FFI ARS Cover Points protocol description

This protocol is a modification of the line-point intercept method described in the USDA Agricultural Research Service (ARS), Monitoring Manual, Vol. I (Herrick et al. 2005). The line-point intercept protocol in general is described further in Measuring and Monitoring Plant Population (Elzinga et al. 1998) and FIREMON: Fire effects monitoring and inventory system (Lutes et al. 2006). Sampling is generally accomplished along a series of parallel transects. Plot size, number of transects and number of points per transect are determined by the user based on objectives, vegetation and resources. One suggested plot design for line-point intercept sampling has five parallel 50 meter transects set 10 meters apart. Sample points are at 1-meter intervals along each transect for a total of 250 sample points per plot.

At each point a sampling pin is lowered and the species and height (optional) is recorded for each species hit by the pin. Record only the top instance of a species hit even if there are multiple hits of that species at a point. At the soil surface record the surface code or the species if it is a basal hit. See the previously mentioned field guides for further description of the method.

The *ARS Cover Points* protocol in FFI is less tedious to use than the standard FFI *Cover Points* protocol but is limited to a maximum of six species hits and one soil surface hit per sample point, compared to an unlimited number of species or surface hits per sample point in the standard *Cover Points* protocol. Data collection is more intensive with the *ARS Cover Points* protocol than with the standard FFI *Cover Points by Transect* protocol but that protocol does not allow the species sampled at each point to be tracked through time like the *ARS Cover Points* protocol does.

Data Field Definitions

Sample Attributes

- *Number of Transects* (Required): Number of transects sampled on the plot. Integer.
- *Transect Length* (Required): Length of each transect. Decimal number. English units-feet, metric units-meters.
- *Number of Points per Transect* (Required): Number of sample points on each transect. Integer.
- *Collected By:* Field crew information. Text
- *Entered/Verif. By:* Data entry/verification information. Text

Method Attributes

- *Transect* (Required): The transect number the current sample point is located on. Generally, this is a sequential number but may be numbered for the distance from the plot origin. Integer.
- *Point* (Required): Sample point number. Generally, this is sequential by transect but can be numbered cumulatively for the entire plot or set as the transect distance. Integer.
- *Top Canopy* (Required): Species code of top/tallest species hit. Species code. See the cover calculations section below for use of the user species code “NONE”.
- *Top Height:* Height of the top canopy. One decimal place. English units-inches, metric units-centimeters.

- *Shape:* Shape of the sagebrush crown (assumed to be the top hit): S-Spreading, M-Mixed, C-Columnar)
- *Lower Canopy 1*: Species code of the second tallest species hit. Species code.
- *Height 1*: Height of Lower Canopy 1. English units-inches, metric units-centimeters. One decimal place.
- *Lower Canopy 2*: Species code of the third tallest species hit. Species code.
- *Height 2*: Height of Lower Canopy 2. English units-inches, metric units-centimeters. One decimal place.
- *Lower Canopy 3*: Species code of the fourth tallest species hit. Species code.
- *Height 3*: Height of Lower Canopy 3. English units-inches, metric units-centimeters. One decimal place.
- *Lower Canopy 4*: Species code of the fifth tallest species hit. Species code.
- *Height 4*: Height of Lower Canopy 4. English units-inches, metric units-centimeters s. One decimal place.
- *Lower Canopy 5*: Species code of the sixth tallest species hit. Species code.
- *Height 5* Height of Lower Canopy 5. English units-inches, metric units-centimeters. One decimal place.
- *Soil Surface*: Code at the point the sample rod meets the surface. Table 1 code list. Required if soil surface summary report is desired.

The codes listed in table 1 are used in soil surface cover calculations.

Table 1. Special Codes used in the FFI ARS Cover Points protocol. All codes used must be entered as User Species in FFI Species Management using all capital letters.

