate indicator, the U.S. Army Corps of Engineers stream attributes rating method was also used to compare existing stream conditions with anticipated improvements to the watershed as a result of plan implementation. The models and stream rating system helped to identify the following benefits to the Little Hunting Creek Watershed:

1. Reductions in peak stormwater discharges resulting in
   - Reductions in road, house, and yard flooding
   - Reductions in stream velocities and bank erosion
2. Reductions in pollutant loads resulting in improved stream water quality
3. Improved stream habitat

Future ultimate development conditions without any proposed BMP alternatives (future), and future ultimate development conditions with the proposed BMP alternatives (future proposed), were modeled to evaluate the effect of the proposed alternatives in the watershed and to allow formalization of cause and effect relationships. The future and future proposed conditions take into consideration the development of vacant parcels, redevelopment of underutilized parcels, and an approximate 19% impervious cover associated with residential parcel improvements (greater than the 18% allowed by the county for new home construction on non-bonded lots normally associated with residential infill development). These models were developed using the same foundation data and modeling guidelines and techniques outlined in Chapter 3 of this plan. Additional work to develop the models and analyze the results included the following steps:

- Delineate coverage areas for all structural BMP alternatives, including retrofitting BMPs, new BMPs, and LID practices
- Delineate coverage areas for all non-structural BMP alternatives for which quantifiable benefits could reasonably be estimated (e.g., Richmond Highway redevelopment)
- Assess water quantity and quality impacts from the proposed actions

Peak discharges for each subbasin were compared between future and future proposed conditions to evaluate the change in stormwater runoff as a result of implementing the proposed plan actions. The results are shown on Map 4.2, titled "Peak Flow Model Results – Future vs. Future Proposed." The cumulative effects of the runoff flow reduction on the downstream portions of the watershed are shown on Map 4.16. The proposed plan strategies focus on

peak flow reduction for the more frequent two-year storm event by targeting strategies at headwaters to detain runoff and promote infiltration.

The result of implementing these strategies across the watershed yields a significant average peak flow percent reduction. The average peak discharge was calculated by dividing the resulting peak flow reduction from the plan strategies by the number of subbasins with proposed projects. The resulting flow reduction is approximately 14% and 13% for the two-year and 10-year peak discharges, respectively; however, this corresponds to a relatively minor reduction with respect to the overall peak discharge rate. For example, in the North Little Hunting Creek sub-basin LH-LH-0004, the future peak flow rate for a two-year rain event is 221 cfs. With a 16% reduction due to the proposed draft plan strategies, the future proposed peak flow rate for a two-year rain event is 186 cfs. The plan strategies provide a peak flow reduction benefit to their immediate area, but because the watershed is so urbanized, the reduced peak discharge rate does not have a significant impact on the watershed as a whole. For a summary of individual project peak flow reductions and the quantified benefits resulting in each watershed, as well as the total improvement to the entire watershed, please see Tables 4.1, 4.2, and 4.3. The following table summarizes the cumulative peak flow reduction benefit for the plan actions for each subwatershed. The flows presented in this table were generated from the hydraulic model since the individual peak flow reductions for each subbasin are not additive.

Table 4.4 Subwatershed Peak Flow Reduction Summary

Subwatershed	Two-Year Future Peak Flow (cfs)	Two-Year Future Proposed Peak Flow (cfs)	Two-Year Reduction in Peak Flow (%)	10-Year Future Peak Flow (cfs)	10-Year Future Proposed Peak Flow (cfs)	10-Year Reduction in Peak Flow (%)
North Little Hunting Creek	578.8	474.9	-18.0	1161.5	1000.6	-13.8
South Little Hunting Creek	72.2	69.9	-3.2	140.7	137.5	-2.3
Paul Spring	562.5	432.3	-23.1	1505.1	1011.6	-33.2
North Branch	972.0	834.5	-14.1	2115.8	1786.6	-15.6
Potomac River	N/A	N/A	N/A	N/A	N/A	N/A

The hydraulic model results were reviewed with respect to future and future proposed flow velocities in the streams, and the velocities for the two-year rainfall event for the future and future proposed conditions are shown on Map 4.3. The percent reductions in stream velocities from future to future proposed conditions are shown on Map 4.4. The changes in watershed hydraulics due to the plan strategies have reduced the stream velocities but were not intended to reduce 100-year flood limits The velocities have been reduced such that some areas would no longer experience erosion or the extent of erosion would be somewhat reduced with the proposed plan actions. The model results for the flooding limits for the two- and 10-year peak

rainfall events were also evaluated, and the results for the future development conditions are shown on Map 4.5. The difference in the flooding limits for the future and future proposed conditions was very minor. The water surface elevations which determine the floodplain limits changed very little due to the proposed strategies since the existing stream geometry, according to the digital terrain model, has steep side slopes.

The target pollutant for the Chesapeake Bay protection strategy is phosphorus. For modeling purposes, the removal rate for new and retrofit BMPs was set to 40% for this constituent. However, since the entire watershed area cannot be directly treated by a BMP facility, the resulting removal rate is less than 40%. In addition to phosphorus, the most significant pollutants of concern to the Chesapeake Bay are suspended solids and nitrogen. The following table summarizes the loading rate reduction for these pollutants for each subwatershed in Little Hunting Creek, as well as the total reduction for the entire watershed.

Table 4.5 Pollutant Loading Rate Reduction

Subwatershed	Future TSS Loading Rate, lb/ac/yr	Future Proposed TSS Loading Rate, lb/ac/yr	Reduction in TSS Loading Rate, lb/ac/yr	% Decrease TSS Loading Rate	Future TP Loading Rate, lb/ac/yr	Future Proposed TP Loading Rate, lb/ac/yr	Reduction in TP Loading Rate, lb/ac/yr	% Decrease TP Loading Rate	Future TN Loading Rate, lb/ac/yr	Future Proposed TN Loading Rate, lb/ac/yr	Reduction in TN Loading Rate, lb/ac/yr	% Decrease TN Loading Rate
North Little Hunting Creek	430	368	62	14	0.518	0.448	0.070	14	4.83	4.33	0.50	10
South Little Hunting Creek	274	270	4	1	0.314	0.310	0.004	1	2.96	2.92	0.04	1
Paul Spring	327	262	65	20	0.339	0.288	0.051	15	3.69	3.37	0.32	9
North Branch	361	311	50	14	0.408	0.362	0.046	11	3.96	3.70	0.26	7
Potomac River	216	215	1	0	0.279	0.278	0.001	0	2.19	2.18	0.01	0
Little Hunting Creek Total	1608	1426	182	11	1.858	1.686	0.172	9	17.63	16.50	1.13	6

The overall watershed benefit of the proposed projects in the plan, with respect to the Chesapeake Bay Preservation Ordinance, is a reduction in total phosphorus of 9%. This has nearly the same effect as treating the entire watershed as a redevelopment project, which would generally require a reduction in phosphorus of approximately 10%. This reduction would be in addition to the benefits provided by water quality controls constructed with any actual redevelopment or new development in the watershed. Although the total future proposed pollutant loading rates for suspended solids, phosphorus, and nitrogen will still be considered poor according to the ranges discussed in Table 2.12, this is still a significant improvement over future conditions without implementation of the proposed projects in the plan.

The model result summaries for each subwatershed are provided in the following sections. To help monitor the success of the Little Hunting Creek Watershed Management Plan strategy, the hydrologic, hydraulic, and water quality models should be updated as the plan strategies are implemented.

North Little Hunting Creek Subwatershed

This subwatershed has the most significant increase in future stormwater discharge due to the potential development of vacant parcels and the increase in medium-density residential land use, especially in the area located east of Huntley Meadows Park. For this reason, multiple proposed BMPs, both structural and non-structural, are recommended for implementation as depicted on Map 4.1. The majority of these actions are proposed in the upper reaches of North Little Hunting Creek to reduce the runoff from the Richmond Highway corridor, which produces the greatest volume of runoff in the subwatershed. The result of implementing these recommendations is a significant average reduction in the subwatershed's peak discharges of 17% for the two- and 10-year storm events. The most significant reduction in peak discharge is for subbasin LH-LH-0005, which has an almost 50% decrease for the two-year storm and a 42% decrease for the 10-year storm. Changes in peak discharges between future and future proposed two-and 10-year storm events for each subbasin are shown on Map 4.2.

Velocities in North Little Hunting Creek are relatively unchanged from the future to future proposed conditions; however, several sections of high velocity have been reduced. These high flow velocities could be attributed to the high flow volumes under future proposed conditions (even though they have been reduced significantly) and the geometry of the stream. The velocity results from the modeling of the future and future proposed conditions can be seen on Map 4.3 and Map 4.4.

The two- and 10-year peak discharges for the future and future proposed conditions are almost unchanged from the existing conditions described in Chapter 3, section 3.1.6. This is due to continued high peak discharges, even though they have been significantly reduced by the future proposed plan actions and no modeled alteration of the stream geometry. The future proposed model shows some minor flooding of the Harmony Trailer Park. Improvement of the floodplain and flood reduction for the Harmony Trailer Park along North Little Hunting Creek is addressed in the proposed stream restoration activities (Map No. NLHC12 and Map No. NLHC15). There are no roadway overtopping locations for the two- or 10-year storm event for future or future proposed conditions along North Little Hunting Creek. The future proposed flooding limits for North Little Hunting Creek are shown on Map 4.5.

