Chapter 6
Dead Run

6.1 Watershed Condition

The Dead Run Watershed has an area of approximately 1,922 acres as shown on Map 6.1. Of this 1,922 acres, there are 186 acres draining directly to the Potomac River via an unnamed tributary, which has been added to the Dead Run watershed area to facilitate planning. It is bounded to the west by Balls Hill Road and I-495; to the east by Old Chain Bridge Road and Ridge Drive; to the south by Chain Bridge Road; and to the north by the Potomac River.

The county initiated a Stream Physical Assessment (SPA), described in detail in Section 2.5.10, for all of its watersheds in August 2002 to systematically characterize the existing conditions of stream corridors. This data has provided invaluable details of the conditions of streams as a "snap-shot" in time. However, it is recognized that conditions are changing and in some cases, may have changed significantly since the initial SPA was conducted. Due to the dynamic nature of streams as they adjust to the continual impact of development, it is believed that reassessment of physical conditions will be needed to determine the exact need before the implementation of any recommended projects.

The overall condition of the watershed, as determined during the SPA, is summarized as follows.

Dead Run Watershed Condition Summary

- **Current imperviousness = 25 percent for the area draining to Dead Run and to the Potomac River Tributary, with a majority being medium density residential land use.**
- **Future imperviousness = 29 percent for the area draining to Dead Run and to the Potomac River Tributary.**
- **All 24 crossings have "minor to moderate" impacts.**
- **There are 48 BMPs in this watershed.**
- **The majority of the habitat quality is fair with inadequate buffers.**
- **The entire assessed stream length is actively widening and the impact of erosion was observed as "moderate to severe" at three locations.**
- **Two obstruction locations have "moderate to severe" impacts.**
- **One trash dumpsite was observed.**

6.1.1 Watershed Characteristics

The headwaters of the Dead Run main stem begin near Pathfinder Lane and the stream

continues through the McLean Central Park, which is located near the intersection of Old Dominion Drive and Dolley Madison Boulevard. The stream then passes through the Dead Run Stream Valley Park and continues until it discharges to the Potomac River. The headwaters for a major tributary of Dead Run are located near the Dominican Retreat and Evans Farm pond and flow into Dead Run at McLean Central Park. Dead Run flows from south to north throughout the watershed. The length of Dead Run from its headwaters to its outfall at the Potomac River is approximately three miles.

Several major unnamed tributaries contribute significant runoff and drainage area to Dead Run. One small 1,100-foot stream drains directly to the Potomac River and is included in the watershed for planning purposes. The terrain in the watershed is moderate with land elevations ranging from 260 to 270 feet in the southern part to elevations of 55 to 85 feet in the northern part. Dead Run has a low-gradient slope of 1.20 percent.

6.1.2 Existing and Future Land Use

Land use in the watershed is predominantly medium-density residential, with low-density residential and low-intensity commercial throughout the downstream portions of the watershed. The existing and future land use in the Dead Run Watershed are described in Table 6.1. Medium-density residential land use currently comprises 28 percent of the watershed area. There are currently 265 acres of open space, parks, and recreational areas in the Dead Run Watershed, which account for approximately 14 percent of the existing land use. The parks and recreational areas in the Dead Run Watershed include Langley Oaks Park, Churchill Road Park, Dead Run Stream Valley Park, and McLean Central Park. There are 53 acres that are currently vacant or undeveloped and 42 acres that are currently underutilized. Undeveloped and underutilized parcels comprise five percent of the watershed area and vacant parcels are primarily zoned as low-density and medium-density residential land use. The U.S. Fish and Wildlife Service National Wetlands Inventory shows that there are 0.62 acres of wetlands in this watershed.

Table 6.1 Dead Run Watershed Land Use

Land Use Description[1]	Land Use			
	Existing		Future	
	Area (Acres)	%	Area (Acres)	%
Dead Run				
Open space, parks, and recreational areas	125	7%	123	7%
Estate residential	85	5%	15	1%
Low-density residential	438	25%	428	25%
Medium-density residential	521	30%	661	38%
High-density residential	80	5%	91	5%
Low-intensity commercial	156	9%	125	7%
High-intensity commercial	21	1%	36	2%
Industrial	2	0%	1	0%

Land Use Description[1]	Land Use			
	Existing		Future	
	Area (Acres)	%	Area (Acres)	%
Other	0	0%	0	0%
Unknown	2	0%	2	0%
Vacant/Undeveloped	53	3%	0	0%
Road right-of-way (including shoulder areas)	254	15%	254	15%
TOTAL	1,737	100%	1,737	100%
Unnamed Tributary to the Potomac River				
Open space, parks, and recreational areas	140	75%	140	75%
Estate residential	12	6%	0	0%
Low-density residential	20	11%	32	17%
Medium-density residential	10	6%	10	6%
High-density residential	0	0%	0	0%
Low-intensity commercial	0	0%	0	0%
High-intensity commercial	0	0%	0	0%
Industrial	0	0%	0	0%
Other	0	0%	0	0%
Unknown	0	0%	0	0%
Vacant/Undeveloped	0	0%	0	0%
Road right-of-way (including shoulder areas)	4	2%	4	2%
TOTAL	186	100%	186	100%
TOTAL for Dead Run Watershed	**1,922**	**100%**	**1,922**	**100%**

[1]The land use categories presented here are for watershed planning purposes only and were used to determine the impervious cover in the area.

The current impervious area in this watershed is 25 percent of the total area. In the future, under ultimate build out conditions, it is anticipated that estate residential land use will be replaced by low-density and medium-density residential development and the future imperviousness is predicted to increase to 28 percent. In addition to the predicted changes in land use, mansionization will increase the amount of impervious area in the watershed by 18.3 acres, increasing total future imperviousness to 29 percent.

Impervious area measures the amount of hard surfaces such as roofs, roadways and sidewalks which impede rainwater from percolating into the ground. Increases in impervious area allow runoff to flow directly into the streams in larger quantities, often causing downstream flooding and stream deterioration, including instream erosion. When watershed imperviousness reaches ten percent, stream quality begins to decline with poor water quality, alteration of the stream channel, and degraded plant and animal habitat becoming apparent.

The *Fairfax County Comprehensive Plan* for land use in the Dead Run Watershed calls for the redevelopment of the McLean Community Business Center (CBC), which is a large community shopping, service, and residential area centered at the intersection of Chain Bridge Road and Old Dominion Drive. The *Comprehensive Plan* also includes future

transportation improvements such as widening roadways, improving interchanges, and adding new trails throughout the Dead Run Watershed. The improvements are described in more detail below.

The planned roadway and interchange improvements for the Dead Run Watershed include:

- Improving Balls Hill Road between Lewinsville Road and Georgetown Pike.
- Widening and improving Elm Street and Beverly Road to four lanes.

The planned trails for the Dead Run Watershed include:

- The extension of the Potomac Heritage Trail along the George Washington Memorial Parkway along or close to the Potomac River.
- A major eight-foot-wide asphalt or concrete trail along Georgetown Pike, Old Dominion Drive, Chain Bridge Road, and Dolley Madison Boulevard.
- A bike lane along Old Dominion Drive and Balls Hill Road, connecting Georgetown Pike to Dolley Madison Boulevard.
- A minor four-foot- to eight-foot-wide asphalt or concrete trail along Balls Hill Road, Churchill Road, Pine Hill Road, Mackall Avenue, Kensington Road, Ingleside Avenue, and adding trails to McLean Central Park and Churchill Road Park.

6.1.3 Existing Stormwater Management

The headwaters of Dead Run originate from several storm drain pipe outfalls that drain the areas south of Old Dominion Drive. Storm drain systems that collect runoff from local street networks convey runoff from the majority of the watershed directly to Dead Run and its several small tributaries. The outfalls of these storm drain systems vary in size, ranging from ten inches to 48 inches in diameter. There are also several minor culverts and a 12-foot circular concrete culvert. Most segments of the outfall channels have been altered with concrete lining or with riprap bed and bank protection. The stream has minor to moderate erosion due to pipes with outfalls into the stream system. The locations of all pipe impacts are shown on Map 6.1.

Erosional impacts were also assessed for all roads, footbridges, and driveways that crossed the stream reaches evaluated in the SPA. Map 6.1 shows the location of the crossings and their erosional impacts on the streams. None of the 24 crossings evaluated in the SPA had a "severe to extreme" impact on the stream and one crossing had a "moderate to severe" impact as described below:

- Old Dominion Drive: Two four- by five-foot concrete box culverts located on an unnamed tributary to Dead Run cause a "moderate to severe" impact to the stream.

The county's list of master plan drainage projects shows that there are 11 identified projects in this watershed. Table 6.2 summarizes the type of master plan drainage project, project name/location, project cost and current project status.

