SUSTAINABILITY INITIATIVES BY STUDENT ORGANIZATIONS FUNDING PROPOSAL

Name of Student Organization	Stroubles Creek Restoration Initiative (SCRI), American Water Resource Association at Virginia Tech, The Environmental Coalition at Virginia Tech, VT StREAM Lab
Contact/Responsible Person	Maria Saxton - SCRI Planner
Contact Office Held/Title	Cully Hession - BSE, StREAM Lab coordinator
Contact Email Address	chession@vt.edu, maria.saxton@vt.edu
Contact Telephone Number	540-449-6968

Estimate Cost of this Proposal	$21,720	See Part III.C
Estimated Savings –	$5,220	
Net Cost of this Proposal	**$16,500**	

Part III

A. Please describe your sustainability initiative and attach supporting documentation.

This proposal seeks funding for ongoing riparian restoration efforts along portions of Stroubles Creek owned by Virginia Tech. The requested funding will be used to plant approximately 2,400 native trees along Stroubles Creek and major tributaries. This project will be completed over the course of two years (Fall 2018 – Fall 2020) with planting events occurring in late fall and early spring of each year while tree seedlings are dormant and their rate of survival is highest.

This funding is needed for various vegetation and riparian habitat restoration projects that will be conducted by undergraduate and graduate students from the College of Natural Resources and Environment, Agriculture and Life Sciences, and Biological Systems Engineering (BSE). The restoration sites are located in historically disturbed riparian

areas, existing wetlands, and floodplains which are regularly inundated with stormwater runoff. These sites are experiencing a rapid influx of non-native, invasive vegetation such as autumn olive, multiflora rose, and tall fescue. These invasive species threaten biodiversity, severely hamper natural successional processes, and do not filter out pollutants from surrounding land uses or absorb stormwater runoff as effectively as a native riparian forest would be able to. By planting native seedlings we can ensure the healthiest and most resilient riparian habitat which will provide the greatest benefits to humans, water quality, and wildlife for years to come[7,8,9,10].

The below maps outline targeted restoration sites. The Beef Farm Restoration Sites west of State Route 460 are located within current project boundaries (definite restoration sites). The Smithfield Branch and Upper Stroubles Creek sites east of State Route 460 are located within proposed future sites with permission to proceed pending. If permission is not granted for the pending sites, we will utilize the entirety of the funding within the current project sites west of State Route 460.

Figure 1: An overview map of the proposed Stroubles Creek restoration project on Virginia Tech Property. The sites outlined in red are definite restoration sites while the areas outlined in pink are potential future sites with permission pending.

Figure 2: Overview of definite restoration sites near Virginia Tech's Beef Center. These sites are located along Stroubles Creek and Holtan Branch, a tributary of Stroubles. The sites along Stroubles Creek and the southern half of Holtan Branch were planted between 2014-2017 while the northern 1,300' of Holtan Branch has not yet been planted.

Work within the sites where previous plantings have occured would be composed of existing seedling maintenance, invasive species management, and additional plantings in areas that currently have a low vegetation density. Historically, low density plantings have experienced an influx of aggressive non-native vegetation, and by planting a second wave of slower growing, shade tolerant species, we can effectively outcompete aggressive, understory, invasive species and better ensure a healthy riparian forest. Our work on the northern 1,300 feet of Holtan Branch will include improving livestock exclusion fencing and planting native species.

