Science, Policy and Outcomes in Developing Stream Compensatory Mitigation Criteria

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What is a “good stream compensation”?

- The development of stream assessment and credit measures involves the different views of scientists, regulatory staff, and mitigation bankers. How are these expressed and resolved?
- Do mitigation projects have physical characteristics that are different from non-mitigation restoration projects?

2008 Compensation Rule

"Existing literature regarding stream restoration, as well as our experience with past stream mitigation projects supports our decision to require mitigation plans for stream compensatory mitigation projects to contain the same twelve fundamental elements [as wetland compensation]"

-- Preamble, p. 19596

"In cases where appropriate functional or condition assessment methods or other suitable metrics are available, these methods should be used where practicable to determine how much compensatory mitigation is required."

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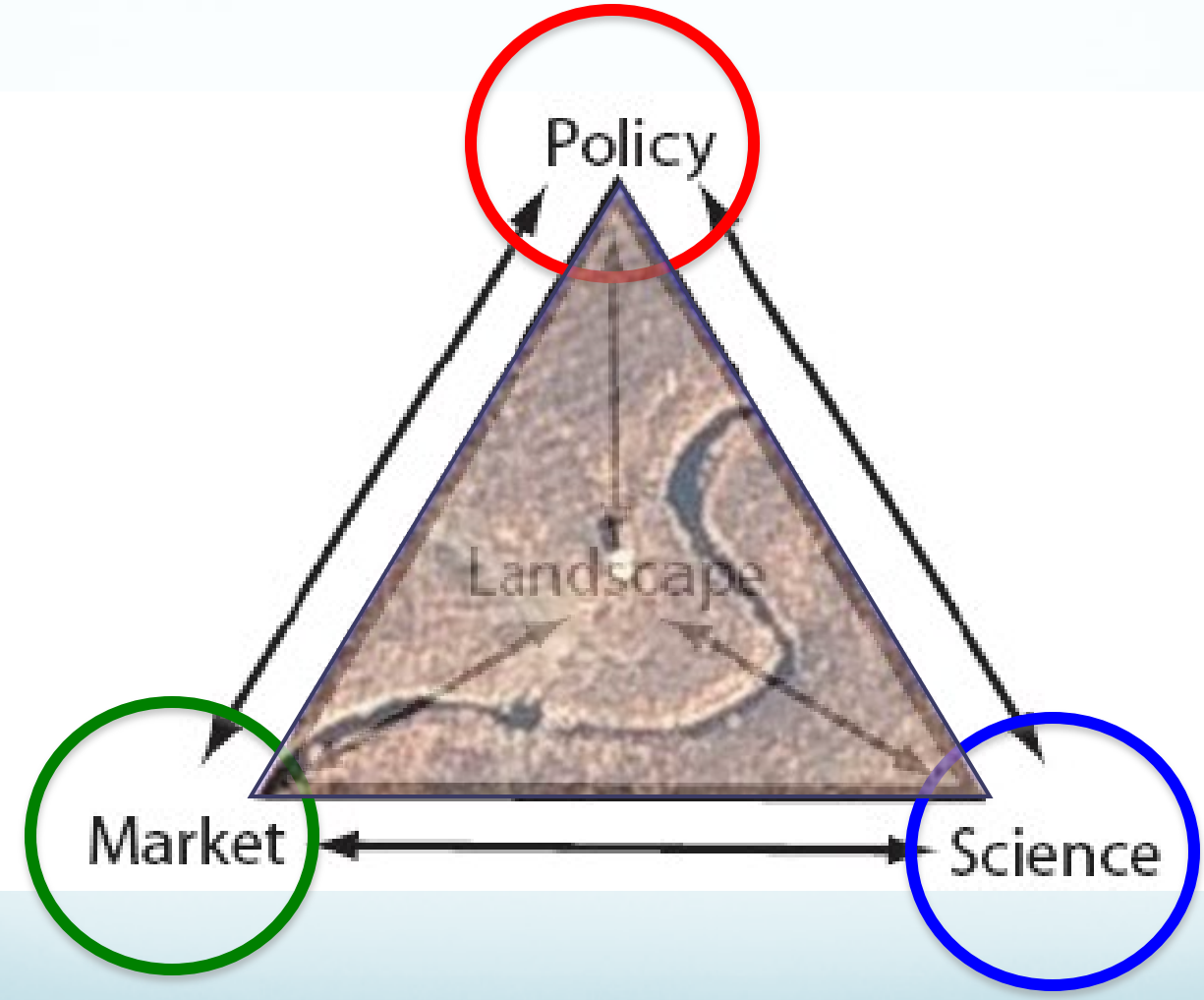
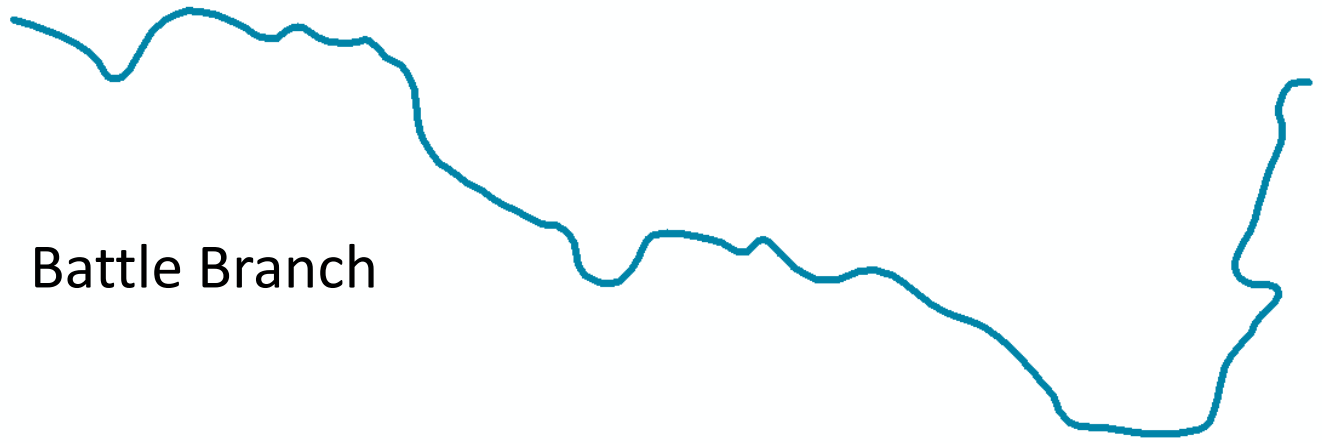
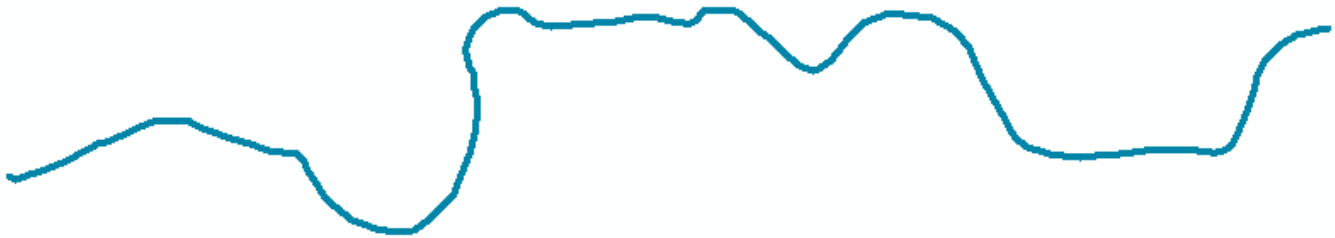

