



Smithsonian
National Zoological Park
Conservation Biology Institute



VIRGINIA WORKING LANDSCAPES

KINLOCH FARM

2023 BIODIVERSITY SURVEY RESULTS

Introduction

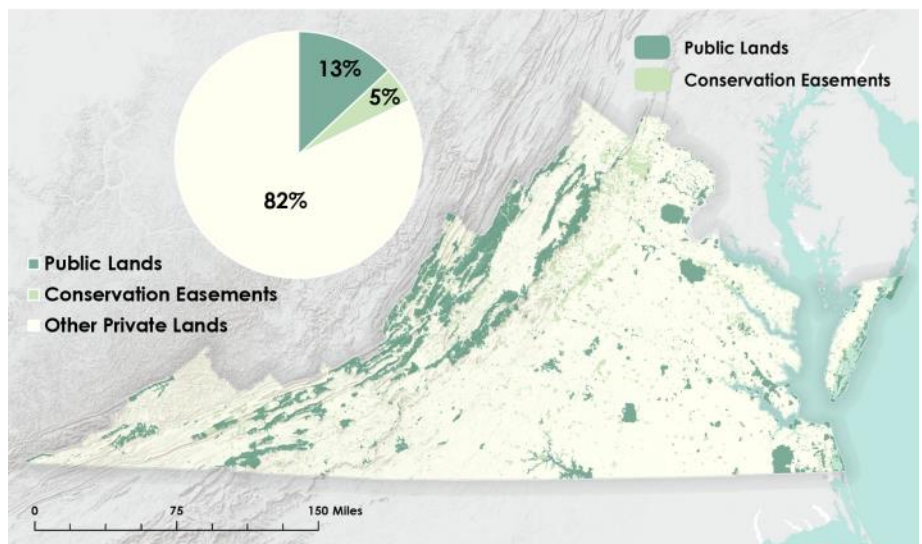
“Land conservation is truly an area where individuals can make a difference—in fact, where individuals are critical. What America will look like a hundred years from now is being decided day-by-day, parcel-by-parcel, by landowners like you.”

—Conservation Options: A Landowner’s Guide

Virginia Working Landscapes (VWL), a program of the Smithsonian’s National Zoo and Conservation Biology Institute in Front Royal, VA, *promotes the conservation of native biodiversity and sustainable land-use through scientific **research, education, and community engagement***. VWL was formed in 2010 to bridge the science of the Smithsonian with deep-rooted local expertise to collectively study, inform, facilitate, and inspire conservation management on working landscapes. This includes critical research on one of our nation’s most threatened habitats — grasslands.

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.* Furthermore, one-third of North American species considered endangered are found on grasslands. As such, the majority of our research efforts focus on grassland habitats — from restored native meadows to actively grazed pastures — in an effort to understand how to optimize opportunities for biodiversity conservation in these understudied systems. Over time, we have also expanded partnerships to periodically pursue research questions that explore other systems, such as forests and even human behavior.

Each year, VWL partners with scientists, graduate students, interns, landowners, and volunteer community scientists to organize and conduct our foundational grassland biodiversity surveys on private lands throughout the region. The information we learn from these surveys provide vital insights into what species are here and thriving, and which ones are not. They also allow us to examine the impacts of land-use practices on those species and their habitats.



The overwhelming majority of land in Virginia is held in private hands, with more than 90% of grasslands now privately-owned. Therefore, you and other landowners are collectively stewarding the majority of Virginia’s natural resources.

Introduction

The more we learn, the more we identify species, land-use practices, and habitats that might require a closer look. To do so, we can harness the expertise of other Smithsonian units, as well as local partners like NGOs, academic institutions, land trusts, state agencies, and landowners to help develop and conduct focal research projects that address critical gaps in knowledge. Currently, we're prioritizing questions that address the complex interactions between agriculture, species conservation, habitat restoration, and land-use. For example:

- ◆ How do grazing and haying practices impact the nesting success of breeding grassland birds? Can we identify management practices that work for both farmers and birds?
- ◆ What are the optimal techniques for successfully restoring and maintaining diverse native grassland habitats?
- ◆ Can the establishment of native wildflowers into cattle pastures improve pollinator habitat while maintaining forage quality?
- ◆ How do land-use practices common to our region impact grassland bird, pollinator, and plant communities?

