

CALIFORNIA NATIVE PLANT SOCIETY / DEPARTMENT OF FISH AND GAME  
PROTOCOL FOR COMBINED VEGETATION RAPID ASSESSMENT  
AND RELEVÉ SAMPLING FIELD FORM  
(February 27, 2014)

**Introduction**

This protocol describes the methodology for both the relevé and rapid assessment vegetation sampling techniques as recorded in the combined relevé and rapid assessment field survey form of the same date as this protocol. The same environmental data are collected for both techniques. However, the relevé sample is plot-based, with each species in the plot and its cover being recorded. The rapid assessment sample is based not on a plot but on the entire stand, with 12-20 of the dominant or characteristic species and their cover values recorded. For more background on the relevé and rapid assessment sampling methods, see the relevé and rapid assessment protocols at [www.cnps.org](http://www.cnps.org).

**Selecting stands to sample:**

To start either the relevé or rapid assessment method, a stand of vegetation needs to be defined.

A stand is the basic physical unit of vegetation in a landscape. It has no set size. Some vegetation stands are very small, such as alpine meadow or tundra types, and some may be several square kilometers in size, such as desert or forest types. A stand is defined by two main unifying characteristics:

- 1) It has compositional integrity. Throughout the site, the combination of species is similar. The stand is differentiated from adjacent stands by a discernable boundary that may be abrupt or indistinct.
- 2) It has structural integrity. It has a similar history or environmental setting that affords relatively similar horizontal and vertical spacing of plant species. For example, a hillside forest originally dominated by the same species that burned on the upper part of the slopes, but not the lower, would be divided into two stands. Likewise, sparse woodland occupying a slope with very shallow rocky soils would be considered a different stand from an adjacent slope with deeper, moister soil and a denser woodland or forest of the same species.

The structural and compositional features of a stand are often combined into a term called homogeneity. For an area of vegetated ground to meet the requirements of a stand, it must be homogeneous (uniform in structure and composition throughout).

Stands to be sampled may be selected by evaluation prior to a site visit (e.g., delineated from aerial photos or satellite images), or they may be selected on site during reconnaissance (to determine extent and boundaries, location of other similar stands, etc.).

Depending on the project goals, you may want to select just one or a few representative stands of each homogeneous vegetation type for sampling (e.g., for developing a classification for a vegetation mapping project), or you may want to sample all of them (e.g., to define a rare vegetation type and/or compare site quality between the few remaining stands).

*For the rapid assessment method, you will collect data based on the entire stand.*

### **Selecting a plot to sample within in a stand (for relevés only):**

Because many stands are large, it may be difficult to summarize the species composition, cover, and structure of an entire stand. We are also usually trying to capture the most information as efficiently as possible. Thus, we are typically forced to select a representative portion to sample.

When sampling a vegetation stand, the main point to remember is to select a sample that, in as many ways possible, is representative of that stand. This means that you are not randomly selecting a plot; on the contrary, you are actively using your own best judgment to find a representative example of the stand.

Selecting a plot requires that you see enough of the stand you are sampling to feel comfortable in choosing a representative plot location. Take a brief walk through the stand and look for variations in species composition and in stand structure. In many cases in hilly or mountainous terrain look for a vantage point from which you can get a representative view of the whole stand. Variations in vegetation that are repeated throughout the stand should be included in your plot. Once you assess the variation within the stand, attempt to find an area that captures the stand's common species composition and structural condition to sample.

### ***Plot Size***

All relevés of the same type of vegetation to be analyzed in a study need to be the same size. Plot shape and size are somewhat dependent on the type of vegetation under study. Therefore, general guidelines for plot sizes of tree-, shrub-, and herbaceous communities have been established. Sufficient work has been done in temperate vegetation to be confident the following conventions will capture species richness:

Herbaceous communities: 100 sq. m plot

Special herbaceous communities, such as vernal pools, fens: 10 sq m plot

Shrublands and Riparian forest/woodlands: 400 sq. m plot

Open desert and other shrublands with widely dispersed but regularly occurring woody species: 1000 sq. m plot

Upland Forest and woodland communities: 1000 sq. m plot

### ***Plot Shape***

A relevé has no fixed shape, though plot shape should reflect the character of the stand. If the stand is about the same size as a relevé, the plot boundaries may be similar to that of the entire stand. If we are sampling streamside riparian or other linear communities, our plot dimensions should not go beyond the community's natural ecological boundaries. Thus, a relatively long, narrow plot capturing the vegetation within the stand, but not outside it would be appropriate. Species present along the edges of the plot that are clearly part of the adjacent stand should be excluded.

