Planning for Growth and Open Space Conservation

This webinar series is sponsored by:
USDA Forest Service
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Organized by
Susan Stein, Sara Comas, Susan Guynn (Clemson University)
and the
Forest Service National Open Space Conservation Group

May 14, 2014

This webinar is being recorded

Audio is Streamed Through the Computer

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School of AGRICULTURAL, FOREST, AND ENVIRONMENTAL SCIENCES

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Session #13: City and County Open Space Programs

This program presents growth and open space conservation planning for cities and counties. Speakers will present the Trust for Public Land's Conservation Almanac and LandVote resources that are available online for researching conservation activities, and public funding for land conservation. We will also learn about open space conservation planning processes, ordinances, funding mechanisms, and partnerships employed in Missoula, Montana, and Baltimore County, Maryland.

- **Mary Bruce Alford** Trust for Public Land
- **Jackie Corday** City of Missoula, Montana
- **Don Outen** Baltimore County, Maryland

Link to video presentation
Link to PDF Presentation
Link to resources from this webinar

Session #12: Greening Grey Infrastructure: Federal Highway Administration's Eco-Logical Approach and Case Studies from National Forests in Ohio and Washington

Session #11: An All Lands Approach to Ecosystem Services for Water

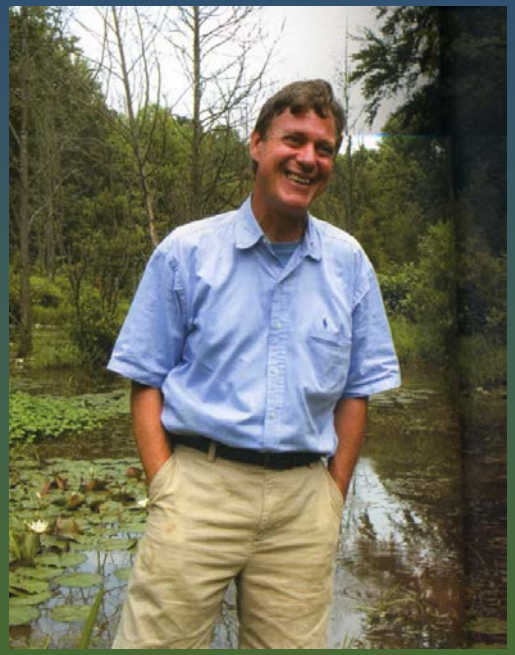
Session #10: Tools for Conservation Planning

Webinar Resources and Tools

Find relevant resources for each webinar session here!
If you have relevant resources to share please send them to us!

Session #24: Integrated Water Strategies at the Urban Fringe

Joe Berg
Biohabitats, Inc.



Keith Underwood
Underwood and Associates

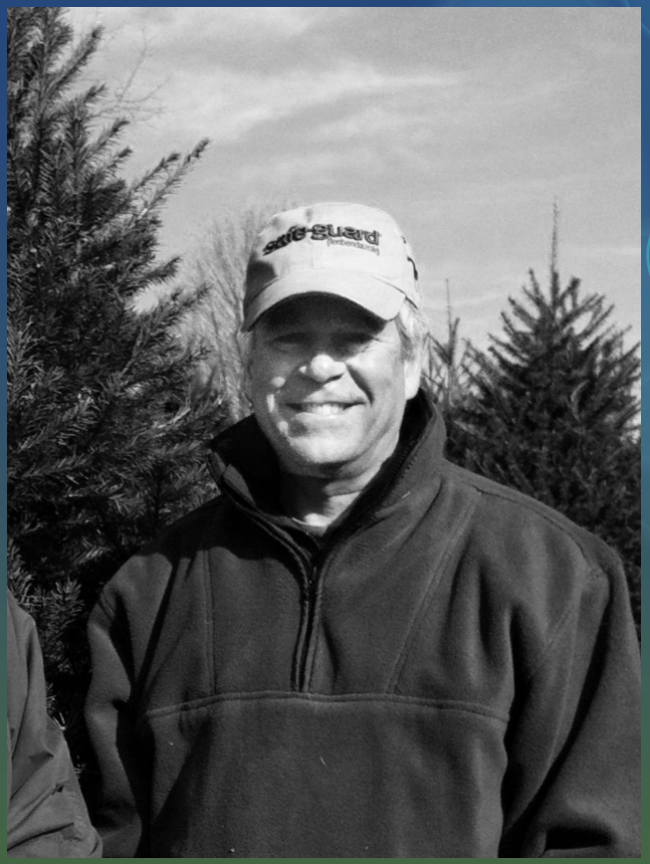
John McLaughlin
New York City Department of Environmental Protection

Logistics – Q&A

- **Continuing Education Credits**
  - Attend the **entire** presentation (including Q&A)
- **Questions for speakers – chat pod**
- **Technical difficulties – chat pod or**

  email Susan Guynn: SGUYNN@clemson.edu

Getting to Know You!



Joe Berg

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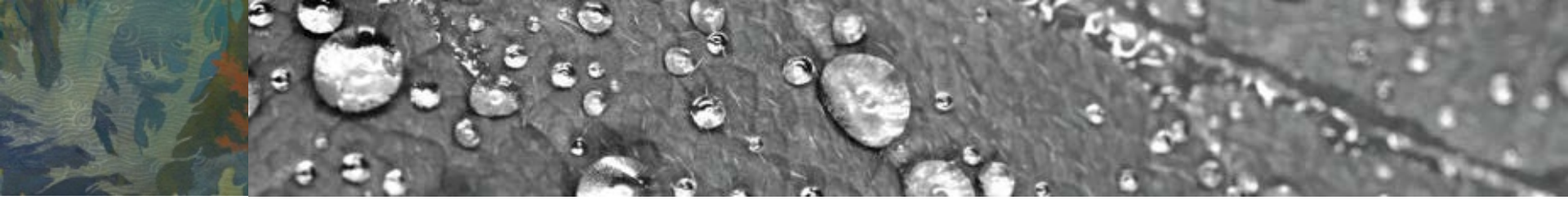

Integrated Water Strategies in the Urban Fringe

Joe Berg, Biohabitats, Inc.

jberg@biohabitats.com

Biohabitats

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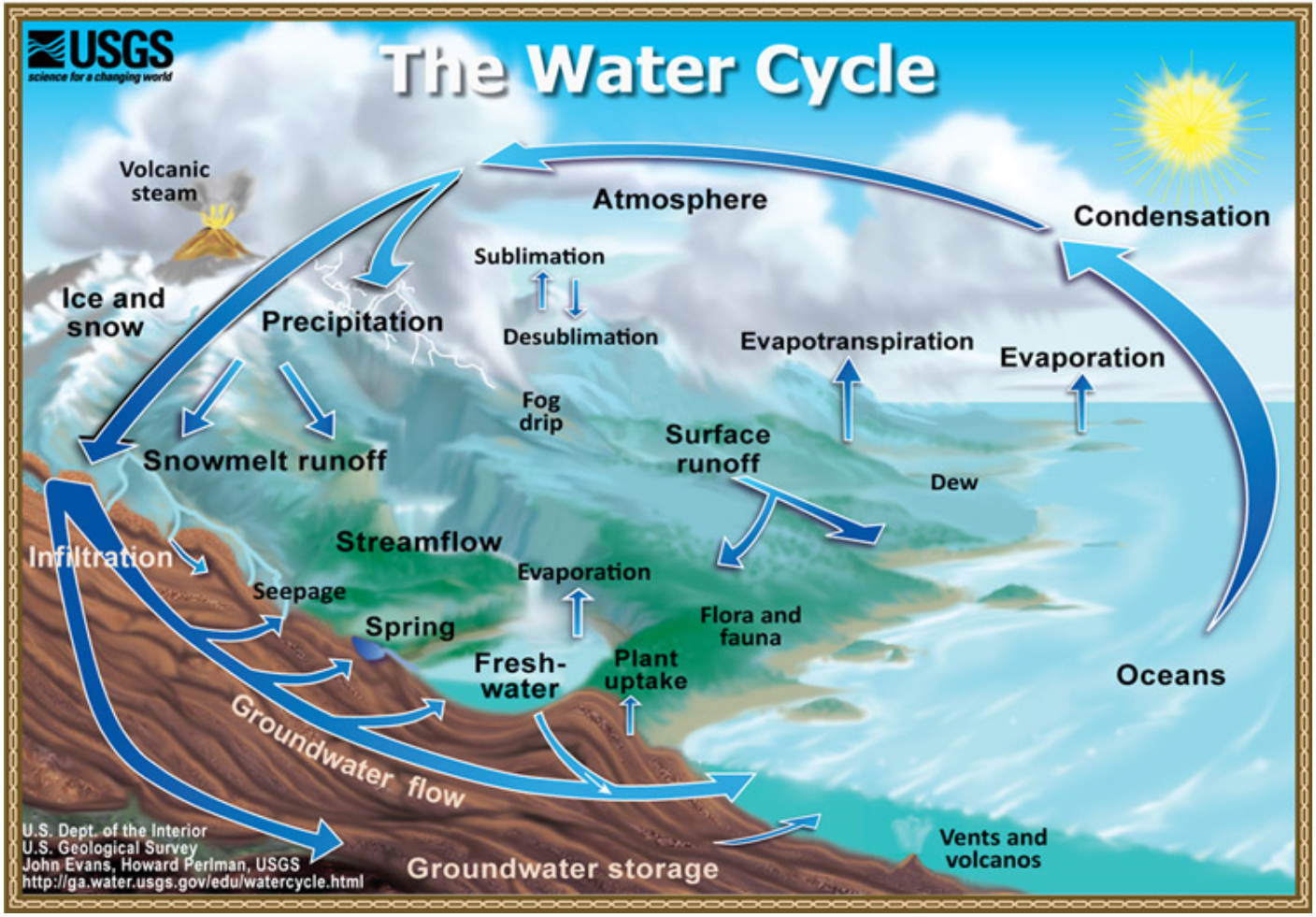
Precipitation as a Fundamental Resource



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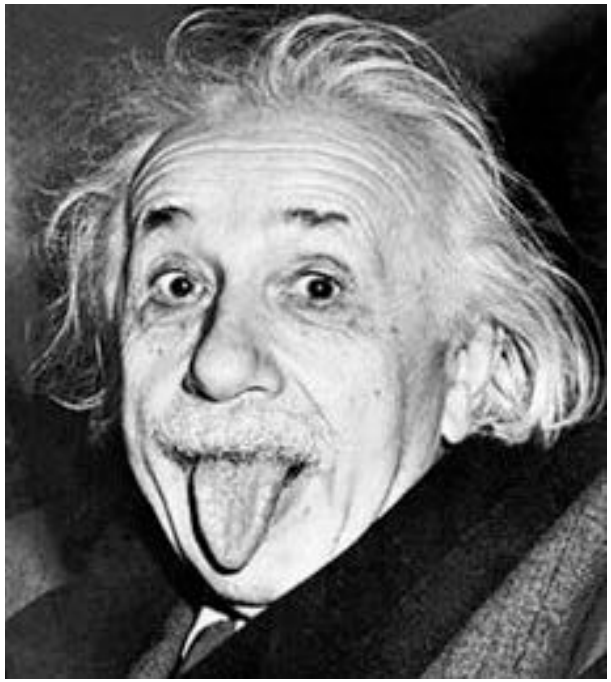
"We can't solve problems
by using the same kind of thinking
we used when we created them."



