Grassland Plant Survey Manual

Virginia Working Landscapes (VWL) began in 2010 in response to a strong grass-roots demand from regional landowners, citizens, and conservation NGOs for leadership from the Smithsonian on how to sustain native biodiversity on working landscapes. What began as a dynamic network of regional stakeholders convened by the **Smithsonian Conservation Biology Institute (SCBI)**, is now an emergent and vital program of the SCBI that studies and promotes the sustainable use of Virginia's landscapes for native biodiversity through ecosystem research, habitat monitoring, and community engagement.

Why Grassland Plants?

From the outset, VWL determined that grassland dependent species in particular require 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. Humans are profoundly impacting native plant species diversity through land use changes, such as urban development, and the introduction of nonnative species. As Virginia's human population continues to grow we expect further depletion of native plant communities and a shrinking diversity of other native taxa within ecosystems. One-third of North American species considered endangered are found on grasslands.

The bulk of Virginia's landscape is managed by private landowners, a significant proportion of which has been cleared for agriculture and is subject to a variety of management approaches and methods. Surveys of plant communities on working farms allow ecologists to track the effects of these management methods on plant diversity and supplies important data to answer a variety of research questions. For example, do restored native warm-season grasslands or fallow fields support higher species diversity among grassland-obligate songbirds? The grassland plant surveys help us answer such questions and allow us to determine the plant species composition of each survey site, which can provide insight into habitat quality and the impact of land use on plant communities.

Goals and Objectives of VWL Plant Surveys

- 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?
- How does the establishment or maintenance of native grasses impact plant communities?

Accessing Private Properties

Many of our field sites are privately owned. At the beginning of each site visit, place the provided VWL signs in your car window to let landowners know that you are there to conduct surveys. Only drive and park in designated areas as illustrated in the property maps provided to you. You will be notified if you are responsible for contacting the landowner/property manager before visiting your site as the

instructions differ for each site. Some landowners may wish to join you for your survey. This is allowed and encouraged.

If any of your sites are on public land (state parks, national park, etc.) then it is likely that you will always need to carry a research permit with you. Make sure to obtain a copy of this from the VWL survey coordinator.

Plant Survey Protocol

To determine plant species occurrence and diversity, field team members identify plant species along a straight line transect at each survey point. Each transect consists of seven 1m^2 quadrats, with most sites having three points. A total of 21quadrats will therefore be sampled during each site visit. Sites are visited twice, once in the early summer and once in the late summer of each year. Please follow along our training video: https://youtu.be/rHWU3Ak4KBo

EQUIPMENT LIST

REQUIRED	**RECOMMENDED**
Meter poles (2)	Hat
Compass &/or GPS	Sunglasses
Notebook or field plant press	Sunscreen
Datasheets	Work gloves
Clipboard	Field Boots
ID aids (field guides, floras, grass ID handouts, etc.)	Insect repellent
Pens/pencils (pencils better in case of rain)	
Hand lens/loupe	
Water	
Lunch and ample snacks	

IDENTIFYING YOUR SURVEY PLOTS

Survey waypoints will be provided to survey teams as GPS points on site maps and are identified as point A, B or C. This map can also be used to make navigating to survey

locations easy. Waypoints are placed at least 200 meters apart from one another in most fields so that survey plots do not overlap.

CONDUCTING A TRANSECT SURVEY

The early summer season goes from **1 June to 30 June**. The late summer survey season goes from **1 August to 31 August**. If necessary because of weather or logistical difficulties, surveyors are allowed to complete surveys after the season closing date. To stay organized, make a schedule with your partner before the survey season starts.

Surveyors will go out in pairs; one person will be the primary for plant identification while the other records observations and collects samples of unknown species.

Use a GPS unit and the provided map to locate your first survey point. Once you reach the first point, fill out the required information at the top of your data sheet. **ALWAYS** make sure to fill out this information **before** starting your survey; do not leave any spaces blank.

