Division of Campus Planning, Infrastructure, and Facilities
Sterrett Center
230 Sterrett Drive
Blacksburg, Virginia 24061

GREEN RFP SUBMISSION FORM

Part I- General Information:

Name of Student Organization	
Contact/Responsible Person	**Devan Eilbert**
Contact Office Held/Title	**Student**
Contact Email Address	**Devaneilbert18@vt.edu**
Contact Telephone Number	**703-966-7907**

Part II- Project Cost Information

Estimated Cost of this Proposal	$4,800	See III.C. below
Estimated Savings -	$840 annually	See III.D. below
Net Cost of this Proposal =	$4,800	

Part III- Supporting Information

A. Please describe your climate action, sustainability, and/or energy initiative and attach supporting documentation.

This proposal was developed in close contact with Matthew Gart, the Virginia Tech Grounds Manager, and with assistance from Lane Roberston, a student who is simultaneously writing a Green RFP for a pollinator garden.

Grove Lane Pond is located on the west side of campus between Grove Lane, Duck Pond Drive, and Life Cycle Circle, near the Litton Reaves Ext Lot. Currently, located around the south side of the pond and extending alongside the parking lot, there is an aging meadow that was planted in 2007. When started, it was seeded with wildflowers that grew into a beautiful meadow within just a year or two, mainly due to the fertile soil around the pond. After many years, the wildflowers began to die back, and invasive species of herbaceous plants and shrubs have mainly overtaken the area (see “Plant Species Survey” in Appendix A); however, voluntary native trees have taken root and are progressively reclaiming the land by shading and crowding out the invasive species. Over time, this area is turning into an ecologically valuable forest that stores carbon, increases biodiversity, and improves the natural aesthetics of the area.

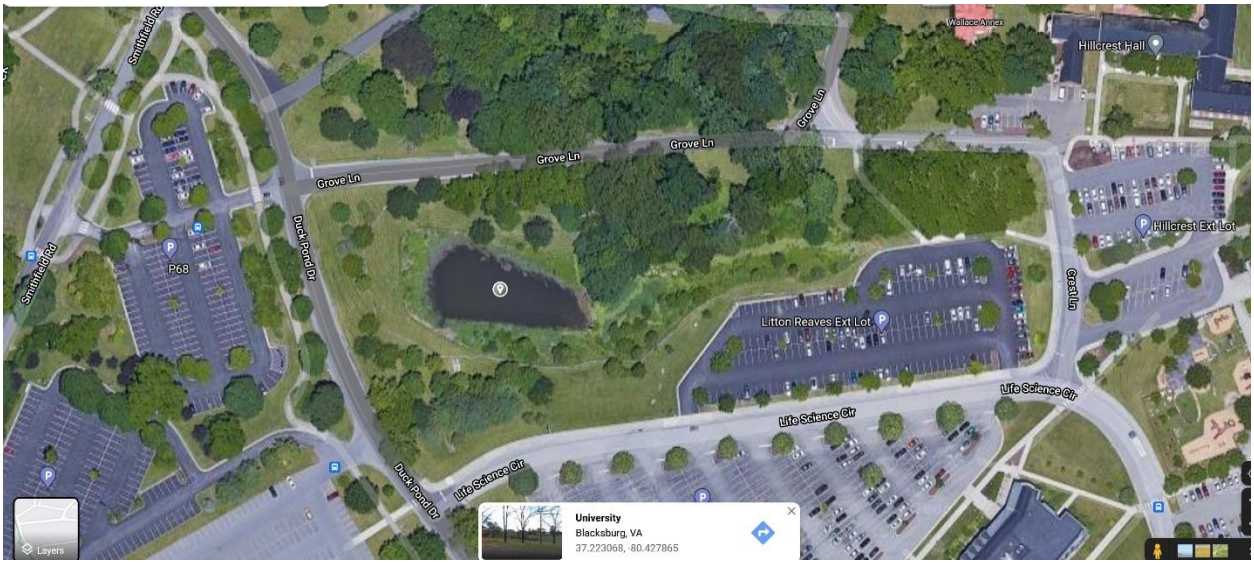

Figure 1: Google Maps image of the pond and surrounding area.