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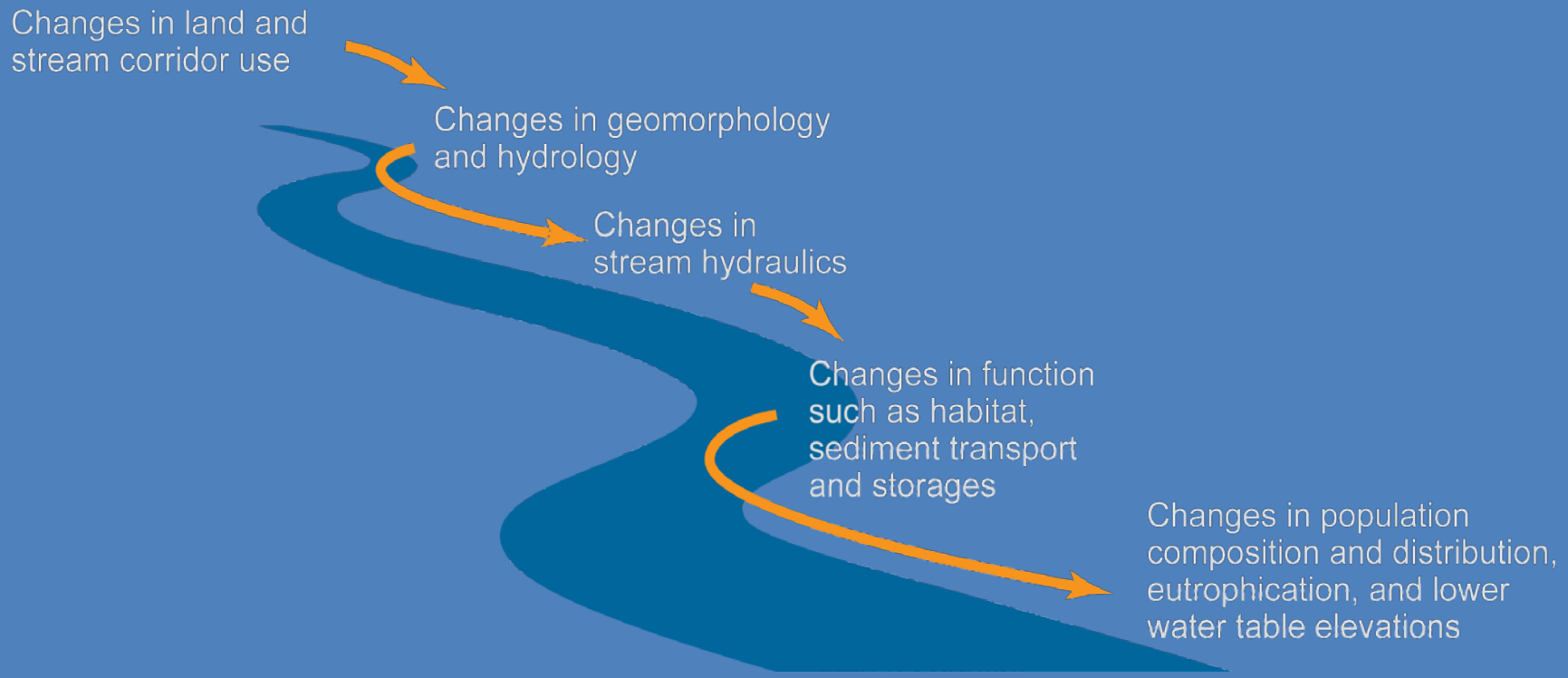
Negative Feedback

Disturbance to a stream corridor system typically results in *an increasingly negative spiral of degradation* to stream structure and function.



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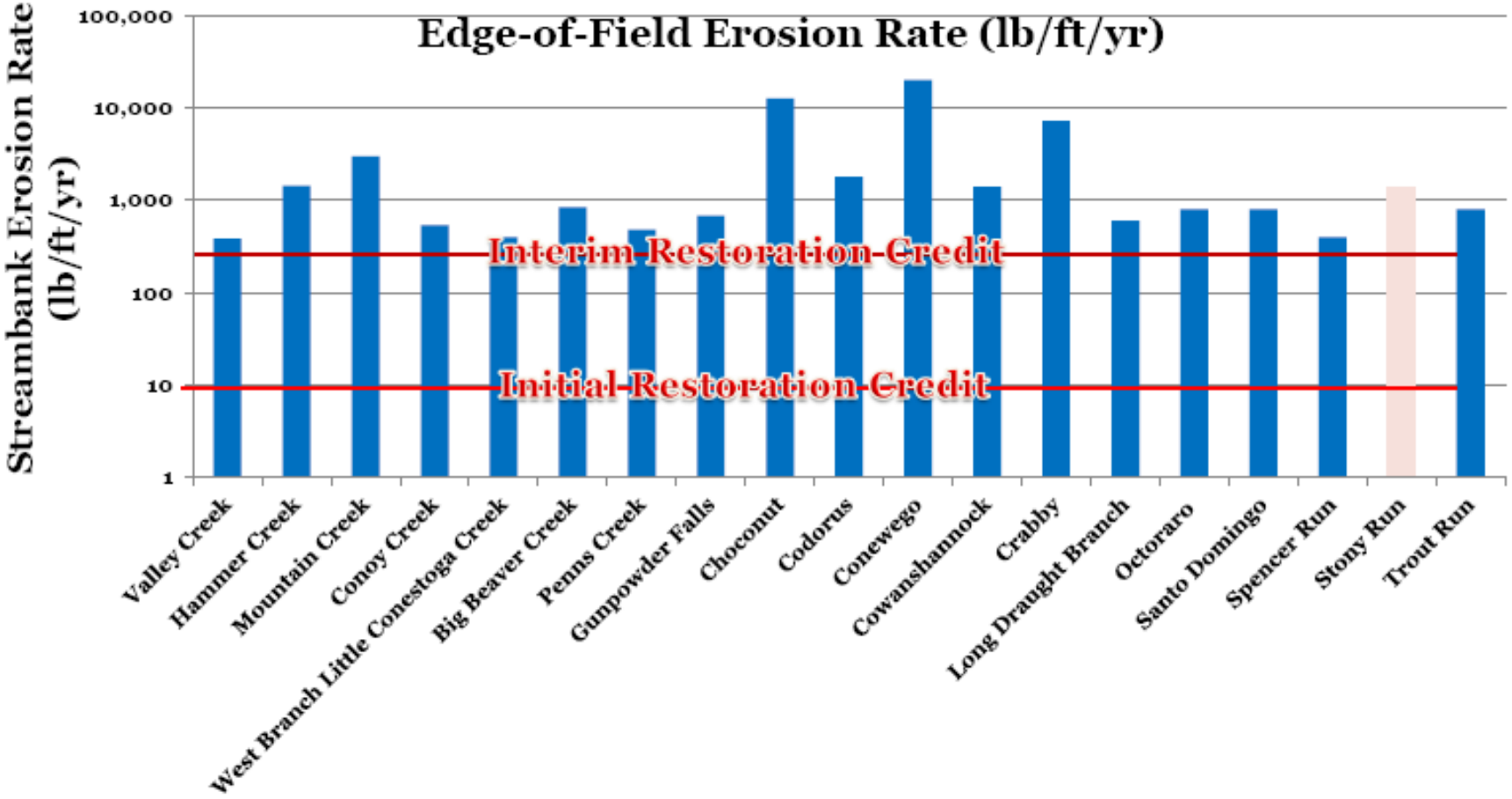
Sediment from Stream Channel Erosion, NOT Sediment from Watershed Supply



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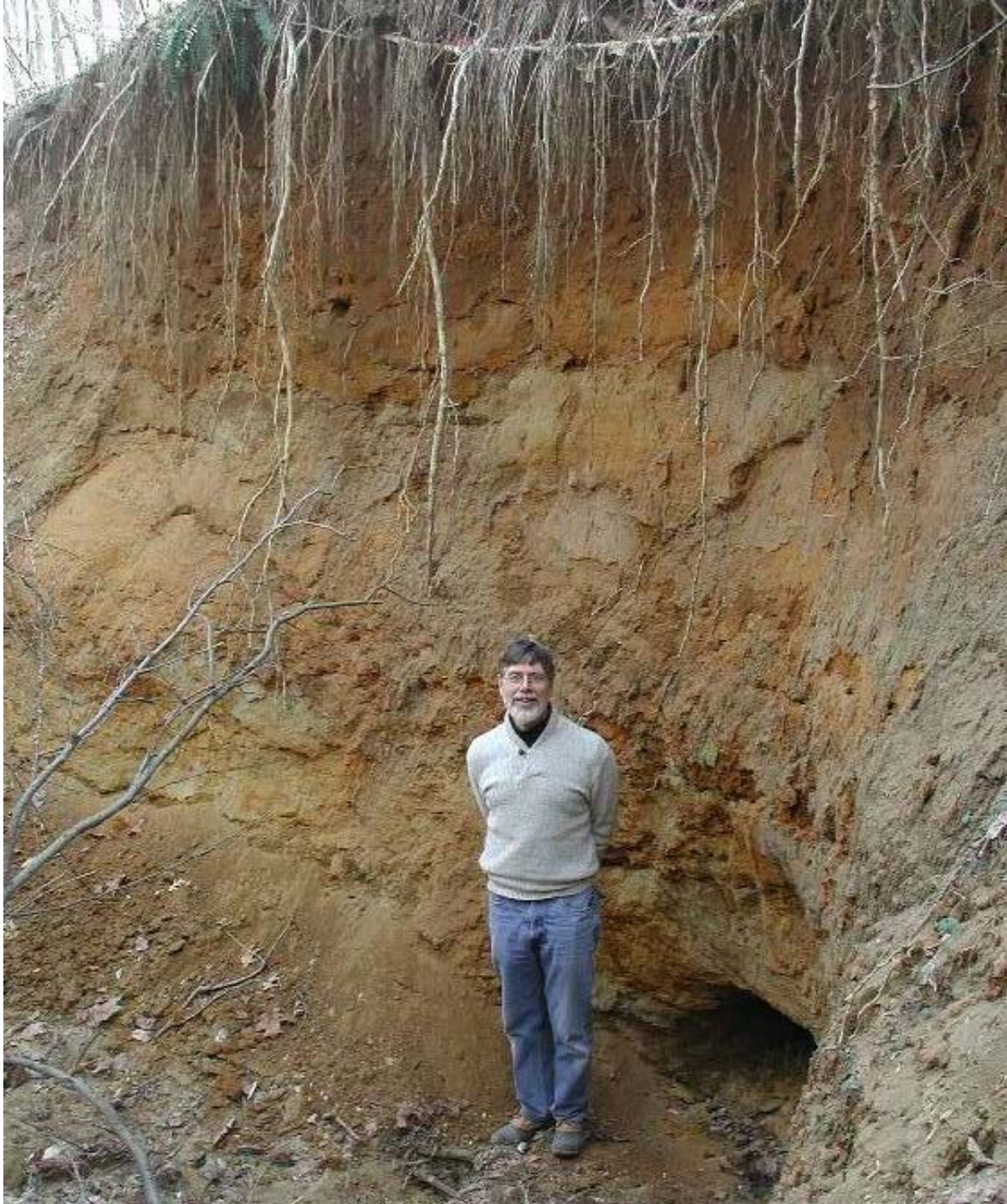
Source: Expert Stream Panel Report, Stack 2013

Pre-Restoration 22-ft Incised

Adverse effect on
- Groundwater
- Downstream flows
- Water quality
- Aquatic resources
- Riparian resources
- And others