If we are sampling broad homogeneous stands, we would most likely choose a shape such as a circle (which has the advantage of the edges being equidistant to the center point) or a square (which can be quickly laid out using perpendicular tapes).

## Definitions of fields in the protocol

### I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION

**Polygon/Stand #:** Number assigned either in the field or in the office prior to sampling. It is usually denoted with a four-letter abbreviation of the sampling location and then a four-number sequential number of that locale (e.g. CARR0001 for Carrizo sample #1). The maximum number of letters/numbers is eight.

**Date:** Date of the sampling.

**Name of recorder:** The full name of the recorder should be provided for the first field form for the day. On successive forms, initials can be recorded.

**Other Surveyors:** The full names of each person assisting should be provided for the first field form for the day. On successive forms, initials of each person assisting can be recorded.

**GPS name:** The name/number assigned to each GPS unit. This can be the serial number if another number is not assigned.

**Datum: (NAD 83)** The standard GPS datum used is NAD 83. If you are using a different datum, note it here.

**Bearing°, left axis at SW point of Long or Short side:** Fill this in for relevés only. For square or rectangular plots: from the SW corner (= the GPS point location), looking towards the plot, record the bearing of the axis to your left. If the plot is a rectangle, indicate whether the left side of the plot is the long or short side of the rectangle by circling "long" or "short" side (no need to circle anything for circular or square plots). If there are no stand constraints, you would choose a circular or square plot and straight-sided plots should be set up with boundaries running in the cardinal directions. If you choose a rectangular plot that is not constrained by the stand dimensions, the short side should run from east to west, while the long side should run from north to south.

**UTM coordinates:** Easting (UTME) and northing (UTMN) location coordinates using the Universal Transverse Mercator (UTM) grid. Record in writing the information from a GPS unit. These coordinates are always the base point of the survey. Soil samples and photos are taken from this point, and exposure, steepness, topography, etc. are measured here. If the GPS is not within the stand (ie: the point is projected), these are the UTMs of the base point.

*For relevé plots, take the waypoint in the southwest corner of the plot whenever possible or in the center of a circular plot.*

**UTM zone:** Universal Transverse Mercator zone. Zone 10 is for California west of the 120<sup>th</sup> longitude, zone 11 is for California east of 120<sup>th</sup> longitude, which is the same as the straight portion of California's eastern boundary.

**Error: ±** The accuracy of the GPS location, when taking the UTM field reading. Please record the error units by circling feet (ft), meters (m), or positional dilution of precision (pdop). If your GPS does not determine error, insert N/A in this field.

**Is GPS within stand? Yes / No** Circle “Yes” to denote that the GPS waypoint was taken directly within or at the edge of the stand being assessed for a rapid assessment, or circle “No” if the waypoint was taken at a distance from the stand (such as with a binocular view of the stand). If the point is taken at the edge of the stand, note the direction to the stand.

**If No, cite from GPS to stand: distance (in meters), bearing (in degrees), inclination (in degrees):** From the base GPS point, measure the distance to the projected point using a range finder. Record the compass bearing from the base point to the projected point; record the inclination if the base and projected points are not at the same elevation. **and record projected UTM:** These are the coordinates of the projected point, or the point being surveyed. They are generated in the field if the GPS units have the ability to calculate projected points. If the GPS unit does not have this capability, make a note to that effect and leave these fields blank.

**Elevation:** Recorded from the GPS unit or USGS topographic map. Please circle feet (ft) or meters (m).

**Photograph #s:** Write the name of the camera or the initials of the camera owner, JPG/frame number, and direction of photos. *Take four photos in the main cardinal directions (N, E, S, W) clockwise from the north, from the GPS location.* If additional photos are taken in other directions, please note this information on the form. If this is a distance survey to a projected point, take the four cardinal photos at the base point and at least one photo of the stand.

**Stand Size:** Estimate the size of the entire stand in which the sample is taken. As a measure, one acre is about 4000 square meters (approximately 64 x 64 m), or 208 feet by 208 feet. One acre is similar in size to a football field.

**Plot Size:** If this is a relevé, circle the size of the plot.

**Plot Shape:** Record the length and width of the plot and circle measurement units (i.e., ft or m). If it is a circular plot, enter radius (or just put a check mark in the space).

