

Executive Summary

The Little Rocky Run – Johnny Moore Creek Watershed Management Plan is a strategic plan that aims to protect and improve the water quality within the watershed over the next 25 years. Fairfax County's first set of watershed plans was completed in the 1970s. Land use has changed significantly since that time. Additionally, there have been many advances in technology and development in the field of stormwater management which have resulted in updates to stormwater policies and regulations. New plans were needed to reflect these changes and to plan for a future in which Fairfax County balances the needs of the environment coupled with a highly developed land area.

This watershed plan provides more targeted strategies for addressing stream health given current and future land uses and evolving regulations. It is one of several tools that enable the County to address program requirements and to improve and maintain watershed health.

Planning Process

The plan includes a prioritized 25-year list of proposed capital improvement projects in addition to non-structural programs and projects. The planning process, initiated by Fairfax County, for development of this watershed management plan included the participation and recommendations of a watershed advisory group.

The principal goals for public involvement were:

- Increase community awareness and understanding of stormwater management
- Provide meaningful participation options for a diversity of stakeholders
- Incorporate community ideas into the scope of the watershed plans
- Strive for community support for the final plans

The first step of the public involvement process was to host an Introductory and Issues Scoping Forum that was open to all residents. The primary purpose of this forum was to solicit informed input on the development of the watershed management plan. Other objectives were to explain the planning process to the community and develop an initial list of watershed issues and concerns.

After the forum, stakeholder groups were invited to be part of a Watershed Advisory Group (WAG) for each plan. These were comprised of local stakeholders who represented various interests (homeowners association (HOA) representatives, environmental groups, etc). The WAG advised County staff about community outreach opportunities, key issues affecting their watershed and potential project locations.

The County selected three overarching goals, or intended outcomes of the watershed management plans:

1. Improve and maintain watershed functions in Fairfax County, including water quality, habitat and hydrology
2. Protect human health, safety and property by reducing stormwater impacts
3. Involve stakeholders in the protection, maintenance and restoration of County watersheds.

Ten objectives were developed related to the three goals. Each objective may achieve one or more goals, and each goal may be achieved by one or more objectives. These ten objectives were grouped into five categories based on certain aspects of watershed management the objectives could influence:

1. **Hydrology** - healthy movement and distribution of water through the environment in a way that is protective of streams and human dwellings
2. **Habitat** - suitable environment for sustaining plants and animals
3. **Stream water quality** - general chemical and physical properties of surface waters
4. **Drinking water quality** - quality of water used for human consumption

5. **Stewardship** - the roles the County, other jurisdictions and members of the general public can play in caring for the environment

Since accomplishment of objectives cannot be directly measured, indicators that are able to detect changes in the watershed were developed. Indicators are used to assess the condition of the environment, as early-warning signals of changes in the environment and to diagnose causes of ecological problems. Each indicator was measured by one or more metrics. A metric is an analytical benchmark that responds in a predictable way to increasing human, climatic or other environmental stress. The indicators used by Fairfax County may be grouped into the following categories:

- **Watershed Impact Indicators** – Measure the extent that reversal or prevention of a particular watershed impact, sought by the goals and objectives, has been achieved (“What’s there now, and how is it doing?”).
- **Source Indicators** – Quantify the presence of a potential stressor or pollutant source (“Is there a problem, and what’s causing it?”).
- **Programmatic Indicators** –After the plans are adopted, these will assess outcomes of resource protection and restoration activities (“What’s the County doing about the problem, and how is it doing?”).

The indicator metric values were translated into scores, and objective, composite and overall composite scores were calculated for use in subwatershed ranking. Weighting factors were used when calculating composite scores to give more importance to certain indicators and objectives.

The composite scores were used to identify problem areas in the watershed and rank subwatersheds for management priority. Subwatersheds were further categorized based on which management opportunities were most likely to restore functions to the problem areas identified. The resulting data were then utilized to identify key issues and select projects that would achieve the watershed planning goals and objectives.

Hydrologic, hydraulic and pollutant load models were used to develop a baseline for existing conditions and to assess the impact of the projects proposed in the watershed management plan.

