3.7 Dog Run – Subwatershed Condition

3.7.1 Subwatershed Characteristics

The Dog Run **subwatershed** is located in northeastern Fairfax County. This 515-**acre** (0.8 mi^2) subwatershed is the third-smallest subwatershed in the Difficult Run watershed. It is bound by Utterback Store Road (Virginia 717) to the east and Seneca Road (Virginia 602) to the west. Leesburg Pike traverses the southwest corner of the subwatershed.

There are 2.5 miles of stream within the subwatershed that flow south and join Piney Run north of Woodbrook Lane. The majority of the length of the stream flows through open space and estate residential areas. There is a short segment of the stream that is adjacent to a high-intensity commercial area just to the east of Northfalls Court.

Refer to DFDG_1 for a map of the Dog Run subwatershed highlighting the Subwatershed Characteristics including existing **land use**, **flood limit**, **wetlands**, **resource protection areas** and **stormwater management**.

3.7.2 Existing and Future Land Use

The type and density of land use in a subwatershed can affect the downstream water quality and stream condition. While each land use type introduces issues to the natural stream system, more intense land use types, such as high-density residential, commercial and industrial, can have high levels of **impervious** surface and contribute **runoff** and **pollutants** to the stream system. Less intense types such as open space and estate residential are generally less impervious, have more natural vegetation and therefore have less impact on stream quality.

The Dog Run subwatershed development is not very densely developed. Fifty-three percent of the Dog Run subwatershed is developed as low-density or estate residential. Another 22 percent of the land in the Dog Run subwatershed is open space or parks, although there are no major park facilities located within the subwatershed. Six percent of the subwatershed is developed for commercial uses. The majority of this commercial area is clustered along the west-central edge of the subwatershed at the junction of Leesburg Pike (Virginia 7) and Georgetown Pike (Virginia 193). There are no industrial areas.

There are 71 acres, 14 percent of the subwatershed, used for transportation such as roads and highways. Total **impervious** area for the subwatershed, which includes all roads, parking lots, sidewalks, residential driveways and buildings, is approximately 81 acres, or 16 percent of the total subwatershed area. A summary of land use within the subwatershed can be found in Table 3.10.

Changes in the land use that result in higher intensity uses in the future can present problems for streams. For example, if the land use shifts from open space to high-intensity commercial use, additional buildings, roadways and parking lots may replace the forest and open fields and impact stream condition.

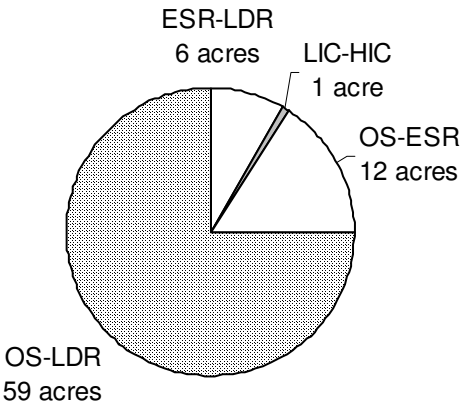
Table 3.10 Existing and Future Land Use

Land Use Type	Existing		Future		Change	
	Acres	Percent	Acres	Percent	Acres	Percent
Open space, parks, and recreational areas	111	22%	40	8%	-72	-14%
Golf Course	0	0%	0	0%	0	0%
Estate residential	73	14%	79	15%	6	1%
Low-density residential	199	39%	264	51%	66	13%
Medium-density residential	30	6%	30	6%	0	0%
High-density residential	0	0%	0	0%	0	0%
Low-intensity commercial	9	2%	8	2%	-1	0%
High-intensity commercial	9	2%	10	2%	1	0%
Industrial	0	0%	0	0%	0	0%
Institutional	8	2%	8	2%	0	0%
Transportation	71	14%	71	14%	0	0%
Water	5	1%	5	1%	0	0%
Total	**515**	**100%**	**515**	**100%**		**0%**

When comparing existing land use to future land use, major acreage shifts are projected in the open space and low-density residential categories. There is a projected 14 percent loss in the open space category. Gains in acreage are projected in the low-density residential (+13 percent) and estate residential (+1 percent) land uses.

According to Figure 3.13, 59 acres are projected to shift from open space to low-density residential. Twelve acres shift from open space to estate residential and 6 acres shift from estate residential to low-density residential.

