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## Executive Summary

The *Difficult Run Watershed Management Plan* presents a strategy for improving and preserving the water resources and aquatic habitat in the watershed. The plan was initiated by Fairfax County with input from watershed residents as a response to the area's rapid growth and the associated impacts on the stream system.

The approach to developing the *Difficult Run Watershed Management Plan* has been threefold:

- Work with County staff, Steering Committee and other stakeholders to identify the goals, issues, and problems affecting the watershed.
- Synthesize information from stream assessments, monitoring studies, and watershed modeling to pinpoint the location and severity of watershed impairments.
- Conduct field surveys and other analysis to identify constraints and select potential improvements.
- Develop cost estimates then rank and select alternatives.

### Background

The Difficult Run watershed is located in the Chesapeake Bay watershed in northern Virginia. Difficult Run drains 58.3 square miles in the north-central portion of Fairfax County and continues to the Potomac River. Development and population growth over the past century have transformed Fairfax County, and the Difficult Run watershed, into a bustling suburban community. Today the watershed, the largest of the County's 30 watersheds, is a varied mix of open space, residential communities, and commercial centers.

In the mid to late 1970s, an environmental baseline and subsequent master plan for flood control and drainage were completed for Difficult Run. The plans recommended immediate and future projects that would address sanitary sewer issues, stream stability, detention ponds, and flooding through the year 2000. In addition, the *Difficult Run Headwaters Land Use Study* was prepared by the Fairfax County Office of Comprehensive Planning in 1978 to analyze the watershed's ability to accept various residential densities and simultaneously maintain high-quality environmental standards. In the late 1980s, Fairfax County proposed the installation of regional ponds to control erosion and flooding in the western portion of the County, including Difficult Run.

More recently, the 2001 *Stream Protection Strategy Baseline Study* recommended County watersheds for protection, restoration and further study. Spurred by the SPS baseline recommendations, the Chesapeake Bay 2000 agreement, and advances in stormwater management technologies, the Stormwater Planning Division of the Fairfax County Department of Public Works and Environmental Services (DPWES) initiated the creation of watershed management plans for the County's 30 watersheds.

The *Difficult Run Watershed Management Plan* is a response to the watershed's rapid growth. The plan presents the issues affecting the quality of the watershed's streams and receiving waters, builds on previous management efforts, and presents a comprehensive strategy for mitigating and reducing the impacts of development.

### Purpose

The *Difficult Run Watershed Management Plan* was developed with four broad goals underlying the process and results of the plan.

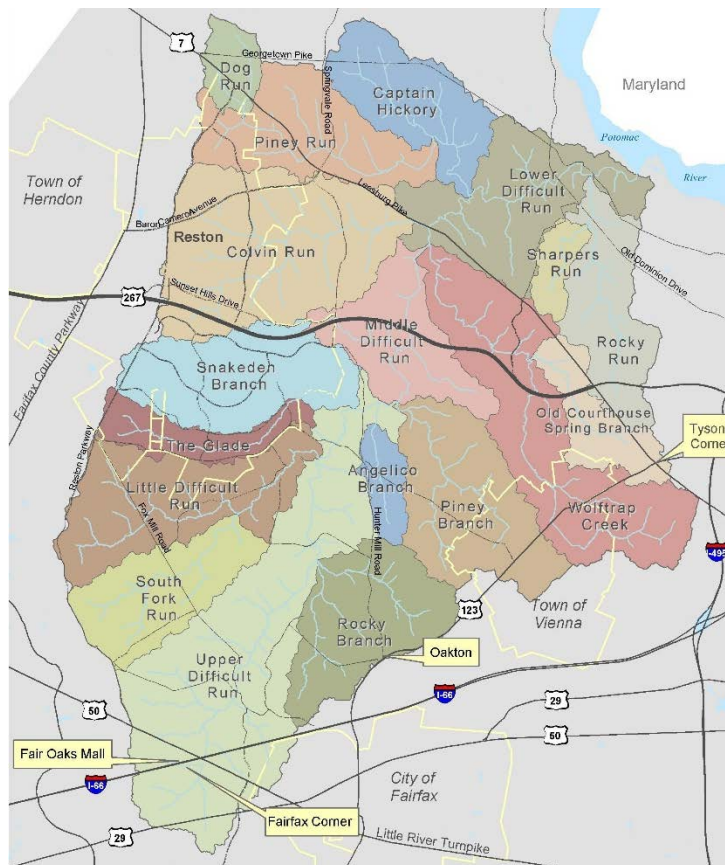
1. To restore and protect the County's streams, 70 percent of which are in fair to very poor condition.
2. To position the County to meet state and federal water quality standards, including listed impairments for Difficult Run.
3. To support Virginia's commitment to the Chesapeake 2000 Agreement to clean the Chesapeake Bay
4. To develop alternatives, where feasible, to the unbuilt regional ponds.

The goals were developed in partnership with Fairfax County staff and the Difficult Run Steering Committee. The plan provides a strategy to meet these goals, by identifying the watershed impairments and presenting solutions for restoration and preservation.

## Watershed Condition

The Difficult Run watershed was subdivided into eighteen subwatersheds for the purpose of the study and further subdivided into 201 catchments for further analysis.

Land use within the Difficult Run watershed is currently dominated by residential use. Estate, low, medium and high-density residential areas make up more than 57 percent of the watershed. The distribution of the varying intensities of residential areas is similar to that reported 30 years ago with large lots occupying the central portion of the watershed along the mainstem of Difficult Run. Open space makes up 20 percent of the Difficult Run watershed, much of it is found along the various stream valley parks and Resource Protection Areas that border the watershed's major streams.



**Map ES.1 Difficult Run Subwatersheds**

Commercial centers in the watershed are centered around Reston and along the corridor between Tysons Corner, the Town of Vienna, Oakton, and the City of Fairfax. Commercial use occupies approximately 9 percent of the watershed. Transportation use makes up 11 percent of the watershed as several major highways including Leesburg Pike (Virginia 7), The Washington Dulles Access and Toll Road (Virginia 267), I-66 and the Lee Jackson Memorial Highway (US Route 50) cross the watershed. The total impervious acreage for the watershed is currently 6,862 acres, or 18.4 percent of the total area.

