VIRGINIA WORKING LANDSCAPES

Hidden Creek Farm

2021 Bee-friendly Beef Report

Photo by Parry Kietzman

INTRODUCTION

Bee-friendly Beef : *Integrating native wildflowers into Southeastern grazing systems*

Pollinators have experienced precipitous declines in recent decades due, in part, to changing land-use and declines in floral resources. Integrating native wildflowers into pastures across the 37 million acres of the fescue belt in the Southeastern U.S. has the potential to conserve pollinators while maintaining cattle production. The predominant grass across these landscapes, tall fescue, feeds millions of cattle and grows well during the cool spring and fall seasons. However, this non-native grass introduced from northern Europe outcompetes native grasses and wildflowers, which contributes to declines in populations of pollinating insects.

Virginia Working Landscapes (VWL) has partnered with Virginia Tech (VT) and the University of Tennessee (UT) to develop bee-friendly beef production practices through a series of demonstration sites and on -farm trials. This project examines the integration of native wildflowers into grazing systems. The bee-friendly beef research team is working with producers to plant native prairie grasses and wildflowers in pastures at university research stations in Virginia and Tennessee and at six working farms in Northern Virginia. (Figure 1– next page). Wildflower establishment and persistence are documented along with the benefits of wildflower-enhanced grazing systems to cattle and pollinators.

Study objectives:

1) Document the establishment and persistence of wildflowers in grazing systems
2) Assess the benefits of wildflower-enhanced grazing systems for cattle
3) Assess the benefits of wildflower-enhanced grazing systems for pollinators
4) Calculate the economic profitability of wildflower-enhanced grazing systems
5) Create educational materials and provide outreach about wildflower-enhanced grazing systems

In this report, you will find a summary of the 2021 baseline vegetation surveys on your property.

Thank you so much for your involvement in this project!

For more information, please contact us at SCBIVWL@si.edu, (540)-635-0038, visit our website (www.vaworkinglandscapes.org), or find us on Facebook & Instagram.

