

# Appendix E

## Stream Restoration Opportunity

### Fact Sheet Summaries

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# Neabsco Creek Watershed Study

## Stream Restoration Project Opportunity

E-1

Subwatershed 805

Site Name Trident Lane

Score 135

SiteID RST2602 (Page 1 of 2)

Rank 1 of 15

### Site Description and Proposed Project

The candidate stream restoration encompasses approximately 1,600 feet of the mainstem of Neabsco Creek, running generally between Trident Lane and Tapestry Drive (excluding wetlands), and upstream of the culvert under Dale Boulevard. In general, the reach is severely downcut, exposing near vertical banks. Restoration of the reach would remedy severely eroded and incised areas and reconnect the stream with the local floodplain.

Stream Type Perennial

### Issues for Implementation

The restoration was rated high in potential by investigators, with moderate ease of access. Existing trees would be moderately impacted.



Downcut section of stream in potential restoration project



Impacted stream in overgrown area

E-1

# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

Subwatershed 805

Site Name Trident Lane

SiteID RST2602 (Page 2 of 2)

Score 135

Rank 1 of 15

## Locator Map



### Estimated Pollutant Load Reductions

Stream Size		Pollutant Reductions	
Length (mi)	0.30	Total Nitrogen (lbs/yr)	118.45
Length (ft)	1,579.39	Total Phosphorus (lbs/yr)	107.40
		TSS (lbs/yr)	70,882.82

# Neabsco Creek Watershed Study

## Stream Restoration Project Opportunity

E-3

Subwatershed 805

Site Name Trentdale Drive

Score 118

SiteID RST2604 (Page 1 of 2)

Rank 2 of 15

### Site Description and Proposed Project

This candidate reach, a tributary of Neabsco Creek, encompasses approximately 1,220 feet of impacted stream. It begins on the downstream side of a crossing under Hoadly Rd. and ends at a culvert under Trentdale Dr., just upstream of the confluence with Neabsco Creek. The stream is in an upland area, consisting mainly of downcut channel with low aggradation.

Restoration is recommended to correct stream instability and re-establish standard stream features. Restoration will control erosion and reconnect the stream with the surrounding floodplain.

Stream Type Perennial

### Issues for Implementation

Much of the reach lies adjacent to a transmission line right of way, which would provide easy access to the stream. The restoration potential is high, due to ease of access and expected minimal impact to trees.



Eroded area of stream channel



Stream channel showing aggradation

E-3

# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

Subwatershed 805

Site Name

Score 118

SiteID  (Page 2 of 2)

Rank 2 of 15

## Locator Map



### Estimated Pollutant Load Reductions

Stream Size		Pollutant Reductions	
Length (mi)	<input type="text" value="0.23"/>	Total Nitrogen (lbs/yr)	<input type="text" value="91.38"/>
Length (ft)	<input type="text" value="1,218.44"/>	Total Phosphorus (lbs/yr)	<input type="text" value="82.85"/>
		TSS (lbs/yr)	<input type="text" value="54,683.43"/>

# Neabsco Creek Watershed Study

## Stream Restoration Project Opportunity

E-5

Subwatershed 820

Site Name Karen Road

Score 108

SiteID SR001 (Page 1 of 2)

Rank 3 of 15

### Site Description and Proposed Project

This impacted drainage channel originates at an outfall at the intersection of Karen Rd. and Delaney Rd. The total impacted length is approximately 2,600 feet, however, the most severely impacted area is immediately downstream of the outfall between residences along Kirkdale Dr. and Kurtz Rd. The stream channel in this area is unstable with no healthy stream features apparent. The damage to the channel is readily apparent from lack of habitat structure and deposition of urban trash. The stream bed has downcut, exposing a sanitary sewer line. The downstream half of the channel enters the floodplain of Hoadly Run and is less impacted.

Restoration of the reach would involve raising the stream bed to protect buried sanitary sewer infrastructure. Upstream remedies would include repairs to the existing stream channel to correct the effects of chronic erosion. Upstream restoration should also include consideration of new practices in the neighborhood to manage stormwater prior to entry into the storm sewer system.

Stream Type Perennial

### Issues for Implementation

The restoration opportunity was rated as moderate due to challenges in accessing the reach behind residences and moderate impact to existing trees.