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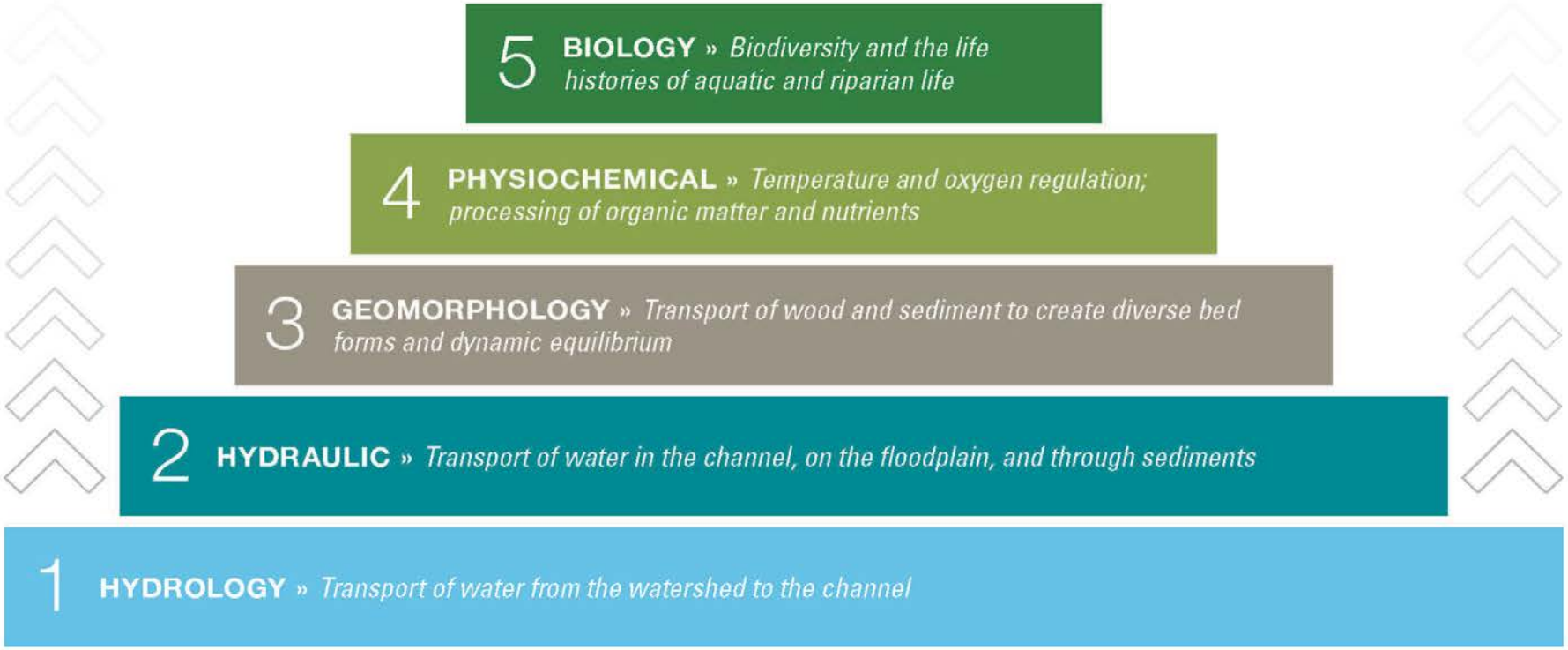
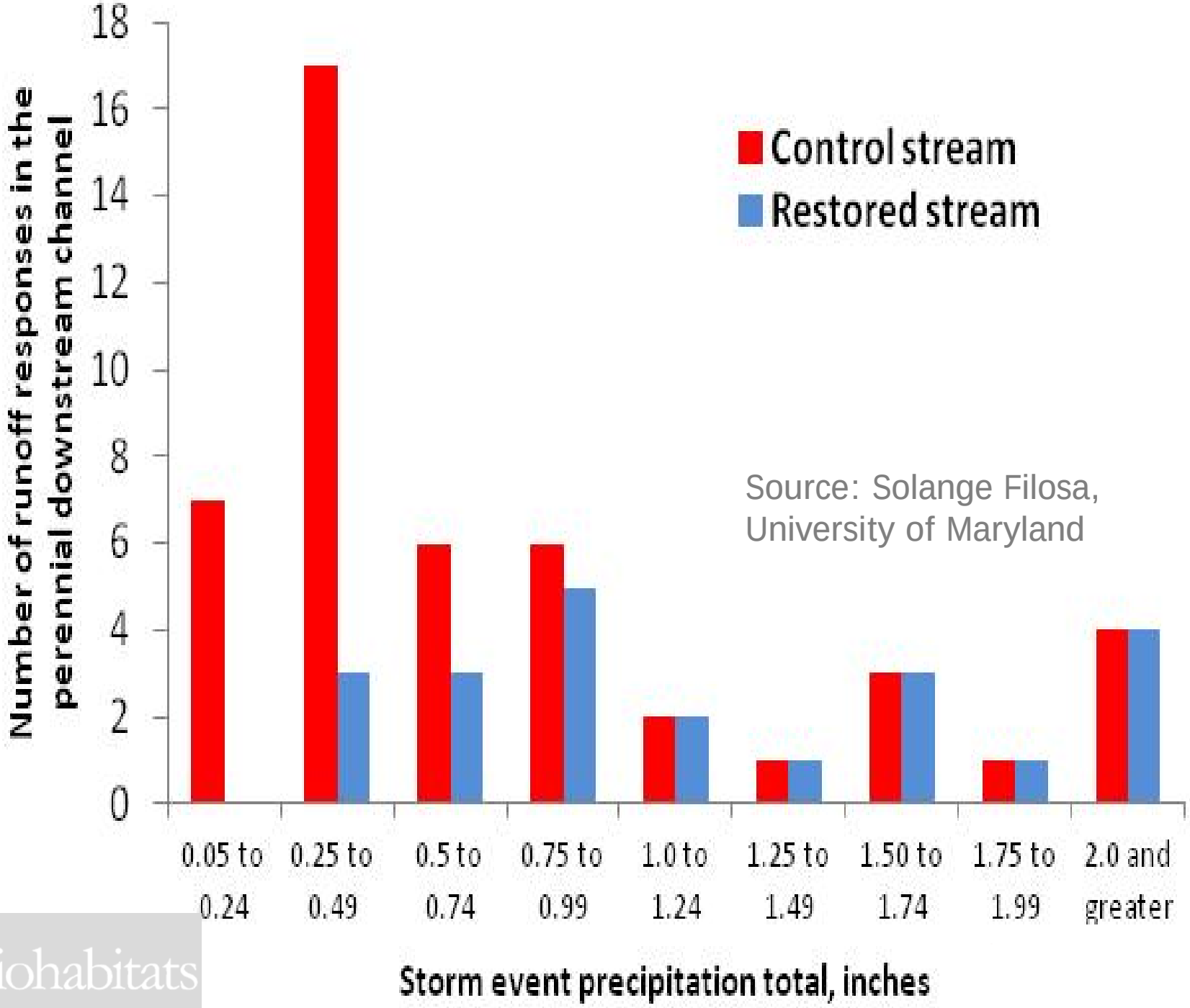
Carriage Hills Post-Restoration
Biohabitats

Stream Functions Pyramid

A Guide for Assessing & Restoring Stream Functions » OVERVIEW



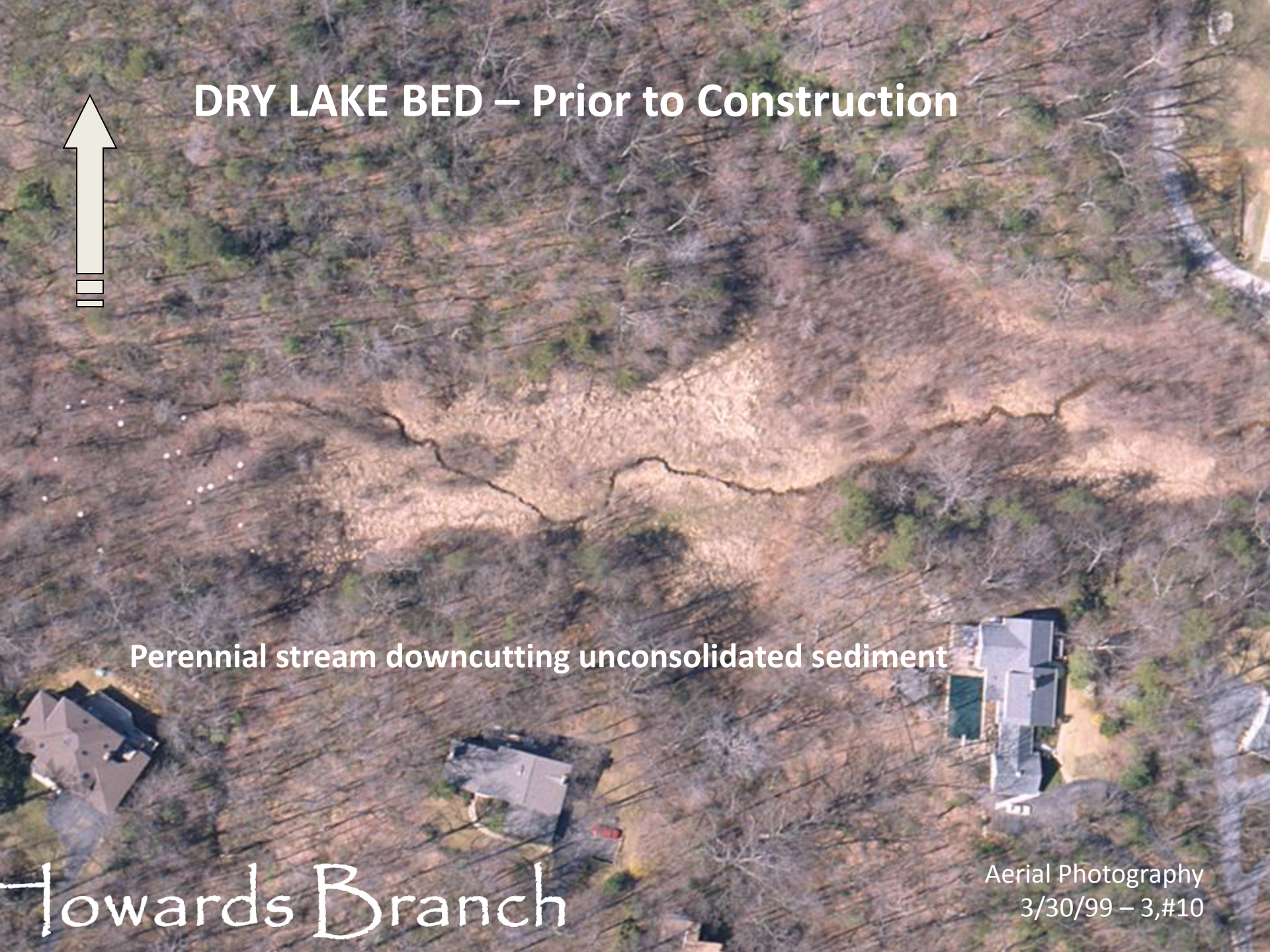
http://www.fws.gov/chesapeakebay/Newsletter/Fall11/Pyramid/pyramid_-overview.jpg



