Prioritizing Watershed Restoration: Headwater Versus Downstream Projects

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Statement of Problem

- Watershed restoration plans identify a variety of projects competing for grant dollars:
  - many small, high unit-cost projects (e.g., source controls, retrofits, etc.)
  - thousands of linear feet of headwater stream reach rehabilitation (e.g., actively eroding gullies)
  - large projects with significant drainage areas (e.g., confluence wetlands, regional ponds)

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Statement of Problem

- Prioritization efforts often aren't sufficient
  - Biased towards multiple economic metrics
    - Private vs public lands
    - Estimated construction costs
    - Cost per unit area
  - Focused on a narrow set of costs and benefits
    - Construction and long-term O&M costs
    - Volume of water 'handled'
    - Sediment and nutrient removal efficiency

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Statement of Problem

- Decisions often focused on ‘1st Cost’ economics and lack ‘whole system’ thinking and analysis
- May not properly capture value of projects with source control

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Regenerative Design

perpetuates a reinforcing feedback loop that continues to build and sustain life-supporting processes.

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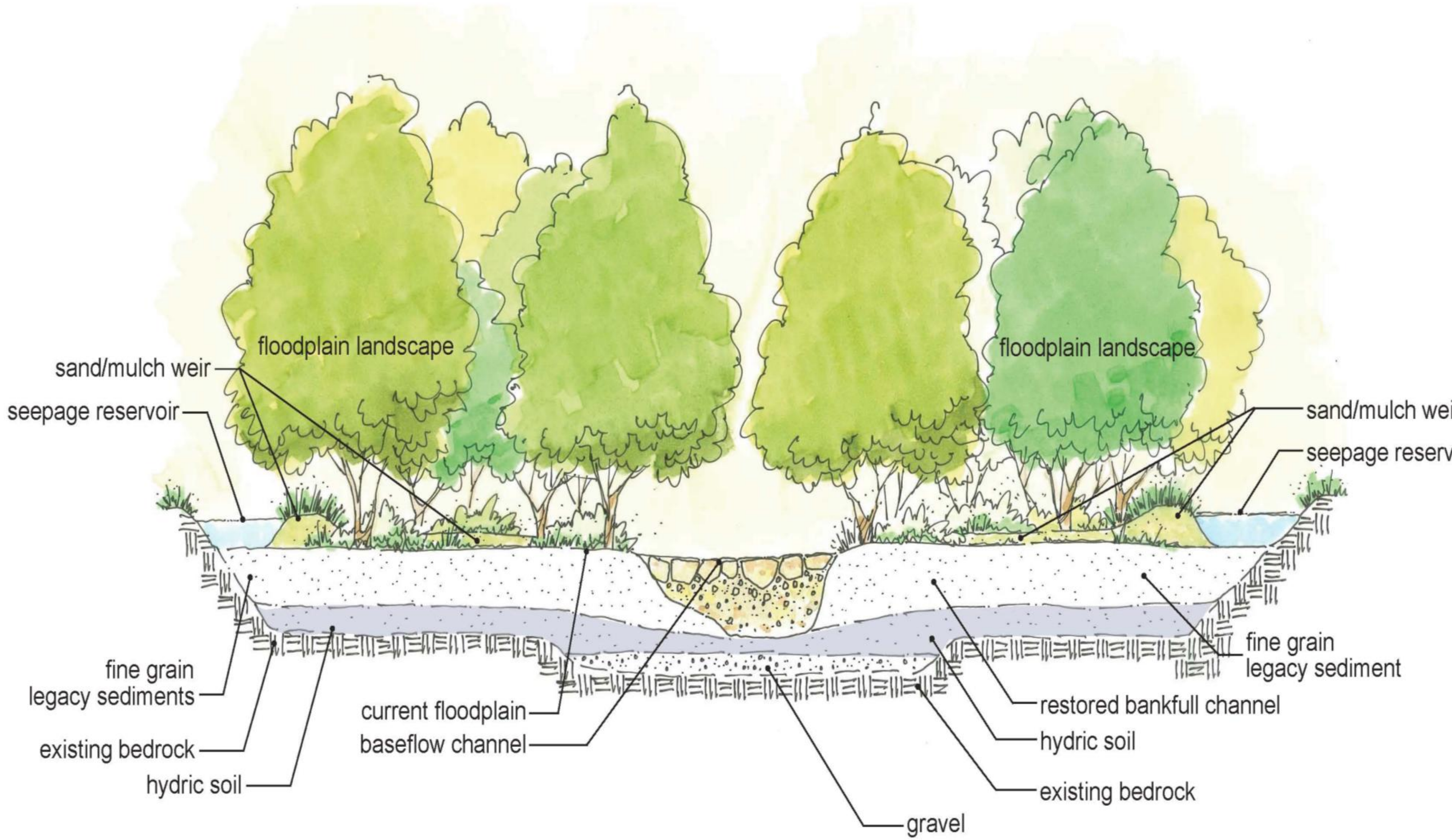