Analysis of future land use conditions shows the largest potential percentage change in land use will be the conversion from open space to low and medium-density residential areas.



Growth in these areas will bring the total residential use to 63 percent of the watershed and contribute to a higher overall imperviousness of 20.6 percent.

The County's 2001 *Stream Protection Strategy Baseline Study* evaluated the overall health of the Difficult Run watershed and gave several of the subwatersheds a composite qualitative rating based on the biological condition (benthic macro-invertebrates and fish taxa richness), habitat assessment and imperviousness. The ratings used were Very Poor, Poor, Fair, Good and Excellent. The ratings indicate divergence from reference, or the best possible conditions.

The only subwatershed in the Difficult Run watershed to receive a composite rating of "Excellent" was located in Captain Hickory Run. Sites in Rocky Run, Difficult Run at the very downstream end as well as just before its confluence with Little Difficult Run, and the south fork of Rocky Branch all received "Good" composite site ratings. Sites with "Very Poor" composite ratings include Snakeden Branch along its mainstem, Piney Branch, and Wolftrap Creek just before its confluence with the Difficult Run mainstem. All other sites within the Rocky Run subwatershed were in the "Fair" to "Poor" categories.

The Stream Physical Assessment was conducted in the Difficult Run watershed in the fall of 2002 and winter of 2003 to provide a baseline condition in support of the upcoming watershed management plans. As part of the assessment, field crews conducted a physical habitat assessment, a geomorphologic assessment and collected infrastructure information for all streams within the watershed. Of the 130 miles of stream assessed, 48 percent (62 miles) was assessed as fair, 34 percent (44 miles) as poor, 16 percent (21 miles) as good, 1 percent (2 miles) as very poor and less than 1 percent (1 mile) as excellent.

The segment of Difficult Run between the confluence with Captain Hickory Run and the Potomac River near Georgetown Pike (Virginia 193) has been placed on the 303(d) list for two impairments: benthic (bottom-dwelling) macroinvertebrate community and fecal coliform bacteria.

The Virginia Department of Environmental Quality (VDEQ) maintains a water quality monitoring station (1ADIF000.86) at the Route 193 bridge. Biological monitoring at this station was used to determine that the bottom-dwelling community in the stream is moderately impaired. As a result, this segment was assessed as not supporting the Aquatic Life Use goal ("fishable") for the 2004 water quality assessment. This segment was first listed for an aquatic life use impairment in the 1994 303(d) report.

Sufficient exceedances of the instantaneous fecal coliform bacteria and *E. coli* bacteria criterion were recorded at the Route 193 bridge station to assess this stream segment as not supporting of the Recreation Use goal ("swimmable") for the 2004 water quality assessment. The recreation use impairment was added to this segment in 2004.

Once a waterbody has been listed as impaired, a Total Maximum Daily Load (TMDL) report identifying the sources causing the water quality problem and the reductions needed to resolve it must be developed and submitted to the United States Environmental Protection Agency (EPA) for approval. Upon approval, VDEQ must develop a TMDL Implementation Plan to restore water quality. A benthic TMDL is scheduled to be developed by 2010 and a TMDL to address the recreation use impairment may extend to 2016.

## **Issues and Recommendations**

The goals and issues for the watershed were based on analysis of watershed conditions, and reviewed by the community in Steering Committee meetings and public forums. The recommendations are those which were developed for both capital improvements and

Countywide policy implementation. Table ES.1 provides the list of proposed structural projects in the Difficult Run watershed, sorted by project number. The project number, type, subwatershed, location and implementation phase are listed. If the project is part of a regional pond alternative, the regional pond number is also given.

The issues identified during the watershed management plan development process have been addressed in the plan as follows:

**Issue 1: Stormwater runoff pollution**

Structural Project Action: Carry out preliminary engineering, design, and construction of LID retrofit projects recommended in Table ES-1 below. Culvert retrofit, pond retrofit, and new pond projects will also have a positive effect on this issue.

Policy Action 4.3.5 Continue efforts to add LID design criteria and keep PFM up to date.

**Issue 2: Increased stormwater runoff**

Structural Project Action: Carry out preliminary engineering, design, and construction of culvert retrofit and pond retrofit projects recommended in Table 5.1 below.

Policy Action 4.3.1 Evaluate revising land development regulations to set a maximum impervious percentage for each type of development.

Policy Action 4.3.2 Evaluate requesting road construction projects to manage the whole roadway, not just the added lane widths.

Policy Action 4.3.3 Evaluate and implement incentives where appropriate for the use of pavers or porous pavement for seasonal or overflow parking.

Policy Action 4.3.4 Evaluate and implement incentives into County ordinances to consider establishing more stringent stormwater quality control standards for redevelopment.

**Issue 3: Uncontrolled stormwater**

Structural Project Action: Carry out preliminary engineering, design, and construction of new pond projects recommended in Table ES-1 below.

Non-Structural Measure 4.3.7 Conduct a drainage study and develop an improvement plan for the right fork of Dog Run.

Non-Structural Measure 4.5.1 In partnership with the Town of Vienna, conduct a drainage study and develop an improvement plan to reduce flooding in Vienna near Echols Street.

**Issue 4: Erosion and streambank stability**

Structural Project Action: Carry out preliminary engineering, design, and construction of stream restoration and drainage retrofit projects recommended in Table ES-1 below.

Non-Structural Measure 4.2.2 Enhance inspections of all outfalls and other interfaces between the man-made and natural drainage systems for scour and erosion and make repairs as necessary.

Watershed-Wide Action 3.38.2: Remove obstructions from stream corridors.

Watershed-Wide Action 3.38.4: Repair utility crossings.

**Issue 5: Stream water quality**

Structural Project Action: Carry out preliminary engineering, design, and construction of buffer restoration projects recommended in Table ES-1 below.

Non-Structural Measure 4.2.3 Continue and enhance the volunteer monitoring program.

Policy Action 4.4.1 Evaluate and implement incentives that could be applied locally to encourage lawn care companies in Fairfax to enroll in the Virginia Water Quality Improvement Program.

Non-Structural Measure 4.4.2 Education and outreach for proper lawn care.

Non-Structural Measure 4.4.3 Golf course nutrient management. Work with golf course managers within the watershed to evaluate turf management practices.