**Exposure:** (Enter actual ° and circle general category): With your back to the general uphill direction of the slope (i.e., by facing downhill of the slope), read degrees of the compass for the aspect or the direction you are standing, using degrees from north, adjusted for declination. Average the reading over the entire stand, even if you are sampling a relevé plot, since your plot is representative of the stand. If estimating the exposure, write “N/A” for the actual degrees, and circle the general category chosen. “Variable” may be selected if the same, homogenous stand of vegetation occurs across a varied range of slope exposures. Select “all” if stand is on top of a knoll that slopes in all directions or if the same, homogenous stand of vegetation occurs across all ranges of slope.

**Steepness:** (Enter actual ° and circle general category): Read degree slope from a compass or clinometer. If estimating, write “N/A” for the actual degrees, and circle the general category chosen. Make sure to average the reading across the entire stand even if you are sampling in a relevé plot.

**Topography:** First assess the broad (**Macro**) topographic feature or general position of the stand in the surrounding watershed, that is, the stand is at the top, upper (1/3 of slope), middle (1/3 of slope), lower (1/3 of slope), or bottom. **Circle all of the positions that apply for macrotopography.**

Then assess the local (**Micro**) topographic features or the lay of the area (e.g., surface is flat or concave). **Circle only one of the microtopographic descriptors.**

**Geology:** Geological parent material of site. If exact type is unknown, use a more general category (e.g., igneous, metamorphic, sedimentary). *See code list for types.*

**Soil Texture:** Record soil texture that is characteristic of the site (e.g., coarse loamy sand, sandy clay loam). *See soil texture key and code list for types.*

**Upland or Wetland/Riparian** (circle one): Indicate if the stand is in an upland or a wetland. There are only two options. Wetland and riparian are one category. Note that a site need not be officially delineated as a wetland to qualify as such in this context (e.g., seasonally wet meadow).

**% Surface cover (abiotic substrates).** It is helpful to imagine “mowing off” all of the live vegetation at the base of the plants and removing it – you will be estimating what is left covering the surface. **The total should sum to 100%.** Note that non-vascular cover (lichens, mosses, cryptobiotic crusts) is not estimated in this section.

**% Water:** Estimate the percent surface cover of running or standing water, ignoring the substrate below the water.

**% BA Stems:** Percent surface cover of the plant basal area, *i.e.*, the basal area of stems at the ground surface. Note that for most vegetation types BA is 1-3% cover.

**% Litter:** Percent surface cover of litter, duff, or wood on the ground.

**% Bedrock:** Percent surface cover of bedrock.

**% Boulders:** Percent surface cover of rocks > 60 cm in diameter.

**% Stone:** Percent surface cover of rocks 25-60 cm in diameter.

**% Cobble:** Percent surface cover of rocks 7.5 to 25 cm in diameter.

**% Gravel:** Percent surface cover of rocks 2 mm to 7.5 cm in diameter.

**% Fines:** Percent surface cover of bare ground and fine sediment (e.g. dirt) < 2 mm in diameter.

**% Current year bioturbation:** Estimate the percent of the sample or stand exhibiting soil disturbance by fossorial organisms (any organism that lives underground). Do not include disturbance by ungulates. Note that this is a separate estimation from surface cover.

**Past bioturbation present?** Circle Yes if there is evidence of bioturbation from previous years.

**% Hoof punch:** Note the percent of the sample or stand surface that has been punched down by hooves (cattle or native grazers) in wet soil.

**Fire Evidence:** Circle Yes if there is visible evidence of fire, and note the type of evidence in the “Site history, stand age and comments section,” for example, “charred dead stems of *Quercus berberidifolia* extending 2 feet above resprouting shrubs.” If you are certain of the year of the fire, put this in the Site history section.

**Site history, stand age, and comments:** Briefly describe the stand age/seral stage, disturbance history, nature and extent of land use, and other site environmental and vegetation factors. Examples of disturbance history: fire, landslides, avalanching, drought, flood, animal burrowing, or pest outbreak. Also, try to estimate year or frequency of disturbance. Examples of land use: grazing, timber harvest, or mining. Examples of other site factors: exposed rocks, soil with fine-textured sediments, high litter/duff build-up, multi-storied vegetation structure, or other stand dynamics.

**Disturbance code / Intensity (L,M,H):** List codes for potential or existing impacts on the stability of the plant community. Characterize each impact as **L** (=Light), **M** (=Moderate), or **H** (=Heavy). For invasive exotics, divide the total exotic cover (e.g. 25% *Bromus diandrus* + 8% *Bromus madritensis* + 5% *Centaurea melitensis* = 38% total exotics) by the total % cover of all the layers when added up (e.g. 15% tree + 25% shrub + 40% herbs = 80% total) and multiply by 100 to get the % relative cover of exotics (e.g. 38% total exotics/80% total cover = 48% relative exotic cover). L = 0-33% relative cover of exotics; M =34-66% relative cover, and H = > 66% relative cover. See code list for impacts.