OPTION 3
regenerative approach
cross section

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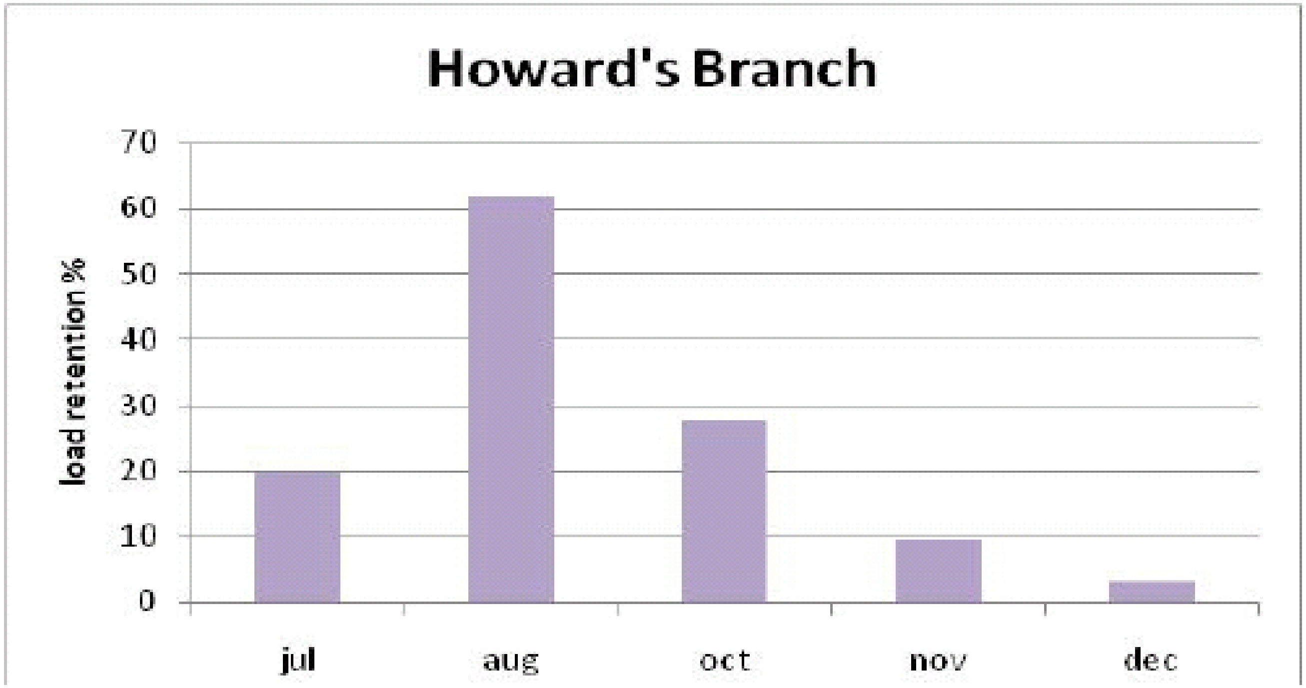


Figure 32. Percent load reduction of TN in the restored reach of Howard's Branch during five different storm events.