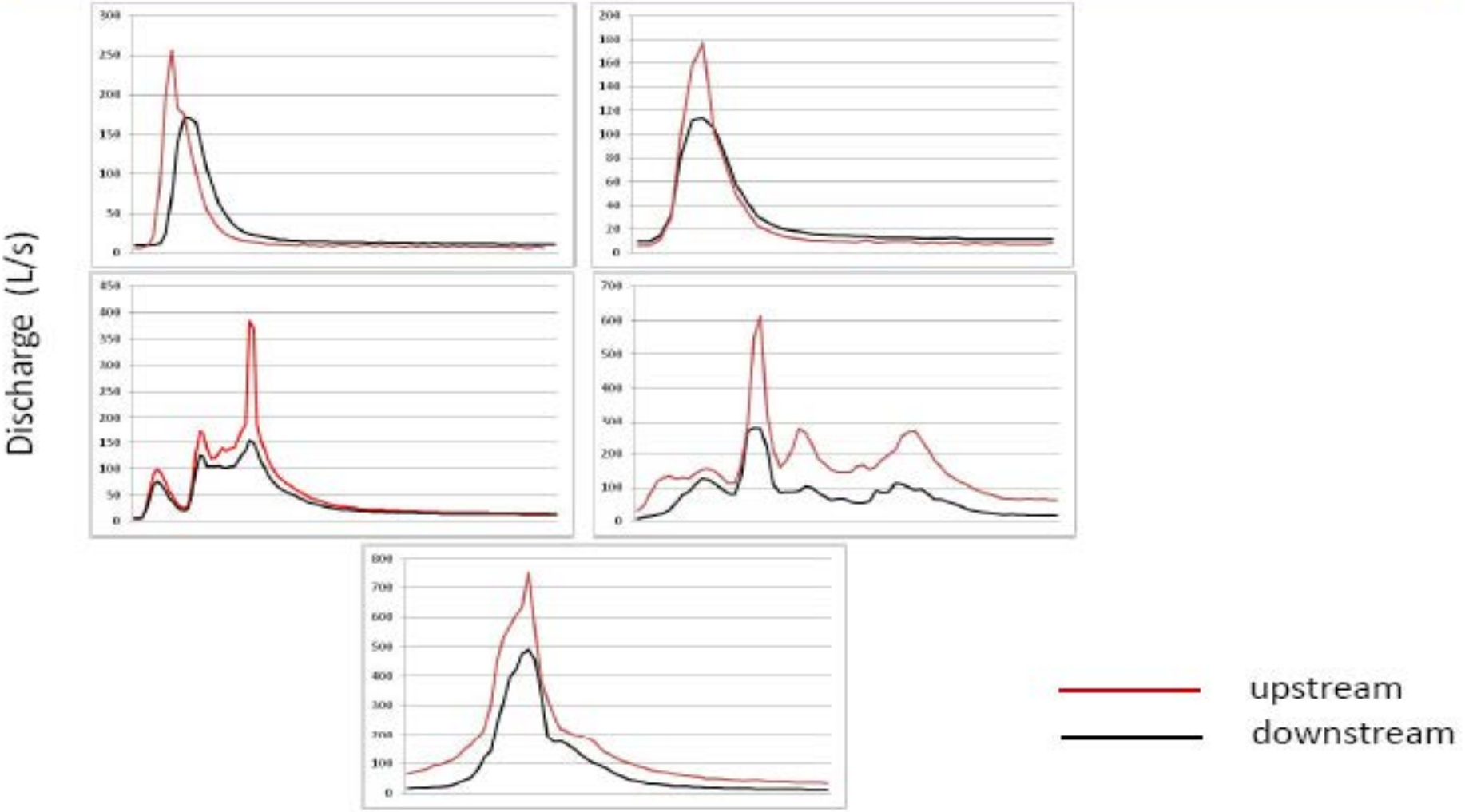
Keith Underwood

Underwood and Associates

Regenerative Stream Conveyance at the Urban Fringe


DRY LAKE BED – Prior to Construction
Perennial stream downcutting unconsolidated sediment
Howards Branch
Aerial Photography
3/30/99 – 3,#10

Hydrographs during individual storms
HOWARD'S BRANCH



Source: Solange Filoso, University of Maryland

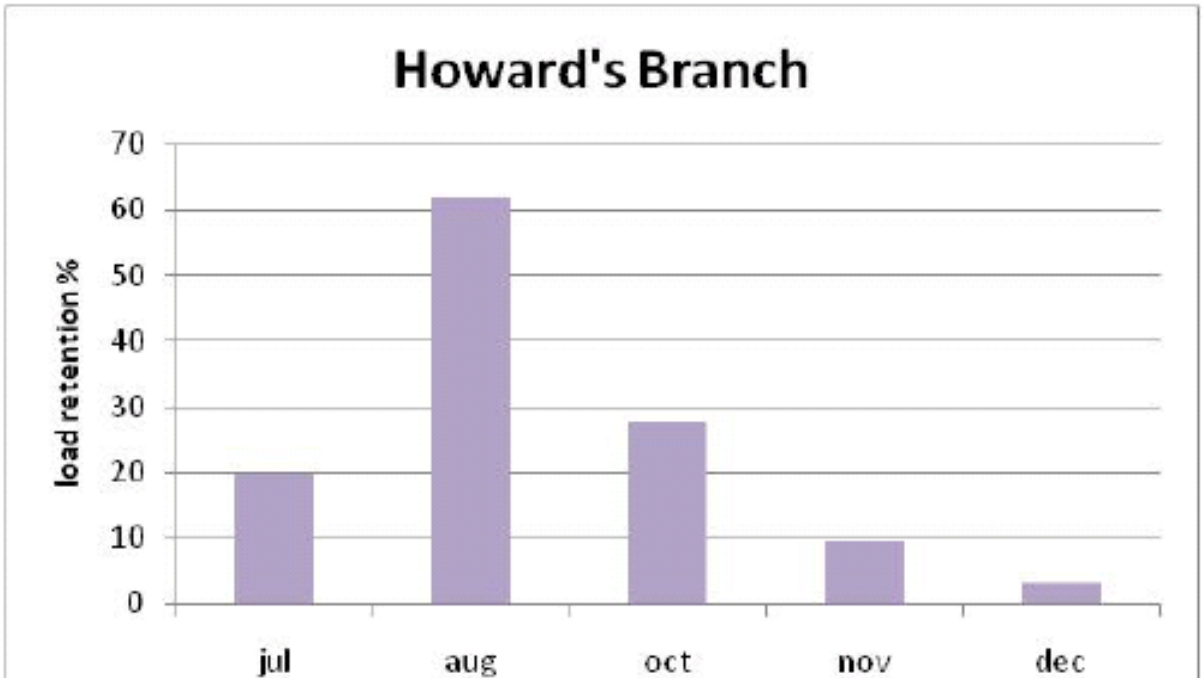


Figure 32. Percent load reduction of TN in the restored reach of Howard's Branch during five different storm events.

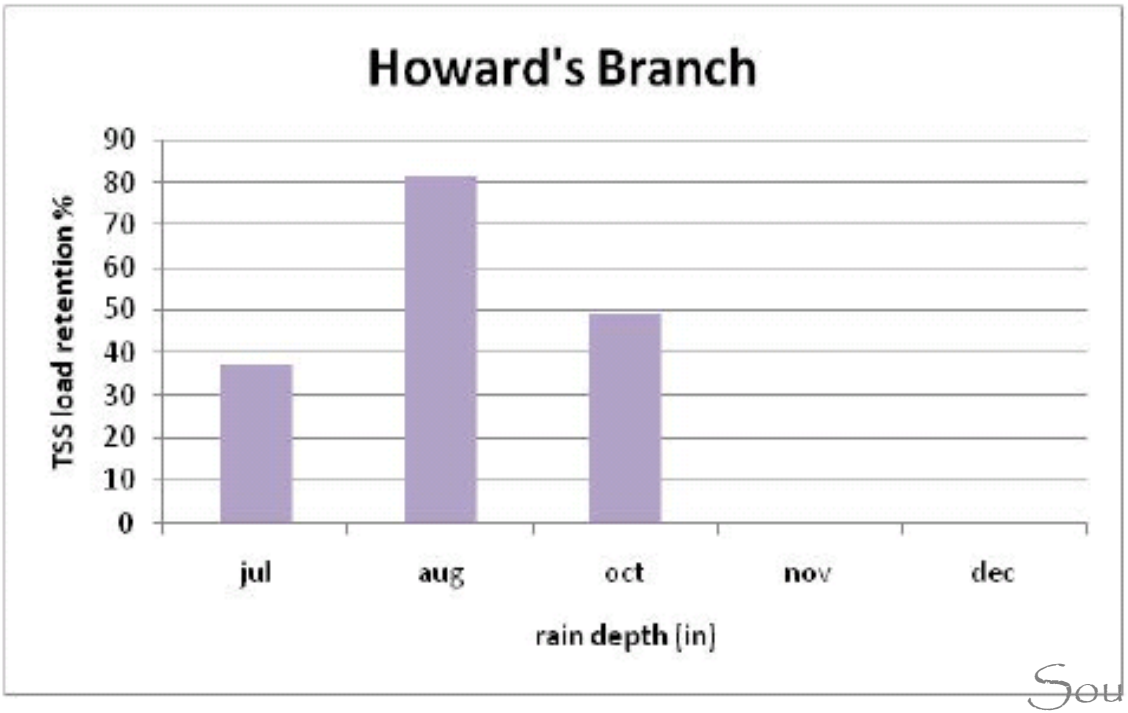


Figure 34. Percent load reduction of TSS in the restored reach of Howard's Branch during five different storm events.

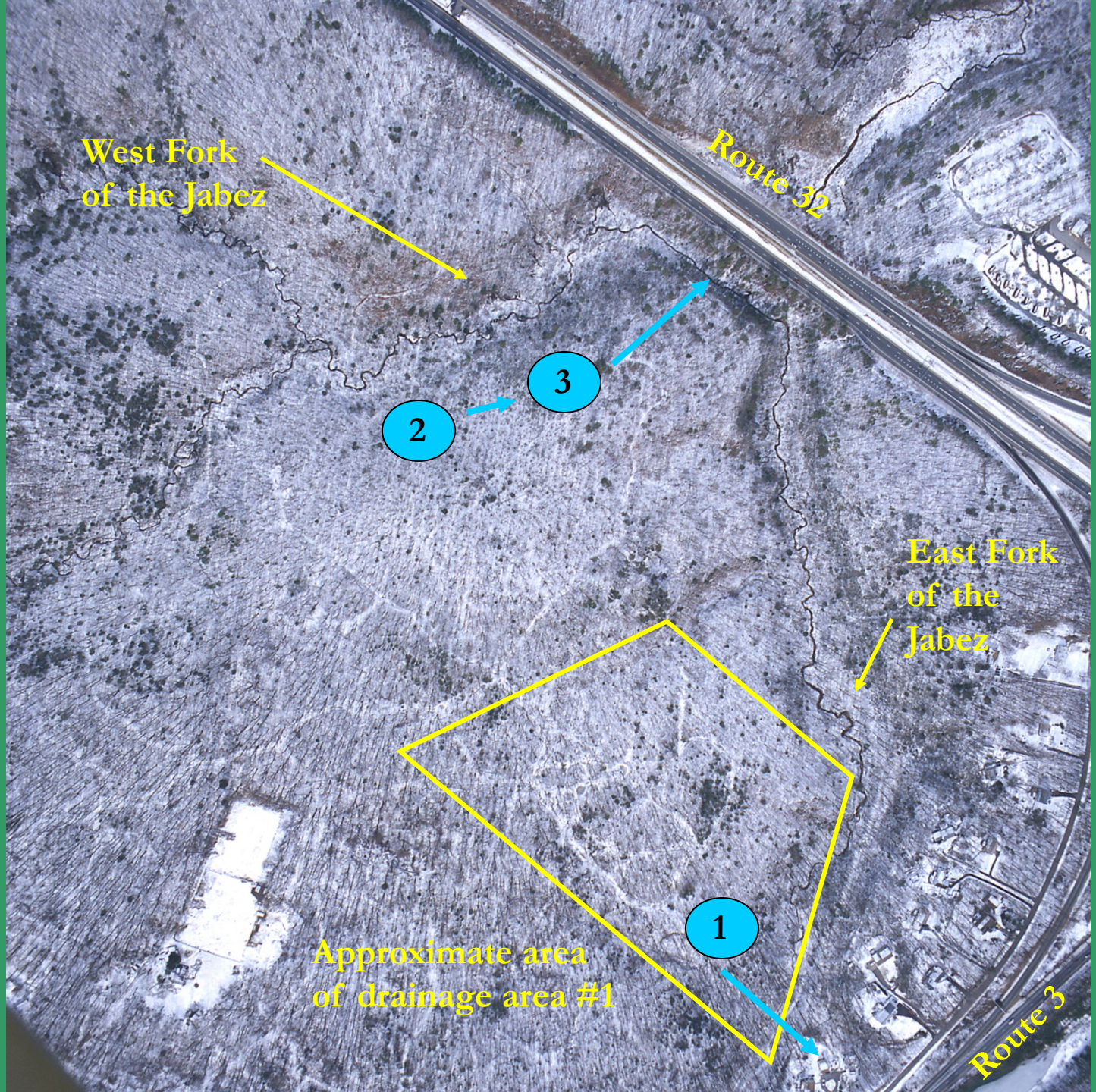
Source: Palmer and Filoso, 2009

Sand Seepage Wetland Cost/Benefit Example

Project	Cost	Benefits	Value*
Howard's Branch	$386,940	2.5 acres of wetland restoration	$437,500
		798 LF of stream restoration	$119,700
		49,594 cf of water storage	$495,940
Total	*$386,940*		*$1,053,140*

