EPA Stormwater TMDL for the Benthic Impairment in the Accotink Creek Watershed

Technical Advisory Committee Meeting

Fairfax County Government Center
Fairfax, Virginia

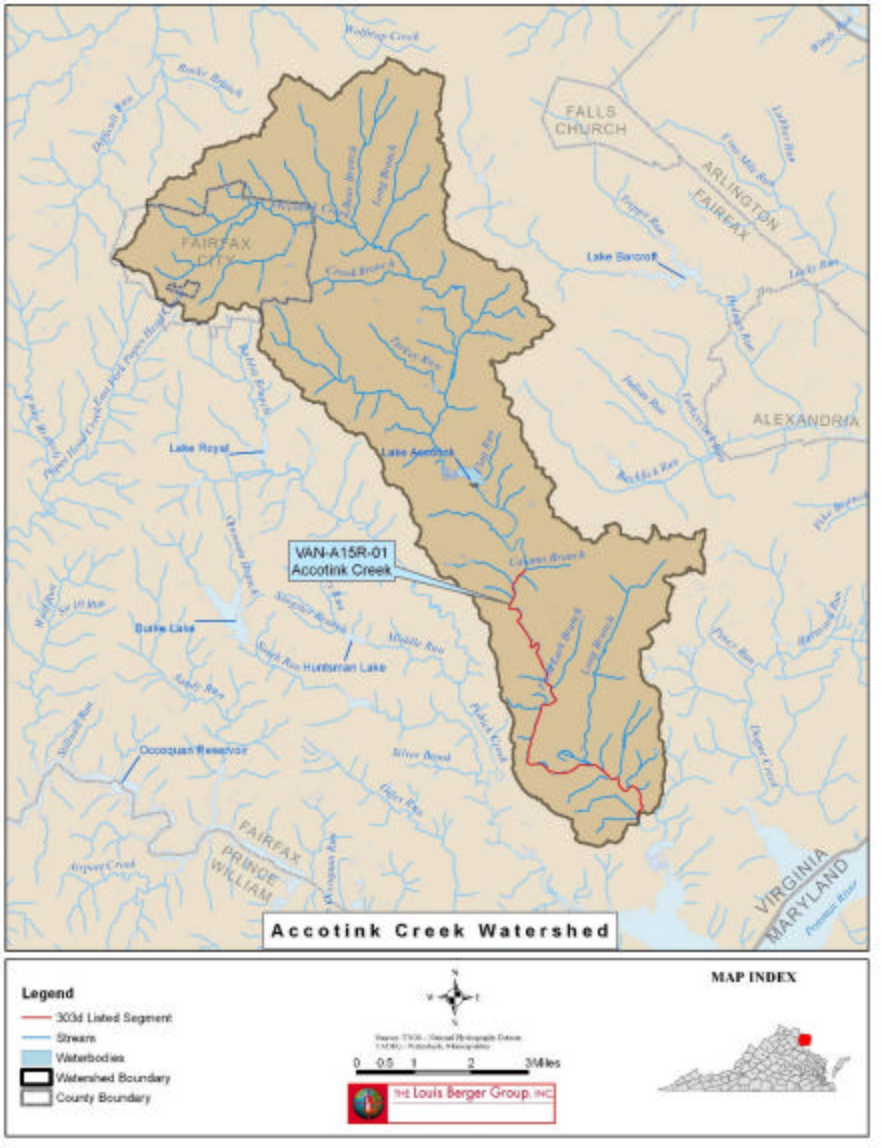
Tuesday, January 19, 2010
10:30am-12:30pm

Agenda

- 10:30am Welcome and Introductions (Greg Voigt, USEPA)
- 10:35am Project Overview (Greg Voigt)
- 10:40am Technical Approach (Raed El-Farhan, Louis Berger Group)
- 10:55am Draft TMDL Allocations (Raed El-Farhan)
- 11:05am Request for TAC Input (Helene Drago, USEPA)
- 11:20am TMDL WLA Implementation (Elizabeth Ottinger, USEPA)
- 11:30am Questions/Comments
- 12:30pm Adjourn

Project Overview

- Impaired Benthic Community
- Failure to Meet Aquatic Life Designated Use
- Listed as Impaired Since 1996
- EPA Consent Decree TMDL



Project Overview

Pollutant of Concern: Sediment

Stream Bank Erosion in Accotink Creek.
June 2008 RBS Study, Station 1AACO004.84

Project Overview

Sediment deposit under Route 1 Bridge.

