

VIRGINIA WORKING LANDSCAPES



The Clifton Institute 2018 Biodiversity Survey Results



Smithsonian
Conservation Biology Institute



INTRODUCTION

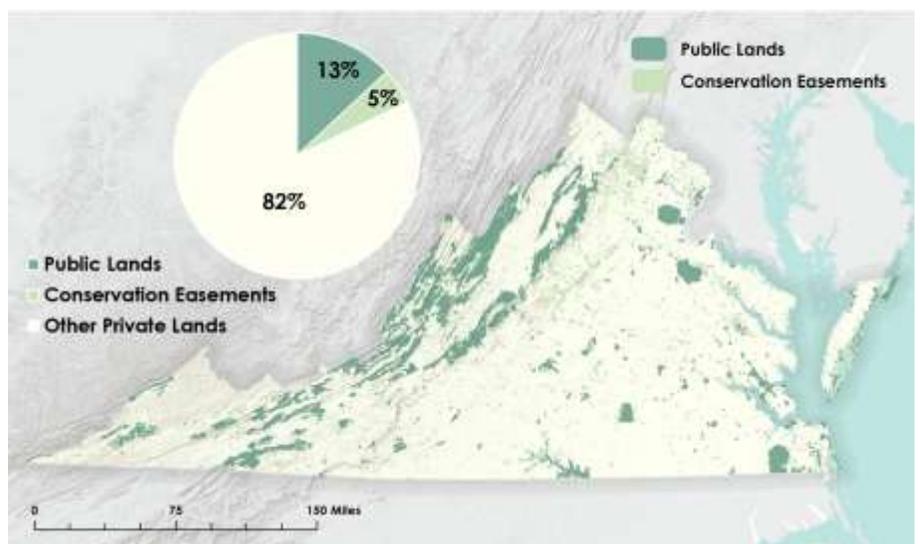
*“Land conservation is truly an area where individuals can make a difference—in fact, where individuals are critical. What America will look like a hundred years from now is being decided day-by-day, parcel-by-**parcel**, by **landowners like you.**”*

— ‘Conservation Options: A Landowner’s Guide’

The central mission of Virginia Working Landscapes (VWL) is to *promote sustainable land use and the conservation of native biodiversity through research, education, and community engagement.* First assembled at the Smithsonian Conservation Biology Institute: Front Royal, VA in 2010, VWL was formed at the behest of regional landowners, citizen scientists, and conservation organizations who wanted to better understand how to conserve Northern **Virginia’s native wildlife on working (i.e., agricultural/forestry) lands.**

From the outset, VWL determined that grassland dependent species in particular are in need of further study and protection. According to The International Union for Conservation of Nature (IUCN), **grasslands are “the most endangered, the most altered, and the least protected biome on the planet.”** Today, many plants and animals that depend on grasslands have declined, due primarily to the loss or fragmentation of their native habitat and one-third of North American species considered endangered are found on grasslands. Recognizing the need to **consider grassland species when studying native flora and fauna on working landscapes,** VWL’s initial research focused on grasslands. Since 2010, we have expanded our focus to other working lands (forests) and to consider the impact that changes in the overall landscape mosaic have on native biodiversity.

To accomplish our mission, VWL utilizes partnerships with scientists, graduate students, interns, and volunteer citizen scientists to organize and conduct annual biodiversity surveys on public and private lands throughout the region, in



The overwhelming majority of land in Virginia is held in private hands, with more than 90 percent of grasslands privately-owned. Therefore, landowners like you are stewards of most of the natural resources in Virginia.

order to reveal how land-use practices impact native biodiversity and how these impacts might influence ecosystem function.

This work is important because humans receive many tangible and intangible benefits from the natural world — from the spiritual (a walk through nature) to the utilitarian (the value of food production). These services are under threat from declines in the quantity and quality of native grasslands. Given that most land in Virginia is privately-owned, understanding how private properties are managed and the impact of that management on native species is **critical. Without these data, our ability to effectively steward Virginia’s natural resources is diminished.**

Our research prioritizes studies of biodiversity, threatened species, and ecosystem services. In particular, our research on private lands helps us to answer such questions as:

- How will current land-use practices (and projected changes thereto) impact grassland biodiversity?
- How are ecosystem services, like pollination, related to species presence or native biodiversity?
- Are quail Habitat Management Areas effective at restoring bobwhite populations? How might they be improved?
- Does arthropod community composition or nutritional value differ in cool- vs warm-season grass fields? What are the implications of this difference for birds or other insect-eating animals?
- What impact does field management timing have on overwintering bird or insect diversity?
- How does the establishment or maintenance of native grasses impact plant communities?

To answer these questions, VWL relies on engagement from the people living in the region, like you. Each year, we train a group of citizen scientists to conduct biodiversity surveys on private and public lands and recruit private landowners who enable us to collect these **data on their property. These individuals play a critical role in advancing VWL’s goals by** supporting our research and, just as importantly, by being conservation ambassadors in their own community. This work would not be possible without their dedication and support.

In this report, you will find a summary of surveys on your property.

Thank you so much for your involvement in this project; it would not be possible without you!

For more information, please contact our Outreach Coordinator, Charlotte Lorick, at (540)-635-0038, visit our website (www.vaworkinglandscapes.org), or find us on Facebook & Instagram.



SURVEY METHODS

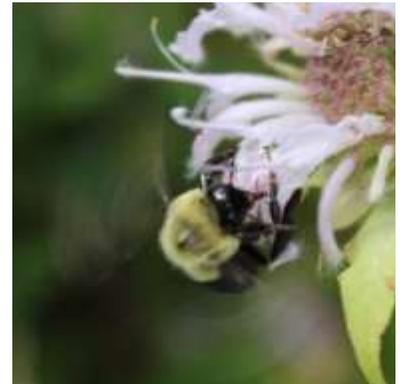
BREEDING BIRD SURVEY METHODS

The breeding bird survey quantifies grassland bird presence in fields during the breeding season. Many native birds rely on grasslands throughout the year, but not all birds use all types of fields. We survey birds using 10-min point counts, wherein we record each bird **seen or heard within 100 m of the survey point (or, “pole”).** A survey site typically has three poles, which are placed at least 100 m from the forest edge and ~200 m from each other. VWL surveyors conduct three rounds of point counts over the course of the survey season.



BUMBLE BEE SURVEY METHODS

The goal of the bumble bee survey is to determine species occurrence and diversity in grasslands. Bumble bees are vital pollinators and their diversity is a good indicator of grassland forb diversity. Field team members place one blue vane trap filled with propylene glycol (a non-toxic preservative) at each survey site, located at least 100 m from the forest edge. Team members collect specimens from the traps four times during the survey period (June-**early August**). **In the lab, bees are washed, dried, and sorted.** Dr. T'ai Roulston and colleagues at Blandy Experimental Farm conduct final species identification.