Cost/Benefit ratio: 1:3

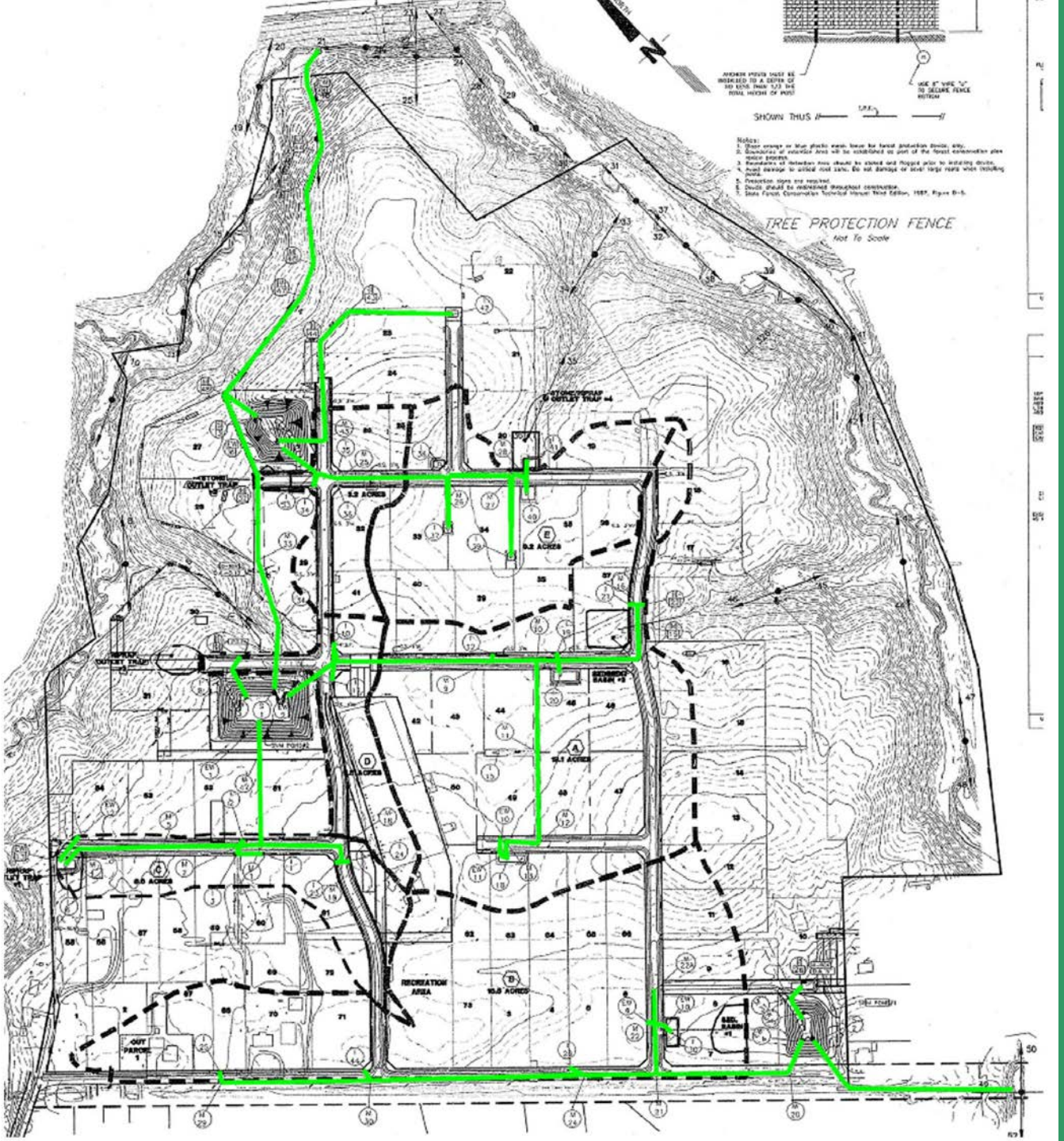
***Value is calculated based on a conventional cost of: $175k/acre wetland; $150 lf/stream; and, $10 cf of water storage.**