- Stormwater used as Surrogate for Sediment
- TMDL Developed using Flow Duration Curves
- LA/WLAs Expressed as Flow

Project Overview

Schedule

- 1/19 – 2/17 : TAC Comment Period
- April 2010 : Public Comment Period
- Late-Spring 2010 : TMDL Approved

TAC Comment Period

January 19 – February 17, 2010

Please Send Comments to:

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Overview of the Technical Approach

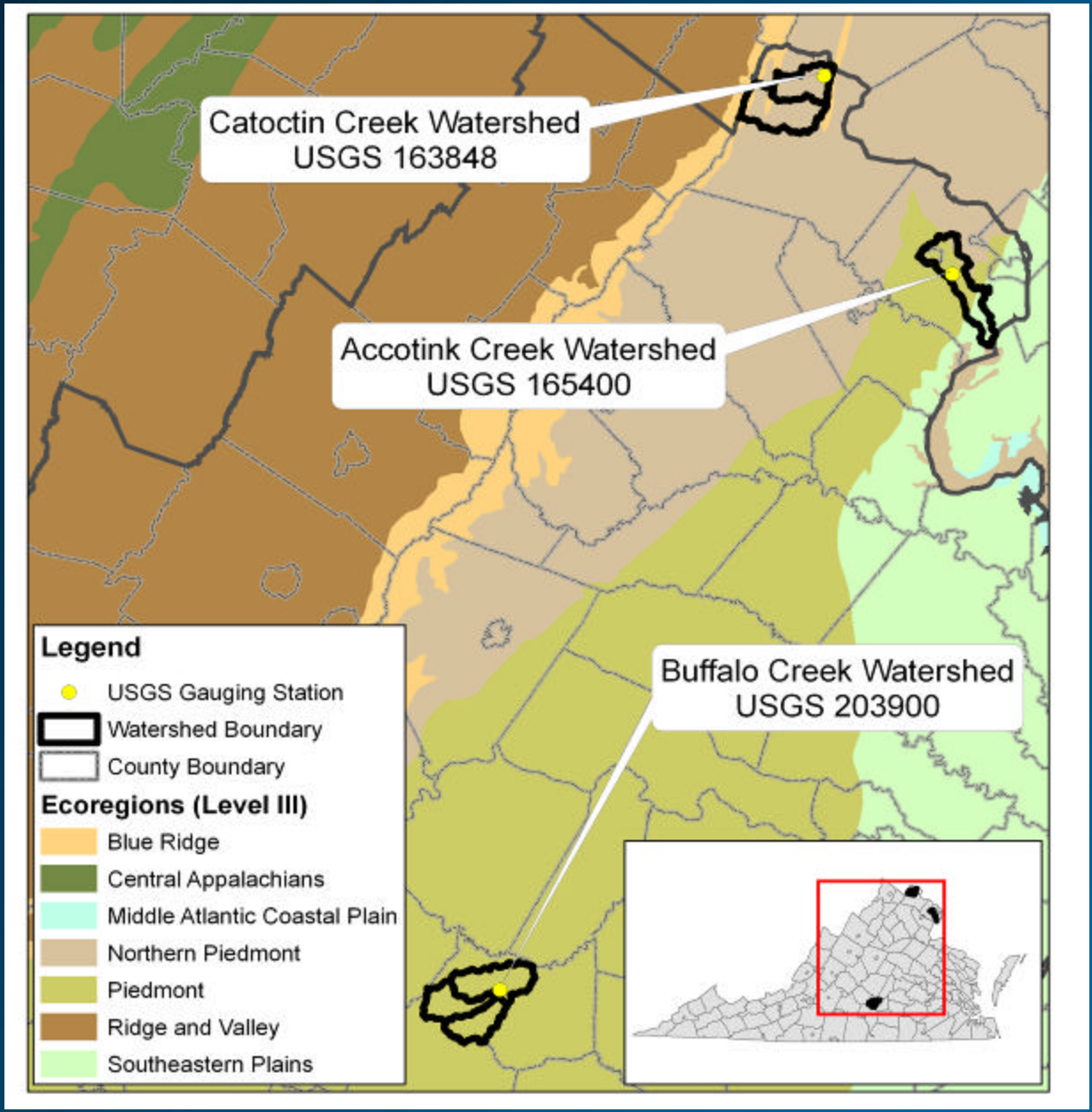
Based on the Attainment Watershed Approach

