Using Ecological Expertise and Assessment Data to Inform Functional Improvement in Urban Stream Restorations

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Department of Public Works and Environmental Services
Working for You!

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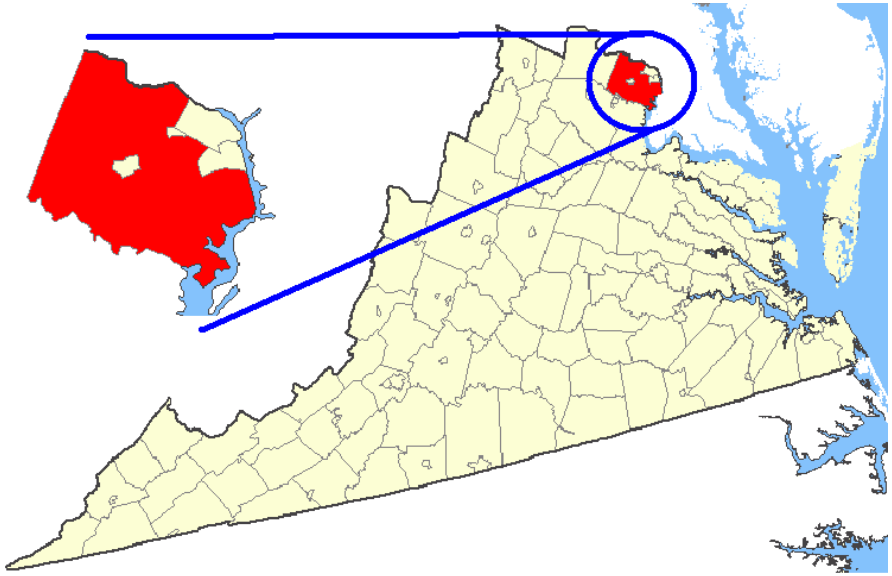
Fairfax County, VA - Urban Streams

- 400 square miles
- 1.1 million residents
- ~800 miles of stream
- 17% have impairments



https://upload.wikimedia.org/wikipedia/commons/7/7b/Map_showing_Fairfax_County%2C_Virginia.png

Why do we restore streams in the first place?

- $8 million in stream restorations/yr
- At $1300/lf ☺ it's not because we are nice…
- Complaints
  - Erosion
  - Flooding
- Regulatory directives
  - Mitigation
  - Chesapeake Bay TMDL
  - Local (watershed) TMDLs

And this is what we want…

Early 2000s – Urban Stream Restorations

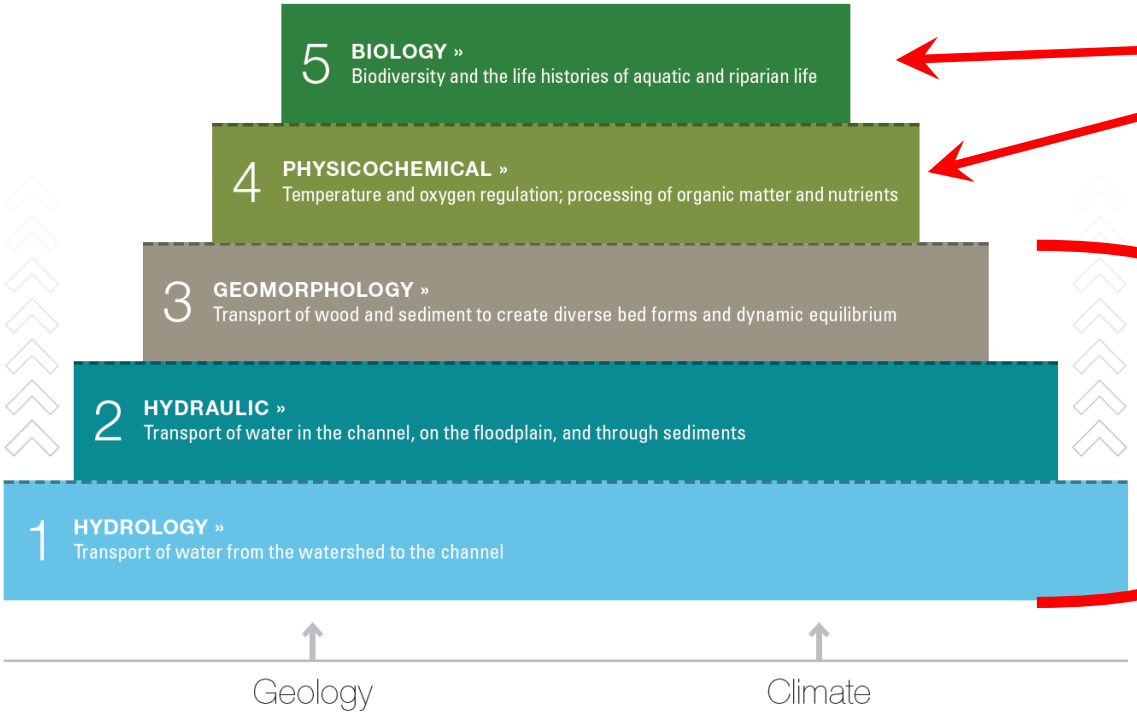
Oversized Bed Material – Where did the stream go?