Table 6.2 Dead Run Watershed Master Plan Drainage Projects

Type of Work	Project Name/Location	Old Project Number	Cost	Status
Stream stabilization	Whann Avenue	DE201	$196,700	Incorporated into DE9204.
Stream stabilization	Hampshire Avenue	DE202	$526,471	Partially incorporated into DE9303.
Stream restoration and stabilization	Kyleakin Court	DE203	N/A	Incorporated into DE9244.
Stream stabilization	The Cloisters (near Holsing Lane)	DE211	$345,958	Incorporated into DE9244.
Replace culvert	Ingleside Avenue (near Churchill Road) Phase II	DE214	$270,952	Incorporated into DE9244.
Replace culvert, stream stabilization	Mackall Avenue	DE401	$272,595	Incorporated into DE9204.
Replace culvert	West McLean Subdivision at Georgetown Pike	DE402	$266,403	Incorporated into DE9204.
Add culvert	Georgetown Pike	DE411	$679,553	Keep as CIP project.
Replace culvert	Capital View Court	DE412	$138,785	Keep as CIP project.
Replace culvert	Earnestine Street	DE413	$96,064	Keep as CIP project.
250' storm sewer	Enterprise Avenue	N/A	$35,270	Neighborhood Stormwater Improvement Area DE9836 will determine if this work is necessary. Keep as CIP project.

The county's Maintenance and Stormwater Management Division (MSMD) tracks storm drainage problems as reported by county residents. According the MSMD data, 25 drainage complaints from 24 households regarding flooding and erosion were registered with the county. The locations of these complaints are shown on Map 6.1. Projects were not added for all MSMD complaints; only for the serious complaints where a project was warranted.

According to the county's MSMD BMP inspection database, there are 41 private and seven public stormwater management facilities located in the Dead Run Watershed. The majority of private facilities are located in the southern part of the watershed, while public facilities are located mostly in the northern part. The area served by stormwater management facilities in this watershed is 294 acres out of the total area of 1,922 acres, or 15 percent of the watershed. The types of facilities listed in the MSMD database are described in Table 6.3. The facilities in the table are shown on Map 6.1 along with some additional stormwater management facilities that are in the county's Stormnet GIS database. The Stormnet database does not have as much detailed information as the MSMD database, so the type of facility could not be determined for these additional sites.

Table 6.3 Dead Run Watershed Stormwater Management Facilities

Type of Facility	Number of Facilities	
	Privately owned	Publicly owned
Bioretention	-	1
Dry pond	2	5
Manufactured BMP	-	-
Parking lot	-	-
Roof top detention	16	-
Sand filter	1	-
Infiltration Trench	8	-
Underground	13	1
Wet pond	1	-
Total	**41**	**7**

Note: The source of data for this table was the MSMD database.

6.1.4 Stream Geomorphology

The majority of the soil types in the watershed exhibit characteristics of hydrologic soil group B. The hydrologic soil group classifications of A, B, C, and D describe the soil's runoff potential and are based on the characteristics of soil texture, permeability, and infiltration rate. Hydrologic soil group B soils are classified as having moderate infiltration rates and tend to soak up more water and have less runoff than many of the other soil groups.

The geomorphology of the stream segments of Dead Run and its tributaries can be summarized as shown below. More information about the Channel Evolution Model (CEM) used to classify the watersheds is in Section 2.5.10 of Chapter 2.

- The dominant substrate in the majority of stream segments is gravel; however, the stream beds of the downstream reaches of Dead Run consist mainly of bedrock.
- The majority of reaches are of CEM type 3, referring to nearly vertical stream bank slopes, active widening and accelerated bend migration.

Map 6.2 shows the stream segment CEM type in the watershed. Fallen trees and debris obstructing the flow were observed at two locations along Dead Run. The impact of this debris on the stream was moderate to severe. Only one dumpsite was identified during the SPA and it has a severe to extreme impact on the stream. The dumpsite is located east of Kyleakin Court and consists of lawn waste such as leaves and grass.

6.1.5 Stream Habitat and Water Quality

The Virginia Department of Environmental Quality does not perform water quality monitoring of Dead Run and there are no volunteer water quality monitoring sites in the Dead Run Watershed.

The Fairfax County Health Department monitored stream water quality at one sampling site in the Dead Run Watershed, located approximately 0.5 mile upstream of the George Washington Memorial Parkway. In 2002, water samples were collected from this site and evaluated for fecal coliform, dissolved oxygen, nitrate nitrogen, pH, phosphorous,

temperature, and heavy metals. These parameters indicate the amount of non-point source pollution contributed from manmade sources and help to evaluate the quality of the aquatic environment. The sample testing found that for fecal coliform, 67 percent of the samples had fecal coliform counts greater than 400/100 ml. The maximum fecal coliform count of all the samples was 1300/100 ml. The dissolved oxygen was an average of 8.8 mg/l, which was lower than the values for Scotts Run, Bull Neck Run, Turkey Run, and Pimmit Run. The average nitrate nitrogen was 1.5 mg/l and the average total phosphorus was 0.1 mg/l. The pH value was close to 7.0 for the samples. The heavy metals were found to be at acceptable levels and well below contaminant levels. Approximately 190 acres of Dead Run Watershed, or ten percent, are served by on-site sewage disposal systems. Most of these areas are in the northern part of the watershed in the Langley Forest, Park View Hills and River Oaks Neighborhoods. Properties with on-site sewage systems are shown on Map 6.2, but this information is based on the best available data only and may not be completely accurate.

The *Fairfax County Stream Protection Strategy (SPS) Baseline Study* from January 2001 evaluated the quality of streams throughout the county. Dead Run received a "very poor" composite site condition rating. The rating was based on environmental parameters such as an index of biotic integrity, stream physical assessment, habitat assessment, fish taxa richness, and percent imperviousness. In the *SPS Baseline Study*, Dead Run was classified as a Watershed Restoration Level II area with the goals of maintaining areas to prevent further degradation and implementing measures to improve water quality and comply with Chesapeake Bay initiatives, TMDL regulations, and other water quality initiatives and standards.

The stream reaches of Dead Run have high gradient slopes and are classified as the riffle/run prevalent stream type. A riffle/run is an area in a stream where the water flow is rapid and usually shallower than the reaches above and below.

The habitat assessment for Dead Run and its tributaries, as determined from the *Fairfax County Stream Physical Assessment (SPA)*, can be summarized as follows:

- For less than 50 percent of the upstream reaches, at least four types of habitat such as cobble, large rocks, logs, and pool substrate were common
- In 50 percent of the downstream reaches and some portions of the upstream reaches, at least seven habitat types were common.
- Dominant substrate in the stream reaches is a mixture of gravel stones and bedrock.
- Sediment deposition is mainly gravel, sand and silt with 40 percent of the stream bottom affected in the downstream segments and 60 to 70 percent of the stream bottom affected in the upstream segments.
- Approximately 30 to 40 percent of the stream segments have minor alterations of the channel or banks. The downstream portions of Dead Run and the tributary that discharges directly to the Potomac River exhibit no channel disturbance.
- For most of Dead Run, the water fills approximately 70 percent of the available channel cross section during normal flow periods. This amount of water filling the channel allows for adequate aquatic habitat.
- A majority of the channel banks have approximately 70 percent vegetated cover with

few barren or sparsely vegetated areas.

- Sixty-one percent of Dead Run exhibits fair habitat quality and 20 percent exhibits good habitat quality as depicted on Map 6.2. Flows were observed in the stream channel for the majority of Dead Run and no head cuts were observed.
- The majority of the stream buffer is inadequate and consists of mainly lawn grass with a width of 50 to 100 feet. The locations of deficient buffer areas along the stream corridor for Dead Run are shown on Map 6.2. Thirty to fifty percent of the banks have erosional areas.

6.1.6 Problem Locations Identified During Public Forums

Problem locations were provided by the public at the Community Watershed Forum held on April 16, 2005, the Draft Plan Workshop on November 1, 2005, and by the Middle Potomac Watersheds Steering Committee. The problem locations were investigated and the observations are included in the following table. Map 6.1 shows the locations of the problems identified.

Table 6.4 Problem Locations Identified During Public Forums

Map ID	Description
DE1	Location: Dead Run at Pathfinder Lane Problem: Participants noted frequent and significant flooding of residential property at this location. Observation: We could not determine which property had significant flooding. Rock gabion baskets and concrete walls line the majority of the channel near Pathfinder Lane. There is some buffer vegetation adjacent to the channel on the east side. An unused street right-of-way upstream of this channel and owned by the county is proposed new BMP Project DE9132, which will help alleviate flooding.
DE2	Location: Downtown McLean Problem: Inadequate pipe infrastructure, pre-1993 development, no BMPs in place. Observation: Demonstration LID projects should be installed with the redevelopment of property. Neighborhood Stormwater Improvement Area DE9828 is in this location.
DE3	Location: McLean Central Park at the McLean Community Center. Problem: Trail erosion from overuse. Trail is in the floodplain. Observation: The trail is in the floodplain and some areas of the trail had erosion but it was not significant. The Frisbee golf area had ponded water. This issue will be addressed by Stream Restoration Project DE9244.
DE4	Location: Dead Run at Churchill Road Elementary School Problem: Impervious surface and pollution from the parking lot. Observation: The parking lot area did not look excessive. Churchill Road Park is located between the Churchill Road Elementary School and the Cooper Middle School. There are large areas of grass with no other vegetation such as shrubs and trees. This issue will be addressed by New LID project DE9814. A new parking area and addition were recently added that may have increased the problems at this location. The issues will still be addressed by the new LID project.