PLANT SURVEY METHODS

The grassland plant surveys help us determine plant species composition of each survey site, which can provide insight into habitat quality and the impact of land use on plant communities. To determine plant species occurrence and diversity, field team members identify plant species along a straight line transect at each pole. Each transect consists of seven one-m² plots. Sites are visited twice, once in the spring and once in the summer.



ORCHID SURVEY METHODS

Orchids are remarkably sensitive to environmental disturbances and, therefore, their presence or absence may be an indicator of forest health. Beginning in 2018, VVWL is partnering with the Changing Landscapes Initiative in hopes of establishing a long-term monitoring effort to understand how forest patch size and land use influence orchid occupancy. Each forest survey site consists of an unmarked circular survey plot, 200 m in diameter, centered on a GPS point. Within the plot, surveyors conduct a visual encounter survey, flagging any orchids they find and recording the species and location.



MAMMAL SURVEY METHODS

eMammal is a program of the Smithsonian Institution, designed to study the effects of human activity on mammal distribution. eMammal partners with VVWL to study mammals on private properties in Virginia. Reconyx Hyperfire cameras are deployed each year, usually between May and November. Researchers place cameras a minimum of 200 m apart, within forest fragments and old fields. Cameras are visited and moved on a three week rotation throughout the survey season. Surveyors work with eMammal experts to review and identify photographs of wildlife, and upload images and data to a Smithsonian digital repository.



SOIL SURVEY METHODS

Soil composition is useful for understanding plant communities and can provide information to landowners to improve management practices. A total of eight samples are taken at each survey pole and mixed together to give an average measure of soil characteristics at each site. Results represent the soil composition (i.e. organic matter, phosphorus, potassium, calcium, magnesium, pH, acidity and cation exchange capacity) within 100 m of the survey poles. Samples are analyzed by Waypoint Analytical.



ARTHROPOD SURVEY METHODS

This year VWL launched a pilot survey to test field protocols and collect data for a new Arthropod Diversity and Nutritional Quality project. Using canvas nets, pairs of volunteers collect insects along three 50 m transects located in two different fields; one field managed for cool-season grasses, and one field managed for warm-season grasses. Working in tandem, collectors survey a total area of about 300 m² per transect. Insects are brought back to the lab for identification and sorting. Nutritional analyses of collected insects will begin in 2019.



HOW DO WE SELECT SURVEY SITES?

All VWL properties do not receive the same surveys, and surveys on a property vary year to year.

That's because each survey has specific goals, requiring specific property characteristics or features.

Below, we describe some characteristics required for each type of survey.

Breeding Bird Survey

This survey requires 10+ acres of field that remains unmown from May 15th to June 30th. Given current research needs, some priority is now placed on smaller fields located near cities or towns.

Bumble Bee Survey

This survey can be conducted in any habitat type or patch size, but is more effective when located in fields and away from forest edges. Given current research needs, some priority is now placed on sites located near cities or towns.

Grassland Plant Survey

This survey requires 10+ acre fields, and is most effective when plants are allowed to reach maturity, and management actions such as mowing, grazing or burning can be delayed until surveys are completed.

Orchid Survey

This survey requires ~25+ acre patches of mature forest. Pilot sites are being selected based on research needs.

Mammal Survey

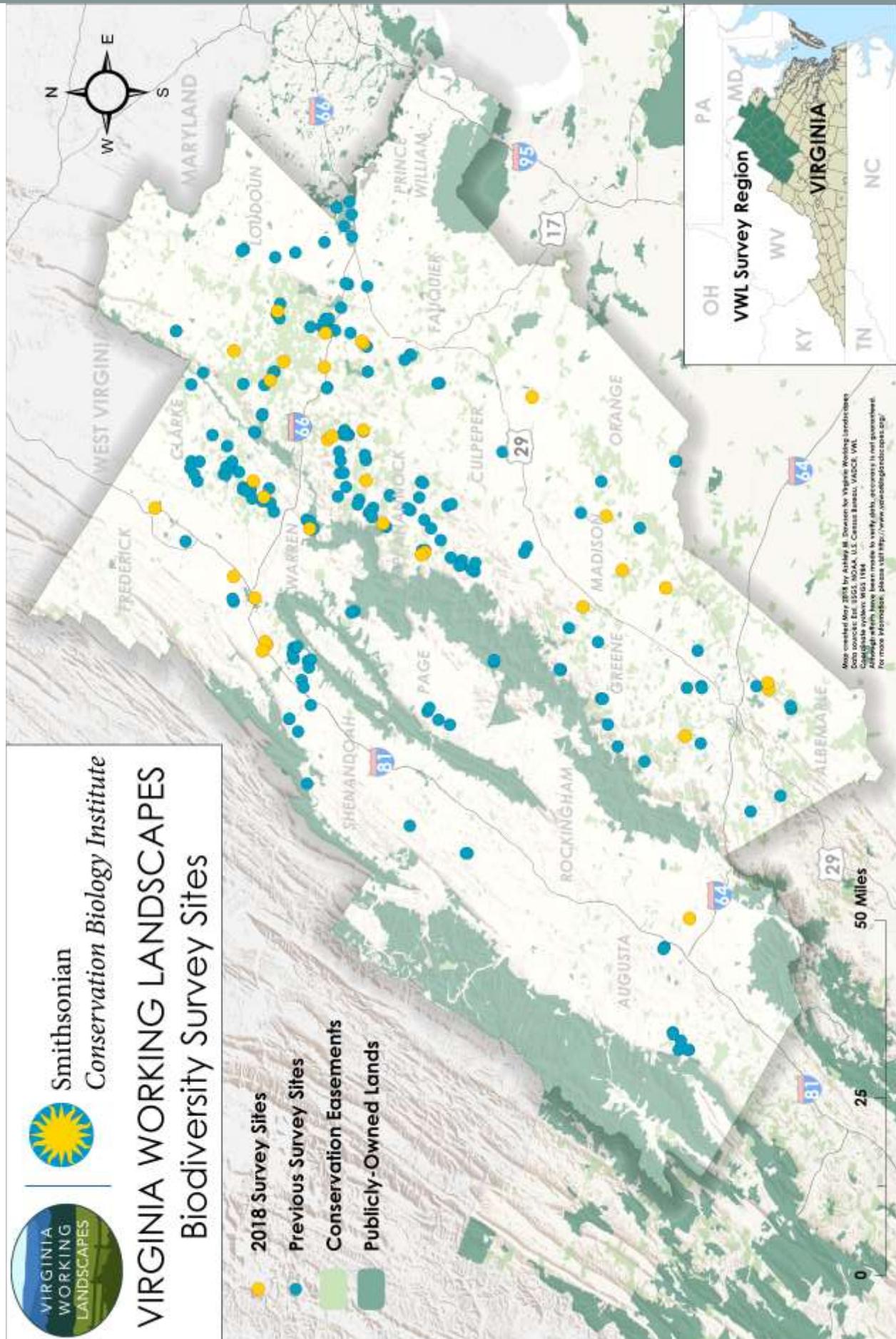
This survey requires forest patches that are a minimum of 10+ acres [or 120 meters across in all directions], or fields and other open spaces with minimal human/domestic animal activity.