Upstream portion of reach near residences showing severe erosion



Downstream portion of reach showing exposed sanitary sewer line

E-5

# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

Subwatershed 820

Site Name Karen Road

SiteID SR001 (Page 2 of 2)

Score 108

Rank 3 of 15

## Locator Map



### Estimated Pollutant Load Reductions

Stream Size		Pollutant Reductions	
Length (mi)	0.50	Total Nitrogen (lbs/yr)	196.12
Length (ft)	2,614.99	Total Phosphorus (lbs/yr)	177.82
		TSS (lbs/yr)	117,360.72

# Neabsco Creek Watershed Study

## Stream Restoration Project Opportunity

E-7

Subwatershed 805

Site Name Dale Boulevard

Score 106

SiteID RST2603 (Page 1 of 2)

Rank 4 of 15

### Site Description and Proposed Project

The candidate restoration reach consists of approximately 2,500 feet of degraded stream extending from downstream of the Oaklawn Lane crossing to near Trident Lane and bisected by Dale Boulevard. The reach conditions alternate between areas of active downcutting and downstream deposition of sediment, indicating adverse impacts to the stream due to development. The overall erosion condition was rated high.

Restoration remedies would correct stream instability brought about by migrating headcuts, erosion, and deposition, and reintroduce a more natural morphology. Restoration should be coupled with construction of new stormwater controls in the headwaters areas in the neighborhoods.

Stream Type Perennial

### Issues for Implementation

The site of restoration is moderately easy to access, but may result in moderate impact to existing trees.



Eroded area of stream channel



Eroded outer bank of stream channel,  
exposing root systems

E-7



# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

Subwatershed 805

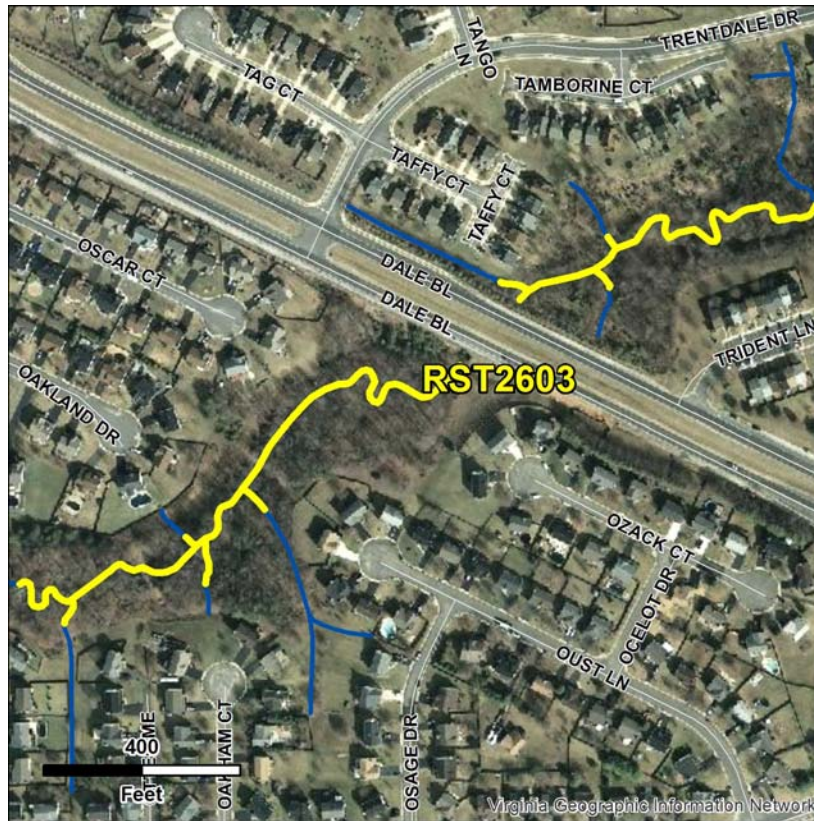
Site Name Dale Boulevard

SiteID RST2603 (Page 2 of 2)

Score 106

Rank 4 of 15

## Locator Map



### Estimated Pollutant Load Reductions

Stream Size		Pollutant Reductions	
Length (mi)	0.48	Total Nitrogen (lbs/yr)	189.02
Length (ft)	2,520.27	Total Phosphorus (lbs/yr)	171.38
		TSS (lbs/yr)	113,109.73

