Sullivan Branch Stream Restoration

Urbanization of Chesapeake Bay watershed has resulted in

- Increase in impervious surface
- Excess erosion
- Sediment plumes
- Stream degradation
- Disconnected floodplains

Increased development changes the hydrology ; natural channels essentially unravel…

Problems

- Bed erosion
- Bank erosion
- Tree loss
- Channel incision
- Disconnected floodplains
- Water Quality degradation
- Sediment loads
- Undermining of outfall structures

Low impact development (LID) strategies offer hope for the future

- Stormwater management strategy
  - Includes land planning and engineering design to mimic predevelopment hydrology
- Goal of LID
  - Infiltrate, store, filter and evaporate runoff
  - Manage stormwater at the surface
  - Protect streams and natural resources
- LID strategies
  - Bioswales
  - Bioretention (raingardens)
  - Infiltration faciltiies
  - Functional landscapes

Low impact design can reduce impacts of future development and redevelopment

Prince Frederick County, Maryland

SULLIVAN BRANCH

A stream suffering from the effects of increased urbanization

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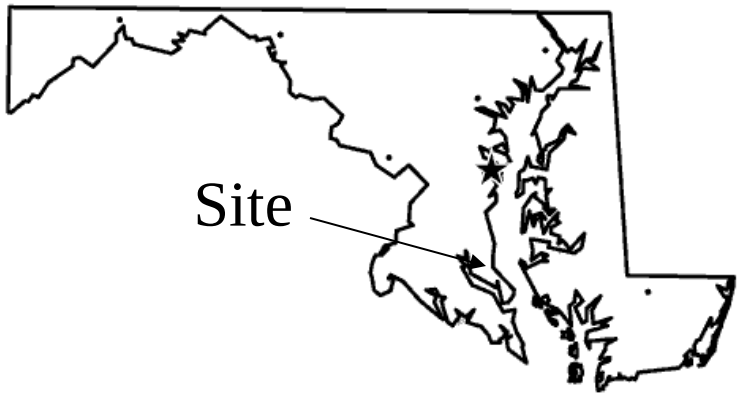
Sullivan Branch

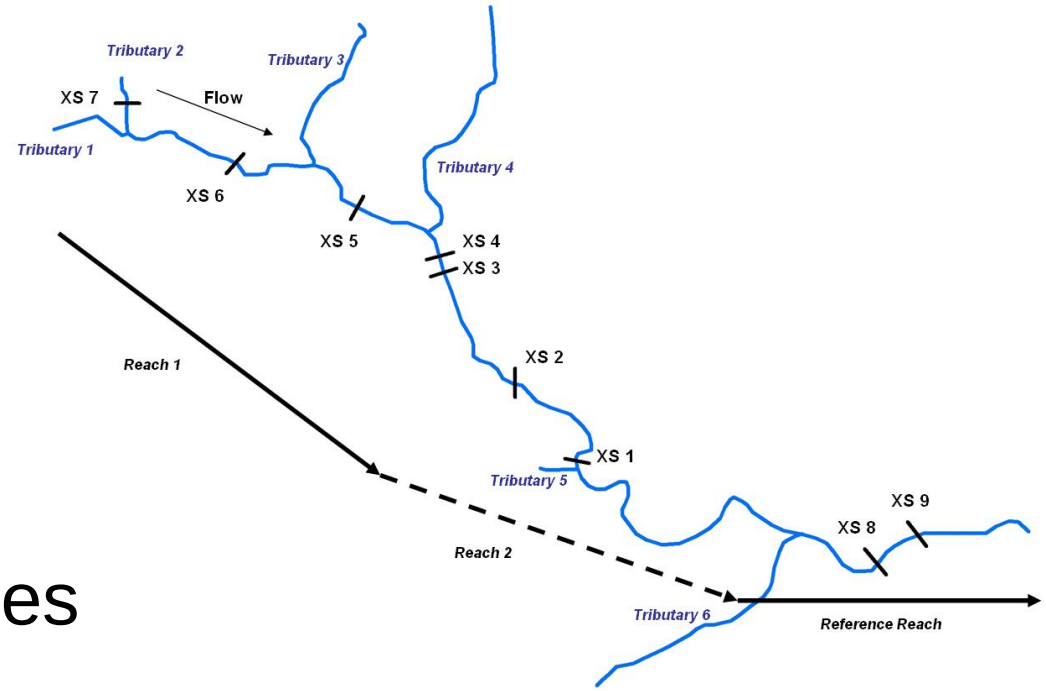
- Coastal plain
- Restoration at headwaters
- West Chesapeake area sub-basin
- 15 acre drainage area
- 62% imperviousness



Sullivan Branch Problems

- Failing/undersized outfalls
- Bank erosion
- Severe channel incision
- Sediment settling in wetland of Special State Concern
- Falling trees

Geomorphic Assessment



- Three distinct reaches

Reach 1

- Laterally and vertically unstable
- Unable to access floodplain
- Steep slope
- Severe erosion
- Intermittent flow

Reach 2

- Moderately unstable
- Decrease in bank height
- Decrease in slope
- Transitional reach

Reach 3

- Vertically and laterally stable
- Dimensions consistent with regional curve
- Access to floodplain
- Reference reach