Policy
Landscape
Market
Science

Non-Restored Stream Pattern



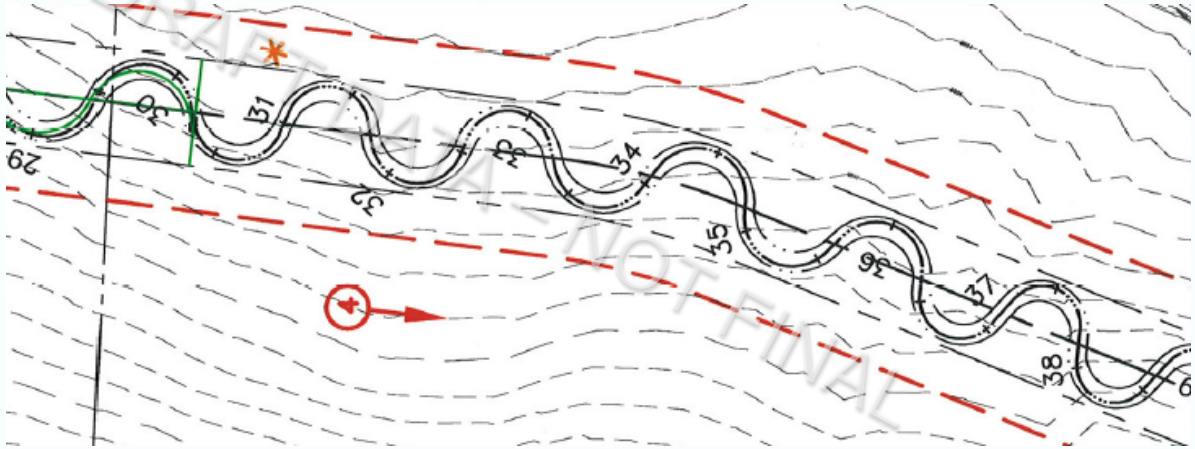
Battle Branch



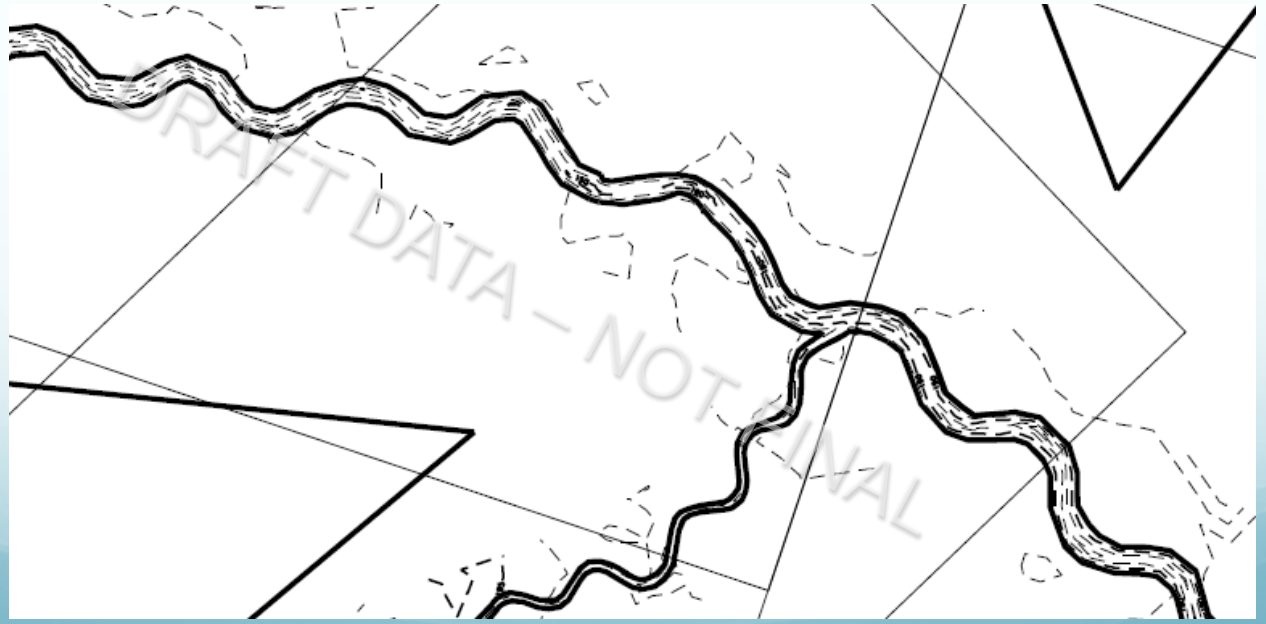
