

Restoration of a 100-acre Overgrazed Pasture in the Headwaters of the Occoquan River



Bert Harris, Jordan Coscia, Leighton Reid, Amy Johnson

Outline

- 1. Brief introduction to the Clifton Institute
- 2. Northern Piedmont prairies
- 3. Pasture restoration at Clifton



The Clifton Institute

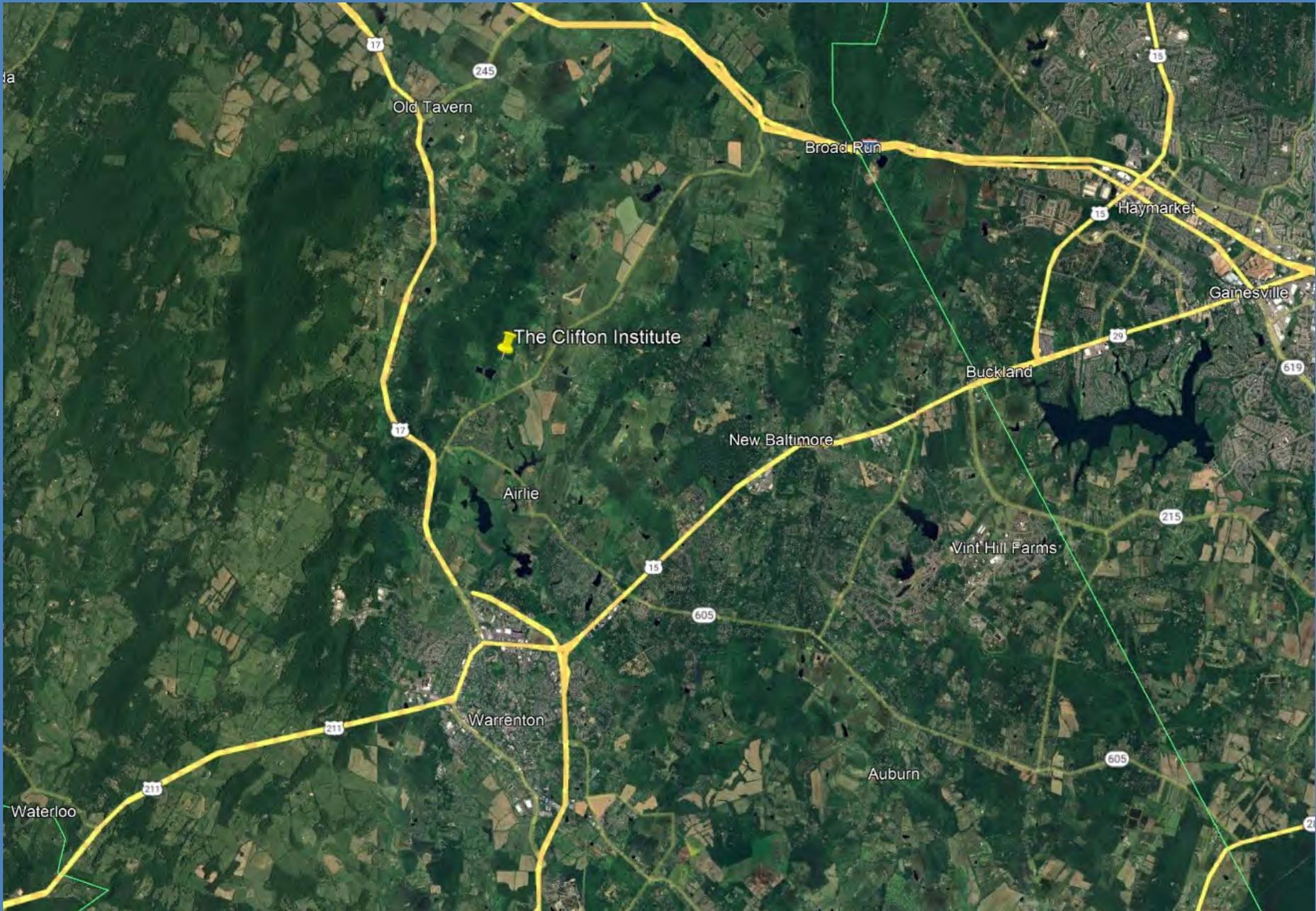
- 501(c)(3) non-profit organization
 - Eight full-time staff
 - Funded by individual donations and foundation grants
- Three program areas:
 - Education
 - Restoration
 - Research



Our Mission

- to inspire a deeper understanding and appreciation of nature,
- to study the ecology of our region,
- to restore habitat, and
- to conserve native biodiversity.







Field Station

- 900 acres just north of Warrenton, VA
- Protected by a conservation easement



cliftoninstitute.org/inaturalist

Environmental Education

- Field trips for local schools
- Summer camps
- Home school programs
- Research-based
- Natural history and conservation programs for adults
- 2022: 1,983 kids and 900 adults



Restoration

- Managing habitat to benefit declining species
- Focused on early successional habitats
- Native plant propagation



Restoration: Land Management Advice for Landowners

- Kадiera Ingram,
Landowner Outreach
Associate
- We have visited 200
landowners who
manage 11,000 acres

kingram@cliftoninstitute.org



Research

- American Kestrel nesting habitat



Research

- American Kestrel nesting habitat
- The effects of mowing on Box Turtles



Research

- American Kestrel nesting habitat
- The effects of mowing on Box Turtles
- Experimental restoration of forest understories



Research

- American Kestrel nesting habitat
- The effects of mowing on Box Turtles
- Experimental restoration of forest understories
- Research informs landowners who would like to help plants and animals

