Watershed and Stormwater Management in Fairfax County

Challenges and Opportunities

Department of Public Works and Environmental Services

Working for You!

A Fairfax County, VA, publication

June 26, 2021

Presentation Outline

Duration: 20-30 minutes

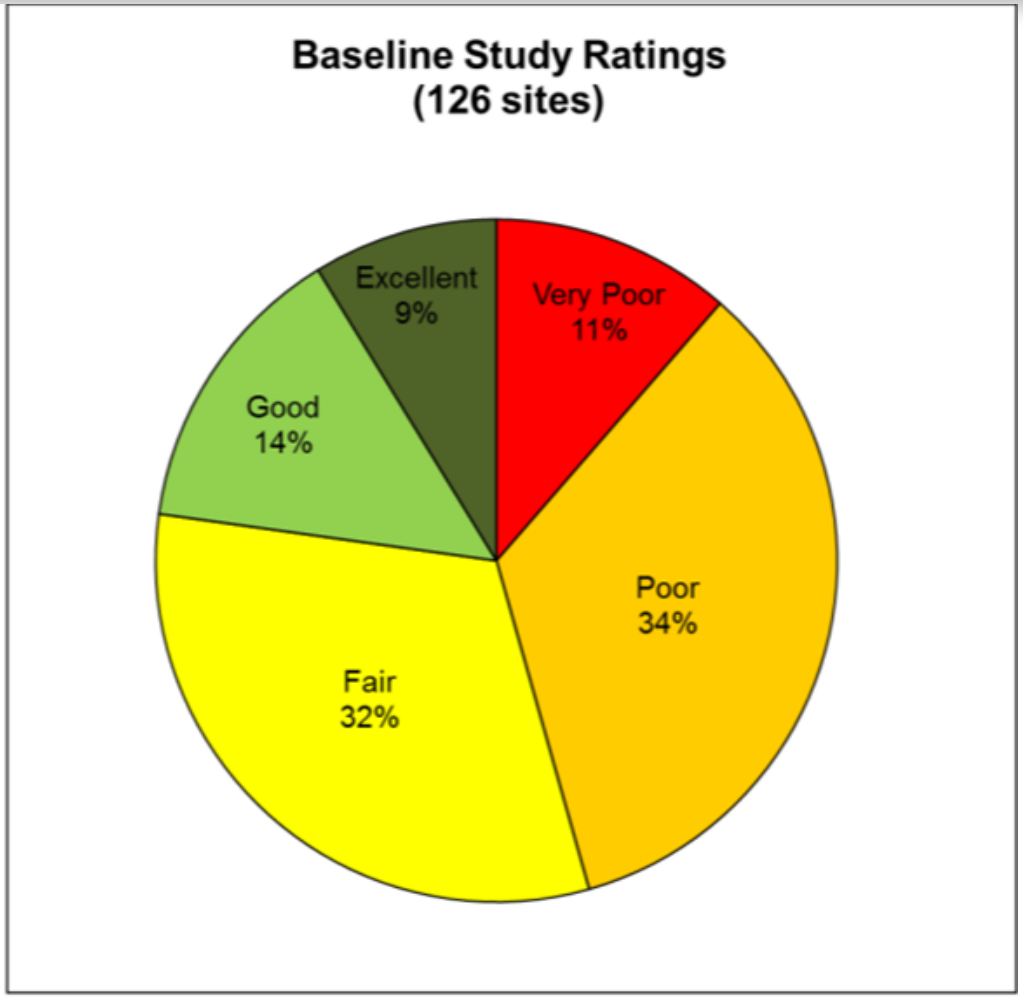
Shannon:

- Countywide Watershed Conditions & Stream Health
- Causes, Impacts
- Opportunities for Improvements

Catie:

- Stormwater Management (SWM) Solutions
- Case Study: Public Safety Headquarters
- Ongoing SWM Challenges and Opportunities