Open Canopy – Primary Production

- "OMG – look at
- "That's not…"
- Now what?

Stream Restoration – Functions-Based Approach

- How well are we restoring functions?
  - What's is the time scale?
  - What's achievable?



Local TMDLs – direct measures (benthics, fish, water chemistry, etc.)

Chesapeake Bay TMDL or Stream Mitigation Credits – required indirect reductions (modelled) for stream; can be measured

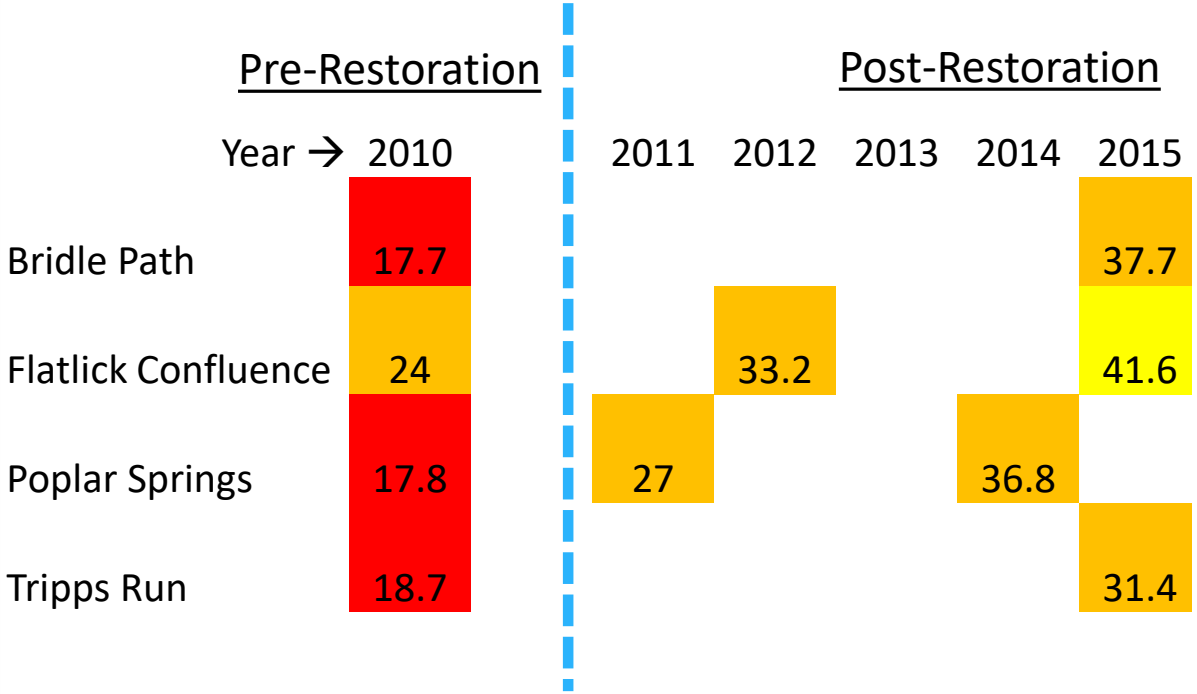
Why is the Old Way Not Working?

- How do we know it's not?
  - Need to monitor
  - Monitoring is expensive
- Need to educate designers and managers
  - Needs data (i.e. monitor some more)
- Need to insert ecology into the design
  - Stream restoration is interdisciplinary (not just design engineers)
  - Report on monitoring
  - Innovative designs – replicate nature

Stream Restoration Monitoring - Benthics

- Success! Or not?
- Cautionary tale of limited data

FFX_Genus_ IBI
Excellent (80-100)
Very Good (60-79)
Fair (40-59)
Poor (20-39)
Very Poor (0-19)