Buffalo Creek

Restored Stream Pattern

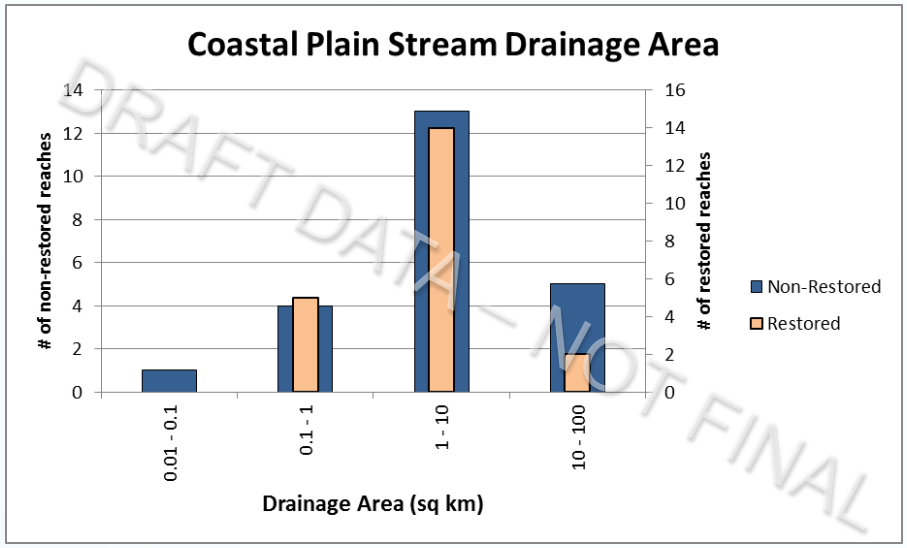
South Muddy Creek

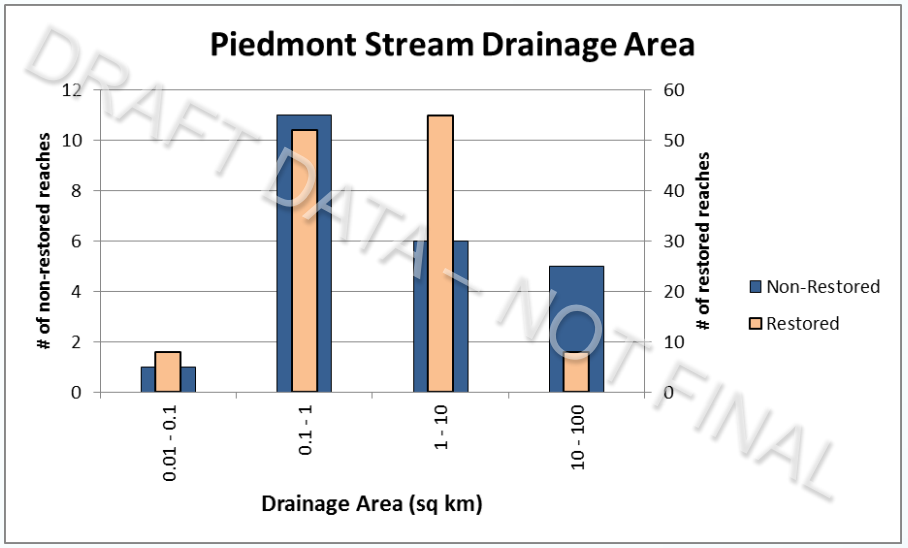