1. Selection of Appropriate Attainment Streams where the VADEQ Aquatic Life Criteria are currently met
2. Development of Flow Durations Curves (FDC) for Accotink Creek and the Attainment Streams
3. Identification of the Hydrologic Endpoints
4. Estimation of the Existing-Conditions Stormwater Flow In Accotink Creek and the TMDL Stormwater Flow
5. Development of the TMDL Allocations

Criteria Used in the Selection of Attainment Streams

- Existing biological monitoring data indicating that the stream is not impaired
- Existing USGS Gage Station located in close proximity to a DEQ Biological Station
- Biological Station is located in either the Piedmont or Northern Piedmont eco-region (Most of the drainage area of the Accotink Creek watershed is within these 2 Ecoregions)
- Drainage Area at the USGS Station has to be greater than 10 mi^2 and less than 100 mi^2 (Accotink drainage area is 24 mi^2 at the gauging station and about roughly 51 mi^2 at the outlet of the impairment). This generally corresponds to the same stream order as Accotink Creek.

Selection of Attainment Streams



Attainment Streams

Stream Name	Ecoregion	USGS Station	Period of Flow Record	Drainage Area (mi^2)
Buffalo Creek	Piedmont	02039000	1946-2009	69.6
Catoctin Creek	Northern Piedmont	01638480	1971-2009	89.5
Accotink Creek	Northern Piedmont, Piedmont, Southeastern Plain	01654000	1947-2009	23.9

Attainment Streams Biomonitoring Data
Virginia SCI Scores

Collection Period	Buffalo Creek	Catoctin Creek
Fall 1994	-	70.5
Spring 1995	-	73.1
Fall 1995	-	66.2
Spring 1996	-	67.0
Fall 1996	-	63.1
Spring 1997	-	72.8
Fall 1997	-	75.5
Spring 1998	-	74.7
Fall 1998	-	69.7
Spring 1999	-	74.0
Fall 1999	-	71.1
Spring 2000	-	71.7

Collection Period	Buffalo Creek	Catoctin Creek
Fall 2000	-	68.5
Spring 2001	-	69.6
Fall 2001	67.1	
Spring 2002	63.5	75.48
Fall 2002	69.0	68.74
Spring 2003	-	54.99
Fall 2003	-	66.7
Fall 2005	77.8	-
Spring 2006	61.0	-
Fall 2006	80.8	-
Spring 2008	70.6	61.4
Fall 2008	68.8	-