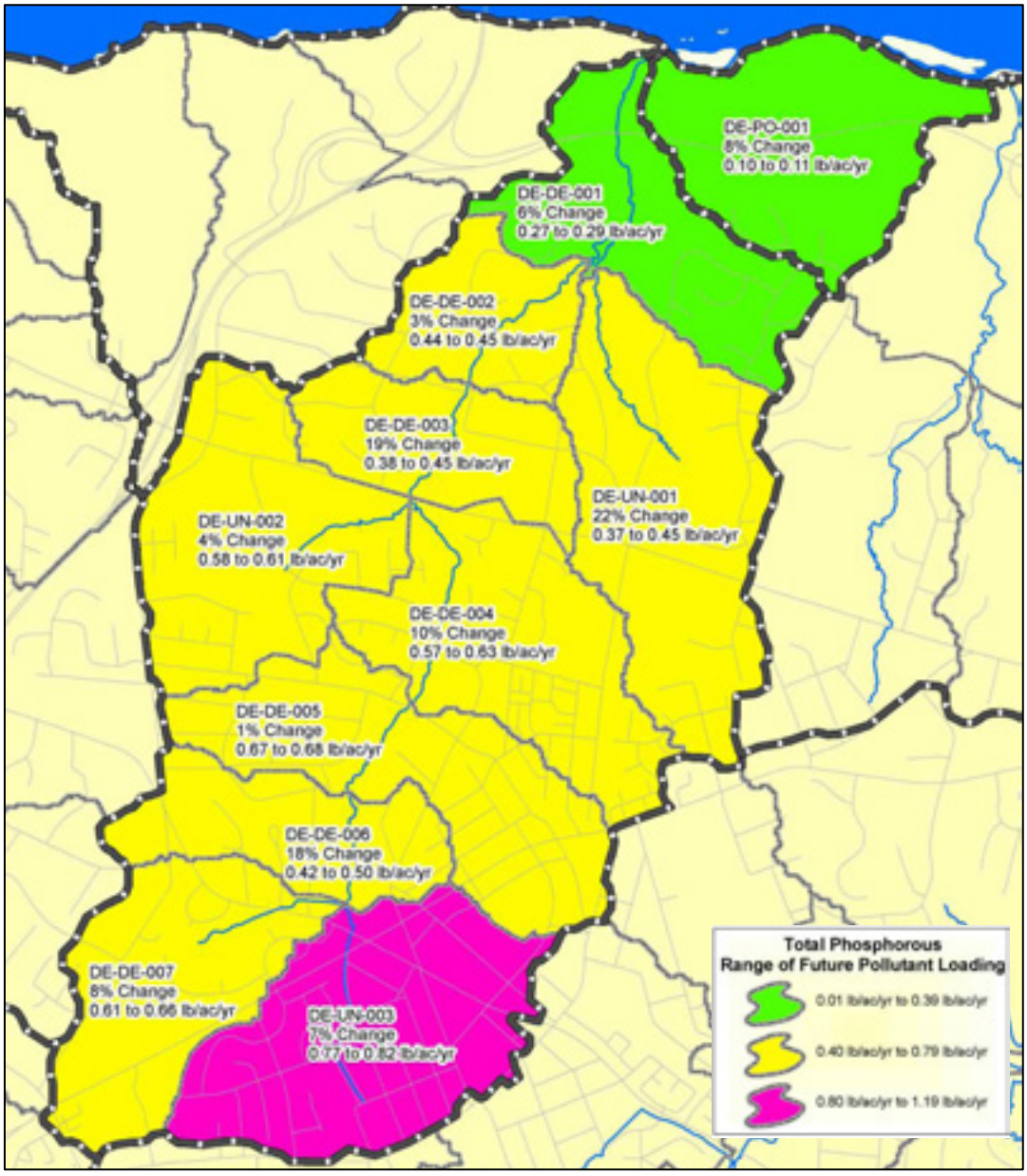
Map ID	Description
DE5	Location: Dead Run at Cooper Middle School. Problem: Impervious surface and pollution from parking lot impacting stream. Observation: There is a large parking lot at the school. Churchill Road Park is located between the Churchill Road Elementary School and the Cooper Middle School. There are large areas of grass with no other vegetation such as shrubs and trees. This issue will be addressed by New LID Project DE9813. Also a new addition has been recently added at this location, but the solution remains the same.
DE6	Location: Georgetown Pike near Dead Run Problem: Non-functioning storm drain. Observation: The ditches and pipes along Georgetown Pike that drain to Dead Run have some blockages with plant debris. This issue will be addressed by Project DE9408.
None – watershed wide	Location: Watershed wide Problem: Road expansions by the Virginia Department of Transportation are a source of excessive runoff in Dead Run. Observation: Roadway expansion with an increase of one acre or more of impervious surface is required to have a stormwater management facility.
None – watershed wide	Location: Evans Farm Development on Dolley Madison Boulevard at Evans Farm Drive Problem: Recent townhouse development at this site has created impacts downstream in Dead Run. Observation: Increases in runoff from the development are part of the larger problem within the watershed. These impacts should be helped by BMP Retrofit Project DE9130 at this location.
DE7	Location: Pond on the north side of Dolley Madison Boulevard adjacent to Evans Mill Road Problem: Brown color and excessive siltation in this pond could be the result of runoff from the Evans Farm Development. Observation: The pond is functioning as intended by trapping sediment. The sediment will need to be dredged in the future. This issue will be addressed by BMP Retrofit Project DE9130.
DE8	Location: Dead Run on Dominican Retreat property north of Dolley Madison Boulevard Problem: Erosion, sedimentation and channel instability are found throughout this stretch of Dead Run. One participant suggested that these problems are the result of runoff from Evans Farm, Dolley Madison Boulevard and other development in downtown McLean. Observation: The county's stream physical assessment determined that this portion of Dead Run is actively widening. This issue will be addressed by Stream Restoration Project DE9244.
None – watershed wide	Location: Watershed wide Problem: New development on Earnestine Street is a good example of old lots that have been redeveloped with much larger homes. Several homes on this street have been built right up to the lot lines, increasing the imperviousness on the sites significantly. Observation: The new larger houses are increasing the amount of imperviousness in the watershed. The average imperviousness for medium density single family homes is 24 percent.
DE9	Location: McLean Central Park Problem: Recent flooding in Dead Run seems to be coming from Earnestine Street rather than from the stream channel itself. Perhaps this is the result of recent build out on several residential properties. Observation: The cumulative effects of increased runoff from development were observed for all of Dead Run. Increases in runoff from the development along Earnestine Street are part of the larger problem within the watershed. This will be taken into account in Stream Restoration Project DE9244.

Map ID	Description
DE10	Location: Near the intersection of Churchill Road and Dead Run Drive, on the west side of the stream Problem: There is a lack of vegetated buffer between the houses and the stream. Observation: Stream Restoration Project DE9244 will help to restore the vegetated buffer next to the stream.
DE11	Location: 6952 Kyleakin Court, project DE9901 Problem: The homeowner is experiencing flooding and has a collection of court orders for their neighbor to cleanup or cease dumping in the RPA. Additional gabions plus bioengineering for higher volume runoff and greater attention to enforcement of violations were suggested. The participant noted fifteen years of personal records and court orders on violations, but has received no response from the county. Observation: Action C2.4 recommends better enforcement of anti-dumping regulations.
DE12	Location: Near project DE9204, at 847 Whann Avenue Problem: There is consistent and serious uncontrolled stormwater runoff and flow from culverts into the yard. The homeowners have spent money to try to mitigate this problem without success. Observation: Infrastructure Improvement Project DE9438 will address this problem.

6.1.7 Modeling Results

Hydrologic, hydraulic, and water quality models were developed for the Dead Run Watershed to simulate the generation of runoff, how the runoff is transported downstream, and the amount of pollutants in the runoff and stream flow. The hydrologic and water quality models include the entire Dead Run Watershed, which consists of the area draining to Dead Run and a smaller area draining directly to the Potomac River. Eleven subbasins were created for the model in order to provide more detail for the modeling results. The subbasins with the future total phosphorus loading are shown in Figure 6.1.