Soil Survey

This survey is performed at sites where grassland plant, breeding bird, and bumble bee surveys have been conducted within the last five years.

Arthropod Survey

This survey requires 5+ acre fields. Pilot sites are being selected based on research needs.





SURVEY RESULTS ACROSS ALL SITES

SUMMARY RESULTS FOR ALL SURVEY PROPERTIES

In 2018, we surveyed a total of 30 properties, where we conducted a total of 78 plant surveys, 61 pollinator surveys, and 290 breeding bird point counts. We also collected 26 soil samples, and deployed 30 remote cameras for mammal surveys. For our pilot studies, we conducted a total of 18 arthropod surveys on one farm and three orchid surveys on two farms.

Across all sites, breeding bird surveys recorded a grand total of 89 species (including incidental observations). Of the 67 species that were recorded during official surveys, 14 were species of regional or continental concern. The four most commonly recorded birds were: Red-winged blackbird, American goldfinch, Indigo bunting, and Field sparrow.

Across all sites, pollinator surveys recorded a grand total of 10 bumblebee species, and the most common species was the two-spotted bumblebee (*Bombus bimaculatus*).

Across all sites, grassland plant surveys identified a grand total of 249 species (including subspecies and varieties), with an additional 59 groups only identifiable to genus or family. Of those identified to species level or better, 151 (61%) are considered native, 78 (31%) introduced, and 15 (6%) invasive in Northern Virginia. The three most commonly recorded plants were: Carolina horsenettle (*Solanum carolinense*), Tall fescue (*Lolium arundinaceum*), and Nimblewill (*Muhlenbergia schreberi*).

Across all sites, camera trap surveys detected a grand total of 11 mammal species. The most frequently detected species during the survey period were White-tailed deer, Northern raccoon, and Eastern gray squirrel.





SURVEY RESULTS: THE CLIFTON INSTITUTE

SUMMARY RESULTS

In 2018 we performed breeding bird, grassland plant, bumblebee pollinator, and soil surveys.

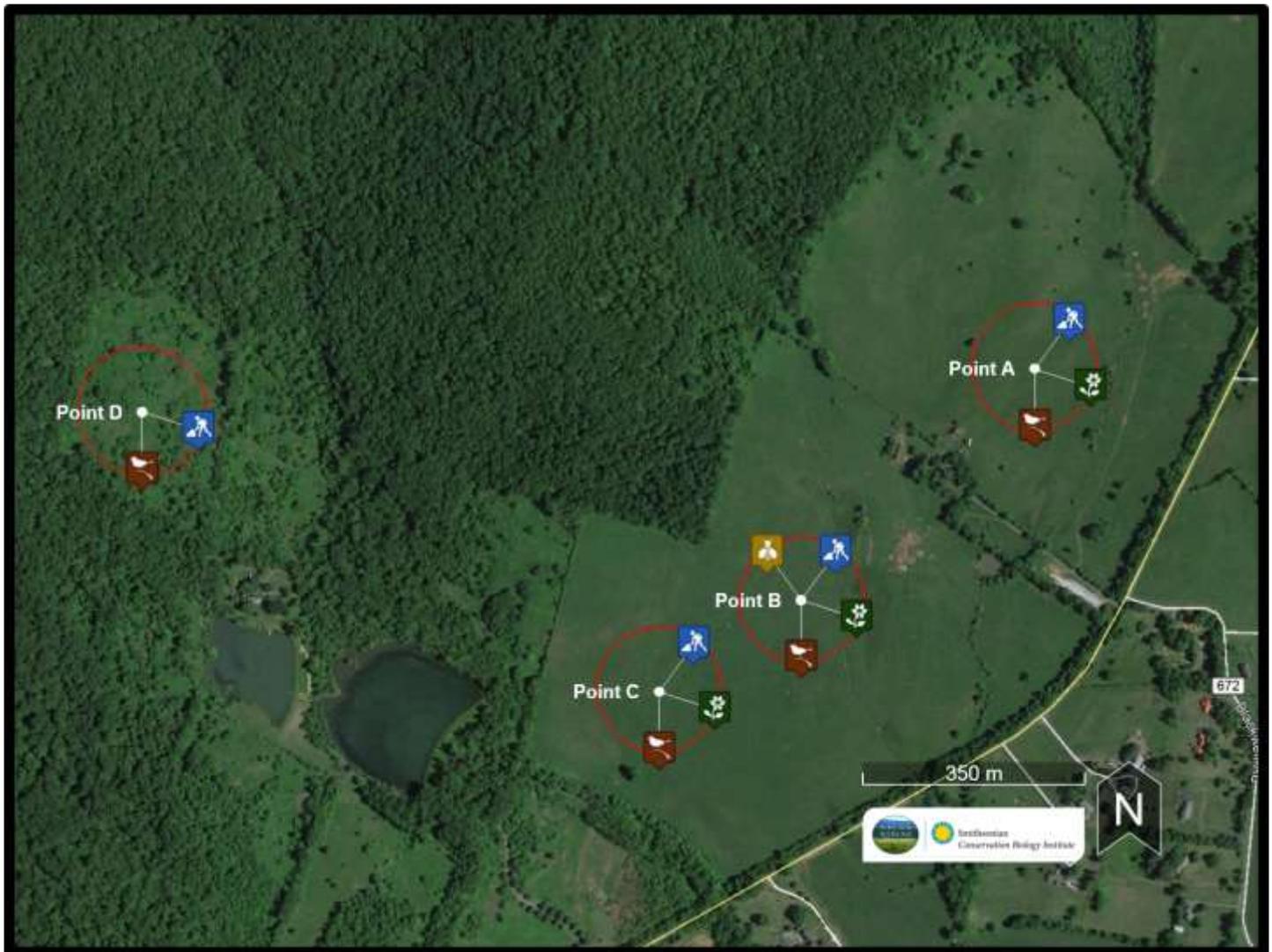


Figure 1. Overview map showing location of surveys.

Survey Type	
	Breeding Bird
	Grassland Plants
	Bumblebee Pollinators
	Soil Collection

BREEDING BIRD SURVEY

Table 1a: 2018 Breeding Bird Survey Results for Points A, B, and C. Species are listed in rank order of occurrence, out of a maximum occurrence of 9. Incidental observations (birds observed before or after the survey, or outside the survey area) are indicated with a “*” in the Occurrence column. The Species Status column indicates whether the species is considered to be of Regional or Continental concern (or Both).