Figure 3.13: Changed Land Use



There are approximately 32 acres of land along the Leesburg Pike in the western portion of the subwatershed that is currently designated as open space, but the future planned use is low-density residential. There is another larger swath of open space (~20 ac.) in the eastern portion of the subwatershed that is planned for a low-density residential use. There is no guarantee that these areas will be developed; yet, both pieces have adjacent low-density uses currently and will be well integrated into the existing land use pattern if and when the need arises to develop more residential uses. These shifts illustrate the demand for more housing within the Dog Run subwatershed and the potential for increases in impervious surfaces, which can contribute additional runoff and pollutants to the stream system.

3.7.3 Existing Stormwater Management

Stormwater management provides treatment of otherwise uncontrolled runoff to reduce the harmful effects of increased stormwater flows and stormwater runoff pollution. County records indicate that there are seven **stormwater management facilities** within the Dog Run subwatershed, of which three are private and four are public. Eighty-six percent of the Dog Run subwatershed is not served by any stormwater management facility. Fourteen percent of the total area has quantity control only. There is no area within the subwatershed that receives both **quantity and quality control**.

The difference between the amount of total developed area in the subwatershed (79 percent) and the area served by stormwater management (14 percent) indicates a possible need for additional management efforts, specifically in the low and medium-density residential and commercial areas. A list of all stormwater management facilities in the Dog Run subwatershed is found in Appendix D.

Outfalls

The storm drainage system connects the developed portions of the land to the stream system. Stormwater outfalls are located where the stormwater system ends and the natural channel begins. Outfalls may be sources of pollutants and excessive stormflow from pipes can cause erosion at the outfall and downstream. During the Stream Physical Assessment, field crews located four **outfall** pipes discharging into the Dog Run subwatershed. None of the outfalls were having a significant impact on the stream system.

Stream Crossings

Stream crossings, such as bridges and culverts are often locations of erosion and flooding. The combination of aging structures and frequently high stormwater levels can cause downstream stream stability problems and habitat impairment. Most of the stream crossings in Dog Run were having only very minor impact on the stream condition. One of the crossings is a stream ford, which has deficiencies that should be addressed to enhance stream integrity and future stability of the structure. The impairment is likely due to high levels of upstream debris. The ford, which is a shallow part of a stream that can be crossed by foot or by land vehicle, is shown in Photo 3.8 and is located just upstream of a stream restoration candidate site S78.

Photo 3.8 Ford located upstream east of Kimberly Place.

3.7.4 Soils

Soils found in the Dog Run subwatershed belong primarily to the Glenelg – Elioak – Manor association. This association consists of rolling and hilly landscapes, which can generate rapid **runoff**, and **micaceous** soils, which are erodible. The **groundwater** is fairly shallow with numerous natural springs. The subwatershed contains 72 percent of the B hydrologic soil group with Glenelg silt loam being the dominant soil type (51 percent). B soils and the Glenelg soil type are compatible with **infiltration** practices and may provide potential

stormwater management sites. There are 16.9 acres of land with unclassified soils in the Dog Run subwatershed. Soils that cover at least 20 acres within the subwatershed can be found in Appendix A.

3.7.5 Geomorphology

There are approximately 2.5 miles of stream in the Dog Run subwatershed that were assessed and assigned a **Channel Evolution Model** classification as part of the Stream Physical Assessment. The classification indicates the stream channel's physical condition and stability as a response to disturbances such as upstream land use changes.

The eastern reach of Dog Run (7,333 ft.) is a Type II stream, where the streambed is degrading and incision is beginning, and is primarily sand and gravel substrate. There is major restoration potential for this reach. The west reach (3,976 ft.) is Type III, which is indicative of a generally unstable channel that is actively widening in response to changes in flow, and is primarily sand substrate.

The entire stream length of Dog Run is characterized by moderately unstable banks with high erosion potential during **floods** as in Type II and III channels. Two specific erosion locations where located that are impacting the stream system. The first is located south of Georgetown Pike and east of Kimberly Place, and is 1,800 linear feet on the outer bends (see Photo 3.9). The eroding area is causing instream degradation, may be damaging property and is a stream restoration candidate site S78. The second erosion location (Photo 3.10) is on the most downstream reach near the confluence with Piney Run. It is 50 linear feet in length, has instream degradation, and is also a stream restoration candidate site S02.

Photo 3.9 Erosion located south of Georgetown Pike, East of Kimberly Place (DFDG001.E002).

Photo 3.10 Erosion located near confluence of Dog Run with Piney Run (DFDG001.E001).