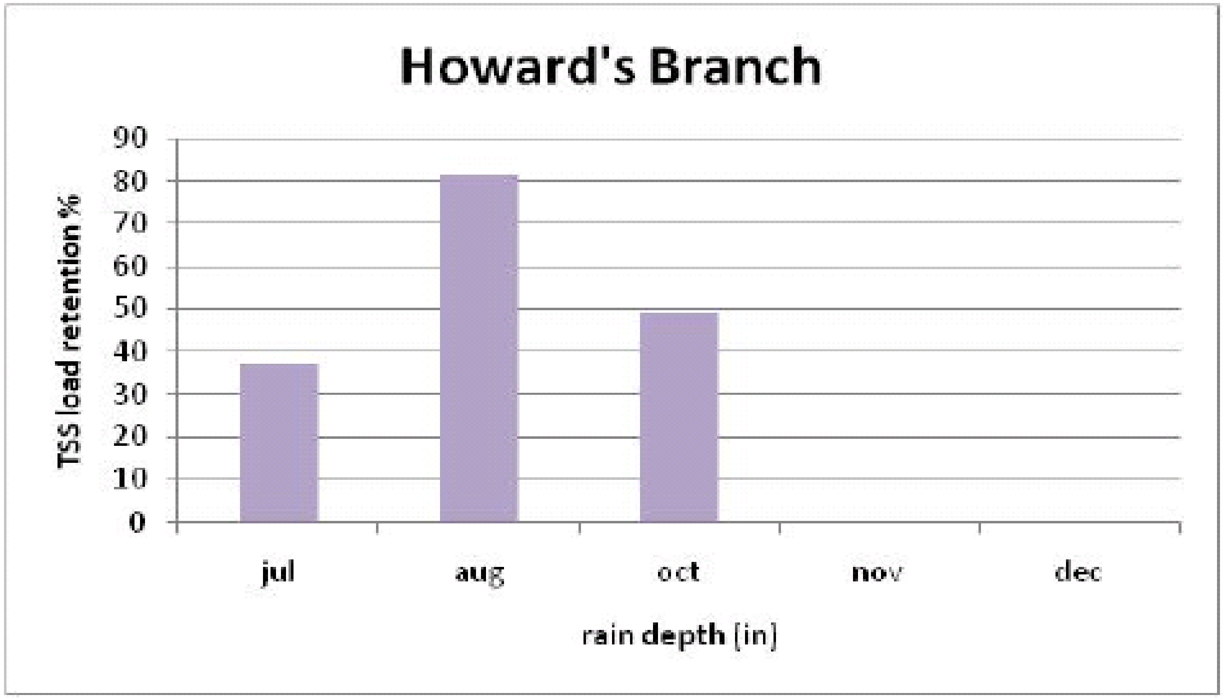
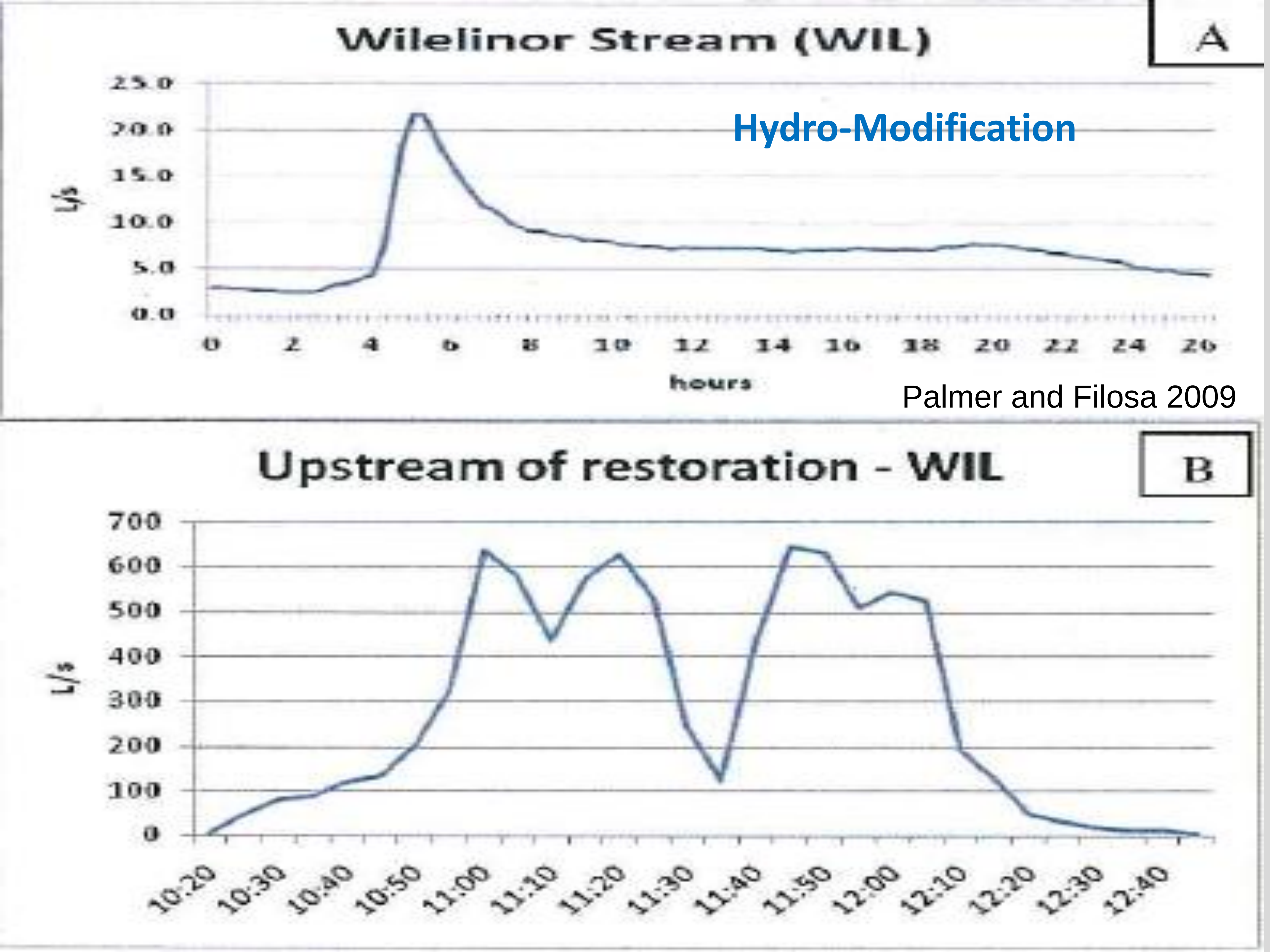