This proposal recommends planting a wildflower meadow around Grove Lane Pond to expand the reach of the original meadow and developing forest, and includes suggestions for educational signage and an introduction to the environmentally-friendly method of sheet mulching. The meadow alone will provide benefits such as:

- A gorgeous wildflower meadow that will visually and ecologically tie the existing young forest to the grass lawn that surrounds it.
- Provide a physical buffer between the growing forest and the grass lawn, crowding out the invasive species that grow along the edge of the old meadow.
- Provide a food source for local populations of bees and butterflies, increasing the beneficial insect population which will support nearby agriculture and other flowering plants.
- Improve the riparian buffer around the pond, filtering runoff and removing environmental contaminants.
- After an extended period of time, the meadow will follow the path of the old meadow and transform into a thriving natural forest that increases tree cover, stores carbon, and promotes native biodiversity.
- Take the place of a currently maintained lawn, reducing Virginia Tech's annual expenditure on grounds maintenance

The boundaries of the proposed meadow were drafted by Matthew Gart and can be seen in Figure 2 below.
Informational signage will play the role of educating students and faculty on the biodiversity of the meadow, its environmental benefits, and how it promotes the Climate Action Commitment. The writeup for the sign will be decided by university faculty, but can be very similar to that of the existing sign, shown in Figure 6 of Appendix B. There are three suggested locations for signage, depicted as red dots in Figure 2 below.

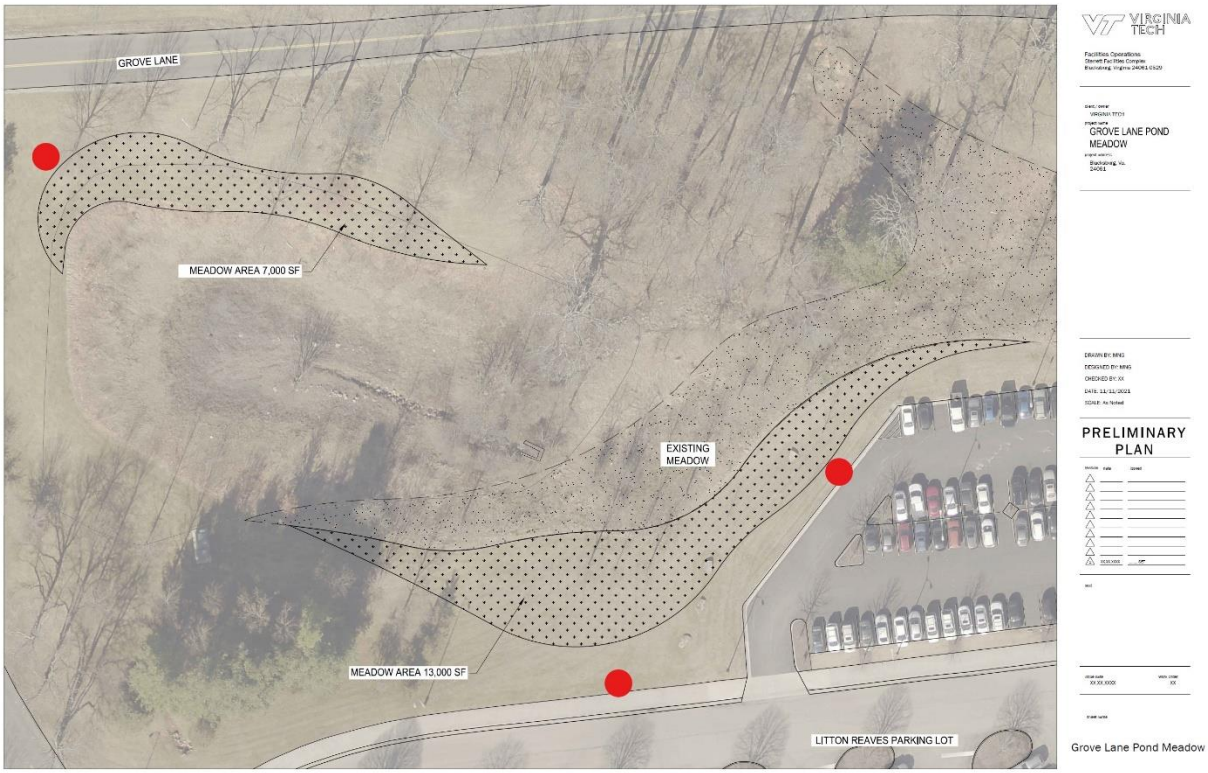

Figure 2: Proposed Meadow Boundaries and Sign Locations (red dots)

Sheet mulching is a method of mulching that incorporates composting techniques, and in this particular application, will be used to 1) kill grass without ecologically harmful herbicide, 2) suppress weed growth, 3) activate natural composters like earthworms, and 4) provide long-lasting nutrients for the wildflowers.