Once these initial steps are complete, you can begin your plant survey:

1. At Point A use the first 'Heading' (e.g. A: 120 degrees, 10 meters) indicated on the site directions sheet (which will be provided).
2. Using a compass to follow the bearing, pace to the first designated distance and put down a **1m² sampling quadrat** (which will be provided).
    - Consistent rules in placing the quadrat can help avoid bias, whether conscious or unconscious (choosing a slightly more open area, including a cool plant, etc.).
    - One method is for the surveyor to avoid looking down during the last couple of steps and then to place the quadrat with the center of the back edge touching the toe of their boot.
3. Estimate the percent of the quadrat covered by **bare soil, rock, and vegetation**, in **10% increments** (0, 10, 20, etc.). Record "**P**" (indicating "present") for anything less than 10%. The datasheets have spaces for each of these categories.
    - Enter a value (which may be a zero) for each of these three categories for every quadrat you survey.
4. Identify all vascular plants rooted within the quadrat.
    - Certainty is more important than identifying everything to species (see identification tips below).

Vegetation should include all plant tissue (woody or herbaceous, living or dead) rooted in, on the ground in, or winding through the quadrat (vines).

Areas covered by **fungi, lichens, or non-vascular plants like mosses and algae** may be ignored (please note if they comprise greater than 10%).

5. On the same line as each species, record whether plants are in **flower (FL), fruit (FR), or both (FL/FR)**, and then record the **percent of the quadrat the species covers, in 10% increments** (10, 20, 30, etc.). Record "P" for anything less than 10%.
    - **The covers of multiple species can overlap to add up to more or less than 100%.**
6. Using two, 1-meter sampling poles stacked end-to-end, sample quadrat corners. Stack poles to two meters in height and place them in one corner of the sample quadrat and record whether **forb (F), grass/sedge (G), or woody (W)** plant touches the pole in each of the decimeter (10 cm) divisions, up to 2 meters.
    - **Do not record the species**, only an F, G, or W (or GW, FGW, etc.) for each

touched segment. Next, move to the diagonal corner of the quadrat, repeat this step, and record the touches.

7. **Collect samples of all unidentified species**. Assign each a unique name on the datasheet.
    - A good practice is to name samples by the location and a short, descriptive name that includes the growth form, like "Blandy CSG A4 sprawling grass". If found in subsequent plots, use the same name.
8. Repeat the previous steps at each of the remaining transects. Complete 21, 1-meter square quadrats.
9. You may record an **Incidentals** plot, if there are plants in the field that were not captured within your plots.
10. Lastly, visually check the field to assess the major species (1-4) in flower at the time, and record these in the space near the top of the datasheet.

Pressing plant samples can be done in the field or more carefully at home if samples are collected in large Ziplock bags first. If taking samples home for pressing, please guard against wilting or crushing by keeping samples cool (a cooler and icepack can help), and safe from damage. Use scrap paper to label samples (a smaller Ziplock bag inside the sample bag may help protect labels). Label samples according to the following:

- Name assigned to the species
- Date
- Names of the collectors
- Site name (both property and field names)
- The transect letter, heading, and distance.