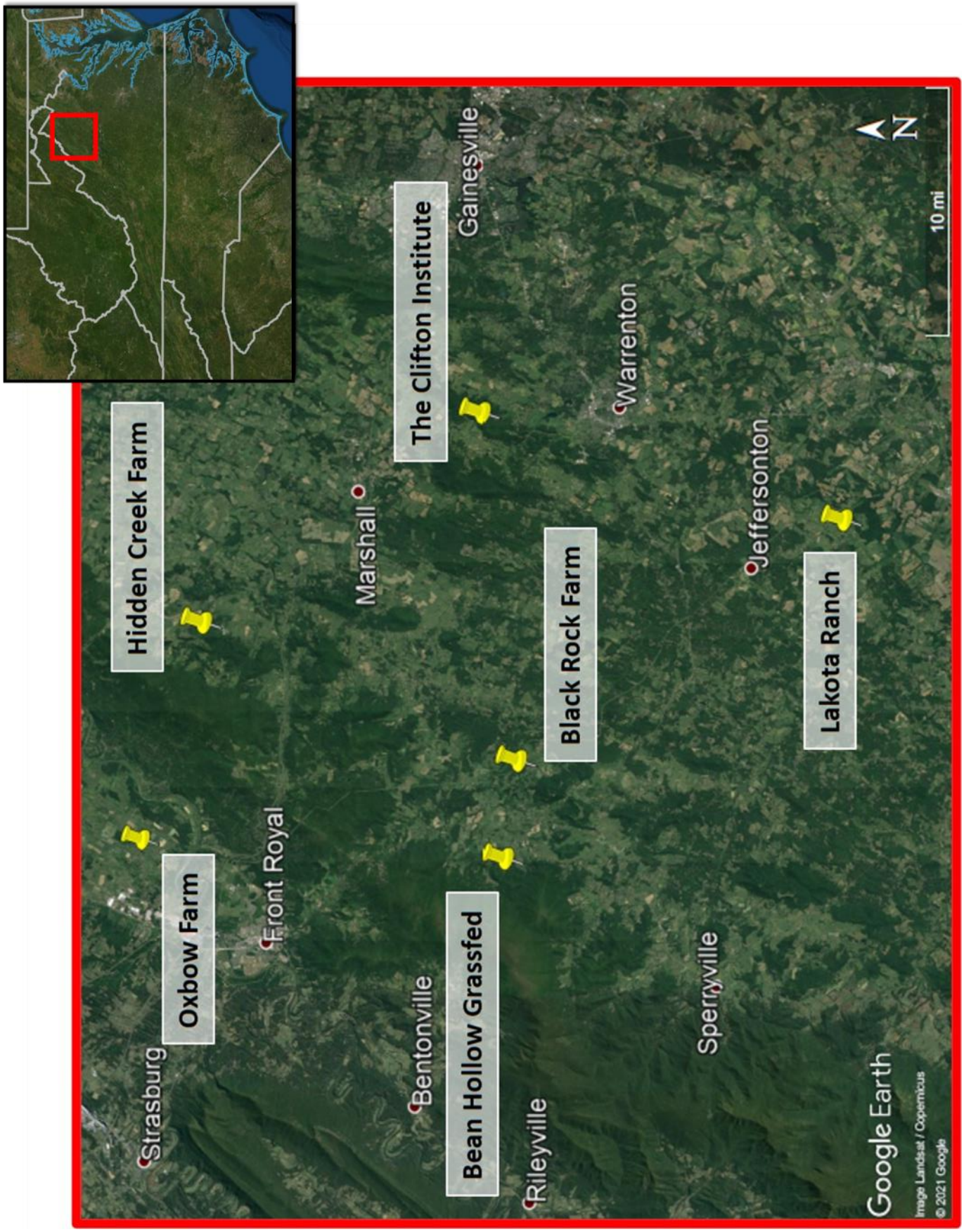

Figure 1. Locations of the on-farm trials in northern Virginia

METHODS

In 2020, experimental trials were initiated at VT and UT sites to determine optimal methods for establishment of wildflowers in actively grazed sites. In 2021, we used results from the first year of establishments to initiate on-farm trials through VWL in northern Virginia.

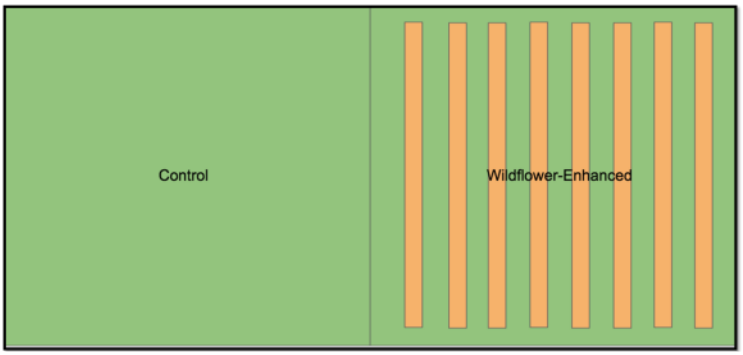

Figure 2. The experimental field and control field are each 5 acres at minimum, and at least 25% of the wildflower-enhanced field is planted with wildflowers.

On each farm, one actively-grazed pasture (at least 10 acres) was selected for the study and divided into two experimental treatments. On some farms, two separate pastures with similar baseline vegetation communities were selected. Half of the pasture serves as the "wildflower-enhanced" treatment, and the other half serves as a control (Figure 2). In the "wildflower-enhanced" treatment, at least 25% of the area will be planted with a native wildflower seed mixture. The control field will have no wildflowers planted.

Producers managed livestock according to their individual farm operations through spring and summer of 2021, and preparation for field conversions commenced in September and October (Table 1– next page). In the fall of 2021, producers grazed or bushhogged the entire study area in preparation for spraying or tilling. To prepare the "wildflower-enhanced" field for planting, producers either tilled the treatment area or sprayed herbicide according to the requirements of their farming operation (e.g. organic certification) to reduce the density of fescue grass. A cover crop (either Nomini barley or rye) was then planted in the portions of the field that were either sprayed or tilled in preparation for the wildflower planting in 2022.

PROJECT TIMELINE

Table 1. Each study site contains two fields, a control (C) and a wildflower-enhanced (WE) treatment. This table depicts a timeline of all the activities that make up the experimental design at each study site. Green and red indicate grazing activities (Grazing = green, no grazing = red). Yellow indicates field management activities. Blue indicates research activities. H = herbicide establishment, O = organic establishment.