Non-Structural Measure 4.4.4 Develop an enhanced illicit discharge and sewer infiltration / inflow removal program to eliminate potential sewer leaks, overflows and illegal cross-connections.

Watershed-Wide Action 3.38.1: Remove dumpsites from stream corridors.

**Issue 6: Stream habitat loss**

Structural Project Action: Carry out preliminary engineering, design, and construction of stream restoration projects recommended in Table ES-1 below.

Watershed-Wide Action 3.38.3: Remove fish passage obstructions

Watershed-Wide Action 3.38.5: Restore riparian buffers

**Issue 7: Natural resource protection measures**

Policy Action 4.6.2 Continue efforts to obtain develop a forest conservation ordinance that would preserve existing woodlands.

**Issue 8: Stormwater regulatory compliance**

Policy Action 4.3.5 Update and improve the County's database of all public and private SWM facilities.

Policy Action 4.3.6 Enhance SWM inspection, maintenance, and enforcement programs.

**Table ES. 1 Difficult Run Watershed Proposed Improvement Projects**

Project No	Type	Subwatershed	Location	Phase
DF9001A	Drainage Retrofit	Dog Run	Distributed at outfalls throughout the drainage area	B
DF9001B	Pond Retrofit	Dog Run	End of Branton Lane	A
DF9002A	Culvert Retrofit	Piney Run	Upstream of Riva Ridge Drive	B
DF9002B	Drainage Retrofit	Piney Run	Distributed at outfalls throughout the drainage area	B
DF9003AA	Pond Retrofit	Piney Run	Near Tottenham Court	A
DF9003AB	Pond Retrofit	Piney Run	Near Tottenham Court	A

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<b>Project No</b>	<b>Type</b>	<b>Subwatershed</b>	<b>Location</b>	<b>Phase</b>
DF9003B	Drainage Retrofit	Piney Run	Distributed	A
DF9005B	Culvert Retrofit	Captain Hickory Run	At Polo Place	B
DF9006B	Drainage Retrofit	Captain Hickory Run	Distributed at outfalls throughout the drainage area	B
DF9007A	Drainage Retrofit	Captain Hickory Run	Distributed at outfalls throughout the drainage area	B
DF9007C	Culvert Retrofit	Captain Hickory Run	Upstream of Sunnybrook Drive	A
DF9007D	LID Retrofit	Captain Hickory Run	Commercial area W of Walker Road	A
DF9009A	Pond Retrofit	Lower Difficult Run	End of Lyons Street	A
DF9009B	Pond Retrofit	Lower Difficult Run	Near Wood Glade Drive	A
DF9009C	Drainage Retrofit	Lower Difficult Run	Distributed at outfalls throughout the drainage area	B
DF9010A	Culvert Retrofit	Lower Difficult Run	Upstream side of Forestville Drive	B
DF9010B	Culvert Retrofit	Lower Difficult Run	Upstream side of Trotting Horse Lane	B
DF9010C	Culvert Retrofit	Lower Difficult Run	Upstream side of Tackroom Lane	B
DF9010D	Drainage Retrofit	Lower Difficult Run	Distributed at outfalls throughout the drainage area	B
DF9010E	Stream Restoration	Lower Difficult Run	Upstream side of Tackroom Lane	A
DF9011A	Pond Retrofit	Middle Difficult Run	Upstream of Windstone Road	A
DF9011C	Drainage Retrofit	Middle Difficult Run	Distributed at outfalls throughout the drainage area	B
DF9012	Pond Retrofit	Colvin Run	Private property off of Crowell Road	A
DF9013	Pond Retrofit	Colvin Run	Business Center Drive	A
DF9013A	Pond Retrofit	Colvin Run	Business Center Drive	A
DF9014A	Culvert Retrofit	Colvin Run	Upstream side of Little Run Court	B
DF9014B	Drainage Retrofit	Colvin Run	Distributed at outfalls throughout the drainage area	B
DF9017A	Pond Retrofit	Wolftrap Creek	Existing pond along Spring Ridge Lane	A
DF9017B	Drainage Retrofit	Wolftrap Creek	Distributed at outfalls throughout the drainage area	B
DF9019A	Drainage Retrofit	Rocky Run	Distributed at outfalls throughout the drainage area	B
DF9020B	Drainage Retrofit	Sharpers Run	Distributed at outfalls throughout the drainage area	B
DF9023A	Pond Retrofit	Little Difficult Run	Birdfoot Lanet and Raccoon Ridge Ct	A
DF9024A	Pond Retrofit	Snakeden Branch	Existing facility near Clovermeadow Rd	A
DF9024B	Culvert Retrofit	Snakeden Branch	Upstream of the W&OD Trail	A
DF9024C	Drainage Retrofit	Snakeden Branch	Distributed at outfalls throughout the drainage area	B
DF9027A	Culvert Retrofit	Piney Branch	Upstream of Batten Hollow and Brookhill Roads	A
DF9027B	Drainage Retrofit	Piney Branch	Distributed at outfalls throughout the drainage area	B
DF9028A	Drainage Retrofit	Wolftrap Creek	Distributed at outfalls throughout the drainage area	B
DF9028B	Culvert Retrofit	Wolftrap Creek	End of Ashgrove Lane	A
DF9028C	Pond Retrofit	Wolftrap Creek	Along Lupine Den Road	A