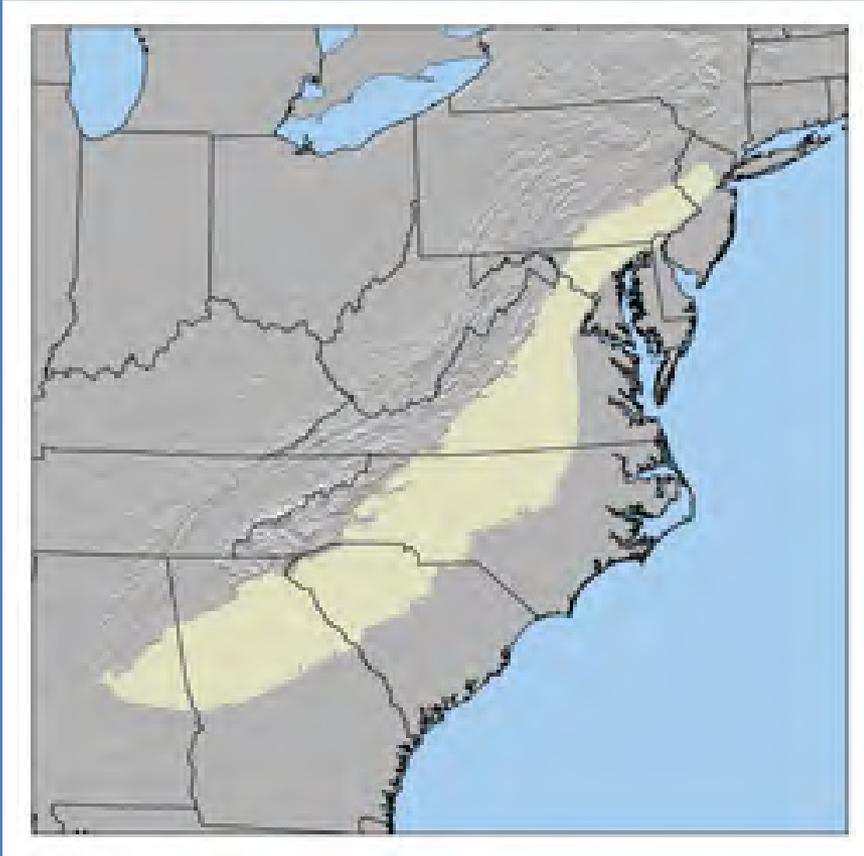


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The Piedmont



- Gently rolling terrain in between the Blue Ridge mountains and Coastal Plain (defined by the fall line)
- Generally granite bedrock with acidic, clayey soil (heavily weathered)

History of Savannas and Grassland in the Virginia Piedmont

- Grasslands and savannas were extensive in the Virginia Piedmont before European colonization (Barden 1997, Noss 2002, Stewart 2009)
- Maintained by bison, and natural and human-lit fires



©DCR-DNH, Gary P. Fleming

Ft. Pickett, Nottoway County (Gary Fleming photo)

Contemporary Piedmont Grasslands



Aaron Watson photo



Non-native, cool-season pasture grasses



Tall Fescue



Orchard Grass



Indiangrass



Slender Ladies'-tresses Orchid



Ragged Fringed Orchid



Hyssop-leaved Skullcap



Maryland Golden-aster



Downy Lobelia



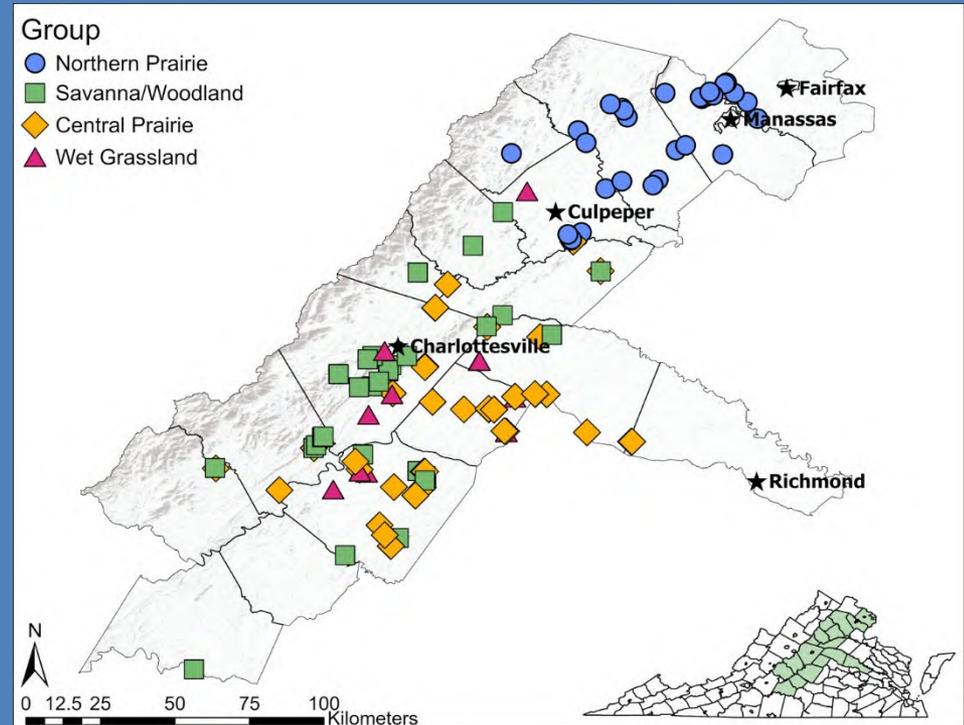
Butterflyweed

Piedmont Prairie Research



Results

- 133 sites
- 715 plant species; most diverse plant communities in the state (100 species in 100 m²)
- Best sites are under power lines, most sites are threatened



Coscia et al. in prep.

Decline of Piedmont prairies and savannas

- Herbicide spraying by power companies
- Fire suppression and afforestation
- Plowing for crops
- Invasion of cool-season pasture grasses and other non-native plants
- Urban development



Herbicide impacts on Stiff Goldenrod (state imperiled), July 2020

Rare Plants of Northern Piedmont Prairies



Hairy Hedge-nettle (critically imperiled in Virginia)



Torrey's Mountain-mint (imperiled globally)



American Bluehearts (imperiled in Virginia)



Stiff Goldenrod (imperiled in Virginia)



Purple Milkweed (imperiled in Virginia)

Restoration and Propagation

- Need for restoration and new meadow establishment
- Clear idea of what we should be planting
- Many species not sold by seed companies
- Only seven species with Virginia genetics are available commercially



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5/2017

Pignut Mountain

Blantyre Rd.