# Neabsco Creek Watershed Study

## Stream Restoration Project Opportunity

E-9

Subwatershed 815

Site Name Beville Middle School - lower

Score 93

SiteID SA710 (Page 1 of 2)

Rank 5 of 15

### Site Description and Proposed Project

The potential restoration reach, encompassing approximately 1,500 feet, receives drainage from Beville Middle School and surrounding residential communities. In this reach, the banks are sandy and highly erosive. Little vegetation is present on the banks and the banks will consequently continue to erode. Investigators noted that sediment that is transporting out of this reach is accumulating in a major dry pond facility to the west of Delaney Road and situated in a transmission line right of way. There are three outfall channels in this reach near the school (one on the east, just north of Lockwood Ln, another on the west towards Langley Ct, and the last to the southwest near Linsey Ct), that should be stabilized in addition to the main stem reach.

Stream restoration would address the effects of stream instability caused by uncontrolled storm runoff. Restoration would halt the effects of stream widening and erosion, reduce sediment transport, and improve instream habitat.

Stream Type Perennial

### Issues for Implementation

The reach is moderately difficult to access and has medium rank restoration potential. Investigators identified some mature trees in the floodplain that may need to be removed to provide access.



Impacted stream reach showing undercut bank



Impacted stream with gravel and cobble deposit

E-9

# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

E-10

Subwatershed 815

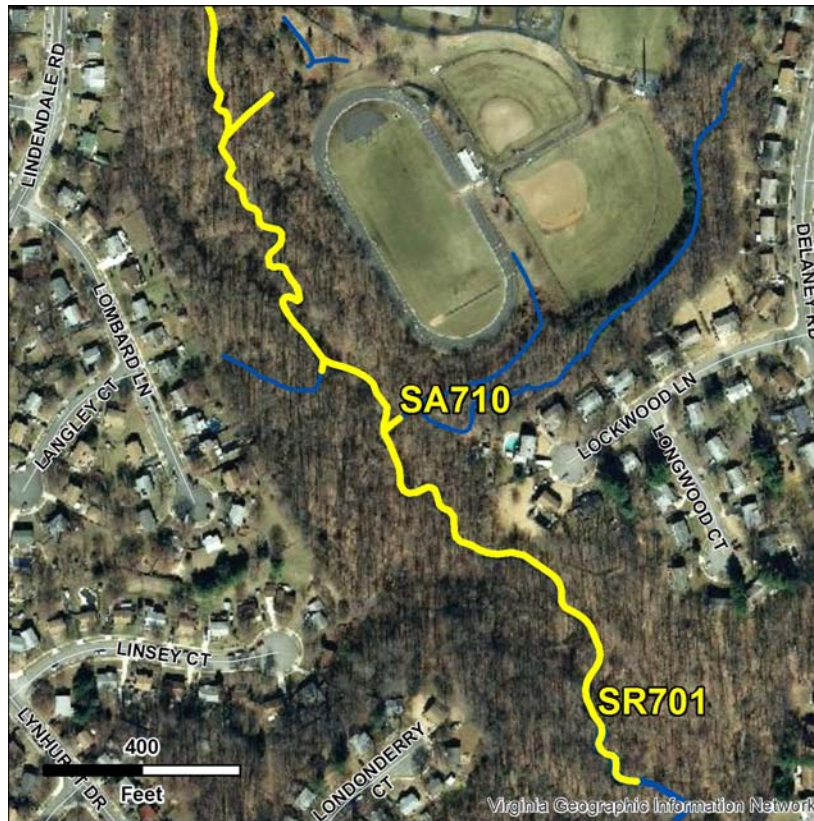
Site Name

Score 93

SiteID  (Page 2 of 2)

Rank 5 of 15

## Locator Map



### Estimated Pollutant Load Reductions

Stream Size		Pollutant Reductions	
Length (mi)	<input type="text" value="0.28"/>	Total Nitrogen (lbs/yr)	<input type="text" value="111.50"/>
Length (ft)	<input type="text" value="1,486.60"/>	Total Phosphorus (lbs/yr)	<input type="text" value="101.09"/>
		TSS (lbs/yr)	<input type="text" value="66,718.80"/>

E-10

# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

E-11

Subwatershed 815

Site Name Logan Park

Score 91

SiteID RST2501 (Page 1 of 2)

Rank 6 of 15 (tie)

## Site Description and Proposed Project

The affected stream is a tributary of Neabsco Creek and extends from its source in Logan Park through a wooded area to the confluence with Neabsco Creek near the wastewater treatment plant. The area to be restored consists of about 500 feet of moderately incised channel.

