

# Arlington's Streams Studying, Protecting, Restoring

A man with a beard is shown in profile, looking down into a white bowl. The bowl contains a small amount of water with some dark sediment or debris. The scene is outdoors, with a blue plastic container visible in the background. The text "How do You Determine a Stream's Status?" is overlaid on the image.

**How do You Determine a Stream's Status?**

# Determining Status

- Common guides and apps can be misleading when used for purposes beyond their intent or ability

## Stream Insects & Crustaceans

**GROUP ONE TAXA**  
Pollution sensitive organisms found in good quality water.

- 1 Stonefly nymph: Order Plecoptera. 1/8" - 1 1/2"; 6 legs with hooked tips; 2 hairlike tails. Smooth (no gills) on abdomen (see arrow). May have gills on thorax under the legs.
- 2 Caddisfly larva: Order Trichoptera. Up to 1"; 6 legs on thorax; 2 hooks at end of abdomen. May be in a stick, rock, or leaf case with its head sticking out. May have fluffy gill tufts on lower half.
- 3 Mayfly nymph: Order Ephemeroptera. 1/4" - 1"; moving, platelike, or feathery gills on abdomen (see arrow); 6 large hooked legs; antennae: 2 or 3 long, hairlike tails. Tails may be webbed together.
- 4 Riffle Beetle: Order Coleoptera. Adult: Tiny, 6-legged beetle; crawls slowly on the bottom. Larva: Entire length of body covered with hard plates; 6 legs on thorax; uniform brown or black color. Combine number of adults & larvae when reporting total counts.
- 5 Water Penny larva: Order Coleoptera. 1/4"; flat saucer-shaped body like a penny; segmented with 6 tiny legs underneath. Immature beetle.
- 6 Gilled Snail: Class Gastropoda. Shell opening covered by thin plate called operculum. When pointed up and opening facing you, the shell opens to right. Do not count empty shells.
- 7 Dobsonfly larva (hellgrammite): Family Corydalidae. 3/4" - 4"; dark-colored; 6 legs, large pinching jaws; eight pairs lateral filaments on lower half of body with paired cottonlike gill tufts along underside of lateral filaments; short antennae; 2 pairs of hooks at back end.

**GROUP TWO TAXA**  
Somewhat pollution tolerant organisms can be in good or fair quality water.

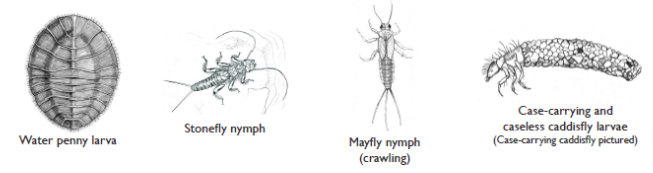
- 8 Dragonfly nymph: Suborder Anisoptera. 1/2" - 2"; large eyes, 6 hooked legs. Wide oval to round abdomen, masklike lower lip.
- 9 Sowbug: Order Isopoda. 1/4" - 3/4"; gray oblong body wider than it is high, more than 6 legs, long antennae, looks like a 'roly poly.'

\* May be larger.  
-Solid bar indicates approx. minimum size. Combined solid and striped bar is approx. maximum size.-

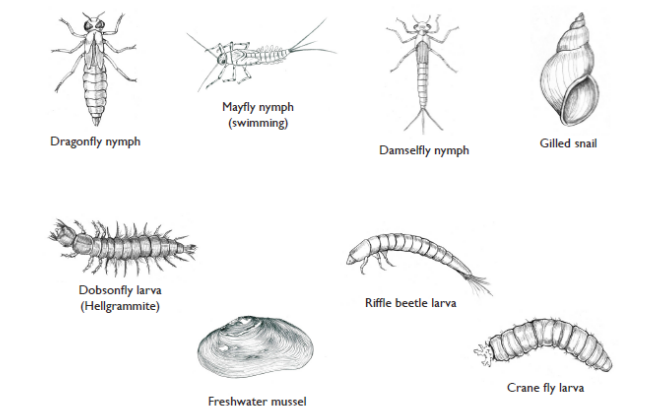
Save Our Streams

## Advanced Macroinvertebrate Key

**GROUP 1** These animals are mostly intolerant to pollution. Their dominance generally signifies Good to Excellent water quality.