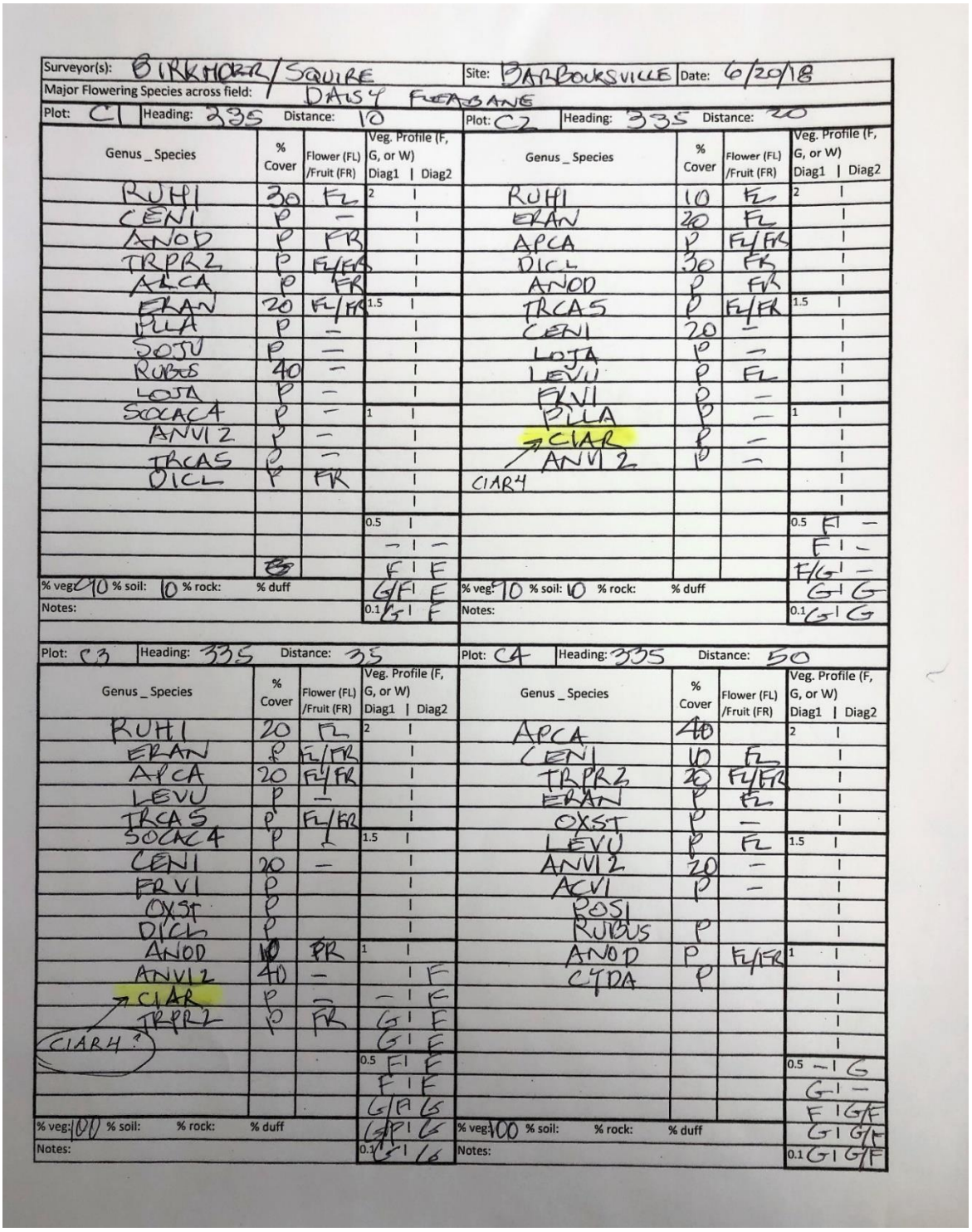
Entering Data

Please follow along with our training video: https://youtu.be/STpF_ou6sdo. After each site visit, enter the data collected during plant surveys into the provided Excel file. Each file comes with an example sheet, accessible by clicking on the "Example Datasheet" tab at the bottom of the worksheet. Save completed datasheets as "**2025_JUNE/AUGUST_Site_VWLPlantData.xls**" and send to **ShibleyE@si.edu** **and/or**

IzlarN@si.edu. For example, the June survey data for Oxbow Pond would be saved in an Excel file as "2025_JUNE_OxbowPond_VWLPlantData.xls".

An example field data sheet and Excel spreadsheet are attached at the end of this protocol.

Example Plant Survey Datasheet



Surveyor(s): BIRKMOIR / SQUIRE Site: BARBOURSVILLE Date: 6/20/18

Major Flowering Species across field: DAISY FLEABANE

Plot: C1 | Heading: 335 | Distance: 10

Genus _ Species	% Cover	Flower (FL) /Fruit (FR)	Veg. Profile (F, G, or W) Diag1	Diag2
RUHI	30	FL	2	
CENI	P	—		
ANOD	P	FR		
TRPR2	P	FL/FR		
ARCA	P	FR		
ERAN	20	FL/FR	1.5	
PLLA	P	—		
SOJU	P	—		
RUBUS	40	—		
LOJA	P	—		
SOCAC4	P	—	1	
ANVI2	P	—		
TRCAS	P	—		
DICL	P	FR		
			0.5	
			—	—
			F	F
% veg: 10 % soil: 10 % rock: % duff			G/F	F
Notes:			0.1 G	F