Common Name	Scientific Name	Species Status [†]	Target Species ^{**}	Occurrence
Field Sparrow	<i>Spizella pusilla</i>	Both	shrubland	9
Grasshopper Sparrow	<i>Ammodramus savannarum</i>		grassland	9
Red-winged Blackbird	<i>Agelaius phoeniceus</i>		shrubland	9
Eastern Meadowlark	<i>Sturnella magna</i>	Both	grassland	8
Common Yellowthroat	<i>Geothlypis trichas</i>		shrubland	6
Song Sparrow	<i>Melospiza melodia</i>			6
Indigo Bunting	<i>Passerina cyanea</i>		shrubland	5
American Goldfinch	<i>Spinus tristis</i>			3
Blue Grosbeak	<i>Passerina caerulea</i>		shrubland	2
Eastern Towhee	<i>Pipilo erythrophthalmus</i>		shrubland	2
Northern Mockingbird	<i>Mimus polyglottos</i>			2
Eastern Bluebird	<i>Sialia sialis</i>		shrubland	1
Eastern Kingbird	<i>Tyrannus tyrannus</i>		grassland	1
American Crow	<i>Corvus brachyrhynchos</i>			*
American Robin	<i>Turdus migratorius</i>			*
Baltimore Oriole	<i>Icterus galbula</i>			*
Barn Swallow	<i>Hirundo rustica</i>			*
Blue Jay	<i>Cyanocitta cristata</i>			*
Canada Goose	<i>Branta canadensis</i>			*
Carolina Wren	<i>Thryothorus ludovicianus</i>			*
Chimney Swift	<i>Chaetura pelagica</i>	Both		*
Common Grackle	<i>Quiscalus quiscula</i>	Both		*
Downy Woodpecker	<i>Picoides pubescens</i>			*
European Starling	<i>Sturnus vulgaris</i>			*
Fish Crow	<i>Corvus ossifragus</i>			*
Killdeer	<i>Charadrius vociferus</i>			*

[†] Information on species of regional/continental conservation concern obtained from Partners in Flight (<http://www.pwrc.usgs.gov/pif/>).

^{**}VWL target species are those identified by SCBI researchers as dependent on grassland/shrubland habitats.

BREEDING BIRD SURVEY

Table 1a Continued: 2018 Breeding Bird Survey Results for Points A, B, and C. Species are listed in rank order of occurrence, out of a maximum occurrence of 9. Incidental observations (birds observed before or after the survey, or outside the survey area) are indicated with a “*” in the Occurrence column. The Species Status column indicates whether the species is considered to be of Regional or Continental concern (or Both).

Common Name	Scientific Name	Species Status†	Target Species**	Occurrence
Mourning Dove	<i>Zenaida macroura</i>			*
Northern Cardinal	<i>Cardinalis cardinalis</i>			*
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>			*
Orchard Oriole	<i>Icterus spurius</i>			*
Pileated Woodpecker	<i>Dryocopus pileatus</i>			*
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>			*
Red-tailed Hawk	<i>Buteo jamaicensis</i>			*
Scarlet Tanager	<i>Piranga olivacea</i>			*
Tree Swallow	<i>Tachycineta bicolor</i>			*
Turkey Vulture	<i>Cathartes aura</i>			*
Willow Flycatcher	<i>Empidonax traillii</i>		shrubland	*
Wood Thrush	<i>Hylocichla mustelina</i>	Both		*
Yellow-breasted Chat	<i>Icteria virens</i>		shrubland	*
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	Both	shrubland	*

† Information on species of regional/continental conservation concern obtained from Partners in Flight (<http://www.pwrc.usgs.gov/pif/>).

**VWL target species are those identified by SCBI researchers as dependent on grassland/shrubland habitats.

BREEDING BIRD SURVEY

Table 1b: 2018 Breeding Bird Survey Results for Point D. Species are listed in rank order of occurrence, out of a maximum occurrence of 3. Incidental observations (birds observed before or after the survey, or outside the survey area) are indicated with a “*” in the Occurrence column. The Species Status column indicates whether the species is considered to be of Regional or Continental concern (or Both).

Common Name	Scientific Name	Species of Concern†	Target Species**	Occurrence
Common Yellowthroat	<i>Geothlypis trichas</i>		shrubland	3
Field Sparrow	<i>Spizella pusilla</i>	Both	shrubland	3
Indigo Bunting	<i>Passerina cyanea</i>		shrubland	3
Northern Cardinal	<i>Cardinalis cardinalis</i>			3
Yellow-breasted Chat	<i>Icteria virens</i>		shrubland	3
American Goldfinch	<i>Spinus tristis</i>			2
Downy Woodpecker	<i>Picoides pubescens</i>			2
Blue Gray Gnatcatcher	<i>Polioptila caerulea</i>			1
Brown-headed Cowbird	<i>Molothrus ater</i>			1
Blue Jay	<i>Cyanocitta cristata</i>			1
Brown Thrasher	<i>Toxostoma rufum</i>		grassland	1
Eastern Towhee	<i>Pipilo erythrophthalmus</i>		shrubland	1
Great Crested Flycatcher	<i>Myiarchus crinitus</i>			1
Prairie Warbler	<i>Setophaga discolor</i>	Both	shrubland	1
Ruby-throated Hummingbird	<i>Archilochus colubris</i>			1
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	Both	shrubland	1
American Crow	<i>Corvus brachyrhynchos</i>			*
American Robin	<i>Turdus migratorius</i>			*
Canada Goose	<i>Branta canadensis</i>			*
Carolina Wren	<i>Thryothorus ludovicianus</i>			*
Cedar Waxwing	<i>Bombycilla cedrorum</i>			*
Eastern Wood-Pewee	<i>Contopus virens</i>			*
Tufted Titmouse	<i>Baeolophus bicolor</i>			*
Red-eyed Vireo	<i>Vireo olivaceus</i>			*
Scarlet Tanager	<i>Piranga olivacea</i>			*
White-eyed Vireo	<i>Vireo griseus</i>		shrubland	*
Wood Thrush	<i>Hylocichla mustelina</i>	Both		*

† Information on species of regional/continental conservation concern obtained from Partners in Flight (<http://www.pwrc.usgs.gov/pif/>).

**VWL target species are those identified by SCBI researchers as dependent on grassland/shrubland habitats.

BREEDING BIRD HIGHLIGHTS

The five bird species highlighted below are all found in grass and shrubland habitat types in Virginia. Those highlighted in green were found on your property.