**GROUP 2** These animals live in a wide range of water quality conditions.





EPA Publication Number: 800-F-14-013

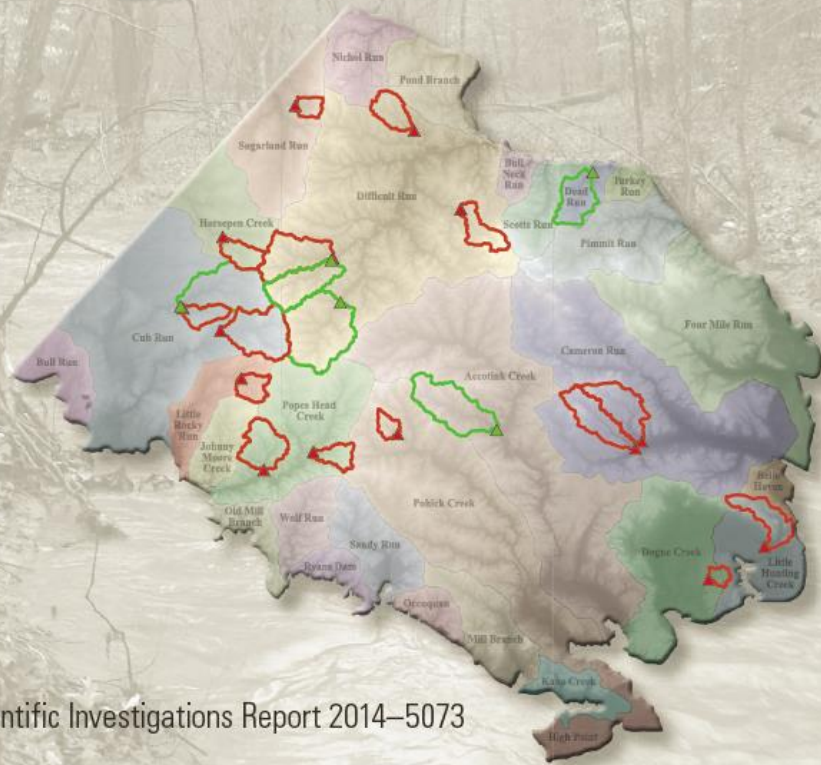


# Fairfax's Comprehensive Baseline Study

- Conducted in partnership with USGS
- First 5 years complete, into second 5-year period
- In-depth streamflow, chemical and macroinvertebrate monitoring at 20 sites around Fairfax