Plot: C2 | Heading: 335 | Distance: 20

Genus _ Species	% Cover	Flower (FL) /Fruit (FR)	Veg. Profile (F, G, or W) Diag1	Diag2
RUHI	10	FL	2	
ERAN	20	FL		
ARCA	P	FL/FR		
DICL	30	FR		
ANOD	P	FR		
TRCAS	P	FL/FR	1.5	
CENI	20	—		
LOJA	P	—		
LEVU	P	FL		
FRVI	P	—		
PLLA	P	—	1	
CIAR	P	—		
ANVI2	P	—		
CIAR4				
			0.5	F —
				F —
				F/G —
% veg: 10 % soil: 10 % rock: % duff				G G
Notes:			0.1	G G

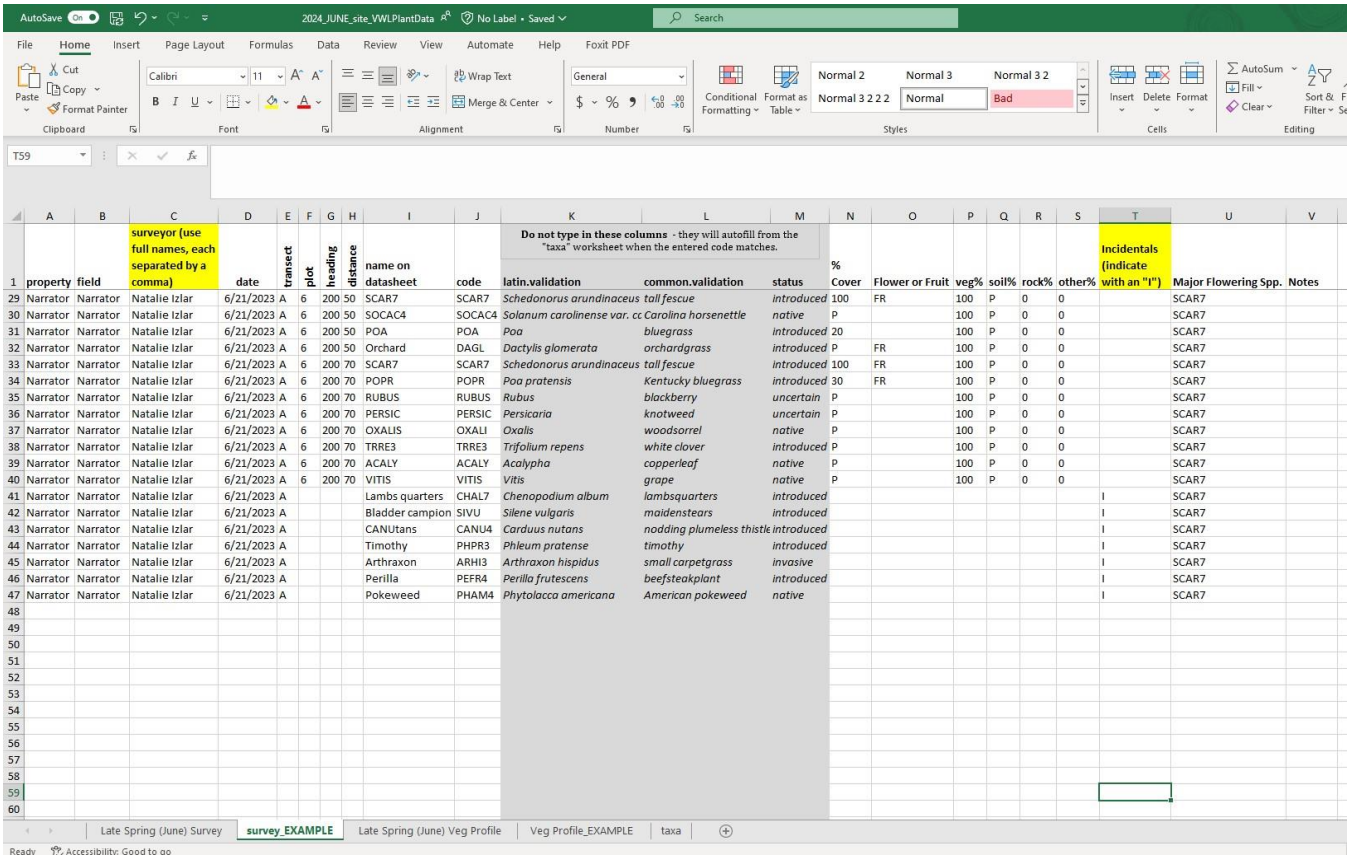
Plot: C3 | Heading: 335 | Distance: 35

Genus _ Species	% Cover	Flower (FL) /Fruit (FR)	Veg. Profile (F, G, or W) Diag1	Diag2
RUHI	20	FL	2	
ERAN	P	FL/FR		
ARCA	20	FL/FR		
LEVU	P	—		
TRCAS	P	FL/FR		
SOCAC4	P	—	1.5	
CENI	20	—		
FRVI	P			
OXST	P			
DICL	P			
ANOD	10	FR	1	
ANVI2	40	—		F
CIAR	P	—	—	F
TRPR2	P	FR	G	F
CIAR4 ?			G	F
			0.5 F	F
			F	F
			G/F	G
% veg: 100 % soil: % rock: % duff			G/F	G
Notes:			0.1 G	G

Plot: C4 | Heading: 335 | Distance: 50

Genus _ Species	% Cover	Flower (FL) /Fruit (FR)	Veg. Profile (F, G, or W) Diag1	Diag2
ARCA	40		2	
CENI	10	FL		
TRPR2	20	FL/FR		
ERAN	P	FL		
OXST	P	—		
LEVU	P	FL	1.5	
ANVI2	20	—		
ACVI	P	—		
POSI				
RUBUS	P			
ANOD	P	FL/FR	1	
CYDA	P			
			0.5 —	G
			G	—
			F	G/F
% veg: 100 % soil: % rock: % duff			G	G/F
Notes:			0.1 G	G/F