Information on the suggested sheet mulching technique, recommended seeds, suggested plan of action, and the informational signage can be found in Appendix A.

Pictures of the existing site conditions and signage can be seen in Appendix B.

B. How does this initiative help to achieve the goals of the Virginia Tech 2020 Climate Action Commitment Resolution and Sustainability Plan?

Goal 1: Achieve a carbon neutral Virginia Tech campus by 2030.

Some research has shown that lawns emit more CO2 than they sequester, as much as 1 kg per square meter according to one study [1]. However, they do not consider the carbon sequestration and storage that occurs, so for all intents and purposes, grass lawns will be considered to have net zero emissions. This applies particularly well to the lawn to be removed in this proposal, since it remains at the same

bio-density every year and no amendments are known to be used to supplement the soil nutrients.

Nonetheless, the maintenance of the lawn through mowing emits carbon and other pollutants such as nitrous oxides. Estimating 25 mowings per year and 36 lbs of CO2 released with each mow of the half-acre space, the current maintenance of this lawn produces about 900 lbs of CO2 annually [2,3,4].

Contrast that to the sequestration of a wildflower meadow, which for half an acre, is estimated to be 1300 lbs annually [5]. This may be even greater during the initial planting and growth of the meadow, and does not consider the carbon sequestered by the cardboard and compost used in the sheet mulching method. Thus, this meadow can provide a net difference in Virginia Tech's annual CO2 emissions of about 2100 lbs (1.05 tons) per year, significantly assisting in the goal of net-zero emissions by 2030.

Another factor worth considering is the sequestration of carbon into the soil by generation of compost from the existing grasses and cardboard due to the sheet mulching technique.

Goal 6: Agricultural, forestry, and land use operations will be carbon neutral by 2030.

a. Develop the University Compost Facility at Kentland to provide benefits to campus organic waste management, help reduce animal waste GHG emissions, support soil health, and reduce need for new land for future land application of animal wastes.

Extensive use of compost in this proposal - 65 cubic yards for half an acre - and the high cost of compost, estimated to be around $50/cu.yd. [6], will further encourage the development of a high-yield compost facility so that future projects utilizing compost and sheet mulch can be more economical.

b. Adopt Campus Tree Policy to increase canopy cover from 16-to-25 percent and manage Virginia Tech trees, forests and woodlands to increase carbon sequestration and provide additional environmental benefits.

Albeit a long process, the meadow will eventually convert into forest just like is occurring with the meadow planted in 2007. At half an acre, this will increase campus tree cover by only about 0.02%, but it will sequester more than the equivalent amount of carbon due to deep wildflower roots and the decomposition of the meadow into more organic matter [8].

Goal 13: Implement the Virginia Tech Climate Action Commitment at a high level of university administration and governance; by integrating goals for facilities, education, and campus culture; and with stakeholder engagement for evaluation of goals and progress.

The meadow will provide Virginia Tech Facilities faculty valuable knowledge and experience in sheet mulching, a sustainable method of removing turf and weeds. It will also provide an ecological and economical perspective on utilization of green space, particularly about returning lawns to more natural ecosystems.

Educational signage will further environmental sustainability awareness among students and promote the related goals of the CAC.

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

Below is a table of the initial one-time costs associated with the proposal.