<p><i>Indigo Bunting</i></p> <p>Preferred habitat: Open woodlands; shrubby areas; rural roadways and old pastures Found in Virginia only between late April and September, Buntings will overwinter throughout Central America and parts of the Caribbean.</p>	<p>Their blue color comes from microscopic structures in the feathers that refract and reflect blue light.</p>	
<p><i>Field Sparrow</i></p> <p>Preferred habitat: Shrubby areas such as open woodlands, forest edges, fence rows, and overgrown pastures. Status: High Regional and Continental Concern</p>	<p>They can raise up to three broods per season. In winter, they form loose flocks that forage together in fields, pastures, along roadsides, and forest edges.</p>	
<p><i>Eastern Meadowlark</i></p> <p>Preferred habitat: Grasslands, meadows, farm fields, and wet fields. Status: High Regional and Continental Concern Year-round residents in Virginia, Meadowlarks primarily eat insects like grasshoppers and crickets in the summer, and plant seeds, wild fruits, and corn in the winter.</p>	<p>Spectrogram analysis has shown the male can sing more than 100 variations of their song!</p>	
<p><i>Northern Bobwhite</i></p> <p>Preferred habitat: Open grassland habitats; pine-hardwood forests; brushy, recently disturbed areas; or patchy early successional forest areas. In winter, require some form of woody cover to prevent snows from covering forage. Status: High Regional and Continental Concern</p>	<p>More commonly heard than seen. Bobwhites forage in coveys of 3-20 individuals in the early morning or after sundown.</p>	
<p><i>Yellow-billed Cuckoo</i></p> <p>Preferred habitat: Open woodlands with dense scrub understory, overgrown orchards and pastures, usually alongside a stream or marsh. Status: High Regional and Continental Concern</p>	<p>Yellow-billed Cuckoos have one of the shortest nesting cycles of any bird species. From the start of incubation to fledging can take as little as 17 days.</p>	

BUMBLE BEE SURVEY

Table 2: 2018 Bumble Bee Survey Results. Species are listed in rank order of abundance. All bumblebee species found in this region are included in the list below, even if they were not detected on your property by this survey.

Common Name	Scientific Name	Status*	Abundance in Trap
Two-spotted bumblebee	<i>Bombus bimaculatus</i>	Common	653
Confusing bumblebee	<i>Bombus perplexus</i>	Common	191
Brown-belted bumblebee	<i>Bombus griseocollis</i>	Common	73
Black and gold bumblebee	<i>Bombus auricomus</i>	Uncommon	71
Unidentified bumblebee	<i>Bombus sp.</i>		27
Common eastern bumblebee	<i>Bombus impatiens</i>	Common, possibly expanding	13
American bumblebee	<i>Bombus pensylvanicus</i>	Uncommon, possibly in decline	11
Yellow bumblebee	<i>Bombus fervidus</i>	Uncommon, possibly in decline	7
Sanderson bumblebee	<i>Bombus sandersoni</i>	Uncommon	1
Lemon cuckoo bumblebee	<i>Bombus citrinus</i>	Common	0
Rusty-patched bumblebee	<i>Bombus affinis</i>	Endangered	0
Half-black bumblebee	<i>Bombus vagans</i>	Common	0

* Information on species status was obtained from the US Forest Service (<http://www.fs.fed.us/wildflowers/pollinators/documents/BumbleBeeGuideEast2011.pdf>)

BUMBLE BEE HIGHLIGHTS

The eleven bumblebee species highlighted below are each found in Virginia. Those highlighted in green were found on your property.

Sanderson Bumble Bee

Preferred plants: Lonicera (Honeysuckles), Rubus (Blackberry), Vaccinium (Blueberry), Monarda (Bee Balms), Melilotus (Sweet Clovers)

Tongue length: Short

Status in East U.S.: Uncommon

Unique Fact: This bee is thought to have limited tolerance of climatic changes; for this reason, it could be more affected by future climate warming than other species.



Half-black Bumble Bee

Preferred plants: Aster, Cirsium (Thistles), Lonicera (Honeysuckles), Monarda (Bee Balms), Trifolium (Clovers), Solidago (Goldenrods), Vicia (Vetches)

Tongue length: Medium

Status in East U.S.: Common.

Unique Fact: This species has shown significant declines in some regions; potential reasons for this include their specialization on flowers with long corollas and delayed spring emergence.



Common Eastern Bumble Bee

Preferred plants: Helianthus (Sunflowers), Asters, Solidago (Goldenrods), Lonicera (Honeysuckles), Vaccinium (Blueberry), Prunus (Cherry), Aesculus

Tongue length: Medium

Status in East U.S.: Common.

Unique Fact: As the name suggests, this is one of the most common bumble bees on the East Coast. It is also the bumble bee species of choice for pollination of commercial crops.



American Bumble Bee

Preferred plants: Vicia (Vetches), Lotus corniculata, Trifolium (Clovers), Solidago (Goldenrods), Hypericum (St. John's Wort), Eupatorium

Tongue length: Long

Status in East U.S.: Uncommon, Species of Conservation Concern.

Unique Fact: This bee was common across eastern & central US. The cause of its decline and the future of this species remain unclear.



Confusing Bumble Bee

Preferred plants: Hypericum (St. John's Wort), Lonicera (Honeysuckles)

Tongue length: Medium

Status in East U.S.: Common

Unique Fact: This bumble bee species has a more golden hue than other species. In the Appalachians, many individuals of this species are extensively yellow, making them resemble Yellow bumblebees, Half-black bumblebees, and Sanderson bumblebees.



BUMBLE BEE HIGHLIGHTS

Rusty-patched Bumble Bee

Preferred plants: Helianthus (Sunflowers), Asters, Solidago (Goldenrods), Lonicera (Honeysuckles), Vaccinium (Blueberry), Prunus (Cherry), Aesculus

Tongue length: Short

Status in East U.S.: Rare, in decline. Endangered.

Unique Fact: The first bee to be federally listed in North America under the Endangered Species Act.



Black and Gold Bumble Bee

Preferred plants: Monarda (Bee balm), Solanum (Nightshades and relatives), Trifolium (Clovers), Hypericum (St. John's Wort), Eupatorium

Tongue length: Long

Status in East U.S.: Uncommon

Unique Fact: While most species in the Bombus genus lay clusters of eggs in a single wax-pollen mass, Bombus auricomus lays individual eggs in several separate cells.



Two-spotted Bumble Bee

Preferred plants: Cirsium (Thistles), Hypericum (St. John's Wort), Melilotus (Sweet Clovers), Rosa, Solidago (Goldenrods), Vicia (Vetches)

Tongue length: Medium

Status in East U.S.: Common.

Unique Fact: Worker bees of this species look very similar to queens, and are sometimes only distinguishable by their difference in size



Lemon Cuckoo Bumble Bee

Preferred plants: Cirsium (Thistles), Eupatorium, Liatris, Pycnanthemum, Solidago (Goldenrods), Veronia
Tongue length: Short

Status in East U.S.: Widespread.

Unique Fact: Cuckoo bees are parasitic, having lost the ability to collect pollen or rear offspring. Females enter bee colonies, kill or subdue the queen, and then force the workers of that colony to feed her and her young.