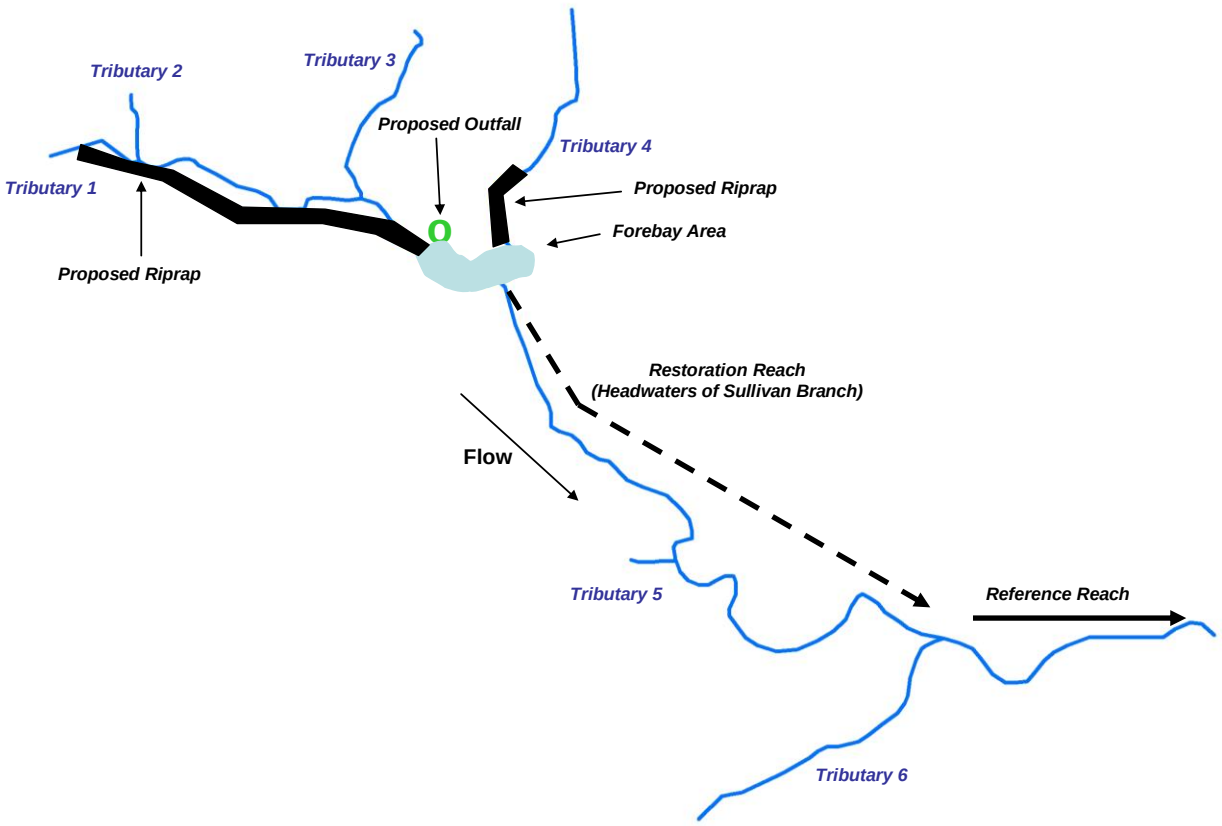
Design Goals

- Reduce sediment/ bank erosion
- Allow access to floodplain
- Increase channel stability
- Stabilize outfalls
- Reduce tree impacts

Design Options

1. Grade back existing banks
   - Significant tree impacts
2. Raise channel invert
   - Large amount of fill
   - Sandy soils compromise stability
3. Combine stormwater mgmt. with natural channel design
   -Agency approval

3rd Option


Tributary 2
Tributary 3
Proposed Outfall
Tributary 4
Tributary 1
Proposed Riprap
Forebay Area
Proposed Riprap
Restoration Reach
(Headwaters of Sullivan Branch)
Flow
Tributary 5
Reference Reach
Tributary 6

Stormwater Management Practices

- Fill and re-vegetate tributaries
- Pipe upland runoff
- Create forebay to dissipate energy and improve water quality

Natural Channel Design

- Stream flows from forebay
- Grade back banks
- Create bankfull and 2-year floodplain benches

Natural Channel Design

- Create meander geometry based on reference reach
- Keeping a majority of the restored channel within the existing channel to decrease tree impacts

Bio-Engineering

- Re-vegetate with native vegetation (including Bald Cypress)
- Coir fiber rolls along meander bends
- Woven coir mattress
- Live stake installation

Structures

- Rock cross vanes
- Step pools
- J-hook vanes

Address localized erosion

- Bank erosion at meander bends downstream of grading
- Rock cross vanes & J-hook vanes installed to convey flow away from eroding banks

Stabilize Tributary 5

- Receives drainage from SHA parking lot
- Replace failing riprap
- Create plunge pool

Project Specifics

- December 2005: Initiation of geomorphic assessment
- April 2007: Plans finalized
- January -February 2009: Stream construction
- 2009-2014: Post construction monitoring
- Construction cost: $200,000

Lessons Learned

- Agency coordination early on
- Develop design based on unique site conditions
- Integration of several approaches necessary for success
- Minimizing tree impacts important aspect in design

Questions?