   
science for a changing world

## Streamflow, Water Quality, and Aquatic Macroinvertebrates of Selected Streams in Fairfax County, Virginia, 2007–12

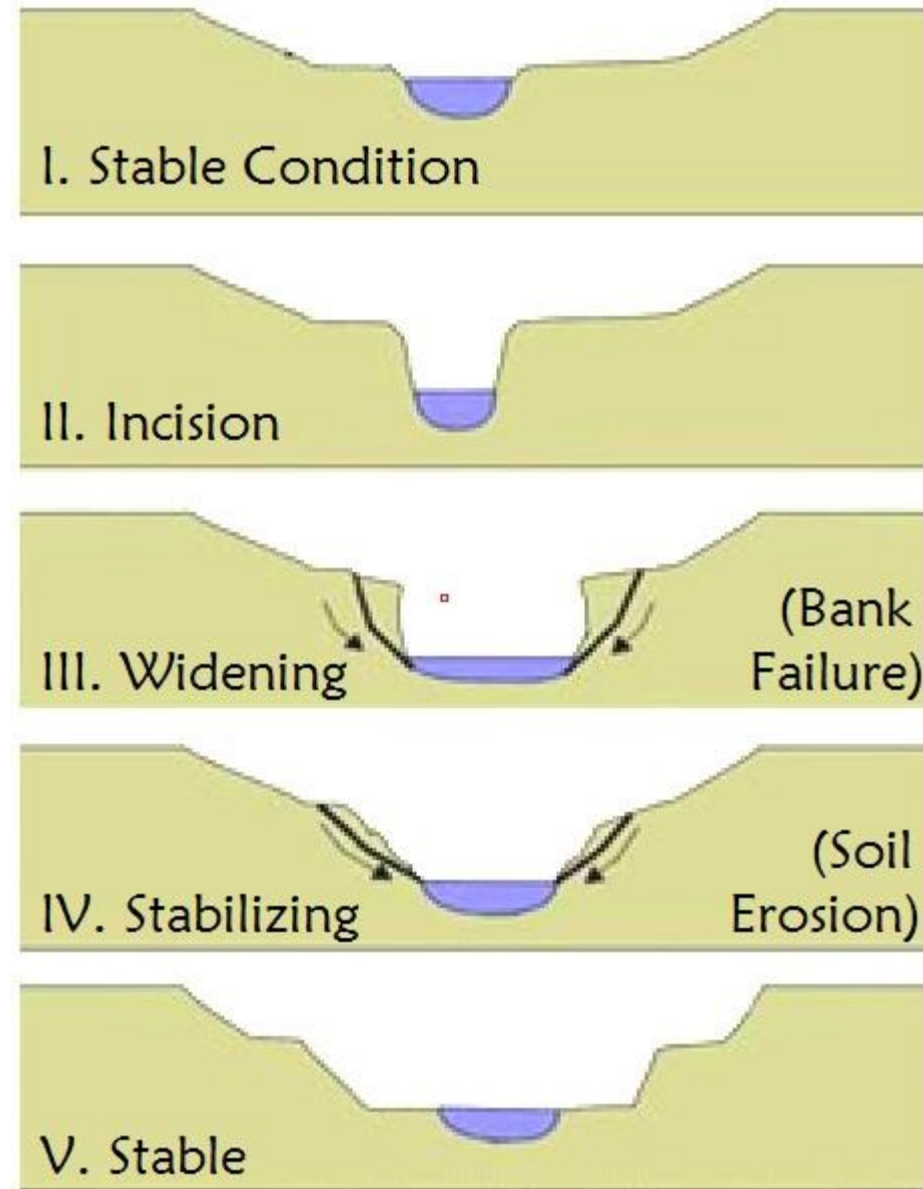


Scientific Investigations Report 2014–5073

U.S. Department of the Interior  
U.S. Geological Survey

# Arlington's Stream Assessment Study

- Channel Evolution Model
- Utilities & outfalls assessed
- High priority watersheds:
  - Gulf Branch
  - Windy Run
  - Donaldson Run
  - Pimmit Run
  - Palisades
- Is a component of the Stormwater Master Plan



## Determining Status

To determine status, a comprehensive picture and consistent methods of monitoring over time are important.

- Habitat surveys
- Fish
- Macroinvertebrates
- Chemical





# What is the Status of Arlington's Streams?

# In-stream Habitat

- Professionally assessed in spring 2012 and 2015
- Decrease in values noted in 2015
- Suboptimal and optimal ratings noted during both assessments
- *“All of the study reaches rated highly for physical potential for propagation and inhabitation. The index does not take algal proliferation into consideration.”*

## HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME:		SITE (or ID) #:	
LAT (DD):		LONG (DD):	
LAT (D,M,S):		LONG (D,M,S):	
INVESTIGATORS:		FORM COMPLETED BY:	
PROJECT:	DATE TIME _____ AM PM	REASON FOR SURVEY:	
FIELD SEASON:	COMMENTS:		

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>2. Embeddedness</b>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>3. Velocity/Depth Regime</b>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Parameters to be evaluated in sampling reach

## Chemical

- Basic water chemistry was professionally collected in 2011/2012 and 2015
- Momentary snap-shot of water quality
- Conductivity, pH, DO, Temp
- All within allowable ranges per DEQ/EPA criteria, however an increase in conductivity was noted in 2015 at all sites



# Fish

- Provide “long term” data compared to chemical data
- Professionally assessed in Fall 2011 at 11 sites around County
- Tolerance values of collected species were predominantly marginal-tolerant
- Fairfax and MD DNR IBI scores rates sites as Poor/Very Poor



# Macroinvertebrates

- Can be seen without magnification
- Do not have a backbone
- Live a part or all of their life within the Arlington's streams
- Have been classified by VA DEQ with specific tolerance values
- Provide "long term" data compared to chemical data





# Virginia Stream Condition Index (VSCI)

Weighted average of specific,  
individual metric scores.

A type of Index of Biotic Integrity  
(IBI).