Yellow Bumble Bee

Preferred plants: Lonicera (Honeysuckles), Cirsium (Thistles), Trifolium (Clovers), Penstemon (Beardtongues), Lythrum, Vicia (Vetches), Monarda (Bee Balms)

Tongue length: Long

Status in East U.S.: Uncommon, possibly in decline

Unique Fact: This bee is very protective of its colony and can be uncharacteristically aggressive for a bumble bee.



Brown-belted Bumble Bee

Preferred plants: Asclepias (Milkweeds), Cirsium (Thistles), Helianthus (Sunflowers), Solidago (Goldenrods), Rhus (Sumacs), Lythrum (Loosestrifes)

Tongue length: Medium

Status in East U.S.: Common.

Unique Fact: This bee's striking brown stripe on its abdomen occasionally causes it to be confused with the Rusty-patched bumble bee.



GRASSLAND PLANT SURVEY

Table 3: 2018 Plant Survey Results. Species are listed in rank order of occurrence, out of a maximum occurrence of 42. Plants are identified to species, unless otherwise noted.

Common Name	Scientific Name	Native Status*	Growth Form**	Occurrence
Carolina horsenettle	<i>Solanum carolinense var. carolinense</i>	native	F	30
Red clover	<i>Trifolium pratense</i>	introduced	F	21
Annual bluegrass	<i>Poa annua</i>	introduced	G	20
Nimblewill	<i>Muhlenbergia schreberi</i>	native	G	17
Coralberry	<i>Symphoricarpos orbiculatus</i>	invasive	W	16
White clover	<i>Trifolium repens</i>	introduced	F	14
Narrowleaf plantain	<i>Plantago lanceolata</i>	introduced	F	14
Field paspalum	<i>Paspalum laeve</i>	native	G	13
Purpletop tridens	<i>Tridens flavus</i>	native	G	12
Yellow crownbeard	<i>Verbesina occidentalis</i>	native	F	10
Yellow foxtail	<i>Setaria pumila</i>	introduced	G	10
Timothy	<i>Phleum pratense</i>	introduced	G	9
Small carpetgrass	<i>Arthraxon hispidus</i>	introduced	G	8
Queen anne's lace	<i>Daucus carota</i>	introduced	F	8
Annual ragweed	<i>Ambrosia artemisiifolia</i>	native	F	7
Japanese clover	<i>Kummerowia striata</i>	invasive	F	6
Sweet vernalgrass	<i>Anthoxanthum odoratum</i>	introduced	G	5
Johnsongrass	<i>Sorghum halepense</i>	introduced	G	5
Ground ivy	<i>Glechoma hederacea</i>	introduced	F	5
Chicory	<i>Cichorium intybus</i>	introduced	F	4
Beaked panicgrass	<i>Coleataenia anceps</i>	native	G	4
Spotted knapweed	<i>Centaurea stoebe ssp. micranthos</i>	invasive	F	4
Multiflora rose	<i>Rosa multiflora</i>	invasive	W	4
Orchardgrass	<i>Dactylis glomerata</i>	introduced	G	3
Common yellow oxalis	<i>Oxalis stricta</i>	native	F	3

* 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/>).

GRASSLAND PLANT SURVEY

Table 3 Continued: 2018 Plant Survey Results. Species are listed in rank order of occurrence, out of a maximum occurrence of 42. Plants are identified to species, unless otherwise noted.

Common Name	Scientific Name	Native Status*	Growth Form**	Occurrence
Japanese honeysuckle	<i>Lonicera japonica</i>	invasive	W	3
Oriental bittersweet	<i>Celastrus orbiculatus</i>	invasive	W	3
Common blue violet	<i>Viola sororia</i>	native	F	3
Common velvetgrass	<i>Holcus lanatus</i>	introduced	G	3
Broomsedge bluestem	<i>Andropogon virginicus</i>	native	G	2
Eastern poison ivy	<i>Toxicodendron radicans</i>	native	W	2
Wild basil	<i>Clinopodium vulgare</i>	native	F	2
Virginia groundcherry	<i>Physalis virginiana</i>	native	F	2
Virginia creeper	<i>Parthenocissus quinquefolia</i>	native	W	2
Green bristlegrass	<i>Setaria viridis</i>	introduced	G	2
Sericea lespedeza	<i>Lespedeza cuneata</i>	invasive	F	1
Field bindweed	<i>Convolvulus arvensis</i>	introduced	F	1
White vervain	<i>Verbena urticifolia</i>	native	F	1
Curly dock	<i>Rumex crispus</i>	introduced	F	1
New york ironweed	<i>Vernonia noveboracensis</i>	native	F	1
Hedge false bindweed	<i>Calystegia sepium</i>	native	F	1
Canada goldenrod	<i>Solidago canadensis</i>	native	F	1
Purple lovegrass	<i>Eragrostis spectabilis</i>	native	G	1
Button eryngo	<i>Eryngium yuccifolium</i>	native	F	1
Woolly ragwort	<i>Packera tomentosa</i>	native	F	1
Oriental lady's thumb	<i>Persicaria longiseta</i>	introduced	F	1
Rough cocklebur	<i>Xanthium strumarium var. glabratum</i>	native	F	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/>).

GRASSLAND PLANT HIGHLIGHTS

The four warm-season grasses highlighted below are typical of grasslands found in Virginia. Those highlighted in green were found on your property. The following botanical information comes from USDA's Plant Guides & Fact Sheets, and from the Lady Bird Johnson Wildflower Center's native plants database

Indiangrass *Sorghastrum nutans*

Description: a bunching grass that reaches 3-8 ft with blue-green blades and a large, golden-brown plume-like seedhead.

Value: may be used singly or in mixtures for livestock; excellent wildlife habitat and food for deer

Management: grows best in deep, well-drained soils; responds well to controlled grazing, prescribed burning, and careful use of herbicides/fertilizers.



Big bluestem *Andropogon gerardii*

Description: a warm-season bunchgrass with blue-green stems that reach 4-8 ft; seedhead resembles a turkey's foot.

Value: cattle love it; provides nesting/escape cover for birds and mammals all year; tall, persistent, stems provide early nesting sites

Management: spreads vigorously on favorable sites, but relatively weak seedling vigor; control of competition necessary for establishment.



Little bluestem *Schizachyrium scoparium*

Description: an ornamental bunchgrass that reaches 2-3 ft with stems that turn red in fall; showy white seedheads.

Value: highly adaptable, drought tolerant; seeds a valuable food for small mammals and birds; attracts diverse insects

Management: adapted to soils ranging from sandy to clay-loam in texture; well-timed burning can help reduce competing cool-season grasses and woody vegetation.



Switchgrass *Panicum virgatum*

Description: a clumping, warm-season grass that reaches 3-6 ft; produces lacy sprays of seeds; leaves last through winter.

Value: a valuable soil stabilization plant; provides nesting and fall and winter cover for wildlife; holds up well in heavy snow

Management: tolerates a wide range of soils, including dry ones, but prefers moist, sandy or clay soils.