Figure 6.1 Dead Run Future Total Phosphorous Loading



6.1.7.1 Hydrology and Water Quality Modeling

In the hydrologic model, the current watershed imperviousness of 25 percent generates moderate peak runoff flows. Additional residential imperviousness caused by adding on to existing houses was added to the future land use impervious area in the hydrologic model. The predicted increase in peak flows for future development conditions may be attributed to the potential change from estate residential land use to medium-density residential land use. The projected future development of vacant parcels also contributes to the increase in flow volumes. Table 6.5 shows the cumulative peak runoff flows and the comparison between the peak flows for the existing and future land use conditions for the two- and ten-year

rainfall events.

Table 6.5 Dead Run Cumulative Peak Runoff Flows

Subbasin	Two-Year Rainfall Event			Ten-Year Rainfall Event		
	Existing Peak Flow (cfs)	Future Peak Flow (cfs)	% Peak Flow Increase	Existing Peak Flow (cfs)	Future Peak Flow (cfs)	% Peak Flow Increase
DE-DE-001	361	392	9%	722	780	8%
DE-DE-002	358	389	9%	694	752	8%
DE-DE-003	348	378	9%	635	690	9%
DE-DE-004	347	375	8%	625	677	8%
DE-DE-005	322	345	7%	580	625	8%
DE-DE-006	273	291	7%	482	515	7%
DE-DE-007	96	97	1%	169	172	2%
DE-PO-001	24	27	13%	59	63	7%
DE-UN-001	81	91	12%	141	158	12%
DE-UN-002	110	114	4%	194	203	5%
DE-UN-003	254	266	5%	458	482	5%

In the water quality model, the moderate levels of pollutants for both existing and future land use conditions can be attributed to the large amount of open space. The subbasins that drain to Dead Run have a predominant land use of medium density residential for both existing and future land use conditions. The predicted increase in pollutant loads can be attributed to the projected development of vacant parcels and the projected change in land use from estate residential land use to medium-density and low-density residential land use. However, not all of the pollutant loads increase in the future. For example, in Subbasin DE-DE-007, four parcels that are currently low-intensity commercial land use are predicted to change to medium-density residential land use, which causes a decrease in the copper and zinc pollutant loadings. Table 6.6 shows the comparison of the existing and future pollutant loading rates in pounds per acre per year for the Dead Run Watershed.

Table 6.6 Dead Run Pollutant Loads

Pollutants		Dead Run Subbasins										Potomac Tributary
		DE-DE-001	DE-DE-002	DE-DE-003	DE-DE-004	DE-DE-005	DE-DE-006	DE-DE-007	DE-UN-001	DE-UN-002	DE-UN-003	DE-PO-001
BOD5	Existing (lb/ac/yr)	8.5	10.7	10.5	25.8	30.4	16.7	29.3	10.2	23.8	37.1	3.4
	Future (lb/ac/yr)	9.2	11.2	14.1	30.2	31.5	21.0	32.6	12.5	25.5	42.7	3.7
	% Load Increase	8%	5%	34%	17%	4%	26%	11%	23%	7%	15%	9%
COD	Existing (lb/ac/yr)	50.3	60.0	59.5	166.3	178.7	96.8	196.2	57.8	137.8	204.4	21.2
	Future (lb/ac/yr)	54.1	62.5	79.7	192.8	183.6	120.9	215.3	70.1	147.4	239.5	23.1
	% Load Increase	8%	4%	34%	16%	3%	25%	10%	21%	7%	17%	9%

Pollutants		Dead Run Subbasins										Potomac Tributary
		DE-DE-001	DE-DE-002	DE-DE-003	DE-DE-004	DE-DE-005	DE-DE-006	DE-DE-007	DE-UN-001	DE-UN-002	DE-UN-003	DE-PO-001
TSS	Existing (lb/ac/yr)	29.3	32.3	32.6	90.1	102.5	61.2	100.1	32.5	101.9	133.3	12.3
	Future (lb/ac/yr)	31.4	33.6	43.4	105.1	104.6	74.7	98.2	38.9	107.7	141.1	13.4
	% Load Increase	7%	4%	33%	17%	2%	22%	-2%	20%	6%	6%	9%
TDS	Existing (lb/ac/yr)	46	44	45	122	134	82	137	45	119	162	23
	Future (lb/ac/yr)	49	45	58	140	138	99	141	51	126	178	26
	% Load Increase	7%	2%	29%	15%	3%	21%	3%	13%	6%	10%	13%
DP	Existing (lb/ac/yr)	0.19	0.31	0.27	0.41	0.48	0.30	0.44	0.26	0.41	0.54	0.07
	Future (lb/ac/yr)	0.20	0.32	0.32	0.45	0.48	0.35	0.48	0.32	0.43	0.59	0.07
	% Load Increase	5%	3%	19%	10%	0%	17%	9%	23%	5%	9%	0%
TP	Existing (lb/ac/yr)	0.27	0.44	0.38	0.57	0.67	0.42	0.61	0.37	0.58	0.77	0.10
	Future (lb/ac/yr)	0.29	0.45	0.45	0.63	0.68	0.50	0.66	0.45	0.61	0.82	0.11
	% Load Increase	7%	2%	18%	11%	1%	19%	8%	22%	5%	6%	10%
TKN	Existing (lb/ac/yr)	1.5	2.3	2.0	3.3	3.8	2.4	3.5	2.0	3.4	4.4	0.5
	Future (lb/ac/yr)	1.6	2.4	2.4	3.6	3.8	2.9	3.9	2.4	3.5	4.7	0.6
	% Load Increase	7%	4%	20%	9%	0%	21%	11%	20%	3%	7%	20%
TN	Existing (lb/ac/yr)	1.99	3.09	2.72	4.58	5.33	3.30	4.97	2.69	4.73	6.31	0.72
	Future (lb/ac/yr)	2.09	3.19	3.27	5.10	5.38	3.92	5.30	3.25	4.94	6.78	0.78
	% Load Increase	5%	3%	20%	11%	1%	19%	7%	21%	4%	7%	8%
Cadmium ($x 10^{-4}$)	Existing (lb/ac/yr)	2.1	2.4	2.1	3.3	3.7	2.8	3.5	2.2	3.1	4.0	1.1
	Future (lb/ac/yr)	2.1	2.4	2.5	3.6	3.9	3.1	3.7	2.4	3.2	4.3	1.2
	% Load Increase	0%	0%	19%	9%	5%	11%	6%	9%	3%	8%	9%
Copper ($x 10^{-3}$)	Existing (lb/ac/yr)	6.3	5.4	5.9	34.1	28.9	15.1	43.5	6.2	32.5	36.4	2.7
	Future (lb/ac/yr)	6.6	5.6	7.4	38.1	29.1	17.3	38.4	7.0	33.6	38.6	3.0
	% Load Increase	5%	4%	25%	12%	1%	15%	-12%	13%	3%	6%	11%
Lead ($x 10^{-3}$)	Existing (lb/ac/yr)	2.2	1.9	1.9	4.7	5.6	3.5	5.2	1.9	4.3	7.0	1.2
	Future (lb/ac/yr)	2.3	1.9	2.4	5.4	6.0	4.1	5.5	2.1	4.6	7.9	1.4
	% Load Increase	5%	0%	26%	15%	7%	17%	6%	11%	7%	13%	17%
Zinc ($x 10^{-2}$)	Existing (lb/ac/yr)	3.3	3.1	3.3	12.9	13.1	8.0	14.9	3.4	16.9	18.7	1.3
	Future (lb/ac/yr)	3.5	3.2	4.3	14.8	13.2	9.4	12.7	4.0	17.5	18.3	1.4
	% Load Increase	6%	3%	30%	15%	1%	18%	-15%	18%	4%	-2%	8%

6.1.7.2 Hydraulic Modeling

The hydraulic model includes the portion of Dead Run from the confluence of the main stem with the southern and southwestern tributaries to the confluence of the main stem with the Potomac River. The existing conditions hydraulic model results show that the peak discharge from the two-year rainfall event is contained within the main channel banks for most of the modeled length of Dead Run and that all three modeled crossings are overtopped by the 100-year rainfall event, but not the ten-year rainfall event. Also there is minor overtopping

of the banks where there are adjacent and connected floodplains. The future land use conditions are nearly the same as the existing land use conditions, so the hydraulic modeling results for the future conditions are fairly consistent with the model results for the existing conditions. However, the ten and 100-year rainfall events overtop the two circular culverts at Benjamin Street and the one circular culvert at Georgetown Pike under the future land use conditions. The bridge at Churchill Road is still only overtopped by the 100-year rainfall event.