## VSCI Scale

≥73	Excellent
60 – 72	Good
43 – 59	Stress
≤42	Severe Stress

VSCI is derived from:

- Total Taxa Richness (Family)
- EPT Richness (Family)
- Percent Ephemeroptera
- Percent PT-H
- Percent Scrapers
- Percent Chironomidae
- Percent Top Two Dominant Families
- Family Biotic Index (FBI)

## Arlington County VSCI Scores

- Severe Stress scores for all in spring 2015 & 2014
- Ten Stress scores (56%) in fall (7 in 2014). Remaining scores were Severe Stress

Stantec sampling occurred prior to County's 2015 sampling in the same reaches.

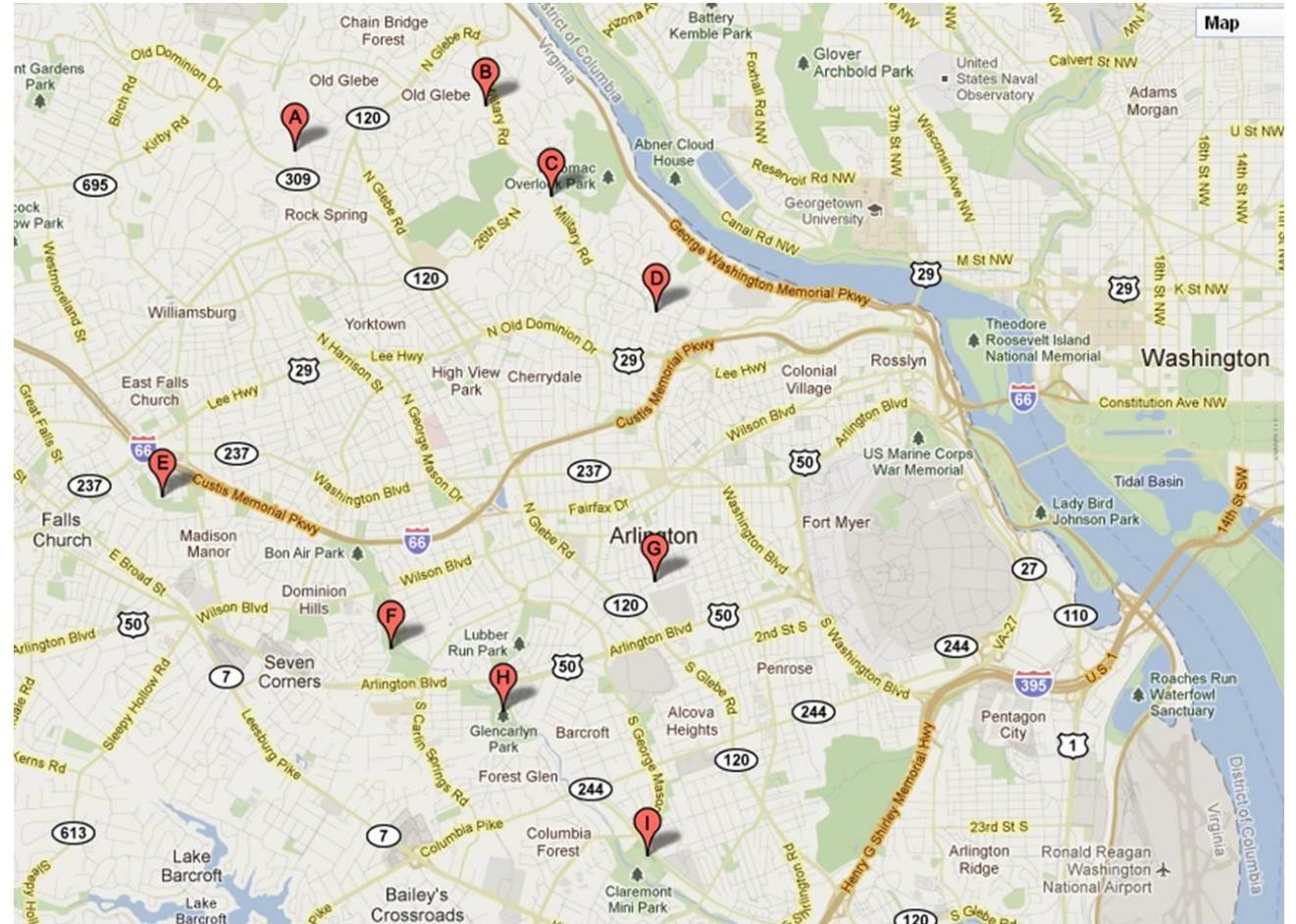
	Spring VSCI		Fall VSCI	
	2015	2014	2015	2014
<u>Gulf Branch</u>	39.6	41.9	38.4	44.1
<u>Windy Run</u>	29	15.2	55.9	56.6
<u>Little Pimmit</u>	33.4	28.4	37.5	41.5
<u>Donaldson Run</u>	31.3	22.7	34.9	47.2
<u>Banneker - 4MR</u>	30.9	22.3	28.2	32.2
<u>Bluemont - 4MR</u>	39.6	34.7	39.1	47.9
<u>Lubber Run</u>	28.9	12.3	20.4	43.7
<u>Barcroft - 4MR</u>	40.1	31.5	58.4	50.4
<u>Upper Long Branch</u>	28.8	39.1	43.8	43.7