WHY DOES THIS MATTER? Native tallgrass prairie grasses like these reach their peak growth late in spring, just when temperatures begin to rise. Bluestems and indiangrass, for example, put out their flowers in mid to late June. Thus, these grasses can be harvested for the first time later in the growing season than either cool-season grasses or switchgrass and eastern gamagrass (late April to late May), and this can benefit wildlife using the fields.

GRASSLAND PLANT HIGHLIGHTS

The two native herbaceous plants highlighted below on the left were commonly sampled at VWL sites this year, whereas the two native herbaceous plants on the right were rare across VWL sites. Those highlighted in green were found on your property.



Photo by John Hilty

Carolina horsenettle *Solanum carolinense*

Description: A deep-rooted perennial covered in fine hairs; flowers white with yellow center; fruits resemble small yellow tomatoes.

Unique: not a true nettle, actually in nightshade family and is poisonous to humans.

Value: blooms for over 6 months (Apr-Oct); pollinated by bumble bees and fed on by 32+ insect species, including caterpillars of Riley's clearwing moth and Carolina sphinx moth.



Photo by R.W. Smith



Common milkweed *Asclepias syriaca*

Description: A tall and conspicuous species that produces large umbels of pink or purplish flowers

Unique: considered a "fugitive" species because it depends on disturbance to open up space for it and can not out-compete other vegetation.

Value: attractive to many insects, including the common milkweed bug, red milkweed beetle, monarch butterfly, as well as many bees



Photo by Julie Makin

Blue wild indigo *Baptisia australis*

Description: A native perennial, deep rooted legume that spreads by seed or rhizomes

Unique: formerly used for blue dye; a popular ornamental because it grows well without needing to be watered, fertilized, or pruned; this plant was found at only one property

Value: as a legume, it fixes nitrogen in the soil; provides ground cover and is part of a good wildlife seed mixture when other grasses and forbs are included.



Photo by Benny Simpson



Photo by Jim Pisarowicz

Green comet milkweed *Asclepias viridiflora*

Description: A native, herbaceous plant with distinctive greenish-white flowers.

Unique: usually found in high-quality undisturbed habitats; endangered in Florida and Connecticut and threatened in New York.

Value: nectar of the flowers attracts bumblebees; caterpillars of the monarch butterfly can feed on the leaves.



Photo by Fritz Flohr Reynolds

SOIL SURVEY

Table 4: 2018 Soil Survey Results. Soil samples were processed by Waypoint Analytical, using the Mehlich-3 test. Ratings of very low, low, medium, high, or very high provide a general guideline for the adequacy of nutrient levels for field crops. Parts per million, ppm, can be converted to pounds per acre, lbs/ac, by multiplying by two.

Pole	Organic Matter			pH	CEC meq/ 100g	P		K			Mg			Ca			H
	Percent	Rating	ENR			ppm	Rating	ppm	Rating	% Sat	ppm	Rating	% Sat	ppm	Rating	% Sat	
A	7.3	VH	150	5.5	11.3	7	VL	178	VH	4	185	M	13.6	1274	M	56.4	25.7
B	6.4	H	150	5.4	9.5	5	VL	144	H	3.9	186	H	16.3	970	M	51.1	28.4
C	6	H	150	5.5	13.1	4	VL	114	M	2.2	312	H	19.8	1354	M	51.7	26
D	5.7	H	150	5.6	7.7	3	VL	127	H	4.2	174	H	18.8	821	M	53.3	23.4

Organic Matter (OM): Amount (percent) of decaying plant and animal material in the soil. The Estimated Nitrogen Release (ENR) is the amount of nitrogen (lbs/ac) that can be released from OM via bacterial activity or other means. The percent OM and ENR may be influenced by seasonal variation in weather or by soil physical conditions.

pH: A measure of soil acidity or alkalinity. A pH of 7.0 is neutral, lower pH is acidic, and higher is alkaline. Rule of thumb suggests a desirable pH for mineral soils is 6-7, and 5-5.5 for organic soils.

Cation Exchange Capacity (CEC): A measure of the soil's ability to hold nutrients (such as Ca, Mg, K, or H) in terms of milliequivalents per 100 grams of soil. Clay minerals and organic matter present in the soil affect CEC; it can range from <5 to 35 meq/100g for agricultural soils; $CEC = \% OM * (Soil\ pH - 4.5)$

Phosphorous (P): Amount of P available to the plant, measured in parts per million (ppm). Levels between 15-31 ppm are adequate for most crops. Excessively high levels can decrease the availability of other nutrients to plants.

Potassium (K): Plant-available potassium (parts per million). Generally higher levels of potassium are needed on soils high in clay and organic matter. On finer textured soils, potassium loss can occur through fixation.

Magnesium (Mg): Plant-available magnesium (parts per million). Soil type, drainage, liming and cropping practices affect Mg levels. Mg saturations >20% can adversely affect soil structure, infiltration, and aeration.

Calcium (Ca): Plant-available calcium (parts per million). In addition to the factors mentioned for Mg, soil pH can also affect Ca levels. Ca saturations >85% may indicate calcareous or gypsiferous soil.

Percent Cation Saturation (% Sat): Proportion (percent) of the CEC occupied by a given cation (i.e., an ion with a positive charge, such as calcium, magnesium or potassium).

WHY DOES THIS MATTER? Traditionally, "ideal" soil was defined as having CEC of 10 meq/100g; pH of 6.5; and CEC occupied by 20% H, 65% Ca, 10% Mg, and 5% K. In reality, as long as the cations ratios are typical of soils in your region, there is nothing to be gained by making them conform to a narrow, idealized range. Instead, ensure that amounts of nutrients are sufficient for most crops, or suitable to a specific, desired crop.

(*information about soil parameters from:* Waypoint Analytical at <http://www.waypointanalytical.com/docs/technicalarticles/howtointerpretasoiltestreport.pdf>; *information about soil suitability from:* Magdoff, F, & Van Es, H. 2010. "Building soils for better crops". 3rd Ed. Sustainable Agriculture Network; *information about soil balancing from:* Chaganti, VN., Culman, SW. 2017. Historical perspective of soil balancing theory and identifying knowledge gaps: A review. Crops and Soils.)



DISCUSSION

Virginia Working Landscapes’ annual biodiversity surveys are designed to inform how land management influences select species groups in select habitats across a large study area. This work allows VVWL researchers and partners to monitor trends among suites of bird species, important insect pollinators, mammal populations, soil health, and more. Collectively, these surveys help us understand the value of biodiversity on working lands.

While we hope these reports are useful to landowners, there are a few considerations to keep in mind. Our reports present a snapshot of species occupancy at each property during the survey period. For instance, some may note that species regularly observed on their property are absent from our lists. Rather than an accounting of all species present on any given property, each report provides a glimpse into the vastly complex ecosystems of each property and, perhaps, of the broader landscape.