3.7.6 Stream Habitat and Water Quality

All stream reaches are of moderate to high slope and are generally characterized as having a predominance of **riffle** and **run** stream type. The stream reaches have the following stream habitat and water quality characteristics as taken from the Stream Physical Assessment, which provides a one time visual inspection. Field crews conducted that assessment in the winter of 2002.

- The entire length of stream in the Dog Run subwatershed has Poor habitat for aquatic insects and fish.
- There is 11,575 linear feet of the stream, or approximately 43 percent of the total, which does not have sufficient **riparian buffer** (the total is for both banks). Of this total, 9,360 feet of the impact is from lawns.
- The western tributary has less than 50 percent of the stream bank surface covered with vegetation such as trees and shrubs.
- Many of the missing riparian buffer areas have good potential for restoration. There is approximately 2,000 feet of deficient buffer located within the Estates at Wyndham Hills between Fieldview Drive and Stones Throw Drive. This area has the potential for stream and buffer restoration, candidate site S79, and is shown in Photo 3.11.

Photo 3.11 Deficient buffer located in the Estates at Wyndham Hills. (DFDG002.B001).

3.7.7 Hydrology and Water Quality Modeling

The water quality and quantity were modeled for each subwatershed and **catchment** in the Difficult Run watershed to provide estimates that can be used for planning. The models used in Dog Run incorporate data on the amount, character and location of the land use, impervious cover, topography, vegetation, streams and stormwater management to generate estimates of water quality and quantity in the streams. Water quality modeling includes **pollutant loading** estimates for total **nitrogen** (TN), total **phosphorus** (TP) and total **suspended solids** (TSS). Because changes in land use effect the amount of runoff, streamflow, the quantity modeling estimates the amount of runoff generated by the land during rainfall and the peak streamflow or **discharge** that results.

Modeling of future conditions generally uses the same data inputs and estimates the same parameters but does so with future land use information. The future land use is a prediction of how land use would change based on the current zoning designations and the Comprehensive Plan. The difference between the existing and future model results identifies areas that will need additional management measures.

The Dog Run subwatershed contains 16 percent impervious surface. Except for a few commercial areas around the intersection of Georgetown Pike and Leesburg Pike, the subwatershed is mostly low-density and estate residential land use.

The catchment with the highest modeled nitrogen and phosphorus overall is DFDG9901, which contains a long stretch of Leesburg Pike and also some medium density residential parcels off of Reston Parkway and Round Pebble Lane. Refer to DFDG_4 for the catchment locations. This catchment also has the highest amount of runoff volume, most likely because it has the most paved area, with 4.9 inches per year. The results of the modeling can be seen in Table 3.11.

Table 3.11 Existing and Future Modeling

Dog Run Catchments		Runoff Volume (in/yr)	Peak (cfs/ac)	TSS (lb/ac/yr)	Runoff TN (lb/ac/yr)	Runoff TP (lb/ac/yr)
DFDG0002	E	2.28	0.11	23.2	1.2	0.2
	F	2.53	0.11	27.5	1.4	0.3
	C	11%	0%	19%	17%	50%
DFDG0003	E	2.78	0.16	29.0	1.6	0.3
	F	3.31	0.17	37.9	2.0	0.4
	C	19%	6%	31%	25%	33%
DFDG9901	E	3.9	0.14	54.5	2.6	0.4
	F	4.43	0.15	64.7	3.1	0.5
	C	14%	7%	19%	19%	25%

E – Existing conditions results, F – Future conditions results, C – Change between existing and future shown as a percentage of the existing condition. Value is based on unrounded figures

The catchment that is predicted to have the biggest percent change in the future is DFDG0003, as much of the open space located along the stream on both sides of Leesburg Pike will be changing to low-density residential.

3.7.8 Hydraulic Modeling

Hydraulic modeling combines topography with information concerning the stream system, the stream crossings and culverts to estimate the depth and speed of flow within the stream for various storm events. The model results indicate where overtopping of culverts may occur. The flows at this site exceed the capacity of the culvert. These sites can present a hazard and are considered candidate sites for improvement, further study and possibly a project to replace or retrofit the culvert.

Of the two crossings in the subwatershed, neither overtopped with existing flows for any storm event.

3.7.9 Candidate Sites for Improvements

Based on the review of the assessment data and modeling results, the most serious problem areas in the Dog Run subwatershed are listed below. Refer to DFDG_4 for site numbers and locations. (S - stream sites, C - catchment sites, D – unconstructed regional pond replacement sites, F – flooding sites, and P – preservation sites).