Habitubes Pilot Study - Design

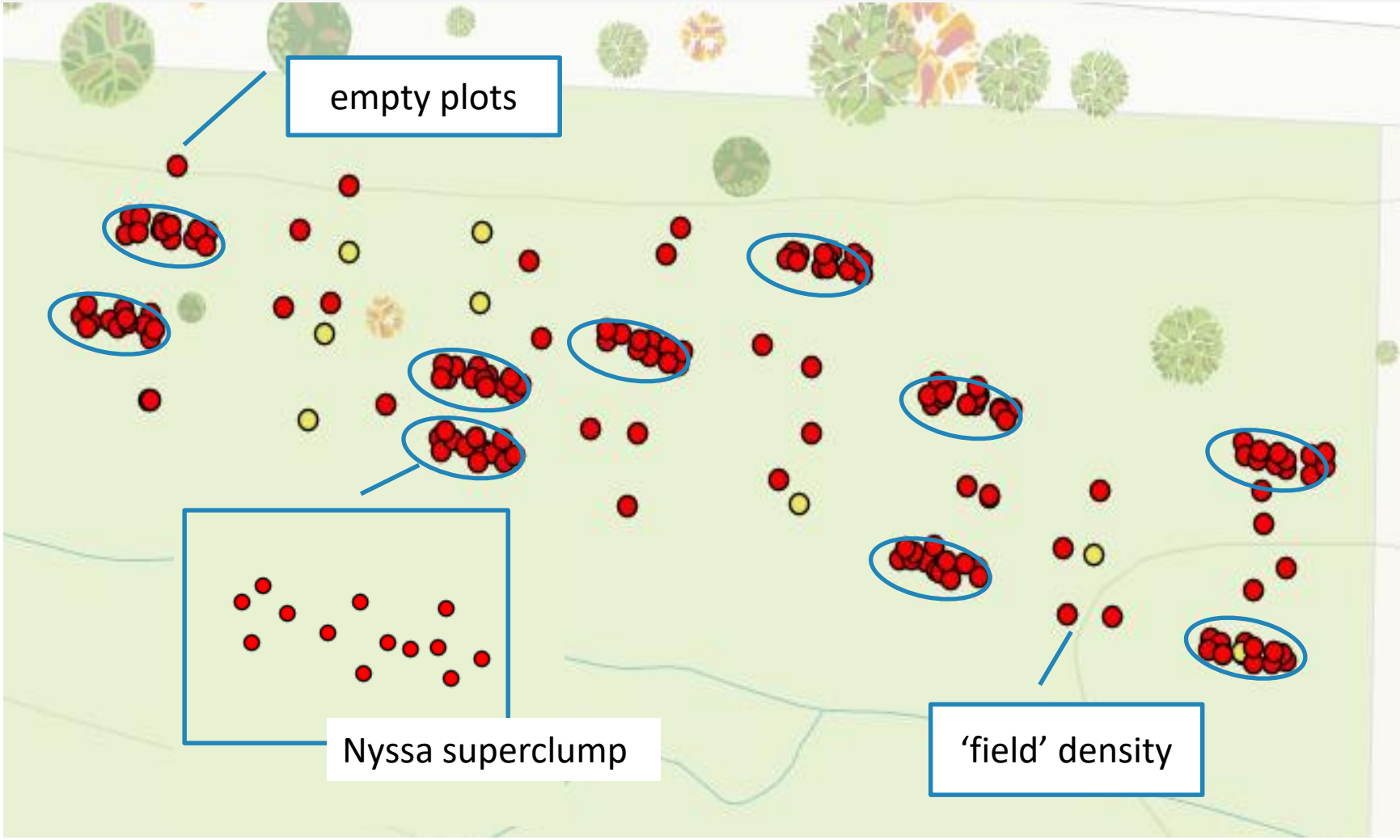
High Quality Stream

Transfer to Restored Stream

Habitubes Pilot Study - Evaluation

- 3-yr Study
  - BACI Design
  - Current Yr 2
- Lessons

Superclump of Vegetation



Planting (and Monitoring) Superclumps

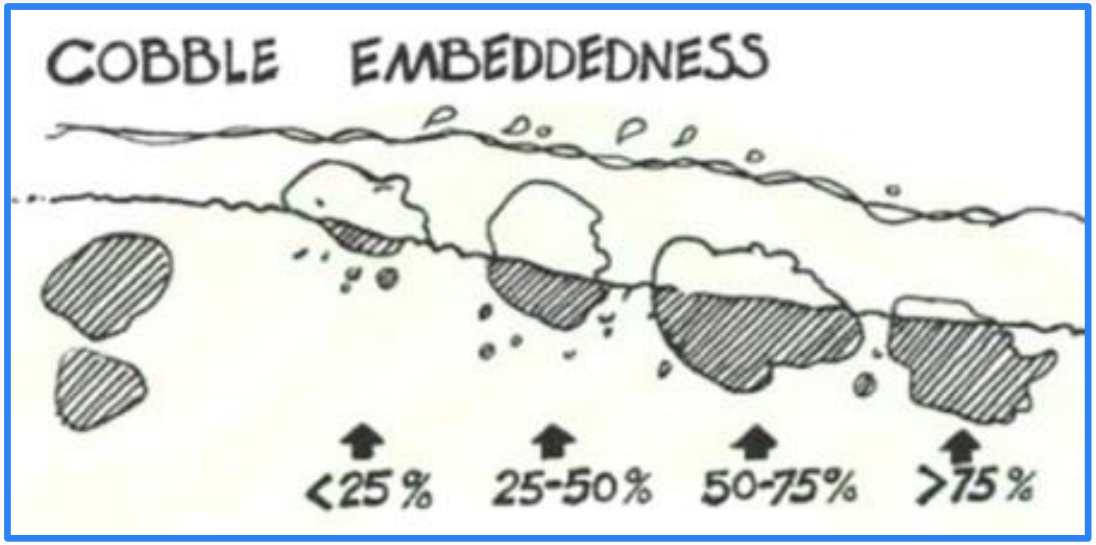
Soil Microbiome (Fungal-Bacterial Community)