		2021												2022												2023											
Activity	**Field**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Grazing as usual	BOTH																																				
Fence off cattle from experimental field	BOTH																																				
Graze or bushhog field to at least 12" in preparation for spraying or tilling	BOTH																																				
Designate areas for Control (C) and Wildflower-enhanced (WE) treatments	BOTH																																				
Herbicide application	WE(H)																																				
Tilling	WE(O)																																				
Plant Cover Crop (Barley or rye)	WE																																				
Drill wildflower mix in prepared strips	WE																																				
Vegetation Surveys by VWL team	BOTH																																				
Pollinator Surveys by VWL team and VA Tech	BOTH																																				

BASELINE VEGETATION SURVEY RESULTS ACROSS ALL SITES

SUMMARY RESULTS FOR ALL SURVEY PROPERTIES

In 2021 we surveyed 20 randomly-placed quadrats across both the bee-friendly beef control and experimental treatment fields at each farm.

Across all sites, baseline vegetation surveys identified a grand total of **86** species (including subspecies and varieties), with an additional **39** groups only identifiable to genus or family. Of those identified to species level or better, **36** (42%) are considered native, **42** (49%) are introduced, **7** (8%) are invasive, and **1** (1%) are of uncertain status in Northern Virginia. The three most commonly recorded plants were tall fescue (*Schedonorus arundinaceus*), Kentucky bluegrass (*Poa pratensis*), and Carolina horsenettle (*Solanum carolinense var. carolinense*).