The future proposed water quality modeling results for the North Little Hunting Creek Subwatershed showed a 15% decrease in the pollutant loads for TSS, a 14% decrease in pollutant loads for TP, and a 13% decrease in the pollutant loads for TN. The decrease in modeled pollutant loads is due to the proposed plan actions for new BMPs, commercial and residential LID projects, redevelopment peak flow reduction, and BMP retrofits. The greatest pollutant reductions are from the LID and new BMP projects located in the commercial areas along the Route 1 corridor.

With implementation of the LID practices, new BMPs, and BMP retrofits, four of the subbasins in the North Little Hunting Creek Subwatershed along Route 1 went from poor condition to fair

condition for sediment loading rates. The greatest reduction in TSS was in LH-LH-0005, which was reduced by 37%. The subbasins in the lower reaches, LH-LH-0001 and LH-LH-0002, showed little improvement in water quality since the proposed stormwater controls do not specifically target water quality improvements in those subbasins.

There was an average reduction of 9% TP in the upper reaches of the North Little Hunting Creek Subwatershed, which included the subbasins LH-LH-0007, LH-LH-0008, and LH-LH-0009. However, the implementation of the proposed BMPs did not change the condition of the area from the poor category. A large reduction in TP was seen in the Route 1 commercial area around the Mount Vernon Plaza and Hybla Valley Plaza areas, which moved the areas to either the fair or good condition.

For total nitrogen, the greatest reduction in the subwatershed occurred in subbasins LH-LH-0004 and LH-LH-0005. Combined, the proposed improvements in the two subbasins achieved a 40% removal rate for TN. Since there is only a small area covered by proposed or new detention basins, the reduction can be attributed to the reduction in flow from the commercial and high-density residential areas, which tend to have higher loading values for TN. The pollutant loading rate reductions for this subwatershed can be found in Table 4.5. The water quality results can be found in Maps 4.10, 4.11, 4.12, 4.13, 4.14, and 4.15.

South Little Hunting Creek Subwatershed

The hydraulic model for this subwatershed consists of only South Branch and not the tidal portion of Little Hunting Creek. The hydrologic model consists of the entire subwatershed area.

The peak runoff discharges for this watershed are relatively high with respect to its overall size. For this reason, only two strategies were proposed and modeled for this subwatershed. The strategies modeled were the installation of rain gardens at Fort Hunt Elementary School (Map No. SLHC3) and the retrofitting of the publicly owned dry detention BMP located opposite of 3301 Woodland Lane (Map No. SLHC6). These strategies produced minor reductions in the two-year and 10-year peak discharges of 0.1% and 0.1%, respectively. A comparison of the reduction in peak discharges between future and future proposed two-and 10-year storm events for each subbasin is shown on Map 4.2.

The velocities produced by the two-year rainfall event in South Branch are generally slow to moderate in future and future proposed conditions. The future velocities are almost unchanged for the future proposed condition, since this subwatershed was not heavily targeted for implementation of water quantity reducing actions. No significant change in stream conditions is anticipated for either future or future proposed conditions as a result of changes in stream velocities. The velocity results from the hydraulic modeling of the future and future proposed conditions can be seen on Map 4.3 and Map 4.4.

The future and future proposed floodplains for the two- and 10-year peak discharges are almost the same, and they are contained within the extended channel banks for both reaches of South Branch. Map 4.5 shows the extent of the future proposed flooding limits for South Branch.

The future proposed water quality modeling results for the South Little Hunting Creek Subwatershed showed a 1% decrease in the pollutant loads for TSS, TP, and TN. The decrease in modeled pollutant loads is minimal because there is one LID project and one BMP retrofit proposed in the plan and modeled for this subwatershed.

Paul Spring Branch Subwatershed

The upper reaches of this subwatershed are highly urbanized and the entire subwatershed has over 25% imperviousness. These characteristics translate into relatively high runoff volumes with respect to the size of the watershed. As discussed in Section 3.3.6, the future conditions in this subwatershed will result in a slight increase in impervious surfaces, which will result in minor increases in the already high stormwater peak discharges. The headwaters of Paul Spring Branch, including the Richmond Highway corridor, were targeted extensively to reduce runoff volumes. The proposed structural and non-structural BMPs for the upper portion of this subwatershed reduce the average peak discharges for LH-PSB-005, LH-PSB-006. and LH-PSB-007 for the two-year storm event by over 30% and by almost 40% for the 10-year storm event. Generally, the proposed future peak discharges for this subwatershed show significant reductions when compared to future conditions. Subwatershed-wide, there is an average 30% and 27% decrease in two- and 10-year storm event runoffs, respectively. Changes in peak discharges between future and future proposed two-and 10-year storm events for each subbasin are shown on Map 4.2.

The future proposed velocity conditions in Paul Spring Branch were very similar to the future velocity conditions with some notable improvements. Overall, the velocities were generally moderate, with some areas of high velocity, for both future and future proposed conditions. The extent of the high velocities for the future proposed condition was either eliminated or reduced significantly, and the velocities were reduced in the areas evaluated in the stream physical assessment as being highly eroded. The exception to this condition is the outlet velocity for the culvert at Mary Baldwin Drive, which is still high under future proposed conditions. Areas still experiencing high flow velocities in the future proposed model could be attributed to the high flow volumes under future proposed conditions (even though they have been reduced significantly) and the geometry of the stream. Areas of high velocity and erosion are addressed in more detail in the proposed stream restoration activities (Map No. PSB15). Map 4.3 and Map 4.4 show the velocity results from the hydraulic modeling of the future and future proposed conditions.

The changes in the existing floodplain under future and future proposed conditions are minimal. There is a slight decrease in water surface elevation for the two- and 10-year storm events and a corresponding negligible decrease in the extent of the associated floodplains. The small extent of changes in water surface elevation and floodplain extent can be attributed to steep slopes of the stream geometry. Under future and future proposed conditions, Paul Spring Road is overtopped for the two- and 10-year storm events. Mary Baldwin Drive is overtopped for the 10-year future storm event and for the future proposed condition. The replacement of these culverts is addressed in the stream restoration activities for Paul Spring Branch (Map No. PSB15). Map 4.5 shows the extent of the future proposed flooding limit for Paul Spring Branch.

The future proposed water quality modeling results for the Paul Spring Branch Subwatershed showed a 24% decrease in the pollutant loads for TSS, a 17% decrease in pollutant loads for TP, and an 11% decrease in the pollutant loads for TN. The decrease in modeled pollutant loads is due to the proposed plan actions for new BMPs; commercial, residential and institutional LID projects; and BMP retrofits. The greatest pollutant reductions are from the LID and new BMP projects.

With the large number of projects in the headwaters of the Paul Spring Subwatershed, the area has one of the greatest improvements in water quality in Little Hunting Creek. For proposed conditions, all subbasins were either in the fair or good category for TSS. One subbasin, LH-LH-0007, moved from the poor category for future conditions to fair condition due to the proposed new BMPs and LID. The largest reduction in the sediment loading rate was also found in LH-PS-0007, which achieved a 40% TSS reduction. The two subbasins LH-PS-0003 and LH-PS-0004 achieved a 21% and 34% reduction and moved to the good category for TSS due to the proposed new and retrofit BMPs.

For TP, two areas, LH-LH-0006 and LH-LH-0007, were moved from the poor category to the fair category with a reduction of 23% and 31%. With the exception of one subbasin, LH-LH-0007, the subwatershed was shown for future conditions as being in the good category for TN. By reducing the TN in LH-LH-0007 by 22%, the proposed improvements in the headwaters changed the subbasin from the fair category for future conditions to the good category.

There were minimal improvements in water quality for the two subbasins in the downstream end of Paul Spring since there were few proposed stormwater controls. The pollutant loading rate reductions for this subwatershed can be found in Table 4.5. The water quality results can be found on Maps 4.10, 4.11, 4.12, 4.13, 4.14, and 4.15.

North Branch Subwatershed

The potential future development in this watershed will result in a slight overall increase in impervious surfaces, as future land uses are almost exclusively medium-density residential and low-intensity commercial. This potential future development will produce peak discharges for the two- and 10-year rainfall events that are slightly higher than they are for existing conditions. The majority of the entire northern portion of this subwatershed was targeted for structural BMP improvements, which corresponds directly to areas of higher existing and future development density. When compared to future conditions, the average future proposed peak flow rates for the two- and 10-year rainfall events were reduced by 13% and 11%, respectively. The most significant decrease in peak discharges was LH-NB-0011, which realized a 40% reduction with implementation of all the proposed BMP alternatives. The reduction in peak discharges between future and future proposed two-and 10-year storm events for each subbasin are shown on Map 4.2.