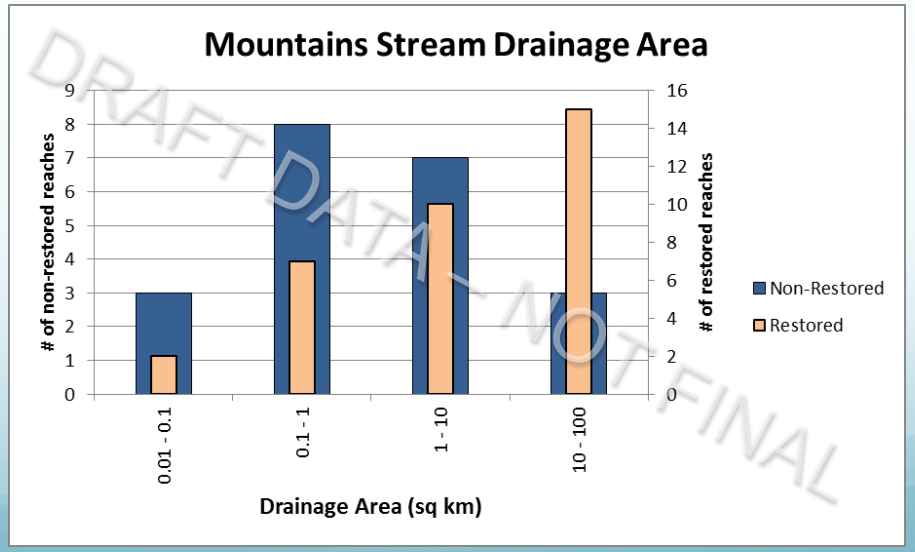
Farrar Dairy



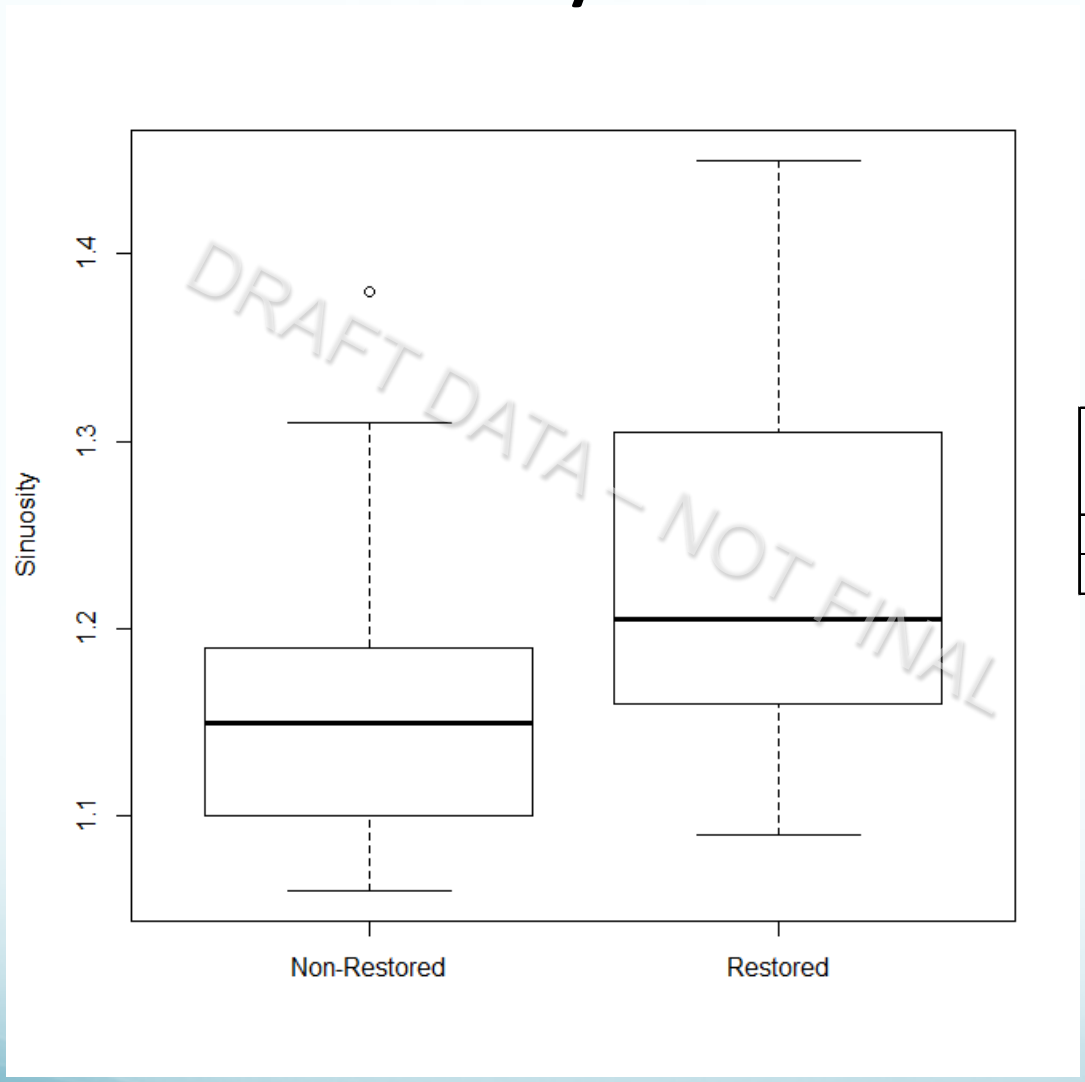
Drainage Area (log cycle histograms)





