

# Sugarland Run and Horsepen Creek Watershed Management Plan

Watershed Advisory Group #2  
March 3, 2009

**Fairfax County Department of Public Works  
and Environmental Services**

Presented by Watershed Planning & Assessment Branch,  
Stormwater Management



A close-up photograph of a dense field of blue and purple flowers, likely Salpiglossis, with vibrant green foliage. The flowers are bell-shaped and hang from thin stems. The background is filled with more of the same plants, creating a lush, textured appearance.

Welcome

---

**Juliana Birkhoff, CBI**



## Today's Meeting Goal

- Discuss County goals and objectives
- Update on Sugarland Run and Horsepen Creek modeling
- Review watershed restoration strategies
- Discuss applying strategies to Sugarland Run and Horsepen Creek

# Group Expectations

- Show your respect for group members by listening and taking everyone's ideas seriously.
- Expect, respect, and accept different interests, perspectives, and opinions.
- Participate actively-share all relevant information, ideas, and concerns.
- Keep the discussion focused on the task or issue at hand. You can help keep the discussion focused by only one person talking at a time, and avoiding side conversations and interruptions.
- Be fully present, turn off or put on vibrate your cell phones, Blackberries, and WiFi, and do not multi-task.

A close-up photograph of a dense field of blue and purple flowers, likely Virginia Bluebells, with vibrant green foliage. The flowers are in various stages of bloom, some fully open and others as buds. The background is a soft-focus expanse of similar flowers and leaves.

# **Watershed Plan Goals and Objectives**

---

**Joe Sanchirico, Fairfax County**

# Goals and Objectives

- Developed to improve efficiency of the Watershed Management Planning Process
- Promote consistency in the watershed plans that are to be developed by the county's various consultants.
- Allow for a countywide evaluation that addresses stakeholder concerns while providing an efficient and effective means of assessment.

# Terminology

- **Goals**- a general statement about the desired outcome of a watershed management strategy
- **Objectives**- more specific statements that define how the goals are accomplished
  - cannot be directly measured, so indicators that are directly linked to the objectives are needed
- **Indicators** –yardsticks for measuring how well the objectives are met (environmental conditions)
  - a quantifiable endpoint to measure the watershed conditions

# The First Round

## Initial set of six Watershed Management Plans

- Each plan had own goals and objectives
  - Developed independently, non-standard format, no indicators
- Issues from this approach
  - Implementation, tracking, inconsistency
  - Time Consuming Public Process
    - Less time devoted to project selection and evaluation

# Lesson Learned

- The county needed consistent goals and objectives to develop a systematic approach for countywide watershed management

# The Second Round

## The final seven Watershed Management Plans

- Overarching goals and objectives
  - Consolidated from all first round plans
- Solutions for a range of problems
  - Implementation, tracking, inconsistency issues
- Streamlined Public Process
  - More time devoted to project selection and evaluation

# Goals and Objectives

- **Countywide watershed planning goals**
  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.
- **Watershed Planning Objective Categories\***
  1. Hydrology
  2. Habitat
  3. Stream Water Quality
  4. Drinking Water Quality
  5. Stewardship

\*each category has one or more specific objectives associated with it

# Objectives

Objective	Linked to Goal(s)
<b>CATEGORY 1. HYDROLOGY</b>	
1A. Minimize impacts of stormwater runoff on stream hydrology to promote stable stream morphology, protect habitat, and support biota.	1
1B. Minimize flooding to protect property, human health, and safety.	2
<b>CATEGORY 2. HABITAT</b>	
2A. Provide for healthy habitat through protecting, restoring, and maintaining riparian buffers, wetlands, and instream habitat.	1
2B. Improve and maintain diversity of native plants and animals in the county.	1
<b>CATEGORY 3. STREAM WATER QUALITY</b>	
3A. Minimize impacts to stream water quality from pollutants in stormwater runoff.	1, 2
<b>CATEGORY 4. DRINKING WATER QUALITY</b>	
4A. Minimize impacts to drinking water sources from pathogens, nutrients, and toxics in stormwater runoff.	2
4B. Minimize impacts to drinking water storage capacity from sediment in stormwater runoff.	2
<b>CATEGORY 5 STEWARDSHIP</b>	
5A. Encourage the public to participate in watershed stewardship.	3
5B. Coordinate with regional jurisdictions on watershed management and restoration efforts such as Chesapeake Bay initiatives.	3
5C. Improve watershed aesthetics in Fairfax County.	1, 3



# Indicators

<b>Watershed Impact Indicators</b>
<b>Benthic Communities</b>
<b>Road Hazards</b>
<b>Fish Communities</b>
<b>Building Hazards</b>
<b>Aquatic Habitat</b>
<b>Flood Complaints</b>
<b>Channel Morphology</b>
<b>In-stream Sediment</b>
<b>Hydrology</b>
<b>Nitrogen Loading</b>
<b>Phosphorous Loading</b>
<b>Headwater Riparian Habitat</b>
<b>Wetland Habitat</b>
<b>Sediment Loading</b>

<b>Source Indicators</b>
<b>Channelized/Piped Streams</b>
<b>Stream Buffer Deficiency</b>
<b>Impervious Area</b>
<b>Nutrient Loading</b>
<b>Stormwater Outfalls</b>
<b>Sediment Loading</b>
<b>Parcels served by septic</b>
<b>Urban Land Cover</b>
<b>Population density</b>
<b>VPDES Point Sources</b>
<b>Erosion and Sediment permits</b>
<b>Sanitary Sewer Crossings</b>
<b>Other Hot Spots</b>



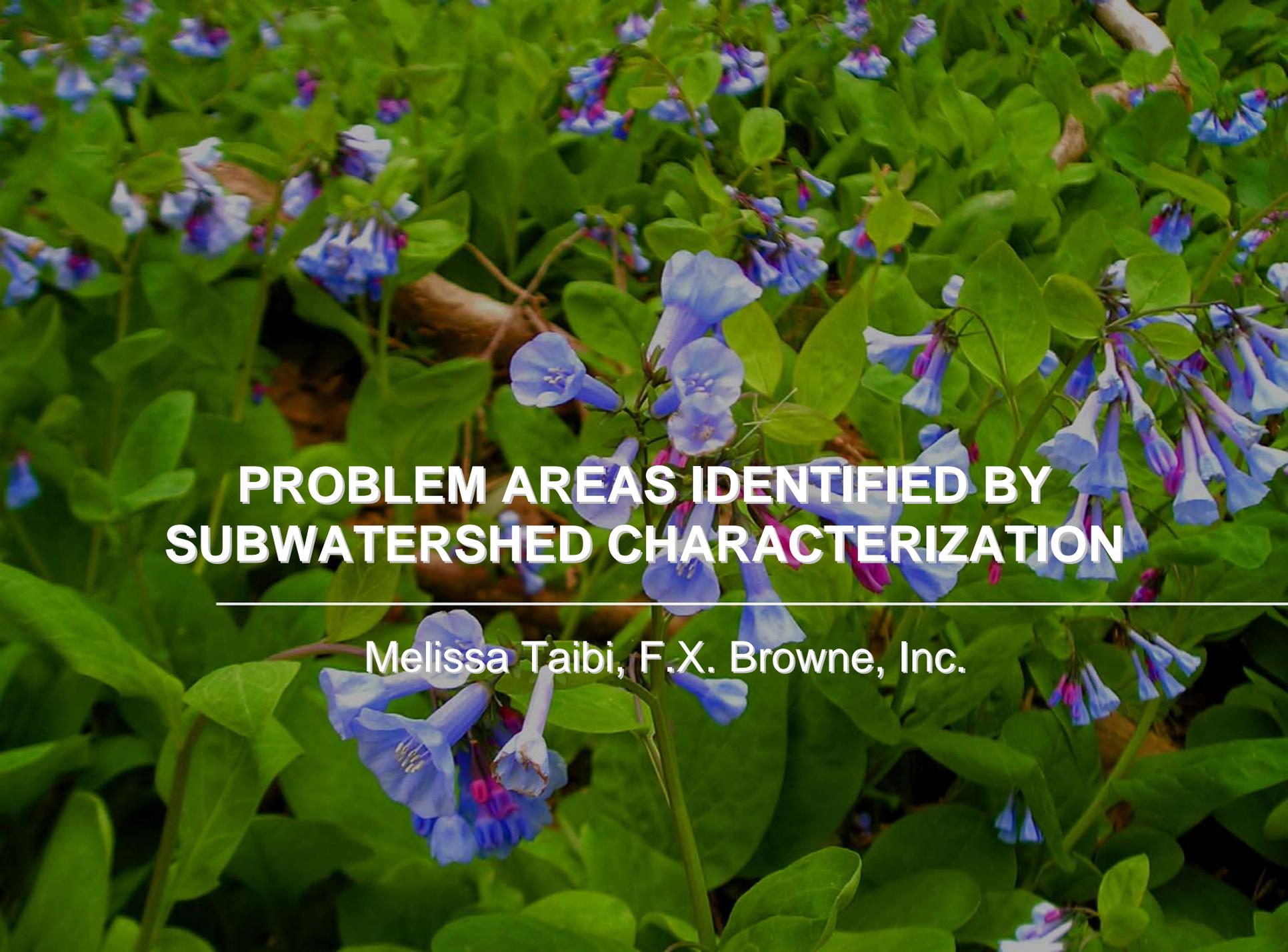
# How does it work?

- **Goal-** Improve and maintain watershed functions in Fairfax County, including water quality, habitat and hydrology
  - **Objective-** Minimize impacts to stream water quality from pollutants in STW runoff
    - **Indicators-** Fish Community Rating, Nutrient Loads, Habitat Quality, Sediment, etc.



