

Vegetation Monitoring Procedure for the Southern Plains Grassland Protocol

Standard Operating Procedure (SOP) #06: Line-Point Intercept Procedures

Version 2.2 (May 2024)

Revision History Log:

Previous Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #
1.0	08/2025	M. Owen	Removed collection of dead vegetation.	Retroactive update to match how data were collected in the field.	1.1
1.1	5/17/22	A. Arulanantham M. Owen	Added data collection of trees >2m in height; removed designation between bare soil with overhead vegetation and bare soil without overhead vegetation; added electronic data entry procedures, additional QA/QC checks, soil substrate codes, and screenshots from database; formatted, edited, and reorganized.	Collect data on all woody species; improve methodology. Data have been recorded electronically since 2016. QA/QC needed, soil substrate codes not in original SOP. Editing and reorganization needed to improve clarity.	2.0
2.0	5/20/23	M. Owen	Establishment sheet generation changed. Data are collected along the left side of the transect line. Clarified procedure for recording interceptions of trees over 2 m tall. Plant bases added as a soil substrate category.	Improve data collection and methodology.	2.1
2.1	5/01/24	M. Owen	Full 50-m transect sampled; reminder to record plot disturbance; tree sub-table added; database updates; QA/QC augmented.	Improve sampling design, data quality, and field methodology.	2.2

This Standard Operating Procedure explains the methods necessary to sample vegetation along a transect line and is adapted from the 2003 USDI-National Park Service Fire Monitoring Handbook. The 50-m transect is sampled at 30-cm increments using the point-intercept method. Field sampling should not occur until the crew has set up and photographed the transect line. Procedures are done in this order to avoid trampling vegetation along the transect before plot photography and to keep crew members out of plot photos.

Preparation for Data Collection

1. Refer to the Plot Revisit Sheet. This form shows all location information for the plot: transect origin and end point UTMs, directions to the plot, annual field notes, and a list of all species codes recorded at the plot during vegetation sampling. Check for any notes referring to unknowns and/or voucher specimens that need to be collected.
2. If using paper data sheets (see data sheet at end of this SOP), be sure to record the park, plot name, date, and recorder/observer at the top of all pages. Remember to print data sheets double sided and include all 166 points.
3. If using a field laptop, open the Grasslands Database. Access the data for the appropriate plot and enter the relevant info into the tab header (Visit Date, Rotation, Data Recorder/Observer for all procedures, etc.). If the rotation is unknown, select “Grasslands.”
4. Remember to record any plot disturbance such as mowing, herbicide spray, fire, animal disturbance, etc., in the Field Notes, as discussed in SOP #3—Plot Design and Setup. Record the percentage of the transect and overall plot affected. Additional Field Notes can be made for any information pertinent to vegetation sampling or crew safety.

Select Equipment

Choose a 1/4-inch-diameter plunking pole (a rigid plumb bob). In order to measure the height of the top vegetation intercept, the pole must be graduated in decimeters (i.e., marked at every 10 cm). Ways to do this include using electric tape to fill in every other 10-cm increment or writing the measurements on the plunking pole with a sharpie.

Data Collection

Plot Layout

Plots have a 50-m transect running down the center, permanently marked with rebar at either end and 6-inch nails and shiners at every 10 m in between. When laying out the transect line, a measuring tape is stretched from end to end, with the 0-m mark at the transect origin stake and the 50-m mark at the transect end stake (see SOP #3, Plot Design and Setup, for further information). Data are collected along the left side of the transect line. Begin collecting data at the 0.30-m mark on the tape.

Collecting a Point-Intercept

1. Drop the plunking pole gently so that it is plumb to the ground (on slopes this will not be perpendicular to the ground), every 30 cm along the transect line. For a 50-m transect, there will be 166 points.
2. Record the tallest living vascular plant as the first intercept, and measure the height, rounded to the nearest 0.05 m, at the highest place on the sampling rod touched by vegetation. Height is recorded in meters, meaning that 50 cm would be recorded as 0.5 m. Trees over 2 m tall may not qualify as the top intercept, but count any other living vegetation, including shrubs, no matter their height (for purposes of this protocol, shrubs will be defined as a woody species with multiple trunks, and trees as woody species with one trunk). If the height of the tallest species is flush with the ground, record it as 0.01 m. If the tallest vegetation is

unexpectedly taller than the sampling rod, try dropping the rod at the sampling point, then placing your hand at the “1” point on the rod and sliding the rod up (without looking up), elevating it by 1 or 1.5 m and recording where it touches the vegetation above you.

3. After recording the tallest plant, record all other vascular plant species that intercept the pole. Record each species only once at each point, even if the pole touches it more than once. Record species in order from tallest to shortest. If the pole fails to intercept any vegetation, record “NP” for “no plant.”