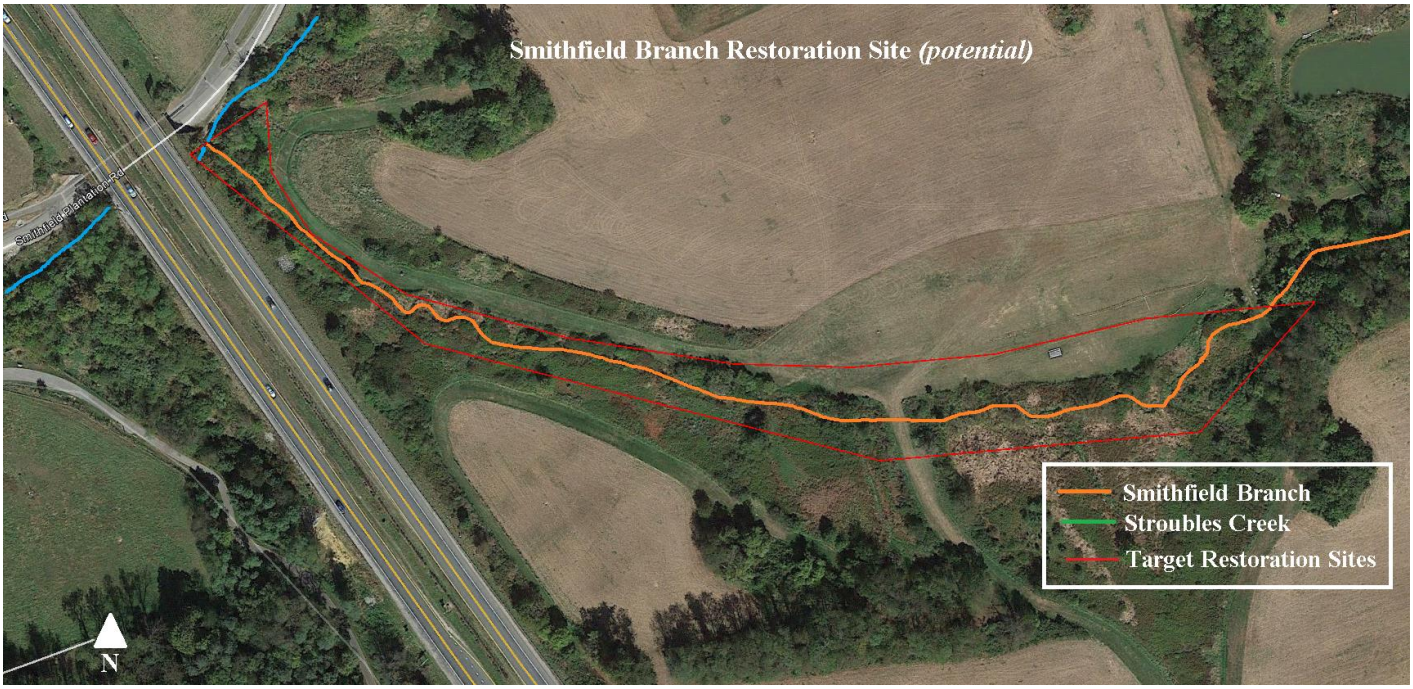

Figure 3: Overview map of potential restoration sites along Smithfield Branch. The permission to plant here is pending. Stakeholders include the VT Athletics Department, the Facilities Department, Site Infrastructure and Development, and the sewer authority. Much of this site is currently completely lacking a riparian forest buffer and is composed of wetland soils. We would plant a narrow riparian buffer on the north side of Smithfield Branch, opposite a broader buffer on the south side. We intend to combine the use of the cross country trail with a healthy stream buffer, while retaining the cultural heritage of Smithfield Plantation. This project would have tremendous positive impacts on the water quality of Stroubles Creek and would absorb excess stormwater runoff from an increasingly urbanized portion of the VT campus upstream.