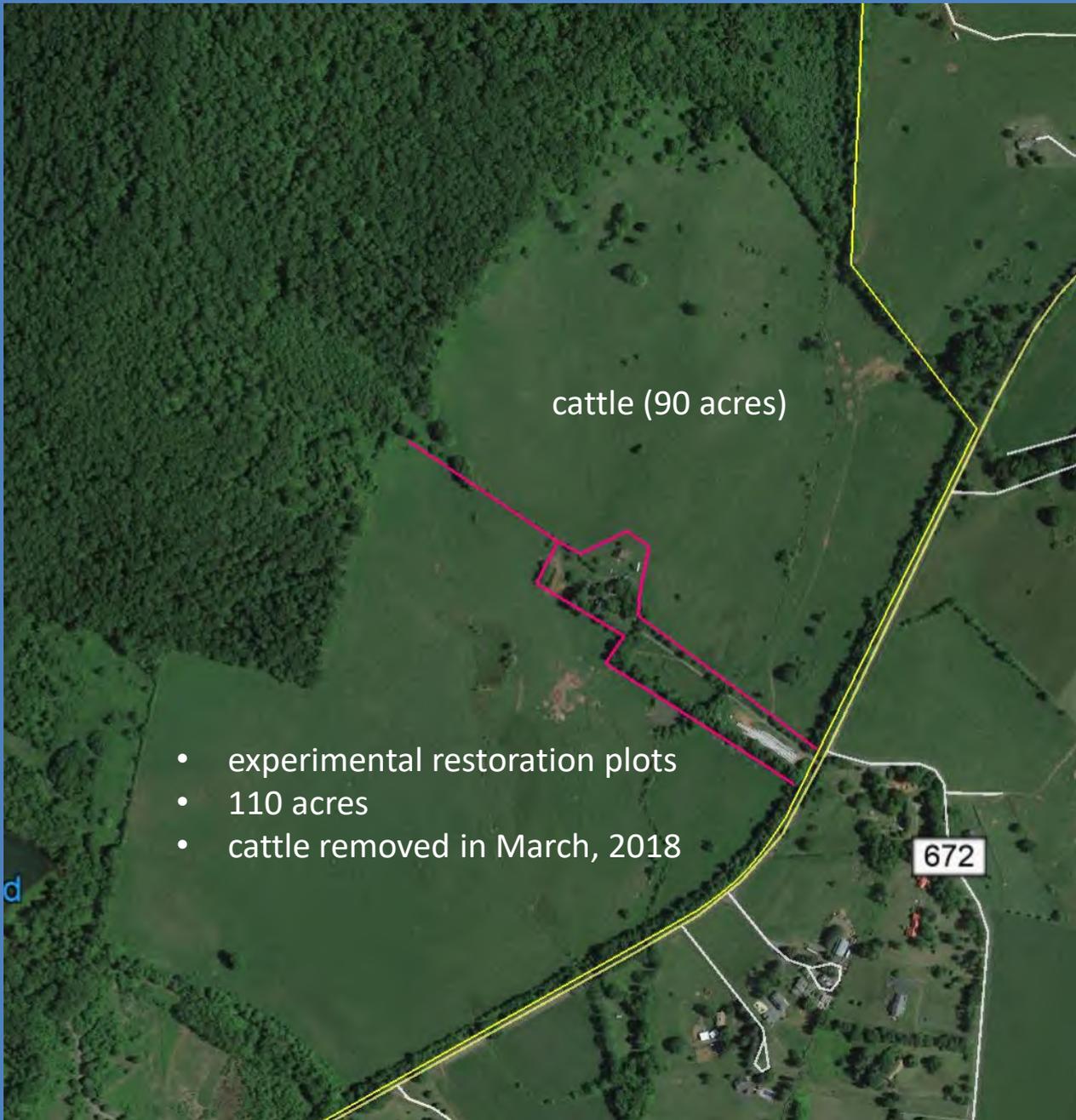
Baseline Conditions (2018)



- 200 acres
- Rented
- Mostly fescue
- Continuously grazed, overgrazed
- Creeks as water sources

Fescue Fields and Biodiversity

- Assume we have “hot” fescue
- Seeds mildly toxic to sparrows
- Poor structure for most wildlife (e.g. quail) but good for some grassland birds
- Limited resources for pollinators
- Non-native plants unpalatable to most species of insects
- Low plant diversity → low insect diversity, low bird diversity



cattle (90 acres)

- experimental restoration plots
- 110 acres
- cattle removed in March, 2018

672

Legend

— fence

Baseline Plant Surveys with Virginia Native Plant Society



- 162 species of plants, mix of natives and non-natives
- Very heterogenous



Dominant plants

NATIVE

- beaked panic grass
- little bluestem
- purple top
- wild bergamot
- narrow-leaf mountain-mint
- black-eyed susan



narrow-leaf mountain-mint

NON-NATIVE

- tall fescue
- orchard grass
- timothy
- joint-head grass
- bermudagrass
- nodding thistle
- Queen Anne's lace



