**Line-Point Intercept Method**

Data on ground cover (litter, lichens and mosses, rocks, bare ground) and foliar cover of vascular plants (by species and functional group, live or standing dead) will be collected along five 30-m transects using the line-point intercept method (Herrick et al. 2005). **A pin flag will be dropped every 0.5 m along each transect starting at 0.5 m and ending at 30 m for 60 points per transect or 300 points per plot**.

Plot Layout

1. Transects will be separated by 7 m and will be oriented parallel to the hillslope contour.
2. The central transect will be centered on the soil pit (15 m each side) but offset 2 m upslope of the soil pit leaving 3 m downslope of the pit to use for the tarp and soil descriptions as well as a 2 m buffer before the next transect.
3. If there is no perceptible slope orient the transects on an E-W axis and offset the central transect to the north
4. Transects will be numbered starting with the most downslope transect. If there is no perceptible slope, transect 1 will be the southernmost transect.
5. If the plot will cross a clearly changing vegetation boundary (e.g. 4 transects in grassland but transect 5 in sagebrush) shift the plot, **including the soil sampling point**, the minimum distance needed to fit the entire plot into vegetation that is visually similar to what is found at the original soils sampling point.
6. If there is not room to fit a plot into relatively homogeneous vegetation, drop the sampling point and move to the next for that category.

7 m

7 m

7 m

7 m

2 m

5 m

15 m

Transect 1

Transect 5

Transect 4

Transect 3

Transect 2

0 m

30 m

**Line-point intercept**

1. Begin at the “0” end of the transect.
2. Working from left to right, move to the first point on the line (0.5 m). Always stand on the same side of the line (downslope side of line for sites with slope, south side without slopes).
3. Drop a pin flag to the ground from a standard height of 5 cm above herbaceous canopy next to the tape on the side on which you are not standing.

***Rules***

3.1 The pin should be held vertical before dropping.

3.2 The pin should be dropped from the same height (~ 5cm) above the vegetation each time. A low drop height minimizes “bounces” off of vegetation but increases the possibility for bias.

3.3 Do not guide the pin all the way to the ground. It is more important for the pin to fall freely to the ground than to fall precisely on the mark.

3.3 If vegetation over the point is greater than arms-length, then the pin should never be dropped from higher than the height of the out-stretched arm.

1. If vegetation is above the height of the out-stretched arm, record the species as a “tree” or “shrub” foliar or canopy hit, appropriately. This will involve projecting upwards and attempting to clearly determine whether vegetation would be contacted if the pin were extended straight above.

***Rules***

* 1. If the pin hits a point where there is a shrub or tree canopy overhead without actually contacting the plant record the species code under the “shrub canopy” or “tree canopy” column. Record whether the branches of the tree above are dead or alive (Y=Dead, N= Alive). If the entire plant is dead put /D after the code.
  2. If a projection above the point would contact vegetation record it as a foliar hit.
  3. For a tree, if there is a hole of 50 cm or greater (i.e a very clear obvious gap in vegetation that extends all the way down to the pin) in the canopy with no vegetation, then no canopy hit will be recorded.
  4. For a shrub, if there is a gap of > 5 cm, then no canopy hit will be recorded.
  5. If the shrub or tree is unidentifiable record DS or DT in species code

1. Once the pin flag is flush with the ground, record every plant species it intercepts.

***Rules***

5.1 If the pin does not contact a shrub or tree, but the line at that point is surrounded (within the perimeter of the canopy) by shrub/tree vegetation from the same shrub/tree species with a gap in the vegetation < 5 cm (shrub) or 50 cm then record a canopy cover hit.

5.11 **If the pin contacts the shrub/tree species anywhere on that point do not record a “Shrub Canopy” hit (you will not have the same species recorded in the “Shrub Canopy” and the “Foliar Layer.”)**

5.12 Record the species code and whether the nearest branches in the canopy hit are live or dead using codes Y or N.

If the entire shrub is dead (has no leaves) identify to species if you can and note it is dead (e.g. ARTRW8/D). If it cannot be identified to species record it as dead shrub (DS) or dead tree (DT).

5.13 If there is a foliar hit of another species over a canopy hit, still record the canopy hit in the “Shrub Canopy” column.

5.2 Record the species of the first stem, leaf or plant base intercepted in the first “Foliar Layer” column using the PLANTS database species code (http://plants.usda.gov/).