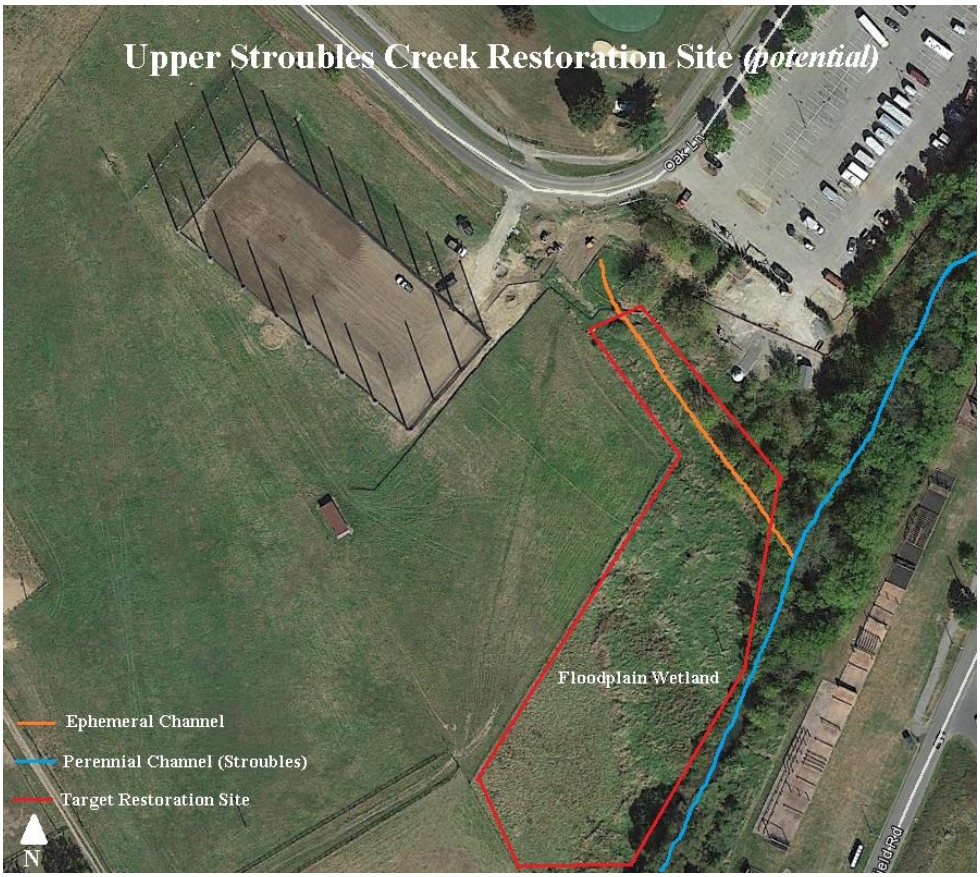

Figure 4: Overview map of the Upper Stroubles Restoration Site. The permission to plant here is pending. This site is along a stretch of Stroubles Creek that has little to no riparian vegetation. This site is also at the confluence of an ephemeral channel (draining from the VT Golf Course and Oak Lane) and Stroubles Creek, forming a broad, low lying floodplain composed of saturated wetland soils. This wetland area is regularly inundated with stormwater and selected vegetation species would be wetland species which tolerate such soils.

The sections of Stroubles Creek within the watershed boundaries of this project are listed as an impaired waterway by the Virginia Department of Environmental Quality (VA DEQ). The VA DEQ identified 10 sources causing the impairment, and this project will positively impact the top three sources from that list[11]:

1. Lack of streamside forest
2. Agricultural runoff
3. Increasing development and peak flows from stormwater runoff

This project will effectively and economically address all three of the above sources of impairment.

Restoring riparian buffers is the most reliable and cost effective approach to improving water quality and managing stormwater runoff. By supporting our initiative, you can help us take a major step forward to ensuring fresh, clean water for generations to come and work to remove Stroubles Creek from the VA DEQ's list of impaired waters.

