F. Step-Point Method

1. *General Description* The Step-Point Method involves making observations along a transect at specified intervals, using a pin to record cover "hits." It measures cover for individual species, total cover, and species composition by cover.

   It is important to establish a photo plot (see Section V.A) and take both close-up and general view photographs. This allows the portrayal of resource values and conditions and furnishes visual evidence of vegetation and soil changes over time.

2. *Areas of Use* This method is best suited for use with grasses and forbs, as well as low shrubs. The greater the structure to the community, the more difficult it becomes to determine "hits" due to parallax, observer bias, wind, etc. This method is good for an initial overview of an area not yet subjected to intensive monitoring.

3. *Advantages and Limitations* This method is relatively simple and easy to use as long as careful consideration is given to the vegetation type to which it is applied. It is suitable for measuring major characteristics of the ground and vegetation cover of an area. Large areas can easily be sampled, particularly if the cover is reasonably uniform. It is possible to collect a fairly large number of samples within a relatively short time.

   A limitation of this method is that there can be extreme variation in the data collected among examiners when sample sizes are small. Tall or armored vegetation reduces the ability to pace in a straight line, and the offset for obstructions described in the procedures adds bias to the data collection by avoiding certain components of the community. Another limitation is that less predominant plant species may not be hit on the transects and therefore do not show up in the study records. The literature contains numerous studies utilizing point intercept procedures that required point densities ranging from 300 to 39,000 in order to adequately sample for minor species. One major consideration in the use of this method is to assure that a sharpened pin is used and that only the point is used to record "hits." Pins have finite diameters and therefore overestimate cover (Goodall 1952). Another limitation of this method is that statistical analysis of the data is suspect unless two and preferably more transects are run per site (see Section III - Study Design and Analysis).

4. *Equipment* The following equipment is needed (see also the equipment listed in Section V.A, page 31, for the establishment of the photo plot):

   - Study Location and Documentation Data form (see Appendix A)
   - Cover Data form (see Illustration 13)
   - Permanent yellow or orange spray paint
   - Tally counter (optional)
   - One stake: 3/4- or 1-inch angle iron not less than 16 inches long
   - 3-foot long, 3/16th-inch diameter sharpened pin
   - Compass
   - Steel post and driver

5. *Training* A minimum amount of training is needed for this method. Examiners must be able to identify the plant species, be familiar with the ground-level cover

categories, know how to collect canopy or foliar cover data, and know how to collect cover data using a pin and notch in the boot.

6. *Establishing Studies* Careful establishment of studies is a critical element in obtaining meaningful data.

   a **Site Selection** The most important factor in obtaining usable data is selecting representative areas (critical or key areas) in which to run the study (see Section II.D). Study sites should be located within a single plant community within a single ecological site. Transects and sampling points need to be randomly located within the critical or key areas. (see Section III).

   b **Pilot Studies** Collect data on several pilot studies to determine the number of samples (transects or observation points) and the number and size of quadrats needed to collect a statistically valid sample (see Section III.B.8).

   c **Number of Transects** Establish the minimum number of transects to achieve the desired level of precision (see Section III.B).

   d **Study Layout** Data can be collected using either the baseline or linear study designs described in Section III.A.2 beginning on page 8. The linear technique is the one most often used.

   e **Reference Post or Point** Permanently mark the location of each study with a reference post and a study location stake (see beginning of Section III).

   f **Study Identification** Number studies for proper identification to ensure that the data collected can be positively associated with specific sites on the ground (see Appendix B).

   g **Study Documentation** Document pertinent information concerning the study on the Study Location and Documentation Data form (see beginning of Section III and Appendix A).

7. *Taking Photographs* The directions for establishing photo plots and for taking close-up and general view photographs are given in Section V.A.

8. *Sampling Process* In addition to collecting the specific studies data, general observations should be made of the study sites (see Section II.F).

   a **Running a Transect** Determine the transect bearing and select a prominent distant landmark such as a peak, rocky point, etc., that can be used as the transect bearing point.

      (1) Start a transect by randomly selecting a point along the transect bearing and reading the first hit (observation point).

      (2) Read hits at specified intervals by placing the heel of the boot on the ground with the sole of the boot at a 30-degree angle to the ground. Place the pin into the 3/16th inch wide by 1/8th inch deep notch in the toe of

the boot and vertically lower the pin until it either intersects an herbaceous plant or the ground for the specified number of hits. It is recommended that the interval be a minimum of 5 paces. To lengthen the transect, increase the distance between hits (10 paces, 20 paces, etc.).

(3) When obstructions such as juniper trees, cholla cactus, or ledge rock, etc., are encountered, sidestep at 90° from the transect line and continue pacing parallel to the transect to avoid the obstructions. Return to the original transect line as soon as possible by sidestepping at 90° in the opposite direction. Continue pacing along the transect bearing. If the obstruction (juniper tree, cholla cactus, or ledge rock) is determined to be a highly important component of the community, this information can be recorded qualitatively on the back of the form.