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<b>Project No</b>	<b>Type</b>	<b>Subwatershed</b>	<b>Location</b>	<b>Phase</b>
DF9029A	Drainage Retrofit	Piney Branch	Distributed at outfalls throughout the drainage area	B
DF9029B	New Pond	Piney Branch	Site of D-29	A
DF9030A	Pond Retrofit	Rocky Branch	End of Martinhoe Court	A
DF9030B	Drainage Retrofit	Rocky Branch	Distributed at outfalls throughout the drainage area	B
DF9031A	Pond Retrofit	Rocky Branch	Oakton Ridge Circle and Oakton Ridge Court	A
DF9031C	LID Retrofit	Rocky Branch	Oakton Ridge Circle and Oakton Ridge Court	A
DF9032A	Culvert Retrofit	Upper Difficult Run	Upstream side of Miller Heights Road	B
DF9032B	Drainage Retrofit	Upper Difficult Run	Distributed at outfalls throughout the drainage area	B
DF9033	Drainage Retrofit	Upper Difficult Run	Distributed at outfalls throughout the drainage area	B
DF9034A	Culvert Retrofit	Upper Difficult Run	Upstream side of Miller Heights Road	B
DF9034B	Drainage Retrofit	Upper Difficult Run	Distributed at outfalls throughout the drainage area	B
DF9035A	Drainage Retrofit	Upper Difficult Run	Distributed at outfalls throughout the drainage area	B
DF9035B	LID Retrofit	Upper Difficult Run	E side of Young Drive	A
DF9036A3	Pond Retrofit	Rocky Branch	Near Miller Road	A
DF9039A	Culvert Retrofit	Little Difficult Run	Upstream side of Westwood Hills Drive	B
DF9039B	Drainage Retrofit	Little Difficult Run	Distributed at outfalls throughout the drainage area	B
DF9040A	Pond Retrofit	South Fork Run	End of Nathaniel Oaks Drive	A
DF9040B	Pond Retrofit	South Fork Run	Near Falkirk Drive	A
DF9040C	Pond Retrofit	South Fork Run	Birdsboro Drive and Country Ridge Lane	A
DF9040D	Pond Retrofit	South Fork Run	End of Navy Drive	A
DF9040E	Drainage Retrofit	South Fork Run	Distributed	A
DF9041A	Drainage Retrofit	South Fork Run	Distributed at outfalls throughout the drainage area	B
DF9041B	Pond Retrofit	South Fork Run	Tilton Valley Drive and Hickory Hills Drive	A
DF9041C	Pond Retrofit	South Fork Run	S Vale Road, E of Valewood Drive	A
DF9041D	LID Retrofit	South Fork Run	Along Brecknock Street	A
DF9041E	Pond Retrofit	South Fork Run	Along a private drive off Vale Road	A
DF9043A	Drainage Retrofit	Little Difficult Run	Distributed at outfalls throughout the drainage area	B
DF9043B	Pond Retrofit	Little Difficult Run	Wild Cherry Place and Black Fir Court	A
DF9043C	LID Retrofit	Little Difficult Run	Parking lot of Fox Mill Swim and Tennis Club	A
DF9045A	LID Retrofit	Upper Difficult Run	Left of drive at Oakton Swim and Racquet Club	A
DF9045B	Pond Retrofit	Upper Difficult Run	Waples Mill Road and Bronzedale Drive	A
DF9045D	Stream Restoration	Upper Difficult Run	E side of Valeview Drive	A

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<b>Project No</b>	<b>Type</b>	<b>Subwatershed</b>	<b>Location</b>	<b>Phase</b>
DF9051D	Culvert Retrofit	Angelico Branch	Upstream of Cedar Pond Road	B
DF9051E	Drainage Retrofit	Angelico Branch	Distributed at outfalls throughout the drainage area	B
DF9054A	Drainage Retrofit	Wolftrap Creek	Distributed at outfalls throughout the drainage area	B
DF9054B	New Pond	Wolftrap Creek	At Site of D-54	A
DF9058A	Culvert Retrofit	Little Difficult Run	Upstream side of Thoroughbred Road	A
DF9058B	Culvert Retrofit	Little Difficult Run	Upstream side of Folkstone Road	B
DF9059A	Pond Retrofit	Upper Difficult Run	Along Center Ridge Road	A
DF9059B	Drainage Retrofit	Upper Difficult Run	Distributed at outfalls throughout the drainage area	B
DF9059C	Pond Retrofit	Upper Difficult Run	Upstream of Berryland Drive	A
DF9061A	Culvert Retrofit	Little Difficult Run	At Stuart Mill Road	A
DF9061B	Drainage Retrofit	Little Difficult Run	Distributed at outfalls throughout the drainage area	B
DF9061C	Culvert Retrofit	Little Difficult Run	Upstream of Foxclove Road	B
DF9061D	Pond Retrofit	Little Difficult Run	Along Foxclove Road	A
DF9064A	Pond Retrofit	Piney Run	Behind private residences by Challedon Road	A
DF9064B	Culvert Retrofit	Piney Run	N of Brevity Drive	B
DF9064C	Pond Retrofit	Piney Run	The end of Artemel Lane	A
DF9064D	Drainage Retrofit	Piney Run	Distributed at outfalls throughout the drainage area	B
DF9065A	New Pond	Wolftrap Creek	Near Pinstripe Court	A
DF9065B	Drainage Retrofit	Wolftrap Creek	Distributed at outfalls throughout the drainage area	B
DF9066A	Pond Retrofit	Rocky Run	Upstream of Daviswood Drive	A
DF9072A	Pond Retrofit	Upper Difficult Run	Across Vale Road from Chris Wood Court	A
DF9073A	LID Retrofit	Piney Branch	Madison HS and Flint Hill ES	A
DF9073B	Drainage Retrofit	Piney Branch	Distributed at outfalls throughout the drainage area	B
DF9073C	Pond Retrofit	Piney Branch	Along Riviera Drive	A
DF9074A	Drainage Retrofit	Piney Branch	Distributed at outfalls throughout the drainage area	B
DF9076A	Culvert Retrofit	Lower Difficult Run	Culvert under Falls Run Road	A
DF9076B	Pond Retrofit	Lower Difficult Run	Pond below Falls Run Road	A
DF9079A	Drainage Retrofit	South Fork Run	At outfalls within this drainage area	B
DF9079B	Culvert Retrofit	South Fork Run	Honda Road and Lariat Lane	A
DF9103	Pond Retrofit	Piney Run	Bright Pond Lane and Fieldview Drive	C
DF9106A	Pond Retrofit	Captain Hickory Run	At Georgetown Pike	A
DF9106B	Pond Retrofit	Captain Hickory Run	Downstream of Columbine Street	A
DF91135	Pond Retrofit	Dog Run	Water Pointe Lane and the Reston Parkway	C
DF9116A	Pond Retrofit	Wolftrap Creek	Kilby Glen Drive and South Courthouse Drive	D
DF9116B	Pond Retrofit	Wolftrap Creek	Along Deramus Farm Drive	D