B. **How does this initiative help to achieve the goals of the Virginia Tech Climate Action Commitment and Sustainability Plan?**

1. This project reflects positively on Virginia Tech's efforts to have Stroubles Creek removed from the state's impaired waters list, while further enhancing our reputation of being a Leader in Campus Sustainability *(#1 &14 VT Climate Action Commitment).*
2. It increases carbon GHG sequestration with increased vegetation biomass on campus[1,5]. According to the National Tree Benefits Calculator, upon reaching 10 inches in diameter (approximately 30 years in age), a single silver maple (*Acer saccharum)* will result in 494 pounds of atmospheric CO2 absorbed annually[4]. Silver maples are one of the native species to be planted in the vegetation restoration phase of the project. There will be 2,400 trees planted in total *(#3 & 4 VT Climate Action Commitment).*
3. It engages Virginia Tech students, faculty, and staff through a collaborative, multi-disciplinary restoration effort to optimize efficient and sustainable use of university resources *(#10 VT Climate Action Commitment).*
    a. Students from the College of Natural Resources & Environment (CNRE), the VT Chapter of American Water Resources Association (AWRA), the Stroubles Creek Restoration Initiative, the Environmental Coalition at VT, and the BSE StREAM lab will provide labor for the vegetation restoration phase. Additional labor will be provided by volunteers during community service events hosted by the Stroubles Creek Restoration Initiative.
4. This project is being incorporated into academic programs at Virginia Tech. It offers immense educational opportunities for students to gain hands-on experience with real world environmental challenges which has the potential to propel them to excellence in their careers *(#12 VT Climate Action Commitment).*
    a. Students within the CNRE's Department of Forest Resources & Environmental Conservation of Dr. Wiseman's Urban Forestry Management course will support the project through lab periods dedicated to learning how to manage wetland and riparian habitat restoration projects.
    b. Students from CNRE's Department of Fish and Wildlife Conservation of Dr. Sarah Karpanty's Conservation Biology course will support habitat restoration phases of the project for semester-long capstone projects.
    c. Students from the Biological Systems Engineering's StREAM Lab will support all aspects of the project and conduct research to provide valuable insights into the effects of land management practices on stream health and water quality.
    d. Students from CNRE's Dr. Sterns Environmental Interpretation course and Meyer's-Lawson School of Construction will collaborate on creating interpretive signs along this portion of Stroubles Creek to educate the community on the project.
    e. Graduate students from the College of Agriculture and Life Sciences will help plan and lead vegetation restoration efforts in the project and work to manage invasive species.

f. Additional courses from a wide array of disciplines across Virginia Tech are currently being identified to assist this project. We are working to involve VT's Sustainability Institute in project work in the future.

5. The riparian vegetation that will be established along Stroubles Creek from this project will improve water quality by:

a. Mitigating pollutants from Virginia Tech's agriculture fields and livestock, golf courses, and runoff from impervious surfaces - these pollutants include nitrogen, phosphorus, heavy metals, pesticides, oil and grease, fecal coliforms, etc. [1,2,3,5].

i. Eg. Nitrogen from livestock manure entering waterways through an ineffective (small) riparian area eventually goes through a process of nitrification and turns to gaseous nitrous oxide. The impact of 1 pound of nitrous oxide on warming the atmosphere is almost 300 times that of 1 pound of carbon dioxide[6] *(#3 & 4 VT Climate Action Commitment).*

b. Absorbing stormwater runoff from impervious surfaces[1,2,3,5]. According to the National Tree Benefits Calculator, upon reaching 10 inches in diameter (approximately 30 years in age), a single silver maple (*Acer saccharum)* will absorb 917 gallons of stormwater annually[4].

c. Stabilizing soil to prevent stream bank erosion and sedimentation in the water [1,2,3,5].

d. Providing shade over the water which keeps water temperatures low and oxygen levels high for aquatic species [1,2,3,5].

C. What is the cost of your proposal? Please describe in adequate detail the basis for your cost estimate.

The cost to have Conservation Services install the 2,400 trees is $21,720, which includes material and labor. We chose Conservation Services as a supplier because they are located in Waynesboro, Virginia and offer seedlings combined with the tube packages that protect the seedlings from grazing deer. Furthermore, they offer the most competitive pricing for materials of the sources we have identified. We have worked with them extensively for previous projects with great success. Other sources for these materials could be seeked out as project needs evolve.