# Expectations

- Extensive work was done in developing goals and objectives during 1<sup>st</sup> Round
- We are open to new ideas on watershed specific goals & objectives not yet considered
- WAG time is to be primarily devoted to assisting with project identification and selection
- WAG members are encouraged to help generate community support for the plan



**PROBLEM AREAS IDENTIFIED BY  
SUBWATERSHED CHARACTERIZATION**

---

Melissa Taibi, F.X. Browne, Inc.

# Subwatershed Characterization and Ranking

- Systematic means of compiling available water quality and natural resources information
- Consistent methodology throughout latest set of Watershed Management Plans
  - Subwatershed ranking results are comparable across watersheds
  - Planners and managers can effectively evaluate and prioritize projects County-wide
- Allows for analysis of future conditions using “predictive” indicators
  - Future scenarios help identify areas in need of preservation rather than restoration
  - County is able to evaluate the benefit of proposed projects

# Subwatershed Ranking Indicators

- Watershed Impact Indicators – *Watershed condition*
- Source Indicators – *Watershed stressors*
- Programmatic Indicators – *Extent and effectiveness of existing watershed management programs*

# Watershed Impact Indicators: *Watershed condition*

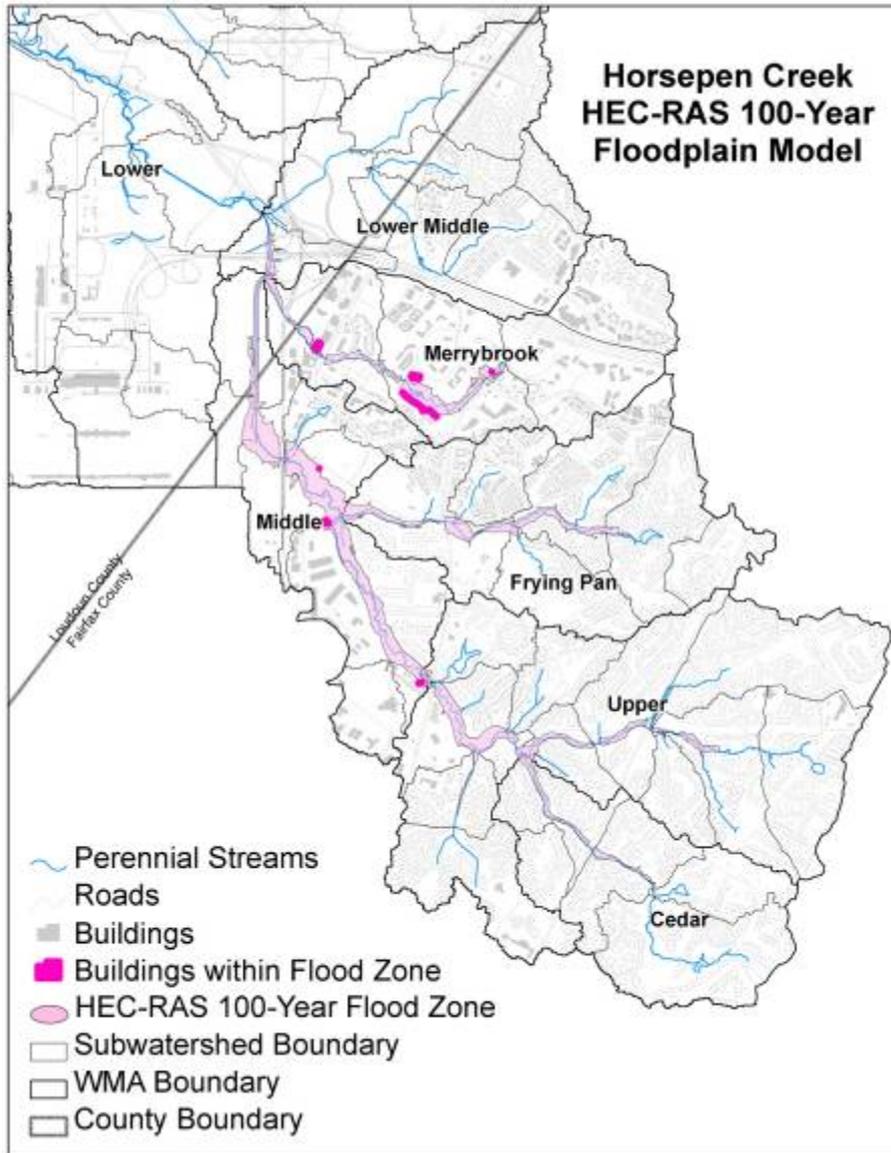
## Objective Composite Scores

- Stormwater Runoff
- Flooding Hazards
- Habitat Health
- Habitat Diversity
- Stream Water Quality
- Drinking Water Quality
- Storage Capacity

## Overall Watershed Impact Objective Composite score



# Objective Composite Scores: *Flooding Hazards*



Indicators are:

- Number of Overtopped Roads
- Magnitude of Overtopped Roads
- Number of Residential Buildings in the Floodplain
- Number of Non-Residential Buildings in the Floodplain
- Citizen Flood Complaints



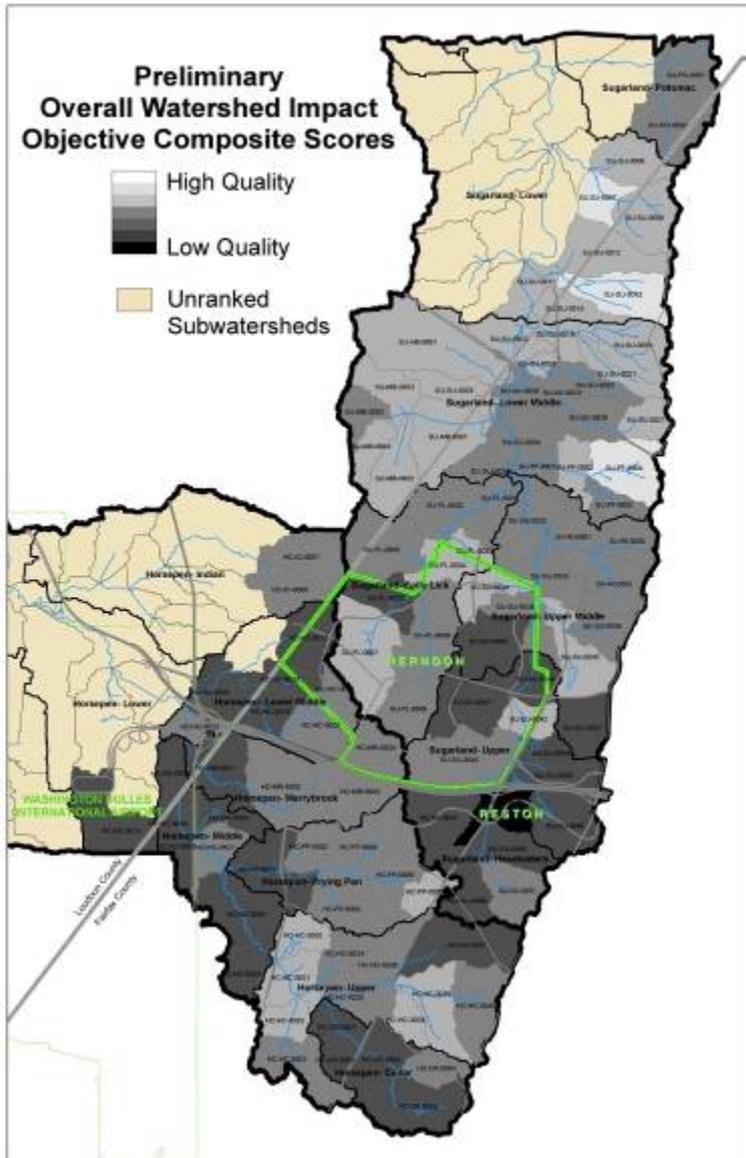






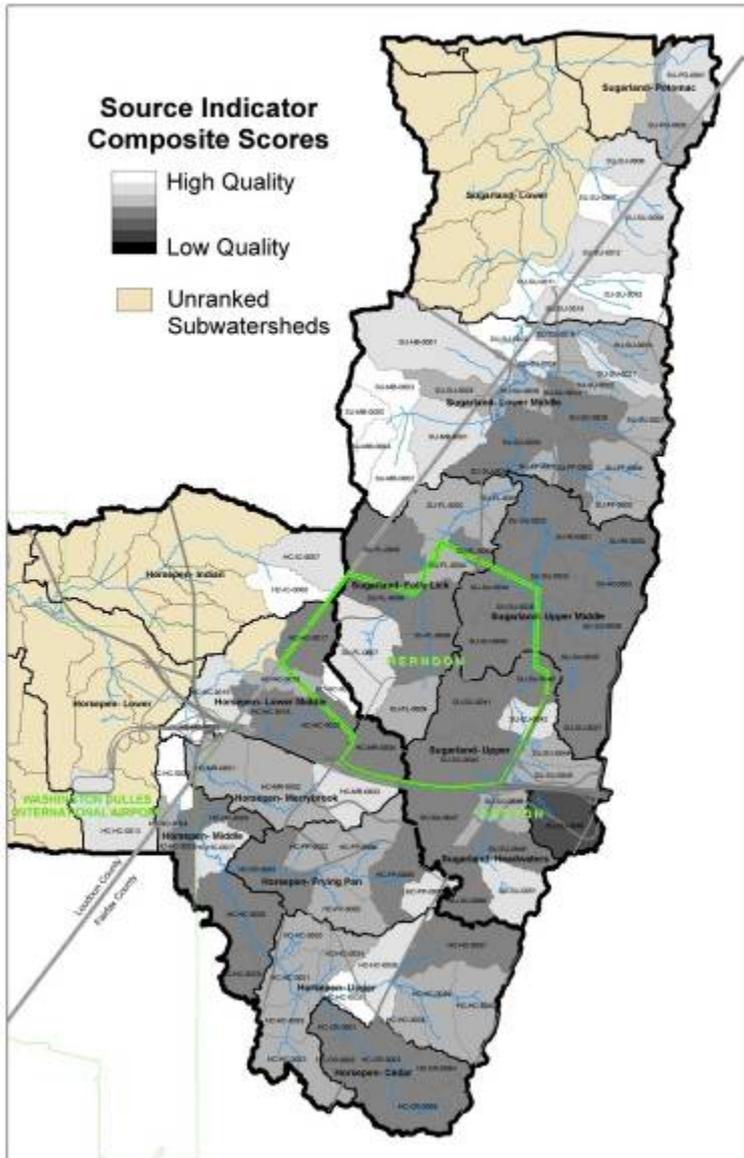


# Objective Composite Scores: *Overall Watershed Impact*



- Summation of all objective composite scores
- Indication of overall subwatershed condition