SURVEY RESULTS FOR HIDDEN CREEK FARM

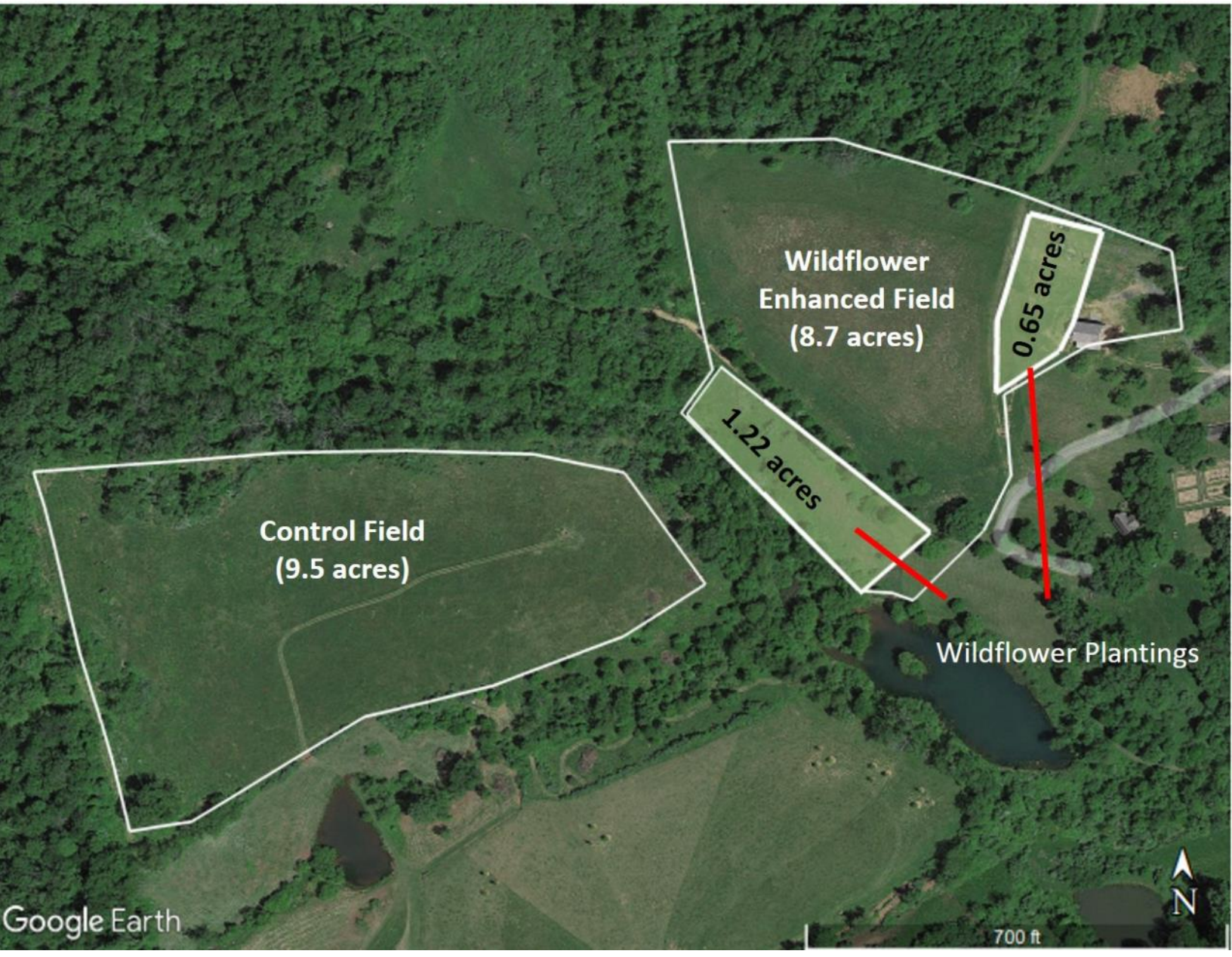

Figure 3. Overview map showing location of experimental fields at Hidden Creek Farm.

BASELINE VEGETATION SURVEY

Table 2: 2021 Baseline Vegetation Survey Results. Species are listed in rank order of occurrence out of a maximum occurrence of 20. Plants are identified to species, unless otherwise noted.

Common Name	Scientific Name	Native Status*	Growth Form**	Occurrence
tall fescue	*Schedonorus arundinaceus*	introduced	G	16
Kentucky bluegrass	*Poa pratensis*	introduced	G	15
Carolina horsenettle	*Solanum carolinense var. carolinense*	native	F	13
sericea lespedeza	*Lespedeza cuneata*	invasive	F	13
grass family	family *Poaceae*	uncertain	G	11
white clover	*Trifolium repens*	introduced	F	11
Bermudagrass	*Cynodon dactylon*	introduced	G	10
woodsorrel	genus *Oxalis*	native	F	8
brome	genus *Bromus*	uncertain	G	7
field clover	*Trifolium campestre*	introduced	F	7
orchardgrass	*Dactylis glomerata*	introduced	G	7
piedmont bedstraw	*Galium pedemontanum*	introduced	F	7
wild garlic	*Allium vineale*	introduced	F	7
corn speedwell	*Veronica arvensis*	introduced	F	6
mouse-ear chickweed	genus *Cerastium*	uncertain	F	6
Japanese clover	*Kummerowia striata*	introduced	F	5
coralberry	*Symphoricarpos orbiculatus*	uncertain	W	4
Queen Anne's lace	*Daucus carota*	introduced	F	4
common dandelion	*Taraxacum officinale*	introduced	F	3
great yellow woodsorrel	*Oxalis grandis*	native	F	3
Indianhemp	*Apocynum cannabinum*	native	F	3
sedge	genus *Carex*	native	G	3
yellow crownbeard	*Verbesina occidentalis*	native	F	3
aster family	family *Asteraceae*	uncertain	F	2
common milkweed	*Asclepias syriaca*	native	F	2
narrowleaf plantain	*Plantago lanceolata*	introduced	F	2

* Plants are characterized native, introduced, or invasive via the USDA plant database
** Plants are characterized by their major growth form as graminoid (G), forb (F), or woody (W) (http://plants.usda.gov/java/).

BASELINE VEGETATION SURVEY

Table 2 cont.: 2021 Baseline Vegetation Survey Results. Species are listed in rank order of occurrence out of a maximum occurrence of 20. Plants are identified to species, unless otherwise noted.