Code	Name	Additional information	FFI Data field
BR	Bedrock		Soil Surface
BY	Boulder	Approx. >24 in. diameter[a]	Soil Surface
CB	Cobble	Approx. 3 in. to 10 in. diameter[a]	Soil Surface
D	Duff		Soil Surface
EL	Embedded litter	See ARS Monitoring Manual, Vol. I	Soil Surface
G	Gravel	Approx. 0.1 in to 3 in. diameter[a]	Soil Surface
LC	Visible lichen crust on soil	Lichen on rock is coded BR, BY, CB, etc.[b]	Soil Surface
M	Moss		Soil Surface
R	Rock fragment	General code for rocks >~0.25 in.[b]	Soil Surface
S	Soil	Soil without any other soil surface code[b]	Soil Surface
ST	Stone	Approx. 10 in. to 24 in. diameter[a]	Soil Surface
NONE	None	No vegetation present	Top Canopy

[a] definition from the NRCS Soil Survey Manual, Chapter 3. Available at: (https://www.nrcs.usda.gov/sites/default/files/2022-09/SSM-ch3.pdf)

[b] definition from Monitoring Manual for Grassland, Shrubland and Savanna Ecosystems, Vol. I.

Cover Calculations used in FFI Reports and Analysis

- *Foliar cover*: Total hits where top layer is a real plant code/total number of points*100. *(Note: A real plant code is any NRCS symbol or user species, except the codes listed in the table 1.)*
- *Bare Ground*: Total number of hits where top layer is "NONE" and surface = "S"/total number of points sampled*100.
- *Basal Cover*: Total number of hits where soil surface is a real plant code/total number of points sampled*100. *(Note: With the exception of "NONE" and the soil surface codes listed in table 1, all codes will be treated as "real plant codes" when calculation of basal cover is made.)*
- *Species Foliar Cover*: Total number of hits where any layer is a real plant code/total number of points sampled*100. Duplicate hits at a point are not included in the cover calculation for a species.
- *Average Canopy Height*: Average height of each layer. Null fields are ignored.

Species cover by layer can be calculated in the FFI Query tool, if desired.

Example Data and Report

ARS_Cover_Points

Save Cancel Delete Delete Visit

Visited:	Yes
Num. of Transects:	1
Tran. Length:	10
Num. Pts/Tran.:	10
Collected By:	
Entered/Verif. By:	

View	Transect	Point	Top Canopy	Top Height	Shape	Lower Canopy 1	Height 1	Lower Canopy 2	Height 2	Lower Canopy 3	Height 3	Lower Canopy 4	Height 4	Lower Canopy 5	Height 5	Soil Surface
	1	1	PSSP6	36		BRTE	6									BY
	1	2	PSSP6	24		FEID	3									BR
	1	3	NONE													S
	1	4	ARTR2	24	M	FEID	18									BRTE
	1	5	PIPO	60		PSSP6	24	FEID	4							BRTE
▸	1	6	NONE													FEID
	1	7	NONE													S
	1	8	ARTR2		M											S
	1	9	ARTR2	24	M	BRTE	9									BR
	1	10	BRTE	12												S

ARS Cover - Points Summary

Macroplot	Monitoring Status	Item	Average Cover%	Avg. Top Can. Ht. (ft.)	Avg. Low Can. 1 Ht. (ft.)	Avg. Low Can. 2 Ht. (ft.)	Avg. Low Can. 3 Ht. (ft.)	Avg. Low Can. 4 Ht. (ft.)	Avg. Low Can. 5 Ht. (ft.)
007	Pre	ARTR2	30.0	24					
007	Pre	BareGround	20.0						
007	Pre	BasalCover	30.0						
007	Pre	BR	20.0						
007	Pre	BRTE	50.0	12	7.5				
007	Pre	BY	10.0						
007	Pre	FEID	40.0		10.5	4			
007	Pre	FoliarCover	70.0	30	12	4			
007	Pre	PIPO	10.0	60					
007	Pre	PSSP6	30.0	30	24				

References

Elzinga, C.L., D.W. Salzer and J.W. Willoughby. 1998. Measuring and Monitoring Plant Populations. Technical Reference 1730-1. Bureau of Land Management. Denver, Colorado. USDI, BLM. Available at: http://www.blm.gov/nstc/library/pdf/MeasAndMon.pdf

Herrick, J.E., J.W. Van Zee, K.M. Havstad, L.M. Burkett, and W.G. Whitford. 2005. Monitoring Manual for Grassland, Shrubland and Savanna Ecosystems, Volume I: Quick Start. USDA - ARS Jornada Experimental Range, Las Cruces, NM
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