Presently, the channel does not have recognizable stream features and is undergoing active erosion. The restoration of the channel, coupled with new BMP recommendations within Logan Park as described elsewhere in this report, would reduce the progression of erosion.

Stream Type Perennial

## Issues for Implementation

Access to the work site is predicted to be easy, however the restoration effort may result in moderate impact to trees in the wooded area. The overall restoration potential is medium.



Downcut section of candidate restoration reach



Unstable section of reach showing active erosion

E-11

# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

E-12

Subwatershed 815

Site Name Logan Park

Score 91

SiteID RST2501 (Page 2 of 2)

Rank 6 of 15 (tie)

## Locator Map



### Estimated Pollutant Load Reductions

Stream Size		Pollutant Reductions	
Length (mi)	0.10	Total Nitrogen (lbs/yr)	37.67
Length (ft)	502.26	Total Phosphorus (lbs/yr)	34.15
		TSS (lbs/yr)	22,541.53

# Neabsco Creek Watershed Study

## Stream Restoration Project Opportunity

E-13

Subwatershed 805

Site Name Baneberry Circle

Score 91

SiteID RST2601 (Page 1 of 2)

Rank 6 of 15 (tie)

### Site Description and Proposed Project

This opportunity consists of a tributary to Neabsco Creek, that runs from a storm drain outfall at the end of Baneberry Circle to the confluence of Neabsco Creek at a culvert that runs underneath Dale Boulevard. The 850-foot impacted area consists of moderately high downcutting erosion through the upland, wooded area. The downstream end of the reach lies within a protected wetland area.

Field investigators noted that erosion is in its early stages and could continue if not addressed. Restoration would reconnect the stream to its local floodplain and arrest erosion. A new BMP, described elsewhere in this report, is recommended for installation at the end of Baneberry Circle and would reduce stormwater volume input to the channel.

Stream Type Perennial

### Issues for Implementation

The site is moderately easy to access and restoration work would result in moderate impact to existing trees. It has overall high restoration potential.



Impacted reach, showing downcutting in upland area



Reach showing downcutting and exposed root systems

E-13

# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

Subwatershed 805

Site Name

Score 91

SiteID  (Page 2 of 2)

Rank 6 of 15 (tie)

## Locator Map



### Estimated Pollutant Load Reductions

Stream Size		Pollutant Reductions	
Length (mi)	0.16	Total Nitrogen (lbs/yr)	63.31
Length (ft)	844.17	Total Phosphorus (lbs/yr)	57.40
		TSS (lbs/yr)	37,886.23

# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

E-15

Subwatershed 825

Site Name Golden Court

SiteID SR301 (Page 1 of 2)

Score 91

Rank 6 of 15 (tie)

## Site Description and Proposed Project

The area to be potentially restored is an approximately 740-foot reach downstream of an existing dry pond facility at the end of Golden Court. The erosion condition is moderately high overall. The concrete apron at an upstream outfall has been eroded out and undercut.

At present, the channel has been straightened to perform as a stormwater runoff conduit. Recommended for inclusion in the stream restoration is the introduction of bends to increase the flow path and reduce the energy of storm flows. Though the upstream dry detention facility is not recommended for conversion in this report, conversion of the facility along with restoration would provide additional improvement along the entire stream reach and better control storm flows.

Stream Type Perennial

## Issues for Implementation

The restoration potential is high due to the severity of the erosion problem; however, the location is in a deep stream valley and would require permission and coordination from landowners. The expected impact to trees would be moderate. Access could be achieved through the easement to the dry pond facility.