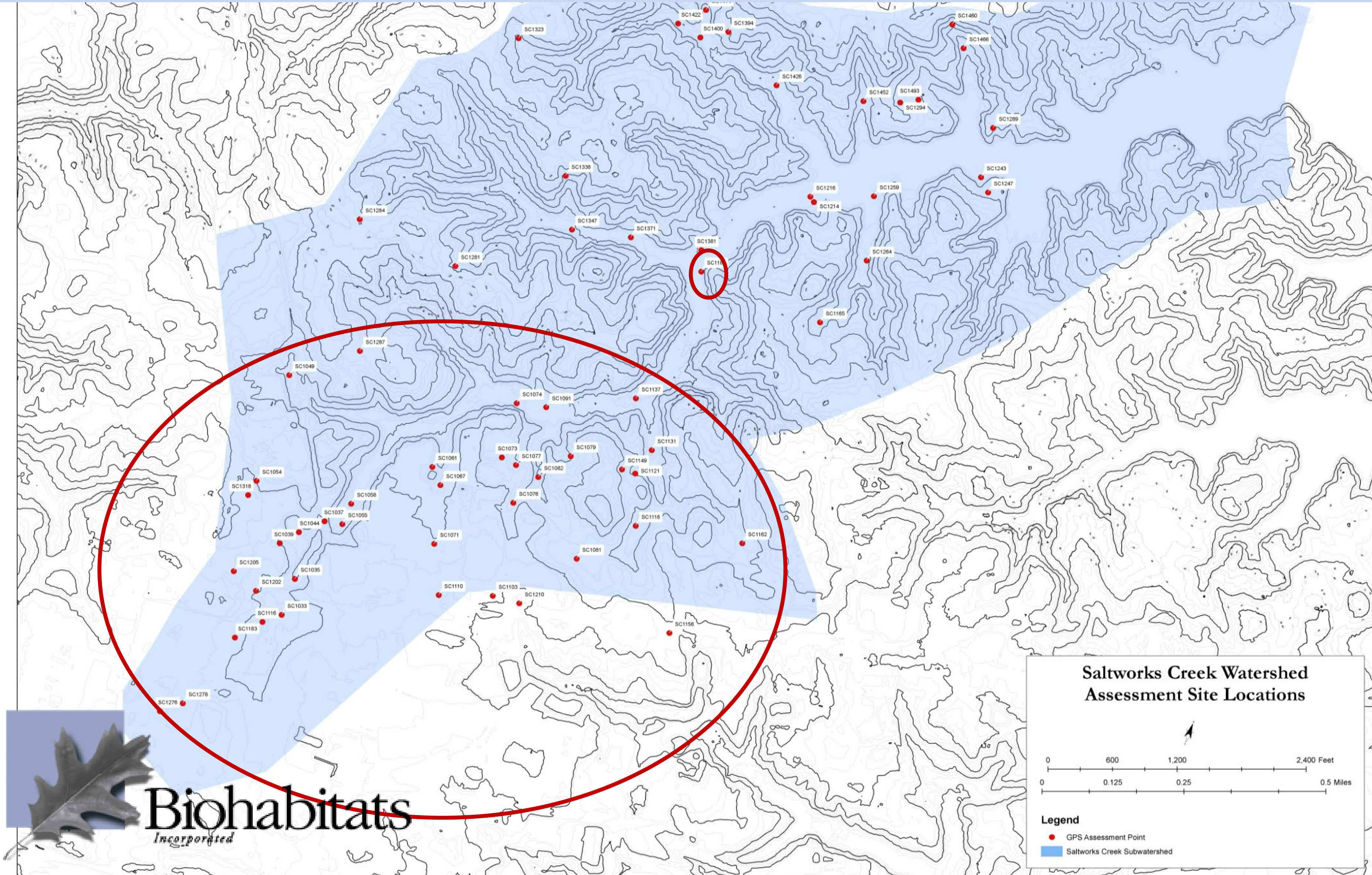
Figure 34. Percent load reduction of TSS in the restored reach of Howard's Branch during five different storm events.