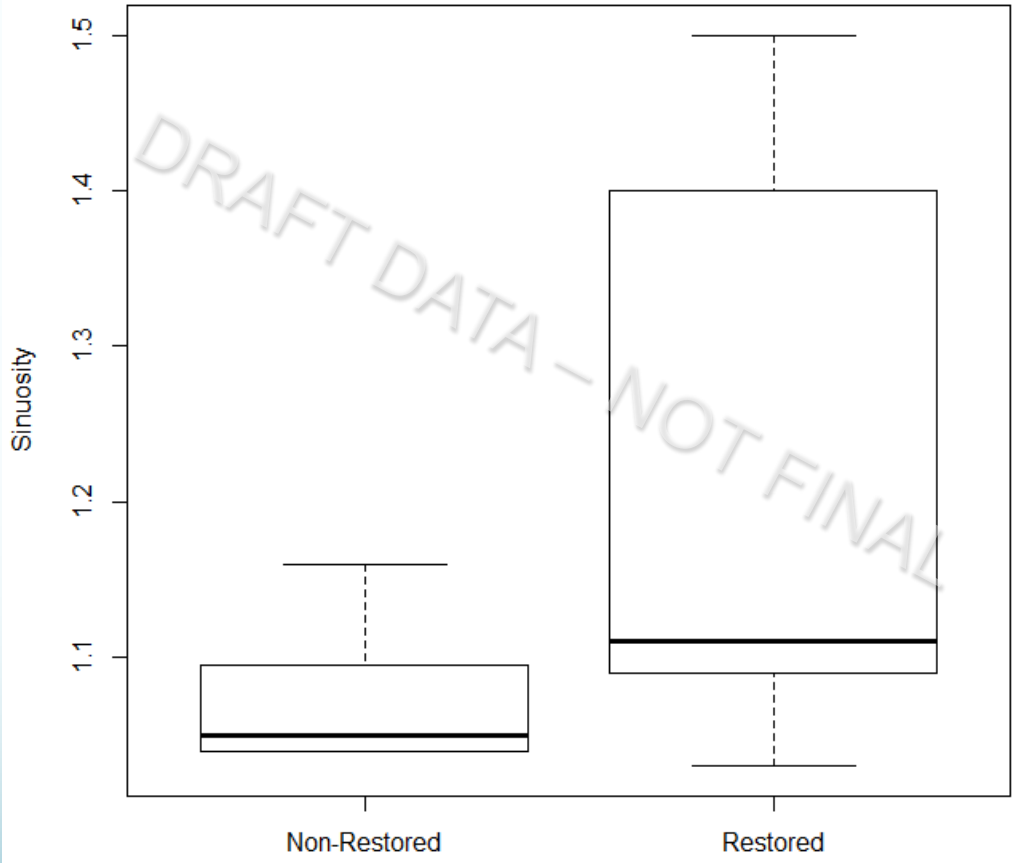


Sinuosity of Piedmont Streams



Stream Type	# of Reaches	Mean Sinuosity	Sinuosity Range
Non-Restored	15	1.17	1.06 to 1.38
Restored	20	1.23	1.09 to 1.45

Sinuosity of Mountain Streams



Stream Type	# of Reaches	Mean Sinuosity	Sinuosity Range
Non-Restored	11	1.07	1.04 to 1.16
Restored	14	1.21	1.03 to 1.50