Why is this research important? Humans receive many tangible and intangible benefits from the natural world — from the spiritual (a walk through nature) to the utilitarian (the value of preserving native pollinators for food production or diverse plant communities for stormwater retention). These services are intricately dependent upon a biodiverse ecosystem. Given that most land in Virginia is privately-owned, understanding how private properties are managed and the impacts of that management on native biodiversity is critical for informing best management practices that can improve the livelihoods of people and the species we share the landscape with.

Illustration by Nick Garnhart



Survey Methods

Breeding Bird Survey Methods

The breeding bird survey quantifies grassland bird diversity and abundance in fields during the breeding season. Many native birds rely on grasslands throughout the year, but not all birds use all types of fields. This survey requires 10+ acres of field that ideally remains unmanaged from May 15th to June 30th. We survey birds using 10-min point counts, wherein we record each bird seen or heard within 100 m of the survey point. A survey site typically has three points that 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.



Plant Survey Methods

The grassland plant surveys measure plant species composition of each survey site, which can provide insight into habitat quality and the impact of land-use on plant communities. 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. To determine plant species occurrence and diversity, surveyors assess plots along a linear transect starting at the designated survey points. Species are identified within seven 1-m² plots arranged along the transect. Each site is visited twice, once in the spring and once in the summer.



Survey Methods

Soil Survey Methods

Soil composition is useful for understanding soil health and its correlation with plant communities. In addition, it can offer valuable insights to landowners, aiding them in enhancing management practices. A total of eight samples are taken at each survey point and mixed together to provide an average measure of soil characteristics at each survey point. 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 points. Samples are analyzed by Waypoint Analytical.



Biodiversity Survey Sites

- 2023 Survey Sites
- Past Survey Sites
- Publicly-Owned Lands
- Conservation Easements