Impacted area downstream of outfall



Section of stream showing damage to both banks

E-15



# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

Subwatershed 825

Site Name Golden Court

Score 91

SiteID SR301 (Page 2 of 2)

Rank 6 of 15 (tie)

## Locator Map



### Estimated Pollutant Load Reductions

Stream Size		Pollutant Reductions	
Length (mi)	0.14	Total Nitrogen (lbs/yr)	55.23
Length (ft)	736.45	Total Phosphorus (lbs/yr)	50.08
		TSS (lbs/yr)	33,051.74

# Neabsco Creek Watershed Study

## Stream Restoration Project Opportunity

E-17

Subwatershed 815

Site Name Reardon Lane

Score 89

SiteID SA503 (Page 1 of 2)

Rank 9 of 15

### Site Description and Proposed Project

This impacted reach is approximately 940 feet long and is located between residences on Reardon Lane and a transmission line right of way. Portions of the channel are armored with concrete and rip rap, but ongoing channel erosion is evident.

Restoration of the reach would improve natural stream function and reduce transmission of erosive energy to points downstream. The restoration could also potentially remove a stand of kudzu.

Stream Type Perennial

### Issues for Implementation

The opportunity has medium restoration potential with moderate impact to trees and moderate ease of access. General access to the work area could be readily achieved via the transmission line right of way.



Reach undergoing downcutting



Restoration opportunity showing concrete stream bottom

E-17

# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

Subwatershed 815

Site Name Reardon Lane

SiteID SA503 (Page 2 of 2)

Score 89

Rank 9 of 15

## Locator Map



### Estimated Pollutant Load Reductions

Stream Size		Pollutant Reductions	
Length (mi)	0.18	Total Nitrogen (lbs/yr)	70.56
Length (ft)	940.75	Total Phosphorus (lbs/yr)	63.97
		TSS (lbs/yr)	42,220.90

# Neabsco Creek Watershed Study

## Stream Restoration Project Opportunity

E-19

Subwatershed 815

Site Name Quate Ln and Keystone Rd

Score 87

SiteID SR108 (Page 1 of 2)

Rank 10 of 15

### Site Description and Proposed Project

The candidate reach flows ~1,700 feet between Quate Ln and Keystone Rd and is downstream of new housing development. Stormwater outfalls within the reach were not significantly eroded but could be potential pollution hotspots. Several areas with depleted buffers and one area with dead mature trees. Channel was downcutting and widening. Debris removal and tree planting would go a long way toward improving this reach is construction is infeasible.

Stream Type Perennial

### Issues for Implementation

The restoration potential was rated medium; the channel is not extremely degraded but there are enough issues along the reach to warrant consideration. Access may be difficult due to ownership and tree impacts.



Exposed and eroded bank



Stream channel widening and downcutting

E-19

# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

Subwatershed 815

Site Name Quate Ln and Keystone Rd

Score 87

SiteID SR108 (Page 2 of 2)

Rank 10 of 15

## Locator Map



### Estimated Pollutant Load Reductions

Stream Size		Pollutant Reductions	
Length (mi)	0.33	Total Nitrogen (lbs/yr)	130.30
Length (ft)	1,737.00	Total Phosphorus (lbs/yr)	118.10
		TSS (lbs/yr)	77,962.00

# Neabsco Creek Watershed Study

## Stream Restoration Project Opportunity

E-21

Subwatershed 815

Site Name Beville Middle School - upper

Score 85

SiteID SA711 (Page 1 of 2)

Rank 11 of 15

### Site Description and Proposed Project

This approximately 1,100-foot reach is upstream of Beville Middle School and downstream of Dale Boulevard. Just downstream of the culvert under Dale Boulevard, the riprap armoring of the plunge pool has been eroded and is washing downstream. Overall, the reach shows moderate erosion; however, the stream is actively widening. Downstream of the culvert, the stream channel alternates between eroded and aggraded sections, showing a highly dynamic system affected by uncontrolled stormwater runoff.

The reintroduction of a stable, more natural stream system can be accomplished through restoration measures. Restoration will reconnect the stream to the surrounding floodplain and reduce scour and re-deposition within the degraded channel.

Stream Type Perennial

### Issues for Implementation

The reach is moderately difficult to access and has medium rank restoration potential.