## II. HABITAT AND VEGETATION DESCRIPTION

### ***California Wildlife-Habitat Relationships (CWHR)***

For CWHR, identify the size/height class of the stand using the following tree, shrub, and/or herbaceous categories. These categories are based on functional life forms.

**Tree DBH:** Circle one of the tree size classes provided when the tree canopy closure exceeds 10 percent of the total cover, or if young tree density indicates imminent tree dominance. Size class is based on the average diameter at breast height (dbh) of each trunk (standard breast height is 4.5ft or 137cm). When marking the main size class, make sure to estimate the mean diameter of all trees over the entire stand, and weight the mean if there are some larger tree dbh's. The "**T6 multi-layered**" dbh size class contains a multi-layered tree canopy (with a size class T3 and/or T4 layer growing under a T5 layer and a distinct height separation between the classes) exceeding 60% total cover. Stands in the T6 class need also to contain at least 10% cover of size class 5 (>24" dbh) trees growing over a distinct layer with at least 10% combined cover of trees in size classes 3 or 4 (>11-24" dbh).

**Shrub:** Circle one of the shrub size classes provided when shrub canopy closure exceeds 10 percent (except in desert types, where MCV rules allow lower shrub cover) by recording which class is predominant in the survey. Shrub size class is based on the average amount of crown decadence (dead standing vegetation on live shrubs when looking across the crowns of the shrubs).

**Herb:** Circle one of the herb height classes when herbaceous cover exceeds 2 percent by recording the predominant class in the survey. Note: *This height class is based on the average plant height at maturity, not necessarily at the time of observation.*

**Desert Palm/Joshua Tree:** Circle one of the palm or Joshua tree size classes by averaging all the stem-base diameters (*i.e.* mean diameter of all stem-base sizes). Diameter is measured at the plant's base above the bulge near the ground.

**Desert Riparian Tree/Shrub:** Circle one of the size classes by measuring mean stem height (whether tree and/or shrub stand).

### ***Overall Cover of Vegetation***

Provide an estimate of cover for the following categories below (based on functional life forms). Record a specific number for the total aerial cover or “bird’s-eye view” looking from above for each category, estimating cover for the living plants only. Litter/duff should not be included in these estimates. The porosity of the vegetation should be taken into consideration when estimating percent cover (how much of the sky can you see when you are standing under the canopy of a tree, or how much light passes through the canopy of the shrub layer?).

To come up with a specific number estimate for percent cover, first use generalized cover classes as reference aids such as the CWHR cover classes (<2%, 2-9%, 10-24%, 25-39%, 40-59%, 60-100%) or the modified Braun-Blanquet cover-abundance scale (<1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%). While keeping these intervals in mind, you can then refine your estimate to a specific percentage for each category below.

**% NonVasc cover:** The total cover of all lichens, bryophytes (mosses, liverworts, hornworts), and cryptogamic crust on substrate surfaces including downed logs, rocks and soil, but not on standing or inclined trees or vertical rock surfaces.

**% Vasc Veg cover:** The total cover of all vascular vegetation taking into consideration the porosity, or the holes, in the vegetation, and disregarding overlap<sup>1</sup> of the various tree, shrub, and/or herbaceous layers and species.

### ***% Cover by Layer***

**% Conifer Tree /Hardwood Tree:** The total foliar cover (considering porosity) of all live tree species, disregarding overlap<sup>1</sup> of individual trees. Estimate conifer and hardwood covers separately.

**Please note:** These cover values should not include the coverage of regenerating tree species (i.e., tree seedlings and saplings).

**% Regenerating Tree:** The total foliar cover of seedlings and saplings, disregarding overlap<sup>1</sup> of individual recruits. See seedling and sapling definitions below.

**%Shrub:** The total foliar cover (considering porosity) of all live shrub species disregarding overlap<sup>1</sup> of individual shrubs.

**%Herbaceous:** The total cover (considering porosity) of all herbaceous species, disregarding overlap<sup>1</sup> of individual herbs.

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<sup>1</sup> Porosity reduces the total cover of the canopy. Overlapping strata should not be included in the total cover percent; for instance, if a shrub is growing under a tree, only the cover of the tree will be added into the total; the cover of the shrub will be disregarded, except for the amount by which it fills in the porosity of the tree canopy.

