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 facilities
  – Functional landscapes
Prince Frederick County, Maryland

SULLIVAN BRANCH

A stream suffering from the effects of increased urbanization
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 1
- Tributary 2
- Tributary 3
- Tributary 4
- Tributary 5
- Tributary 6

Restoration Reach (Headwaters of Sullivan Branch)

Reference Reach

Proposed Outfall

Proposed Riprap

Flow

Forebay Area

Proposed Riprap

Tributary 5

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?