To purchase only materials (2,400 tree seedlings with a 4 foot tree tube, stake, weed mat, and bird netting for each tree) the cost is an estimated $16,000. This is calculated at $5.86 per tree seedling package (the seedling, the tube, stake, mat, and bird net), or $14,064 for 2,400 packages. We intend to reuse as many of the 4 foot tree tubes from previous plantings as possible in order to reduce project resource consumption. The remaining $2,500 covers material shipping costs ($800 estimate), tool needs ($500 estimate), food/water for volunteers ($100 estimate), gas for a utility vehicle used to support projects ($100 estimate), and costs for interpretive materials to educate the public on the project ($1000 estimate). These estimates are as accurate as possible, however the need could arise to shift funds between any of the identified areas mentioned above.

There would be a $5,220 savings in labor by purchasing only materials and allowing students to conduct the project for classroom work and research.

Total requested cost - $16,500

D. Please describe in adequate detail the basis for your savings estimate.

To have Virginia Tech contract out this project, it would cost $21,720. To purchase only materials and have volunteers complete the project, the total cost is an estimated $16,500. This results in a savings of $5,220 and will give countless students at Virginia Tech the powerful educational opportunity of tackling real world problems in their local community. This experience will go a long way to shaping the next generation of leaders with an environmental conscience.

E. Is this funding request an Ongoing or One-Time change (please check one)?

- **One-time** - Ongoing

F. **Is funding available for this request from another source? If yes, describe the funding (source, amount, etc.)**
There is currently no funding for this request from another source.

The labor costs for the tree plantings and vegetation restoration phase will be provided by the Stroubles Creek Restoration Initiative, AWRA, and students from CNRE and BSE. This is a cost savings of $5,220.

G. Conclusion

This proposal seeks to demonstrate Virginia Tech's leadership in sustainability by protecting and restoring the riparian areas along Stroubles Creek and its tributaries through coordinated restoration efforts. The costs on behalf of Virginia Tech are minimal, yet the benefits are abundant and will increase over time. Restoring riparian areas and wetlands is the most cost effective and reliable solution to improving water quality, managing stormwater runoff, and having streams removed from the VA DEQ's list of impaired waterways.

There are few areas of greater priority to conservation than riparian areas along waterways. Clean water is the scarcest natural resource we have on our planet. In the spirit of *Ut Prosim* is it our responsibility to take every means necessary to protect this precious resource for present and future generations. We ask for your help and to join us in a collaborative effort to demonstrate Virginia Tech's continued commitment to environmental, economic, and social sustainability.

Part IV

SUSTAINABILITY INITIATIVES BY STUDENT ORGANIZATIONS FUNDING PROPOSAL

Part IV- Requestors/Reviewers	
Maria Daxton	11/05/2017
Prepared By (Name of Contact for Student Organization)	Date
W.C. Hession	11/02/2017
Reviewed By (Name of Appropriate University Official)	Date
Reviewed By (Name of Office of Sustainability Representative)	Date

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2016/2017 Green RFP Proposal

Our Green RFP proposal from 2016/2017 has been a huge success and a major step forward to improving the health and condition of Stroubles Creek. With the awarded funds, the VT College of Agriculture and Life Sciences successfully installed 1,000 feet of livestock exclusion fencing along Stroubles Creek. This fencing has already gone a long way to improving water quality by completely eliminating livestock manure entry into the stream during recent storm events.

Over 50 volunteers from the Stroubles Creek Restoration Initiative planted 470 native trees to restore this heavily disturbed section of critical riparian habitat in November 2017. The benefits from this project are numerous and will only increase with time, and are being monitored by faculty and students from VT's StREAM lab.

Thank you for your support of this project by awarding us the 2016/2017 funding for our proposal. Without the support from the Office of Sustainability and VT SID, this project would have never been possible. Together, we are taking great strides forward to ensure clean water for tomorrow.

Figure 5: Volunteers from SCRI planting seedlings. The new fence is in the background.