Interdisciplinary Teams & Engaging Experts

Ecologists Role in the Process

- Stream Projects
  - Nomination
  - Site Scoping
  - Ranking/5-yr CIP
  - Goal-setting
  - Design teams
- Bring in the ecology
- Monitor
  - Success!?!?
  - Inform design choices

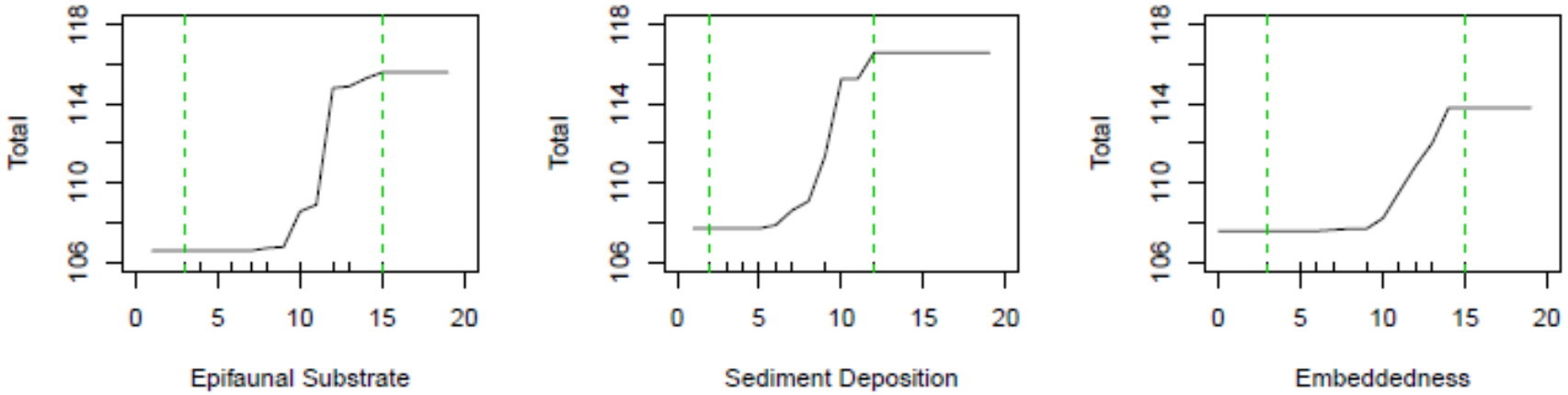
Fairfax County's RBP Habitat Assessments



2) Embedded-ness	Gravel, cobble & boulder particles in riffles and runs are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble & boulder in riffles and runs particles are 25-50% surrounded by fine sediment.	Gravel, cobble & boulder particles in riffles and runs are 50-75% surrounded by by fine sediment.	Gravel, cobble & boulder particles in riffles and runs are >75% surrounded by fine sediment.
Score_____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