VSCI Scale	
≥73	Excellent
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≤42	Severe Stress

# Stantec Comparison of 2011/2012 & 2015 VSCI Scores

- Spring 2015 & 2012 scores were consistent at Severe Stress
  - Northern drainage scores were better in 2012
  - No pattern with 4MR drainages
- Fall 2015 & 2011 were consistent at Severe Stress for 4MR & Gulf Branch drainages
  - Little Pimmit, Windy, DR were “Stress” in 2015



*Arlington Monitoring Sites*

## Stantec Data Suggests

- Northern sites are doing better than Four Mile Run drainage sites
- Systems are doing better during the fall, than spring
  - Highest VSCI scores were in Fall 2015 at all sites but Lubber and Gulf (which were highest in fall 2011).



## In a nutshell (based on current data)

Habitat & Chemical



Fish\*

Macroinvertebrates




## What are the stressors for Arlington streams?

- “Urban Stream Syndrome”
- 42% impervious surfaces
- Nonpoint source runoff
- Flashy stream behavior during storms

*Urban stream syndrome – altered hydrology, increased nutrient and contaminant transport, decreased channel stability, reduced biotic richness and increased dominance of perturbation-tolerant organisms. (Fairfax Study)*



A photograph of a stream flowing through a dense forest. The stream bed is composed of many small, smooth, greyish-brown rocks. The water is clear and flows gently. The surrounding forest is lush with green foliage, including various trees and undergrowth. The lighting is soft, suggesting a shaded forest environment.

**What is being done to improve  
stream quality?**

# Improving Stream Quality: MS4 Permit

## Municipal Separate Storm Sewer System

- Regulatory method used by EPA/state to mandate specific programs and actions at the local level
- Covers numerous practices including:
  - Street sweeping
  - Monitoring
  - StormwaterWise Landscapes
  - Nutrient management plans
  - Green Streets
  - Illicit discharges
  - Outreach
  - And more