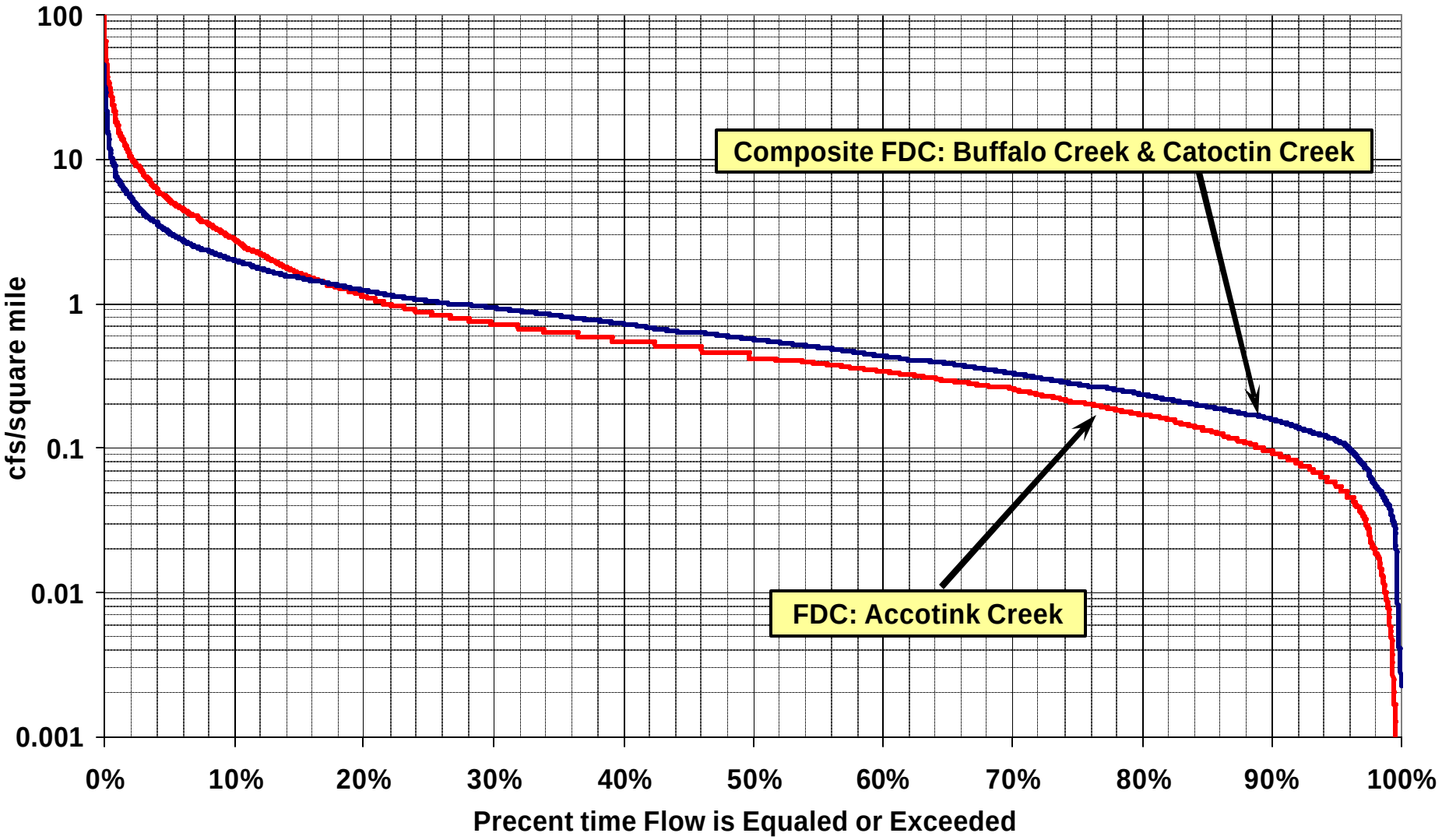
Flow Duration Curves

- The hydrologic target is identified using cumulative frequency curves, called Flow Duration Curves (FDCs)
- FDCs depict the percentage of time that specific daily flows are equaled or exceeded at sites where continuous records of daily flow are available
- FDCs have been widely used for quantifying and studying the effects of urbanization on streams, since they respond to changes in a watershed's hydrologic characteristics
- FDCs are constructed using observed flow data that is readily available

Flow Duration Curves

- Flow duration curves are developed for Accotink Creek (impaired stream) and a composite FDC representing the attainment streams (Buffalo Creek, and Catoctin Creek)
- In order to compare the FDCs and identify the endpoint, the FDC are developed using to flow per unit area (cfs/mi^2)
- The composite Attainment streams FDC combines and uses the average unit-area flows for Buffalo Creek and Catoctin Creek
- FDCs are developed using a similar period of record; a 20-year period of flow record (November 1989 through November 2009) is used to develop the FDCs