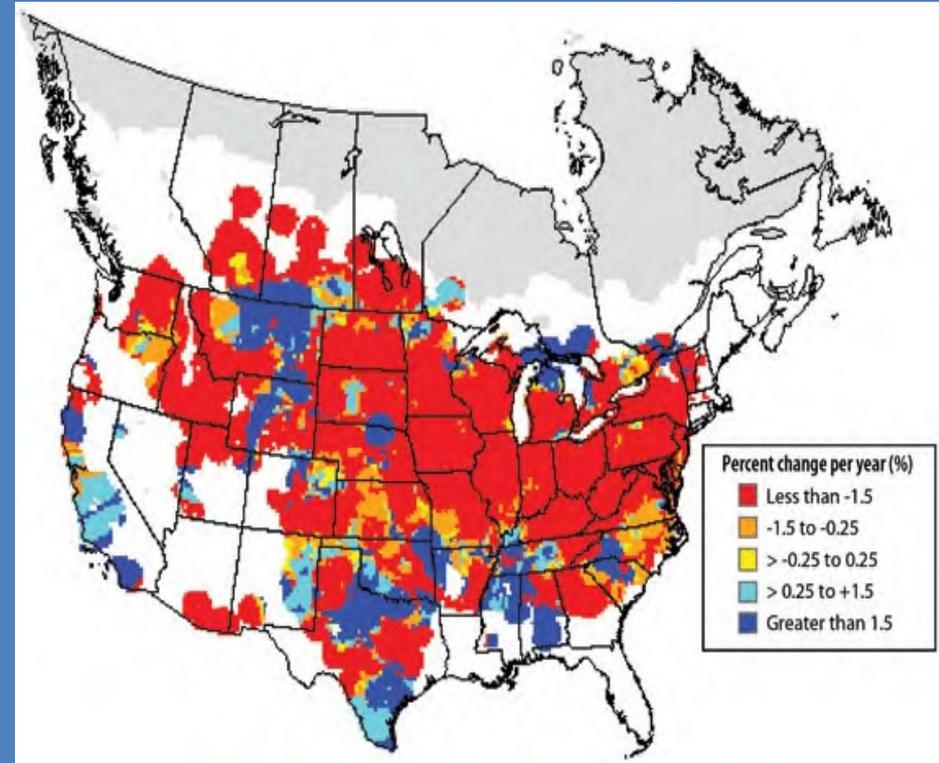
nodding thistle

Baseline Bumblebee Survey

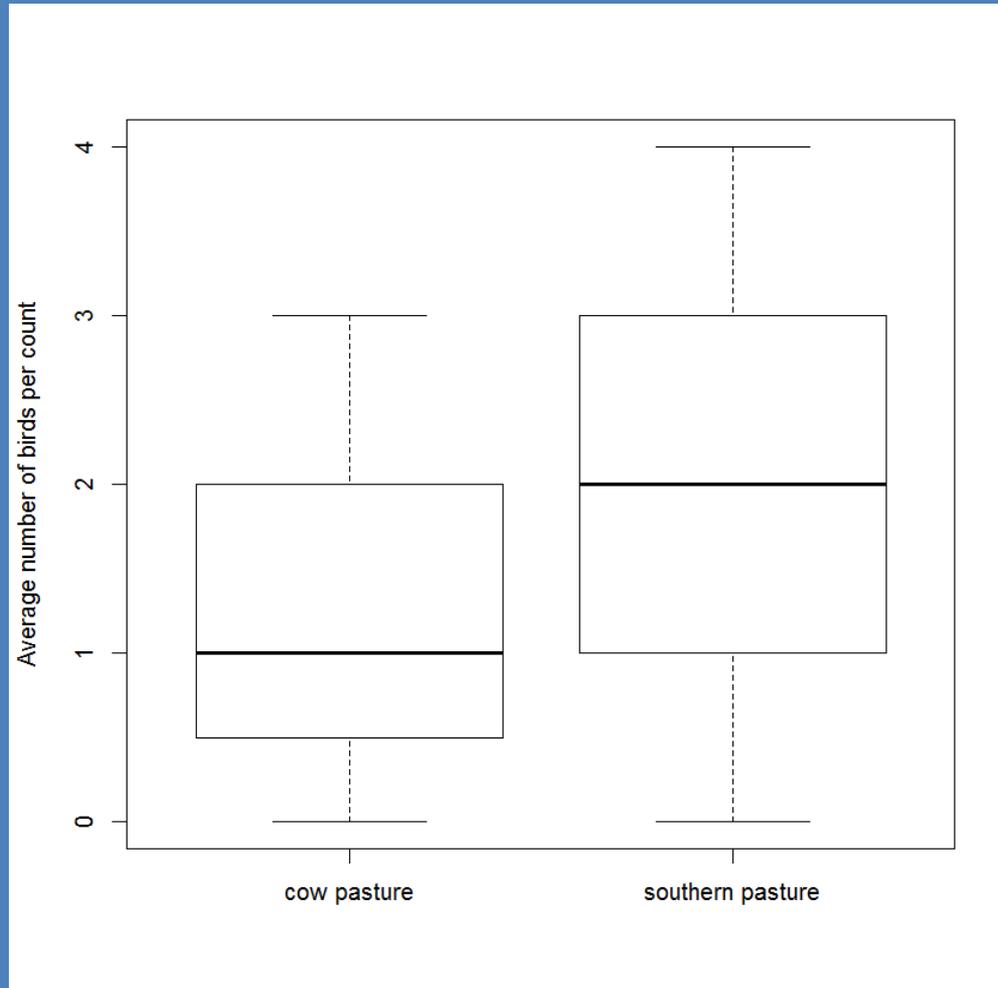
Species	Status	Count
Two-spotted bumblebee <i>B. bimaculatus</i>	Common	653
Confusing bumblebee <i>B. perplexus</i>	Common	191
Brown-belted bumblebee <i>B. griseocollis</i>	Common	73
Black and gold bumblebee <i>B. auricomus</i>	Uncommon	71
Common eastern bumblebee <i>B. impatiens</i>	Common, possibly expanding	13
American bumblebee <i>B. pensylvanicus</i>	Uncommon, possibly in decline	11
Yellow bumblebee <i>B. fervidus</i>	Uncommon, possibly in decline	7
Sanderson bumblebee <i>B. sandersoni</i>	Uncommon	1



Grasshopper Sparrow



Baseline Grasshopper Sparrow Abundance





-  riparian buffer
-  boundary fence
-  creek

Riparian buffers

- 1,500 trees planted in southern pasture from 2019-2022





Experimental Plots



Establishment

Management



Control (no spraying or planting)

+

bushhog



Control (no spraying or planting)