Watershed Conditions – 2001 SPS Baseline Study



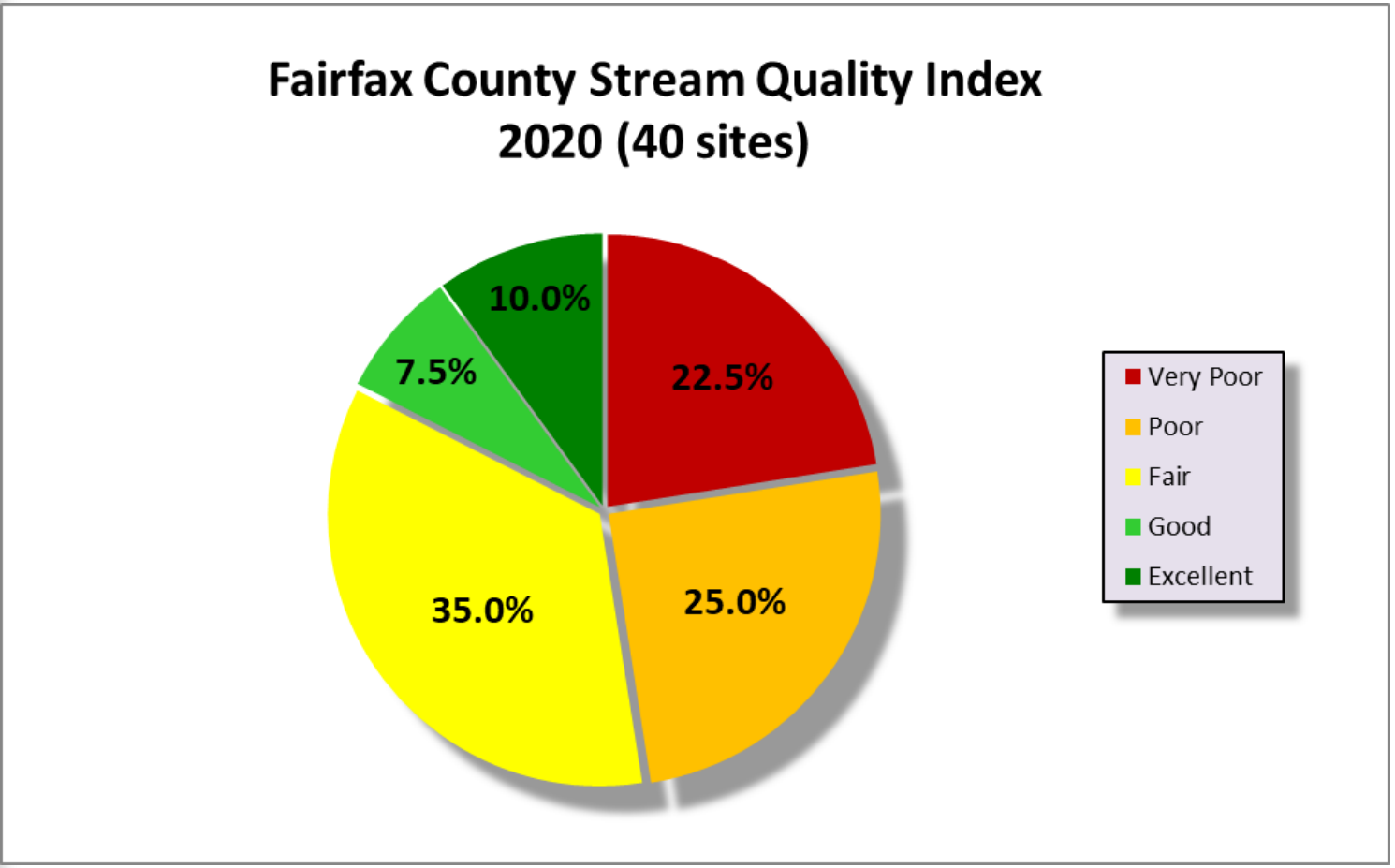
Countywide stream health conditions

(using Fairfax Index of Biological Integrity, IBI)

- **>75% of county streams classified as "fair", "poor", or "very poor" quality**
- Likely to be considered "**impaired**" by Clean Water Act standards and require remediation
- Primary driver for poor conditions: human **land use impacts**

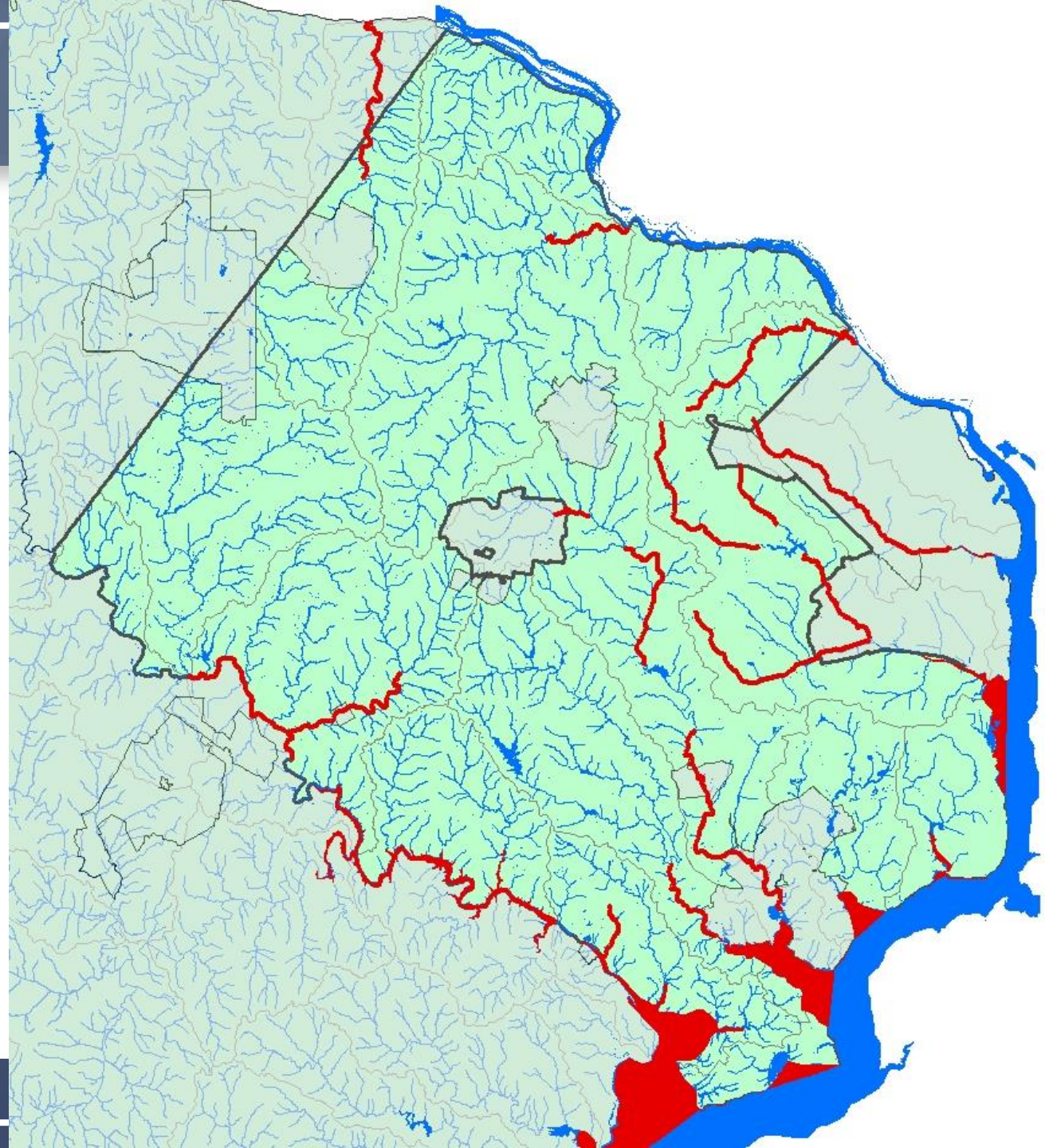
Report: https://www.fairfaxcounty.gov/publicworks/stormwater/stream-protection-strategy-baseline-study