The velocities produced by the two-year rainfall event in North Branch are virtually unchanged between the future and future proposed conditions. No erosion or head cuts were observed in North Branch during the stream physical assessment, but the hydraulic modeling shows high velocity conditions for the culvert crossing at Sherwood Hall Lane. These high velocities will be addressed as part of the proposed stream restoration activities for North Branch (Map No. NB7). Future and future proposed velocity conditions as calculated in the hydraulic model are shown on Maps 4.3 and 4.4.

The changes in the existing floodplain for North Branch under future and future proposed conditions are very small. There is generally a slight decrease in water surface elevation for the two- and 10-year storm events and a corresponding negligible decrease in the extent of the associated floodplain. The small extent of changes in water surface elevation and floodplain extent can be attributed to steep slopes of the stream geometry. There are no roadway overtopping locations for the two- or 10-year storm event for future or future proposed conditions along any reach of North Branch. The future proposed flooding limits for North Branch are shown on Map 4.5.

The future proposed water quality modeling results for the North Branch Subwatershed showed a 14% decrease in the pollutant loads for TSS, a 9% decrease in pollutant loads for TP, and a 7% decrease in the pollutant loads for TN. The decrease in modeled pollutant loads is due to the proposed plan actions for new BMPs, residential and institutional LID projects, and BMP retrofits. The greatest pollutant reductions are from the LID and new BMP projects.

For TSS, all subbasins, with the exception of one, were identified as being in the fair category for future proposed conditions. Subbasin LH-NB-0011, which includes the Hollin Hills area, contained the largest number of proposed improvements and correspondingly showed a large decrease in sediment loading. Subbasins LH-NB-0003 and LH-NB-0005, which are in the area around Mount Vernon Hospital, each contain a large number of proposed new or retrofit BMP projects and each has a 15% reduction in TSS. Subbasins LH-NB-0003 and LH-NB-0004 improved to the fair category due to the proposed LID demonstration projects at Carl Sandburg and Walt Whitman Middle Schools and the retrofit BMPs at Mount Vernon Hospital and in the neighborhood off Lakeshire Drive.

For TP, three subbasins changed from poor to good. The only subbasin that did not improve was LH-NB-0007, in the Hollin Hall and Wellington neighborhoods, which has a high residential development area, a commercial area, and few proposed stormwater controls.

The pollutant loading rate reductions for this subwatershed can be found in Table 4.4. The water quality results can be found in Maps 4.10, 4.11, 4.12, 4.13, 4.14, and 4.15.

Potomac River Subwatershed

No hydraulic modeling was performed for the small streams located in the Potomac River Subwatershed. However, watershed hydrology was evaluated and peak discharges were estimated.

The existing hydrology developed for this subwatershed produced stormwater runoff that is moderate with respect to the size of the watershed, and the future land use is planned to be medium-density residential, which will produce minor increases in peak discharges. For this reason, only one strategy was proposed and modeled for this subwatershed—to construct a LID demonstration project at Waynewood Elementary School (Map No. PR3). These strategies produced minor reductions of 0.4 for both the two- and 10-year peak discharges. Changes in peak discharges between future and future proposed two- and 10-year storm events for each subbasin are shown on Map 4.2.

The future proposed water quality modeling results for the Potomac River Subwatershed showed a 0.4% decrease in the pollutant loads for TSS and for TN and a 0.3% decrease in pollutant loads for TP. The decrease in modeled pollutant loads due to the plan actions is minimal because there is only one LID project, PR3, proposed in this subwatershed at Waynewood Elementary School.

Stream Habitat Improvements

The U.S. Army Corps of Engineers stream attributes rating method[1] was used to compare existing stream conditions with anticipated improvements to the watershed as a result of plan implementation. The following parameters are considered in this rating system:

1. Channel Incision: The degree to which the channel has downcut or is incised in its flood-plain
2. Riparian Condition: Riparian corridor width
3. Bank Erosion: The amount of bank erosion
4. Channelization: Whether or not the stream has been channelized
5. In-stream Habitat: The amount and condition of in-stream habitat

The index values range from 1 (lowest score) to 5 (highest score). By applying the 2003 Stream Physical Assessment habitat-related data to the methodology, the overall existing stream condition index for Little Hunting Creek is 2.86. For comparison, the countywide reach-length weighted stream index is 3.49. Based on complete implementation of the stream and tree buffer restoration projects proposed in the watershed plan, the overall Little Hunting Creek stream index is projected to be 3.51. It is anticipated that the corresponding measur-able improvement for Little Hunting Creek would be for the stream physical assessment total habitat rating to shift from the "poor" category to the high range of the "fair" category. It must be emphasized that this rating system only applies to stream habitat conditions. Direct water quality and quantity improvements realized as a result of implementation of other watershed plan recommendations (i.e. excluding the stream and tree buffer restoration projects) are not reflected in this stream habitat rating.

4.4 Implementation of Plan Actions

The recommended plan actions described in Section 4.2 will be implemented over the 25-year life of the Little Hunting Creek Watershed Management Plan. This plan should serve as guid-ance for all county agencies and officials to steer and determine the development and redevel-opment within the watershed. The plan should also be implemented as an active document. That is to say that as projects are implemented or over a periodic cycle of five years, the implementation schedule should be updated to reflect plan changes. The initial implementation schedule was developed as described below.

The first step in developing a logical and feasible implementation schedule was to provide a prioritization of the actions to evaluate how well they met the plan goals. The objective of the prioritization was to determine which actions best meet the goals of the plan, and the Little Hunting Creek Steering Committee used this information to help prepare the implementation schedule. The following prioritization criteria were used:

1. Peak flow reduction: This criterion describes how much runoff is reduced by the action.
2. Habitat benefit: This criterion describes the amount and type of habitat that is improved or created by the action.
3. Water quality improvement: This criterion describes the amount of water quality improvement.
4. Promotion of watershed stewardship: This criterion describes the amount of community involvement and increase in stakeholder watershed ownership.
5. Cost: This criterion describes the cost or cost versus benefit of the action.

The actions in the plan were scored from 1 to 5 for each of the prioritization criteria, with 5 as the best score and 1 as the worst score. The information that was used to score the actions according to the criteria included quantitative and qualitative information. The quantitative data that was used in the prioritization scoring included the amount of peak flow reduction, size of the existing or proposed drainage area, size of the project such as linear feet of proposed stream restoration, reach habitat score, estimated cost, or estimated benefit versus the cost. As an example of how this data was used, a stream restoration project that restored 1,000 feet of stream with a poor habitat score would be scored higher than a stream restoration project that restored 1,000 feet of stream with a fair habitat score. For those actions with no quantitative data, a qualitative assessment of how well an action would meet the criteria was performed. For example, how well a public education program would motivate stakeholders to perform an action to benefit the watershed.

The reduction of peak flows throughout the watershed is one of the primary goals of the plan and peak flow reduction criteria was weighted at 40% to reflect a greater need to have actions that mitigate the effects of the increased runoff from existing and proposed imperviousness. With this focus in mind, projects that targeted the headwaters of the subwatersheds were given higher scores, since they would provide a more significant peak flow reduction benefit. All the other criteria were weighted at 15% and a total score was given for each action.

The highest score overall score that could be achieved is 5 and the lowest score that could be achieved is 1. The actions were ranked according to their total score. Some of the actions described in Section 4.2 were evaluated as stand-alone capital improvement plan projects such as BMP retrofits, new BMPs, and stream restoration. Other actions that are similar in nature were grouped together as shown in Table 4.6. The policy actions were ranked separately from the capital improvement program actions and are included in Chapter 5.

Table 4.6 Prioritization of Proposed Actions

Project Description and ID	Peak Flow Reduction	Habitat Benefit	Water Quality Treatment	Watershed Stewardship	Cost or Cost/ Benefit	Total Score
Weighting Factor	40%	15%	15%	15%	15%	
Capital Improvement Program Projects						
New BMP PSB27	5	3	5	4	5	4.55
New BMP PSB29	5	3	5	4	5	4.55
New BMP NB11	5	3	5	4	5	4.55

Project Description and ID	Peak Flow Reduction	Habitat Benefit	Water Quality Treatment	Watershed Stewardship	Cost or Cost/ Benefit	Total Score
Weighting Factor	40%	15%	15%	15%	15%	
New Commercial LID NLHC9	5	3	5	3	5	4.4
New BMP PSB32	5	3	5	4	4	4.4
New BMP NLHC20	5	3	5	3	5	4.4
Retrofit BMP PSB7	5	3	4	3	5	4.25
New BMP NLHC1	5	3	4	5	3	4.25
New BMP NLHC19	5	3	5	3	4	4.25
New School LID NB1	5	3	5	4	3	4.25
New BMP PSB30	5	3	4	3	4	4.1
New BMP PSB24	5	3	4	3	3	3.95
New BMP NB14	5	2	4	2	5	3.95
New BMP PSB25	4	3	4	3	4	3.7
New BMP NB12	4	3	4	3	3	3.55
Community Watershed Support Services Project: A4.2, B1.2, D3.1	3	3	2	5	5	3.45
Retrofit BMP PSB4	4	2	3	3	4	3.4
New BMP PSB31	4	3	4	2	3	3.4
New BMP PSB26	4	2	4	2	4	3.4
Wetland Restoration PR2	3	5	4	2	3	3.3
New Comm./Instit. LID PSB2	4	2	3	4	2	3.25
New BMP NLHC24	4	3	4	2	2	3.25
New BMP PSB28	4	2	3	2	4	3.25
Buffer Restoration NLHC11	1	5	4	5	5	3.25
New Commercial LID PSB1	4	3	4	3	1	3.25
New School LID NLHC21	3	3	5	4	1	3.15
New BMP NB13	4	2	2	3	3	3.1
New School LID SLHC3	4	2	3	3	2	3.1
Retrofit BMP NLHC4	4	2	1	1	5	2.95
Public Education Project: B3.5, C2.5, D1.2, D2.2, D2.3	2	2	2	5	5	2.9
North Little Hunting Creek Residential Rain Barrel and Rain Garden: A4.1	3	1	2	5	3	2.85
Paul Spring Branch Residential Rain Barrel and Rain Garden: A4.1	3	1	2	5	3	2.85