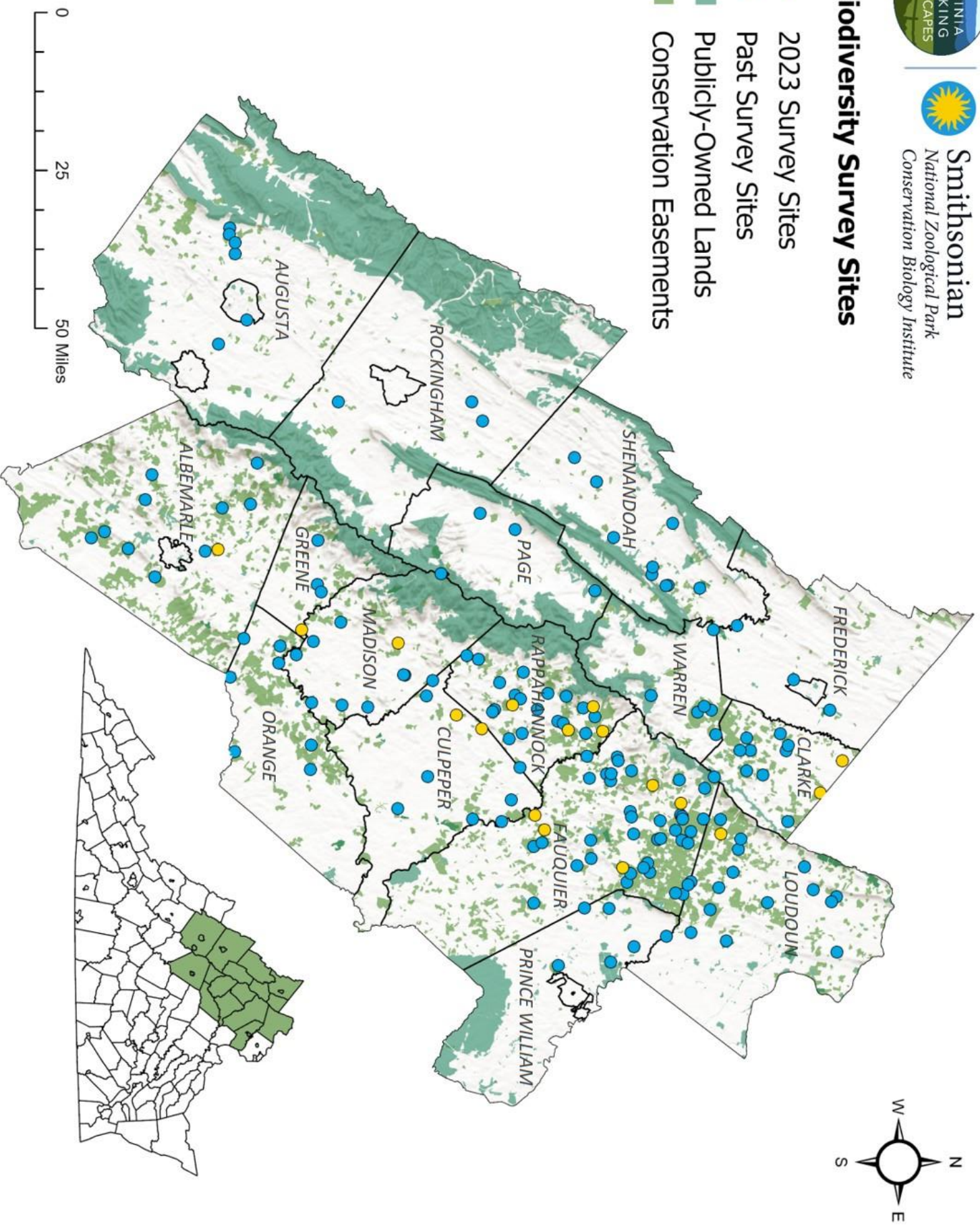


Figure 1. Overview map showing locations of VWL's 2023 Grassland Biodiversity Surveys.

Survey Results Across All Sites

In 2023, our grassland biodiversity surveys spanned 18 properties, encompassing 34 plant surveys, 54 breeding bird point counts, and 41 soil sample collections.



Cumulatively across all sites, breeding bird surveys recorded **103** species (including incidental observations). Of the **68** species that were recorded during official surveys, **19** are formerly listed as Species of Concern according to the 2016 Partners in Flight Continental Watch List Report and the 2015 Virginia Wildlife Action Plan. The four most commonly recorded birds were Red-winged Blackbird (*Agelaius phoeniceus*), Eastern Meadowlark (*Sturnella magna*), Bobolink (*Dolichonyx oryzivorus*), and American Goldfinch (*Spinus tristis*).

Across all plant survey sites, we identified a total of **357** species, subspecies, varieties and an additional **88** plants only identifiable to genus or family. Of those taxa identified to the species level or better, **228** (64%) are native, **103** (29%) are introduced, **21** (6%) are invasive, and **5** (1%) are of uncertain status in Northern Virginia. The three most commonly recorded species were Tall Fescue (*Schedonorus arundinaceus*), Carolina Horsenettle (*Solanum carolinense* var. *carolinense*), and Kentucky Bluegrass (*Poa pratensis*).



Survey Results for Kinloch Farm

SUMMARY RESULTS FOR YOUR PROPERTY

On your property, we performed breeding bird surveys, plant surveys, and soil surveys. We also conducted forest surveys in the deer exclusion plots