## Arlington County, Virginia



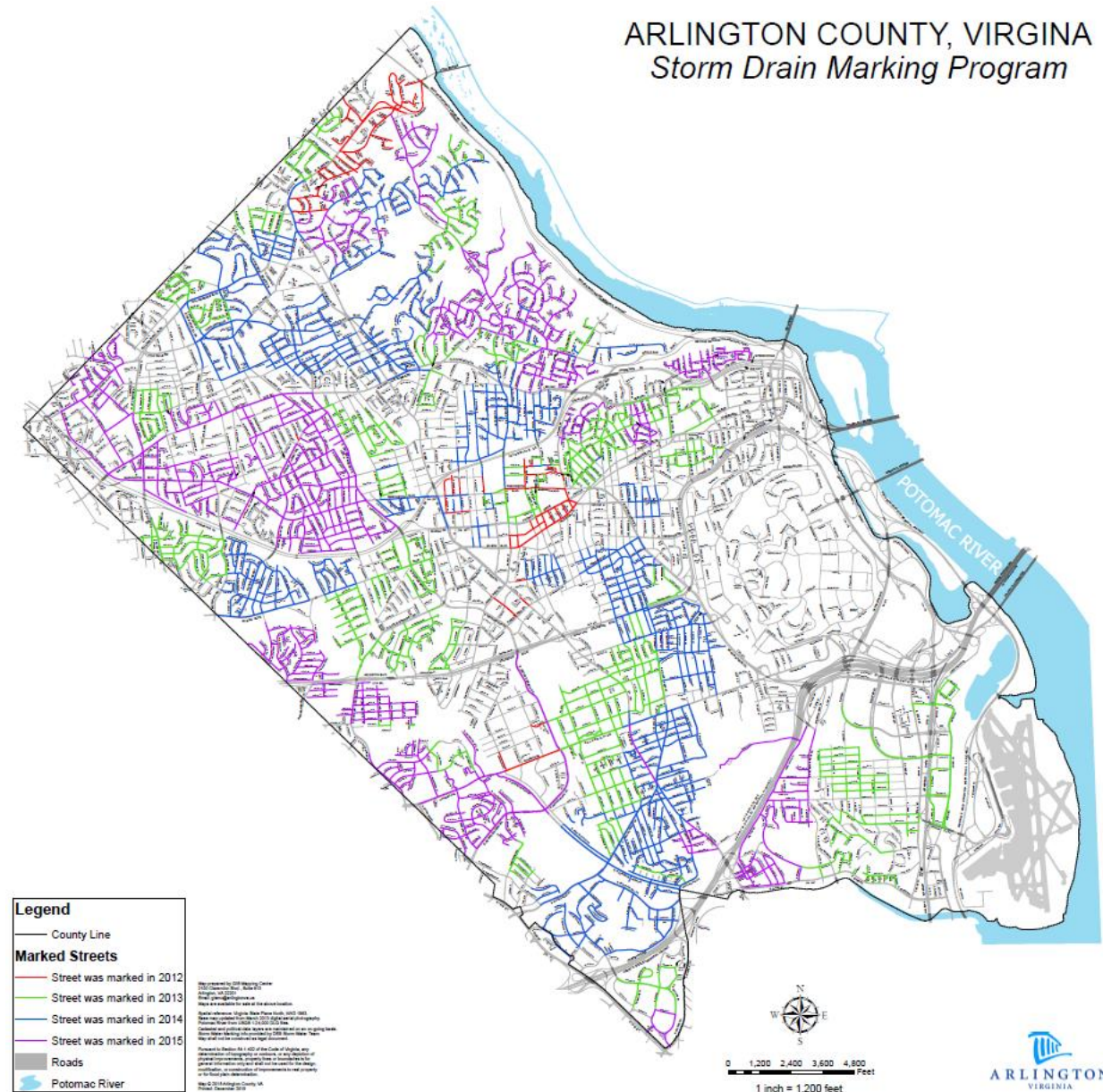
Fiscal Year 2015 Annual Report  
Virginia Stormwater Management Program (VSMP) Permit No. VA0088579  
2013 – 2018 Permit Cycle  
Submitted September 30, 2015