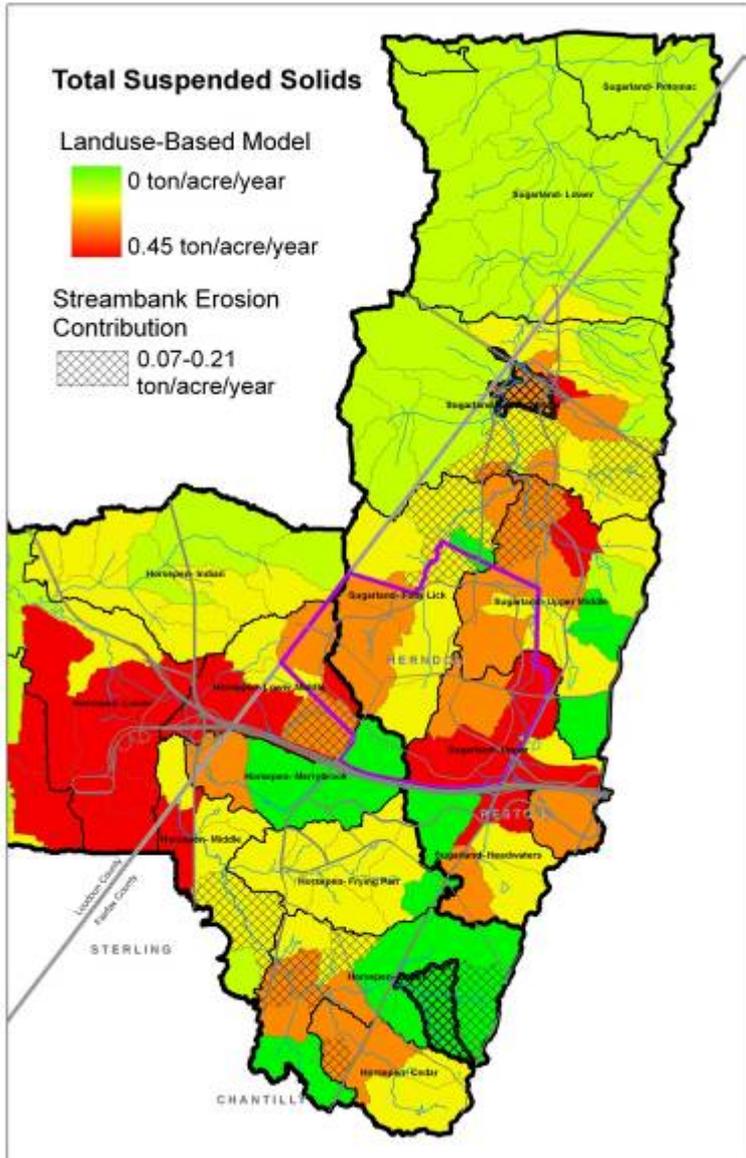
# Source Indicators: *Sources of watershed stressors*



Indicators are:

- Channelized Streams
- Impervious Area
- Stormwater Outfalls
- Onsite Sewage Disposal
- Streambank Buffer Deficiency
- Sediment & Nutrient Runoff
- Percent Urban Landcover
- Industrial Discharges

# Individual Indicators: *STEPL Pollutant Loading Model*

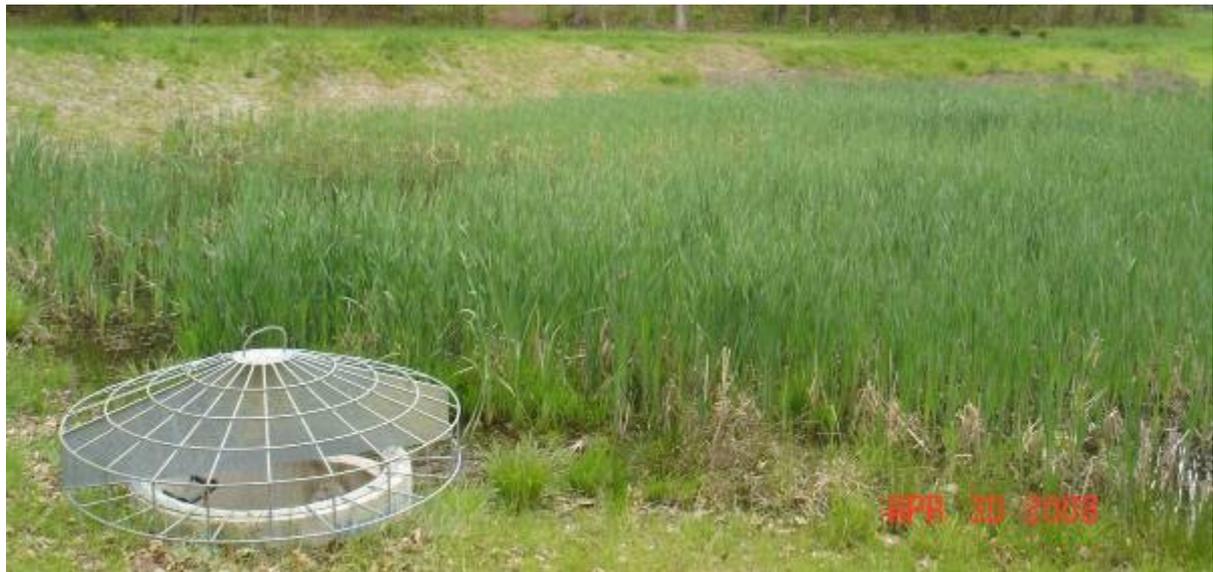


STEPL model includes:

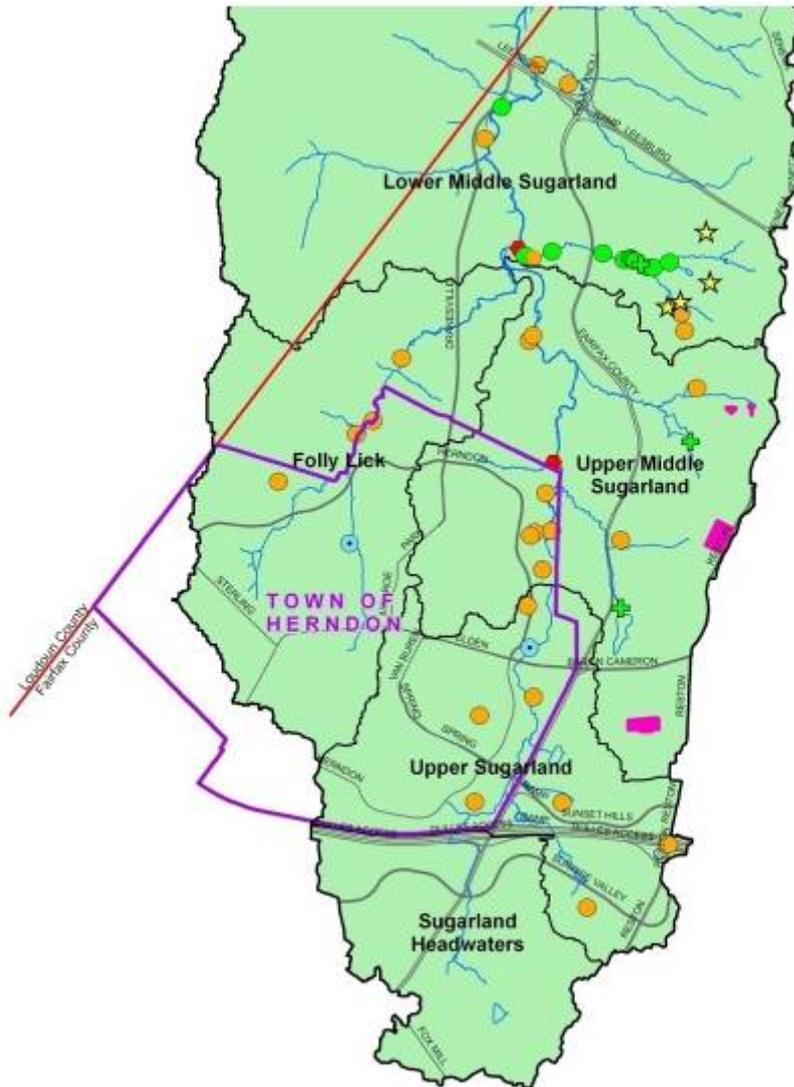
- Landuse-based pollutant modeling
- Pollutant reductions from stormwater facilities
- Streambank erosion