The majority of the 100-year event is not contained within the main channel banks indicating that the floodplains are utilized where they are connected to the stream channel. Floodplains play an important role in reducing flow velocities and it is important that streams remain connected with them wherever possible. Three crossings were included in the hydraulic model and the model results show flooding at the crossings during the 100-year storm event. The majority of the 100-year floodplains in the modeled portions of Dead Run are smaller when compared to the county's 100-year floodplains, which indicates that the stream is experiencing downcutting due to increased flows. The hydraulic modeling results are consistent with the SPA findings that Dead Run is actively widening to establish a geometry that can accommodate existing increased flows. However, four properties have buildings that are located in the county's 100-year floodplain as described in the Flood Protection Project DE9637, described in Action A2.3 later in the chapter.

The velocities produced by the model for the two-year rainfall event in the Dead Run Watershed average approximately 4.9 ft/sec. The velocities are somewhat lower through the stream's upper portions and increase as the stream flows north to its confluence with the Potomac River. According to the county's SPA from 2002, no significant erosion was found along the stream banks in the bends or meanders of the entire modeled reach, which corresponds to the low velocities shown in the hydraulic model results. Please note that conditions in the stream may have worsened since the SPA was conducted due to new development in the watershed.

6.2 Management Plan Strategy

This section outlines proposed projects for the Dead Run Watershed and the locations of the projects in this section are shown on Map 6.3. The projects are organized by goal, objective and action as they were presented in Chapter 3.

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

Objective 1: Reduce stormwater volumes and velocities to minimize stream bank erosion.

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

A number of the BMP retrofit options described in Section 3.2.1 may be suitable for

implementation in the Dead Run Watershed. These options are:

1. Increasing detention storage
2. Modifying or replacing existing riser structures and/or outlet controls
3. Adding infiltration features
4. Modifying basins that are currently "short circuiting"
5. Redirecting runoff from additional drainage area
6. Adding water quality treatment
7. Planting buffer vegetation

Locations of existing stormwater management facilities and BMPs that may be suitable for retrofit projects are described below and grouped by public or private ownership. Retrofit options in the following project descriptions have been taken from the list above.

Public BMP Retrofits

- Publicly owned dry detention SWM basin between Jill Court and Heather Brook Court with access at 6617 Jill Court. Possible retrofit options for this facility include 1, 2, 6, and 7. This pond was designed to minimize the post development peak flows and does not have water quality controls. Increasing the storage volume and modifying the riser structure will allow for extended detention storage. Adding a shallow wetland will also improve water quality treatment. (BMP Retrofit Project DE9102)
- Publicly owned dry detention SWM basin at the Langley Oaks Subdivision located at 908 Ridge Drive. Possible retrofit options include 2 and 6. This project was previously identified as needing dam repairs and is currently in the design phase. (BMP Retrofit Project DE9106)
- Publicly owned dry detention SWM basin located at 6526 Heather Brook Court. Possible retrofit options for this facility include 2, 6, and 7. Modifying the outlet structure to provide extended detention storage and adding a shallow wetland will improve the water quality treatment. (BMP Retrofit Project DE9115)
- Publicly owned dry detention SWM facility at the McLean Community Center located at 1235 Oak Ridge Avenue. Possible retrofit options include 2 and 6. Modifying the outlet structure to provide extended detention storage and adding a shallow wetland will improve water quality treatment. (BMP Retrofit Project DE9120)
- Publicly owned dry detention SWM facility located at 6859 Chelsea Road. Possible retrofit options include 2 and 6. Modifying the outlet structure to provide extended detention storage and adding a shallow wetland will improve water quality treatment. (BMP Retrofit Project DE9122)

Private BMP Retrofits

- Wet SWM pond in the Langley Forest subdivision located at 926 Douglass Drive. Possible retrofit options include 2 and 7. Modifying the outlet structure will provide storage of the channel erosion control volume for this facility which will help prevent downstream erosion. (BMP Retrofit Project DE9107)
- Dry detention SWM facility at Saint Lukes Catholic Church located at 7001 Georgetown Pike. Possible retrofit options include 2, 6, and 7. The property also consists of Saint Lukes Catholic School where some LID facilities can be installed. Three bioretention facilities could be installed to capture runoff from parking lots and the school buildings. Also, two bioswales could be installed to replace a portion of the paved channel to provide water quality treatment. (BMP Retrofit/New LID Project DE9109)

- Privately owned bioretention basins at Saint Johns Episcopal Church located at 6801 Georgetown Pike. Possible retrofit options include 5 and 7. The parking lot runoff is bypassing the bioretention basins and it would be redirected to the bioretention area for water quality treatment. More vegetation would be added to the bioretention area in order to improve the filtering capabilities of the BMP and to improve the aesthetics. (BMP Retrofit Project DE9111)
- A privately owned wet BMP pond located north of 1461 Evans Farm Drive and a privately owned wet SWM pond located east of 7220 Evans Mill Road are connected in series. These ponds should be evaluated together to determine the best retrofit options. Possible retrofit options include 2, 4, 6, and 7. Erosion has taken place downstream of these ponds and the outfall structures may need to be modified to prevent excessive peak flows. The upstream pond is in very good condition. An aquatic bench, underwater baffle, and sediment forebays could be added to the downstream pond at 7220 Evans Mill Road. (BMP Retrofit Project DE9130)
- Privately owned dry detention SWM facility located at the Lewinsville Retirement Residence at 1515 Great Falls Street. Retrofit the northern most pond on the site. Possible retrofit options include 2 and 6. (BMP Retrofit Project DE9135)

The size of the proposed drainage areas and the benefits from the proposed BMP retrofits are included in Table 6.7.

Table 6.7 Benefits of Stormwater Management Facility and BMP Retrofits

Project Number	Subbasin ID	Location	Proposed Drainage Areas (acres)	Total Additional Phosphorus Removal (lbs/yr)	Channel Erosion Control Volume Provided (ac-ft)
DE9102	DE-PO-001, DE-DE-001	6617 Jill Court	24.2	12.1	1.0
DE9106	DE-UN-001	908 Ridge Drive	30.2	15.1	2.9
DE9107	DE-DE-003	926 Douglass Drive	4.9	0	0.1
DE9109	DE-UN-002	7001 Georgetown Pike	6.5	6.1	0.3
DE9111	DE-UN-001, DE-DE-004	6801 Georgetown Pike	2.0	1.9	0
DE9115	DE-PO-001, DE-DE-001	6526 Heather Brook Court	4.1	2.0	0.6
DE9120	DE-DE-006	1235 Oak Ridge Avenue	14.7	9.6	0.5
DE9122	DE-DE-005	6859 Chelsea Road	8.4	3.9	0.7
DE9130	DE-DE-007	7220 Evans Mill Road & 1461 Evans Farm Drive	46.2	7.8	4.2
DE9135	DE-DE-007	1515 Great Falls Street	7.8	5.2	0.7

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

The new BMP projects have been grouped into public or privately owned land and conventional BMPs or LID methods. The proposed new BMP locations are described below and are shown on Map 6.3.

New Public BMPs

- A new one year extended dry detention BMP could be constructed at Churchill Road Park located at 7098 Thrasher Place. The new BMP could be located on the eastern side of the property where the headwaters of an unnamed tributary to Dead Run begin. Implementing a BMP here will help to detain the runoff from the adjacent neighborhoods and schools before it reaches the stream. This facility may consist of a constructed berm to form the detention area in order to minimize tree loss and tree removal will be limited to the embankment area. The estimated buildable area at this location is approximately 29,000 square feet. (New BMP Project DE9112)
- Two new one year extended dry detention BMPs could be constructed in the road right of way near the southwest corner of Enterprise Avenue and Pathfinder Lane located south of 1417 Pathfinder Lane. These BMPs will be located at the headwaters of Dead Run and would treat the runoff from surrounding neighborhoods. (New BMP Project DE9132)

New Private BMPs

- A new one year extended dry detention BMP could be constructed on a privately owned vacant lot located at 1005 Pine Hill Road. In order to minimize tree loss, tree removal would be limited to the embankment area. A storm drain pipe located at Malta Lane discharges to this vacant property. The estimated buildable area at this location is approximately 104,000 square feet. (New BMP Project DE9116)
- Two new one year extended dry detention BMPs could be constructed on the Dominican Retreat property located at 7103 Old Dominion Drive. One of the facilities could be located at the southwest corner of the property and receive runoff from the pipe system located at 7112 Merrimac Drive. The second BMP could be constructed to treat the runoff coming from the pipe outfall located at 7130 Merrimac Drive. These proposed BMPs will detain and treat the runoff from Dolly Madison Boulevard and Merrimac Drive before it reaches the stream. (New BMP Project DE9129)

Public LID Projects

County facilities such as libraries, parks and schools were targeted for LID projects because the properties are owned by the county. Projects on school properties will be especially beneficial as they usually have large impervious areas, most have no existing stormwater controls, and the projects are ideally situated to help educate the students on watershed issues.