Flow Duration Curves



Selection of Hydrologic Targets

- The Accotink Creek TMDL establishes targets for high and low flows
  - The high-flow target is the 1year-24 hour stormwater flow
  - The low-flow target is the 95th percentile flow (flows are equaled or exceeded 95% of the time)

Reductions to the high flow target will result in increased infiltration and groundwater recharge and will ultimately result in achieving the low-flow target. The infiltration & groundwater recharge needed to achieve the 1 Yr- 24 Hr flow target will result in achieving the low flow target.

Selection of Hydrologic Targets

The 1 year-24 hour flow was selected as the high flow target since:

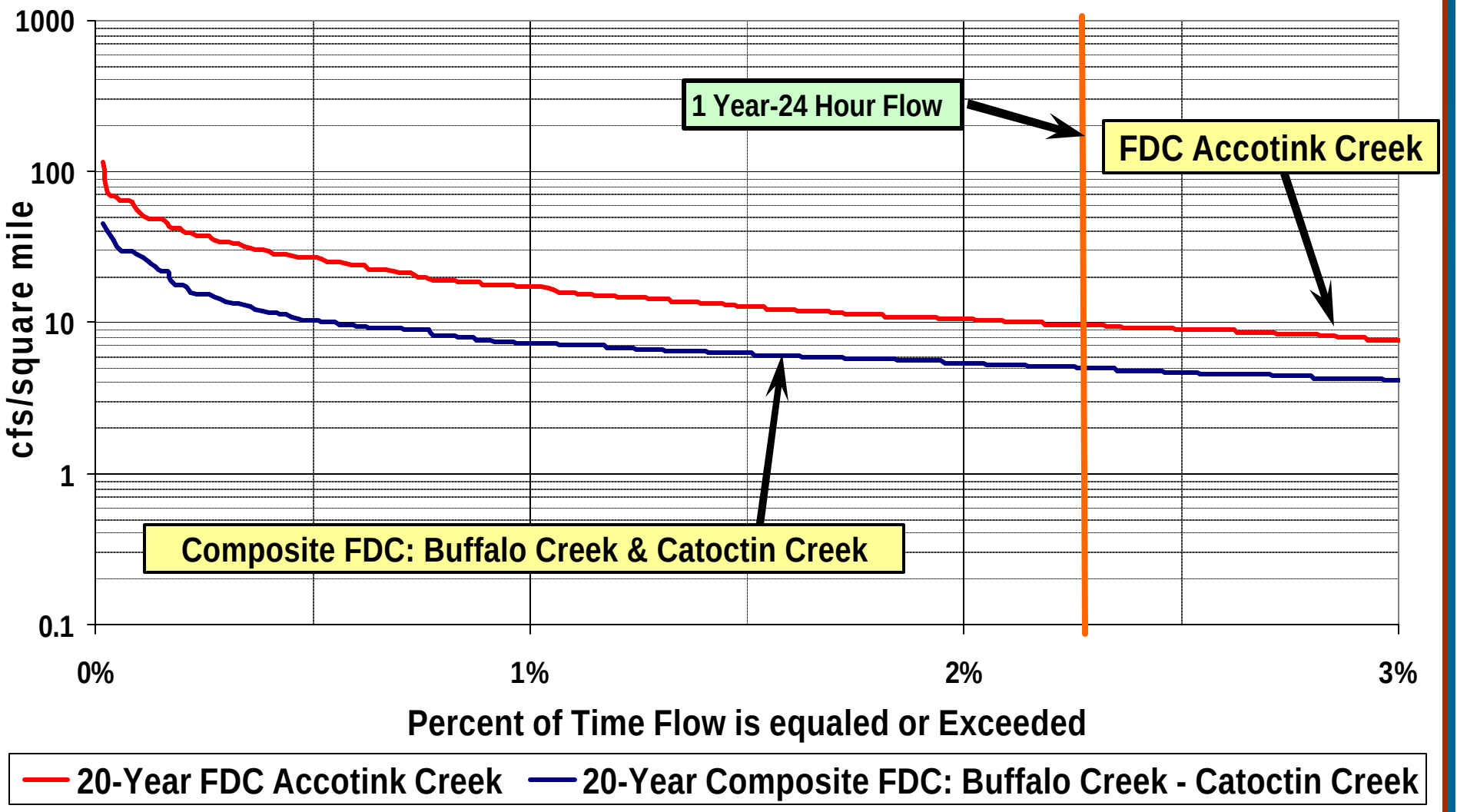
1. Stream channel morphology is more influenced by frequent (1- to 2-year) flow events; “bankfull” or “near bankfull” flows; than by large flood events (Leopold 1994, Hollis 1975)