5.21 If the pin intercepts standing dead material record the standing dead by growth form as follows:

DT Dead tree

DS Dead shrub

DF Dead forb

DG Dead grass

Record the species if you can.

5.22 If the point hits a dead branch of a shrub and the shrub is still alive record the species code and DP for the foliar hit (e.g. ARTRW8/DP). To clarify, for all shrubs, trees, and the large-padded *Opuntia*, but only for these, distinguish completely dead (D) and dead part of a live shrub (DP). We put the *Opuntia* in this category because in places large spreading clones are a patchwork of live and dead parts. If no suffix is added it is a foliar hit on live tissue. For herbaceous species when a foliar hit is on attached dead material (e.g last year’s growth of a perennial grass) consider it a live hit as long as any portion of the contacted plant is alive See appendix for list of species considered shrubs for the purposes of this study.

5.3 Record all additional species intercepted by the pin in the subsequent “Foliar Layer” columns.

5.4 Record each canopy or foliar species (including DT, DS, DF, DG) only once in the foliar *or* canopy columns, even if it is intercepted several times.

5.5 If you can identify the genus, but not the species either use the PLANTS database genus code (http://plants.usda.gov) or record a number for each new species of that genus. ALWAYS define the functional group for the unknown genus at the bottom of the data form.

5.6 Record herbaceous litter as “L,” if present. Litter is defined as detached dead stems and leaves that are part of a layer that comes in contact with the ground. Record “W” for detached woody litter that is greater than 5 mm (or ~1/4 in) in diameter and in direct contact with soil. **Litter and Woody Litter are the lowest foliar layer recorded**.

6. Record whether the pin intercepts a plant base or one of the following in the “Soil surface” column.

**R** = Rock

**R/FG** = fine gravel (>2-5mm diameter)

**R/G** = gravel (>5-76mm diameter)

**R/C** = cobbles (>76-250mm diameter)

**R/CH** = channers (>2-150mm diameter)

**R/F** = flagstones (>150-380mm long)

**R/S** = stones (>250-600mm diameter or >380-600mm long)

**R/B** = boulders (>600mm diameter or >600mm long)

**BR** = Bedrock

**EL** = Embedded litter

**D** = Duff

**M** = Moss

**LC** = Lichen crust on soil (lichen on rock is recorded as “R”)

**S** = Soil that is visibly unprotected by any of the above

If an ant mound or disc is present, record soil surface code followed by /AM or /AD (i.e. S/ AM)

**AD =** Ant Disk

**AM =** Ant Mound

***Rules***

6.1 If pin intercepts a live plant base record the plant code for soil surface. This is the only time one species may be recorded twice for one point (ARTR in ‘canopy’ or in ‘foliar’ layer and in ‘soil surface’.

6.3 If the pin hits the base of a dead plant enter “DS, DT, DF, DG” appropriately for the soil surface code.

6.4 Record embedded litter as “EL” where removal of the litter would leave an indentation in the soil surface or would disturb the soil surface. Record duff as “D” where there is no clear boundary between litter and soil and litter is not removed during typical storms (occurring annually).

6.4 Describe the size class of each rock hit recoding first that it is a rock hit (R), then the size class of the rock (e.g. R/G).

6.4.1. Fine gravel, gravel, and cobbles are roughly spherical

6.4.2. Channers and flagstones are flattish, stones.

6.4.3. Boulders can be either spherical or flat but have separate size requirements depending on the shape.

These rock classes can be found in the *Field Book for Describing and Sampling Soils* Version 3.0 page 2-47.

**Shrub Density**

**This should be done after all other transect measurements are complete because it requires the data collector to walk along the side of the tape where all other measurements are taken from.**

1. Shrub Density will be sampled on the three central transects (transect 2, 3 and 4).
2. Using a meter pole, walk along each side of the transect and count the number of shrubs within 1 meter of the tape. For purposes of density only count *Yucca baccata* as shrubs

***Rules***

* 1. Shrub density counts are recorded by species in five different size classes (<15 cm juvenile, <15 cm adult, >15-50 cm, >50-100 cm, and >100 cm).
     1. Adult shrubs in the <15 cm category can be distinguished from juveniles in the same size class based on the growth form. For example, a sagebrush juvenile will generally have much thinner branches and be less sprawling than an adult in the same height class.
  2. Record by species and for *Artemisia tridentata* by subspecies.
  3. Also record by categories of dead versus alive.