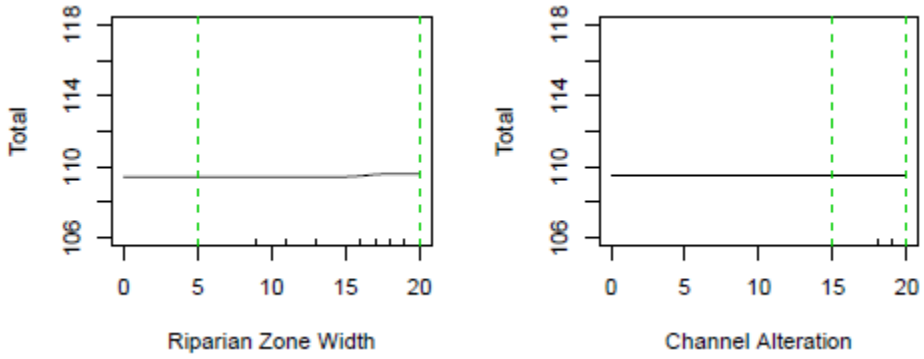
Habitat metrics vs. total habitat score

VERY INFORMATIVE



- Epifaunal substrate/ available cover
- Sediment Deposition
- Embeddedness

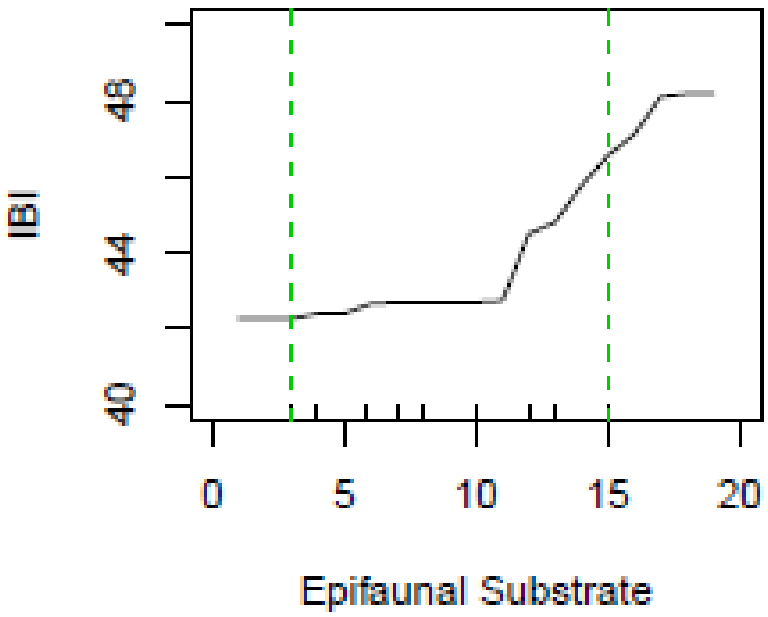
NOT INFORMATIVE



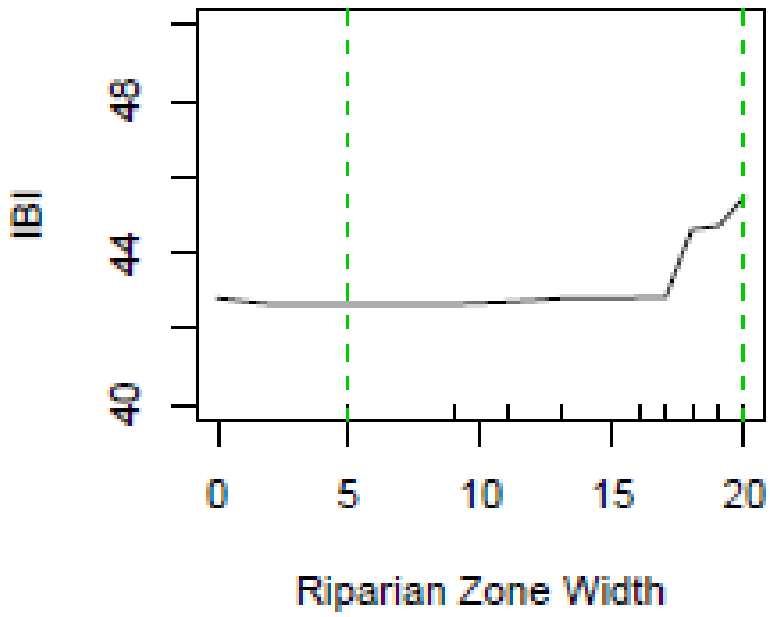
Habitat metrics vs. IBI score

- Same 3: Bed quality/available habitat

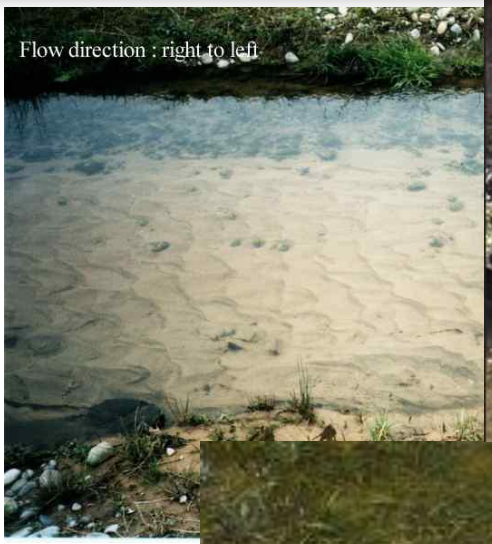
VERY INFORMATIVE



NOT INFORMATIVE



Benthic Surveys – Habitat Types



Habitat Types:

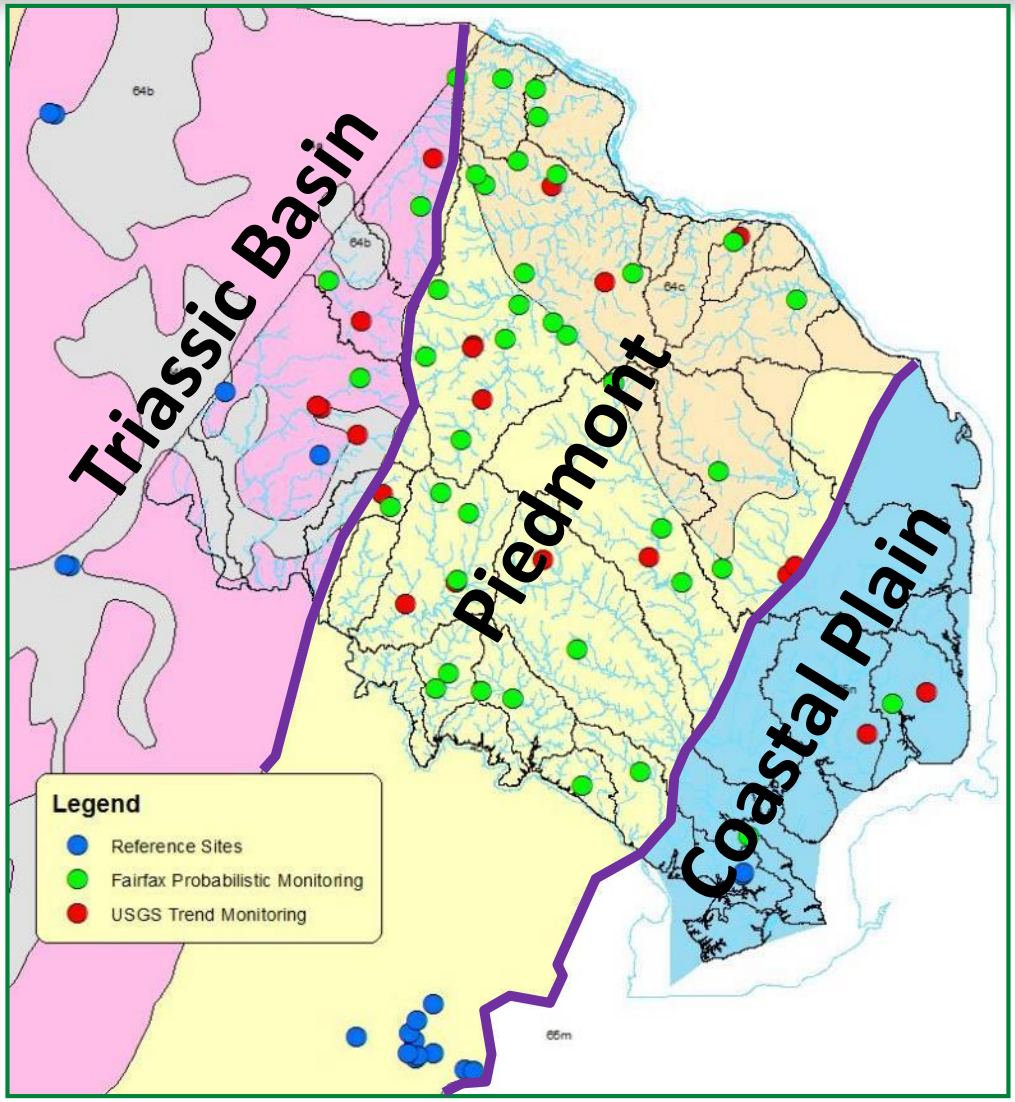
	Tally	# of Jabs:
Sand	_____	_____
Snags	_____	_____
Cobble	_____	_____
Vegetated Banks	_____	_____
Submerged Macrophytes	_____	_____

# of jabs = tally/total number of tallies x 20

*If habitat type is less than 5% of area, do not count it toward jabs

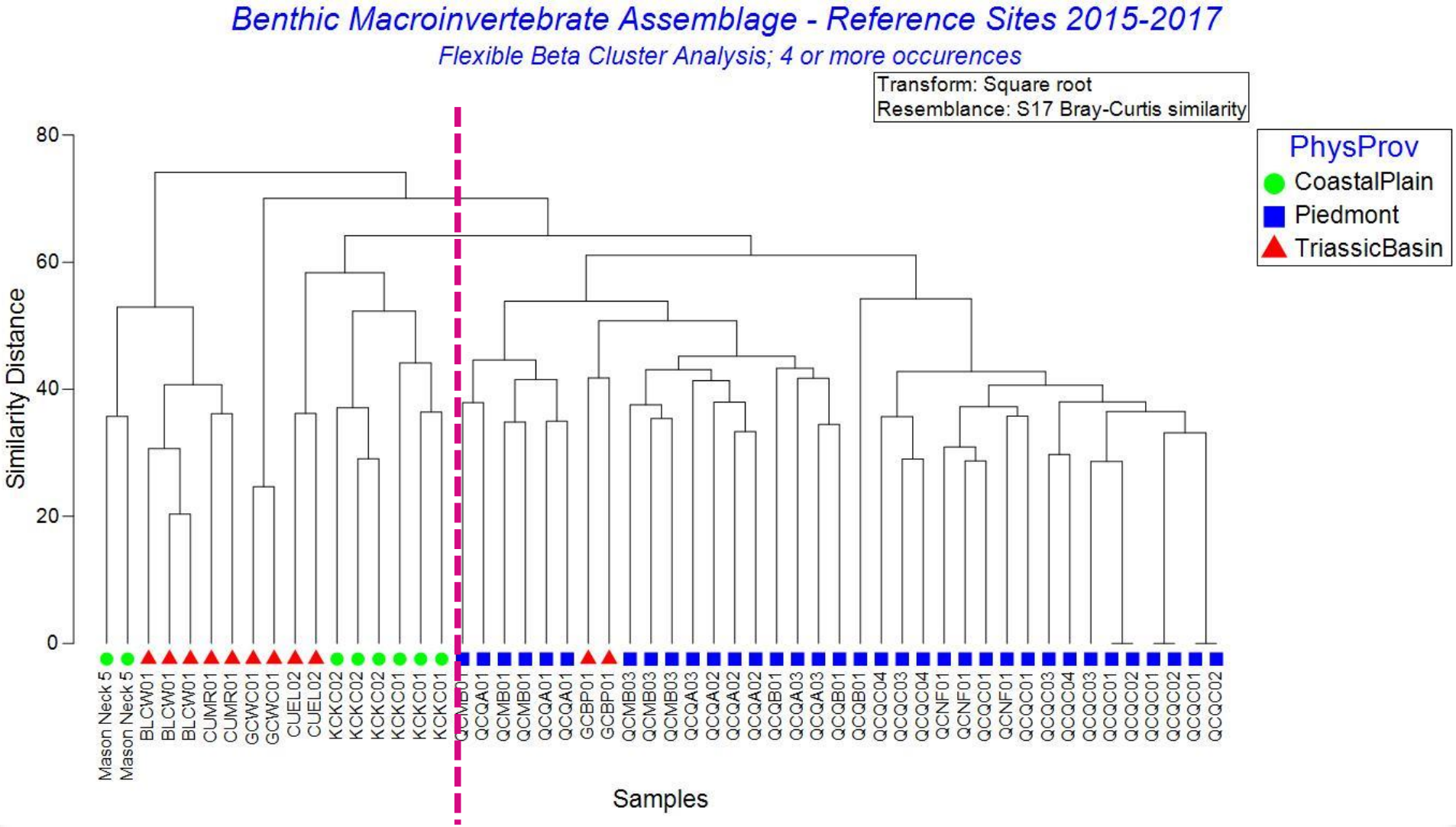
Uniform Channels – Armoring and Step Pools