Palmer and Filosa 2009



Wilelinor Stream (WIL)
A
Hydro-Modification
L/s
25.0
20.0
15.0
10.0
5.0
0.0
0 2 4 6 8 10 12 14 16 18 20 22 24 26
hours
Palmer and Filosa 2009
Upstream of restoration - WIL
B
L/s
700
600
500
400
300
200
100
0
10:20 10:30 10:40 10:50 11:00 11:10 11:20 11:30 11:40 11:50 12:00 12:10 12:20 12:30 12:40

A Case In Point
Saltworks Creek Watershed



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A Clear Choice?

- 1 small high priority site
  - Gully repair, reconnection of incised stream to floodplain
- $450,000 construction
- 1,100 lf of stream
- 6.6 ac of treatment
- 6,000 CY of water storage

- 1 confluence wetland
  - Weir across stream valley with baseflow maintenance
- $550,000 construction
- 1,300 lf stream
- 9.4 ac of treatment
- 38,000 CY of water storage

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Another View

- 1 high priority site
  - Restore 5% of the drainage network
  - Significant source reduction for sediment and nutrient production
  - Capitalize on floodplain reconnection , including pollutant trapping
  - Retains and enhances existing resources
- 1 confluence wetland
  - Restores 0% of the drainage network
  - No source control, focus on trapping delivered ‘pollutants’
  - Converts forested floodplain to treatment wetland
  - Initiates a long-term succession to new endpoint