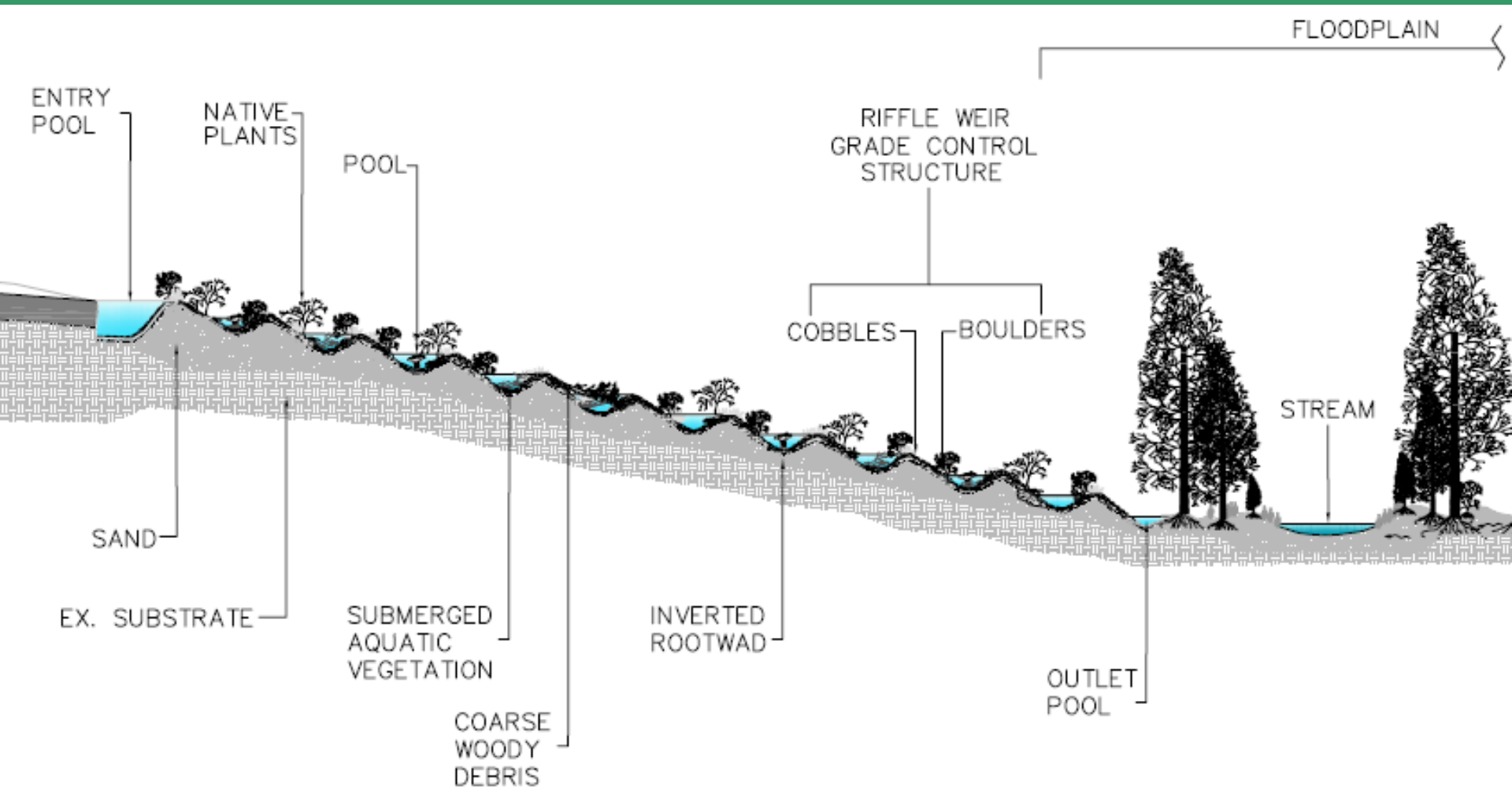


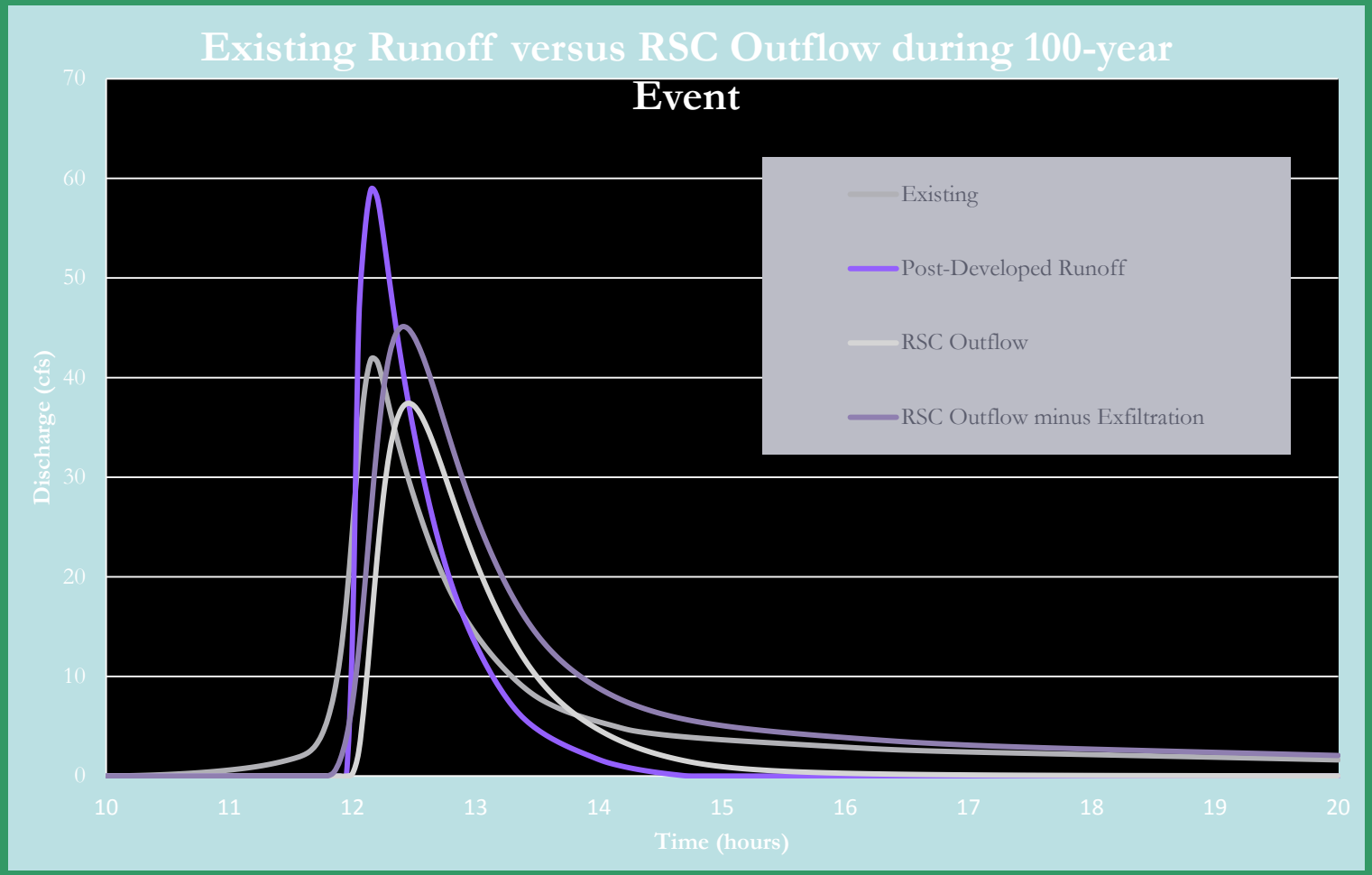
Holladay Park Original Plan - Schematic

Stormwater Pond

Direction of Flow


SHOWN THUS
TREE PROTECTION FENCE
Not To Scale
RECREATION AREA


FLOODPLAIN
ENTRY POOL
NATIVE PLANTS
POOL
RIFFLE WEIR GRADE CONTROL STRUCTURE
COBBLES
BOULDERS
STREAM
SAND
EX. SUBSTRATE
SUBMERGED AQUATIC VEGETATION
INVERTED ROOTWAD
OUTLET POOL
COARSE WOODY DEBRIS



Event	Existing	RSC Outflow	RSC Outflow Minus Exfiltration
	(cfs)	(cfs)	(cfs)
1-yr	0.57	0	0.35
5-yr	6.05	0.72	5.44
10-yr	11.11	5.82	10.94
25-yr	20.69	15.54	21.56
100-yr	42.14	37.44	45.14

Holladay Park- Cost Comparison

Phase 1-Original Design

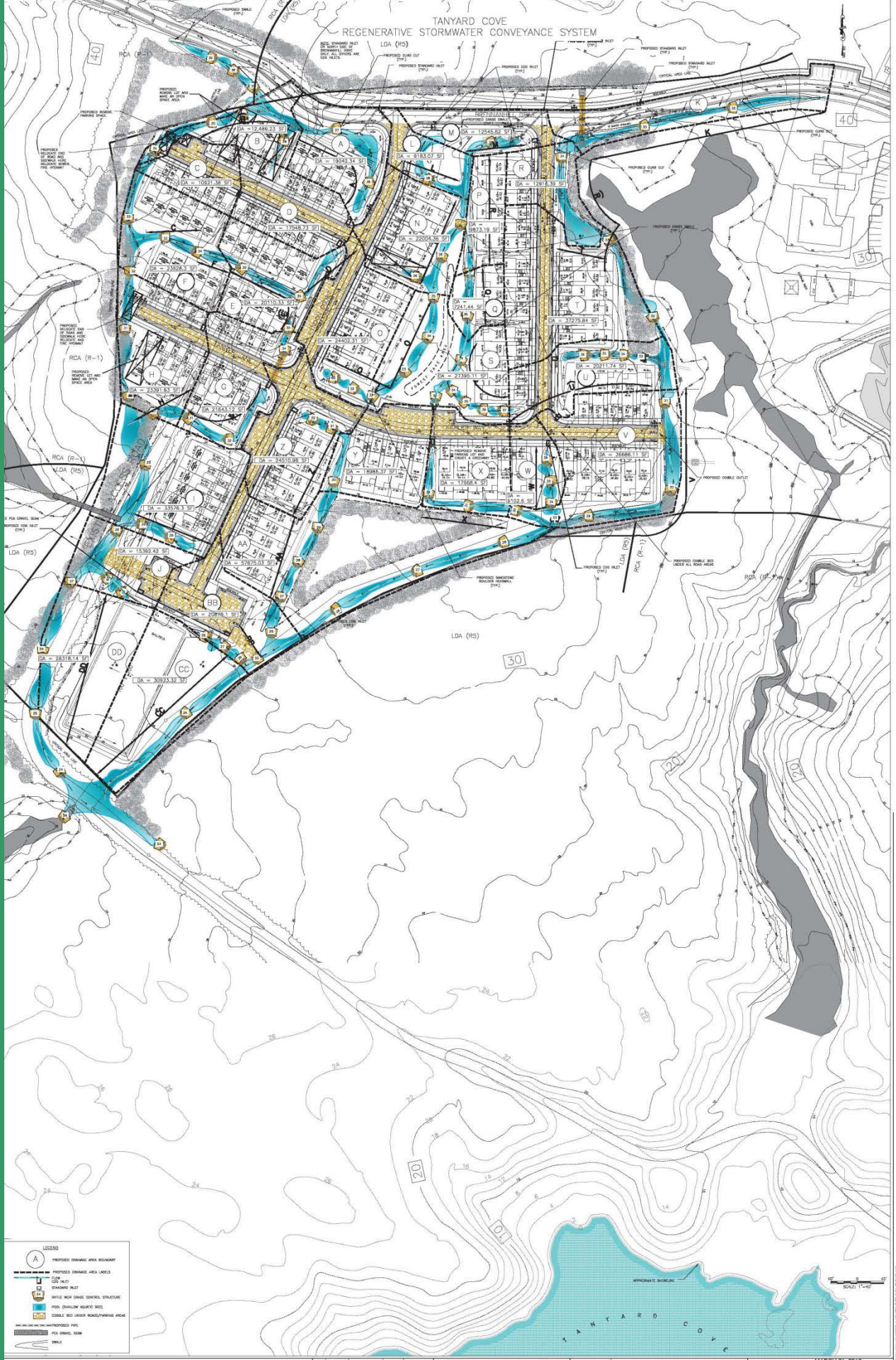
Pipe	LF
15"	1453
18"	408
21"	48
24"	517
27"	470
30"	523
12" x14"	50
Total LF	3469

	Costs
SWM Pond	$ 216,710.00
RCP	$ 592,158.75
SWM Access Rd	$ 8,900.00
Fences for SWM Pond	$ 10,700.00
Total	**$ 828,468.75**

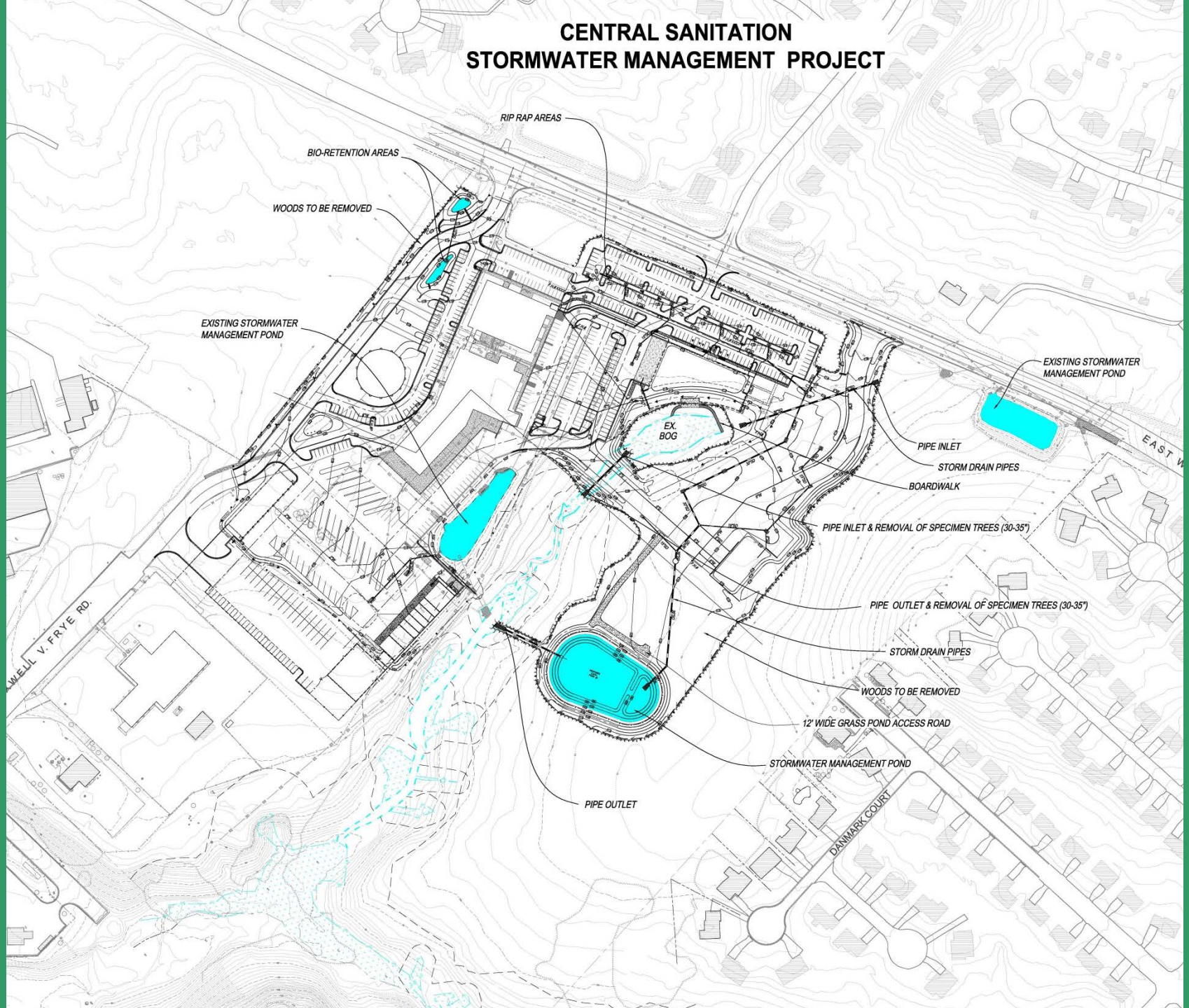
Layout	$44,934.00
Sediment Controls	$21,971.00