- New LIDs could be installed at Cooper Middle School located at 977 Balls Hill Road. This school has large amounts of impervious surface and is located adjacent to an unnamed tributary to Dead Run. Six bioretention areas could be constructed around the parking lot and in the landscaped areas in order to reduce the peak runoff and pollutants from the parking lot and buildings. A curb drop inlet in the parking lot could be replaced with a tree box filter to reduce pollutants from the runoff. (New LID Project DE9813)
- New LIDs could be constructed at Churchill Road Elementary School located at 7100 Churchill Road. This school is located adjacent to Dead Run and currently does not have any stormwater BMP controls. Ten bioretention areas could be constructed around the parking lot and one tree box filter could be installed adjacent to the parking lot. (New LID Project DE9814)
- New LIDs could be constructed at McLean Central Park and the McLean Community

Center located at 1235 Oak Ridge Avenue. Four tree box filters could be installed in the parking lot to control runoff and pollutants. The grass area located north of the tennis courts could be used to construct one bioretention area to help slow and filter the runoff from the impervious surfaces. This location is ideal for LID measures because it is adjacent to Dead Run for approximately 2,000 feet. These LID options will directly help benefit the stream by removing the pollutants from the runoff and reducing the peak flow. (New LID Project DE9819)

- New LIDs will be constructed at the Dolly Madison Library located at 1244 Oak Ridge Avenue as part of a capital improvement project. A bioswale and a tree box filter could be installed adjacent to the parking lot to provide water quality treatment and reduce peak flows. Three bioretention areas could also be constructed in the landscaped areas near the building. This location is ideal for LID options because it is located adjacent to Dead Run. These LID methods will directly help to reduce the peak flow which will improve the integrity of the stream. (New LID Project DE9823)

Private LID Projects

LID projects are recommended for the privately owned commercial properties listed below. These LID sites were chosen because they have large impervious areas and do not have existing stormwater management controls.

- Construct LID measures in downtown McLean areas not controlled by existing BMP facilities. These LID measures would add stormwater treatment to already developed properties. Possible locations include the properties located at 6844, 6852, and 6854 Old Dominion Drive; 6841, 6845, and 6850 Elm Street; and 1378 Beverly Road. Tree box filters could replace the existing curb drop inlets and underground manufactured BMPs could be installed in the parking lots as part of parking lot resurfacing projects. Bioretention areas could be incorporated into the landscaping in parking lots and adjacent to buildings. Vegetated roofs could be established on existing buildings. (New LID Project DE9828)
- Construct LID measures in the portions of the McLean Business Center planned for redevelopment in the *Fairfax County Comprehensive Plan*. These areas include the southeastern corner of the block defined by Old Dominion Drive, Beverly Road, and Ingleside Avenue; the area bounded by Old Dominion Drive, Chain Bridge Road, Ingleside Avenue, and Beverly Road; the triangular block bounded by Old Dominion Drive, Elm Street and Beverly Road; the block bounded by Chain Bridge Road, Emerson, Lowell and Laughlin Avenues; the vacant lot at 6860 Old Dominion Drive; and 1330, 1340, 1350, 1354, and 1356 Old Chain Bridge Road. The majority of these areas do not have any existing stormwater management controls. The redevelopment of these properties presents an excellent opportunity to incorporate LID methods as part of the process. LID options for these areas may include the installation of underground manufactured BMPs, tree box filters, bioretention areas, and vegetated roofs. (New LID Project DE9831)
- The LID measures to be constructed in conjunction with a BMP retrofit for Project DE9109 are described with the BMP Retrofit Projects.

The pollutant removal benefits for the proposed BMP and LID projects that will be implemented first are shown in Table 6.8.

Table 6.8 Benefits of New BMPs and LID Projects

Project Number	Subbasin ID	Location	Proposed Drainage Area (acres)	Total Phosphorus Removal (lbs/yr)
DE9112	DE-UN-002	7098 Thrasher Place	21.8	10.9
DE9116	DE-UN-001	1005 Pine Hill Road	37.9	19.0
DE9129	DE-DE-007	7103 Old Dominion Drive	10.8	5.4
DE9132	DE-UN-003	1417 Pathfinder Lane	20.8	10.4
DE9813	DE-UN-003	977 Balls Hill Road	3.7	3.5
DE9814	DE-UN-002, DE-DE-005	7100 Churchill Road	2.1	2.0
DE9819	DE-DE-006	1235 Oak Ridge Avenue	2.0	1.8
DE9823	DE-DE-006	1244 Oak Ridge Avenue	1.1	1.0
DE9828	DE-UN-003	Various locations in downtown Mclean	N/A	N/A
DE9831	DE-UN-003	Various locations in downtown McLean	N/A	N/A

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

The neighborhoods selected for LID implementation do not have existing stormwater management controls and the runoff from these neighborhoods contributes to downstream erosion problems and pollution. Targeting these neighborhoods for LID methods will help to mitigate the effects of the impervious surfaces and to improve the effectiveness of stream restoration projects downstream. The Neighborhood Stormwater Improvement Areas are described below and are shown on Map 6.3.

- New LID methods could be constructed in the Kings Manor and McLean Crest neighborhoods. The Kings Manor townhouse development has concrete sidewalks, curb and gutter, storm drain inlets, and cul-de-sacs. The McLean Crest neighborhood has curb and gutter, grassed ditches in front yards, and storm drain inlets. The sidewalks could be replaced with porous pavement and the area between the sidewalk and the curb could be made into an infiltration strip. Four storm drain inlets could be replaced with tree box filters and bioswales could be constructed to replace paved ditches. A total of fifteen bioretention areas could be constructed throughout the neighborhood in the cul-de-sacs and other open spaces to capture the runoff from the street and the surrounding houses. The two neighborhoods are different in character and may need to be addressed separately during the implementation phase. (Neighborhood Stormwater Improvement Area DE9821)
- New LID methods could be constructed in the Ingleside, Old Dominion Gardens, and Langley Manor subdivisions. These neighborhoods are located adjacent to the main stem of Dead Run and the storm drain system discharges into the stream without any stormwater management controls. The Old Dominion Gardens and Ingleside neighborhoods have curb and gutter, storm drain inlets, grassed ditches in front yards, and cul-de-sacs. The Langley Manor neighborhood has concrete sidewalks, curb and gutter, storm drain inlets, and cul-de-sacs. The grassed ditches could be retrofitted into infiltration trenches or bioswales. A total of fourteen bioretention areas could be constructed in the cul-de-sacs and available open spaces in the neighborhood to capture the runoff from the streets and surrounding houses. Six tree box filters could

replace the existing curb drop inlets. These LID options will help improve the integrity of the stream by reducing pollutants and peak runoff. (Neighborhood Stormwater Improvement Area DE9824)

- New LID methods could be constructed in the Broyhill-McLean Estates neighborhood. The headwaters of Dead Run begin in this area and the stream travels approximately 1,200 feet through the neighborhood. There are many flooding issues in the neighborhood, so a storm drain study should be conducted, along with implementation of the LID methods, to evaluate the current system and construct recommended drainage system improvements. Currently this neighborhood has curb and gutter, storm drain inlets, concrete sidewalks, grassed ditches in front yards, and cul-de-sacs. The grassed ditches could be retrofitted as infiltration trenches or bioswales. A total of eighteen bioretention areas could be constructed in the cul-de-sacs and available open spaces in the neighborhood to capture the runoff from the streets and surrounding houses. Four tree box filters could replace the existing curb drop inlets. (Neighborhood Stormwater Improvement Area DE9836)

The pollutant removal benefits for the proposed Neighborhood Stormwater Improvement Areas are shown in Table 6.9.

Table 6.9 Benefits of Neighborhood Stormwater Improvement Areas

Project Number	Subbasin ID	Location	Proposed Drainage Area (acres)	Total Phosphorus Removal (lbs/yr)
DE9821	DE-DE-004 DE-DE-005 DE-DE-006	Kings Manor and McLean Crest	11.9	11.1
DE9824	DE-DE-004 DE-DE-005 DE-DE-006 DE-DE-007 DE-UN-002	Ingleside, Old Dominion Gardens, and Langley Manor	15.3	14.2
DE9836	DE-UN-003	Broyhill-McLean Estates	8.2	7.6

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

There are no floodplain restoration projects in this watershed.

Action A1.5: Remove detrimental channel obstructions.

Channel obstructions that block stream flow, like the ones listed below, should be removed. Dumpsites should also be cleaned up on a regular basis, if needed. Dumpsites and obstructions in the watershed will vary over time. It may be necessary to clean up future dumpsites and/or obstructions that are not listed below or shown on any of the watershed maps.

- Remove obstructions from two locations in Dead Run. The obstruction located at the north end of Dead Run Stream Valley Park consists of concrete pipe and tree debris and the obstruction located to the east of Wemberly Way consists of tree debris. A resident noted that some of the debris may be a result of beaver activity. (Dumpsite/Obstruction Removal DE9901)

- A dump site consisting of yard waste was found at the east end of Kyleakin Court during the SPA. (Dumpsite/Obstruction Removal DE9901)

Action A1.6: Stabilize eroding streambanks using bioengineering methods.
The projects identified for this action are also addressed by Action B5.1 and are described under that action.