2. The 1 year-24 hour flow is generally considered the *channel forming* flow for small streams

3. Targeting the *channel forming* flow helps directly reduce key channel altering events that produce large amounts of sediment within the stream system and damage the aquatic habitat

4. Virginia has ***proposed*** design specifications for stormwater management measures that are largely based on controlling the 1 year-24 hour flow

1 year-24 Hour Hydrologic Target



1 year-24 Hour Hydrologic Target

- The 1 year-24 hour stormwater flow is estimated at 230 cfs using the entire flow record in Accotink Creek (1947-2009) and corresponds to:
  - **A unit-area flow of 9.62 cfs/mi^2 using the Accotink Creek FDC, and**
  - **A unit area flow of 4.67 cfs/mi^2 using the attainment-streams composite FDC**

Estimation of Stormwater Flow Reduction – 1 Year-24 Hour Flow			
Accotink Unit-Area Flow (cfs/mi^2)	Corresponding non-Impaired Unit-Area Flow (cfs/mi^2)	Flow Reduction (cfs/mi^2)	% Flow Reduction
9.62	4.95	4.67	48.5%

Overall, the magnitude of the one-year 24-hour stormwater flow in the Accotink Creek watershed must be reduced by 48.5% in order to meet the established TMDL endpoints

Overall Recommended TMDL Allocations

Stormwater TMDL for Accotink Creek (cfs/mi^2)			
TMDL	**Load Allocation**	**Wasteload Allocation**	**Margin of Safety**
4.95	0.32	4.63	Implicit

Existing Conditions Flow Distribution

- Distribution of the 1year-24 hour flow existing-conditions in Accotink Creek was based on:
  - A land-use based approach to estimate the relative stormwater flow contribution from the land areas
  - A Runoff Coefficient Approach to estimate the existing stormwater contribution from each land use category
  - A runoff coefficient (Rc) represents the fraction of precipitation that appears as runoff and is expressed as a constant value between zero and one

Runoff Coefficient (Rc) = 0.05 + 0.91*Fraction of Imperviousness

Accotink Creek Existing Conditions Unit Area Flow
1 Year-24 Hour Flow

Land Use Classification	Land Use Category	Acres	Percent Imperviousness Accepted Range	Runoff Coefficient	Unit Area Flow cfs/mi²
Urban	Developed, Low Intensity	10,099	20.0	0.181	3.19
	Developed, Medium Intensity	4,525	40.0	0.361	2.85
	Developed, High Intensity	2,731	60.0	0.541	2.58
	Developed Open Space	4,245	10.0	0.091	0.67
Agriculture	Pasture/Hay	27	8.0	0.073	<0.01
	Cultivated Crops	94	8.0	0.073	0.01
	Barren Land	42	8.0	0.073	0.01
Forest	Deciduous Forest	8,192	2.0	0.019	0.27
	Evergreen Forest	237	2.0	0.019	0.01
	Mixed Forest	640	2.0	0.019	0.02
	Grassland	54	2.0	0.019	<0.01
	Scrub/Shrub	267	2.0	0.019	0.01
	Total	**31,153**	-	-	**9.62**