Watershed Conditions

The Little Rocky Run watershed encompasses 4,605 acres (7.2 square miles) and the Johnny Moore Creek watershed encompasses 3,374 acres (5.3 square miles). Both watersheds are located in the Piedmont physiographic province, a region characterized by gently rolling hills, deeply weathered bedrock and very little solid rock at the surface. The Little Rocky Run watershed is divided into three watershed management areas (WMAs): Little Rocky Run-Upper, Little Rocky Run-Lower and Little Rocky Run-Bull Run. Johnny Moore Creek watershed is similarly divided into two WMAs, Johnny Moore Creek and Johnny Moore-Bull Run. The WMAs are generally three to five square miles in size. The WMAs are further divided into subwatersheds, ranging in size from 100 to 300 acres. Subwatersheds represent the smallest modeling unit for watershed planning.

Both the Little Rocky Run-Bull Run WMA and the Johnny Moore-Bull Run WMA are small areas (less than 200 acres) that drain directly to Bull Run. Because these two WMAs are mostly protected with only a small percentage of low-density development and no projects are identified for these WMAs, they are not discussed further in the watershed management plan.

The entire Johnny Moore Creek watershed is located in the Resource-Conservation (R-C) District established by the Board of Supervisors to protect the Occoquan Reservoir. This area has a designated density of one dwelling unit per five acres. The portions of the Little Rocky Run watershed south of Compton Road and the area south of Braddock Road and east of Union Mill Road are in the R-C District. The Little Rocky Run watershed consists primarily of open space, residential development and roadways.

The water quality analysis is driven by land use and the results reflect the different levels of development and stormwater controls in place in the three WMAs. Johnny Moore Creek, with less impervious areas and more natural cover, contributes fewer pounds per year of the pollutants of concern than the WMAs in the Little Rocky Run watershed. This watershed is in relatively healthy condition and needs to be protected; even modest changes in land use should be addressed using stormwater controls.

The Little Rocky Run – Lower WMA is a non-homogenous management area. The lower portion of the watershed is primarily open space or part of the R-C District and therefore produces low levels of pollutants. The rest of the WMA contains significant medium- and high-density residential areas and therefore pollutant loading estimates increase.

The subwatersheds located in the Little Rocky Run – Upper WMA are producing relatively high pollutant loadings. The WMA is predominantly medium- to high-density residential and contains commercially zoned parcels as well. This WMA has undergone the most significant development over the past 10 years, owing to medium/high-density residential and commercial areas replacing open space and low-density residential areas.

Watershed Restoration Strategies

Strategies for restoration of the watershed were presented to the Watershed Advisory Group (WAG) and were condensed into categories:

- Stream/Buffer Restoration
- Pond Retrofits
- New Stormwater Management (SWM) Facilities – includes Low Impact Development (LID) Techniques, Ponds, Culvert Retrofits, Outfall Treatment
- Flooding Mitigation

The restoration strategies encompass many different project types. The following table provides a summary of project types for each restoration strategy.

Restoration Strategy	Project Type
Stream Restoration	Stream/Bank Stabilization Stream Realignment Pipe Outfall Stabilization
Pond Retrofits	Regrade pond to provide more storage Remove concrete trickle ditches Redesign pond to include micropools and wetland areas Redesign quantity-only ponds to provide water quality storage
New SWM Facilities	Bioretention areas Vegetated swales Green roofs Underground storage Manufactured BMPs Stormwater Ponds – extended detention dry ponds, wet ponds Constructed wetlands Tree box filters Rain barrel programs
Flooding Mitigation	Resize road crossing structures to convey design discharge Floodproof or purchase structures located in the floodplain

Non-structural projects are a group of projects that do not require traditional construction measures to be implemented and may be programmatic in nature. These projects include but are not limited to the following practices:

- Buffer restorations
- Rain barrel programs
- Dumpsite and obstruction removals
- Community outreach and public education
- Land conservation coordination projects
- Inspection and enforcement projects
- Street sweeping programs
- Recommendation of additional studies, surveys and assessments

In general, non-structural projects represent opportunities to proactively pursue stormwater issues that more traditional structural practices cannot address. The use of non-structural practices aids in fulfilling Fairfax County's MS4 permit requirements and environmental initiatives. The full potential of these projects will be realized through partnerships with County agencies, residents and other interested parties.