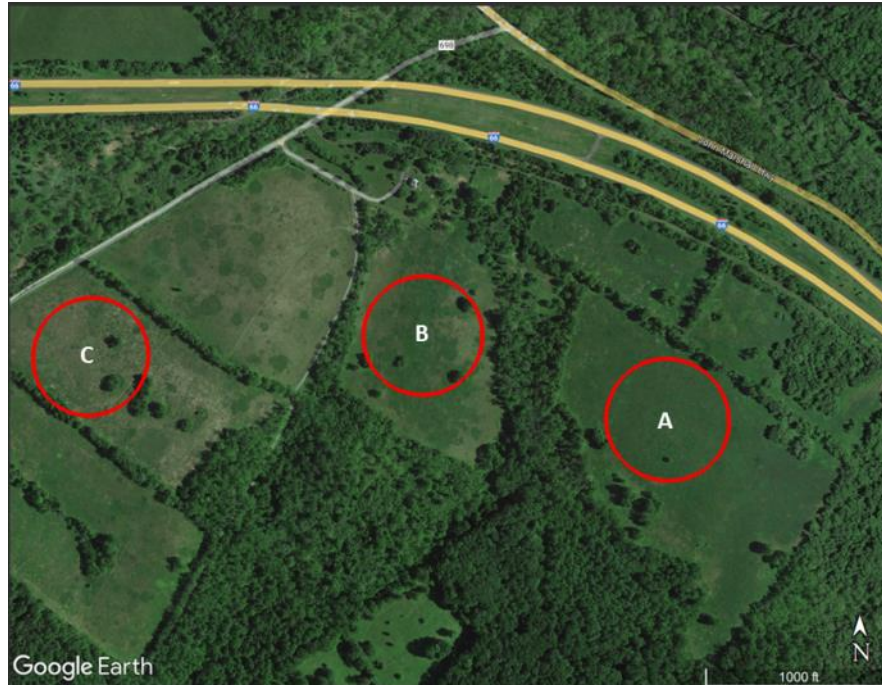


Figure 2. Overview map showing location of grassland surveys conducted at Hansborough.

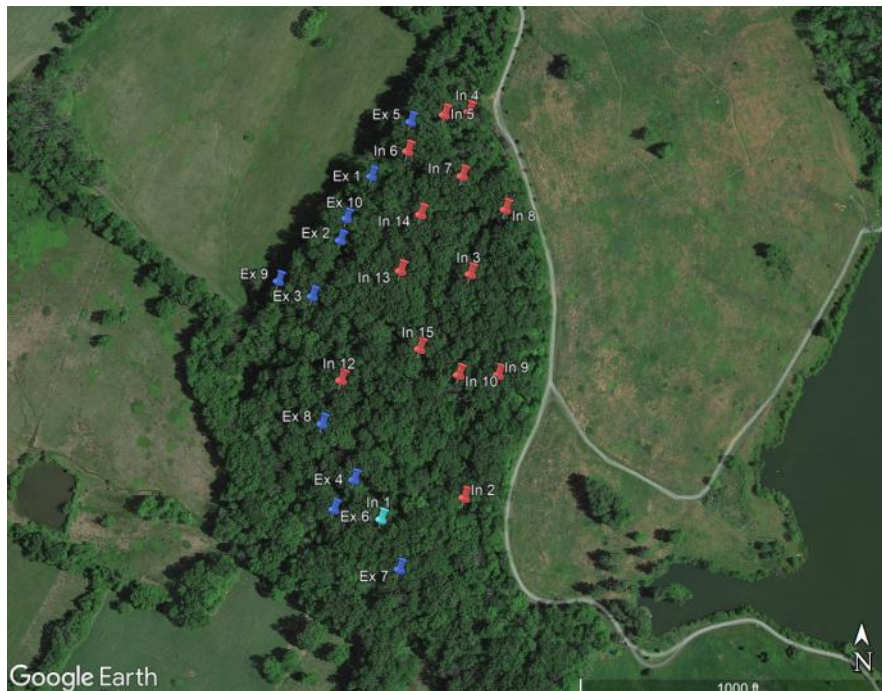


Figure 3. Overview map showing location of forest surveys conducted at the deer exclusion plots.

BREEDING BIRD SURVEY RESULTS

Table 1. 2023 Breeding Bird Survey Results. Species are listed in rank of 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.

Common Name	Scientific Name	Target Species *	Species of Continental Concern **	Virginia Wildlife Action Plan ***	Occurrence
American Goldfinch	<i>Spinus tristis</i>				8
Common Yellowthroat	<i>Geothlypis trichas</i>	shrubland			7
Indigo Bunting	<i>Passerina cyanea</i>	shrubland			6
Field Sparrow	<i>Spizella pusilla</i>	shrubland	Listed	Tier 4	5
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	shrubland			5
Northern Cardinal	<i>Cardinalis cardinalis</i>				3
Barn Swallow	<i>Hirundo rustica</i>			Tier 3	2
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	shrubland		Tier 4	2
Orchard Oriole	<i>Icterus spurius</i>				2
Red-eyed Vireo	<i>Vireo olivaceus</i>				2
Yellow-breasted Chat	<i>Icteria virens</i>	shrubland		Tier 4	2
Blue Grosbeak	<i>Passerina caerulea</i>	shrubland			1
Brown Thrasher	<i>Toxostoma rufum</i>	grassland		Tier 4	1
Carolina Wren	<i>Thryothorus ludovicianus</i>				1
Gray Catbird	<i>Dumetella carolinensis</i>			Tier 4	1
Song Sparrow	<i>Melospiza melodia</i>				1
Turkey Vulture	<i>Cathartes aura</i>				1
American Crow	<i>Corvus brachyrhynchos</i>				*
American Robin	<i>Turdus migratorius</i>				*
Baltimore Oriole	<i>Icterus galbula</i>				*
Blue Gray Gnatcatcher	<i>Poliophtila caerulea</i>				*
Blue Jay	<i>Cyanocitta cristata</i>				*