Watershed Conditions - 2020



Countywide stream health conditions (using Fairfax IBI)

- Conditions have changed very little over 2 decades
- >75% streams are still considered “impaired”
- Continued land development



2004 VA DEQ Impaired Waters

Impaired Segments:

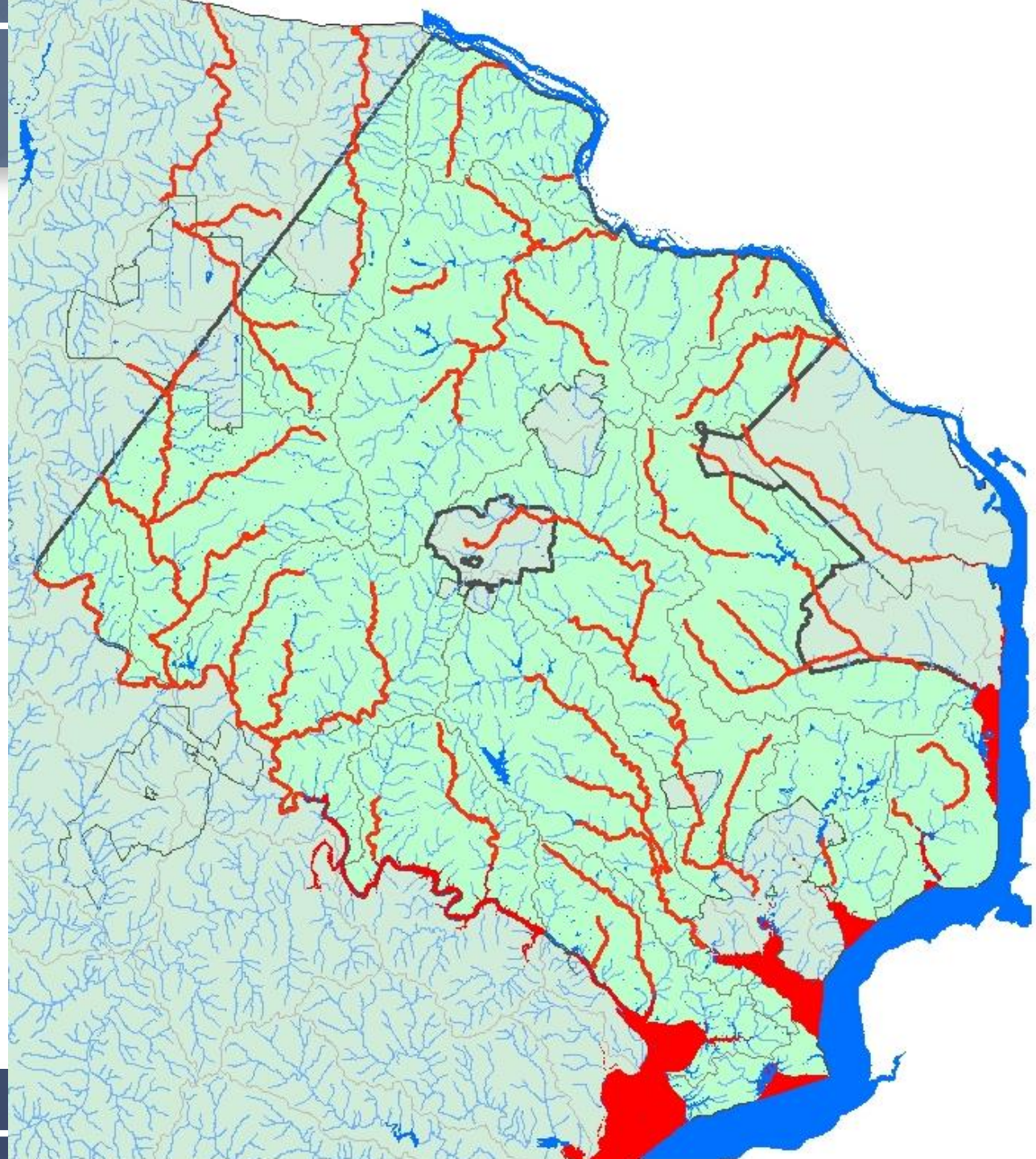
16 Streams

1 Reservoir

9 Estuarine

26 Total

**Regulatory Requirements (TMDLs) to restore these steams to health



2020 VA DEQ Impaired Waters

Impaired Segments:

77 Streams

3 Reservoir

29 Estuarine

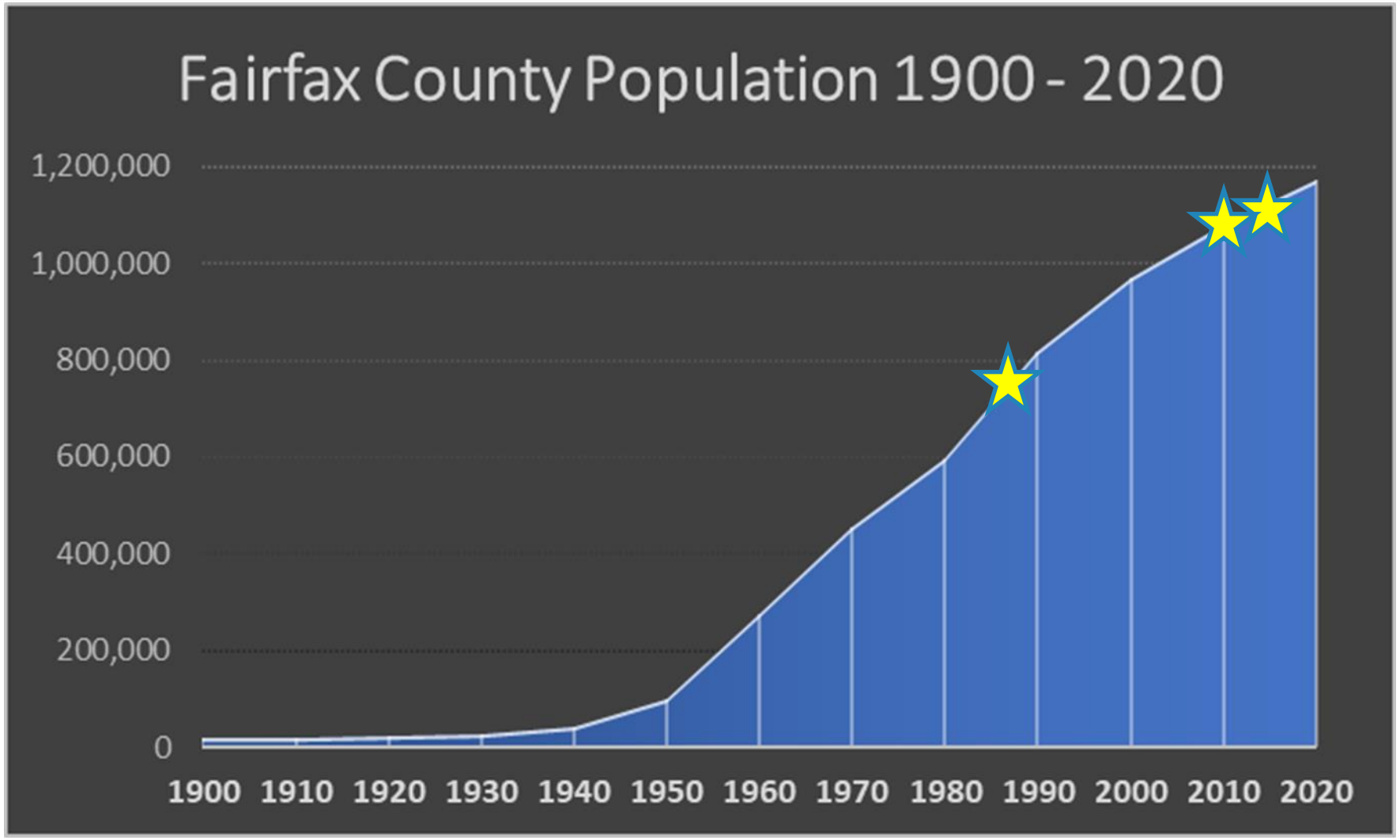
109 Total

**Regulatory Requirements (TMDLs) to restore these steams to health

Why? (how did we get here)

- Human land use impacts for <u>centuries</u>:
  - Deforestation
  - Agriculture (tobacco, dairy)
  - Mill dams in most stream valleys
  - Rapid Urbanization, post-WWII
  - **Fill in floodplains**
  - Burying/piping streams
  - Intense Residential Infill
  - Commercial Redevelopment
  - Transportation infrastructure

