

SIERRA NEVADA FOOTHILL VEGETATION-HABITAT STUDY
HABITAT SAMPLING PROTOCOLS

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Use the attached data sheets for habitat sampling or forms on the handheld computer to complete the wildlife habitat sampling. A total of three (3) 0.05-0.10 ha (0.12-0.25-acre) fixed-radius circular plots will be sampled from each 3.1-ha (7.8-acre) (100-m [328-ft] radius) land bird point count circular plot. Each habitat sampling plots will be randomly located along three transects in each 3.1-ha land bird point count plot. The habitat plots will be at random distances and compass bearings along three (3) transects from center of the point count plot. The center points are the numbered waypoints from the GPS units. The circular habitat plots will have a staged radius of 12.6 m (41.4 ft) to 17.8 m (58.5 ft) depending on the density of trees. The smaller and inner 12.6-m radius plot (0.05-ha [0.12-acre]) will be used when tree densities are ≥ 400 stems/ha (162 stems/acre). The larger 17.8-m radius plot (0.10-ha [0.25-acre]) will be used when tree densities are < 400 stems/ha (162 stems/acre). Therefore, when at least 20 stems are tallied and measured while within the 0.05-ha (0.12-acre), the 0.05-ha (0.12-acre) plot will be used. If the entire 0.05-ha (0.12-acre) plot has been surveyed and < 20 stems have been tallied and measured, the larger 0.10-ha (0.25-acre) plot will be used. Measurements begin in the 0.05-ha (0.10-acre) plot first. Plot radii are measured using tape measures or laser rangefinders. Slope corrections must be applied if measurements are taken on sloping ground.

The three plots are located at random distances between 20-80 m (66-262 ft) and random compass bearings in three sections (1-120°, 121-240°, and 241-360°) at each land bird point count plot to ensure random and representative coverage at each sample location. Distances and bearings will be uploaded into the handheld computers or will be on paper so that field crews will know the location of the habitat sampling plots prior to beginning field sampling. The polygon center point will also have a single 0.05-0.10-ha (0.12-0.25-acre) habitat sampling plot so that it can support vegetation mapping efforts that will also be done for the same polygon. A total of ten (10) habitat sampling plots will then be located in each polygon.

The location of each habitat sampling point will be registered with the GPS units. The waypoints will numbered using a 6-digit numeric code using the following rules. The first 4 digits match the first 4 digits of the Garmin_id code, the 5th digit matches that of the numbered land bird point count location, while the 6th digit is numbered sequentially from 1-3 for habitat sampling plots in the three sections (1 = 1-120°; 2 = 121-240°; 3 = 241-360°). For example, the habitat plot located in Section 121-240° at land bird point count plot No. 2 at Sample_id = 46844 will be numbered as waypoint "684422". The habitat plot located at the polygon center is numbered "xxxx10" so the center plot for Sample_id = 46844 would be "684410".

Two or more observers participate in the habitat sampling. Initial field sampling will be done in 3-person crews. Each observer does one component of the field sampling, and multiple data sheets or collection efforts used on one plot must be consolidated into a single sheet or on the handheld. Observers should trade duties with each station to spread out biases and the work load.

The following types of field data will be collected at each 0.05-0.10-ha circular plot: (1) species, crown position, and dbh for every live woody stem ≥ 10.2 cm (4.0") dbh in the circular plot; (2) height of 4 trees in the circular plot (one in each compass quarter); (3) species, dbh, and decay class

of all snags ≥ 10.2 cm (4.0") dbh and ≥ 3 m (9.8 ft) tall within the plot; (4) canopy cover of the tree layer; (5) % cover of the herbaceous layer; (6) stem density for the shrub layer; (7) densities of oak (*Quercus* spp.) seedlings and saplings; and (8) number of logs and other woody debris. The attached data sheet provides detailed instructions on how to record the field data.

DBH is recorded to the nearest 0.25 cm (0.1") at 1.4 m (4.5 ft) high along the trunk. The dbh tape is wrapped around the trunk perpendicular to the angle of the trunk. The tape must be raised above any large branches, conks, etc. to measure dbh if they are present. The tape may be lowered below branches, conks, etc. only after raising the tape above them puts the tape too high for measurement. DBH is recorded at the uphill side of the trunk. Upright stems growing from horizontal trunks along the ground are measured at 1.4 m (4.5 ft) high while standing on the horizontal trunk. Multi-stemmed trees are measured individually if they branch below dbh, and singly if they branch above 1.4 m (4.5 ft). Begin the plot survey at the N transect and move clockwise through the plot. Count trees on the plot boundary only if $\geq 50\%$ of the trunk in the ground is rooted inside the plot. Record species as: BLOA - blue oak; CABO - CA black oak; VAOA - valley oak; CABU - CA buckeye; INLO - interior live oak; CALO - canyon live oak; FOPI - foothill pine; POPI - ponderosa pine; INCE - incense cedar; DOFI - Douglas-fir; and SUPI - sugar pine; use similar naming conventions for other species encountered but not listed here.