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

** Information on species of continental conservation concern obtained from the [2016 Partners in Flight Watch List](#)

*** Information on species of greatest conservation need obtained from the [2015 Virginia Wildlife Action Plan](#)

BREEDING BIRD SURVEY RESULTS

Table 1 continued. 2023 Breeding Bird Survey Results. Species are listed in rank of 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.

Common Name	Scientific Name	Target Species*	Species of Continental Concern**	Virginia Wildlife Action Plan***	Occurrence
Blue Jay	<i>Cyanocitta cristata</i>				*
Brown-headed Cowbird	<i>Molothrus ater</i>				*
Carolina Chickadee	<i>Poecile carolinensis</i>				*
Cedar Waxwing	<i>Bombycilla cedrorum</i>				*
Common Grackle	<i>Quiscalus quiscula</i>		Listed		*
Downy Woodpecker	<i>Picoides pubescens</i>				*
Eastern Bluebird	<i>Sialia sialis</i>	shrubland			*
Eastern Kingbird	<i>Tyrannus tyrannus</i>	grassland		Tier 4	*
Eastern Phoebe	<i>Sayornis phoebe</i>				*
Eastern Wood-Pewee	<i>Contopus virens</i>			Tier 4	*
Great Blue Heron	<i>Ardea herodias</i>				*
Mourning Dove	<i>Zenaidura macroura</i>				*
Northern Bobwhite	<i>Colinus virginianus</i>	grassland	Listed	Tier 3	*
Northern Flicker	<i>Colaptes auratus</i>			Tier 4	*
Northern Mockingbird	<i>Mimus polyglottos</i>				*
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>			Tier 4	*
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>				*
Scarlet Tanager	<i>Piranga olivacea</i>				*
Tufted Titmouse	<i>Baeolophus bicolor</i>				*
White-eyed Vireo	<i>Vireo griseus</i>	shrubland			*
Yellow Warbler	<i>Setophaga petechia</i>				*

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

** Information on species of continental conservation concern obtained from the [2016 Partners in Flight Watch List](#)

*** Information on species of greatest conservation need obtained from the [2015 Virginia Wildlife Action Plan](#)

Birds Commonly Observed

on VWL Grassland Bird Surveys



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Illustrations by Nick Garnhart



Chimney
Swift



Tree Swallow



Indigo Bunting



American Kestrel



Baltimore Oriole



Carolina Wren



Barn
Swallow



Eastern Kingbird



Northern
Mockingbird



Orchard Oriole



Eastern
Bluebird



Eastern Towhee



Eastern
Meadowlark



Song Sparrow



Field Sparrow



Mourning Dove



Brown Thrasher



American
Goldfinch



Grasshopper Sparrow



Red-winged
Blackbird



Chipping
Sparrow



Common
Yellowthroat



Yellow-breasted
Chat



Gray Catbird



Bobolink*



Northern Harrier*



Loggerhead
Shrike*



Northern Bobwhite*



Prairie Warbler*

GRASSLAND



SHRUBLAND



FOREST EDGE

*VWL focal species not commonly observed on surveys

GRASSLAND PLANT SURVEY RESULTS

Table 2. 2023 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. Incidental observations (plants observed outside the survey area) are also indicated in the Occurrence column.