Fairfax County Watersheds

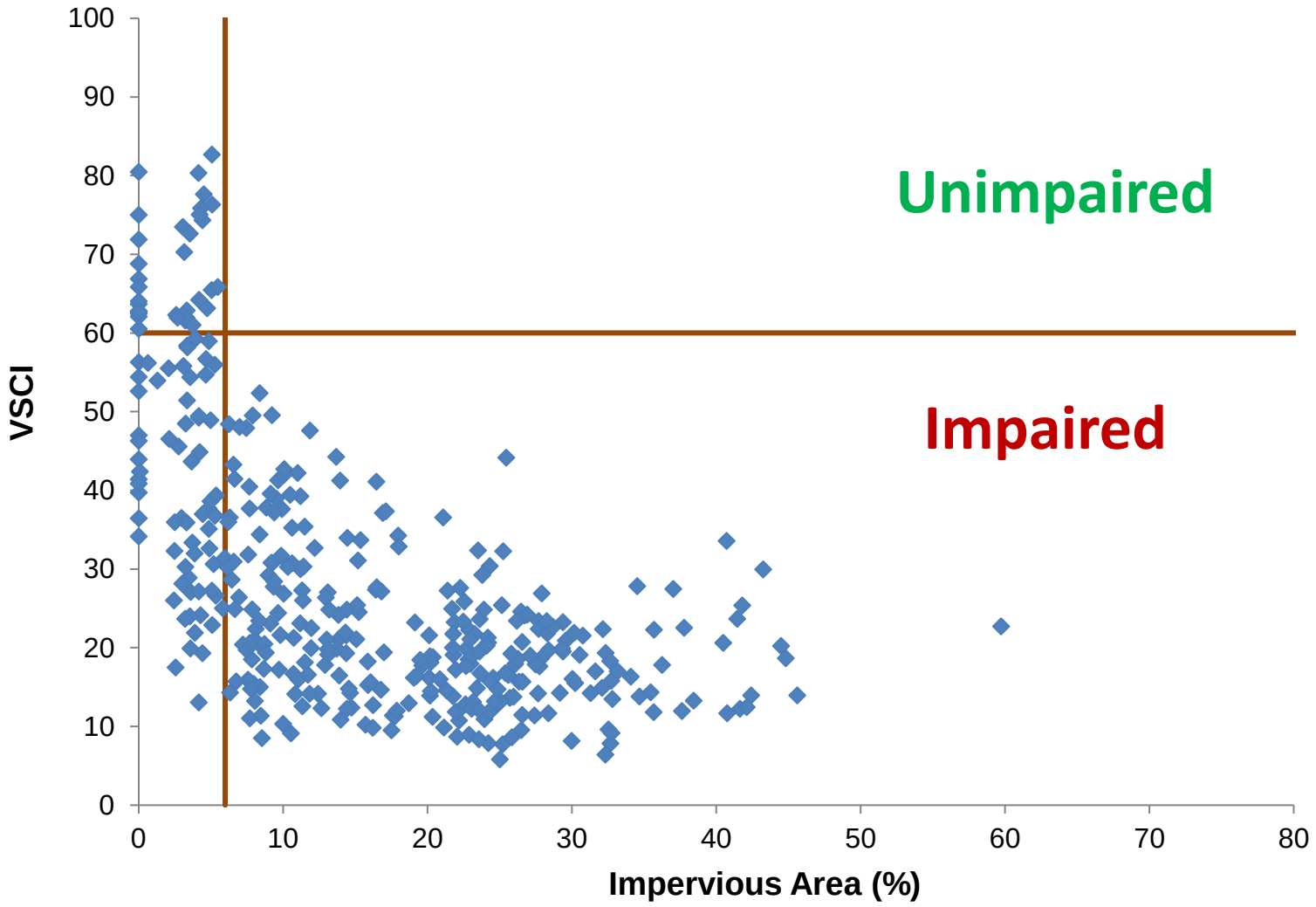


- **No** water quantity and quality requirements until 1980's & 90's
- Watershed Improvement Program initiated in 2010 (stormwater fund)
- Modernized Stormwater Ordinance 2014

Fairfax County Watersheds

- Results:
  - High levels of impervious surfaces
  - More runoff volume, more flooding
  - Altered hydrology
  - More pollutants in runoff
  - Severe erosion and sedimentation
  - Incised channels and disconnected floodplains
  - Poor physical, chemical and biological conditions in streams
  - Imposed regulatory requirements on impaired streams (TMDLs). More $$$

VA Stream Condition Index (VSCI) and % Impervious Area



- In Fairfax County, **no** streams with > 6% impervious area in their watersheds pass the state's VSCI - and can be considered impaired
- Very few watersheds in Fairfax County with < 6% Imperviousness

Fairfax Watersheds

What are we doing? What challenges?

- Stormwater infrastructure retrofits and stream restoration projects in receiving systems
  - We own/have access rights
  - mostly address *symptoms* -> not the *causes*
  - Funded by taxpayers ($100M since 2009)
- Upland improvements address source problems - but we don't have much control here
  - Most upland areas privately owned
- We need both downstream improvements (streams) AND more/better **upland source controls**
- Development must share the burden to achieve success in protection/restoration
  - Opportunities during development/redevelopment
  - Stay out of floodplains!

Fairfax Watersheds

- No way County can remediate this problem alone. Requires:
  - Evolving science
  - Improved regulations (Federal, State, Local)
  - (Re)Development controls must go above legal minimum, whenever possible
  - Development community apprehensive to try “new” things – we have to push

Before

2018
Two years after Construction

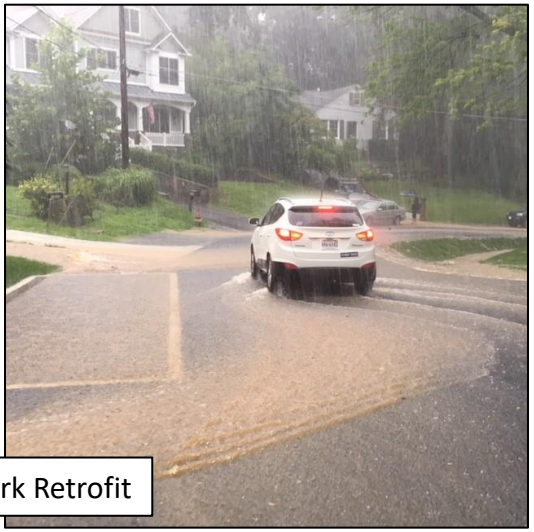
Stormwater Management Solutions

Takeaways

- Impervious cover reduction is key
- Green stormwater infrastructure (GSI) only addresses small storms
- Detention is required to adequately mitigate stream erosion and flooding


Mantua ES Retrofit


Franklin Park Retrofit



Stormwater Management (SWM) Definition

- **Slow it down and Soak it in**
  - Tree preservation
  - Natural landscaping
  - Green stormwater infrastructure (GSI) and stormwater reuse
- **If it must go, hold the overflow**
  - Detention and slow release of larger storms

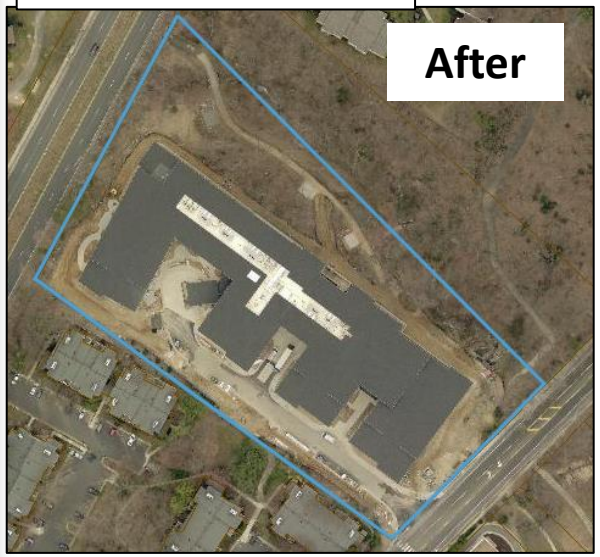

Oakton Library


Luther Jackson MS


Oakton Library

Slow it Down and Soak it In: Tree Preservation

Colts Neck Senior Housing



- **Preserve** existing good quality forests and place in easement
- **Enhance** existing tree canopy through non-native invasive management and additional native plantings
- Stay out of floodplains and Resource Protection Areas (RPAs)