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<b>Project No</b>	<b>Type</b>	<b>Subwatershed</b>	<b>Location</b>	<b>Phase</b>
DF9117	Pond Retrofit	Wolftrap Creek	S Courthouse Drive and Towlston Road	E
DF9118A	Pond Retrofit	Colvin Run	Culvert under Sunset Hills Road	D
DF9118B	Pond Retrofit	Colvin Run	Facility on S side of Dulles Toll Road	D
DF9119	New Pond	Old Courthouse	West of Gosnell Road	B
DF9121	Pond Retrofit	Rocky Run	Retrofit regional pond D-67	C
DF9122	Pond Retrofit	Middle Difficult Run	Brittenford Drive and Hunt Country Lane	E
DF9123B	Pond Retrofit	Snakeden Branch	Existing pond on upstream side of Sugarberry Court	B
DF9124A	Pond Retrofit	Snakeden Branch	East of Barton Hill Road	D
DF9124C	Pond Retrofit	Snakeden Branch	Intersection of the Dulles Toll Road with W&OD Trail	E
DF9129	Pond Retrofit	Piney Branch	At the bend in Liberty Tree Lane	E
DF9133A	Pond Retrofit	Wolftrap Creek	At the outlet to Catchment 33	B
DF9133B	Pond Retrofit	Wolftrap Creek	Upstream side of Silentrete Drive	B
DF9139	Pond Retrofit	Rocky Branch	Intersection of Rosehaven and Jermantown Roads	C
DF9141A	Pond Retrofit	Upper Difficult Run	Fair Oaks Mall property, near Lee Jackson Hwy	C
DF9141B	Pond Retrofit	Upper Difficult Run	N side of US 50	D
DF9142	Pond Retrofit	Upper Difficult Run	E end of the Fair Oaks Mall property	C
DF9143A	Pond Retrofit	Upper Difficult Run	E of the Fairfax Government Center	A
DF9143B1	Pond Retrofit	Upper Difficult Run	S of DF9143A and N of Rockaway Lane	A
DF9143B2	Pond Retrofit	Upper Difficult Run	S of DF9143A and N of Rockaway Lane	A
DF9143C	Pond Retrofit	Upper Difficult Run	N of Government Center Parkway	A
DF9143D	Pond Retrofit	Upper Difficult Run	N side of the stream from project DF9143C	A
DF9143E	Pond Retrofit	Upper Difficult Run	Glen Alden Road and Government Center Pkwy	A
DF9143F2	Pond Retrofit	Upper Difficult Run	N of the Government Center building	A
DF9143H	Pond Retrofit	Upper Difficult Run	Government Center Parkway and Legato Road	A
DF9151	Pond Retrofit	Colvin Run	S of Baron Cameron Avenue	D
DF9152	Pond Retrofit	Colvin Run	Bennington Woods Road and Baron Cameron Avenue	D
DF9157	New Pond	Old Courthouse	At Leesburg Pike and Laurel Hill Road	B
DF9157A	Pond Retrofit	Old Courthouse	At the crossing of Jarrett Valley Drive	B
DF9171	Pond Retrofit	Upper Difficult Run	East of Pender Drive	C
DF9172	Pond Retrofit	Upper Difficult Run	East of Lower Park Drive	C
DF9202	Stream Restoration	Dog Run	SW of Leesburg Pike and E of Reston Parkway	E
DF9205	Stream Restoration	Piney Run	S of Walker Mill Road	D
DF92101	Stream Restoration	Snakeden Branch	N of Sunrise Valley Road	A
DF92102	Stream Restoration	Snakeden Branch	S of N Shore Dr and E of Barton Hill	E

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Project No	Type	Subwatershed	Location	Phase
			Rd	
DF92104	Stream Restoration	The Glade	SW of Stirrup Road	A
DF92106	Stream Restoration	Middle Difficult Run	Mainstem N of Dulles Toll Road	D
DF92108	Buffer Restoration	Middle Difficult Run	S of Dulles Toll Road, E of Hunter Mill Road	E
DF92110	Stream Restoration	Piney Branch	S off Fosbak Drive	D
DF92114	Stream Restoration	Little Difficult Run	E of Colt Run Rd before Stuart Mill Rd	D
DF92117	Stream Restoration	Angelico Branch	S of Whippoorwill Road and N of Lawyers Road	A
DF92120	Stream Restoration	South Fork Run	E of Fox Mill Road, N of Deerfield Drive	D
DF92124	Stream Restoration	Wolftrap Creek	S of Chain Bridge Road, W of Westwood Forest Road	D
DF92125	Buffer Restoration	Wolftrap Creek	Within the Westbriar Country Club golf course	E
DF92126	Stream Restoration	Wolftrap Creek	W of Foxstone Drive	D
DF9213	Stream Restoration	Colvin Run	In Lake Fairfax Park, W of Hunter Mill Road	C
DF92130	Stream Restoration	Rocky Branch	W of Mystic Meadow Road, S of Hunter Mill Road	D
DF92131	Stream Restoration	Rocky Branch	W of Hunter Mill Road before intersection with Vale Road	D
DF92135	Stream Restoration	Colvin Run	S of N Shore Drive	A
DF92136	Stream Restoration	Colvin Run	E of Wiehle Avenue and S of Yellowwood Court	A
DF9225	Stream Restoration	Snakeden Branch	E and W of Soapstone Road	B
DF9236	Stream Restoration	Little Difficult Run	W of intersection of Stuart Mill Road and Birdfoot Lane	D
DF9238	Buffer Restoration	Upper Difficult Run	N of intersection of Waples Mill Road and Fox Mill Road	E
DF9244	Stream Restoration	Upper Difficult Run	N of Government Center Parkway	E
DF9245	Stream Restoration	Upper Difficult Run	N of intersection of Fairfax Farms Road and Valley Road	E
DF9249	Stream Restoration	Colvin Run	S of Fairway Dr and W of Westbriar Dr	A
DF9263	Stream Restoration	Upper Difficult Run	SW of Lawyers Road before Hunters Crest Way	D
DF9265	Stream Restoration	Little Difficult Run	S of Thoroughbred Rd, W of Fox Mill Rd	D
DF9274	Stream Restoration	Captain Hickory Run	At end of Walker Glen Court	A
DF9278	Stream Restoration	Dog Run	By Georgetown Pike and Kimberly Place	A
DF9279	Buffer Restoration	Dog Run	E of Stones Throw Drive	E
DF9280	Buffer Restoration	Piney Run	On either side of Bishops Gate Road	E
DF9284	Stream Restoration	Lower Difficult Run	E of Old Dominion Drive	A
DF9285	Stream Restoration	Lower Difficult Run	Where Colvin Run Road intersects Leesburg Pike	A
DF9289	Stream Restoration	Lower Difficult Run	Confluence with Captain Hickory Run	D
DF9290	Stream Restoration	Sharpers Run	Downstream of Bellview Road	D