# Programmatic Indicators

- Existing stormwater management facilities
- Tool to evaluate watershed management needs
- Will be used during *Candidate Project Identification*

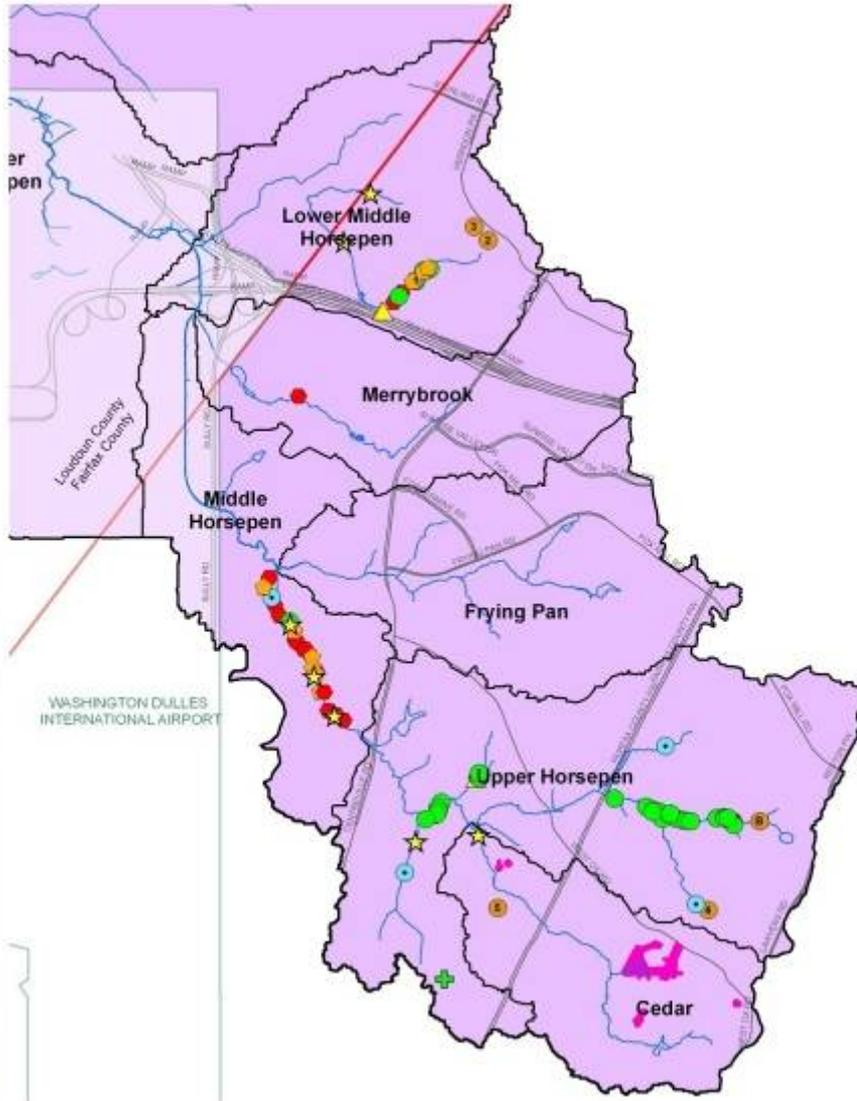


# Sugarland – Identified Problems



-  Perennial Streams
-  Major Roads
-  Moderate to Severe SPA Crossing Impacts
-  Moderate to Severe SPA Ditch Impacts
-  Moderate to Severe SPA Erosion Impacts
-  Moderate to Severe SPA Obstruction Impacts
-  Moderate to Severe SPA Pipe Impacts
-  Moderate to Severe SPA Utility Impacts
-  Field-Confirmed Pro-Rata Projects Still Needed
-  Field-Confirmed Drainage Complain Problems
-  Public Involvement Comments

# Horsepen – Identified Problems



-  Perennial Streams
-  Major Roads
-  Moderate to Severe SPA Crossing Impacts
-  Moderate to Severe SPA Ditch Impacts
-  Moderate to Severe SPA Erosion Impacts
-  Moderate to Severe SPA Obstruction Impacts
-  Moderate to Severe SPA Pipe Impacts
-  Moderate to Severe SPA Utility Impacts
-  Field-Confirmed Pro-Rata Projects Still Needed
-  Field-Confirmed Drainage Complain Problems
-  Public Involvement Comments

A close-up photograph of a dense field of blue and purple flowers, likely Salpiglossis, with vibrant green foliage. The flowers are bell-shaped and hang from thin stems. The background is a soft-focus expanse of similar plants.

# **PRELIMINARY STRATEGIES FOR WATERSHED IMPROVEMENTS AND PRESERVATION**

---

Melissa Taibi, F.X. Browne, Inc.



# Restoration Strategies

## Restoration Strategy Goals:

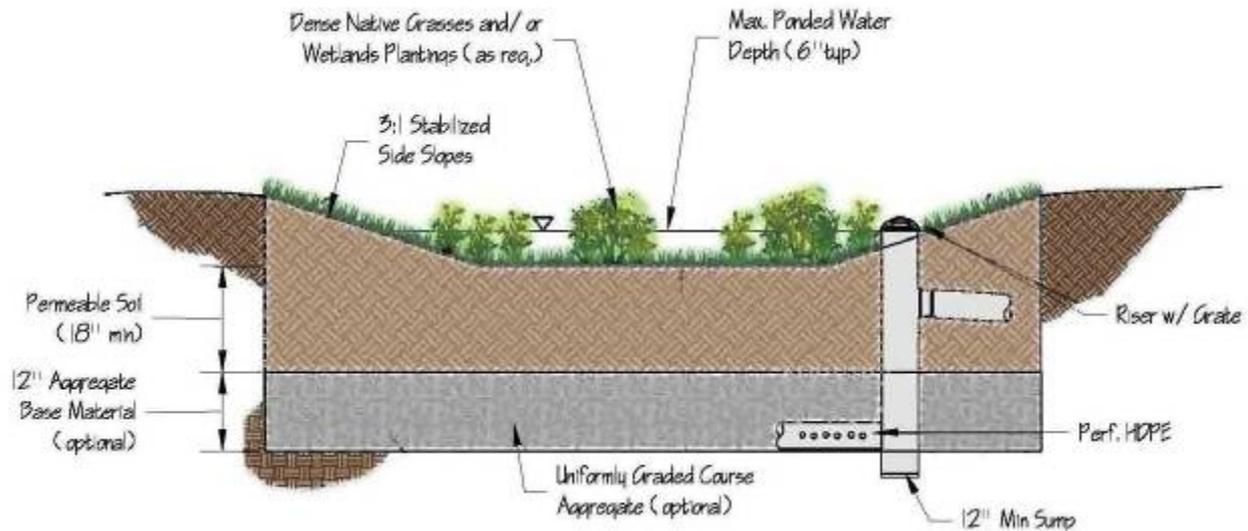
- Reduce Flooding
- Improve Water Quality
- Improve Habitat/Reduce Streambank Erosion

# Restoration Strategies: *Reduce Flooding*

- Reduce runoff volume & peak runoff using infiltration
  - Infiltration Basins/Trenches
  - Rain Garden/Bioretention
  - Vegetated Swales/Filter Strips
  - Porous/Permeable Paving
  - Vegetated Rooftops
- Reduce peak runoff using detention basins
- Improve Road Crossings

# Restoration Strategies: *Reduce Flooding*

## Rain Garden/ Bioretention



# Restoration Strategies: *Reduce Flooding*



**Wet Detention Pond**



**Infiltration Trench**



**Vegetated Roof tops**

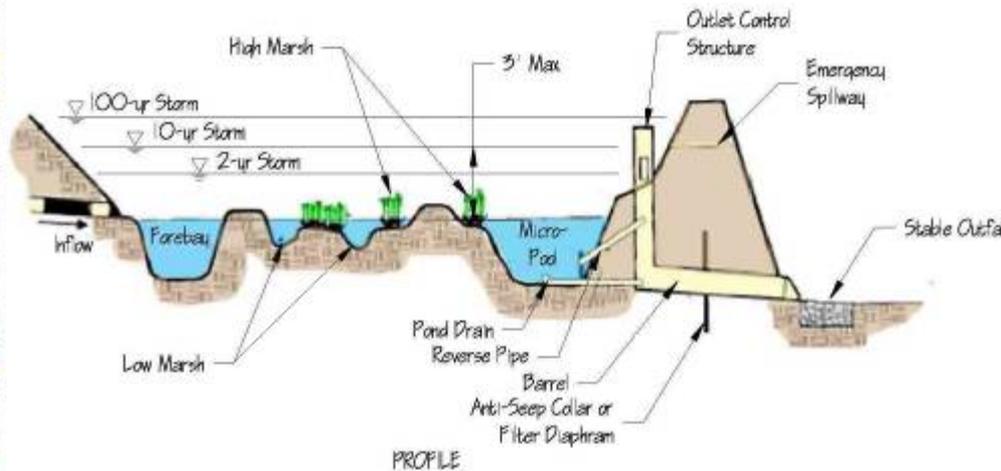
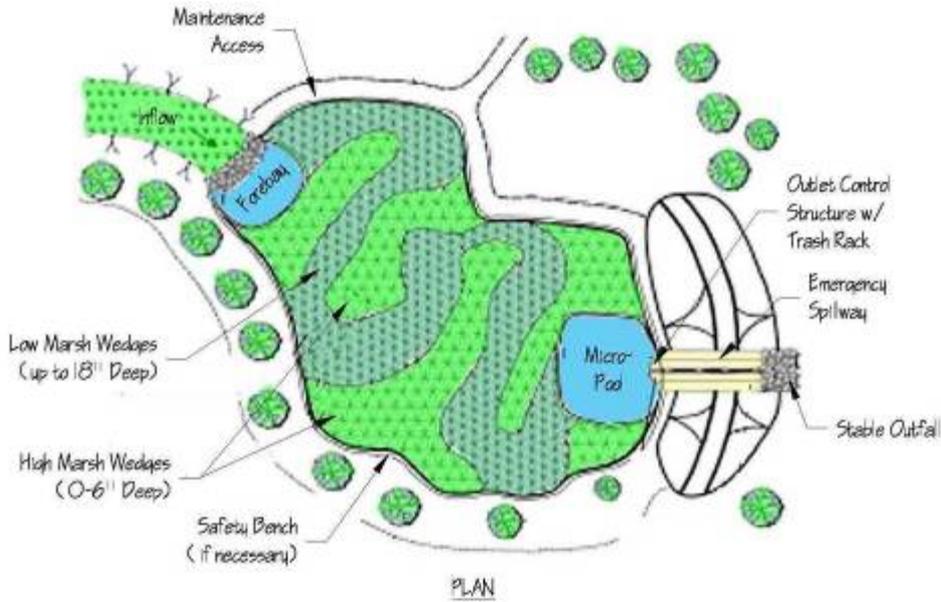