To identify projects, the subwatershed ranking results were used in combination with problem areas identified in the County's stream physical assessment, concerns identified by both the WAG and the public forum, and sites discovered during the field reconnaissance. A 'project universe' of nearly 150 candidate projects was compiled as a result of this analysis. Field investigation of the candidate projects was conducted in June 2009 to evaluate feasibility and to gather other data such as site conditions, site constraints and potential construction considerations. Following the field investigation, 82 projects were selected for further prioritization and ranking (Section 4.3). Some of the projects were combined into one project based on their cost and proximity.

The baseline ranking process consisted of setting values in five categories that, when scored according to the following weighting system, resulted in a preliminary project score. The five categories are described as:

1. Effect on Watershed Impact Indicators (30 percent)
2. Effect on Source Indicators (30 percent)
3. Location within Priority Subwatersheds (10 percent)
4. Sequencing (20 percent)
5. Implementability (10 percent)

The benefits of plan implementation were analyzed through the modeling. Projects in the 10-year implementation plan that could impact the stormwater runoff were modeled in the Storm Water Management Model (SWMM) hydrologic model to determine the magnitude of increased storage on discharge rates. These discharge changes were then input into the Hydrologic Engineering Center River Analysis System (HEC-RAS) hydraulic model to assess any changes to flooding elevations. The changes to flood elevations as a result of the projects were minimal. All project impacts on nitrogen, phosphorus and sediment pollutant loadings were modeled in the Spreadsheet Tool for Estimating Pollutant Load (STEPL).

The plan benefits are improved habitat, improved stream conditions and increased pollutant removal. The cost of the 10-year plan is approximately \$13 million and it is estimated that the 10-year implementation plan would remove 283 tons per year (33 percent) of sediment, 1,583 pounds per year (5 percent) of nitrogen and 317 pounds per year (8 percent) of phosphorus. The cost of the entire plan (10-year and 25-year implementation plans) is approximately \$17.3 million. The pollutant removal of the entire plan is estimated at 348 tons per year (40 percent) of sediment, 2,374 pounds per year (8 percent) of nitrogen and 474 pounds per year (11 percent) of phosphorus. In Little Rocky Run, pollutant loads are reduced below existing condition levels. In Johnny Moore Creek, the future land use changes are due to estate residential development. Because of private property constraints, it was difficult to fully address pollutant removal in these areas through the watershed management plan. As these properties are developed, on-site stormwater measures should be employed to control runoff and pollutant levels.

The following provisions address the funding and implementation of projects and programs in Fairfax County watershed plans. These provisions as recommended by the Board were developed for the Popes Head Creek Watershed Management Plan in February 2006 and have been applied to the Little Rocky Run – Johnny Moore Creek Watershed Management Plan:

- i. Projects and programs (both structural and non-structural) will first undergo appropriate review by County staff and the Board (please see iii below) prior to implementation. Board adoption of the Watershed Management Plan will not set into motion automatic implementation of projects, programs or initiatives that have not first been subject to sufficient scrutiny to ensure that the projects that are funded give the County the greatest environmental benefit for the cost.
- ii. Road projects not related to protection of streambeds or banks or water quality will not be funded out of the stormwater and watershed budget.
- iii. The Watershed Management Plan provides a conceptual master-list of structural capital projects and a list of potential non-structural projects for the watershed. Staff will, on a fiscal year basis, prepare and submit to the Board a detailed work plan to include a description of proposed projects and an explanation of their ranking, based on specific criteria. Criteria used to assemble this list will include, but are not limited to, cost-effectiveness as compared to alternative projects, a clear public benefit, a need to protect public or private lands from erosion or flooding, a need to meet a specific watershed or water quality goal, and ability to be implemented within the same fiscal year that funding is provided. Staff also intends to track the progress of implementation and report back to the Board periodically.
- iv. Each project on the annual list of structural projects will be evaluated using basic value-engineering cost effectiveness principles before implementation and the consideration of alternative structural and non-structural means for accomplishing the purposes of the project will be considered before implementation. This process will ensure the County's commitment to being a fiscally responsible public entity.
- v. Obstruction removal projects on private lands will be evaluated on a case-by-case basis for referral to the Zoning Administrator and/or County Attorney for action as public nuisances; and otherwise to determine appropriate cost-sharing by any parties responsible for the obstructions.
- vi. Stream restoration projects on private lands will be evaluated to determine means for cost-sharing by land owners directly responsible for degradation due to their land uses.