Project Description and ID	Peak Flow Reduction	Habitat Benefit	Water Quality Treatment	Watershed Stewardship	Cost or Cost/ Benefit	Total Score
Weighting Factor	40%	15%	15%	15%	15%	
North Branch Rain Barrel and Rain Garden: A4.1	3	1	2	5	3	2.85
Retrofit BMP NB2	3	3	5	2	1	2.85
Buffer Restoration SLHC7	1	4	3	4	5	2.8
Conservation Acquisition Project: B2.3, B3.3	1	4	3	4	5	2.8
Wetland Restoration SLHC11	2	4	4	2	3	2.75
Wetland Restoration PSB9	2	4	4	2	3	2.75
New School LID PR3	3	1	2	3	4	2.7
New BMP NLHC23	3	3	3	2	2	2.7
Inspection Enhancement Project: A3.1	3	2	3	2	3	2.7
Enforcement Enhancement Project: C2.4, D1.3	1	3	5	4	3	2.65
Buffer Restoration SLHC6	1	3	3	4	5	2.65
Buffer Restoration PSB14	1	3	3	4	5	2.65
Dumpsite Removal Project: D1.1	1	3	3	5	4	2.65
Retrofit BMP NLHC6	3	2	2	3	2	2.55
Retrofit BMP PSB23	3	1	2	1	5	2.55
New BMP NLHC16	3	2	2	2	3	2.55
Stream Restoration NLHC14	1	4	3	4	3	2.5
Buffer Monitoring Project: B1.3	1	4	3	3	4	2.5
Sediment Monitoring/ Stream Physical Assessment/Monitoring Project: B2.2, C2.3	1	4	3	3	4	2.5
Wetlands Survey Project: B3.1	1	4	3	2	5	2.5
Stream Restoration NLHC12	1	5	3	4	2	2.5
Stream/Buffer Restoration NLHC15	1	5	3	4	2	2.5
Stream Restoration SLHC5	1	5	3	4	2	2.5
Retrofit BMP NLHC5	3	1	3	2	2	2.4
Retrofit BMP NB9	3	2	3	1	2	2.4

Project Description and ID	Peak Flow Reduction	Habitat Benefit	Water Quality Treatment	Watershed Stewardship	Cost or Cost/ Benefit	Total Score
Weighting Factor	40%	15%	15%	15%	15%	
Small Watershed Grant Program: D2.1	1	2	2	5	4	2.35
Stream Restoration SLHC9	1	4	3	4	2	2.35
Stream Restoration PSB15	1	5	3	4	1	2.35
Stream Restoration NB7	1	4	3	4	2	2.35
Retrofit BMP PSB3	2	2	1	3	4	2.3
Retrofit BMP NB3	2	2	2	3	3	2.3
New BMP NLHC17	3	1	2	2	2	2.25
Wetland Restoration PSB10	1	3	4	2	3	2.2
Wetland Restoration SLHC17	1	3	4	3	2	2.2
Street Sweeping Program: C1.2	1	2	5	2	3	2.2
Fecal Coliform Source Study Project: C2.1	1	2	5	2	3	2.2
PCB Contamination Study Project: C3.1	1	3	4	2	3	2.2
Stream Restoration PSB13	1	4	3	4	1	2.2
Stormwater Infrastructure Condition Assessment	2	2	2	2	3	2.15
Retrofit BMP PSB8	3	1	1	1	3	2.1
Buffer Restoration PSB12	1	2	1	3	5	2.05
Stream Restoration SLHC4	1	3	3	4	1	2.05
Stream Restoration NLHC13	1	3	1	3	3	1.9
Stream Restoration PSB16	1	2	1	3	4	1.9
Stream Restoration PSB19	1	2	1	3	4	1.9
Stream Restoration PSB20	1	2	1	3	4	1.9
Retrofit BMP PSB5	2	1	1	1	4	1.85
Retrofit BMP PSB6	2	2	1	1	3	1.85
Retrofit BMP NB5	2	2	3	1	1	1.85
Buffer Restoration SLHC8	1	1	1	3	4	1.75
Stream Restoration NB8	1	2	1	3	3	1.75
Retrofit BMP NLHC2	2	1	2	1	2	1.7
Retrofit BMP SLHC16	2	1	1	3	1	1.7
Stream Restoration PSB18	1	1	1	3	3	1.6
Retrofit BMP NB4	2	2	1	1	1	1.55
Flood-Proof Dwellings: A3.12	2	1	1	1	2	1.55

Stream Restoration PSB17	1	1	1	3	2	1.45
Retrofit BMP NLHC3	2	1	1	1	1	1.4
Retrofit BMP NB10	2	1	1	1	1	1.4
Enforcement Enhancement: C2.4, D1.3	1	2	2	2	1	1.45
Dredging Feasibility Study Project: C1.1	1	1	1	2	2	1.3

Some of the actions in the implementation plan were scheduled by the Steering Committee according to the following important factors in addition to the prioritization rating:

- Logical progression of actions such as starting upstream headwater flow reduction actions before downstream stream restoration actions
- High visibility and chance for early success of an action, such as implementing LID at Beacon Mall
- Community support for an action such as the dredging feasibility study
- Spreading of actions throughout the watershed during the plan period and not concentrating early actions only in one area

The capital improvement program projects implementation plan is shown in Table 4.7. The timeline for implementation is shown on Figure 4.1. The dates for implementation shown in the plan are target dates subject to county funding approval and ongoing updates to the plan. Map 4.17 shows the implementation periods for the CIP projects that have specific locations. The projects that are watershed-wide are not shown on Map 4.17.

Table 4.7 Capital Improvement Program Projects Implementation[2]

Plan Map No.	County CIP Project No.	Project Description	Fiscal Year Start	Fiscal Year End	Estimated Cost
NB11	LH9143	New BMP	2005	2006	$240,000
PSB25	LH9154	New BMP	2005	2006	$240,000
PSB1	LH9855	New Commercial LID	2005	2007	$610,000
PSB8	LH1945	Retrofit BMP	2005	2007	$60,000
N/A	LH9972	Community Watershed Support Services Project: A4.2, B1.2, D3.1	2005	2029	$1,000,000
N/A	LH9977	Dumpsite Removal Project: D1.1	2005	2009	$200,000
N/A	LH9982	North Little Hunting Creek Residential Rain Barrel and Rain Garden: A4.1	2005	2029	$40,000
N/A	LH9983	Paul Spring Branch Residential Rain Barrel and Rain Garden: A4.1	2005	2029	$60,000
N/A	LH9984	North Branch Rain Barrel and Rain Garden: A4.1	2005	2029	$70,000
PSB32	LH9156	New BMP	2006	2007	$600,000
NLHC1	LH9139	New BMP	2006	2007	$430,000
NLHC20	LH9144	New BMP	2006	2007	$260,000
PSB24	LH9153	New BMP	2006	2007	$240,000
NLHC23	LH9140	New BMP	2006	2008	$110,000