# Restoration Strategies: *Improve Water Quality*

- Best Management Practices (BMPs) that provide quality and quantity control
  - Constructed Wetlands
  - Wet Ponds
  - Rain Gardens/Bioretenion
  - Vegetated Swales/Filter Strips
  - Dry Extended Detention Basin (Naturalized Basin)
  - Vegetated Rooftops
- BMPs that provide only quality control
  - Sand and Sand/Peat Filters
  - Water Quality Inlets/Catch Basins
- Non-Structural Measures
  - Stream Buffers/Riparian Zones
  - Street Sweeping

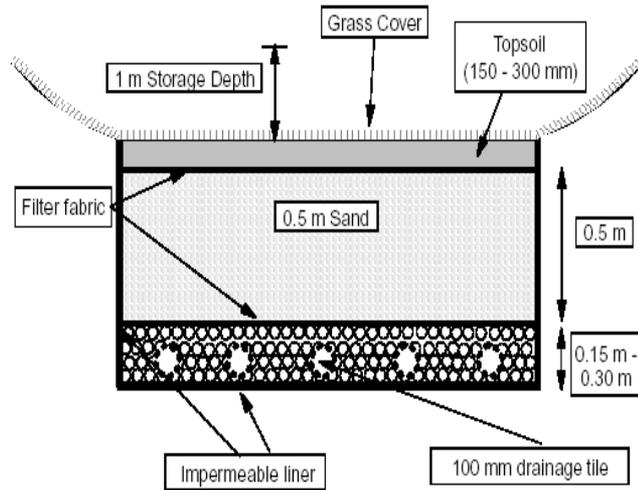
# Restoration Strategies: *Improve Water Quality*



## Constructed Wetland



# Restoration Strategies: *Improve Water Quality*



## Sand Filter & Sand/Peat Filter



# Restoration Strategies: *Improve Habitat/Reduce Streambank Erosion*

- Stream Restoration – Natural Channel Design
  - Holistic view of stream system
  - May involve changes in width, depth, & size of channel
  - Structural techniques based on natural forms
  - Non-structural techniques
- Streambank Stabilization
  - Soft engineering approach to prevent future erosion
  - Use of natural materials provides stream habitat
  - Techniques include natural fiber matting, brush mattresses, live stakes, and natural fiber rolls
- Stream Buffer/Riparian Zone Restoration