# Improving Stream Quality: Storm Drain Marking

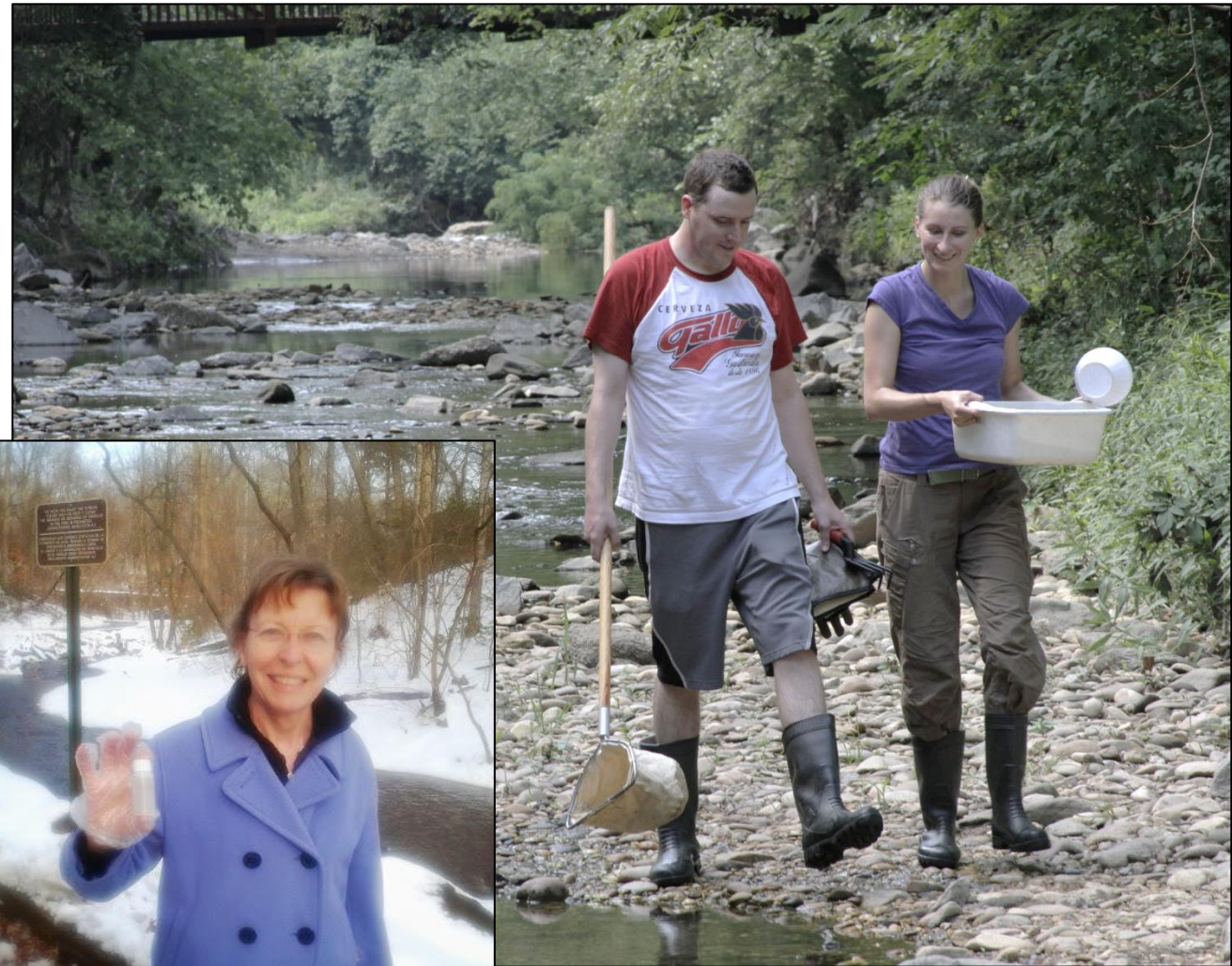
- Educational
  - For those doing the marking as well as those that see the markers
- Enforcement
  - If illegal discharges are discovered at a location that is marked, the penalties can be more harsh

## ARLINGTON COUNTY, VIRGINIA Storm Drain Marking Program



# Improving Stream Quality: Citizen Science Monitoring Programs

- Professional studies 2011 & 2015
- Macro program: Updated protocol, in-field staff support, and new training
- Bacteria program: QAPP & annual recertification



# Improving Stream Quality: Stream Restoration Projects

## Coming Soon:

- Four Mile Run  
(Arlington/Alexandria section, south of Mt Vernon Ave Bridge)
- Donaldson Run Trib B
- Windy Run
- Ballston Pond (Lubber Run)

## Completed:

- Donaldson Run Trib A



# Improving Stream Quality: Green Streets

- South Hayes Street (Pentagon City)
- 8<sup>th</sup> Street South
- Patrick Henry Drive
- N Albemarle Street

## Coming:

- N Kensington & 32<sup>nd</sup> St N
- John Marshall Drive



# Improving Stream Quality: StormwaterWise Landscapes

- Applications to be accepted for 2016 program Feb 14 – Apr 1
- 87 completed projects to date
  - 129 accepted into program
- 4 practices: rain gardens, conservation landscaping, permeable pavement, pavement removal





# Conversations about Streams Are Rarely Just About Streams

- Many interests overlap around streams
  - Trees
  - Infrastructure (drinking water and sewage lines)
  - Recreation in parks
    - Trails
  - Wildlife
  - Water quality
    - Chemical
    - Macroinvertebrate



# Thanks & Good Night

Jen McDonnell

Stormwater Outreach,  
Arlington County DES, OSEM

[jmcdonnell@arlingtonva.us](mailto:jmcdonnell@arlingtonva.us)

703-228-3042