SWM Target

✓ Higher tree canopy standard (County Code Chapter 122)

Reserve at Brookview Estates

Slow it Down and Soak it In: Natural Landscaping

- Preserve and recreate land and water features and native plant communities
- Restore soil to a hydrologically functioning state
- Multiple benefits

SWM Target

✓ Natural landscaping policy

Slow it Down and Soak it In: Green Stormwater Infrastructure (GSI)

Green Stormwater Infrastructure (GSI)

- Suitable for managing small more frequent storm events (1” inch storm)
- Designed to meet state water quality standards

Franklin Park Retrofit

SWM Target:

Using runoff reduction GSI:

- ✓ Meet water quality requirements on site
- ✓ % reduction in phosphorus below pre-development load
- ✓ Capture the 1” storm event on site through GSI

Broyhill McLean Retrofit

When it Must Go, Hold the Overflow: Detention


Pimmit Run Stream

- Larger storm events (2-year and 10-year storms) may exceed GSI capacity
- Detain runoff from larger storm events and slowly release at a non-erosive rate

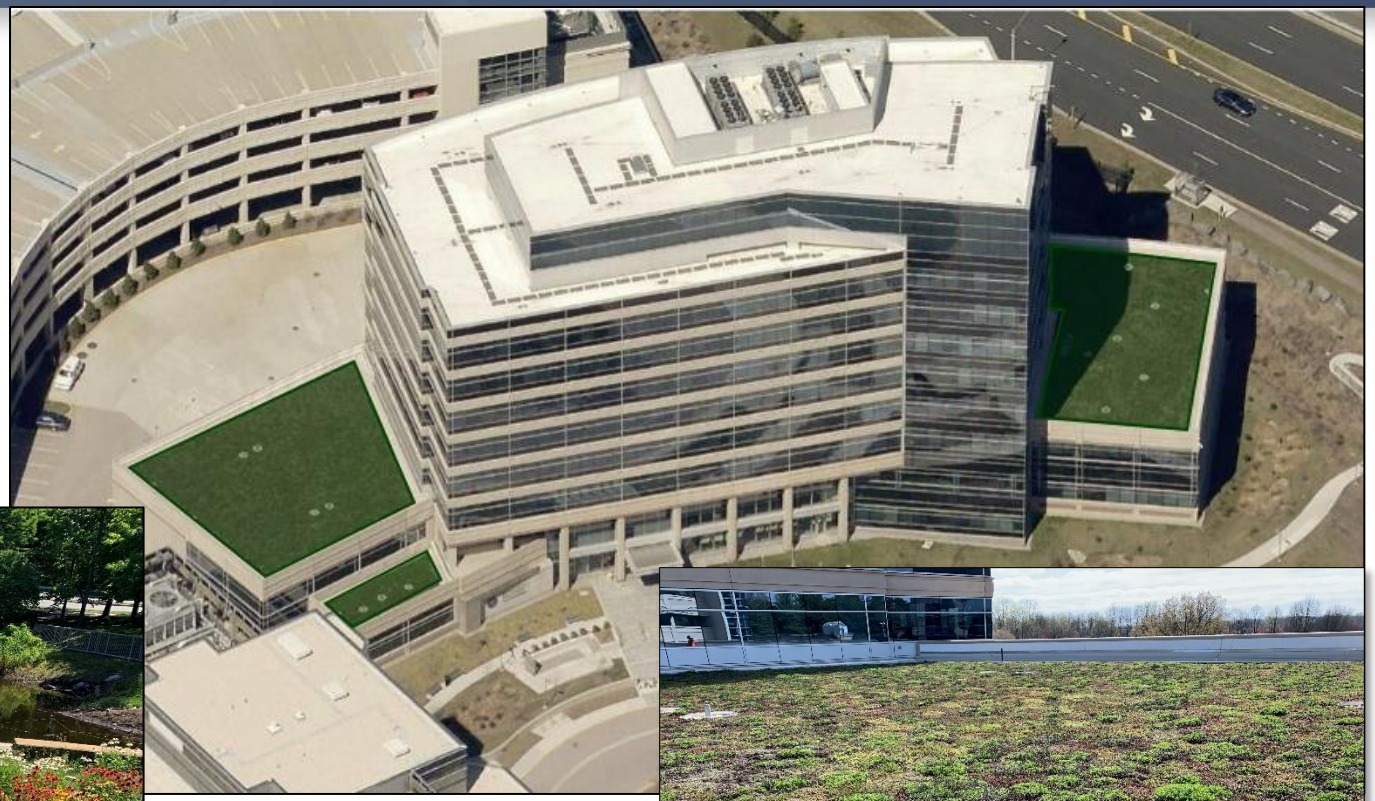

Sully Community Center

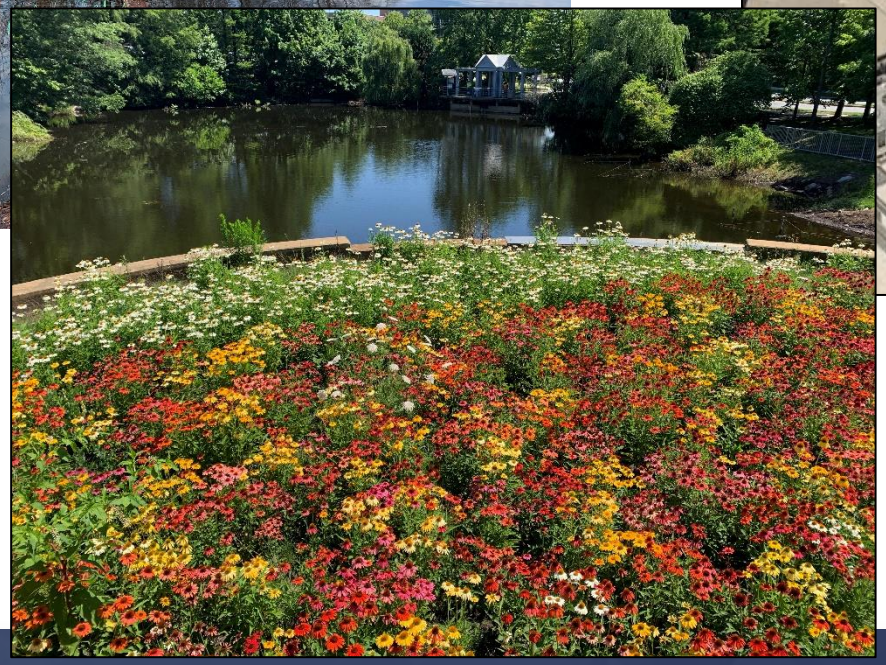
SWM Target:

- ✓ Reduce peak flow rate by % below pre-development condition
- ✓ Release at good forested condition rate

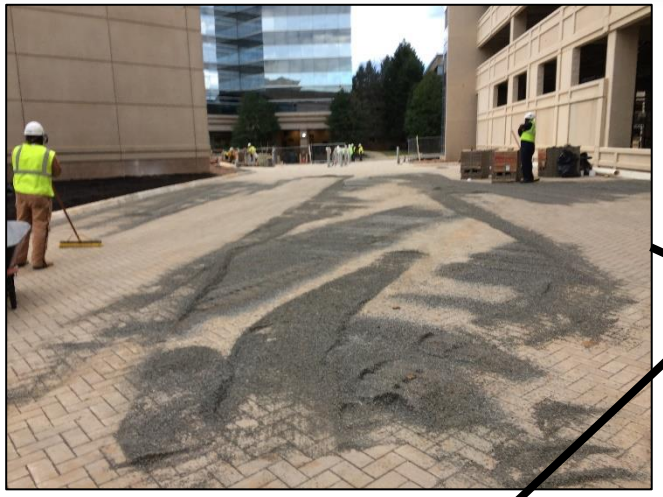
Case Study: Public Safety Headquarters

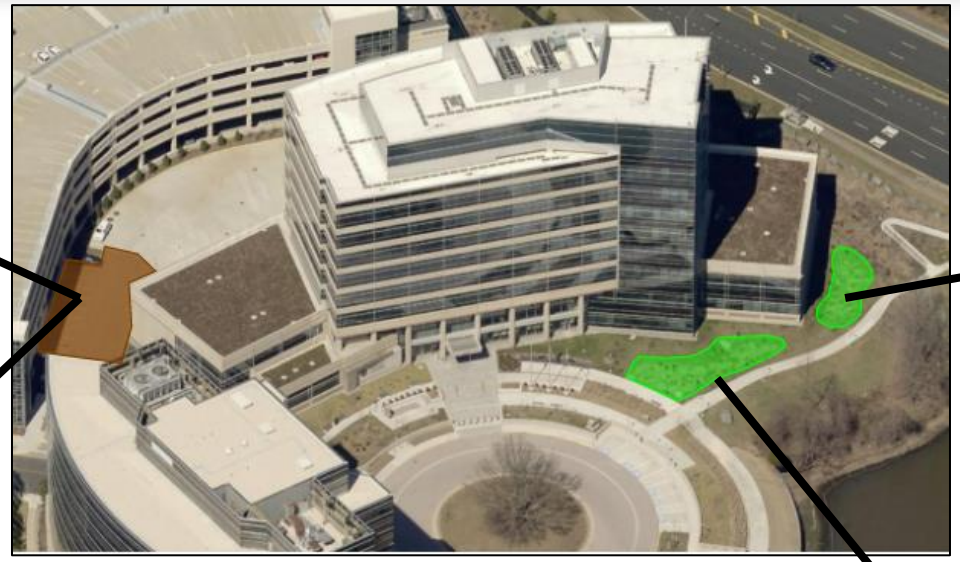
PSHQ: Green Roofs and Natural Landscaping