# Restoration Strategies: *Improve Habitat/Reduce Streambank Erosion*

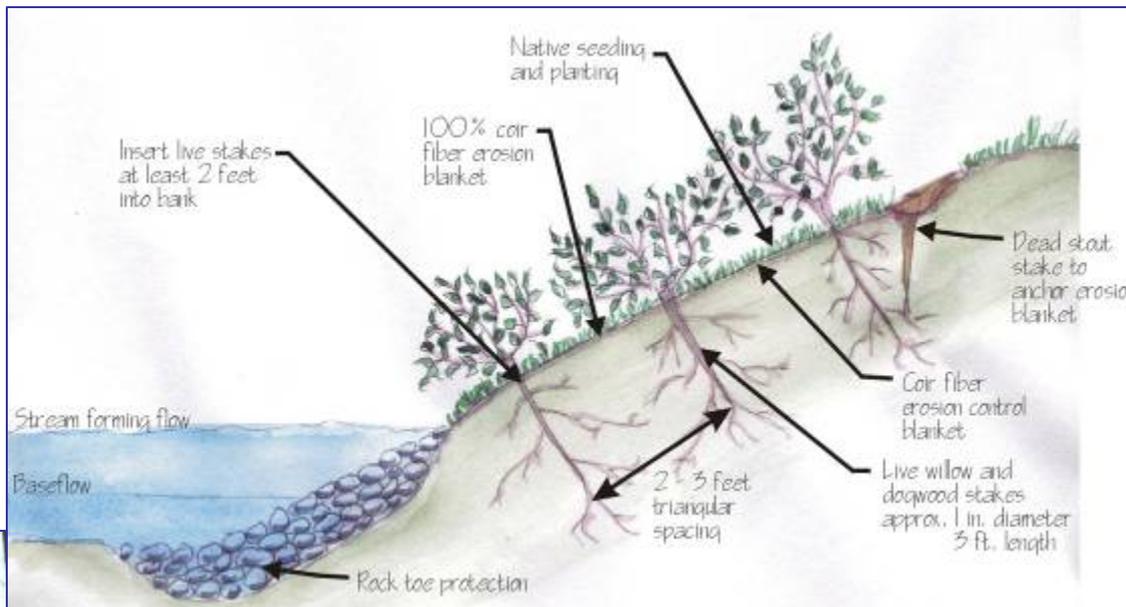
## Natural Stream Channel Design



Reston Association  
Snakeden Watershed

# Restoration Strategies: *Improve Habitat/Reduce Streambank Erosion*

## Streambank Stabilization

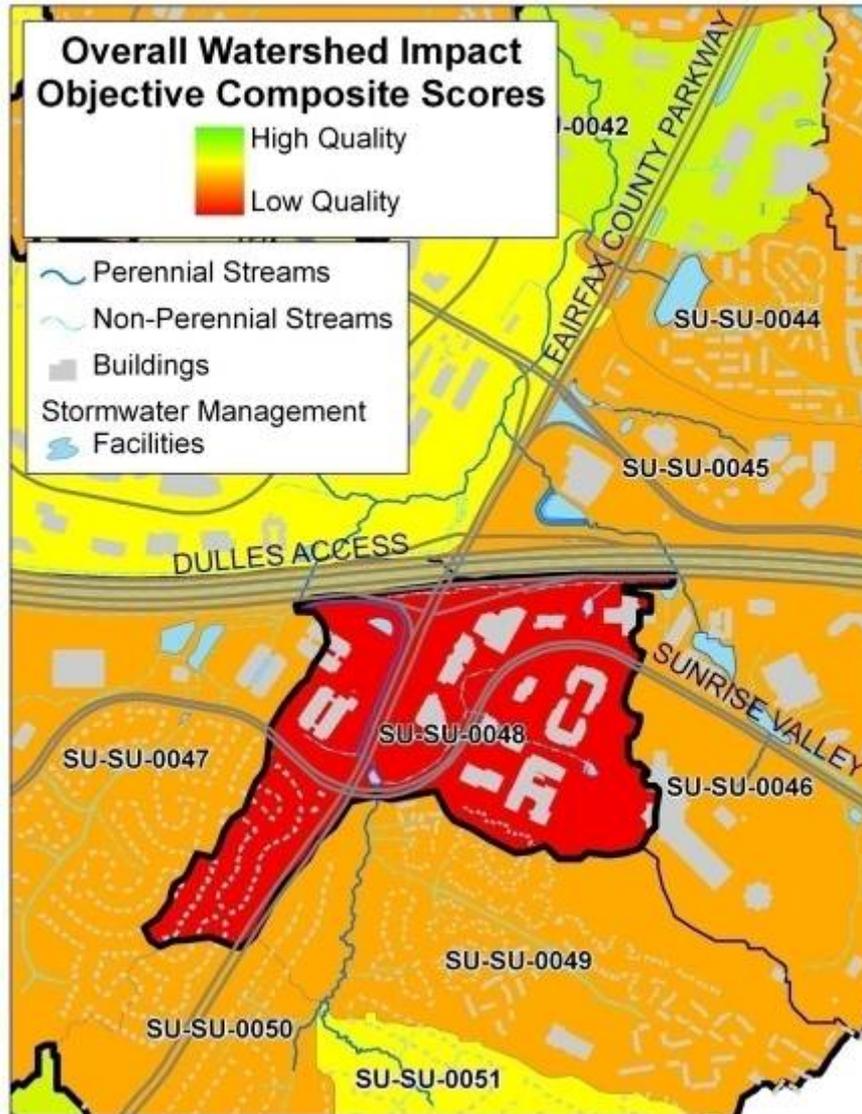


# Applying Strategies in Sugarland Run & Horsepen Creek Watersheds

## Three Examples

- SU-SU-0048
- SU-SU-0041
- HC-HC-0039 & 0040

# Applying Strategies: **SU-SU-0048**



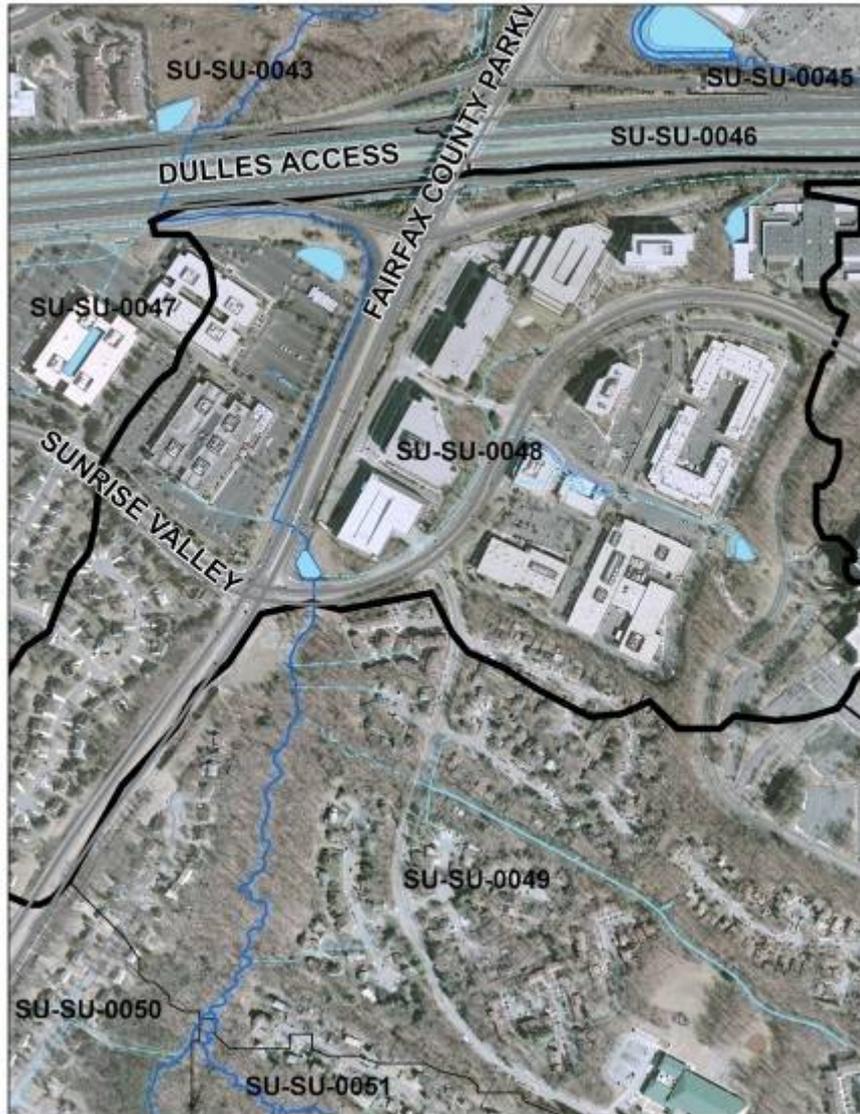
FAIRFAX COUNTY STORMWATER MANAGEMENT

## General Description:

- Commercial/Industrial development
- Main Stem of Sugarland
- Total Impervious 57.7%
- Scored lowest overall objective score



# Applying Strategies: **SU-SU-0048**



FAIRFAX COUNTY STORMWATER MANAGEMENT

## Problems:

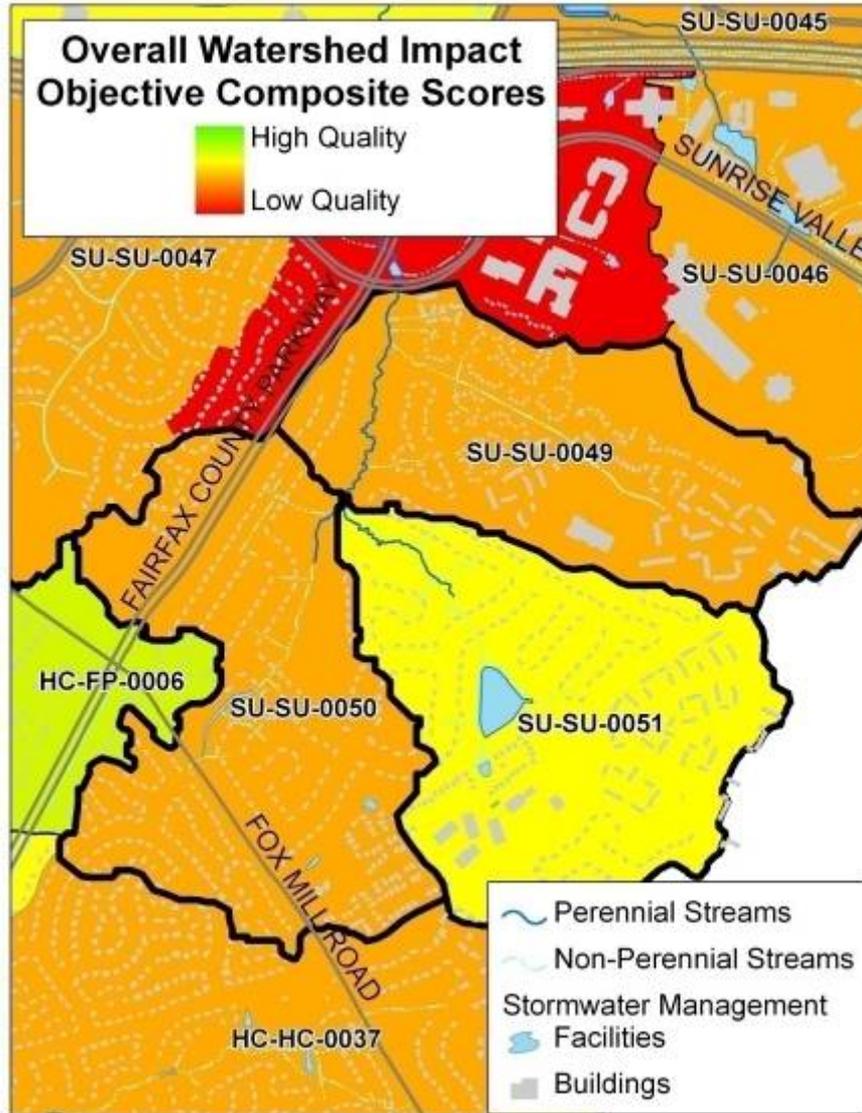
- High peak flows
- High pollutant runoff
- No forested/wetland habitat

## Strategies:

- Control flow volume
- Control peak flow
- Add quality control
- \* **Look Upstream!**



# Applying Strategies: *SU-SU-0048 - upstream*



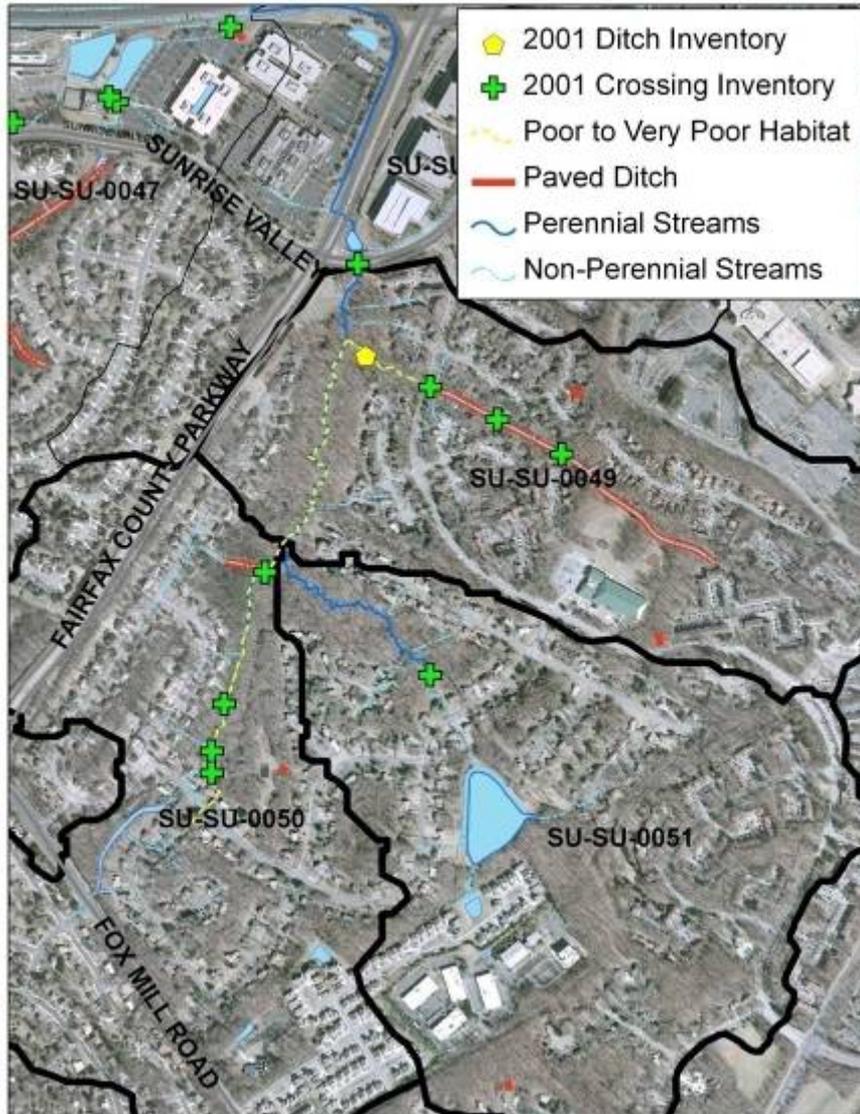
FAIRFAX COUNTY STORMWATER MANAGEMENT

## General Description:

- Residential development
- Sugarland headwaters
- SU-SU-0049 & 0050 scored lower overall than SU-SU-0051