National Trends

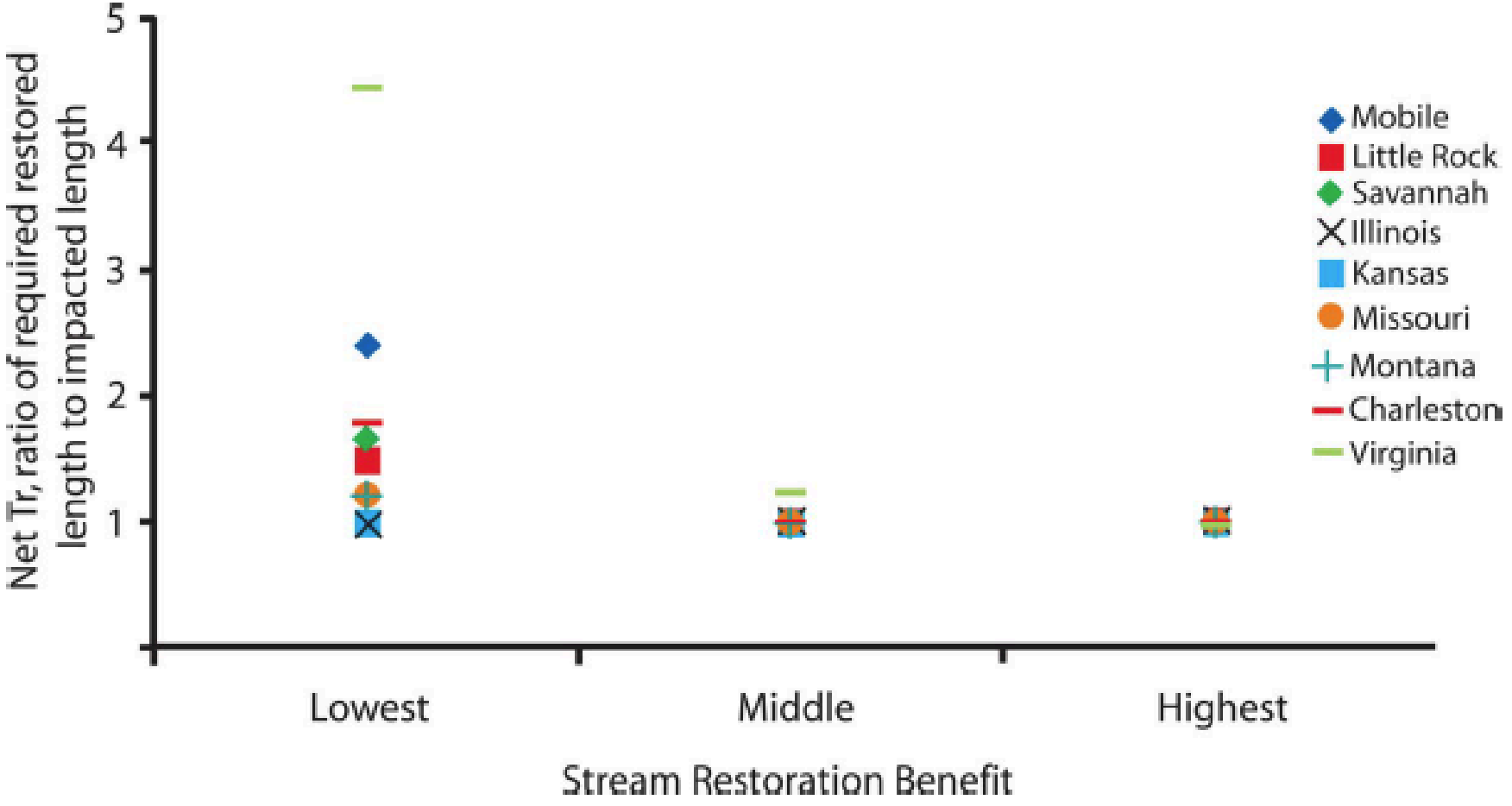
- Stream mitigation guidance not yet universal
  - Well-established in some states
  - Fewer than half the states have programs in place

- Stream mitigation policies in place as of 2011
  - No set of consistent national practices; instead tailored to local ecological and political realities
  - Substantial policy transfer, though, particularly from Charleston and Norfolk Districts

National Trends, cont.

- Key similarities:
  - Ratios of credits to debits
  - Lots of flexibility built in

- Success criteria
  - Mostly qualitative (exceptions Ohio and Norfolk)
  - Only riparian buffers and channel form/stability
  - Puzzling, given CWA phys/chem/bio requirements



From: Doyle *et al*. 2013. "River Federalism." *Annals of the Association of American Geographers* 103(2): 290-298.

National Trends, cont.

- Why no chemical or biological success criteria other than vegetation?
  - Interview results very helpful in explaining this
  - No baseline data: too expensive or difficult to gather
  - “Streams are a product of their watershed”
  - Huge issue, given goals of CWA

- For more detail: Doyle et al. 2013. "River Federalism." *Annals of the Association of American Geographers* 103(2):290-98.