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

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

- Improve the storm drain system near the Georgetown Pike culvert crossing of Dead Run located at 6904 Georgetown Pike. The ditches and storm drain pipes near the crossing should be cleared of debris and repaired. This project is in the county's list of master drainage projects as a capital project to replace the culvert, however, the culvert appeared to be in good condition and does not need replacement. (Infrastructure Improvement Project DE9408)
- Clean and/or repair the ditch adjacent to the house at 847 Whann Avenue. The culverts adjacent to this property discharge water into the ditch causing yard flooding because the ditch has not been maintained properly. (Infrastructure Improvement Project DE9438)
- Improve the capacity of the storm drain system near the Dead Run Drive culvert crossing of an unnamed tributary to Dead Run located at 1012 Dead Run Drive. House flooding is occurring at this location and it may be caused by undersized storm pipes under Dead Run Drive. (Infrastructure Improvement Project DE9445)

Action A2.2: Improve the existing stormwater infrastructure to prevent negative impacts to the stream.
There are no infrastructure projects of this type in this watershed.

Action A2.3: Protect structures located in the 100-year flood limit from flooding.
Table 6.10 lists the number of properties in the watershed that are located in the 100-year flood plain or are recommended for flood protection. (Flood Protection Project DE9637)

Table 6.10 Recommended Flood Protection Locations

Street	# Properties
Benjamin Street	1
Georgetown Pike	1
Wemberly Way	1
Whann Avenue	1

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

Action A3.1: Identify the sources of fecal coliform bacteria in the watersheds and seek to reduce controllable sources.
Collaborate with DEQ and DCR to perform a study to identify the sources of fecal coliform bacteria in the Dead Run Watershed using E. coli as the indicator bacteria and prepare an action plan that describes how the controllable sources, especially human sources, will be reduced (Fecal Coliform Source Study DE9746).

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

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

Action B1.1: Retrofit existing stormwater management facilities and BMPs.
The projects identified for this action are also addressed by Action A1.1 and are described in that section.

Action B1.2: Construct new BMPs including LID methods.
The projects identified for this action also addressed by Action A1.2 and are described under that action.

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

This objective will be achieved through policy and land use recommendations which are located in Chapter 9 under Objective B2.

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

Action B3.1: Restore vegetated buffers along streams especially at public sites such as schools, park, and municipal facilities.
Restore vegetated buffers along streams especially at public sites such as schools, parks, and municipal facilities. The SPA found that the condition of existing riparian buffers is poor for 19 percent of the stream bank length assessed in the watershed. The deficient buffer locations described below were found during the 2002 SPA or were identified as potential locations for buffer restoration during the watershed planning process. These reaches will be further evaluated to determine the locations where buffer restoration is required. The locations of these projects are shown on Map 6.3. Steps to protect existing vegetated buffers are included in Public Education Project DE9939 described later in this chapter.

- Evaluate buffer vegetation adjacent to the stream along 1,900 feet of the downstream portions of Dead Run starting at Benjamin Street and ending near Hampshire Road

and restore where necessary. A portion of this project is in the county's list of master plan drainage projects. (Buffer Restoration DE9303)

- Evaluate buffer vegetation adjacent to the stream along 1,200 feet of an unnamed tributary to Dead Run in Churchill Road Park and restore where necessary.(Buffer Restoration DE9310)

Action B3.2: Provide landowner education about the importance of stream buffers and how to manage and protect them (through coordination, brochures, and workshops).
This is a county-wide action and details of this action are presented in Chapter 3.

Action B3.3: Increase enforcement of stream buffer violations.
This is a county-wide action and details of this action are presented in Chapter 3.

Action B3.4: Remove invasive species from stream buffer areas and replant with native plants.
This is a county-wide action and details of this action are presented in Chapter 3.

Action B3.5: Protect stream buffer areas from development.
There are no land conservation projects in this watershed.

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

Action B4.1: Conduct a detailed inventory of existing wetlands in order to identify areas for protection or restoration.
A wetlands functions and values survey should be performed. This wetlands survey will provide a baseline condition and mapping of the wetlands in the watershed and help the county and watershed stakeholders make decisions regarding priority wetland conservation and preservation areas. (Wetland Assessment Project DE9943)

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

Action B5.1: Utilize bioengineering to restore and stabilize stream banks, restore natural geometries and remove concrete from stream banks and beds.
Utilize bioengineering to restore and stabilize stream banks, restore natural stream geometries, and remove concrete from stream banks and beds. Dead Run is actively widening along the majority of its length and the Stream Protection Strategy (SPS) composite site condition rating was "very poor." Restoring the stream and its tributaries will improve the condition of the aquatic habitat and should be carefully coordinated with the previously described objectives of reducing the quantity and improving the quality of runoff in order to prevent further erosion and channel widening. The locations of proposed stream

restoration activities are described below and shown on Map 6.3. It should be noted that the stream reaches identified in the following project descriptions and on the maps designate lengths that will be further evaluated. Restoration work will be done in required areas, not necessarily along the continuous lengths designated.

- Evaluate approximately 15,200 feet of Dead Run and its tributaries and restore where necessary, including buffer restoration. Proposed activities will include adding in-stream structures, riparian vegetation planting and channel bed and bank reconfiguration. The culvert located at Ingleside Avenue near Churchill Road will be evaluated as part of the project and may need to be replaced. A portion of this project is in the county's list of master plan drainage projects. (Stream Restoration DE9244)
- Evaluate approximately 8,400 feet of an unnamed tributary to Dead Run and restore where necessary, including buffer restoration. The stream was assessed as having a "poor" habitat from the SPA and is beginning to widen, evolving from a narrower deeper stream to a wider shallower stream. The banks are becoming steeper and the channel is becoming filled with eroded bank materials. The stream is seeking to reconnect itself with the floodplain in some locations by creating a new flood prone area within the old channel. Proposed activities will include riparian vegetation planting, some channel reconfiguration, and some bioengineering of the stream banks. The new channel will be equal in dimension, pattern and profile of the channel upstream. The culverts at Mackall Avenue and at Georgetown Pike near Mackall Avenue will be evaluated as part of this project and may need to be replaced. A portion of this project is in the county's list of master plan drainage projects. (Stream Restoration DE9204)
- Evaluate approximately 1,200 feet of Dead Run starting at Pathfinder Lane and ending at Dolley Madison Boulevard and restore where necessary. Proposed activities will include adding in-stream structures, riparian vegetation planting and channel bed and bank reconfiguration. (Stream Restoration DE9226)
- An assessment and evaluation of headwater streams will be performed. Headwater streams with less than 50 acres of drainage area that were not included in the SPA will be evaluated in this project. (Stream Assessment Project DE9947)

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

Watershed stewardship actions will build awareness of the importance of watershed protection and may also provide citizens with an opportunity to improve their watershed. Several watershed-wide projects will help with this goal. The projects under the following objectives will be developed and overseen by county staff, but will depend on the participation of citizens to be successful.

Objective C1: Improve education and outreach.

Public Education Project DE9939 will include the following actions:

- Provide materials to homeowners with septic tank systems to educate them about the proper operation and maintenance of their system.

- Coordinate with community groups to provide technical assistance and suitable educational materials for planting and maintaining healthy buffers.
- Write and distribute a watershed planning fact sheet and lesson plan for teachers that incorporate Standard of Learning 6.7, which deals with watershed protection. Provide specific information about the *Middle Potomac Watersheds Management Plan*.
- Consolidate existing educational materials that describe the value of the watersheds and make them accessible through one county contact.
- Create a watershed planning slide show with watershed basics that can be shown to civic groups, watershed associations, businesses, realtors and other interested groups.
- Provide homeowner brochures about proper yard compost practices and damage done to streams by improper disposal of yard wastes.
- If a stormwater utility is established and it entails billings to individual properties, include educational messages about reducing stormwater runoff (and incentives for doing so) in any mailings.
- Integrate the watershed management plan with existing state and local government planning efforts such as Capital Improvement Project planning, the County Comprehensive Plan, Area Plans, the Virginia Department of Transportation Six Year Plans, road standards and mitigation projects.

Objective C2: Improve watershed access and stewardship.

Community Outreach Project DE9940 will include the following actions:

- Establish an on-going relationship with civics and science teachers at middle schools and high schools who need to provide their students with opportunities for service credits or hands-on projects.
- Encourage voluntary donation of trail and conservation easements.
- Promote annual or semiannual cleanup projects for streams.
- Form or designate a volunteer community organization to aid in the stewardship of the Middle Potomac Watersheds and to coordinate watershed plan implementation activities with county staff.
- Post signage at stream crossings and watershed divides identifying the waterway to increase public awareness of watershed boundaries.
- Encourage private BMP owners to post signage at their facilities with contact information for reporting problems at the facility.