Plan Map No.	County CIP Project No.	Project Description	Fiscal Year Start	Fiscal Year End	Estimated Cost
PSB31	LH9168	New BMP	2006	2008	$140,000
NLHC16	LH9138	New BMP	2006	2008	$130,000
NLHC21	LH9871	New School LID	2006	2008	$250,000
NLHC17	LH9137	New BMP	2006	2008	$110,000
PSB2	LH9828	New Comm./Instit. LID	2006	2009	$520,000
N/A	LH9973	Public Education Project: B3.5, C2.5, D1.2, D2.2 , D2.3	2006	2029	$1,440,000
N/A	LH9985	Wetlands Survey Project: B3.1	2007	2008	$320,000
N/A	LH9987	PCB Contamination Study Project: C3.1	2007	2008	$30,000
NB1	LH9111	New School LID	2007	2008	$580,000
NB14	LH9116	New BMP	2007	2008	$160,000
NLHC9	LH9819	New Commercial LID	2007	2009	$590,000
N/A	LH9986	Fecal Coliform Source Study Project: C2.1	2007	2009	$320,000
PSB29	LH9147	New BMP	2007	2009	$260,000
N/A	LH9974	Conservation Acquisition Project: B2.3, B3.3	2007	2011	$200,000
N/A	LH9979	Sediment Monitoring/Stream Physical Assessment/Monitoring Project: B2.2,	2007	2029	$200,000
N/A	LH9980	Small Watershed Grant Program: D2.1	2007	2029	$460,000
N/A	LH9978	Buffer Monitoring Project: B1.3	2007	2029	$345,000
N/A	LH9981	Street Sweeping Program: C1.2	2007	2029	$460,000
NB12	LH9142	New BMP	2008	2009	$200,000
PSB26	LH9165	New BMP	2008	2009	$150,000
PSB4	LH9132	Retrofit BMP	2008	2009	$110,000
PSB30	LH9150	New BMP	2008	2010	$210,000
NLHC24	LH9141	New BMP	2009	2010	$170,000
PSB7	LH9152	Retrofit BMP	2009	2010	$110,000
PSB15	LH9264	Stream Restoration	2010	2024	$2,620,000
N/A	LH9988	Dredging Feasibility Study Project: C1.1	2010	2014	$510,000
NB13	LH9126	New BMP	2010	2014	$150,000
NB2	LH9125	Retrofit BMP	2010	2014	$250,000
NLHC11	LH9320	Buffer Restoration	2010	2014	$400,000
NLHC14	LH9234	Stream Restoration	2010	2014	$350,000
NLHC19	LH9136	New BMP	2010	2014	$210,000
NLHC4	LH9122	Retrofit BMP	2010	2014	$30,000
NLHC6	LH9117	Retrofit BMP	2010	2014	$70,000
PR2	LH9706	Wetland Restoration	2010	2014	$200,000
PR3	LH9812	New School LID	2015	2019	$80,000

Plan Map No.	County CIP Project No.	Project Description	Fiscal Year Start	Fiscal Year End	Estimated Cost
NLHC6	LH9117	Retrofit BMP	2010	2014	$70,000
PR2	LH9706	Wetland Restoration	2010	2014	$200,000
PR3	LH9812	New School LID	2015	2019	$80,000
PSB14	LH9331	Buffer Restoration	2015	2019	$30,000
PSB27	LH9166	New BMP	2015	2019	$100,000
PSB28	LH9167	New BMP	2015	2019	$70,000
PSB9	LH9748	New Wetland BMP	2015	2019	$230,000
SLHC11	LH9708	Wetland Restoration	2015	2019	$390,000
SLHC17	LH9790	Wetland Restoration	2015	2019	$230,000
SLHC3	LH9804	New School LID	2015	2019	$270,000
SLHC6	LH9301	Buffer Restoration	2015	2019	$20,000
SLHC7	LH9305	Buffer Restoration	2015	2019	$40,000
NB3	LH9114	Retrofit BMP	2015	2019	$60,000
NB7	LH9227	Stream Restoration	2015	2019	$390,000
NB9	LH9115	Retrofit BMP	2015	2019	$90,000
NLHC12	LH9235	Stream Restoration	2015	2019	$800,000
NLHC15	LH9218	Stream/Buffer Restoration	2020	2024	$820,000
NLHC2	LH9121	Retrofit BMP	2020	2024	$90,000
NLHC5	LH9124	Retrofit BMP	2020	2024	$110,000
PSB10	LH9751	New Wetland BMP	2020	2024	$200,000
PSB3	LH9159	Retrofit BMP	2020	2024	$50,000
PSB5	LH9157	Retrofit BMP	2020	2024	$60,000
PSB6	LH9158	Retrofit BMP	2020	2024	$70,000
SLHC5	LH9204	Stream Restoration	2020	2024	$560,000
SLHC9	LH9203	Stream Restoration	2020	2024	$230,000
NB10	LH9113	Retrofit BMP	2020	2024	$30,000
NB4	LH9109	Retrofit BMP	2020	2024	$80,000
NB5	LH9110	Retrofit BMP	2020	2024	$90,000
NB8	LH9270	Stream Restoration	2020	2024	$110,000
NLHC13	LH9233	Stream Restoration	2025	2029	$150,000
NLHC3	LH9123	Retrofit BMP	2025	2029	$60,000
PSB12	LH9360	Buffer Restoration	2025	2029	$20,000
PSB13	LH9230	Stream Restoration	2025	2029	$1,370,000
PSB16	LH9263	Stream Restoration	2025	2029	$100,000
PSB17	LH9249	Stream Restoration	2025	2029	$40,000
PSB18	LH9229	Stream Restoration	2025	2029	$100,000
PSB19	LH9262	Stream Restoration	2025	2029	$100,000
PSB20	LH9269	Stream Restoration	2025	2029	$100,000
PSB23	LH9146	Retrofit BMP	2025	2029	$80,000

Plan Map No.	County CIP Project No	Project Description	Fiscal Year Start	Fiscal Year End	Estimated Cost
SLHC16	LH9100	Retrofit BMP	2025	2029	$60,000
SLHC4	LH9207	Stream Restoration	2025	2029	$200,000
SLHC8	LH9302	Buffer Restoration	2025	2029	$150,000
N/A	LH9975	Inspection Enhancement Project: A3.1[3]	—	2029	$200,000
N/A	LH9976	Enforcement Enhancement Project: C2.4, D1.3[4]	—	2029	$1,920,000
N/A	LH9989	Stormwater Infrastructure Condition Assessment A3.11[3]	—	2029	$216,000

The 25-year estimated funding requirements for all the structural and non-structural recommended actions is $26.6 million, and the breakdown of funding requirements for each five-year period of the plan is shown in Table 4.7. The cost estimates and location maps for the recommended CIP projects are provided in the project fact sheets in Appendix C.

Table 4.8 Funding Requirements

Fiscal Year Period	Estimated Funding Requirements
FY2005 - FY2009	$8,525,000
FY2010 - FY2014	$4,308,000
FY2015 - FY2019	$5,085,000
FY2020 - FY2024	$4,785,000
FY2025 – FY2029	$3,879,000
Total Structural and Non-Structural Action Cost	**$26,582,000**

4.5 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 because of a low success rate or as watershed conditions change.

Action A3.6: Retrofit suitable existing stormwater management facilities and BMPs to make them more effective. Retrofitting these facilities is intended to meet the goals and objectives of this plan which will exceed the performance criteria or standards that were used to design the facility.

MONITOR: Number of retrofit projects implemented and reductions in peak flows from existing facilities

TARGET: Construct the following number of retrofit projects for each five-year period.

- Three retrofit projects for FY 2005 to FY 2009
- Three retrofit projects for FY 2010 to FY 2014
- Two retrofit projects for FY 2015 to FY 2019

Action A3.7: Construct new public BMPs, including LID practices, to detain the runoff from existing surrounding development without current stormwater management controls.

MONITOR: Number of new public BMPs with LID practices installed in headwaters on sites without BMPs

TARGET: Construct the following number of new public BMP projects for each five-year period.

- 16 new BMPs for FY 2005 to FY 2009
- Two new BMPs for FY 2010 to FY 2014
- Two new BMPs for FY 2015 to 2019

Achieve projected peak flow reductions for the two-year storm (see Table 4.2).

Action A3.8: Construct LID demonstration projects at publicly owned locations such as schools, parks, and other county properties.

MONITOR: Number of public demonstrations of LID projects installed

TARGET: Install a LID project at 10% of the public facility locations each year for 100% participation within 10 years, and achieve two-year storm projected peak flow reduction (see Table 4.3).

Action A4.1: Facilitate and provide technical assistance for the construction of LID practices such as rain gardens, cisterns, and rain barrels throughout the watershed, initially targeting areas near the headwaters of streams to detain the runoff from residential developments without existing stormwater management controls.

MONITOR: Percentage of households within the targeted watershed participating in rain barrels and/or rain garden installation, percentage of rain barrels and rain gardens functioning and maintained after five years

TARGET: An average 10% implementation rate with four rain barrels or one rain garden at each participating property. See Map 4.1 for the targeted neighborhoods.

Action A4.2: Implement a watershed-wide rain barrel sale project.

MONITOR: Number of residents purchasing and installing rain barrels, percentage of rain barrels functioning and maintained after five years

TARGET: One-hundred rain barrels sold/distributed each year.

Action B1.1: Plant buffers using native vegetation and trees adjacent to the stream for areas identified as good candidates for buffer restoration.

MONITOR: Amount of new or restored buffer created in the watershed

TARGET: Construction of the following buffer restoration projects in the watershed:

- One project with 16,000 linear feet of buffer restoration in the North Little Hunting Creek Subwatershed
- Three projects with a total of 3,200 linear feet of buffer restoration in the South Little Hunting Creek Subwatershed
- Two projects with a total of 1,900 linear feet of buffer restoration in the Paul Spring Branch Subwatershed.

50% decrease in assessed buffers with a poor rating (baseline amount is 52%) by FY 2024, and 100% of buffers restored in 25 years.

Action B1.2: The county and community groups should provide educational and technical assistance to property owners with tidal shoreline and 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, limiting the use and correct application of fertilizers and herbicides, pet waste management, waste disposal, and proper disposal of leaves and grass clippings.