Recording Species Codes

1. Record plant names using standardized six-letter codes: the first three letters of the genus and the first three letters of the species. Codes will be followed by a number if duplicates exist: the most common example at our parks is ERIANN1 and ERIANN2. The database will show the full species name in the dropdown menu for any code entered. On paper data sheets, be sure to check the species list each time to determine if there are numbers at the end of a given code, as it can be difficult to ascertain the intended species name when numbers are missing. For species identified to the genus level only, use the first 5 letters of the genus name, taking care in matching the code to the proper genus in the database drop-down menu. On paper data sheets, crews should write out the entire genus followed by “sp.” For unknown species, follow the procedures outlined in SOP #10, Management of Unidentified Taxa (Unknowns).

Dead Herbaceous and Shrub Species

1. You may encounter dead standing vegetation along a transect. Always record dead annual vegetation from the same growth year in the same way you would record live individuals. Otherwise, do not record interceptions of dead herbaceous material unless it is from the current growth year, even if it is attached to a living plant. Count dead branches of living shrubs/trees as live intercepts.

Trees over 2 m Tall

1. Trees over 2 m tall should never be recorded as the first intercept. After the first intercept and height are recorded, if the sampling rod intersects the trunk, foliage, or branches of a tree over 2 m tall, record the appropriate 6-letter species code in the Tree Sub-table. If using a paper data sheet, make a note that the species is a tree.
2. If a tree (>2 m tall) is dead but sprouting at the base, consider any live sprout (<2 m tall) you encounter as live. If you encounter a live basal sprout over 2 m tall, the sprout should be considered a tree in its own right.
3. Record overhead interceptions of trees greater than 2 m tall after soil substrate codes have been entered (see following section). To identify an intercept in the upper canopies, either raise the sampling rod directly upwards, or use the periscope. Hold the periscope directly over the correct measurement on the tape (use the sampling rod as a guide) and center both bubbles between the guidelines. Vegetation that appears in the crosshairs is considered an intercept and is recorded in the Tree Sub-table using the appropriate 6-letter species code.

Figure 1. Point Line tab in the database Plot Data Entry form where line-point intercept data are entered. There are fields to enter the height of the top intercept and species codes ranked from tallest to shortest. Soil substrate codes will highlight in yellow. Intercepts of trees over 2-m tall are recorded in the table on the right. NPS figure

Record Soil Substrate

1. After recording all plant species intercepting the pole, record the soil substrate touched by the base of the pole. Use the definitions in Table 1. If the rod encounters multiple types of substrate, record only that which the pole hits first. You can occasionally find vegetation under a soil substrate type; in this case you would record the vegetation as an intercept, and then the substrate underneath it.

Table 1. Definitions of Soil Substrate Types.

Soil Substrate	Definition
Bare soil	Loose soil particles (0–2 mm diameter)
Litter	Detached litter less than 2.5 cm in diameter
Woody debris	Detached woody plant material that is greater than 2.5 cm in diameter and in direct contact with soil
Plant base	Base of plant
Small rock	Rock fragments 2–20 mm in diameter
Large rock	Rock fragments >20 mm in diameter
Lichen	Lichen crust on soil (lichen on rock is recorded as the appropriate rock type)
Moss	Moss on soil (moss on rock is recorded as the appropriate rock type)
Crust, undifferentiated	Anything from physical crust to weak biological crust, but NOT including lichen or moss
Scat, livestock	Any type of livestock scat

QA/QC and Database Backup

Once data collection is finished, the crew lead (or lead technician) is responsible for ensuring that all QA/QC checks are completed, a pdf of the field data is printed, and a backup of the database is made before leaving the plot.

1. Use the database queries (or scan through the paper data sheet) to confirm the following: 166 points were sampled, no points along the 50-m tape were skipped, a substrate was recorded for each point, intercepts at any given point were not given duplicate ranks, and that species were recorded no more than once per point. Confirm that any heights recorded over 1 m are correct, and not a case in which the decimal place was forgotten.
2. If using the database, a list of species recorded may be queried. To verify that species codes were recorded correctly, the recorder should read the listed species codes out loud to the observer and check for misspellings or species that are not on the park species list. If working alone, read the list of species codes to the crew lead. Any plants that are not on the park species list must be labeled as unknowns (see SOP #10).
3. Confirm that all unknown plants have been collected or photographed and entered into the Unknown Plant Tracking Log (see SOP #10).
4. If using the database, print a field data sheet and save the file to the appropriate park folder. For example, LAMR field data sheets will be saved to the C:\Grasslands\Data\Raw_Datasheets\LAMR folder. Use the following nomenclature: “PARKlast 2 digits of year + Transect name + Date printed”. An example entry would look like this: LAMR24_ULAND-LT02_20240522. If edits are made to the plot data later in the day, a new field data sheet must be printed. Do not overwrite previous data sheets—add a lowercase letter to the end of the file name.
5. Exit the database and save a backup. File path for backups: C:\Grasslands\Data\Backups, then save into the appropriate park folder.