In general, our surveys are focused on identifying flora and fauna at specific times and in specific places. Bird surveys aim to inventory birds during a 6-week period of active breeding, **while our bumble bee collection takes place during a specific window of the bees’ annual cycle.** Species present in the area during other times of year – such as winter or migration – may not be picked up by our breeding season surveys. Surveyors are instructed to abide by time and space limits in their searches; they count birds within a strict 10-minute time window and a 100 meter search radius, and document plants within 1 x 1 meter plots. Species detected outside a search area or a time window are not counted. Although it limits total numbers of species on an annual list, this study design standardizes search effort and enables meaningful comparisons among properties. Finally, surveyors have the option to spend **additional time collecting “incidental” observations to enrich their experience and to provide** landowners with fuller species lists. While some surveyors spend considerable time on this, others spend less time or no time at all. Thus, the extensiveness of incidental lists can vary from property to property.

We encourage our readers to examine these results and consider how land management practices might affect these species and their habitats. You might even start a species list of your own, and witness firsthand how the diversity of life on your property changes with the seasons. Indeed, discovering a heretofore unknown wildlife neighbor can be a unique delight, of immeasurable value. For information on available tools to help facilitate this, please reach out to us at SCBIVWL@si.edu.



RESOURCES

Visit our [Helpful Resources](#) and [Partners](#) pages on our website to learn more about what you can do to increase native biodiversity and abundance of specific wildlife species on your property. We have also provided some helpful links below to get you started. If you want to view these resources, click the links on the digital version of your report.

Planting Natives and Establishing/Managing Warm Season Meadows

- [Establishing and managing native warm season grasses](#)
- [Selection and Use of Native Warm-Season Grass Varieties for the Mid-Atlantic Region](#)
- [Native Plants for Wildlife Habitat and Conservation Landscaping: Chesapeake Bay Watershed](#)
- [Native Plants for Conservation, Restoration, and Landscaping](#)

Technical and Financial Assistance

- [Sources of Conservation Funding](#)
- [Introduction to Conservation Easements](#)
- [SWCD Conservation Assistance Program](#)
- [NRCS Service Programs](#)

Managing for Wildlife

- [Managing Land in the Piedmont of Virginia for the Benefit of Birds and Other Wildlife](#)
- [Area Sensitivity in North American Grassland Birds](#)

For quail and other grassland birds:

- [Area Sensitivity in North American Grassland Birds](#)
- [A Tightwad's Guide to Bobwhite Management](#)

For pollinators:

- [Pollinators in Natural Areas, A Primer on Habitat Management](#)
- [Selecting Plants for Pollinators](#)

Invasive Plants

- [Invasive Plant Species of Virginia](#)
- [Native Alternatives to Invasive Plants](#)
- [Blue Ridge PRISM Nonnative Invasive Plant Factsheets](#)

These resources and many more are made available by:





ACKNOWLEDGEMENTS

First, we would like to extend a big *thank you* to you, the landowner, for giving us the opportunity to survey your property. We also gratefully acknowledge the following volunteer citizen scientists and community partners for donating their time and expertise.

Property	County	Citizen Science Volunteers
Ashland	Madison	Kate Heneberry and Alex Bueno (Bird Survey); Richard Stromberg and Debbie Pugh (Plant Survey); Peggy Plass (Pollinator Survey)
Barboursville Vineyards	Orange	Bill Birkhofer and Dana Squire (Bird Survey, Plant Survey, and Pollinator Survey)
Schelford Farm	Albemarle	Eve Gaige (Pollinator Survey)
Blue Hills Farm	Madison	Allyson Whalley and Brandon Haggard (Pollinator Survey); Dana Squire and Robert Petty (Plant Survey); Amy Neale and Janet Paisley (Bird Survey)
The Clifton Institute	Fauquier	Bert Harris (Bird Survey); Cathy Mayes and Jocelyn Sladen (Plant Survey); Marilyn Kupetz (Pollinator Survey)
Eldon Farms	Rappahannock	Art Drauglis (Mammal Survey)
Long Meadow Farm	Augusta	Penny Warren (Bird Survey)
Greenway Farm	Madison	Richard Stromberg and Robert Petty (Plant Survey); Allyson Whalley (Birds)
Innisfree	Fauquier	Cathy Mayes and Karen Fall (Bird Survey); Ben Hamm (Pollinator Survey); Sally Cunningham, Ashley Landes, and Alex Bueno (Plant Survey)
Kinloch Farm	Fauquier	Tricia Booker and Hillary Davidson (Bird Survey)
Lanark Farm	Albemarle	Dana Squire and Ashley Dawson (Plant Survey); Eve Gaige (Pollinator Survey)
Lazy Dog Farm	Loudoun	Shannon Dart and Robin Richards (Bird Survey)
Learning Tree Farms	Fauquier	Liz Harrington (Pollinator Surveys); Paul Guay, Karen Fall, and Phyllis Partain (Plant Surveys); Steph Ridder (Bird Surveys); Paul Guay (Orchid Survey)
MARE Center	Fauquier	Phil Kenny and Russ Taylor (Bird Survey); Joyce Harman (Plant Survey); Jennifer Holder (Pollinator Survey)
Mount Vernon Farm	Rappahannock	Bert Harris (Bird Survey)
Oak Spring Garden Foundation	Fauquier	Sally Anderson and Mary Bartlett (Plant Survey); Eugenia Bodnar (Pollinator Survey); Bob Butterworth and Art Drauglis (Bird Survey)
Oxbow Farm	Warren	Alex Newhart, Jeff Woods, Karen Fall, Mike and Annette Masnik, and Byron Waltham (Arthropod Survey)

Property	County	Citizen Science Volunteers (cont from above)
Rose Hill Game Preserve	Culpeper	Ashley Landes (Pollinator Survey); Bill Birkhofer (Bird Survey); Ashley Dawson and Bill Birkhofer (Plant Survey)
South River Nature Preserve	Greene	Mark Walkup (Mammal Survey)
The Volgenau Farm	Fauquier	Laura Helm (Pollinator Survey); Sally Anderson, Karl Brotzman, Theresa Krause, and Mary Bartlett (Plant Survey); Bert Harris (Bird Survey)

SURVEY PARTNERS 2018

Thank you to all our partners for helping with pollinator, arthropod, quail, mammal, and drone surveys!



VWL TEAM 2018

Amy Johnson	<i>Program Director</i>
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VWL is supported by private philanthropy and our work is made possible by the generous contributions from our community. Your support 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: Jennifer Davis

Smithsonian Conservation Biology Institute, Office of Advancement
1500 Remount Rd, MRC 5530, Front Royal, VA 22630

- ◆ To donate online, visit www.vaworkinglandscapes.org/donate and follow the instructions.
- ◆ To donate over the phone, please call Jennifer Davis at 540-635-0264.

*For further inquiries, please contact Jennifer Davis at DavisJ@si.edu, 540-635-0264
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