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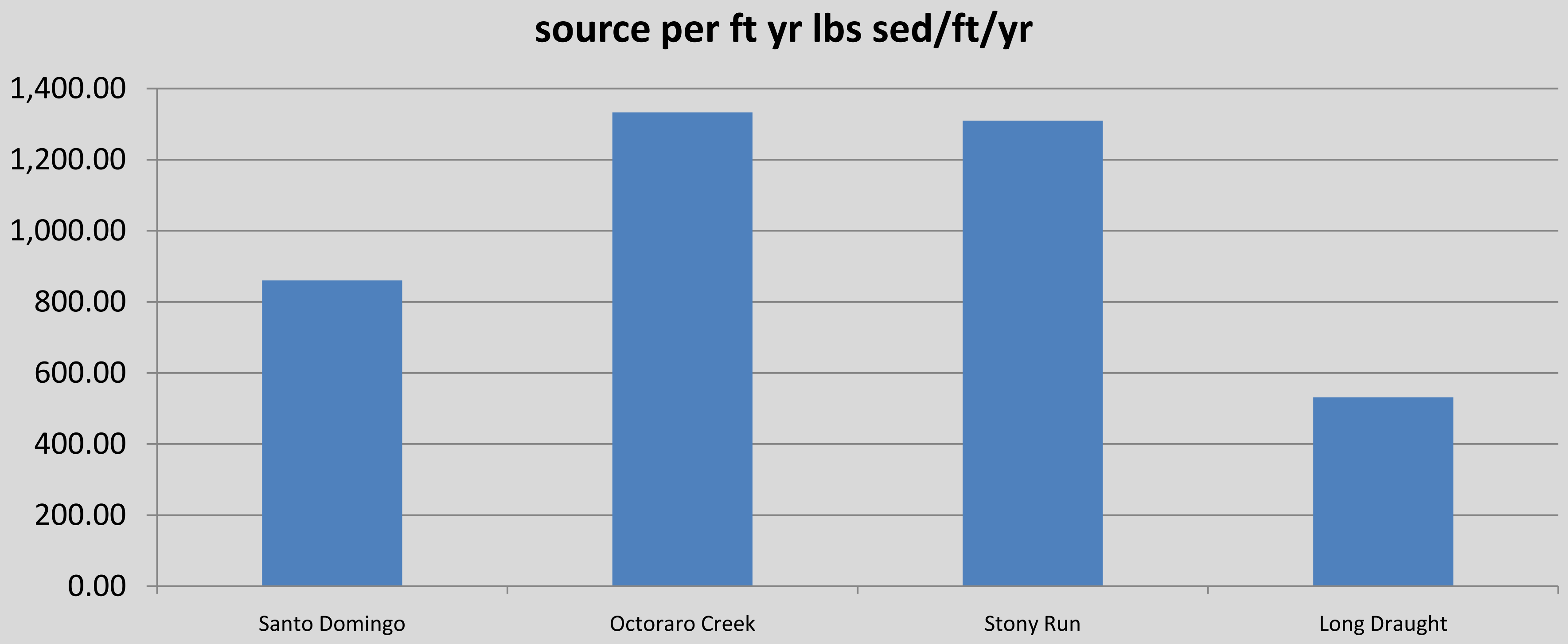
Sediment Supply
Channel Adjustment to Stormwater Flow



- Based on estimated channel length and sediment yield/foot, total annual sediment load to the confluence wetland is estimated at about 10,434 CY

Source:http://www.landstudies.com/media/pdf/10.pdf

Performance Comparison

1 Small High Priority Site

- reduction in channel adjustment source yields
  - 470 CY annual reduction in sediment load—for a 50 yr project 23,475 CY reduction
- Little remaining sediment delivered to 6,000 CY storage volume—sediment trapping capacity projected to last for more than 50 yr project life

1 Large Confluence Wetland

- 0% reduction in channel adjustment source
  - does nothing to reduce sediment supply to project, reducing its life
- 50% storage volume of 38,000 CY, filled in <2 years, then new equilibrium and nothing for remainder of 50 yr project life

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Cost Per Unit Sediment 'Handled'

1 Small High Priority Sites

- $450,000 implementation cost
- ~23,475 CY source reduction (470 CY/yr *50 yrs)
- 3,000 CY trapping
- ~26,475 CY total/$450,000 =$17/CY

1 Large Confluence Wetland

- $550,000 implementation cost
- 0 CY source reduction
- 19,000 CY trapping/$550K = $29/CY

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Other Benefits/Costs?