Level IV Ecoregions – Benthic Monitoring

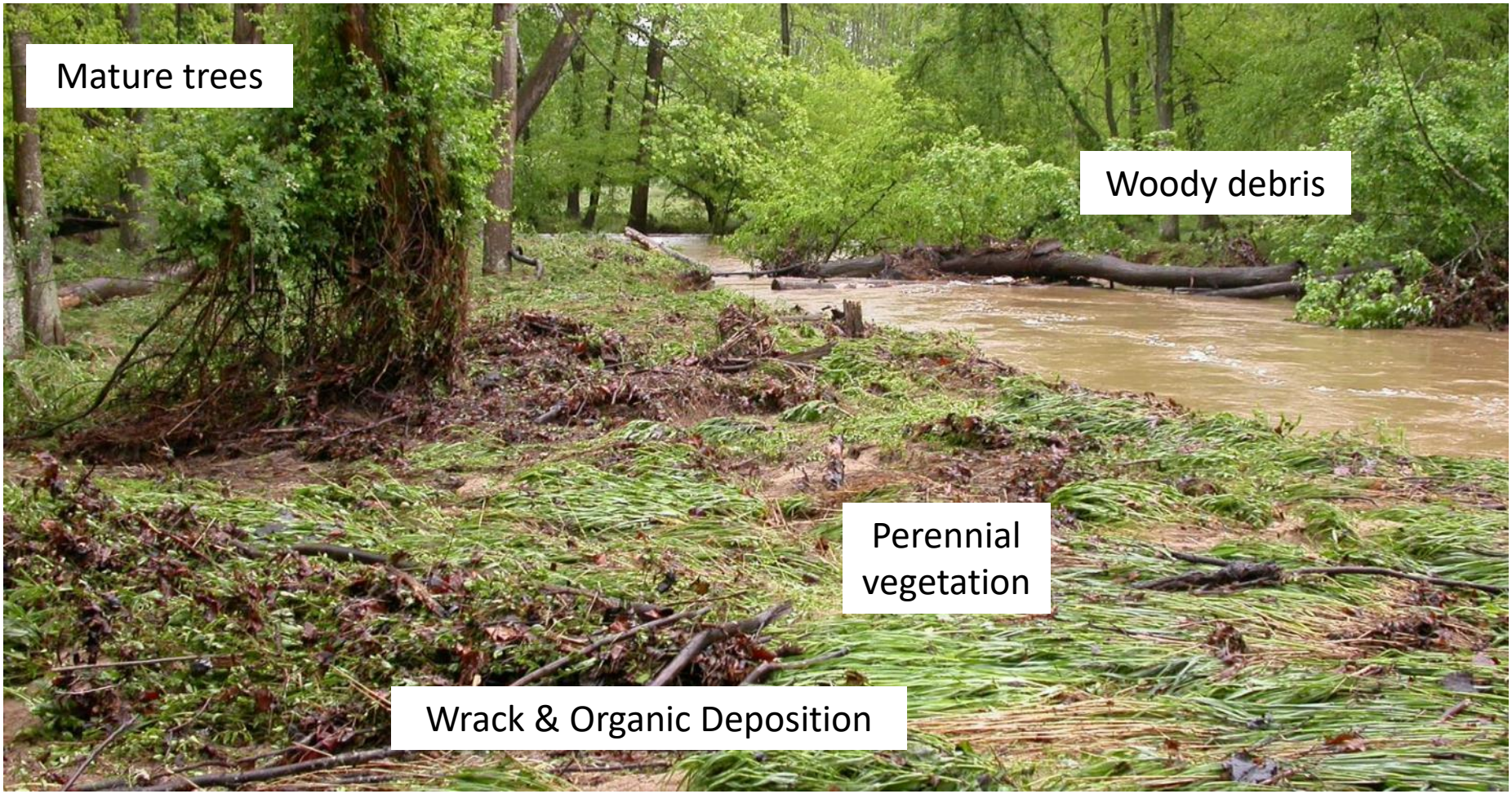


- Northern Piedmont (64)
  - 64a Triassic Lowlands
  - 64b Diabase and Conglomerate Uplands
  - 64c Piedmont Uplands
- Piedmont (45)
  - 45e Northern Inner Piedmont
- Southeastern Plains (65)
  - 65e Chesapeake Rolling Coastal Plain