# Applying Strategies: *SU-SU-0048 - upstream*



FAIRFAX COUNTY STORMWATER MANAGEMENT

## Problems in SU-SU-0049 & SU-SU-0050:

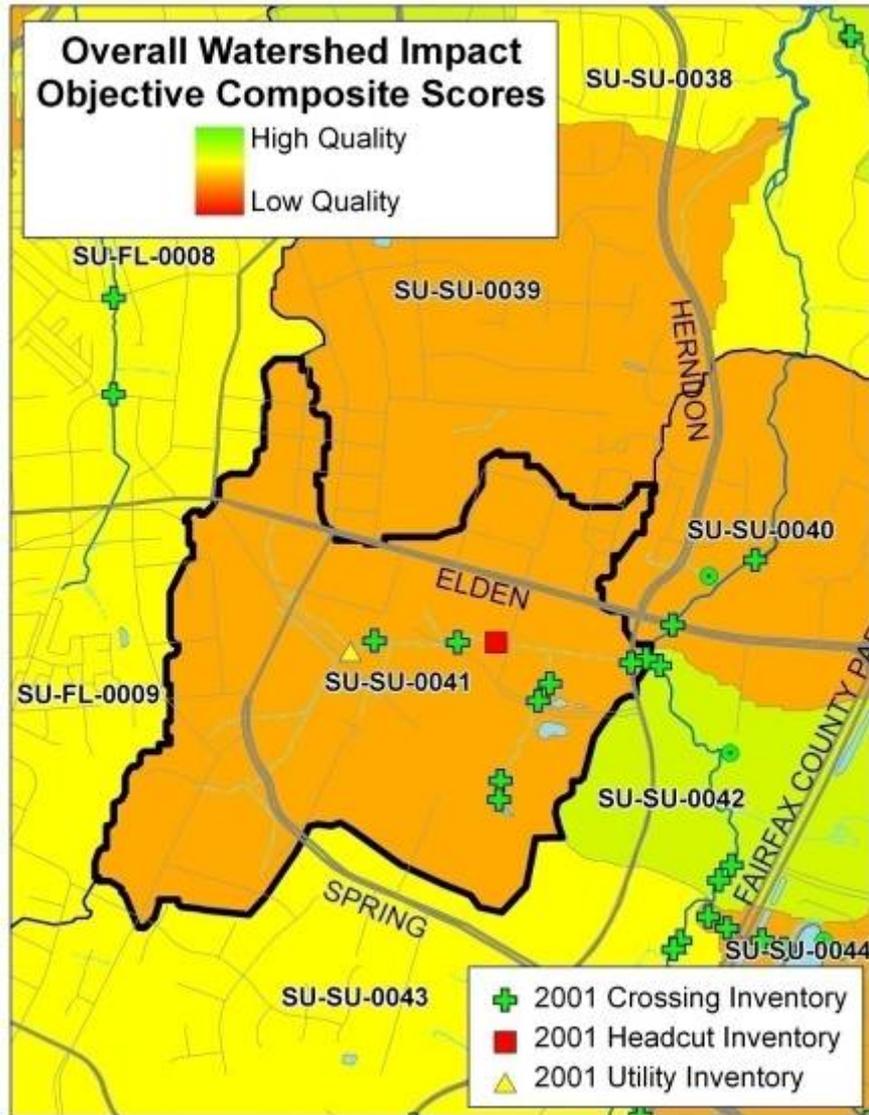
- Poor & very poor habitat in spite of stream buffers
- Crossing & ditch impacts

## Strategies:

- Control flow volume
- Control peak flow
- Add quality control
- Stream restoration:  
Natural channel design



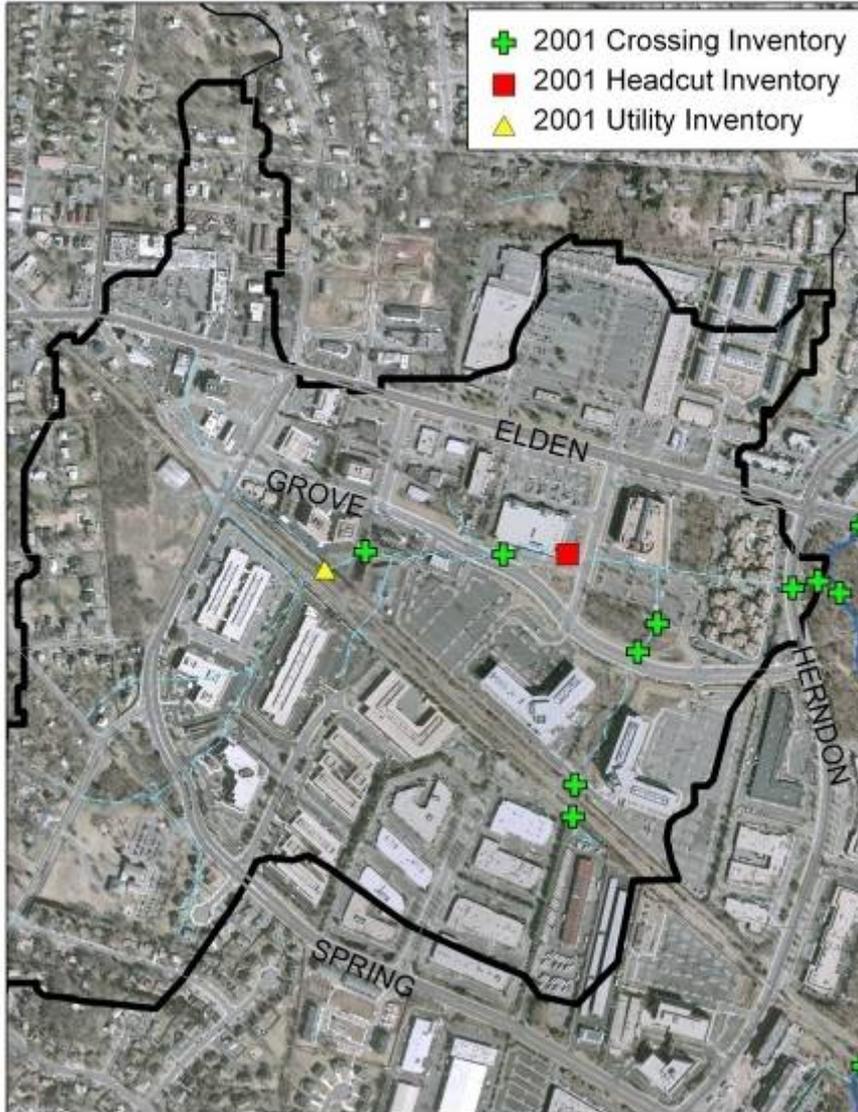
# Applying Strategies: **SU-SU-0041**



## General Description:

- Commercial/Industrial development
- Headwaters area
- Total Impervious 49.6%
- Scored moderately low for all objective scores
- Significant development in subwatershed in recent years

# Applying Strategies: **SU-SU-0041**



FAIRFAX COUNTY STORMWATER MANAGEMENT

## Problem:

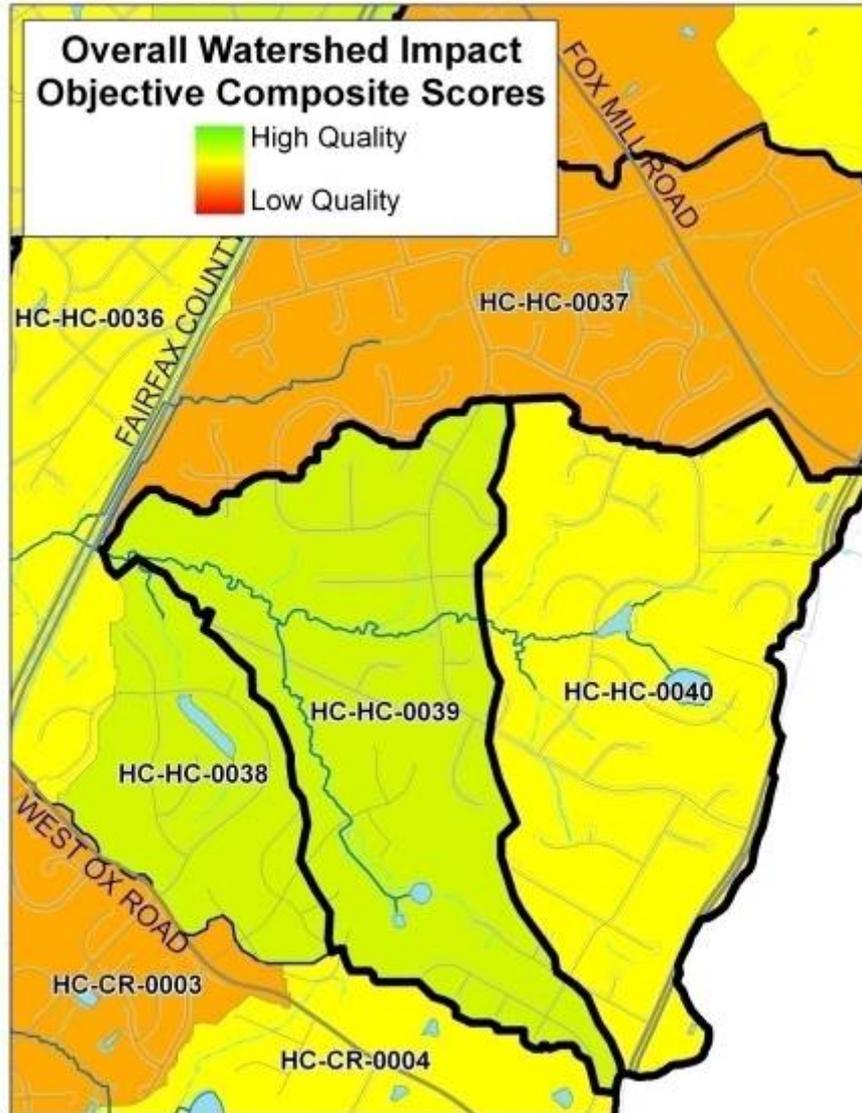
- 2001 SPA Inventory found head cuts, utility & crossing impacts
- Recent development, entire stream channel has been paved over