Area of moderate erosion along reach



Area of aggradation along reach

E-21

# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

Subwatershed 815

Site Name

Score 85

SiteID  (Page 2 of 2)

Rank 11 of 15

## Locator Map



### Estimated Pollutant Load Reductions

Stream Size		Pollutant Reductions	
Length (mi)	<input type="text" value="0.20"/>	Total Nitrogen (lbs/yr)	<input type="text" value="80.36"/>
Length (ft)	<input type="text" value="1,071.51"/>	Total Phosphorus (lbs/yr)	<input type="text" value="72.86"/>
		TSS (lbs/yr)	<input type="text" value="48,089.53"/>

# Neabsco Creek Watershed Study

## Stream Restoration Project Opportunity

E-23

Subwatershed 825

Site Name Gilbert Road

SiteID SR300 (Page 1 of 2)

Score 78

Rank 12 of 15

### Site Description and Proposed Project

The candidate restoration reach consists of 1,340 feet of degraded stream that runs generally parallel between Gilbert Road and Granby Road. The overall erosion condition is moderately high; however, locally the channel is severely degraded, with some eroded banks as high as eight feet. The stream bed is mostly exposed bedrock. Sanitary sewer lines are exposed in the channel, but are armored.

A restoration project in this area would reverse the long-term effects of erosion, introduce a more natural stream system, and potentially reinforce the stream banks. Since the stream degradation is severe and especially evident, the introduction of stormwater controls at the neighborhood level is recommended.

Stream Type Perennial

### Issues for Implementation

The restoration potential was rated medium due to the severity of the problems but access will be difficult due to presence of sanitary sewer lines and steep banks. The anticipated impact to trees is moderate.



Exposed and bare bank



Exposed root systems in widening stream channel

E-23



# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

E-24

Subwatershed 825

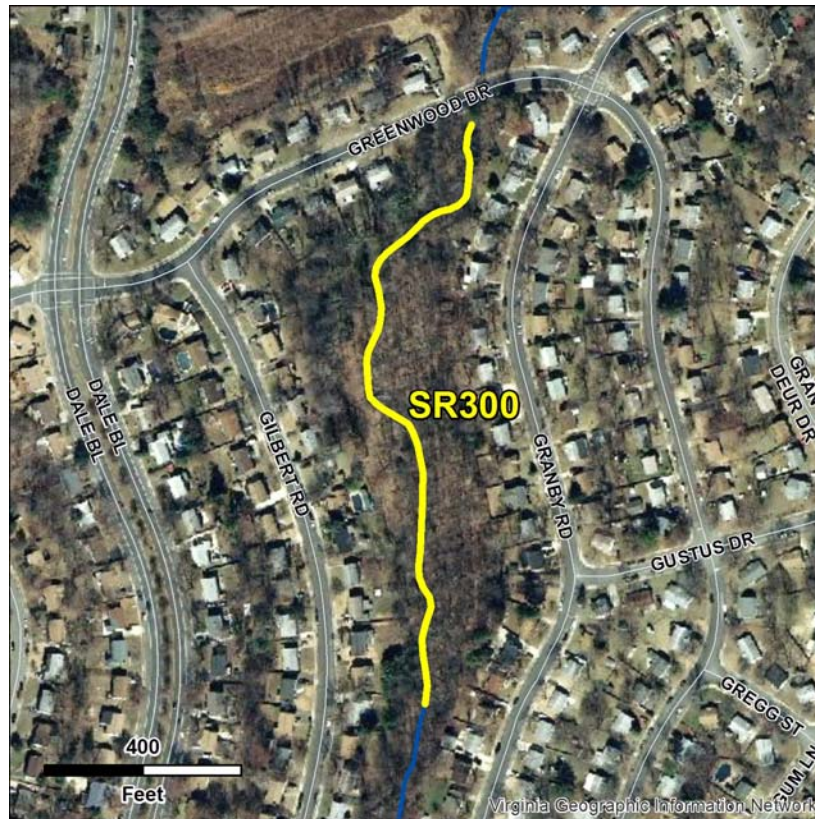
Site Name Gilbert Road

Score 78

SiteID SR300 (Page 2 of 2)

Rank 12 of 15

## Locator Map



### Estimated Pollutant Load Reductions

Stream Size		Pollutant Reductions	
Length (mi)	0.25	Total Nitrogen (lbs/yr)	100.48
Length (ft)	1,339.78	Total Phosphorus (lbs/yr)	91.10
		TSS (lbs/yr)	60,129.28

E-24

# Neabsco Creek Watershed Study

## Stream Restoration Project Opportunity

E-25

Subwatershed 815

Site Name Pearson Drive

Score 76

SiteID SR700 (Page 1 of 2)

Rank 13 of 15 (tie)

### Site Description and Proposed Project

This degraded stream reach is located upstream of Pearson Drive and the confluence of Neabsco Creek. The overall length is approximately 1,400 feet and is moderately eroded with steep banks. The stream has downcut and is no longer connected to the floodplain.