Differences in the potential benthic assemblage



Floodplain Connectivity – Difficult Run (VA)



Difficult Run after a flood

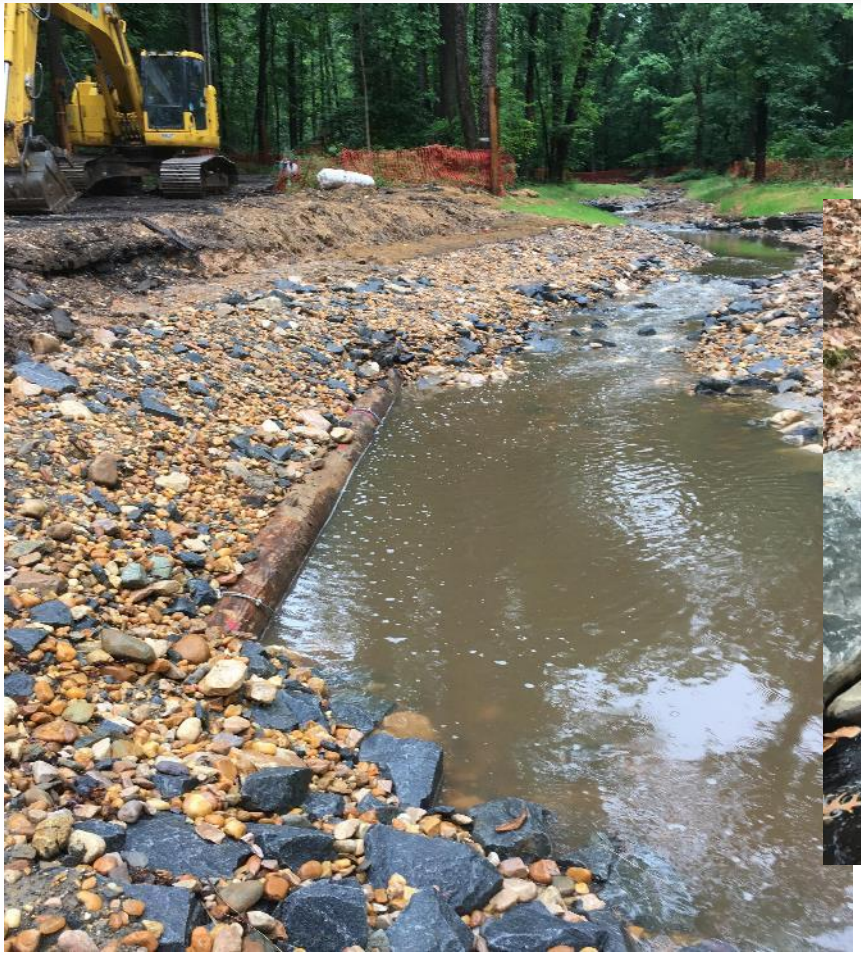
Floodplain Connectivity – New Designs

Native LWD

Restoration Large Woody Debris

Native Undercuts (Overhanging banks)

Cantilevered Toe Logs – Turkey Run @ Truro



Native Organic Debris

- "Sticky" wood & rocks

Type VI Riffle-Glide Woody Debris Installation

Type VI Riffle-Glide Woody Debris Installation

Type VI Riffle-Glide Woody Debris Installation

Type VI Riffle-Glide Woody Debris (3 weeks)

Type VI Riffle-Glide Woody Debris (3 weeks)

Urban Stream Restoration – The "take home"

Stability is easy, Ecology is hard

1) Involve experts: ecologists, biologists, urban foresters, naturalists, etc.
2) Whole stream corridor
3) Monitor, monitor, monitor – BUT
   - Monitoring should inform design

Thanks to Fairfax County Ecologists

- LeAnne Astin
- Shannon Curtis
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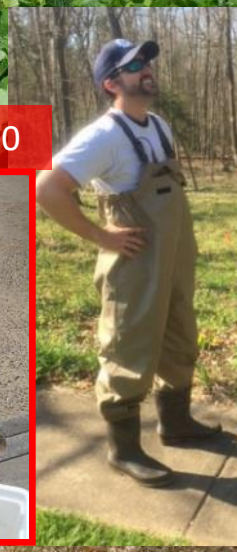
- Chad Grupe
- Anna Haley
- Chris Mueller
- Joe Sanchirico
- Jonathan Witt
- Danielle Wynne



Thursday, 9:30am, Rm 320

Additional Information

For additional information, please contact

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www.fairfaxcounty.gov/publicworks

Genus–level Tolerance Values

Chimarra

TV 4.4→7.6

Hydropsyche

TV 7.5→9.7

Cheumatopsyche

TV 6.5→9.2

Dasyhelea

TV 3.6→8.9