Common Name	Scientific Name	Native Status*	Growth Form**	Occurrence
red clover	*Trifolium pratense*	introduced	F	2
scarlet pimpernel	*Anagallis arvensis*	introduced	F	2
thistle	genus *Cirsium*	uncertain	F	2
timothy	*Phleum pratense*	introduced	G	2
white vervain	*Verbena urticifolia*	native	F	2
American pokeweed	*Phytolacca americana*	native	F	1
annual ragweed	*Ambrosia artemisiifolia*	native	F	1
bittercress	genus *Cardamine*	uncertain	F	1
blackberry	genus *Rubus*	uncertain	W	1
blackseed plantain	*Plantago rugelii*	native	F	1
bluegrass	genus *Poa*	introduced	G	1
common mullein	*Verbascum thapsus*	introduced	F	1
common velvetgrass	*Holcus lanatus*	introduced	G	1
deertongue	*Dichanthelium clandestinum*	native	G	1
eastern daisy fleabane	*Erigeron annuus*	native	F	1
eastern poison ivy	*Toxicodendron radicans*	native	W	1
grape	genus *Vitis*	native	W	1
green comet milkweed	*Asclepias viridiflora*	native	F	1
Japanese honeysuckle	*Lonicera japonica*	invasive	W	1
knotweed	genus *Fallopia*	uncertain	F	1
Korean clover	*Kummerowia stipulacea*	introduced	F	1
nodding plumeless thistle	*Carduus nutans*	introduced	F	1
Oriental bittersweet	*Celastrus orbiculatus*	invasive	W	1
pepperweed	genus *Lepidium*	uncertain	F	1
poverty brome	*Bromus sterilis*	introduced	G	1
poverty rush	*Juncus tenuis*	native	G	1

* Plants are characterized native, introduced, or invasive via the USDA plant database

** Plants are characterized by their major growth form as graminoid (G), forb (F), or woody (W) (http://plants.usda.gov/java/).

BASELINE VEGETATION SURVEY

Table 2 cont.: 2021 Baseline Vegetation Survey Results. Species are listed in rank order of occurrence out of a maximum occurrence of 20. Plants are identified to species, unless otherwise noted.

Common Name	Scientific Name	Native Status*	Growth Form**	Occurrence
prairie fleabane	*Erigeron strigosus*	native	F	1
prostrate knotweed	*Polygonum aviculare*	introduced	F	1
small carpetgrass	*Arthraxon hispidus*	invasive	G	1
spiny sowthistle	*Sonchus asper*	introduced	F	1
sweet vernalgrass	*Anthoxanthum odoratum*	introduced	G	1
violet	genus *Viola*	uncertain	F	1
wildrye	genus *Elymus*	native	G	1

* Plants are characterized native, introduced, or invasive via the USDA plant database
** Plants are characterized by their major growth form as graminoid (G), forb (F), or woody (W) (http://plants.usda.gov/java/).

NEXT STEPS

Cattle will graze in the study field from December 2021 to May 2022. A second field preparation event (spraying or tilling) will commence in the spring of 2022. The native wildflower seed mix will be sown with a seed drill into the "wildflower-enhanced" treatment area in early June 2022. The wildflower seed mix will be determined based on species that are native to North America, are nontoxic to cattle and sheep, and bloom at different times of the season so that flowers will be continually available to pollinators throughout their foraging period.

Vegetation and pollinator surveys will be conducted in the late summer and early fall, and cattle will return to graze in the field in August 2022. Citizen scientists will be recruited by VWL to assist with pollinator surveys. Researchers from VWL, Virginia Tech, and the University of Tennessee will conduct annual surveys of these treatments to assess both the economic and ecological impacts of integrating wildflowers into actively grazed pastures.

For more information about the project, visit: https://beesandbeef.spes.vt.edu/

PROJECT IMPACT

The bee-friendly beef research team will measure wildflower establishment success and persistence, pollinator attractiveness, and changes in costs and revenue compared to traditional grazing systems through the on-farm trials in northern Virginia. In addition to these assessments, the university research teams will measure cattle weight gain and forage productivity and quality at the university treatment plots. Taken together, these data will provide the necessary information to recommend wildflower planting technologies and seed mixes, produce fact sheets about wildflower forage value and grazing options to promote blooms, create a "pollinator value index" for different mixes of wildflowers, and to develop an excel-based budgeting tool for bee-friendly beef production options.