A master list of the projects follows. More detailed cost estimates were prepared for the 40 10-year implementation plan projects and these costs are provided on the following table. The rough cost estimates for the 33 25-year implementation plan projects and the 7 non-structural projects are not provided in the tables.

Priority Structural Projects (Ten Year Implementation Plan)				
Project #	Project Type	WMA	Location	Cost
JM9100	Stormwater Pond Retrofit	Johnny Moore Creek	7005 Union Mill Rd Clifton, VA 20124	\$ 200,000
JM9200	Stream Restoration	Johnny Moore Creek	13309 Balmoral Greens Av Clifton, VA 20124	\$ 770,000
JM9201	Stream Restoration	Johnny Moore Creek	13309 Balmoral Greens Av Clifton, VA 20124	\$ 420,000
JM9202	Stream Restoration	Johnny Moore Creek	7029 Union Mill Rd Clifton, VA 20124	\$ 320,000
JM9203	Stream Restoration	Johnny Moore Creek	13400 Compton Rd Clifton, VA 20124	\$ 770,000
JM9400	Culvert Retrofit	Johnny Moore Creek	13165 Compton Rd Clifton, VA 20124	\$ 120,000
JM9500	BMP/LID	Johnny Moore Creek	7051 Balmoral Forest Rd Clifton, VA 20124	\$ 120,000
LR9005	Regional Pond Group	Little Rocky Run - Lower	6351 Littlefield Ct Centreville, VA 20121	\$ 650,000
LR9010	Regional Pond Group	Little Rocky Run - Upper	5378 Harrow La Fairfax, VA 22030	\$ 350,000
LR9013	Regional Pond Group	Little Rocky Run - Lower	13600 Wildflower La Clifton, VA 20124	\$ 740,000
LR9100	Stormwater Pond Retrofit	Little Rocky Run - Lower	13943 Stonefield Dr Clifton, VA 20124	\$ 100,000
LR9102	Stormwater Pond Retrofit	Little Rocky Run - Lower	6579 Rockland Dr Clifton, VA 20124	\$ 220,000
LR9103	Stormwater Pond Retrofit Stream Restoration	Little Rocky Run - Lower	13815 Springstone Dr Clifton, VA 20124	\$ 560,000
LR9106	Stormwater Pond Retrofit	Little Rocky Run - Lower	13534 Union Village Ci Clifton, VA 20124	\$ 190,000
LR9109	Stormwater Pond Retrofit	Little Rocky Run - Upper	5064 Cavalier Woods La Clifton, VA 20124	\$ 40,000
LR9110	Stormwater Pond Retrofit	Little Rocky Run - Lower	13214 Kilby Landing Ct Clifton, VA 20124	\$ 120,000
LR9111	Stormwater Pond Retrofit	Little Rocky Run - Lower	13022 Cobble La Clifton, VA 20124	\$ 100,000
LR9114	Stormwater Pond Retrofit	Little Rocky Run - Upper	13114 Blue Willow Pl Clifton, VA 20124	\$ 60,000
LR9115	Stormwater Pond Retrofit	Little Rocky Run - Upper	5403 Willow Valley Rd Clifton, VA 20124	\$ 290,000
LR9117	Stormwater Pond Retrofit	Little Rocky Run - Upper	12837 Lee Hy Fairfax, VA 22030	\$ 40,000
LR9201	Stream Restoration	Little Rocky Run - Lower	14104 Sorrel Chase Ct Centreville, VA 20121	\$ 830,000
LR9202	Stream Restoration	Little Rocky Run - Lower	6419 Stonehaven Ct Clifton, VA 20124	\$ 820,000