Among other benefits, a stream restoration project would reconnect this stream with the surrounding floodplain and thereby reduce the potential for down-cutting and scour caused by high-volume storm flows.

Stream Type Perennial

### Issues for Implementation

The restoration potential for this project is medium with moderate ease of access. Investigators identified a potential conflict with a nearby underground utility.



Eroding section of reach



Widened and downcut section of reach

E-25

# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

Subwatershed 815

Site Name Pearson Drive

Score 76

SiteID SR700 (Page 2 of 2)

Rank 13 of 15 (tie)

## Locator Map



### Estimated Pollutant Load Reductions

Stream Size		Pollutant Reductions	
Length (mi)	0.27	Total Nitrogen (lbs/yr)	106.10
Length (ft)	1,414.68	Total Phosphorus (lbs/yr)	96.20
		TSS (lbs/yr)	63,490.76

# Neabsco Creek Watershed Study

## Stream Restoration Project Opportunity

E-27

Subwatershed 815

Site Name Surrydale Drive

Score 76

SiteID SR963 (Page 1 of 2)

Rank 13 of 15 (tie)

### Site Description and Proposed Project

Investigators identified this approximately 410-foot channel that is undergoing active erosion. The area in question is located near the end of Surrydale Drive and downstream of a dry pond facility. Investigators noted deep downcutting downstream of the culvert that drains the dry pond.

Stream restoration will address downcutting and instability within the channel, reconnect it with the surrounding floodplain, and reduce sediment transport. Conversion of the upstream dry pond facility described elsewhere in this report (BCON 107) will provide additional water quantity control in the receiving channel.

Stream Type Intermittent

### Issues for Implementation

The instream restoration potential was rated as medium. Access to the work site is predicted to be difficult due to terrain and the need to remove a significant amount of trees to gain access and perform the restoration.



Downcut channel with exposed roots and bare bank



Damaged channel showing aggradation, erosion, and debris

E-27

# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

E-28

Subwatershed 815

Site Name

Score 76

SiteID  (Page 2 of 2)

Rank 13 of 15 (tie)

## Locator Map



### Estimated Pollutant Load Reductions

Stream Size		Pollutant Reductions	
Length (mi)	0.08	Total Nitrogen (lbs/yr)	30.51
Length (ft)	406.76	Total Phosphorus (lbs/yr)	27.66
		TSS (lbs/yr)	18,255.47

# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

E-29

Subwatershed 815

Site Name Delaney Road

Score 74

SiteID SR701 (Page 1 of 2)

Rank 15 of 15

## Site Description and Proposed Project

The degraded area of this stream consists of a tributary of Neabsco Creek that generally runs parallel to Delaney Road and is downstream of Beville Middle School. Along the 360-foot reach, banks are moderately eroded to a depth of four feet. A portion of this reach flows within a concrete channel.

Restoration should address ongoing bank erosion and re-establish a more natural morphology and habitat within the channel.

Stream Type Perennial

## Issues for Implementation

The reach is moderately difficult to access and has medium rank restoration potential.



Outside bank erosion in reach

# Neabsco Creek Watershed Study Stream Restoration Project Opportunity

Subwatershed 815

Site Name

Score 74

SiteID  (Page 2 of 2)

Rank 15 of 15

## Locator Map



### Estimated Pollutant Load Reductions

Stream Size		Pollutant Reductions	
Length (mi)	<input type="text" value="0.07"/>	Total Nitrogen (lbs/yr)	<input type="text" value="26.78"/>
Length (ft)	<input type="text" value="357.03"/>	Total Phosphorus (lbs/yr)	<input type="text" value="24.28"/>
		TSS (lbs/yr)	<input type="text" value="16,023.71"/>