## Height Class by Layer

Modal height for conifer tree /hardwood tree, shrub, and herbaceous categories: Provide an estimate of height for each category listed. Record an average height value per each category by estimating the mean height for each group. Please use the following height intervals to record a height class: 01 = <1/2 m, 02 = 1/2-1 m, 03 = 1-2 m, 04 = 2-5 m, 05 = 5-10 m, 06 = 10-15 m, 07 = 15-20 m, 08 = 20-35 m, 09 = 35-50 m, 10 => 50 m.

## Species List and Coverage

**For rapid assessments**, list the 10-20 species that are dominant or that are characteristically consistent throughout the stand. These species may or may not be abundant, but they should be constant representatives in the survey. When different layers of vegetation occur in the stand, make sure to list species from each stratum. As a general guide, make sure to list at least 1-2 of the most abundant species per stratum.

**For relevés**, list all species present in the plot, using the second species list page if necessary.

**For both sample types**, provide the stratum:

**T = Tree.** A woody perennial plant that has a single trunk.

**S = Shrub.** A perennial, woody plant, that is multi-branched and doesn't die back to the ground every year.

**H = Herb.** An annual or perennial that dies down to ground level every year.

**E = SEedling.** A tree species clearly of a very young age that is < 1" dbh or has not reached breast height. Applies only to trees propagating from seed; resprouts are not recorded here even if they meet the size requirements.

**A = SApling.** 1" - <6" dbh and young in age, OR small trees that are <1" dbh, are clearly of appreciable age, and are kept short by repeated browsing, burning, or other disturbance. Includes trees that are re-sprouting from roots or stumps following fire, logging or other disturbance. These re-sprouts may exhibit a shrubby form, with multiple small trunks, but are species that are generally considered trees. If a majority of the trunks are >6" dbh, then the re-sprouts would be recorded under the "Tree" stratum.

**N = Non-vascular.** Includes moss, lichen, liverworts, hornworts, cryptogammic crust, and algae.

Be consistent and don't break up a single species into two separate strata. The only time it would be appropriate to do so is when one or more tree species are regenerating, in which case the Seedling and/or Sapling strata should be recorded for that species. These may be noted on the same line, e.g.:

Strata	Species	%Cover	C
T/E/A	Quercus douglasii	40/<1/<1	

If a species collection is made, it should be indicated in the collection column with a "C" (for collected). If the species is later keyed out, cross out the species name or description and write the keyed species name in pen on the data sheet. Do not erase what was written in the field, because this information can be used if specimens get mixed up later. If the specimen is then thrown out, the "C" in the collection column should be crossed out. If the specimen is kept but is still not confidently identified, add a "U" to the "C" in the collection column (CU = collected and unconfirmed). In this case the unconfirmed species epithet should be put in parentheses [e.g. *Hordeum (murinum)*]. If the specimen is kept and is



confidently identified, add a “C” to the existing “C” in the collection column (CC = Collected and confirmed).

Use Jepson Manual nomenclature. Write out the genus and species of the plant. Do not abbreviate. When uncertain of an identification (which you intend to confirm later) use parentheses to indicate what part of the determination needs to be confirmed. For example, you could write out *Brassica (nigra)* if you are sure it is a *Brassica* but you need further clarification on the specific epithet.

Provide the % absolute aerial cover for each species listed. When estimating, it is often helpful to think of coverage in terms of the following cover intervals at first:

<1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%.

Keeping these classes in mind, then refine your estimate to a specific percentage. All species percent covers may total over 100% because of overlap.

Include the percent cover of snags (standing dead) of trees and shrubs. Note their species, if known, in the “Stand history, stand age and comments” section.

For rapid assessments, make sure that the major non-native species occurring in the stand also are listed in the space provided in the species list with their strata and % cover. For relevés, all non-native species should be included in the species list.

Also for relevés, you can record the <1% cover in two categories: r = trace (i.e., rare in plot, or solitary individuals) and + = <1% (few individuals at < 1% cover, but common in the plot).

**Unusual species:** List species that are locally or regionally rare, endangered, or atypical (e.g., range extension or range limit) within the stand. This field will be useful to the Program for obtaining data on regionally or locally significant populations of plants.