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<b>Project No</b>	<b>Type</b>	<b>Subwatershed</b>	<b>Location</b>	<b>Phase</b>
DF9291	Stream Restoration	Rocky Run	N of Bellview Road, S of Galium Court	D
DF9295	Stream Restoration	Colvin Run	S of Colvin Forest Dr, W of Leesburg Pike	D
DF9501B	Culvert Retrofit	Dog Run	Upstream of Stones Throw Drive	E
DF9501C	Culvert Retrofit	Dog Run	End of Bright Pond Lane	E
DF9503	Culvert Retrofit	Piney Run	Intersection of Hawthorne Court and Reston Parkway	D
DF9504A	Culvert Retrofit	Piney Run	Upstream side of Tiverton Circle	E
DF9504B	Culvert Retrofit	Piney Run	Culvert under Wiehle Avenue	E
DF9507B	Culvert Retrofit	Colvin Run	Culvert under Wiehle Avenue	A
DF9508A	Culvert Retrofit	Colvin Run	Along Village Road and Baron Cameron Avenue	D
DF9508B	Culvert Retrofit	Colvin Run	Culvert under Baron Cameron Avenue	E
DF9512A	Culvert Retrofit	Colvin Run	Culvert under N Shore Drive	D
DF9512B	Culvert Retrofit	Colvin Run	Culvert under N Shore Drive	D
DF9512C	Culvert Retrofit	Colvin Run	Culvert under Wiehle Avenue	E
DF9515A	Culvert Retrofit	Lower Difficult Run	Under Leesburg Pike	D
DF9515B	Culvert Retrofit	Lower Difficult Run	Upstream of Locust Hill Drive	E
DF9520A	Culvert Retrofit	Wolftrap Creek	Culvert under Dulles Toll Road	B
DF9520B	Culvert Retrofit	Wolftrap Creek	Culvert under Dulles Toll Road	B
DF9522A	Culvert Retrofit	Middle Difficult Run	Driveway off of Willow Crest Court	E
DF9522B	Culvert Retrofit	Middle Difficult Run	Upstream of Brittenford Drive	E
DF9522C	Culvert Retrofit	Middle Difficult Run	At Brittenford Drive, E of Raleigh Hill Road	E
DF9522D	Culvert Retrofit	Middle Difficult Run	At Brittenford Drive, E of Landon Hill Road	E
DF9523	Culvert Retrofit	Snakeden Branch	Upstream side of Soapstone Drive	B
DF9524	Culvert Retrofit	Snakeden Branch	N of Sunrise Valley Dr, E of Preston White Dr	A
DF9531B	Culvert Retrofit	Wolftrap Creek	Above Creek Crossing Road	E
DF9532A	Culvert Retrofit	Wolftrap Creek	Upstream side of Follin Lane	B
DF9532B	Culvert Retrofit	Wolftrap Creek	Upstream side of Woodford Road	B
DF9535A	Culvert Retrofit	Snakeden Branch	Upstream side of Colts Neck Road	B
DF9535B1	Culvert Retrofit	Snakeden Branch	Culvert under Glade Drive	B
DF9535B2	Culvert Retrofit	Snakeden Branch	Culvert under Glade Drive	B
DF9540A	Culvert Retrofit	The Glade	Upstream side of Steeplechase Drive	E
DF9540B	Culvert Retrofit	The Glade	Upstream side of Colts Neck Road	C
DF9550A	Culvert Retrofit	Colvin Run	Culvert under Baron Cameron Avenue	A
DF9551	Culvert Retrofit	Colvin Run	Upstream of Gates Meadow Way	D
DF9552A	Culvert Retrofit	Colvin Run	Upstream of Bennington Woods Road	D
DF9552B	Culvert Retrofit	Colvin Run	Upstream of N Shore Drive	E
DF9555A	Culvert Retrofit	Middle Difficult Run	Upstream of Hunter Mill Road	E
DF9555B	Culvert Retrofit	Middle Difficult Run	Upstream of Dulles Toll Road	E
DF9555C	Culvert Retrofit	Middle Difficult Run	At Brittenford Drive, E of Rosaleigh Ct	E
DF9557	Culvert Retrofit	Old Courthouse	Upstream of Laurel Hill Road	B

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<b>Project No</b>	<b>Type</b>	<b>Subwatershed</b>	<b>Location</b>	<b>Phase</b>
DF9558	Culvert Retrofit	Wolftrap Creek	Upstream side of Old Courthouse Road	E
DF9701	Drainage Retrofit	Dog Run	Distributed at outfalls throughout the drainage area	E
DF9706	Drainage Retrofit	Captain Hickory Run	Distributed	A
DF9707	Drainage Retrofit	Colvin Run	Distributed at outfalls throughout the drainage area	E
DF9712	Drainage Retrofit	Colvin Run	Distributed at outfalls throughout the drainage area	E
DF9716	Drainage Retrofit	Wolftrap Creek	Along Tuba and Laurlin Court	E
DF9722	Drainage Retrofit	Middle Difficult Run	Distributed at outfalls throughout the drainage area	E
DF9723	Drainage Retrofit	Snakeden Branch	Distributed at outfalls throughout the drainage area	B
DF9724	Drainage Retrofit	Snakeden Branch	Distributed at outfalls throughout the drainage area	E
DF9728	Drainage Retrofit	Snakeden Branch	Along Purple Beech Drive and Ridge Heights Road	E
DF9729	Drainage Retrofit	Piney Branch	Distributed at outfalls throughout the drainage area	E
DF9730	Drainage Retrofit	Piney Branch	Distributed at outfalls throughout the drainage area	E
DF9731	Drainage Retrofit	Wolftrap Creek	Distributed at outfalls throughout the drainage area	E
DF9735	Drainage Retrofit	Snakeden Branch	Distributed at outfalls throughout the drainage area	B
DF9740	Drainage Retrofit	The Glade	Distributed at outfalls throughout the drainage area	E
DF9741	Drainage Retrofit	Upper Difficult Run	Distributed at outfalls throughout the drainage area	E
DF9750	Drainage Retrofit	Colvin Run	Distributed at outfalls throughout the drainage area	E
DF9751	Drainage Retrofit	Colvin Run	Distributed at outfalls throughout the drainage area	E
DF9755	Drainage Retrofit	Middle Difficult Run	Distributed at outfalls throughout the drainage area	E
DF9757	Drainage Retrofit	Old Courthouse	Distributed at outfalls throughout the drainage area	B
DF9758	Drainage Retrofit	Wolftrap Creek	Distributed at outfalls throughout the drainage area	E
DF9806	LID Retrofit	Captain Hickory Run	N of Georgetown Pike	A
DF9807	LID Retrofit	Colvin Run	Rain garden at Wiehle Ave and N Shore Dr	C
DF9808	LID Retrofit	Colvin Run	Intersection of Village Drive and N Shore Drive	C
DF9809	LID Retrofit	Colvin Run	S of the intersection of Village Drive and N Shore Drive	C
DF9812	LID Retrofit	Colvin Run	Isaac Newton Square and Wiehle Avenue	C
DF9818	LID Retrofit	Colvin Run	Throughout catchment N of the Dulles	C

