Cornell University

New York State
Water Resources Institute

2016 Undergraduate Intern ships

Biological and Environmental Engineering
Cornell University

Assessing Riparian Restoration: Impacts on Stream Health

Advisor: Todd Walter
Ecohydrology Group, Soil and Water Lab
Biological and Environmental Engineering

How to apply

Email a cover letter (1 pg) and resume to nyswri@cornell.edu. In the cover letter, please explain why you are interested in this internship and highlight any skills or courses you have taken that might be relevant to this internship. Applications Due: April 8, 2016.

Background

Riparian areas have been historically degraded during the land development process in many upstate New York watersheds. Degradation of critical habitat can lead to negative impacts to streams and rivers, including increased sediment deposition and loss of biodiversity. Maintaining and restoring healthy riparian buffers is a critical element of any watershed program. The Hudson River Estuary Program (HERP) is actively engaged in re-planting degraded riparian areas through its Trees for Tribs (TfT) program[1], which last year became a state-wide, DEC funded program; it has also been recently replicated in Pennsylvania. TfT offers free native trees and shrubs to plant along riparian buffer planting/restoration sites and works with partners to engage volunteers in planting and site maintenance. They have been planting since 2007 and are guided by two principals: (1) to educate the public about the importance of stream buffers and (2) to increase community resiliency through restoration of vegetation in buffers. Monitoring of the TfT program has been limited, but the HREP is eager for data that can be used to assess potential habitat and water quality impacts associated with their efforts.

Research objective & work plan

The objective of this project is to assess the impact of the TfT program on water quality and stream ecology. A parallel effort led by Dr. Suzanne Beyeler will assess the riparian area itself. Data from both efforts will be pooled at the end of the summer to prepare a report on the overall impact of the TfT program, including potential guidance for future efforts to maximize success.

Nine to fifteen watersheds variously dominated by agriculture, urban, and forested land use/cover will be assessed. Additionally, 3-5 sites will be identified for planting in the near future that will serve as control sites. Interns will assist with field work, laboratory analyses, report preparation, and a final presentation to stakeholders. Field work will involve collecting data to assess channel geometry, streambed condition, and stream habitat health:

[1] For information about the TfT program: http://www.dec.ny.gov/lands/43668.html

Channel Geometry: Bankfull hydraulic geometry will be quantified, i.e., bankfull width, hydraulic depth, and hydraulic radius. The stream slope will also be measured. These factors have a strong influence on "stream power," which is a primary driver of stream bed erosion and sediment carrying capacity. Students will also measure stream discharge, which will allow them to quantify "roughness" using Manning's equation for open channel flow.

Physical Streambed Condition: The grain size distribution of riffle substrate will be characterized using systematic Wolman (1954)[2] pebble counts. This parameter is often used as an index of stream bed stability.

I**n-stream Aquatic Habitat:** We will use the Stream Visual Assessment Protocol (SVAP, USDA, 1998)[3] and Pfankuch surveys (Pfankuch, 1975)[4] for insights into the effectiveness of riparian tree plantings on in-stream habitat creation and channel stability. Briefly, the SVAP and Pfankuch indices provide a qualitative ranking of stream integrity by assigning a numeric value to stream condition factors that are then averaged to obtain an overall rating for the study reach.

Watershed Area / Stream Order: The student researchers will use GIS to determine the stream order of each reach and drainage area above each stream reach; we will provide GIS training if necessary. We anticipate that ecosystem response to tree planting will be different for different size streams. For example, if the stream is small enough for complete canopy coverage we expect lower stream temperatures than for large streams for which the there is a gap in the canopy that allows direct solar radiation to reach the water surface.

All reaches will be thoroughly photographed as part of the data collection.

Laboratory analyses and macroinvertebrate identification will be carried-out in the Cornell Soil and Water Lab in Ithaca. In addition to the final report, interns will help develop outreach materials for the NYS Water Resources Institute website and for use in future TfT presentations.

Faculty and Staff Support

Dr. Todd Walter (mtw5)
Professor; WRI Director
Department: BEE

Dr. Alex Flecker (asf3)
Professor
Department: BIOES

Dr. Clifford Kraft (cek7)
Professor
Department: NTRS

Dr. Brian Rahm (bgr4)
Research Associate
Department: BEE

Graduate Student Coordinator

Lisa Watkins (ltw35)
Department: BEE

Community Partner

Name: Hudson River Estuary Program
Contact: Beth Roessler
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For More Information

Contact Todd Walter (Ph. 607-255-2488, Email. mtw5@cornell.edu)
Department of Biological and Environmental Engineering
NYS Water Resources Institute - Director

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[2] Wolman MG. 1954. A method for sampling course river-bed material. American Geophysical Union Transactions 35: 951–956

[3] USDA. 1998. Stream Visual Assessment Protocol. United States Department of Agriculture, Natural Resource: Conservation Service.

[4] *Pfankuch DJ. 1975. Stream reach inventory and channel stability evaluation. USDA Forest Service: Northern Region, Montana.*