Common Name	Scientific Name	Native Status*	Growth Form**	Occurrence
Crownvetch	<i>Securigera varia</i>	invasive	F	27
Coralberry	<i>Symphoricarpos orbiculatus</i>	uncertain	W	26
Nepalese Browntop	<i>Microstegium vimineum</i>	invasive	G	23
Carolina Horsenettle	<i>Solanum carolinense</i> var. <i>carolinense</i>	native	F	21
Smooth Brome	<i>Bromus inermis</i>	introduced	G	18
Woodsorrel	<i>Oxalis</i>	native	F	15
Common Yellow Oxalis	<i>Oxalis stricta</i>	native	F	14
Grape	<i>Vitis</i>	native	W	13
Oriental Bittersweet	<i>Celastrus orbiculatus</i>	invasive	W	13
Eastern Poison Ivy	<i>Toxicodendron radicans</i>	native	W	9
Indianhemp	<i>Apocynum cannabinum</i>	native	F	9
Nodding Plumeless Thistle	<i>Carduus nutans</i>	introduced	F	9
Common Milkweed	<i>Asclepias syriaca</i>	native	F	8
Honeyvine	<i>Cynanchum laeve</i>	native	F	7
American Burnweed	<i>Erechtites hieraciifolius</i>	native	F	6
Canada Thistle	<i>Cirsium arvense</i>	invasive	F	5
Crested False Buckwheat	<i>Fallopia cristata</i>	native	F	5
Cutleaf Teasel	<i>Dipsacus laciniatus</i>	introduced	F	5
Plumless Thistle	<i>Carduus</i>	introduced	F	5
Wingstem	<i>Verbesina alternifolia</i>	native	F	5
Blackberry	<i>Rubus</i>	uncertain	W	4
Bull Thistle	<i>Cirsium vulgare</i>	invasive	F	4
Copperleaf	<i>Acalypha</i>	native	F	4
Garlic Mustard	<i>Alliaria petiolata</i>	invasive	F	4
Kentucky Bluegrass	<i>Poa pratensis</i>	introduced	G	4
Morning Glory Family	<i>Convolvulaceae</i>	uncertain	F	4
Teasel	<i>Dipsacus</i>	introduced	F	4
Virginia Creeper	<i>Parthenocissus quinquefolia</i>	native	W	4
White Vervain	<i>Verbena urticifolia</i>	native	F	4
Arrowleaf Tearthumb	<i>Persicaria sagittata</i>	native	F	3
Asiatic Tearthumb	<i>Persicaria perfoliata</i>	invasive	F	3
Bluegrass	<i>Poa</i>	introduced	G	3
Brown Mustard	<i>Brassica juncea</i>	introduced	F	3
Japanese Honeysuckle	<i>Lonicera japonica</i>	invasive	W	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)

(plants.usda.gov).

GRASSLAND PLANT SURVEY RESULTS

Table 2 continued. 2023 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. Incidental observations (plants observed outside the survey area) are also indicated in the Occurrence column.

Common Name	Scientific Name	Native Status*	Growth Form**	Occurrence
Multiflora Rose	<i>Rosa multiflora</i>	invasive	W	3
Pennsylvania Blackberry	<i>Rubus pensilvanicus</i>	native	W	3
Sedge Family	<i>Cyperaceae</i>	uncertain	G	3
Violet	<i>Viola</i>	uncertain	F	3
White Clover	<i>Trifolium repens</i>	introduced	F	3
Broomsedge Bluestem	<i>Andropogon virginicus</i>	native	G	2
Cinquefoil	<i>Potentilla</i>	uncertain	F	2
Corn Speedwell	<i>Veronica arvensis</i>	introduced	F	2
Garden Vetch	<i>Vicia sativa</i>	introduced	F	2
Goldenrod	<i>Solidago</i>	native	F	2
Groundcherry	<i>Physalis</i>	native	F	2
Knotweed	<i>Persicaria</i>	uncertain	F	2
Nimblewill	<i>Muhlenbergia schreberi</i>	native	G	2
Oriental Lady's Thumb	<i>Persicaria longiseta</i>	invasive	F	2
Wild Garlic	<i>Allium vineale</i>	introduced	F	2
Yellow Crownbeard	<i>Verbesina occidentalis</i>	native	F	2
Canada Goldenrod	<i>Solidago altissima</i>	native	F	1
Catnip	<i>Nepeta cataria</i>	introduced	F	1
Clasping Venus' Looking-Glass	<i>Triodanis perfoliata</i>	native	F	1
Common Mullein	<i>Verbascum thapsus</i>	introduced	F	1
Devil'S Darning Needles	<i>Clematis virginiana</i>	native	F	1
Dock	<i>Rumex</i>	uncertain	F	1
False Bindweed	<i>Calystegia</i>	uncertain	F	1
Field Thistle	<i>Cirsium discolor</i>	native	F	1
Ground Ivy	<i>Glechoma hederacea</i>	introduced	F	1
Hedge False Bindweed	<i>Calystegia sepium</i>	native	F	1
Japanese Bristlegrass	<i>Setaria faberi</i>	introduced	G	1
Legume Family	<i>Fabaceae</i>	uncertain	F	1
Lespedeza	<i>Lespedeza</i>	uncertain	F	1
Maple	<i>Acer</i>	uncertain	W	1
Mulberry	<i>Morus</i>	uncertain	W	1
Mustard Family	<i>Brassicaceae</i>	uncertain	F	1
Northern Dewberry	<i>Rubus flagellaris</i>	native	W	1
Prickly Lettuce	<i>Lactuca serriola</i>	introduced	F	1