MONITOR: Number of residents requesting technical assistance and development and distribution of educational materials, number of miles of undeveloped buffers lost to development

TARGET: 5% of property owners requesting or receiving technical assistance to manage buffers each year.

Action B1.3: Monitor the condition of restored and existing riparian buffers with annual stream walks to evaluate the condition and areas needing improvement.

MONITOR: Length of stream buffer assessed

TARGET: 20% of the total length of stream buffers evaluated by citizen volunteers or the county every five years.

Action B2.1: The county and community groups should perform stream restoration projects in the areas identified as good candidates for these types of projects.

MONITOR: Percentage of stream corridors where condition of stream habitat is very poor or poor (baseline is 58% poor and 15% very poor), amount of stream restoration, for in-stream projects, monitor benthic invertebrates to assess habitat quality using county staff and volunteer stream monitors

TARGET: Construction of the following stream restoration projects:

- Four stream restoration projects with a total of 8,200 linear feet in the North Little Hunting Creek Subwatershed
- Three stream restoration projects with a total of 5,100 linear feet in the South Little Hunting Creek Subwatershed

- Seven stream restoration or bank stabilization projects with a total of 12,100 linear feet in the Paul Spring Branch Subwatershed
- Two stream restoration projects with a total of 3,200 linear feet in the North Branch Subwatershed

30% reduction in amount of stream habitat rated very poor by FY 2019, and 50% of streams achieving higher water quality rating from baseline by FY 2019.

Action B2.2: Monitor the condition of the streams by performing a stream physical assessment every five years in the future to track the improvement or degradation of streams from the baseline condition.

MONITOR: Length of streams assessed

TARGET: Implement stream monitoring and assessment program to include smaller streams (as shown by PR1 on Map 4.1) by FY 2007.

Assess 20% of the stream length every year and repeat the stream assessment cycle for the life of the plan and beyond.

Action B2.3: Facilitate the acquisition and donation of conservation easements by community groups for riparian buffers, stream protection, and public/private open space for the environmental quality corridors described in the Fairfax County Comprehensive Plan.

MONITOR: Number and acreage of new riparian conservation easements recommended on Map 4.1 and along Stockton Parkway, condition of easements over time

TARGET: Acquire conservation easements for all stream corridors and creek buffer areas not covered by existing easements by FY 2024.

Action B3.1: Perform a wetlands function and value survey to identify the location, size, owner, type, and quality of existing wetlands in the watershed to determine the baseline information.

MONITOR: Performance of wetlands function and value survey

TARGET: Identify the location, size, owner, type, and quality of existing wetlands of wetlands in the watershed by FY 2008, and catalog the wetlands with the greatest potential for restoration by FY 2008.

Action B3.2: Construct and restore wetlands at suitable locations in the watershed as identified by the wetlands function and value survey in Action B3.1.

MONITOR: Number and acreage of new and restored wetlands and restored functions and values for locations identified in the watershed plan, number of wetland acreage lost through dredging/filling, and condition and percentage change of wetland acreage over time.

TARGET: Construct the wetland projects described in the plan, and double the amount of new or restored acres of wetlands by FY 2020.

Action B3.3: Purchase private land, designate public land, or acquire easements for land conservation of critical wetland habitat areas as identified in the wetlands function and value survey in Action B3.1.

MONITOR: Number and acreage of critical wetland habitat area protected, and condition of wetland habitat over time

TARGET: 10% of new total wetland acreage protected every five years.

Action B3.5: Create and distribute a brochure or other materials that inform the public about the value and benefit of wetlands.

MONITOR: Development of a county wetlands brochure and distribution of information about wetlands to the public

TARGET: Create county wetlands brochure by FY 2008, and 5% of property owners receiving information about wetlands each year.

Action C1.1: Perform a hydrographic survey in the future to determine the existing depths in South Little Hunting Creek and initiate a study to determine where dredging to restore the navigation channel in the tidal portion of the creek and access from the shoreline may be feasible.

MONITOR: Implementation of hydrographic study

TARGET: Study to take place between FY 2010 and FY 2014.

Action C1.2: The county, community groups, and commercial property owners should sweep up sand used for traction control on Richmond Highway and other major streets and parking areas in the watershed during the winter to prevent it from reaching the creek. Limit the use of certain de-icing materials, especially those that greatly impair water quality.

MONITOR: Implementation of street sweeping program in neighborhoods and reduction in total suspended solids in streams

TARGET: One new neighborhood street sweeping program every two years and ongoing implementation of past projects, and a 10% reduction in total suspended solids.

Action C2.1: Initiate a future project to identify the sources of fecal coliform in the watershed that may be from humans, domesticated animals, or wildlife, and prepare an action plan to address the reduction of fecal coliform.

MONITOR: Monitor sources of fecal coliform to establish baseline, and track development and implementation of TMDL remediation plan to reduce or eliminate fecal coliform

TARGET: Meet state water quality standards for fecal coliform by TMDL plan date.

Action C2.2: Install BMPs or enhance the performance of existing BMPs at selected locations to reduce the nitrogen and phosphorous pollutant loading from existing developments that

currently have no water quality treatment. This action should be performed in conjunction with actions identified under Objectives A3 and A4.

MONITOR: Track development and implementation of new BMPs or retrofit BMPs under actions A3.6, A3.7, A3.8m and A4.1

TARGET: The pollutant reduction from the BMP retrofits and new BMPs was quantified in the watershed model. See Table 4.4 for the pollutant removal percentages for all of the proposed actions for TSS, TP, and TN.

Action C2.3: Perform additional water quality monitoring and conduct a macroinvertebrate and aquatic plant survey of South Little Hunting Creek, such as where it discharges into the Potomac and other locations in the main stem of Little Hunting Creek, in the future to get more information concerning the water quality in the tidal portion of the creek.

MONITOR: Benthic invertebrates to indicate habitat quality and hydric and submerged vegetation for types and percentages indigenous species

TARGET: Significant improvement (or rating change) from baseline condition (e.g. fair to good).

Action C2.4: Investigate and identify locations of possible illicit discharges from commercial and residential activities such as car repair and painting. Take enforcement action to stop the identified illicit discharges.

MONITOR: Number and locations of illicit discharges (beginning with those identified in the watershed plan) and number and type of enforcement actions

TARGET: 100% of illicit discharges stopped.

Action C2.5: The county and community groups should educate the public on ways to reduce the amount of pollutants in stormwater runoff.

MONITOR: Number of residents requesting technical assistance and development and distribution of educational materials

TARGET: 10% of property owners requesting or receiving technical assistance to manage yards/properties.

Action C3.1: The county and community should engage the U.S. Army Corps of Engineers, Virginia Marine Resources Commission, and Virginia DEQ to investigate the extent and concentrations of chlordane and PCB contamination and to aid in the restoration of water quality for the tidal portions of Little Hunting Creek (Map No. SLHC14). The feasibility of remediation will be evaluated, and at a minimum, activities that may suspend the contaminants will be restricted.

MONITOR: Extent and concentrations of PCBs and chlordane in sediments and fish

TARGET: Complete the study by FY 2008 and mitigate the PCBs and chlordane by FY 2029.

Action D1.1: The county and community groups should partner to clean up trash, woody debris that impairs stream flow, and dumpsites at several locations in the watershed.

MONITOR: Number of linear feet of streams cleaned (cleanup locations are shown on Map 4.1 at NLHC18, PSB11, and NB6) and/or tons of trash removed each year and percentage change from year to year, and number of people participating in cleanup activities each year

TARGET: Cleanup of trash and dumpsites by FY 2009 and reduction in pounds of trash picked up per year by 70%.

Action D1.2: Conduct a vigorous public information campaign, including installing signs throughout the watershed, and coordinate with community groups to deter littering and the dumping of trash. Posted signs could indicate information such as stream names, watershed boundaries, public access areas to creeks, and areas where dumping is prohibited. They should also encourage and support recycling and storm drain stenciling. The information campaign should also inform the public on the proper disposal of litter and trash and consequences of violation of county ordinances.

MONITOR: Number and locations of educational signs and stencils and number of illegal dumping reports received by the county

TARGET: Install educational signs and stencils by FY 2008, and reduce the number of illegal dumping reports received by 50%.

Action D2.1: Create and administer a new small grant program to sponsor volunteer community groups in watershed stewardship and restoration activities.

MONITOR: Number of residents requesting grants for watershed stewardship activities and types of projects implemented

TARGET: Five watershed stewardship projects initiated each year.

Action D2.2: Create a brochure to describe the Little Hunting Creek Watershed Management Plan and explain what homeowners and businesses in the watershed can do to improve the streams in the watershed. Create brochures for homeowners and businesses to provide information on how they can specifically help reduce peak flows in the Little Hunting Creek Watershed.

MONITOR: Number of watershed brochures distributed

TARGET: 500 watershed brochures distributed each year with success indirectly measured by increased participation in watershed plan activities.

Action D2.3: Establish a county liaison to help coordinate watershed education in schools and encourage school participation in developing and caring for county restoration projects.