Interview themes

- ***Success criteria tend to emphasize static conditions and the durability of design features rather than the restoration of processes***
  - "Self-forming channels"
- ***The deployment of functional assessment is happening unevenly***
  - NC implementing NCSAM
  - Ohio: strong tradition of condition assessment
  - Oregon: state law meeting resistance

Interview themes

- ***Streams often fail to conform to the "textbook stream" in key ways unique to a region***
  - "Wetland streams", "linear wetlands", "headwaters wetlands" confound classification and assessment.

Conceptual Response Curves

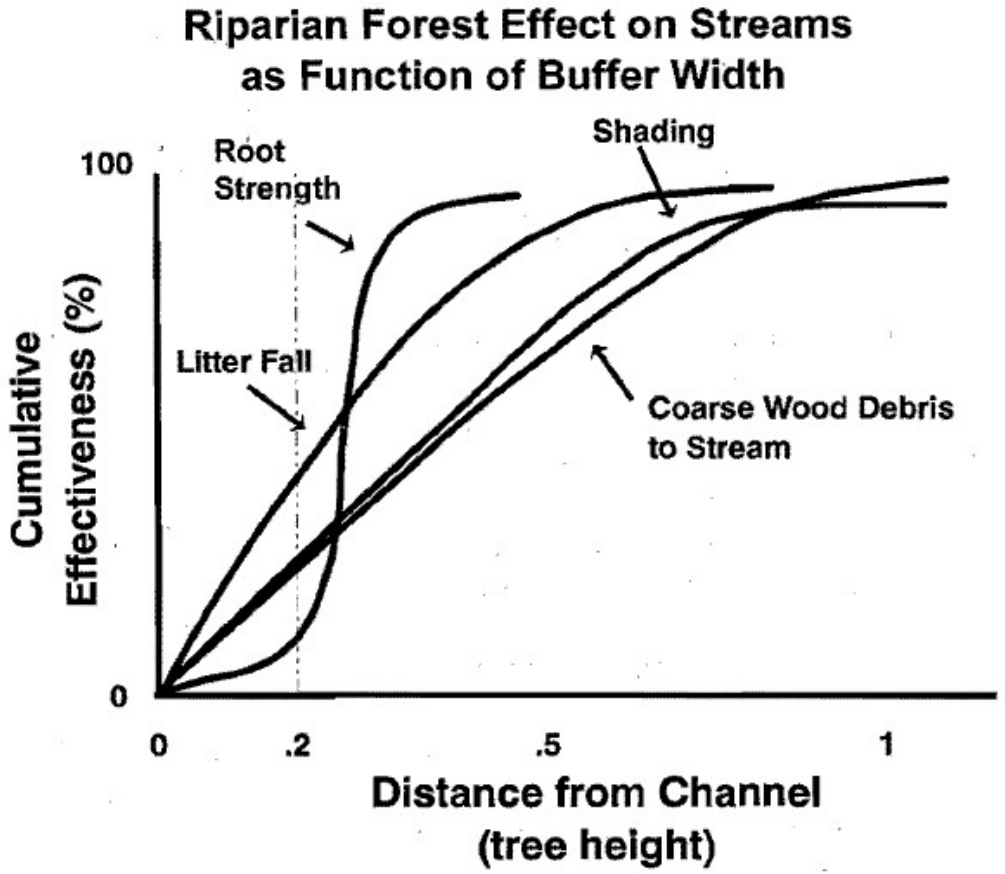


Figure V-12. Generalized curves indicating percent of riparian ecological functions and processes occurring within varying distances from the edge of a forest stand.

Not Stacked (Spatially Distinct)		Stacked (Spatially Overlapped)
1 acre forest earning carbon credits	1 acre forest earning endangered species habitat credits	1 acre forest earning both carbon credits and endangered species habitat credits
 One property		 One property
Total Credits = 2 Total Acres = 2		**Total Credits = 2 Total Acres = 1**

From: Fox, J. 2011. U.S. National Opinion Survey on Stacking Environmental Credits: Definition, Status, and Predictions of Wetland, Species, Carbon, and Water Quality Credit Stacking. Palo Alto, CA: EPRI.

http://my.epri.com/portal/server.pt?open=512&objID=423&&PageID=235467&mode=2&in_hi_userid=230564&cached=true

Remainder of grant

- Finish geomorphological work comparing compensation sites to natural sites.
- Cluster analysis of interviewees responding to set of statements drawn from interviews.
- Qualitative analysis of interviews to characterize important axes of debate over stream compensation and assessment.