Sample Excel Datasheet



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	property	field	surveyor (use full names, each separated by a comma)	date	transect	plot	heading	distance	name on datasheet	code	latin.validation	common.validation	status	% Cover	Flower or Fruit	veg%	soil%	rock%	other%	Incidentals (indicate with an "I")	Major Flowering Spp.	Notes
29	Narrator	Narrator	Natalie Izlar	6/21/2023	A	6	200	50	SCAR7	SCAR7	*Schedonorus arundinaceus*	*tall fescue*	*introduced*	100	FR	100	P	0	0		SCAR7	
30	Narrator	Narrator	Natalie Izlar	6/21/2023	A	6	200	50	SOCAC4	SOCAC4	*Solanum carolinense var. cc*	*Carolina horsenettle*	*native*	P		100	P	0	0		SCAR7	
31	Narrator	Narrator	Natalie Izlar	6/21/2023	A	6	200	50	POA	POA	*Poa*	*bluegrass*	*introduced*	20		100	P	0	0		SCAR7	
32	Narrator	Narrator	Natalie Izlar	6/21/2023	A	6	200	50	Orchard	DAGL	*Dactylis glomerata*	*orchardgrass*	*introduced*	P	FR	100	P	0	0		SCAR7	
33	Narrator	Narrator	Natalie Izlar	6/21/2023	A	6	200	70	SCAR7	SCAR7	*Schedonorus arundinaceus*	*tall fescue*	*introduced*	100	FR	100	P	0	0		SCAR7	
34	Narrator	Narrator	Natalie Izlar	6/21/2023	A	6	200	70	POPR	POPR	*Poa pratensis*	*Kentucky bluegrass*	*introduced*	30	FR	100	P	0	0		SCAR7	
35	Narrator	Narrator	Natalie Izlar	6/21/2023	A	6	200	70	RUBUS	RUBUS	*Rubus*	*blackberry*	*uncertain*	P		100	P	0	0		SCAR7	
36	Narrator	Narrator	Natalie Izlar	6/21/2023	A	6	200	70	PERSIC	PERSIC	*Persicaria*	*knotweed*	*uncertain*	P		100	P	0	0		SCAR7	
37	Narrator	Narrator	Natalie Izlar	6/21/2023	A	6	200	70	OXALIS	OXALI	*Oxalis*	*woodsorrel*	*native*	P		100	P	0	0		SCAR7	
38	Narrator	Narrator	Natalie Izlar	6/21/2023	A	6	200	70	TRRE3	TRRE3	*Trifolium repens*	*white clover*	*introduced*	P		100	P	0	0		SCAR7	
39	Narrator	Narrator	Natalie Izlar	6/21/2023	A	6	200	70	ACALY	ACALY	*Acalypha*	*copperleaf*	*native*	P		100	P	0	0		SCAR7	
40	Narrator	Narrator	Natalie Izlar	6/21/2023	A	6	200	70	VITIS	VITIS	*Vitis*	*grape*	*native*	P		100	P	0	0		SCAR7	
41	Narrator	Narrator	Natalie Izlar	6/21/2023	A				Lambs quarters	CHAL7	*Chenopodium album*	*lambsquarters*	*introduced*							I	SCAR7	
42	Narrator	Narrator	Natalie Izlar	6/21/2023	A				Bladder campion	SIVU	*Silene vulgaris*	*maidenstears*	*introduced*							I	SCAR7	
43	Narrator	Narrator	Natalie Izlar	6/21/2023	A				CANUtans	CANU4	*Carduus nutans*	*nodding plumeless thistle*	*introduced*							I	SCAR7	
44	Narrator	Narrator	Natalie Izlar	6/21/2023	A				Timothy	PHPR3	*Phleum pratense*	*timothy*	*introduced*							I	SCAR7	