MONITOR: Designation of county liaison and number of schools participating in school restoration projects

TARGET: County liaison established by FY2007, and at least two schools in the watershed participating in restoration projects each year.

Action D3.1: The Little Hunting Creek Steering Committee should help form a community organization for the Little Hunting Creek Watershed.

MONITOR: Formation of community watershed organization

TARGET: Residents/businesses from each subwatershed participating in the organization and related watershed activities. An indirect measure is successful tracking and implementation of the watershed plan.

(Footnotes)

[1] Stream Attributes Crediting Methodology: Impact and Compensation Reaches. Norfolk District Corps of Engineers Regulatory Branch.

[2] The implementation dates are target time frames subject to county funding approval and updates to the watershed plan.

[3] Actions A3.1and A3.11, described in Chapter 5 as "policy" recommendations, would be implemented as capital projects. Since the projects are subject to the policy review process, no fixed start date can be proposed at this time.

[4] Action D1.3, described in Chapter 5 as a "policy" recommendation, would be implemented as a capital project. Since the project is subject to the policy review process, no fixed start date can be proposed at this time.

Figure 4.1 Implementation Timeline

ID	Map No.	CIP No.	Project Description	Cost
1	N/A	LH9972	Community Watershed Support Services Project: A4.2, B1.2, D3.1	$1,000,000.00
2	N/A	LH9982	North Little Hunting Creek Residential Rain Barrel and Rain Garden: A4.1	$40,000.00
3	N/A	LH9983	Paul Spring Branch Residential Rain Barrel and Rain Garden: A4.1	$60,000.00
4	N/A	LH9984	North Branch Rain Barrel and Rain Garden: A4.1	$70,000.00
5	N/A	LH9977	Dumpsite Removal Project: D1.1	$200,000.00
6	PSB1	LH9855	New Commercial LID at 6700 Richmond Highway	$610,000.00
7	PSB8	LH1945	Retrofit BMP at 1909 Windmill Lane	$60,000.00
8	NB11	LH9143	New BMP at 7603 Elba Road	$240,000.00
9	PSB25	LH9154	New BMP at 3223 Groveton Street	$240,000.00
10	N/A	LH9973	Public Education Project: B3.5, C2.5, D1.2, D2.2 , D2.3	$1,440,000.00
11	PSB2	LH9828	New Comm./Instit. LID at Various Churches and the Bucknell Elementary School	$520,000.00
12	NLHC23	LH9140	New BMP at Mount Vernon Square Townhomes	$110,000.00
13	PSB31	LH9168	New BMP at 2223 Beacon Hill Road	$140,000.00
14	NLHC16	LH9138	New BMP at 2313 Darius Lane	$130,000.00
15	NLHC21	LH9871	New School LID at the Hybla Valley Elementary School and the Bryant High School	$250,000.00
16	NLHC17	LH9137	New BMP at 3431 Lockheed Boulevard	$110,000.00
17	PSB32	LH9156	New BMP at 6950 Richmond Highway	$600,000.00
18	NLHC1	LH9139	New BMP at 7201 Richmond Highway	$430,000.00
19	NLHC20	LH9144	New BMP at 2709 Popkins Lane	$260,000.00
20	PSB24	LH9153	New BMP at 6625 Lenclair Street	$240,000.00
21	N/A	LH9979	Sediment Monitoring/Stream Physical Assessment/Monitoring Project: B2.2, C2.3	$200,000.00
22	N/A	LH9980	Small Watershed Grant Program: D2.1	$460,000.00
23	N/A	LH9978	Buffer Monitoring Project: B1.3	$345,000.00
24	N/A	LH9981	Street Sweeping Program: C1.2	$460,000.00
25	N/A	LH9974	Conservation Acquisition Project: B2.3, B3.3	$200,000.00
26	NLHC9	LH9819	New Commercial LID along Richmond Highway	$590,000.00
27	N/A	LH9986	Fecal Coliform Source Study Project: C2.1	$320,000.00
28	PSB29	LH9147	New BMP at 1600 Paul Spring Road	$260,000.00
29	N/A	LH9985	Wetlands Survey Project: B3.1	$320,000.00
30	N/A	LH9987	PCB Contamination Study Project: C3.1	$30,000.00
31	NB1	LH9111	New School LID at Whitman M.S., Hollin Meadows E.S., and Stratford Landing E.S.	$580,000.00