Assumed manual labor cost	**per hour**	**$20.00**	**All labor hours are estimated**
Item	**Quantity**	**Cost**	**Notes**
Seed	**Sub-Total:**	**$610.80**	
Ernst Showy Northeast Native Wildflower Mix	5 lbs at $110.66/lb	$553.30	
Ernst Grain Oat/Rye Seed for cover crop	15 lbs at ~$0.50/lb	$7.50	
Shipping		$50.00	
Sheet Mulching	**Sub-Total:**	**$3,350.00**	
Cardboard: 60,000 sq ft			20,000 sq ft, 3 layers thick
Cardboard collected from other organizations	free	$0.00	
- labor for collection and transport	24 hours	$480.00	
Reuse cardboard collected from VT facilities	free	$0.00	
Compost: ~ 65 cu. yd			20,000 sq ft, 1 in thick, +3 extra
Purchased finished compost	35 cu.yd. at $50/cu.yd.	$1,750.00	Estimate [6]
- shipping and labor	24 hrs	$480.00	
Compost from campus supply	free, 30 cu.yd.	$0.00	Estimated campus compost availability
Wood Chips: ~ 190 cu yd			20,000 sq. ft, 3 in thick, +4 extra
Wood chips	free	$0.00	Provided by VT or local arborists
- labor and transport costs	32 hrs	$640.00	
Mulch from campus supply	free	$0.00	
Signage	**Sub-Total:**	**$150.00**	
Sign posts	3 at $50/each	$150.00	Estimated cost
Contingency 20% = $689.2			
Grand Total = $4,800			

Applying sheet mulch	64 hrs	$1,280.00	Supplement with help from student orgs
Sowing seeds with available machinery	24 hrs	$480.00	
	Grand Total:	**$6,830.80**	

See Part F for discussion of compost and labor cost assumptions.

The only ongoing cost associated with this project is weeding around the bases of trees which are already planted in the wildflower planting zone. Using a wage of $20/hr, 1 hour time to weed around the handful of trees, and one weeding a month for 8 months of the year, this amounts to an annual cost of $160. See Part D for the net savings when factoring this cost.

D. Will your proposal produce cost savings for the university? If so, how much? Please describe in adequate detail the basis for your savings estimate.

The only recognized cost savings provided by this proposal is the reduction of required lawn mowing area. At half an acre, an estimated cost of $80 per acre [7], and estimated 25 mowings annually, the meadow will produce an annual savings of **$1000**. If offset by the added cost of weed maintenance described in Part C, the net annual savings are **$840.**

However, the pricing structure and existing contracts with the mowing contractor are unknown and may not permit a cost reduction for the university.

E. Is this funding request for a one-time need or an ongoing need (please mark one)?

One-Time ___X__ Ongoing _____

F. Is funding available for this request from another source? If yes, describe the funding (source, amount, etc.).

No funding is available from other sources.

However, the amount of compost to be purchased depends on the amount owned by VT that is available for this project. Matthew Gart has suggested that the university may be able to supply a portion of the compost from its own facilities, but the amount is unknown. The proposal assumes a supply of 30 cubic yards owned by Virginia Tech, roughly half the required amount. Depending on the implementation

timeline, the university may be able to procure more compost as needed before the sheet mulching takes place.

Not included in the cost analysis is that some of the labor costs, particularly placing the sheet mulching, can be offset with volunteer help from environmentally and ecologically centered clubs around campus. I am connected with a few of these clubs and can solicit help as needed to reduce the cost of the sheet mulching, as well as assisting with accumulation of cardboard by collecting from student members.

GREEN RFP SUBMISSION FORM
(Continued)

Part IV- Requestors/Reviewers	
Devan Eilbert Prepared By: Devan Eilbert	Date 11/18/21
Reviewed By (Name of Appropriate University Official)	Date 11/19/21
Nathan King Reviewed By (Name of Office of Climate Action, Sustainability, and Energy Representative)	12-3-21 Date

Appendix A

Sheet Mulching Guidelines:

Sources:
How to sheet mulch, guide from Wellesley Botanical Garden:
https://www.ecolandscaping.org/03/installing-and-maintaining-landscapes/mulching/sheet-mulching/

- Overlapping layer of cardboard, 1 in of compost, and wood chips
- Provides guidance on mulching around trees

https://modernfarmer.com/2016/05/sheet-mulching/

- Cardboard must overlap by at least 6 inches on each piece, more layers better
- Wait a year before planting so cardboard and mulch has time to decompose

https://www.opnseed.com/blog/prepping-a-bed-for-seeding-101919

- Use a thick layer aged wood chips (over 1 year, soil-like consistency)
- After laying mulch, sow seeds over area and 'tickle' them through the mulch

I have never sheet mulched myself, all guidance I am providing comes from the above sources and my own understanding of the process.