(4) In most cases, do not count hits along portions of a transect that have been unnaturally disturbed, such as roads or trails. When such areas are encountered, proceed three paces past the disturbance before resuming the reading of hits along the transect line.

b **Collecting Cover Data** At each observation point, identify the ground level or basal hit with the point of the pin and record the data by dot count tally by category and/or plant species code in the appropriate section of the Cover Data form (see Illustrations 13 and 14). If there is a vegetation canopy layer, lower the pin through the vegetation until a basal or ground level hit is determined. Record the basal or ground level hit and any subsequent vegetation layers that intersect the pin. For vegetation structure above 3-feet (length of pin), a visual observation of plant intercepts above the notch in the boot can be made and recorded as additional canopy or foliar level hits on the data form.

(1) ***Ground-level or basal hits***

(a) Ground-level hits (excluding basal vegetation hits) will fall into four cover categories. They can be redefined and/or additional categories added, depending on the data needed. The four categories are:

L - Litter

B - Bare ground

G - Gravel (particle sizes between 1/12 inch and 10 inches)

S - Stone (greater than 10 inches)

(b) Record the ground-level hits by dot count tally by ground-level cover category in the Ground-Level Cover section of the form, except where there are ground-level and, basal or canopy cover hit combinations. In this situation, use the Basal and Canopy/Foliar Cover section of the form.

(c) Basal hits on live vegetation are identified by species (includes mosses and lichens more than 1/16 inch thick). To count as a basal hit on live vegetation, the plant crown at or below a 1-inch height above the ground MUST be intercepted by the pin.

(d) Enter the appropriate plant species code in the Basal or Ground-Level Column in the Basal and Canopy/Foliar Cover section of the form.

(e) Enter a dot count tally for each basal hit on a species in the Dot Count Column in the Basal and Canopy/Foliar Cover section of the form when the plant species code is first entered on the form. Enter an additional dot count tally each time there is a basal hit on that species on the transect, except where there are basal and canopy/foliar cover hit combinations.

(2) ***Ground-level or basal and canopy/foliar cover hit combinations***

(a) Identify the ground-level or basal hit, as well as any canopy cover hit(s) below 3 feet in height, intercepted at each point by the pin. For canopy cover above 3 feet, use line-of-sight observations directly perpendicular to the notch in the boot.

(b) Enter the appropriate ground-level cover category code and/or plant species code for each level of hit (up to four levels) in the appropriate columns in the Basal and Canopy/Foliar Cover section of the form (see Illustration 13).

(c) Enter a dot count tally for each ground-level or basal and canopy/foliar cover hit combination when it is first entered on the form and each time this same combination is encountered on the transect.

(d) Enclose plant species codes for vegetation cover hits more than 20 feet above ground level in brackets [ ].

9. *Calculations* Calculate the percent cover for each cover category by dividing the number of hits for each category by the total number of hits for all categories, including hits on vegetation.

a **Ground Cover** Ground cover is determined by dividing the total number of hits for all categories except bare ground by the total number of hits (including bare ground).

b **Canopy/Foliar Cover** Canopy/Foliar cover is determined by dividing the total number of hits on vegetation (includes all basal and canopy/foliar hits) by the total number of hits.

c **Basal Cover** Basal cover is determined by dividing the number of basal hits by the total number of hits.

10. *Data Analysis*

a When transects are the sampling units: For trend analysis, permanent sampling units are suggested. If permanent transects are monitored, use the appropriate paired analysis technique to compare change in average cover by species and cover class. When comparing more than two sampling periods, use repeated

measures ANOVA. If the transects are not permanently marked, use the appropriate nonpaired test.

b When points are the sampling units: To determine if the change between sampling periods is significant, use Chi Square analysis of variance for cover data.

11. References

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Mueller-Dombois, Dieter and Heinz Ellenberg. 1974. Aims and methods of vegetation ecology. John Wiley & Sons, New York, NY. 547 p.

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Cover Data

Study Number	Date	Examiner	Pasture
Allotment Name & Number	Study Location		Number of Points

Ground-Level Cover

Category	B Bare Ground	L Litter	G Gravel (2mm-10")	S Stone (>10")	Vegetation	Total
Dot Count						
Total Hits						
% Cover						

Basal and Canopy/Foliar Cover

Bsl or Grnd-Lev	Level 1	Level 2	Level 3	Dot Count	Total Hits
				Total	

Notes (use other side or another page)

Cover Data

Study Number	Date	Examiner	Pasture
Red Feather #2	9/28/95	Josh Gibson	1

Allotment Name & Number	Study Location	Number of Points
Red Feather 11473	Two miles south of Headquarters Well on west side of road.	100

Ground-Level Cover

Category	B Bare Ground	L Litter	G Gravel (2mm-10")	S Stone (>10")	Vegetation	Total
Dot Count	⊠	⊠ :	⊠ ⁝	:		31
Total Hits	9	12	16	2	61	100
% Cover	9	12	16	2	61	100

Basal and Canopy/Foliar Cover

Bsl or Grnd-Lev	Level 1	Level 2	Level 3	Dot Count	Total Hits
L	BOCU			⊠ :	12
G	BOGR 2	D	[JUNIP]	•	1
BOGR 2	Junip			⊠ ⊠	20
G	BOCU			: :	4
SIHY				:	2
L	ERIOG			:	2
G	SIHY	RHTR		:	2
B	VIGUI			:	2
G	L	VIGUI		: :	4
B	BOCU			:	2
B	BOHI 2			: •	3
L	BOGR 2	BOCU		:	2
BOCU	L			:	2
OPUNT				•	1
BOGR 2	BOCU			:	2
				Total	61

Notes (use other side or another page)