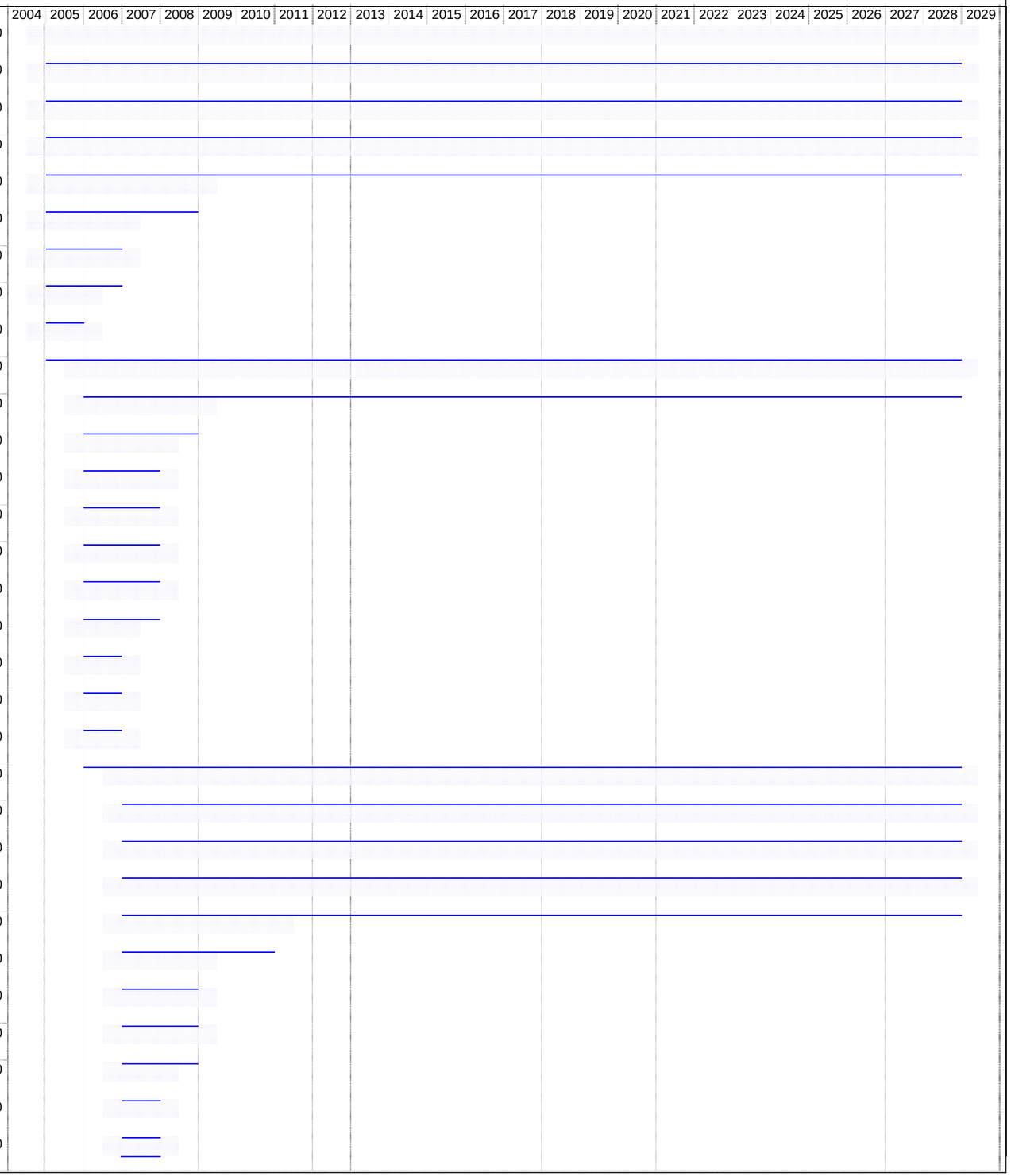

Figure 4.1 Implementation Timeline

ID	Map No.	CIP No.	Project Description	Cost
32	NB14	LH9116	New BMP at 8200 West Boulevard Drive, and 1138, 1200, 1204, and 1208 Cedar Dale Lane	$160,000.00
33	PSB30	LH9150	New BMP at 7509 Fort Hunt Road	$210,000.00
34	NB12	LH9142	New BMP at 2500 Woodlawn Terrace	$200,000.00
35	PSB26	LH9165	New BMP at 2501 Beacon Hill Road	$150,000.00
36	PSB4	LH9132	Retrofit BMP at 7628 Essex Manor Place	$110,000.00
37	NLHC24	LH9141	New BMP at the Mount Vernon Square Apartments at 2722 Arlington Drive	$170,000.00
38	PSB7	LH9152	Retrofit BMP at 7116 Fort Hunt Road	$110,000.00
39	PSB15	LH9264	Stream Restoration at Paul Spring Branch	$2,620,000.00
40	N/A	LH9988	Dredging Feasibility Study Project: C1.1	$510,000.00
41	NB13	LH9126	New BMP at 2500 Parkers Lane	$150,000.00
42	NB2	LH9125	Retrofit BMP at 8033 Holland Road	$250,000.00
43	NLHC11	LH9320	Buffer Restoration at North Little Hunting Creek	$400,000.00
44	NLHC14	LH9234	Stream Restoration at North Little Hunting Creek	$350,000.00
45	NLHC19	LH9136	New BMP at the Grove at Huntley Meadows	$210,000.00
46	NLHC4	LH9122	Retrofit BMP at 3115 Sherwood Hall Lane	$30,000.00
47	NLHC6	LH9117	Retrofit BMP at 3742 Roxbury Lane	$70,000.00
48	PR2	LH9706	Wetland Restoration at Various Locations	$200,000.00
49	PR3	LH9812	New School LID at the Waynewood Elementary School	$80,000.00
50	PSB14	LH9331	Buffer Restoration at Paul Spring Branch	$30,000.00
51	PSB27	LH9166	New BMP at 6925 University Drive	$100,000.00
52	PSB28	LH9167	New BMP at 2424 Ross Street	$70,000.00
53	PSB9	LH9748	New Wetland BMP at Paul Spring Branch	$230,000.00
54	SLHC11	LH9708	Wetland Restoration at Martin Luther King Jr. Park	$390,000.00
55	SLHC17	LH9790	Wetland Restoration at the Main Stem of Little Hunting Creek	$230,000.00
56	SLHC3	LH9804	New School LID at the Fort Hunt Elementary School	$270,000.00
57	SLHC6	LH9301	Buffer Restoration at South Little Hunting Creek	$20,000.00
58	SLHC7	LH9305	Buffer Restoration at South Little Hunting Creek	$40,000.00
59	NB3	LH9114	Retrofit BMP at 8306 Rampart Court	$60,000.00
60	NB7	LH9227	Stream Restoration at North Branch	$390,000.00
61	NB9	LH9115	Retrofit BMP at 8225 Stacey Road	$90,000.00
62	NLHC12	LH9235	Stream Restoration at North Little Hunting Creek	$800,000.00

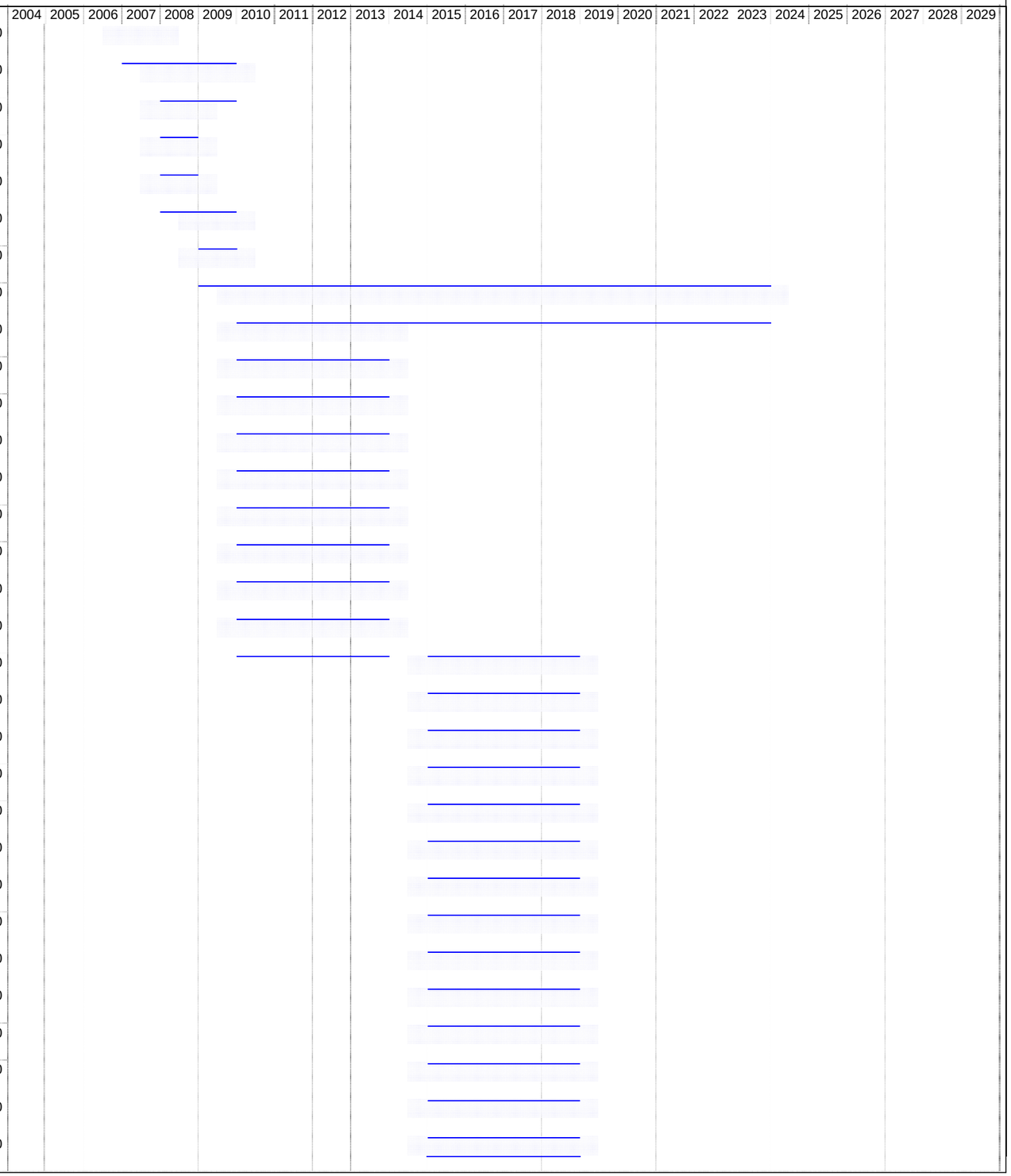

Figure 4.1 Implementation Timeline

ID	Map No.	CIP No.	Project Description	Cost
63	NLHC15	LH9218	Stream/Buffer Restoration at North Little Hunting Creek	$820,000.00
64	NLHC2	LH9121	Retrofit BMP at 7770 Richmond Highway	$90,000.00
65	NLHC5	LH9124	Retrofit BMP at the Village at Gum Springs Townhomes	$110,000.00
66	PSB10	LH9751	New Wetland BMP Paul Spring Branch at Fort Hunt Road	$200,000.00
67	PSB3	LH9159	Retrofit BMP at 7008 Bryant Towne Court	$50,000.00
68	PSB5	LH9157	Retrofit BMP at 2923 Preston Avenue	$60,000.00
69	PSB6	LH9158	Retrofit BMP at 6733 Richmond Highway	$70,000.00
70	SLHC5	LH9204	Stream Restoration at South Little Hunting Creek	$560,000.00
71	SLHC9	LH9203	Stream Restoration at South Little Hunting Creek	$230,000.00
72	NB10	LH9113	Retrofit BMP at Noral Place	$30,000.00
73	NB4	LH9109	Retrofit BMP at 8306 Marble Dale Court	$80,000.00
74	NB5	LH9110	Retrofit BMP at 8313 Riverton Lane	$90,000.00
75	NB8	LH9270	Stream Restoration at North Branch	$110,000.00
76	NLHC13	LH9233	Stream Restoration at North Little Hunting Creek	$150,000.00
77	NLHC3	LH9123	Retrofit BMP at 7836 Fordson Road	$60,000.00
78	PSB12	LH9360	Buffer Restoration at Paul Spring Branch	$20,000.00
79	PSB13	LH9230	Stream Restoration at Paul Spring Branch	$1,370,000.00
80	PSB16	LH9263	Stream Restoration at Paul Spring Branch	$100,000.00
81	PSB17	LH9249	Stream Restoration at Paul Spring Branch	$40,000.00
82	PSB18	LH9229	Stream Restoration at Paul Spring Branch	$100,000.00
83	PSB19	LH9262	Stream Restoration at Paul Spring Branch	$100,000.00
84	PSB20	LH9269	Stream Restoration at Paul Spring Branch	$100,000.00
85	PSB23	LH9146	Retrofit BMP at 2002 Windmill Lane	$80,000.00
86	SLHC16	LH9100	Retrofit BMP at Woodland Heights	$60,000.00
87	SLHC4	LH9207	Stream Restoration at South Little Hunting Creek	$200,000.00
88	SLHC8	LH9302	Buffer Restoration at South Little Hunting Creek	$150,000.00
89	N/A	LH9975	Inspection Enhancement Project: A3.1 (Start date unknown)	$200,000.00
90	N/A	LH9976	Enforcement Enhancement Project: C2.4, D1.3 (Start date unknown)	$1,920,000.00
91	N/A	LH9989	Stormwater Infrastructure Condition Assessment A3.11 (Start date unknown)	$216,000.00