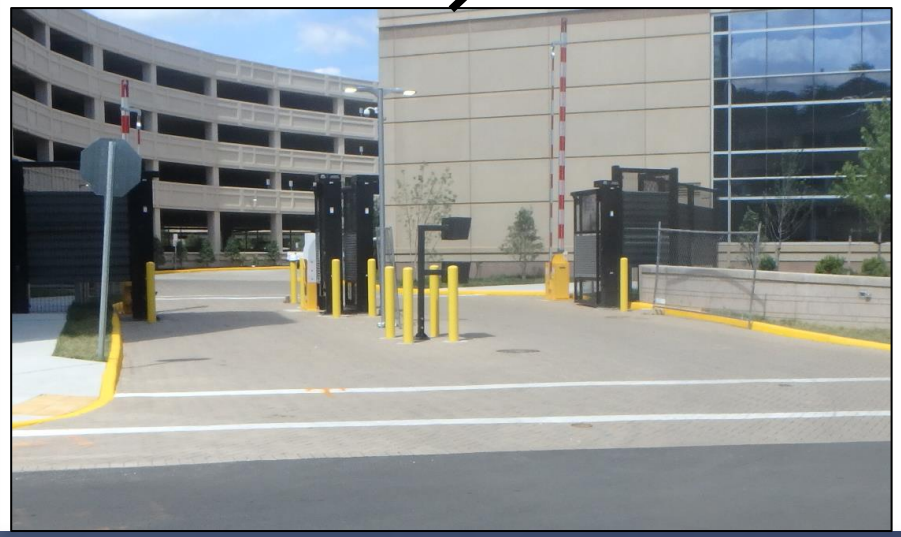




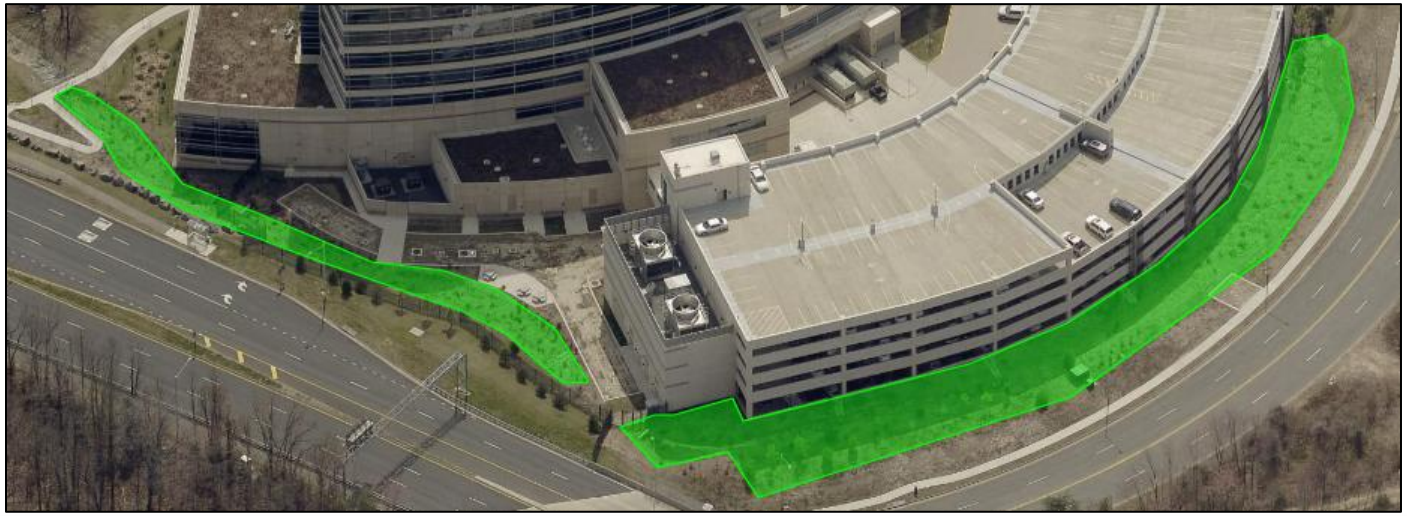
PSHQ: Permeable Pavers and Bioretention



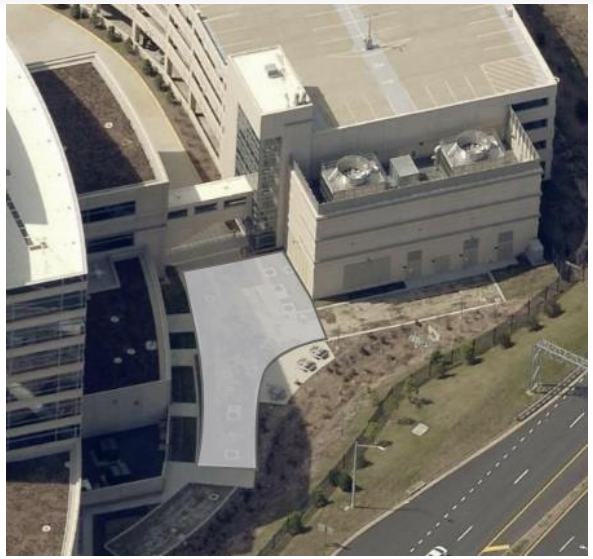




PSHQ: Vegetated Swale



PSHQ: Cistern and Wet Pond



Challenges & Opportunities

- Increased pressure to develop in environmentally sensitive areas
  - RPA encroachments
  - Fill in the Floodplain
- GSI
  - Cost
  - Designed to support multiple functions
- Climate Adaptation and Resilience

Alt.	Description		Capital Cost ($M)	O&M Cost ($M/yr)	NPV 30 years ($M)	% Over Low
1	All Gray (9.5 mg storage)		$ 185	$ 0.28	$ 211	**+2%**
2	All Green (365 ac of GI) • 27.4 ac Project 1 • 266.6 new ac • 71 ac DC Stormwater Regs 365 ac total		$ 206	$ 4.3	$ 401	**+94%**
3	Hybrid (9.5 mg) • 92 ac of GI (27 ac Project 1 + 65 new ac, including downspout disconnect • Gray storage • BMPs per DC Stormwater Regs Total	3.0 mg 4.2 mg 2.3 mg 9.5 mg	$ 133	$ 1.5	$ 207	**0%**

https://www.dcwater.com/sites/default/files/project/documents/gi-webinar.pdf

Summary

- More than 75% of county streams are classed as “fair,” “poor,” or “very poor” quality
- We need both downstream improvements (streams) AND more/better upland source controls
- Watershed health is a shared responsibility between public and private entities
- Stormwater Management Solutions
  - Impervious reduction and preservation of natural vegetation is key to stream health
  - For the small storms, slow it down and soak it in
  - To prevent stream erosion and flooding, hold the overflow through detention
- Do not allow development in the floodplains (and RPAs)

Additional Information

For additional information, please contact

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www.fairfaxcounty.gov/publicworks