Current Costs

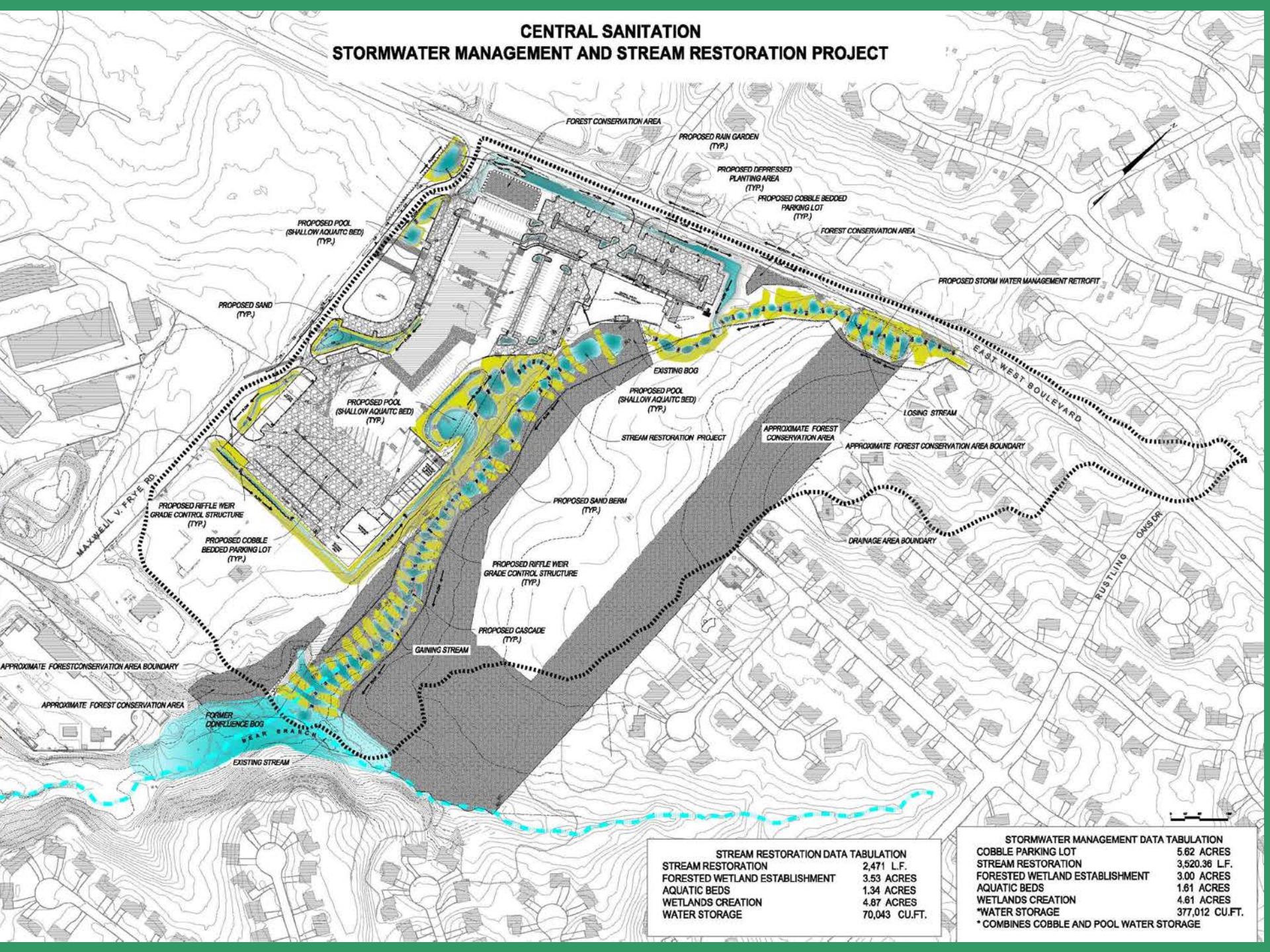
Grading/Excess	$248,750.00
SWM Pond	$80,131.00
Pipe	$23,194.00
Risers/structures/headwalls	$30,000.00
24" Pipe	$8,420.00
Sandstone Weirs	$14,360.00
Total	**$404,855.00**


TANYARD COVE
REGENERATIVE STORMWATER CONVEYANCE SYSTEM
LEGEND
PROPOSED DRAINAGE AREA BOUNDARY
PROPOSED DRAINAGE AREA LABELS
FLOW
CODE INLET
STANDARD INLET
RIFFLE WEIR GRADE CONTROL STRUCTURE
POOL (SHALLOW AQUATIC SED)
COBBLE BED UNDER ROADS/PARKING AREAS
PROPOSED PIPE
PCA GRAVEL SEAM
SWALE
APPROXIMATE SHORELINE
TANYARD COVE
SCALE 1"=40'

CENTRAL SANITATION
STORMWATER MANAGEMENT PROJECT



CENTRAL SANITATION
STORMWATER MANAGEMENT AND STREAM RESTORATION PROJECT



STREAM RESTORATION DATA TABULATION	
STREAM RESTORATION	2,471 L.F.
FORESTED WETLAND ESTABLISHMENT	3.53 ACRES
AQUATIC BEDS	1.34 ACRES
WETLANDS CREATION	4.87 ACRES
WATER STORAGE	70,043 CU.FT.

STORMWATER MANAGEMENT DATA TABULATION	
COBBLE PARKING LOT	5.62 ACRES
STREAM RESTORATION	3,520.36 L.F.
FORESTED WETLAND ESTABLISHMENT	3.00 ACRES
AQUATIC BEDS	1.61 ACRES
WETLANDS CREATION	4.61 ACRES
*WATER STORAGE	377,012 CU.FT.

* COMBINES COBBLE AND POOL WATER STORAGE

BEST URBAN BMP in the Bay Award

- BUBBAs were awarded for projects completed in the last 5 years
- Our projects placed first and third in the Stream Restoration category and first in the Habitat Creation in a BMP category

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John McLaughlin

New York City
Department of Environmental Protection

Green Infrastructure and Ecology

US Forest Service Webinar Series

John McLaughlin

Director, Office of Ecological Services

New York City Department of Environmental Protection

May 14, 2014

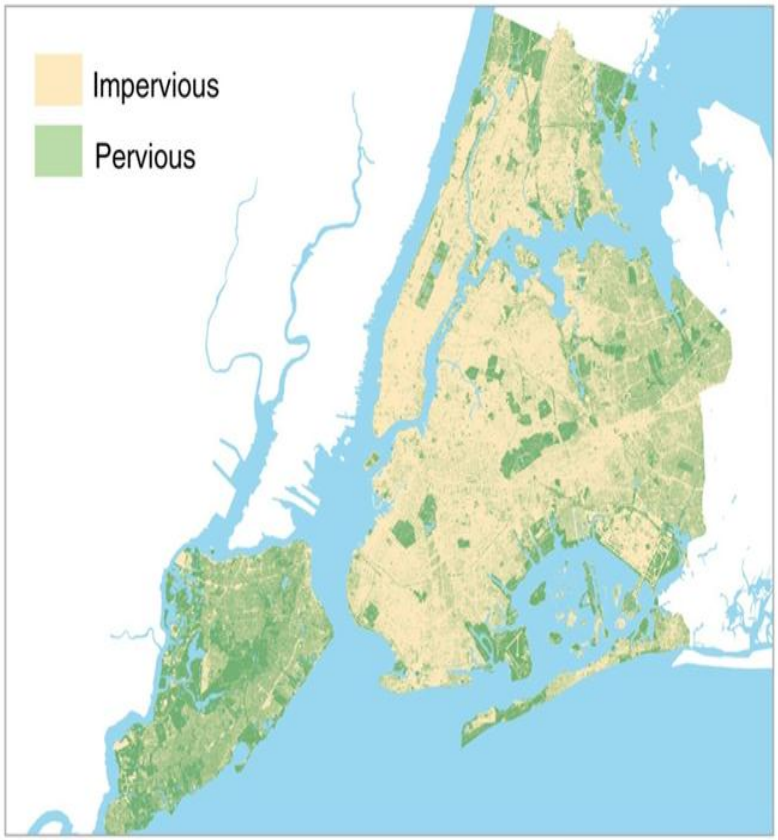
Significantly Altered and Dense Landscape (above and below)

Credit: Ecobrookly.com

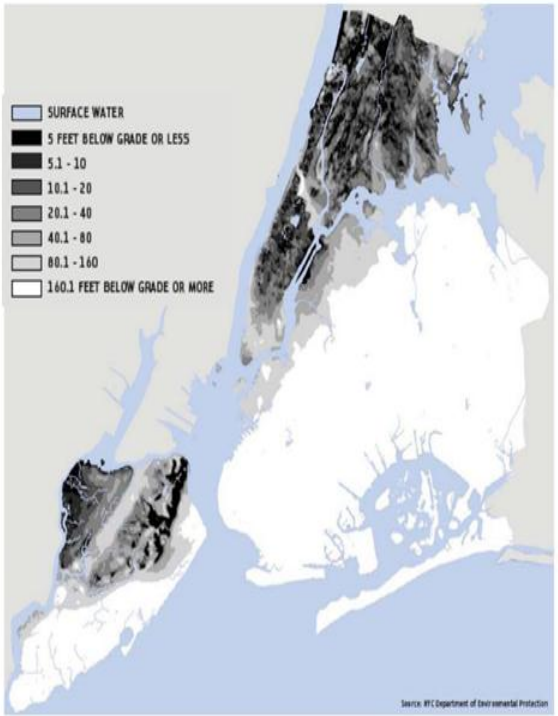
Restoring stormwater ecological connection back to landscape is goal.

But, there are a variety of unique challenges in ultra-urbanized areas….

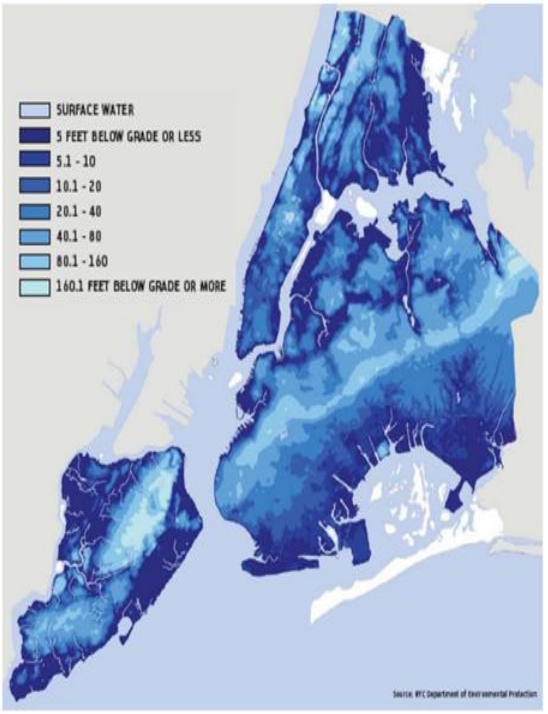
Additional Considerations



Depth to Bedrock

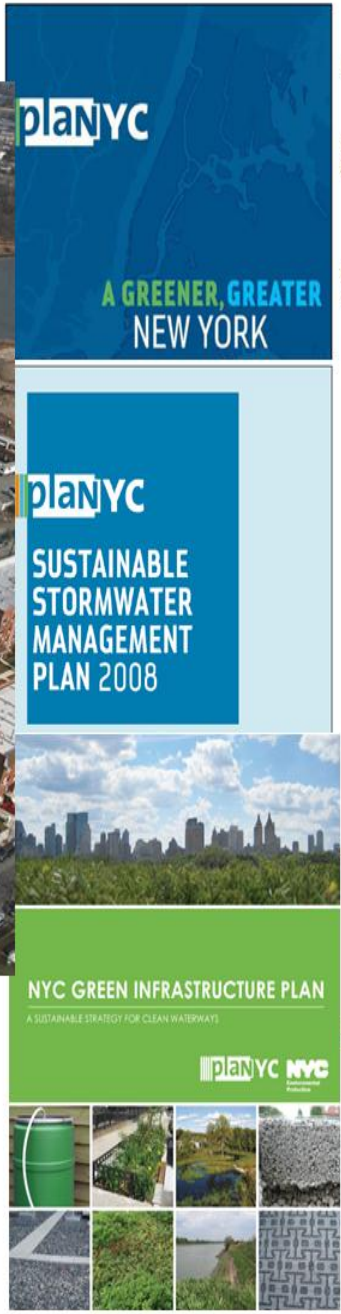


Depth to Groundwater



NYC's Hybrid Approach

Traditional solution: CSO detention Facility



1. Build cost-effective grey infrastructure
2. Optimize the existing wastewater system
3. **Control runoff from impervious surfaces through green infrastructure and other source controls**
   - **Many opportunities in roads and sidewalks, rooftops and new development**
   - **Modular, scalable, and adaptable**
   - **Targeted to specific watersheds**
4. Institutionalize adaptive management, model impacts, measure CSOs, and monitor water quality
5. Sustained stakeholder engagement