1 Small High Priority Site

- 1,100 lf stream restoration
  - Improved aquatic resources
- 6.5 ac floodplain reconnection
  - Enhancement of wetlands
  - Suppression of invasive plants
- Assume restoration and enhancement results in an increase in natural capital with a real dollar value

1 Large Confluence Wetland

- Conversion of 9.4 ac of bottomland forest into mosaic of
  - Aquatic bed, emergent, shrub/scrub wetlands
- Conversion of ~1300 lf of stream into lacustrine wetland habitat
- Assume habitat conversion has neutral financial impact

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Solution

- Don’t rely on ‘1st Cost’ Analysis
- Identify project as a Source Control or a Trap
  - Address the problem, not the symptom
- Provide an Estimate of Project Life
  - Sustainable solutions are integrated solutions
- Avoid dominating multiple processes by optimizing a single process

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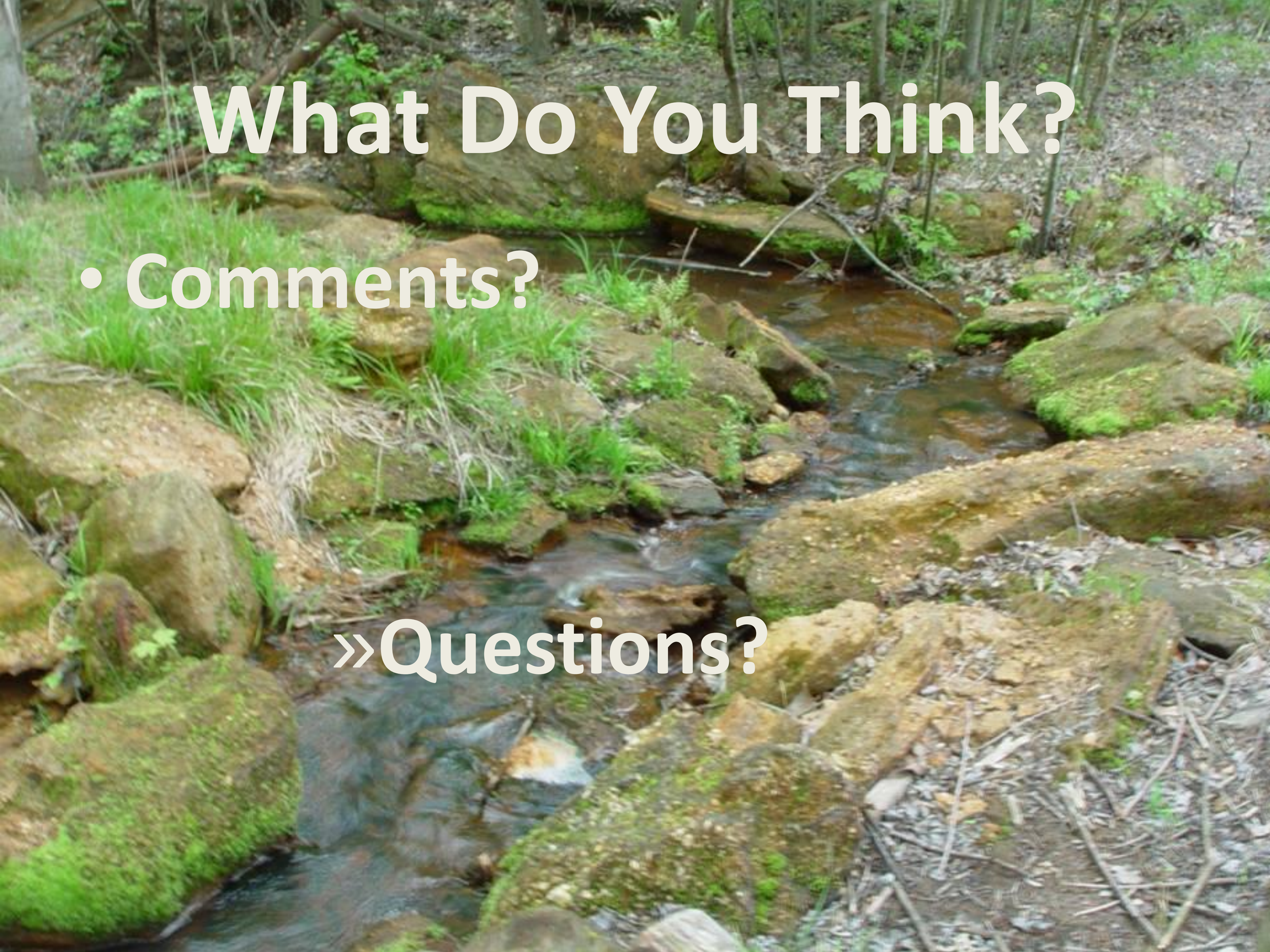

What Do You Think?

- Comments?

»Questions?