Land use distribution developed using the National Land Use Land Cover (NLCD) 2006 Data

Basis for Developing the Allocations

- **Most of the Accotink Creek watershed is covered by MS4 areas**
  - Therefore, stormwater runoff allocations from the Urban/Developed category represent the WLA for the Accotink Creek TMDL and includes the MS4 and the VPDES stormwater permits
- **The nonpoint source stormwater contribution in Accotink Creek comprises the stormwater flow for forested and agricultural areas**
  - No reductions are applied to the forested nonpoint source stormwater flows
  - Agriculture acreage is extremely small in Accotink Creek and contributing less than 0.03% of the total existing conditions stormwater flow; no reductions are applied to the agricultural nonpoint source stormwater flows
  - TMDL LA for Accotink creek is comprised of the existing conditions unit-area stormwater flow from the forested and agricultural areas

TMDL Waste Load Allocations (WLA)

Wasteload Allocations Summary for Accotink Creek Stormwater TMDL					
	Land Use Category	Acres	Existing conditions cfs/mi^2	Allocation cfs/mi^2	% Reduction
Waste Load Allocations	Developed, Low Intensity	10,099	3.19	1.59	50.2
	Developed, Medium Intensity	4,525	2.85	1.42	50.2
	Developed, High Intensity	2,731	2.58	1.29	50.2
	Developed Open Space	4,245	0.67	0.33	50.2
	Total	**21,600**	**9.30**	**4.63**	**50.2**

This WLA will be further disaggregated to develop specific allocations for each MS4 and Stormwater Permit (Industrial, General, etc..)

TMDL Waste Load Allocations (WLA)

Permit Type	Permit #	Permit Holder	Acres	Existing Conditions	WLA
Industrial Stormwater	VAR050988	Canada Dry - Springfield	21,600	9.30 cfs/mi^2	4.63 cfs/mi^2
	VAR051032	Potomac Disposal Services - Fairfax			
	VAR051042	SICPA Securink Corporation			
	VAR051047	Fairfax County - Connector Bus Yard			
	VAR051053	United Parcel Service - Springfield			
	VAR051066	US Postal Service - Merrifield Vehicle Maintenance			
	VAR051100	Shenandoahs Pride Dairy			
	VAR051109	Federal Express Corporation - NYGA Station former			
	VAR051134	G and L Metals			
	VAR051565	Rolling Frito Lay Sales LP - South Potomac DC			
	VAR051719	National Asphalt Paving Corporation - Fairfax			
	VAR051770	Fairfax County - Jermantown Maintenance Facility			
	VAR051771	Fairfax County - Newington Maintenance Facility			
	VAR051772	Fairfax County - DVS - Alban Maintenance Facility			
	VAR051795	HD Supply - White Cap			
	VAR051863	United Parcel Service - Newington			
	VAR051711	United Parcel Service - Fleet			
MS4	VA0088587	Fairfax County			
	VAR040062	VDOT Northern Urban Area			
	VAR040104	Fairfax County Public Schools			
	VAR040095	Northern VA Comm. College			
	VAR040093	Fort Belvoir			
	VAR040066	Town of Vienna			

TMDL Load Allocations (LA)

Load Allocations Summary for Accotink Creek Stormwater TMDL					
	Land Use Category	Acres	Existing Conditions cfs/mi^2	Allocation cfs/mi^2	%Reduction
Load Allocations	Pasture/Hay	27	<0.001	<0.01	0.0
	Cultivated Crops	94	0.01	0.01	0.0
	Barren Land	42	0.01	0.01	0.0
	Deciduous Forest	8,192	0.27	0.27	0.0
	Evergreen Forest	237	0.01	0.01	0.0
	Mixed Forest	640	0.02	0.02	0.0
	Grassland	54	<0.001	<0.01	0.0
	Scrub/Shrub	267	0.01	0.01	0.0
Total		**9,553**	**0.32**	**0.32**	**0.0**

Questions

TAC Comment Period

January 19 – February 17, 2010

Please Send Comments to:

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