45	Narrator	Narrator	Natalie Izlar	6/21/2023	A				Arthraxon	ARHI3	*Arthraxon hispidus*	*small carpetgrass*	*invasive*							I	SCAR7	
46	Narrator	Narrator	Natalie Izlar	6/21/2023	A				Perilla	PEFR4	*Perilla frutescens*	*beefsteakplant*	*introduced*							I	SCAR7	
47	Narrator	Narrator	Natalie Izlar	6/21/2023	A				Pokeweed	PHAM4	*Phytolacca americana*	*American pokeweed*	*native*							I	SCAR7	
48																						
49																						
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Do not type in these columns - they will autofill from the "taxa" worksheet when the entered code matches.

NAVIGATING THE EXCEL DATASHEET

The taxonomic authorities VWL and our project collaborators utilize are the Flora of Virginia (BRIT Press, Fort Worth, Texas, USA) and the USDA Plants Database (online; https://plants.sc.egov.usda.gov/java/). Incidental data can be recorded as Species identification sessions are organized and hosted by VWL. Citizen scientists bring specimens collected during field work to ID sessions, where keying is done under supervision of Virginia Native Plant Society collaborators and other subject matter experts. Following ID sessions, workers enter data electronically using Microsoft Excel. These datasheets are then submitted to the VWL Survey Coordinator for review and incorporation into the VWL Plant Database.

Property:	property name
Field:	field name (if applicable)
Surveyor Names:	survey team members by first and last name; separated by comma
Date:	date of survey
Transect:	Transects are sequenced A, B, or C
Plot:	quadrat number (1-7) associated with each transect
Heading:	directional heading from point in degrees (0-360)
Distance:	distance of each quadrat from point
Code:	four letter alpha code for each plant species
% Cover:	percentage of quadrat covered by each species (1-100)
Flower/fruit:	FL=flowering; FR=fruiting; FL/FR=flowering and fruiting at once
Veg%:	percentage of quadrat with vegetation
Soil%:	percentage of quadrat with exposed soil
Rock%:	percentage of quadrat with exposed rock
Other:	percentage of quadrat covered by any other material
Incidentals	Mark which species are incidentals with an "I"; Helpful to enter these after the 7 plots have been entered to avoid confusion/repetition
Major flowering spp	qualitative assessment of dominant flowering species across field
Notes:	anecdotes