Link to reports:
http://www.nyc.gov/html/planyc2030/html/publications/publications.shtml

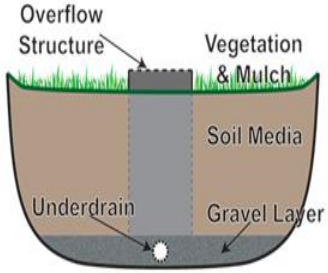
4

Variation of Drainage Area to Practice Footprint

Site	Impervious	DA:GI
Autumn Ave ETP	3,948 ft²	39:1
Blake Ave ETP	2,176 ft²	22:1
Ridgewood ETP	4,420 ft²	44:1
Union St ETP	1,679 ft²	17:1
Eastern Pkwy SSIS	19,883 ft²	99:1
Howard Ave SSIS	6,630 ft²	33:1
Ridgewood SSIS	5,513 ft²	28:1
Union St SSIS	2,231 ft²	11:1

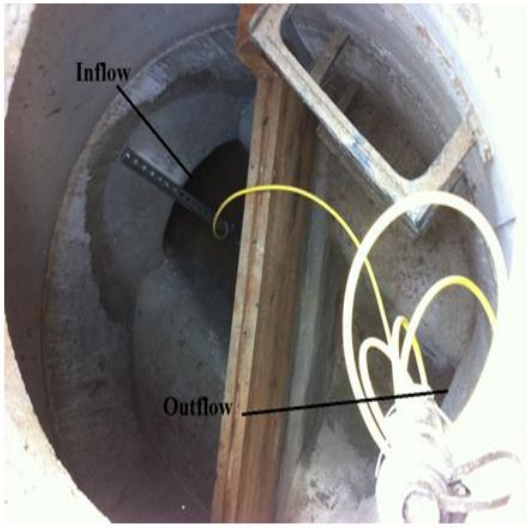
Roadway Median (North/South Conduit Bioretention)

- Major Functional Elements
  - Surface storage for detention
  - Subsoil contact for seepage losses
  - Bio-soil evapotranspiration losses
  - Underdrain and overflow to prevent long term standing water
  - Infiltration losses in conveyance swales



Impervious Area	81,870 ft²
DA: GI Footprint	11:1

Flow and Water Quality Monitoring



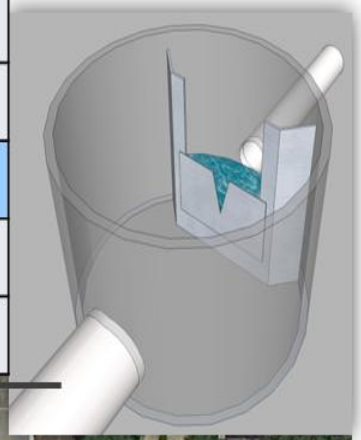
Evaluate whether pollutant concentrations are similar to those observed elsewhere
Inform potential maintenance needs

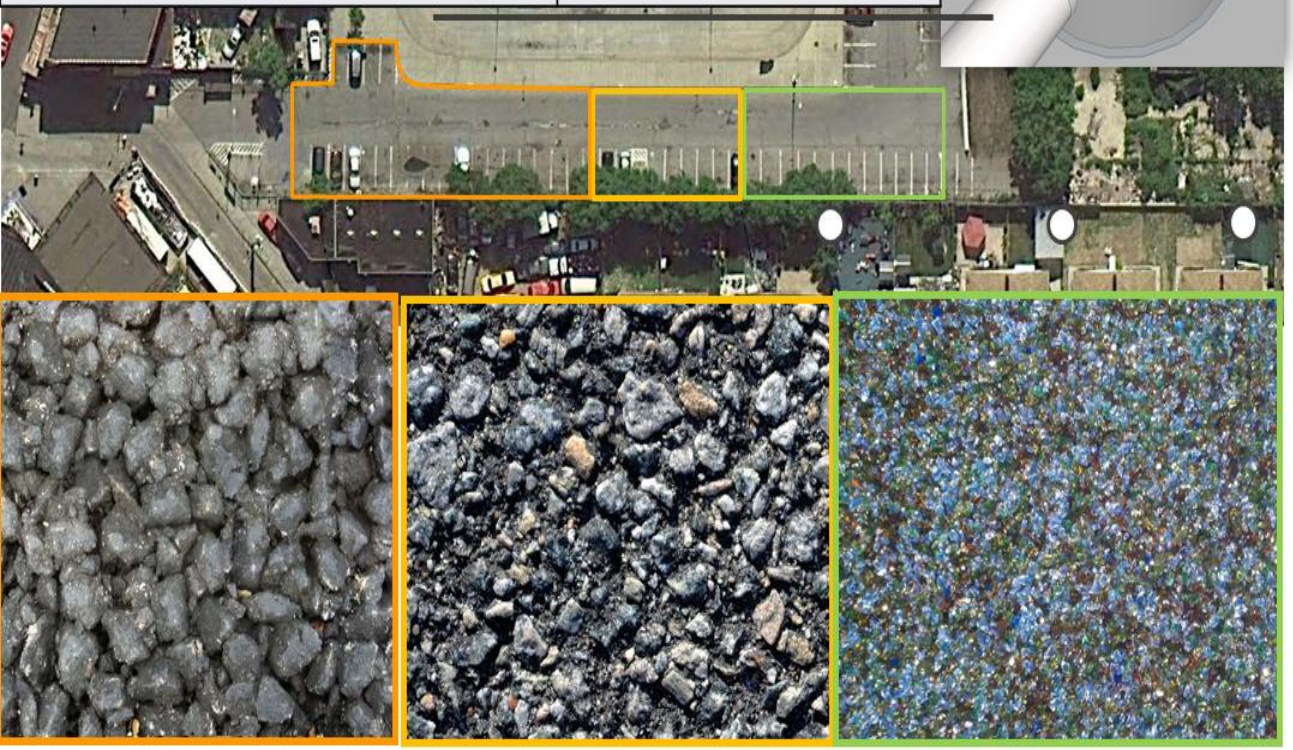
Diesel, gasoline, nitrogen, phosphorus, total organic carbon, total suspended solids, total salts, and metals

- Maintenance:
  - Removal of debris and sediment from curb cuts
  - Weeding and mulching

Permeable Pavement

Porous Asphalt	
Impervious Area	6,380 ft²
DA:GI Footprint	1:1
FilterPave	
Impervious Area	4,260 ft²
DA:GI Footprint	1:1





- Major Functional Elements
  - Surface infiltration of runoff
  - Subsurface detention
  - Subsoil contact for seepage losses
  - Retention within subsurface drainage layers

Porous Asphalt | Standard Asphalt | FilterPave

Constructed Wet Meadow

Impervious Area	14,000 ft²
DA: GI Footprint	5.4 : 1

Co-Benefits Monitoring and Analysis

Temperature

Air = 84.5°

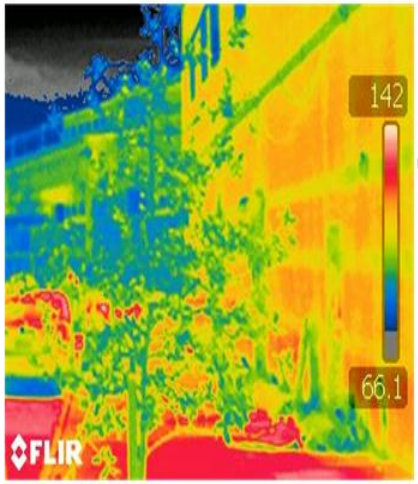
Asphalt = 104°

Sidewalk = 96°

Vegetation = 78.1°

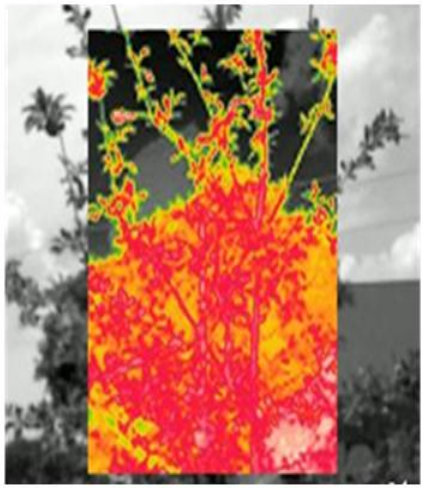
Bare Soil = 90.2°

Direct measurement of infrared surface temperatures minimizes outside influences



Cooler canopy actively transpiring water (approx. 20°F cooler)

Much warmer canopy not actively transpiring water



Cost and Benefit Comparison Tool

NYC Environmental Protection

NYC Green Infrastructure Cost-Benefit Comparison Tool

ROW Bioswales | Large Bioretention | Porous Pavement | Constructed Wetland | Green Roof | Blue Roof | Tool Setup

Co-Benefits

- Carbon Sequestration
- Urban Heat Island Mitigation
- Reduced Energy Demand
- Improved Habitat and Ecosystem Services
- Improved Air Quality
- Improved Quality of Life
- Flood Mitigation
- Reduced Stormwater Treatment Demand
- Green Jobs

Co-Benefit Details

Carbon Sequestration

Description:

By supporting plant growth, ROWBs can provide carbon sequestration. Carbon is taken from the atmosphere and integrated into above and below ground biomass. When plant material is decomposed, some of this carbon can return to the atmosphere.

Literature:

Carbon sequestration generally supported by the literature, particularly for urban trees, but also low-lying plants.

Details

NYC Monitoring:

Direct measurement of carbon sequestration not performed in NYC due to availability of literature and intensive evaluations needed to capture variability.

Details

Calculator Inputs

100	ROWB Footprint (ft²)
3000	Managed Impervious Area (ft²)
60	Low-Lying Vegetation Coverage (%)
70	Tree Canopy Coverage (%)
Flowering Vegetation	50%
Native Vegetation	>75%
Plant Species	2-10
Existing Visible Greenspace	Corner Park
Underserved Area	No / Yes
GI Accessibility	Viewable Only

Calculate

Calculator Outputs

Total | Per ft² GI | Per ft² Managed

Environmental

1,330	CO2 Produced (lb)
1,388.22	Carbon Sequestered (lb/yr)
7.31	Ozone Removed (lb/yr)
6.52	PM10 Removed (lb/yr)
6.00	NO2 Removed (lb/yr)
3.28	SO2 Removed (lb/yr)
1.55	CO Removed (lb/yr)
7 / 10	Ecosystem Services Score
87 %	Urban Heat Island Potential

Social

3 / 10	Social Benefits Score

Economic

$25,000	Construction Cost
$65.64	Stormwater Treatment Savings

Save Name: ROWB 1 ↓ SAVE FOR COMPARISON ↓

Save/Open Mode | Compare Mode | Help Enabled | Tutorial

Save Location: ROWB 1 | ROWB 2 | GI Control 3 | GI Control 4 | GI Control 5 | GI Control 6 | GI Control 7 | GI Control 8 | GI Control 9 | GI Control 10

Open Saved Control

Questions and Answers

Ask questions through the chat pod

Foresters: Type your FULL NAME, email address and Licensing Number or SAF Membership/CF Number in the chat pod in order to receive CFE credit.

General Audience: If you would like a general certificate of attendance, please download the file in the "Files Pod."

Give us your feedback!

www.fs.fed.us/openspace/webinars

Or Contact

Susan Stein – sstein@fs.fed.us

Sara Comas - scomas@fs.fed.us