+

burn



riparian buffer

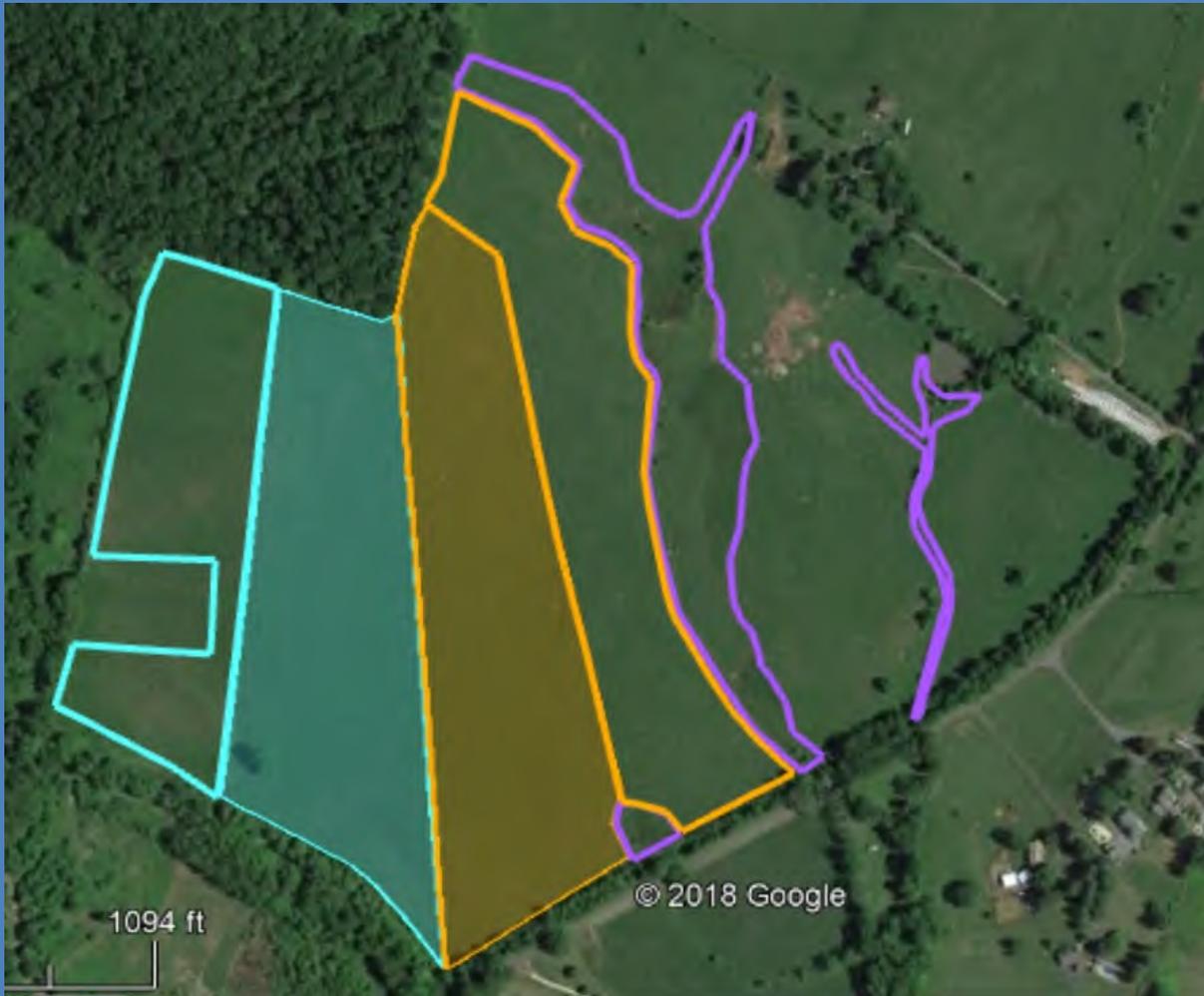


boundary fence



creek

Experimental Plots



Establishment

Management



Control (no spraying or planting)

+

bushhog



Control (no spraying or planting)

+

burn



Spray once but plant nothing

+

bushhog



Spray once but plant nothing

+

burn



riparian buffer

Experimental Plots



Establishment

Management

	Control (no spraying or planting)	+	bushhog
	Control (no spraying or planting)	+	burn
	Spray once but plant nothing	+	bushhog
	Spray once but plant nothing	+	burn
	Spray three times and plant diverse seed mix	+	bushhog
	Spray three times and plant diverse seed mix	+	burn
	riparian buffer		



Establishment

Management

	Control (no spraying or planting)	+ mow
	Control (no spraying or planting)	+ burn
	Spray once, plant nothing	+ mow
	Spray once, plant nothing	+ burn
	Spray three times and plant seed mix	+ mow
	Spray three times and plant seed mix	+ burn
	Organic establishment (discing)	+ burn
	Organic establishment (discing)	+ mow
	Riparian buffers	

Research on plants and soils



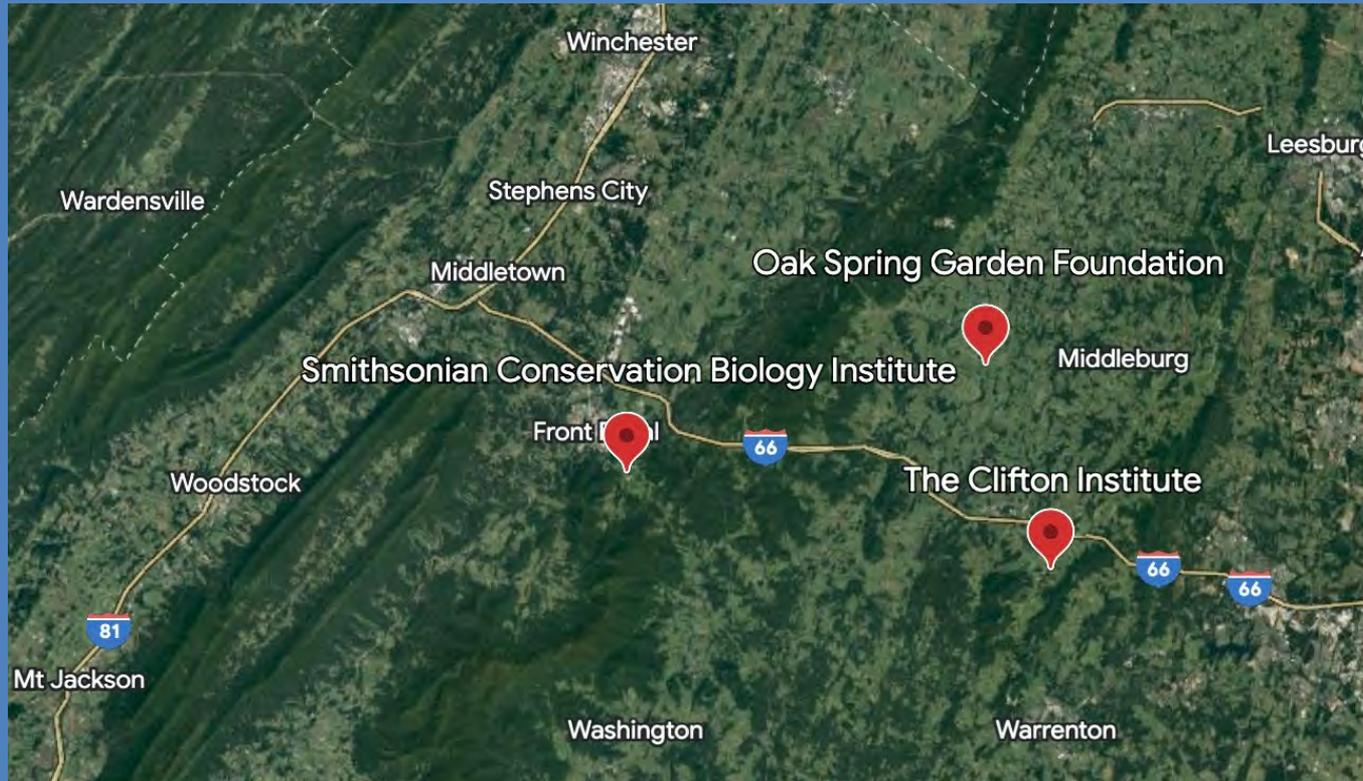
Jordan Coscia, Ph.D. student, Virginia Tech