Priority Structural Projects (Ten Year Implementation Plan)				
Project #	Project Type	WMA	Location	Cost
LR9203	Stream Restoration	Little Rocky Run - Lower	14100 Wood Rock Wy Centreville, VA 20121	\$ 310,000
LR9204	Stream Restoration	Little Rocky Run - Lower	5587A Rockpointe Dr Clifton, VA 20124	\$ 110,000
LR9205	Stream Restoration	Little Rocky Run - Upper	5217 Whisper Willow Dr Fairfax, VA 22030	\$ 510,000
LR9207	Stream Restoration	Little Rocky Run - Upper	5378 Ashleigh Rd Fairfax, VA 22030	\$ 650,000
LR9208	Stream Restoration	Little Rocky Run - Upper	5418 Ashleigh Rd Fairfax, VA 22030	\$ 800,000
LR9209	Stream Restoration	Little Rocky Run - Upper	12753 Ashleigh Ct Fairfax, VA 22030	\$ 380,000
LR9504	BMP/LID	Little Rocky Run - Lower	13916 Rock Brook Ct Clifton, VA 20124	\$ 80,000
LR9508	BMP/LID	Little Rocky Run - Lower	6612 Creek Run Dr Centreville, VA 20121	\$ 90,000
LR9509	BMP/LID	Little Rocky Run - Lower	6600 La Petite Pl Centreville, VA 20121	\$ 140,000
LR9510	BMP/LID	Little Rocky Run - Lower	14330 Green Trails Bv Centreville, VA 20121	\$ 260,000
LR9514	BMP/LID	Little Rocky Run - Lower	13611 Springstone Dr Clifton, VA 20124	\$ 100,000
LR9516	BMP/LID	Little Rocky Run - Lower	6001 Union Mill Rd Clifton, VA 20124	\$ 330,000
LR9521	BMP/LID	Little Rocky Run - Upper	13516 Canada Goose Ct Clifton, VA 20124	\$ 180,000
LR9522	BMP/LID	Little Rocky Run - Upper	13340 Leland Rd Centreville, VA 20121	\$ 220,000
LR9523	BMP/LID	Little Rocky Run - Upper	13006 Feldspar Ct Clifton, VA 20124	\$ 510,000
LR9524	BMP/LID	Little Rocky Run - Upper	5355 Ashleigh Rd Fairfax, VA 22030	\$ 210,000
LR9526	BMP/LID	Little Rocky Run - Upper	4864 Muddler Way Fairfax, VA 22030	\$ 130,000
LR9527	BMP/LID	Little Rocky Run - Upper	5400 Willow Springs School Rd Fairfax, VA 22030	\$ 130,000
				\$12,970,000