Data Sheet (four pages)

Park/Unit 4-Character Alpha Code: _____

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50 m TRANSECT DATA SHEET

Plot ID: _____ B/C (Circle One) Date: ____/____/____

Burn Unit: _____ Recorders: _____

Burn Status: Circle one and indicate number of times treated, e.g., 01-yr01, 02-yr01

00-PRE ____ Post ____-yr01 ____-yr02 ____-yr05 ____-yr10 ____-yr20Other: ____-yr____; ____-mo____

Phenological Stage: _____ (Circle One) Q4–Q1 w Q3–Q2 w 0P–50P

Pnt	Tape	Hgt (m)	Spp; Species or Substrate Codes (tallest to lowest)					
1	0.3							
2	0.6							
3	0.9							
4	1.2							
5	1.5							
6	1.8							
7	2.1							
8	2.4							
9	2.7							
10	3.0							
11	3.3							
12	3.6							
13	3.9							
14	4.2							
15	4.5							
16	4.8							
17	5.1							
18	5.4							
19	5.7							
20	6.0							
21	6.3							
22	6.6							
23	6.9							
24	7.2							
25	7.5							
26	7.8							
27	8.1							
28	8.4							
29	8.7							
30	9.0							
31	9.3							
32	9.6							
33	9.9							
34	10.2							
35	10.5							
36	10.8							
37	11.1							

Date Entered: ____/____/____

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Plot ID: _____ Date: ____/____/____ (Circle One) Q4–Q1 • Q3–Q2 • OP–50P

Pnt	Tape	Hgt (m)	Spp; Species or Substrate Codes (tallest to lowest)					
38	11.4							
39	11.7							
40	12.0							
41	12.3							
42	12.6							
43	12.9							
44	13.2							
45	13.5							
46	13.8							
47	14.1							
48	14.4							
49	14.7							
50	15.0							
51	15.3							
52	15.6							
53	15.9							
54	16.2							
55	16.5							
56	16.8							
57	17.1							
58	17.4							
59	17.7							
60	18.0							
61	18.3							
62	18.6							
63	18.9							
64	19.2							
65	19.5							
66	19.8							
67	20.1							
68	20.4							
69	20.7							
70	21.0							
71	21.3							
72	21.6							
73	21.9							
74	22.2							
75	22.5							
76	22.8							
77	23.1							
78	23.4							
79	23.7							
80	24.0							
81	24.3							

Plot ID: _____ Date: ____/____/____ (Circle One) Q4–Q1 • Q3–Q2 • 0P–50P

Pnt	Tape	Hgt (m)	Spp; Species or Substrate Codes (tallest to lowest)					
82	24.6							
83	24.9							
84	25.2							
85	25.5							
86	25.8							
87	26.1							
88	26.4							
89	26.7							
90	27.0							
91	27.3							
92	27.6							
93	27.9							
94	28.2							
95	28.5							
96	28.8							
97	29.1							
98	29.4							
99	29.7							
100	30.0							
101	30.3							
102	30.6							
103	30.9							
104	31.2							
105	31.5							
106	31.8							
107	32.1							
108	32.4							
109	32.7							
110	33.0							
111	33.3							
112	33.6							
113	33.9							
114	34.2							
115	34.5							
116	34.8							
117	35.1							
118	35.4							
119	35.7							
120	36.0							
121	36.3							
122	36.6							
123	36.9							
124	37.2							
125	37.5							

Pnt	Tape	Hgt (m)	Spp; Species or Substrate Codes (tallest to lowest)					
126	37.8							
127	38.1							
128	38.4							
129	38.7							
130	39.0							
131	39.3							
132	39.6							
133	39.9							
134	40.2							
135	40.5							
136	40.8							
137	41.1							
138	41.4							
139	41.7							
140	42.0							
141	42.3							
142	42.6							
143	42.9							
144	43.2							
145	43.5							
146	43.8							
147	44.1							
148	44.4							
149	44.7							
150	45.0							
151	45.3							
152	45.6							
153	45.9							
154	46.2							
155	46.5							
156	46.8							
157	47.1							
158	47.4							
159	47.7							
160	48.0							
161	48.3							
162	48.6							
163	48.9							
164	49.2							
165	49.5							
166	49.8							

Species observed within ____ m of either side of the transect but not intercepted: _____