Hannah Alizz, Masters student,
American University

- Baseline surveys of plants and soil microbes/chemistry in 2019
- Follow-up surveys in 2023

Research: Three Sites



COLLEGE OF AGRICULTURE AND LIFE SCIENCES
SCHOOL OF PLANT AND ENVIRONMENTAL SCIENCES
VIRGINIA TECH



OAK SPRING
— GARDEN FOUNDATION —



Preliminary Plant Results

- Fire is hurting fescue a bit in controls, and native grasses are spreading
- Single herbicide spray killed the fescue and mostly native plants (annuals, aggressive species) came up
- Herbicide + seeds was the most effective treatment overall
- Repeated discing caused major soil compaction but the treatment was somewhat successful



November 2020



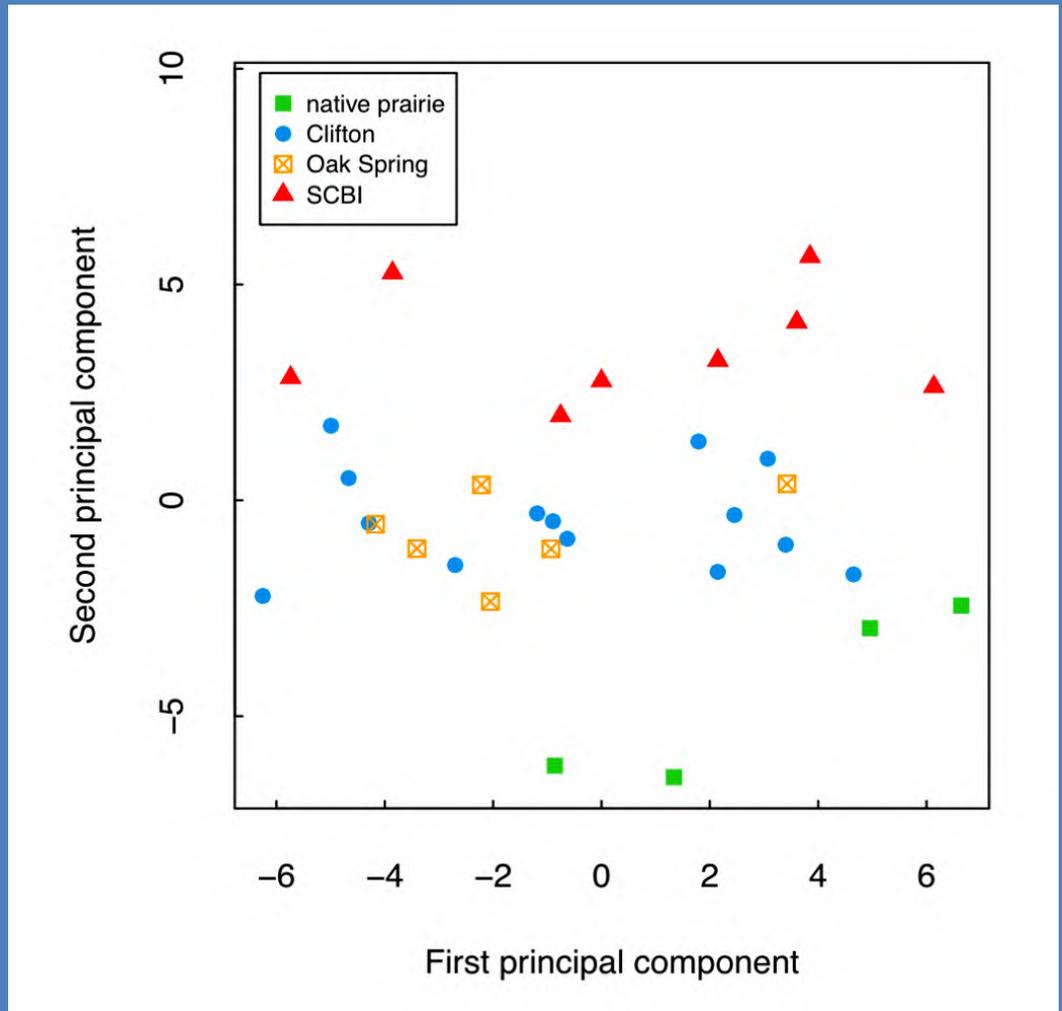
Establishment

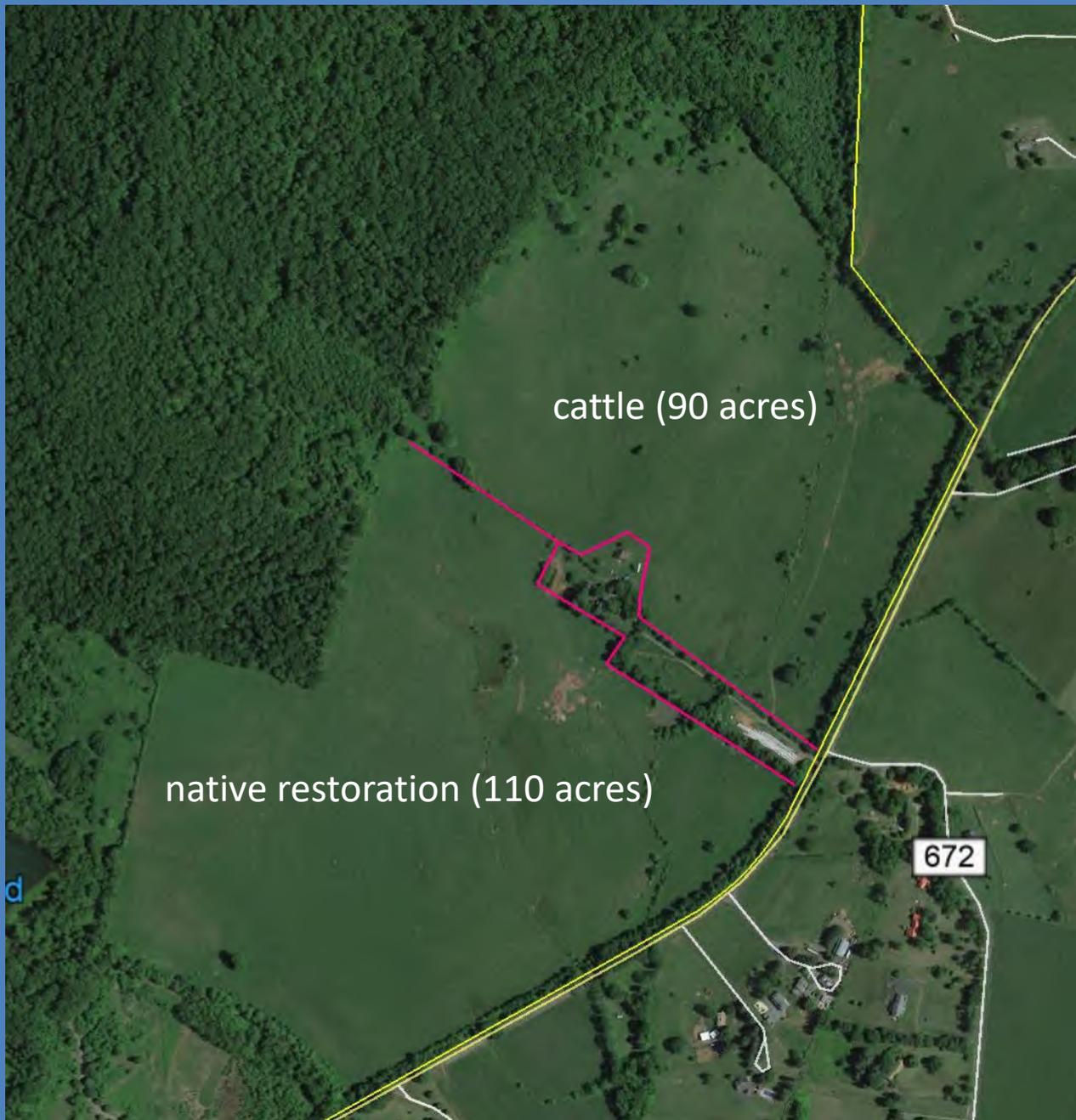
-  Control (no spraying or planting)
-  Spray once but plant nothing
-  Spray three times and plant diverse seed mix
-  Organic
-  riparian buffer



Baseline Soil Microbe Results

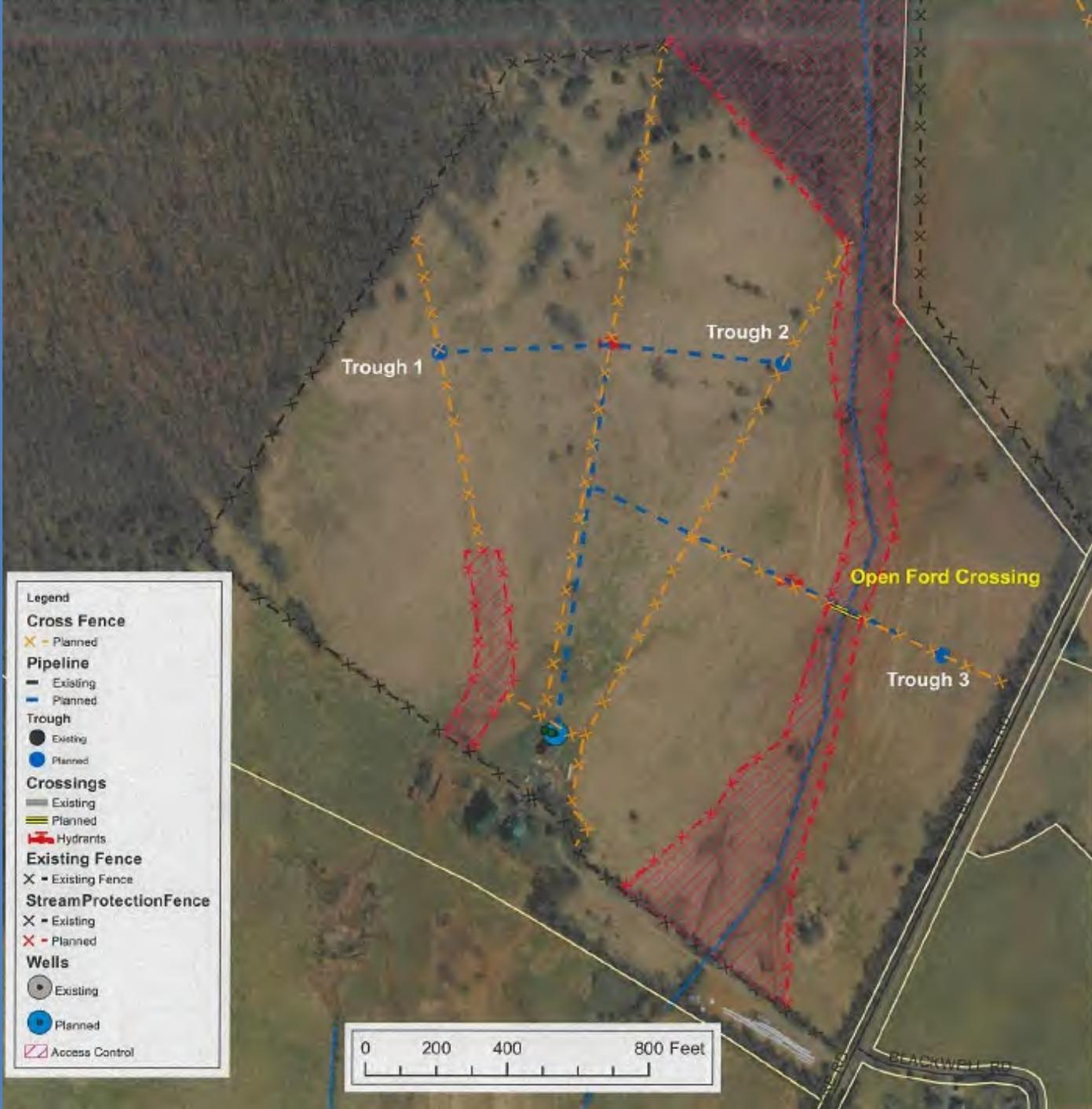
- Native prairies had more fungi, fewer bacteria, higher biomass, and higher diversity than fescue fields
- Soil microbe community at SCBI distinct from other sites