<u>Streams</u>

S02 This reach has active widening, unstable banks, and erosion. It is located in the downstream portion of Dog Run near the confluence with Piney Run (Photo 3.10)

S78 This eastern reach is in an area with missing buffer and erosion problems combined. This stream has Poor habitat (Photo 3.8 and 3.9).

S79 This reach has missing buffer on both the left and right banks along with Poor habitat. Channel disturbance in the form of channelization is also an issue on this reach (Photo 3.11).

Hydrology and Water Quality

D01 (Catchment DFDG0002) This catchment has low runoff loads for the subwatershed. Site S78, with unstable banks and erosion problems, is within the catchment.

C01 (Catchment DFDG0003) This catchment has moderate runoff and pollutants. The streams in this catchment are eroding and have unstable banks.

C135 (Catchment DFDG9901) This catchment has the highest modeled pollutant nitrogen and phosphorus load. It also has one of the highest runoff volumes and peak flows. Site S79 is directly downstream of this catchment.

Preservation

No sites were identified. DFDG0002 is in good condition, but model results show that future development does not make it significantly worse. This means that it is essentially preserved under the current development plans and regulations

3.8 Dog Run - Subwatershed Plan Action

In the previous subwatershed condition section, information from stream assessments, monitoring studies, and watershed modeling was presented to identify the location and severity of watershed impairments. For the subwatershed action plan section that follows, the candidate sites for improvement are discussed in terms of the specific impairment, a description of the project, and the goal of the project. Table 3.12 below is a list of all projects proposed in this subwatershed.

Table 3.12 Recommendations for Dog Run

Project #	Project Type	Candidate Site
DF9001A	Drainage Retrofit	D-01
DF9001B	Culvert Retrofit	D-01
DF91135	Pond Retrofit	C135
DF9202	Stream Restoration	S02
DF9278	Stream Restoration	S78
DF9279	Buffer Restoration	S79
DF9501B	Culvert Retrofit	C01
DF9501C	Culvert Retrofit	C01
DF9701	Drainage Retrofit	C01

3.8.1 Regional Pond Alternative Projects

D01 (DFDG0002)

Site Investigation and Projects:

DF9001A (Drainage Retrofit) Where the piped drainage system flows into natural channels, scour and erosion have become evident. This project will provide improvements to the drainage infrastructure by improving outlet protection at the storm sewer outfalls.

DF9001B (Pond Retrofit) The existing pond at this site treats a large area of this catchment. This project would look to change the detention characteristics to reduce downstream impacts, and reconstruct the pond for improved water quality treatment. This would also help address the issue of road overtopping, discussed in DF9001C.

3.8.2 Catchment Improvement Projects

C01 (DFDG0003)

Site Investigation and Projects:

DF9501B (Culvert Retrofit) This project would be a retrofit to the two culverts crossing Stones Throw Drive. The goal would be dry detention storage in existing open space. This would provide peak attenuation as well as quality improvements.

DF9501C (Culvert Retrofit) This large, shallow area of unmanaged land would be used to store and treat streamflow. While this area is not able to store as much as the previous projects, the existing vegetation would help to improve water quality along with reducing the peak flows.

DF9701 (Drainage Retrofit) The developed area of this catchment is served by storm drains with outfalls that are experiencing erosion and scour. This project would consist of energy dissipation at those outfalls to reduce scour and erosion in the stream.

C135 (DFDG9901)

Site Investigation and Projects:

DF91135 (Pond Retrofit) This project would consist of retrofitting the existing pond located between Water Pointe Lane and the Reston Parkway by modifying the control structure to improve outflow for channel protection. An aquatic bench would be constructed for water quality treatment.

3.8.3 Stream Restoration Projects

S02 (DFDG0003)

Site Investigation and Projects: This site is located on what appears to be either homeowners association or County property.

DF9202 (Stream Restoration) A more natural stream would be established with meanders, dimension, and a profile. The stream would be reconnected with the floodplain, the banks would be stabilized, and a stream buffer would be reestablished.

S78

Site Investigation and Projects: This site is on the downstream side of Georgetown Pike, east of Kimberly Place.

DF9278 (Stream Restoration) A pattern, dimension and profile more consistent with a natural stream will be recreated. The stream would be re-connected to the floodplain. A riparian buffer would be established and bed features would be created.

S79

Site Investigation and Projects:

DF9279 (Buffer Restoration) The buffer at this site has been degraded by development and the clearing of trees up to the streams edge. The riparian zone would be replanted with native trees and shrubs in the non-forested areas.

3.8.4 Preservation

No preservation candidate sites were identified for this subwatershed.

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