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

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GRASSLAND PLANT SURVEY RESULTS

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Common Name	Scientific Name	Native Status*	Growth Form**	Occurrence
Queen Anne's Lace	<i>Daucus carota</i>	introduced	F	1
Sedge	<i>Carex</i>	native	G	1
Shepherd'S Purse	<i>Capsella bursa-pastoris</i>	introduced	F	1
Spiny Sowthistle	<i>Sonchus asper</i>	introduced	F	1
Tree Of Heaven	<i>Ailanthus altissima</i>	invasive	W	1
Waterhorehound	<i>Lycopus</i>	uncertain	F	1
Wild Bergamot	<i>Monarda fistulosa</i>	native	F	1
American Pokeweed	<i>Phytolacca americana</i>	native	F	Incidental
Ironweed	<i>Vernonia</i>	native	F	Incidental
Agrimony	<i>Agrimonia</i>	native	F	Incidental
Annual Ragweed	<i>Ambrosia artemisiifolia</i>	native	F	Incidental
Autumn Olive	<i>Elaeagnus umbellata</i>	invasive	W	Incidental
Black Walnut	<i>Juglans nigra</i>	native	W	Incidental
Common Persimmon	<i>Diospyros virginiana</i>	native	W	Incidental
Common Yarrow	<i>Achillea borealis</i>	native	F	Incidental
Garden Asparagus	<i>Asparagus officinalis</i>	introduced	F	Incidental
Poison Hemlock	<i>Conium maculatum</i>	introduced	F	Incidental
Tall Fescue	<i>Schedonorus arundinaceus</i>	introduced	G	Incidental
Ticktrefoil	<i>Desmodium</i>	native	F	Incidental
Ash	<i>Fraxinus</i>	native	W	Incidental
Aster	<i>Aster</i>	uncertain	F	Incidental
Beebalm	<i>Monarda</i>	native	F	Incidental
Beefsteakplant	<i>Perilla frutescens</i>	introduced	F	Incidental
Canadian Horseweed	<i>Conyza canadensis</i>	native	F	Incidental
Chicory	<i>Cichorium intybus</i>	introduced	F	Incidental
Common Elderberry	<i>Sambucus canadensis</i>	native	W	Incidental
Common Sheep Sorrel	<i>Rumex acetosella</i>	introduced	F	Incidental

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Dodder	<i>Cuscuta</i>	uncertain	F	Incidental
Eastern Daisy Fleabane	<i>Erigeron annuus</i>	native	F	Incidental
Green Ash	<i>Fraxinus pennsylvanica</i>	native	W	Incidental
Harvestlice	<i>Agrimonia parviflora</i>	native	F	Incidental
Jewelweed	<i>Impatiens capensis</i>	native	F	Incidental
Joe Pye Weed	<i>Eutrochium</i>	native	F	Incidental
Moth Mullein	<i>Verbascum blattaria</i>	introduced	F	Incidental
Mountainmint	<i>Pycnanthemum</i>	native	F	Incidental
New York Ironweed	<i>Vernonia noveboracensis</i>	native	F	Incidental
Perennial Rye Grass	<i>Lolium perenne</i>	introduced	G	Incidental
Scarlet Pimpernel	<i>Anagallis arvensis</i>	introduced	F	Incidental
Sweet Vernalgrass	<i>Anthoxanthum odoratum</i>	introduced	G	Incidental
White Ash	<i>Fraxinus americana</i>	native	W	Incidental
Wild Basil	<i>Clinopodium vulgare</i>	native	F	Incidental
Wild Mint	<i>Mentha canadensis</i>	native	F	Incidental
Wine Raspberry	<i>Rubus phoenicolasius</i>	invasive	W	Incidental

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