Legend

— fence





New grazer: Andrea Young, Hidden Creek Farm

What's next?

- We lost Grasshopper Sparrows and most meadowlarks in the south pasture
- Plan to reintroduce cattle to most of the field but maintain small experimental plots for several years
- Need to study:
 - 1. How grazing affects native plants, pollinators, and birds
 - 2. The economics of grazing natives (e.g. 75% of pasture in natives)

Thank you!

Co-authors

Jordan Coscia
Leighton Reid
Amy Johnson
Hannah Alizz

Advice and project management

Casey James
Celia Vuocolo
Kris Jarvis
Justin Folks
Jacob Gilley



- bharris@cliftoninstitute.org
- cliftoninstitute.org
- facebook.com/clifton.institute

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Search

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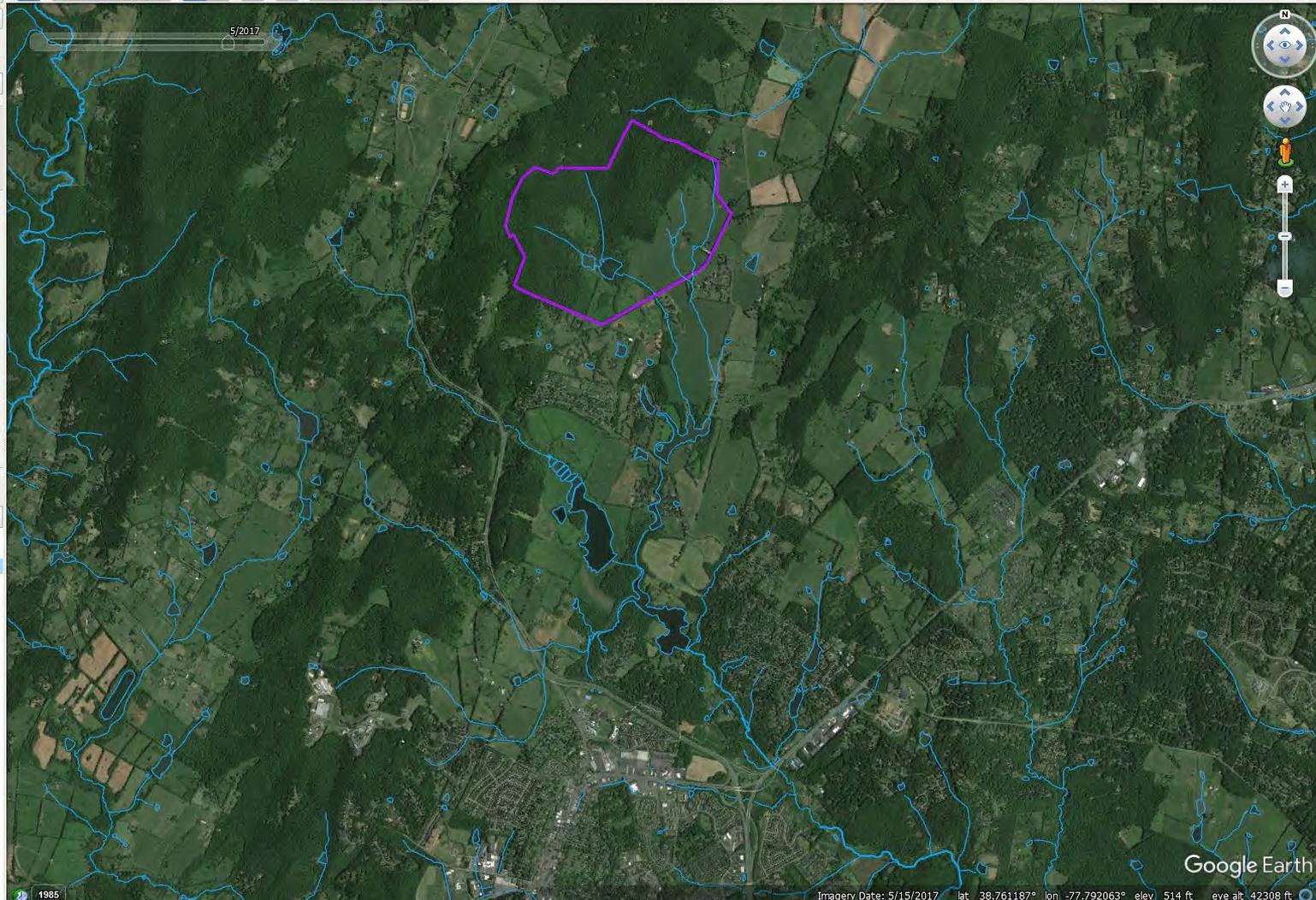
Get Directions History

Places

- bedrock along banks
- south woods
- big hickories
- cottage (bathroom)
- black light
- moist meadow
- two owls place for inat
- two owls boundary
-
-
- woods outcrop
- fameflower outcrop
- creeks for soil and water talk
- CLIFTON BOUNDARY revised
- water_features.shp
- Untitled Path
- Temporary Places

Layers

- Primary Database
- Announcements
- Borders and Labels
- Places
- Photos
- Roads
- 3D Buildings
- Weather
- Gallery
- More
- Terrain



1985

Imagery Date: 5/15/2017 lat 38.761187° lon -77.792063° elev 514 ft eye at 42308 ft