Long Term Structural Projects (25 Year Implementation Plan)			
Project #	Project Type	WMA	Location
JM9101	Stormwater Pond Retrofit	Johnny Moore Creek	6801 Union Mill Rd Clifton, VA 20124
JM9700	Outfall Improvement	Johnny Moore Creek	6301 Clifton Rd Clifton, VA 20124
LR9005B	BMP/LID	Little Rocky Run - Lower	13905 Green Trails Ct Centreville, VA 20121
LR9013A	Stream Restoration	Little Rocky Run - Lower	5733 Old Clifton Rd Clifton, VA 20124
LR9013B	BMP/LID	Little Rocky Run - Lower	13400 Braddock Road Clifton, VA 20124
LR9013C	New SWM	Little Rocky Run - Lower	13619 Orchard Dr Clifton, VA 20124
LR9101	Stormwater Pond Retrofit	Little Rocky Run - Lower	13909 Warm Spring Ct Clifton, VA 20124
LR9104	Stormwater Pond Retrofit	Little Rocky Run - Lower	13932 Preacher Chapman Pl Centreville, VA 20121
LR9105	Stormwater Pond Retrofit	Little Rocky Run - Lower	13801 Laura Ratcliff Ct Centreville, VA 20121
LR9107	Stormwater Pond Retrofit	Little Rocky Run - Upper	5901 Spruce Run Ct Centreville, VA 20121
LR9108	Stormwater Pond Retrofit	Little Rocky Run - Upper	13660 Forest Pond Ct Centreville, VA 20121
LR9112	Stormwater Pond Retrofit	Little Rocky Run - Upper	13270 Maple Creek La Centreville, VA 20120
LR9113	Stormwater Pond Retrofit	Little Rocky Run - Upper	5324 Sammie Kay La Centreville, VA 20120
LR9116	Stormwater Pond Retrofit	Little Rocky Run - Upper	5130 Myrtle Leaf Dr Fairfax, VA 22030
LR9200	Stream Restoration	Little Rocky Run - Lower	7014 Dalemar Dr Clifton, VA 20124
LR9206	Stream Restoration	Little Rocky Run - Upper	5112 Lincoln Dr Fairfax, VA 22030
LR9500	BMP/LID	Little Rocky Run - Lower	6901 Newby Hall Ct Clifton, VA 20124
LR9501	BMP/LID	Little Rocky Run - Lower	6818 Compton Heights Cr Clifton, VA 20124
LR9502	BMP/LID	Little Rocky Run - Lower	14024 Marblestone Dr Clifton, VA 20124
LR9503	BMP/LID	Little Rocky Run - Lower	14100 Rock Canyon Dr Centreville, VA 20121
LR9505	BMP/LID	Little Rocky Run - Lower	13933 Marblestone Dr Clifton, VA 20124
LR9506	BMP/LID	Little Rocky Run - Lower	6596 Creek Run Dr Centreville, VA 20121
LR9507	BMP/LID	Little Rocky Run - Lower	13930 South Springs Dr Clifton, VA 20124

Long Term Structural Projects (25 Year Implementation Plan)			
Project #	Project Type	WMA	Location
LR9512	BMP/LID	Little Rocky Run - Lower	13905 Springstone Dr Clifton, VA 20124
LR9513	BMP/LID	Little Rocky Run - Lower	13671 Wildflower La Clifton, VA 20124
LR9515	BMP/LID	Little Rocky Run - Lower	13609 Bridgeland La Clifton, VA 20124
LR9517	BMP/LID	Little Rocky Run - Lower	6021 Little Brook Ct Clifton, VA 20124
LR9518	BMP/LID	Little Rocky Run - Upper	13644 Barren Springs Ct Centreville, VA 20121
LR9519	BMP/LID	Little Rocky Run - Upper	5813 Rockdale Ct Centreville, VA 20121
LR9520	BMP/LID	Little Rocky Run - Upper	13660 Bayberry La Centreville, VA 20121
LR9525	BMP/LID	Little Rocky Run - Upper	4895 Annamohr Dr Fairfax, VA 22030
LR9600	Flood Protection/Mitigation	Little Rocky Run - Upper	5416 Arrowhead Park Dr Centreville, VA 20120
LR9700	Outfall Improvement	Little Rocky Run - Lower	6436 Battle Rock Dr Clifton, VA 20124

Non-Structural Projects			
Project #	Project Type	WMA	Location
JM8800	Buffer Restoration	Johnny Moore Creek	13309 Balmoral Greens Av Clifton, VA 20124
JM8801	Buffer Restoration	Johnny Moore Creek	7404 Union Ridge Rd Clifton, VA 20124
LR8800	Buffer Restoration	Little Rocky Run - Upper	12810 Westbrook Dr Fairfax, VA 22030
LR9010A	Buffer Restoration	Little Rocky Run - Upper	12524 Chronical Dr Fairfax, VA 22030
LR9800	Outreach/Education	Little Rocky Run - Lower	14123 Compton Valley Wy Centreville, VA 20121
LR9801	Outreach/Education	Little Rocky Run - Upper	Bent Tree Apartments Centreville, VA 20121
LR9802	Outreach/Education, Street Sweeping Program	Little Rocky Run - Upper	5702 Union Mill Rd Clifton, VA 20124