Figure 6: Volunteer planting bareroot seedlings between the new fence and Stroubles Creek.

Figure 7: SCRI tree planting event. November, 2017

Figure 8: Restoring riparian habitats with Green RFP funding.

About the Stroubles Creek Restoration Initiative

The Stroubles Creek Restoration Initiative was formed in 2014 by forestry students in the College of Natural Resources and Environment (CNRE) with the mission to improve the health and condition of Stroubles Creek by restoring heavily damaged riparian habitats through university wide collaboration. Since 2014, SCRI has planted 1,700 native trees, hosted volunteer events with hundreds of student volunteers, incorporated restoration projects in course curriculums within CNRE, and worked with VT's StREAM lab and the College of Agriculture and Life Sciences to improve livestock fencing around Stroubles Creek and its tributaries. SCRI has catalyzed collaboration between various stakeholders in Stroubles Creek such as Virginia Tech's Department of Site and Infrastructure Development, Biosystems Engineering, CNRE, the Office of Sustainability, the College of Agriculture and Life Sciences, VT Department of Horticulture, Virginia Department of Forestry, Virginia Department of Environmental Quality, and hundreds of VT students, alumni and Blacksburg locals.

Our work has been covered by media sources such as the Roanoke Times, the Collegiate Times, and VT News. This has reflected positively on Virginia Tech as the university continues to be a global leader in advancing the science and implementation of sustainability.

Figure 9: Volunteers conducting a planting event along Holtan Branch, a tributary to Stroubles Creek.

Figure 10: A riparian restoration site along Holtan Branch conducted by SCRI in 2015.

Appendix

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2. Easton, Z.M. (2012). *How Do Stream Buffers Reduce the Offsite Impact of Pollution?* Retrieved from http://pubs.ext.vt.edu/BSE/BSE-38/BSE- 38P-PDF.pdf
3. Klapproth, J. and Johnson, J. (2009). *Understanding the Science Behind Riparian Forest Buffers: Effects on Water Quality.* Retrieved from https://pubs.ext.vt.edu/420/420-151/420-151_pdf.pdf
4. National Tree Benefit Calculator. (n.d.). *National Tree Benefit Calculator.* Retrieved from http://www.treebenefits.com/calculator/
5. Neary, D.G., Smethurst, P.J., Baillie, B., and Petrone, K.C. (2011). *Water Quality, Biodiversity and Codes of Practice in Relation to Harvesting Forest Plantations in Streamside Management Zones.* Canberra, Australia: CSIRO, National Research Flagships.
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7. Schultz, R. C., Isenhart, T. M., Simpkins, W. W., Colletti, J. P. (2004). Riparian Forest Buffers in Agroecosystems – Lessons Learned from the Bear Creek Watershed, Central Iowa, USA. *Agroforestry Systems, 61*, 1-3(35-50).
8. Lee, K. H., T. M. Isenhart, and R. C. Schultz. (2003). Sediment and Nutrient Removal in an Established Multi-Species Riparian Buffer. *Journal of Soil and Water Conservation, 58(1),*1-7.
9. Trozzo, K.E., Munsell, J. F., Chamberlain, J. L., and Aust, W. M. (2014). Potential Adoption of Agroforestry Riparian Buffers Based on Landowner and Streamside Characteristics. *Journal of Soil and Water Conservation, 69(2),* 140-150.
10. Bennett, A. F., Nimmo, D. G., and Radford, J. Q. Riparian Vegetation has Disproportionate Benefits for Landscape-scale Conservation of Woodland Birds in Highly Modified Environments. *Journal of Applied Ecology, 51(2),* 514-523.
11. Virginia Department of Environmental Quality. (2006). Upper Stroubles Creek Watershed TMDL Implementation Plan Montgomery County, Virginia. Retrieved September 2015, from http://www.deq.virginia.gov/Portals/0/DEQ/Water/TMDL/ImplementationPlans/stroubip.pdf