Project No	Type	Subwatershed	Location	Phase
			Toll Road	
DF9819	LID Retrofit	Old Courthouse	Intersection of Leesburg Pike and Chain Bridge Road	B
DF9830	LID Retrofit	Piney Branch	Along Maple Avenue and the W&OD Trail	C
DF9831	LID Retrofit	Wolftrap Creek	Rear parking lot on Follin Lane	B
DF9831B	LID Retrofit	Wolftrap Creek	On both sides of Maple Street	B
DF9832	LID Retrofit	Wolftrap Creek	Notre Dame and Our Lady of Good Counsel Catholic Church	B
DF9833	LID Retrofit	Wolftrap Creek	Upper third of Catchment 33	B
DF9835	LID Retrofit	Snakeden Branch	In and around Hunters Woods Village Shopping Center	B
DF9839	LID Retrofit	Rocky Branch	Around intersection of Jermantown and Route 123	C
DF9841	LID Retrofit	Upper Difficult Run	On and around Fair Oaks Mall	C
DF9842	LID Retrofit	Upper Difficult Run	Throughout the Fair Oaks Mall property	C
DF9843	LID Retrofit	Upper Difficult Run	Entire parking area for the Government Center	A
DF9871	LID Retrofit	Upper Difficult Run	E of Pender Drive	C

### Benefits of Plan Actions

Plan benefits were estimated with the watershed computer model developed during the project. Proposed conditions were compared to future conditions to determine the benefits of the proposed projects.

Proposed stormwater treatment measures, including pond retrofits, culvert retrofits, LID retrofits, and new ponds were modeled based on the amount of runoff each was capable of treating, and literature values for pollutant removal efficiency. Peak flow reductions were also modeled, again based on the amount of area draining to each retrofit project and its size. The majority of the proposed projects were designed to improve both water quality and water quantity control, and should help to reduce pollutant loads, but also to reduce the erosive peak flows that damage streambeds and scour stream systems.

Results of the modeling showed improvements in water quality constituents, such as reduction of nitrogen and phosphorus levels, throughout the entire Difficult Run watershed. Table ES-2 below compares the existing and future conditions model results for each subwatershed with the model containing the proposed concept plans.

The projects proposed in this report will reduce peak flows and pollutant loads throughout all of Difficult Run. The model results show an 8 percent decrease in Total Suspended Solids (TSS), an 11 percent decrease in Total Nitrogen (TN), and a 17 percent decrease in Total Phosphorus (TP) throughout the watershed.

**Table ES.2: Pollutant Loads and Reductions**

Subwatershed	Area (acres)	Scenario	Runoff Volume (in/yr)	Peak Flow (cfs/ac)	TSS (lb/ac/yr)	TN (lb/ac/yr)	TP (lb/ac/yr)
Angelico Branch	483	Existing	2.1	1.6	19.1	1.00	0.20
		Future	2.5	1.8	25.5	1.35	0.27
		Proposed	2.5	1.7	25.4	1.28	0.24
		Reduction	<b>-2.6%</b>	<b>-5.8%</b>	<b>-0.5%</b>	<b>-5.0%</b>	<b>-12.5%</b>
Captain Hickory Run	1,695	Existing	2.1	1.2	24.5	1.2	0.21
		Future	2.3	1.2	26.5	1.3	0.24
		Proposed	2.3	1.1	24.9	1.1	0.18
		Reduction	<b>-2.6%</b>	<b>-8.1%</b>	<b>-6.1%</b>	<b>-13.4%</b>	<b>-23.6%</b>
Colvin Run	3,876	Existing	5.1	2.1	108.6	4.3	0.52
		Future	5.7	2.2	119.4	4.6	0.55
		Proposed	5.3	1.8	103.1	3.9	0.44
		Reduction	<b>-6.7%</b>	<b>-14.4%</b>	<b>-13.7%</b>	<b>-16.2%</b>	<b>-20.2%</b>
Dog Run	516	Existing	3.0	1.5	35.7	1.8	0.32
		Future	3.4	1.6	43.0	2.1	0.40
		Proposed	3.3	1.4	42.8	1.8	0.25
		Reduction	<b>-1.8%</b>	<b>-17.0%</b>	<b>-0.7%</b>	<b>-13.9%</b>	<b>-36.4%</b>
The Glade	853	Existing	3.3	1.6	45.5	2.3	0.44
		Future	3.3	1.6	46.0	2.3	0.45
		Proposed	3.3	1.4	46.0	2.2	0.39
		Reduction	<b>-1.4%</b>	<b>-13.0%</b>	<b>-0.1%</b>	<b>-4.9%</b>	<b>-12.2%</b>
Little Difficult Run	2,590	Existing	2.0	1.4	20.2	1.1	0.21
		Future	2.2	1.5	23.5	1.3	0.25
		Proposed	2.2	1.3	23.5	1.2	0.23
		Reduction	<b>-2.8%</b>	<b>-10.9%</b>	0.0%	<b>-3.2%</b>	<b>-8.6%</b>
Old Courthouse Spring	981	Existing	9.3	2.7	192.9	7.7	0.88
		Future	9.5	2.8	197.9	8.0	0.93
		Proposed	9.4	2.7	191.8	7.6	0.86
		Reduction	<b>-1.1%</b>	<b>-3.1%</b>	<b>-3.1%</b>	<b>-5.1%</b>	<b>-7.7%</b>
Piney Branch	2,475	Existing	4.6	2.1	73.7	3.6	0.63
		Future	4.9	2.2	85.6	4.2	0.72
		Proposed	4.8	2.1	84.7	4.0	0.64
		Reduction	<b>-3.0%</b>	<b>-7.5%</b>	<b>-1.0%</b>	<b>-4.8%</b>	<b>-11.5%</b>
Piney Run	2,100	Existing	3.2	1.6	48.8	2.1	0.32
		Future	3.5	1.6	56.8	2.5	0.37
		Proposed	3.5	1.3	57.0	2.4	0.33
		Reduction	<b>-2.0%</b>	<b>-19.0%</b>	0.5%	<b>-4.8%</b>	<b>-12.7%</b>
Rocky Branch	2,167	Existing	3.4	1.6	47.9	2.3	0.39
		Future	3.7	1.7	53.2	2.5	0.44
		Proposed	3.6	1.6	53.2	2.3	0.36
		Reduction	<b>-2.3%</b>	<b>-10.1%</b>	0.1%	<b>-7.0%</b>	<b>-17.7%</b>