Height is recorded with the clinometer to the nearest 0.3 m (1 ft) from the standing live woody tree closest to the plot center in the NE, SE, SW, and NW quarters. Only one (1) tree per quarter and only four (4) trees per plot will be measured. Use the appropriate compass quarter in the handheld or indicate the compass quarter in the appropriate column on the data sheet for the appropriate tree. Measured height is height of the tallest, live portion of the tree to the ground, not entire trunk/bole height. Clinometer distance must begin on the ground below the tallest point extending out the appropriate clinometer distance. Do not go outside the plot to measure a tree in a quarter if one is not found within the 12.6-17.8 (41.4-58.5 ft) radius. Distance from the tree should be from the center of the trunk on conifers and from the highest point of the tree to the ground in hardwoods that are typically leaning. Distance should be measured along flat ground (along the same slope contour as the tree). Slope corrections must be applied if measurements are taken on sloping ground.

Overstory/Understory is recorded for all trees with dbh measurements. Record as OVERSTORY trees that are:

OVERSTORY TREES (Always):

Predominant: crown extends well above general canopy level, and is a tree that is a remnant from the earlier stand condition.

Dominant: crown extends above general level of the canopy; receives full light from above and some direct light from sides.

Codominant: crown is part of general canopy level; receives full light from above but little from sides; crown is usually medium-sized and somewhat crowded by other trees.

OVERSTORY OR UNDERSTORY TREE (Depending on relative crown position):

Intermediate: shorter tree than dominants and codominants; crown is below or barely reaches into main canopy; crown receives little direct light from above and none from sides; crown usually small and quite crowded.

A few Codominant trees may be considered understory trees.

UNDERSTORY TREES (Always):

Overtopped/Suppressed: crown entirely below general level of canopy at the stand or plot level; receives no direct light from above or from sides; small trees in canopy openings that are well below the tree canopy layer are not overstory trees.

Crown position is very subjective, especially for more open canopy conditions where clear understory trees are receiving full sunlight because of a canopy gap. The attached write-up should clarify this situation. The important thing is to evaluate each tree given the other trees in the sample plot and stand, and rate the tree relative to the others. Typically, even-structured stands will have mostly overstory trees, while uneven-structured stands will have overstory and understory trees.

Snags are measured within the 0.05-0.10-ha (0.12-0.25-acre) circular plot using the same methods as dbh measurements. Snags are standing dead trees > 10.2 cm (4.0") dbh and > 3 m (9.8 ft) tall within the plot; (4) canopy cover of the tree layer; and their dbh is measured to the nearest 0.25 cm (0.1"). Species and decay class (see attachment) are also recorded. At least identify snags as "conifer" or "hardwood" if unable to determine species.

Tree layer canopy cover is recorded using a densitometer. These measurements must be taken after the tree dbh measurements have been taken so the plot size can be determined because the spacing between the cover readings will vary depending on plot size. A total of 25 readings are taken per habitat plot. There will be eight (8) transects used for the readings and three (3) readings are taken per transect. The transects are 0°, 45°, 90°, 135°, 180°, 225°, 270°, and 315°. Readings are taken at three (3) equally spaced points along these transects depending on the size of the habitat sampling plot. One measurement is taken at the center point at each plot to begin the sampling. With the 0.05-ha (0.12-acre), measurements are taken at 4 m (13.1 ft), 8 m (26.2 ft), and 12 m (39.4 ft). With the 0.10-ha (0.25-acre), measurements are taken at 5 m (16.4 ft), 10 m (32.8 ft), and 15 m (49.2 ft). With three (3) readings per transect and the center point, there will be 25 measurements per plot. The tube is held at eye level centered over the measurement point. Multiple readings are taken when ≥ 2 individual trees overlap the same point. Record to species with the overstory tree first on data sheet followed by the mid-canopy and understory tree(s) as follows: "BLOA/BLOA/CABU". If using data sheets, indicate with "-" whether a layer was absent (e.g., "BLOA/-/CABU" indicates that mid-canopy was absent. Measurements are made of live woody vegetation that > 2.0 m (6.6 ft) tall. Tapes can be laid out on the ground for the measurements, and measurements are taken at the appropriate interval depending on plot size, and distance and slope corrections must be applied.