A concurrent study by researchers at Virginia Tech is examining consumer willingness to pay for bee-friendly beef. This research will explore consumer perceptions, purchase intentions, and willingness to pay for bee-friendly beef labeled products. Information from this study will enhance our understanding of strategies and incentives that can be implemented to restore pollinators through the establishment of wildflower-enhanced pastures.

Improving resources for pollinators while improving livestock performance would be beneficial to both grassland landscapes and beef cattle producers. Integrating native wildflowers into pastures across the fescue belt has the potential to become a new conservation practice that USDA's National Resource Conservation Service could cost-share with landowners.

This research is generously funded by the USDA NRCS Conservation Innovation Grant program and the USDA NIFA.

ACKNOWLEDGMENTS

We would like to extend a big *thank you* to you, the landowners and land managers, for participating in this research. All 2021 baseline vegetation surveys were conducted by VWL Research Fellow, Jordan Coscia, and VWL Survey Coordinator, Erin Thady. Northern Virginia on farm trials were coordinated by Erin Thady.

Property	County	Landowners and Land Managers
Oxbow Farm	Warren	Beatrice and Adie von Gontard
Lakota Ranch	Culpeper	Jeremy and Jill Engh
Hidden Creek Farm	Fauquier	Andrea and Dendy Young
Blackrock Farm	Rappahannock	Nick and Gardiner Lapham; Eddie Fletcher; Mike Sands
The Clifton Institute	Fauquier	Bert Harris and Eleanor Harris; Marie Norwood
Over Jordan Farm	Rappahannock	Mike Sands and Betsy Dietel

PROJECT PARTNERS 2021

Thank you to each of our partners for their involvement with the Bee-friendly beef project implementation!

Dr. Ben Tracy	Project Lead; Professor, Virginia Tech
Dr. Catherine Larochelle	Assistant Professor, Virginia Tech
Dr. Michael Flessner	Assistant Professor, Virginia Tech
Dr. Leighton Reid	Assistant Professor, Virginia Tech
Dr. Parry Kietzman	Research Associate, Virginia Tech
Dr. Gabriel Pent	Superintendent, Virginia Tech's Shenandoah Valley Agricultural Research and Extension Center
Elizabeth Chishimba	Ph.D. student, Virginia Tech
Jonathan Kubesch	Ph.D. student, Virginia Tech
David Bellangue	M.S. student, Virginia Tech
Raven Larcom	M.S. student, Virginia Tech
Dr. Patrick Keyser	Professor, University of Tennessee; Director, Center for Native Grasslands at the University of Tennessee
Dr. Laura Russo	Assistant Professor, University of Tennessee
Jessica Prigge	Ph.D. student, University of Tennessee
Caroline Sherony	USDA-NRCS, Natural Resource Specialist
Edward Henry	USDA-NRCS, National Ecologist

VWL TEAM 2021

Dr. Amy Johnson	Program Director
Charlotte Lorick	Program Coordinator
Erin Thady	Survey & Volunteer Coordinator
Justin Proctor	Piedmont Grassland Bird Initiative Coordinator
Jordan Coscia	Research Fellow
Rachael Green	Research Fellow
Bernadette Rigley	Research Fellow
Margot Breiner	Intern
Samantha Fishman	Intern
Marissa Jacquemin	Intern

SUPPORT VWL

VWL is 100% supported by grants and private philanthropy and our work is made possible by the generous contributions of our community. Your donation will help VWL to continue developing new research projects and innovative wildlife surveys throughout our region.

VWL accepts donations by check or credit card.

- To donate by check, please write checks out to "Smithsonian Institution" with "*Virginia Working Landscapes*" noted on the reference line and send to:

  Attention: Amy Johnson

  Virginia Working Landscapes
  Smithsonian Conservation Biology Institute,
  1500 Remount Rd, MRC 5537, Front Royal, VA 22630

- To donate by credit card over the phone, please call Amy Johnson at 540-635-0035.

For further inquiries, please contact Amy Johnson at JohnsonAE@si.edu; 540-635-0035.

The Smithsonian Institution is a 501(c)(3). All contributions are tax-deductible.

VIRGINIA WORKING LANDSCAPES

Smithsonian
Conservation Biology Institute