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Subwatershed	Area (acres)	Scenario	Runoff Volume (in/yr)	Peak Flow (cfs/ac)	TSS (lb/ac/yr)	TN (lb/ac/yr)	TP (lb/ac/yr)
Rocky Run	1,673	Existing	4.0	1.9	64.5	2.9	0.36
		Future	4.2	2.0	66.2	3.1	0.40
		Proposed	4.1	1.8	65.5	3.0	0.40
		Reduction	-2.1%	-9.2%	-1.2%	-1.5%	-2.3%
Snakeden Branch	2,239	Existing	6.1	2.1	126.5	5.0	0.66
		Future	6.4	2.1	132.9	5.1	0.66
		Proposed	6.3	1.8	130.3	4.9	0.60
		Reduction	-2.4%	-12.9%	-1.9%	-4.7%	-9.4%
South Fork Run	1,745	Existing	2.1	1.3	23.4	1.3	0.25
		Future	2.3	1.3	25.4	1.4	0.27
		Proposed	2.2	1.2	25.3	1.3	0.23
		Reduction	-2.1%	-10.4%	-0.2%	-6.2%	-15.7%
Sharpers Run	415	Existing	1.7	1.2	21.3	1.2	0.18
		Future	2.2	1.2	30.0	1.6	0.23
		Proposed	2.1	1.1	29.8	1.6	0.23
		Reduction	-3.1%	-10.9%	-0.7%	-0.4%	-0.5%
Wolftrap Creek	3,631	Existing	5.1	2.3	80.8	3.7	0.60
		Future	5.6	2.5	95.4	4.5	0.74
		Proposed	5.3	2.0	84.4	3.8	0.58
		Reduction	-5.0%	-20.2%	-11.5%	-15.8%	-22.7%
Upper Difficult Run	5,684	Existing	3.7	1.8	60.6	2.5	0.34
		Future	4.1	1.9	73.1	3.0	0.39
		Proposed	4.0	1.5	60.5	2.3	0.30
		Reduction	-2.2%	-20.4%	-17.3%	-20.9%	-24.8%
Middle Difficult Run	1,721	Existing	3.3	1.7	41.2	1.9	0.31
		Future	3.5	1.8	45.1	2.1	0.33
		Proposed	3.3	1.5	42.8	1.9	0.26
		Reduction	-5.6%	-14.0%	-5.1%	-11.8%	-20.8%
Lower Difficult Run	2,450	Existing	1.9	1.4	17.5	0.9	0.17
		Future	2.0	1.5	19.0	1.0	0.19
		Proposed	1.9	1.4	18.9	0.9	0.16
		Reduction	-1.5%	-5.1%	-0.5%	-4.7%	-12.6%
Difficult Run Total	37,924	Existing	3.8	1.8	63.1	2.7	0.41
		Future	4.2	1.9	70.6	3.1	0.46
		Proposed	4.0	1.6	65.4	2.7	0.38
		Reduction	-3.3%	-13.6%	-7.5%	-10.9%	-16.6%

### Implementation Plan

The recommended actions will potentially be implemented over the 25-year life of the *Difficult Run Watershed Management Plan*. This Plan will be a guide for all County agencies and officials in protecting and maintaining the health of the watershed. It will be an active or “living” document that will be revisited and updated regularly throughout the implementation phase.

The final scope and design of each project will be determined during implementation, in collaboration with all parties affected, including the Fairfax County Park Authority, homeowners associations, adjacent landowners and others.

The policy actions and many of the nonstructural actions will be considered with similar recommendations from other watershed plans and will potentially be implemented across all watersheds. Also, many of the actions involve coordination with other agencies such as the Northern Virginia Soil and Water Conservation Service, Fairfax County Health Department and Virginia Department of Conservation and Recreation.

A weighted set of five categories was used to prioritize each plan action. The following categories were used:

- Board Adopted Categories (40%)
- Direct Regulatory Contribution (10%)
- Public Support (10%)
- Effectiveness / Location (25%)
- Ease of Implementation (15%)

The Plan identifies the projects to be evaluated and implemented within each of the following five-year implementation phases, A through E. The implementation phase for each individual structural project is shown in Table ES.1.

A - Year 1 – 5

B - Year 6 – 10

C - Year 11 – 15

D - Year 16 – 20

E - Year 21 - 25

### **Plan Total Cost**

The total cost of the proposed structural projects is approximately \$71.0 million. Over the Plan's lifespan of 25 years, this will require approximately 4.9 Fairfax County Staff Year Equivalents for project management, land acquisition, and construction management, which are factored into the project costs.