Shrub layer cover is recorded using a densitometer at the same transect points as the tree layer cover using the densitometer. The densitometer is held upright or turned upside down to measure cover in the shrub layer, and it is held at eye level while standing with the densitometer held over the sample point. Any live vegetation in the shrub layer (0.51 m to 2.0 m)(1.6 ft to 6.6 ft) in height is recorded if it is intersected by the sighting point including small shrubs and small trees that are seedlings and saplings within the shrub layer. Layering is not recorded here, only what is intersected by the densitometer at the top of the shrub vegetation layer. Any part of a live plant intersecting the sighting point in the shrub layer is tallied. See **Herbaceous layer cover** instructions for some of the shrub species codes.

Herbaceous layer cover is recorded at the same transect points as tree layer and shrub layer cover using the densitometer. The tube is turned upside down, and anything ≤ 0.5 m (1.6 ft) in height is recorded if it is intersecting by the sighting point, including shrubs and trees. Layering is not recorded here, only what is intersected by the densitometer at the top of the vegetation. Categories may include: MANZ = manzanita; CEAN = unid. *Ceanothus*; CECU = buckbrush; CEIN = deer brush; LITT = litter that is vegetation residue < 2.5 cm (1") diameter; DUFF = non-structured decaying matter; ROCK = rock > 13 cm (5 inches) in size; BARE = bare ground with or without rocks ≤ 13 cm (5 inches) in size; FORB = forbs; GRAS = grasses; BLOA = blue oak seedling; INLO = interior live oak seedling; VAOA = valley oak seedling; CABO = CA black oak seedling; seedlings of all tree species recorded using appropriate species code; LOG = downed woody debris of any type as defined for log and downed woody debris measurements. Use appropriate naming protocols for other items not listed here.

Oak and conifer seedlings and saplings are counted in nine (9) 0.56-m (1.8-ft) radius circular plots per habitat sampling. Seedlings are ≤ 2.5 cm (1") dbh and saplings are > 2.5 cm (1") but < 15.2 cm (6.0") dbh. Individual seedlings and saplings are counted by individually rooted plants, or individual sprouts rooted to a stump. One seedling/sapling plot is centered at the plot center while the other eight are located on the overstory and understory transects centered at the 8-m (26.3-ft) or 10-m (32.8-ft) points along the eight (8) transects depending on plot size. Seedlings and saplings must be rooted within the circular plot to be tallied, and seedlings and saplings must be identified to species.

Logs and downed woody debris are tallied by CWHR class (large log, medium log, and large slash) using the same eight (8) transects centered along the N-S, NE-SW, E-W, and NW-SE axis's used for the cover and seedling/sapling tallies. The entire length of each transect is sampled. Transect length depends on the plot size as with other measures. Logs and slash intersected by these transects are tallied by CWHR log class. Log and slash length must be ≥ 1 m (3.3 ft) to be tallied, and diameter is measured at the greatest diameter of the log or slash. Logs intersecting multiple transects are tallied once; multiple branching logs and slash are tallied once based on the largest diameter by following branches to the trunk or largest diameter branch. Branches and slash broken off larger branches and trees are tallied as individual items. The $0^\circ/360^\circ$ and 180° transects are the N-S transect, 45° and 225° transects are the NE-SW transect, the 90° and 270° transects are the E-W transect, and the 135° and 315° transects are the NW-SE transect. Put blaze orange flagging on logs or slash that intersect multiple transects so that double counting is avoided.

CWHR habitat elements are measured at two scales. The first scale is within the 0.05-0.10-ha (0.12-0.25-acre) circular habitat plot. The second scale is within the 3.1-ha (7.8-acre) land bird point count plot. Observers record with an "IV" if the habitat element is present within the habitat plot, while "IB" is used when elements are present within the larger bird plot. The "IB" is reserved only for those elements that are not present inside the habitat plot but present within the larger bird plot. Some elements have inferred presence, such as animal diet elements, or have seasonal patterns, such as vegetative diet elements, and observers must carefully evaluate the presence or absence of these elements. "IB" elements do not have to be included on all three (3) data sheets for each sampling location but each vegetation sample plot must have a complete list of "IV" elements. Record "IB" elements where found, and make a complete sweep of the entire 3.1-ha (7.8 acre) bird point count circle before finishing the element list for "IB" elements.