Enforcement Enhancement Project DE9942 will include the following actions:

- Evaluate the current enforcement of the Chesapeake Bay Preservation Ordinance to determine the best way to prevent the destruction of buffer vegetation.
- Improve enforcement of anti-dumping regulations.

Objective C3: Promote the implementation and maintenance of Low Impact Development (LID) practices.

LID Promotion Project DE9941 will include the following actions:

- Inspire landowners to use LID measures by demonstrating LID benefits via recognition programs for businesses and neighborhoods that implement LID measures voluntarily.
- Demonstrate that LID measures can increase property values.
- Provide marketing ideas to showcase properties using extensive LID methods and publicize environmental and social benefits.

- Provide a training and certification program for landscaping companies to learn LID installation and maintenance methods.
- Contact supply companies that could carry LID materials (such as biofilter soils and plants or pervious pavers) and encourage them to stock those items so that construction companies, landscaping companies and homeowners will have easy access to them.
- Stock educational brochures about LID practices for homeowners at hardware stores, home improvement stores, and nurseries.

6.3 Benefits of Plan Actions

Ten BMP retrofit projects, six LID projects, three Neighborhood Stormwater Improvement Areas, and four new BMP projects have been proposed for the Dead Run Watershed to help improve the quality of the stream. The channel erosion control volume to be provided by the BMP retrofit projects will serve approximately 88 percent of the required channel erosion control volume for the 146 acres controlled by the BMP retrofit locations. The channel erosion control volume to be provided by the new BMP projects will serve approximately 88 percent of the required channel erosion control volume for the 92 acres of drainage area. For the 21 BMP retrofit projects, LID projects, Neighborhood Stormwater Improvement Areas, and New BMP projects that had benefit calculations performed, the total phosphorus removal is estimated to be 152 lbs/year upon successful implementation of these projects.

Approximately 3,100 linear feet of stream buffers will be restored by implementing two buffer restoration projects and 24,800 linear feet of stream will be restored by implementing three stream restoration projects. These projects will increase the amount of habitat, reduce erosion and provide nutrient reduction for Dead Run. The storm drain study project will help to evaluate the storm drain system deficiencies and construct recommended drainage system improvements for the Broyhill-McLean Estates neighborhood.

6.4 Implementation of Plan Actions

The recommended plan actions described in this chapter will be implemented over the 25-year life of the watershed plan. The initial implementation schedule was developed using prioritization criteria provided by the county which were used to calculate a numerical score. The prioritization scores are on a scale of 0 to 5 with the highest scores having the highest priority in each watershed. Projects which received higher scores were generally located in the subbasins with the poorest existing conditions, in the headwaters of the watershed, on public land, or would provide the greatest benefits.

Once the prioritization score was calculated, other factors were considered when assigning the implementation timeframes. These factors included promoting projects that have high visibility and low costs but that may not have received a high priority score such as buffer restoration projects and obstruction removal projects. Sequencing and geographic location were also considered so that the Group A or B projects, when successfully implemented, will help to minimize the effects of stormwater in a specific subbasin which will make it possible to implement other projects in later timeframes.

The implementation periods have been divided into five year timeframes with the following designations:

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

The public education, community outreach, LID promotion, and the enforcement enhancement capital projects were not ranked because they are to be implemented for the length of the 25-year plan period. Hence, these projects are designated under Group A*.

Priority projects will be implemented within the first fifteen years of the plan in each watershed. More detailed costs and benefits were computed for these projects. The priority projects each have a Fact Sheet, presented in Appendix A, which summarizes key information about the projects. This is only preliminary information and is expected to change as projects enter the design phase of implementation. The priority project total cost for Dead Run is $6,080,000. The priority projects are summarized in Table 6.11 below along with the land owners, prioritization scores and implementation groups for the projects.

Coordination with the land owners will be essential to the successful implementation of the plan actions. Cost-sharing opportunities may be explored for projects where both the land owner and the county will benefit. Projects identified on VDOT property will be coordinated directly with VDOT to determine final schedule and cost sharing.

Table 6.11 Summary of Dead Run Priority Projects

Project Number	Type	Land Owner	Estimated Cost	Score	Year Group
DE9120	BMP Retrofit Project	Fairfax County Board of Supervisors (FCBS)	$70,000	4.20	A
DE9836	Neighborhood Stormwater Improvement Area	Private Residential and Virginia Department of Transportation (VDOT) [1]	$1,950,000	4.10	**
DE9112	New BMP Project	Fairfax County Park Authority (FCPA)	$300,000	4.05	A
DE9129	New BMP Project	Private Organization[1]	$130,000	4.00	A
DE9130	BMP Retrofit Project	Evans Mill Pond HOA and Evans Farm HOA[1]	$370,000	4.00	A
DE9106	BMP Retrofit Project	Langley Oaks HOA [1]	$40,000	3.90	A
DE9122	BMP Retrofit Project	Private Residential[1]	$60,000	3.90	A
DE9303	Buffer Restoration	Private Residential[1]	$100,000	3.50	A
DE9226	Stream Restoration	VDOT and Private Residential[1]	$770,000	3.25	A
DE9310	Buffer Restoration	FCPA and Private Residential[1]	$60,000	2.40	A
DE9111	BMP Retrofit Project	Private Organization[1]	$20,000	3.80	B
DE9116	New BMP Project	Private Residential[1]	$410,000	3.80	B

Project Number	Type	Land Owner	Estimated Cost	Score	Year Group
DE9102	BMP Retrofit Project	Langley Oaks HOA[1]	$80,000	3.75	B
DE9823	New LID Project	FCPA and FCBS	$60,000	3.75	B
DE9821	Neighborhood Stormwater Improvement Area	Private Residential and VDOT[1]	$580,000	3.70	**
DE9824	Neighborhood Stormwater Improvement Area	Private Residential and VDOT[1]	$740,000	3.70	**
DE9813	New LID Project	FCPS	$190,000	3.65	B
DE9814	New LID Project	FCPS	$120,000	3.65	B
DE9819	New LID Project	FCPA and FCBS	$100,000	3.55	B
DE9109	BMP Retrofit Project/New LID	Private Organization[1]	$180,000	3.55	C
DE9107	BMP Retrofit Project	Private Residential[1]	$30,000	3.50	C
DE9115	BMP Retrofit Project	FCBS	$50,000	3.45	C
DE9132	New BMP Project	VDOT[1]	$170,000	3.40	**
DE9135	BMP Retrofit Project	Residential Development[1]	$40,000	3.40	C

[1]These projects will require coordination with land owners prior to implementation to determine cost sharing and project schedule.

**These projects will be coordinated directly with VDOT.

The non-priority projects, including the watershed stewardship actions in Year Group A*, are shown in Table 6.12 below along with the land owners, prioritization scores, and implementation groups for the projects. While the projects in Groups A and A* will be implemented right away, the remainder of the projects in the table should be thought of as future opportunities. Conditions in the Middle Potomac Watersheds may be very different in fifteen years time, so the projects in Groups C, D, and E will be re-evaluated at that time.

Table 6.12 Summary of Dead Run Non-Priority Projects

Project Number	Type	Land Owner	Score	Year Group
DE9939	Public Education Project	Watershed-wide Project	N/A	A*
DE9940	Community Outreach Project	Watershed-wide Project	N/A	A*
DE9941	LID Promotion Project	Watershed-wide Project	N/A	A*
DE9942	Enforcement Enhancement Project	Watershed-wide Project	N/A	A*
DE9947	Stream Assessment Project	Watershed-wide Project	N/A	A*
DE9901	Dumpsite/Obstruction Removal	National Park Service, Private Residential, and VDOT[1]	1.95	A
DE9445	Infrastructure Improvement	VDOT and Private Residential[1]	3.00	**
DE9943	Wetland Assessment Project	Watershed-wide Project	2.95	C

Project Number	Type	Land Owner	Score	Year Group
DE9244	Stream Restoration	VDOT, Private Residential, Private Organizations, FCPA, Evans Mill Pond HOA, and the Cloisters Association[1]	3.40	D
DE9828	New LID Project	Commercial Development[1]	3.35	D
DE9831	New LID Project	Commercial Development[1]	3.35	D
DE9204	Stream Restoration	VDOT, Private Residential, Langley Oaks HOA, FCBS, and National Park Service[1]	3.20	D
DE9408	Infrastructure Improvement	VDOT and Private Residential[1]	2.95	**
DE9438	Infrastructure Improvement	Private Residential [1]	2.95	E
DE9746	Fecal Coliform Source Study	Watershed-wide Project	2.35	E
DE9637	Flood Protection Project	Private Residential[1]	1.70	E

[1]These projects will require coordination with land owners prior to implementation to determine cost sharing and project schedule.

*All public education and outreach projects will be implemented for the entire 25-year period.

**These projects will be coordinated directly with VDOT.