Sheet mulching is the process of covering the ground with cardboard and amenities to decompose and suppress underlying grasses and weeds and create a fertile soil for seeding. The most consistent list of materials between guides is a bottom layer of overlapping cardboard, then compost, and a top layer of mulch. No herbicides or other methods of removing the existing grass is required, sheet mulching will accomplish that on its own.

First: Cardboard. The cardboard must be free of plastic, wax, and other environmental contaminants. I suggest three layers for the site to ensure adequate overlap to prevent weeds from growing through. If the university is unable to supply the required cardboard, many businesses will provide cardboard for free. There also may be a supply available at Montgomery County Consolidated Waste Sites.

Second: Compost. The role of the compost is to facilitate the decomposition of the cardboard and underlying weeds, as well as the overlying mulch, with earthworms. It will also provide nutrients for the wildflowers. I will leave decisions on the types of compost up to the university.

Third: Mulch. Mulch is required to prevent wild invasive seeds from taking hold, and to help trap heat and moisture to accelerate the composting process. The most commonly recommended kind of mulch is aged wood chips, which will decompose with the compost and provide more nutrients to the flowers as they grow.

Seeds:
The project will use Ernst Showy Northeast Native Wildflower mix, as suggested by Matthew Gart as the best match to the old meadow which had fantastic success rates. Per recommendation of the supplier's website, 5 lbs of the wildflower seeds will be

mixed with 15 lbs of ground cover seeds - grain oats or grain rye - for the half acre of space.

Suggested Steps:

1. In late spring to early summer, lay down sheet mulch. Use three layers of cardboard, 1 inch of compost, and 3 inches of mulch. The heat of summer will cause the underlying grass and cardboard to decompose quickly.
2. In late fall to early winter, spread the wildflower and groundcover seeds over the mulched area. Use a roller to shimmy the seeds through the compost and give them good soil contact. The seeds will germinate over the cold months and sprout in the following spring.
3. That's it! The seeds should take hold on their own.

Plant Species Survey:

I conducted an amateur survey of plant species in the old meadow using the app iNaturalist. The notable and identified plants are listed in the table below.

Native Species	**Invasive Species**
Perennial grasses (lots)	Teasels
Asters – goldenrod, etc.	Honeysuckle (lots)
Pokeweeds	Hemlock (lots)
Milkweed (rare)	Fennel
Hollies	
Lambsquarter	

Appendix B

Figure 3: Old Meadow – Many low-lying plants are invasive, while native trees are visible along the right side.

Figure 4: Old Meadow – voluntary trees are taking hold, but the invasive species are most persistent along the edges.

Figure 5: End of Old Meadow Next to Pond – the grass space on the right from the center tree and beyond will be converted to the wildflower meadow

Figure 6: Existing Meadow Sign

Resources

Normal lawn CO2 emissions:
[1]https://www.udel.edu/udaily/2021/march/urban-lawn-carbon-emissions-vargas-hill-velasco/

Lawn mowing CO2 emissions:
[2]https://www.onlynaturalenergy.com/grass-lawns-are-an-ecological-catastrophe/ - review of emission and sequestration mechanisms of lawns
[3]https://palebluedot.llc/carbon-copy/2015/7/16/the-carbon-footprint-of-a-lawn - estimates 17.6 lbs CO2 released for the “average lawn”
[4]https://www.homeadvisor.com/r/average-yard-size-by-state/ - the average lawn is about ¼ an acre

Meadow CO2 sequestration estimate sources:
[5]https://www.brightseeds.co.uk/article/23-carbon-offsetting-with-wildflowers- - a hectare of wildflower meadow can store 3 tonnes (metric) of CO2 annually

Compost costs:
[6]https://www.motherearthnews.com/organic-gardening/cost-of-compost-price-chart

Lawn mowing cost:
[7]https://www.fixr.com/costs/lawn-maintenance#lawn-mowing-prices

Wildflower and grasses sequester carbon with deep roots:
[8]https://www.wildlifehc.org/the-carbon-sequestering-power-of-soils/