## Strategies:

- Control flow volume
- Control peak flow
- Add quality control



# Applying Strategies: *HC-HC-0039 & 0040*



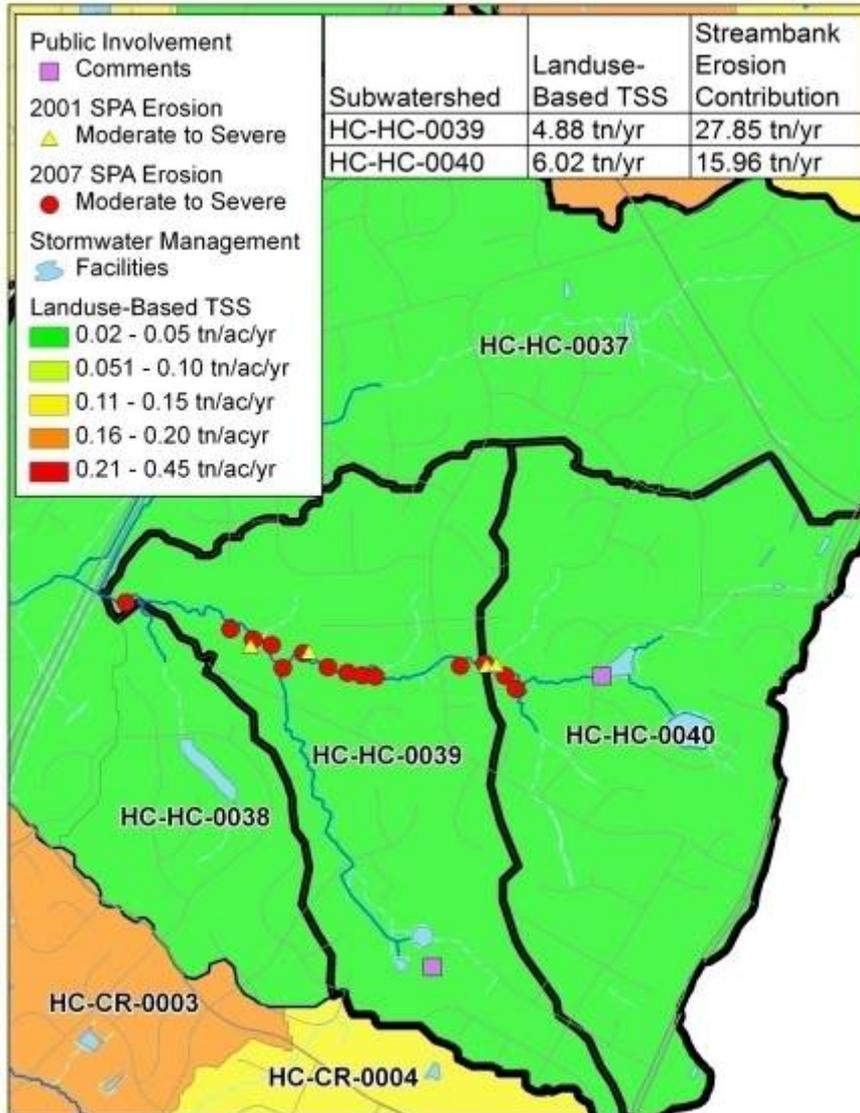
FAIRFAX COUNTY STORMWATER MANAGEMENT

## General Description:

- Residential development
- Headwaters area
- Did not score poorly in overall objective composite scores
- STEPL tool pinpoints streambank erosion problems



# Applying Strategies: *HC-HC-0039 & 0040*



FAIRFAX COUNTY STORMWATER MANAGEMENT

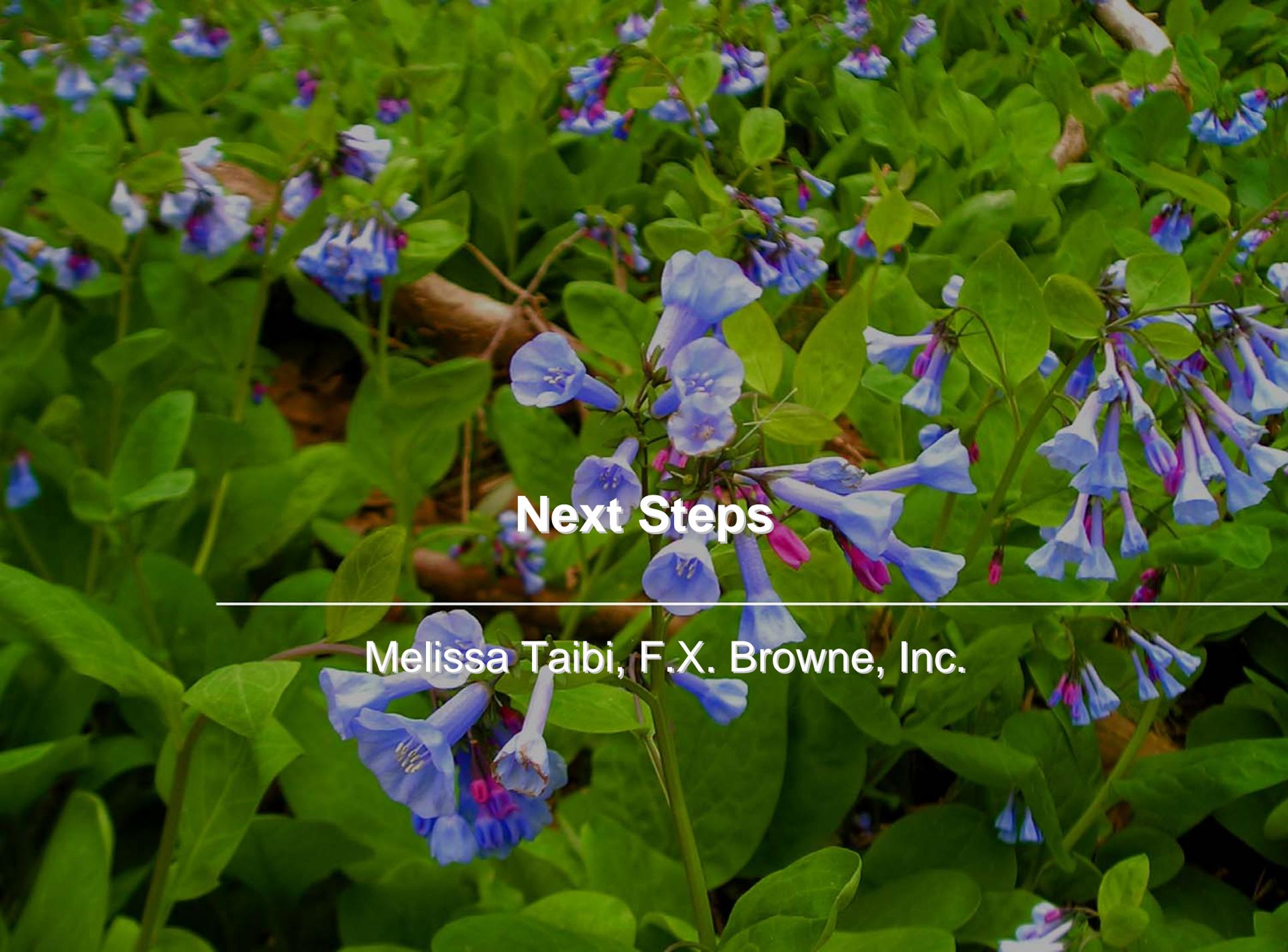
## Problem:

- Streambank erosion observed (2001 SPA and supplemental 2007 SPA)
- Ineffective stormwater facility & erosion (public involvement)

## Strategies:

- Control flow volume
- Control peak flow
- Add quality control



A close-up photograph of a dense field of blue and purple flowers, likely Salpiglossis, with vibrant green foliage. The flowers are bell-shaped and hang from thin stems. The background is filled with more of the same plants, creating a lush, textured appearance.

## Next Steps

---

Melissa Taibi, F.X. Browne, Inc.

# Next Steps

- Finalize subwatershed ranking to include future build-out condition
- Identify specific projects based on subwatershed ranking, field reconnaissance and public input
- Provide WAG members with “homework” regarding possible project sites for feedback prior to third meeting
- Next meeting in mid-April to discuss the proposed solutions

A close-up photograph of a dense field of blue and purple flowers, likely Salpiglossis, with vibrant green foliage. The flowers are bell-shaped and hang from thin stems. The background is filled with more of the same plants, creating a lush, textured appearance. The lighting is bright, highlighting the colors of the flowers and leaves.

**Thank You**

---