## INTERPRETATION OF STAND

**Field-assessed vegetation alliance name:** Name of alliance or habitat following the most recent CNPS classification system or the Manual of California Vegetation (Sawyer J.O., Keeler-Wolf T., and Evens, J. 2009). Please use scientific nomenclature, e.g., *Quercus agrifolia* forest. An alliance is based on the dominant or diagnostic species of the stand, and is usually of the uppermost and/or dominant height stratum. A dominant species covers the greatest area. A diagnostic species is consistently found in some vegetation types but not others.

Please note: The field-assessed alliance name may not exist in the present classification, in which case you can provide a new alliance name in this field. If this is the case, also make sure to state that it is not in the MCV under the explanation for “Confidence in alliance identification.”

**Field-assessed association name (optional):** Name of the species in the alliance and additional dominant/diagnostic species from any strata, as according to CNPS

classification. In following naming conventions, species in differing strata are separated with a slash, and species in the uppermost stratum are listed first (e.g., *Quercus douglasii*/*Toxicodendron diversilobum*). Species in the same stratum are separated with a dash (e.g., *Quercus lobata*-*Quercus douglasii*).

Please note: The field-assessed association name may not exist in the present classification, in which you can provide a new association name in this field.

**Adjacent Alliances/direction:** Identify other vegetation types that are directly adjacent to the stand being assessed by noting the dominant species (or known type). Also note the distance away in meters from the GPS waypoint and the direction in degrees aspect that the adjacent alliance is found

(e.g., *Amsinckia tessellata* / 50m, 360° N *Eriogonum fasciculatum* /100m, 110°).

**Confidence in Identification: (L, M, H)** With respect to the “field-assessed alliance name”, note whether you have L (=Low), M (=Moderate), or H (=High) confidence in the interpretation of this alliance name.

**Explain:** Please elaborate if your “Confidence in Identification” is low or moderate. Low confidence can occur from such things as a poor view of the stand, an unusual mix of species that does not meet the criteria of any described alliance, or a low confidence in your ability to identify species that are significant members of the stand.

**Phenology:** Indicate early (E), peak (P) or late (L) phenology for each of the strata.

**Other identification problems or mapping issues:** Discuss any further problems with the identification of the assessment or issues that may be of interest to mappers. Note if this sample represents a type that is likely too small to map. If it does, how much of the likely mapping unit would be comprised of this type. For example: “this sample represents the top of kangaroo rat precincts in this general area, which are surrounded by vegetation represented by CARR000x; this type makes up 10% of the mapping unit.”

**Note:** Field forms are generally filled out in pencil, so that changes may be made easily while working in the plot or stand. Once out of the stand, however, entries on the field form should not be erased, but should be crossed out and corrected in a different-colored ink.

## GEOLOGY CODE

### **IGTU Igneous (type unknown)**

MIIG	Mixed igneous
ULTU	Ultramafic (type unknown)
VOLC	General volcanic extrusives
ANDE	Andesite
ASHT	Ash (of any origin)
BASA	Basalt
DIAB	Diabase
OBSI	Obsidian
PUMI	Pumice
PYFL	Pyroclastic flow
RHYO	Rhyolite
VOFL	Volcanic flow
VOMU	Volcanic mud
INTR	General igneous intrusives
DIOR	Diorite
GABB	Gabbro
GRAN	Granitic (generic)
MONZ	Monzonite
PERI	Peridotite
QUDI	Quartz diorite

### **METU Metamorphic (type unknown)**

MIME	Mixed metamorphic
GREE	Greenstone
BLUE	Blue schist
FRME	Franciscan melange
GNBG	Gneiss/biotite gneiss
HORN	Hornfels
MARB	Marble
PHYL	Phyllite
SCHI	Schist
SESC	Semi-schist
SLAT	Slate
ULTU	Ultramafic (type unknown)
SERP	Serpentine

### **SETU Sedimentary (type unknown)**

BREC	Breccia (non-volcanic)
CACO	Calcareous conglomerate
CALU	Calcareous (origin unknown)
CASA	Calcareous sandstone
CASH	Calcareous shale
CASI	Calcareous siltstone
CHER	Chert
CONG	Conglomerate
DOLO	Dolomite
FANG	Fanglomerate
LIME	Limestone
MISE	Mixed sedimentary
SAND	Sandstone
SHAL	Shale

SILT	Siltstone
CLAL	Clayey alluvium
DUNE	Sand dunes
GLTI	Glacial till, mixed origin, moraine
GRAL	Gravelly alluvium
LALA	Large landslide (unconsolidated)
LOSS	Loess
MIAL	Mixed alluvium
SAAL	Sandy alluvium
SIAL	Silty alluvium
MIRT	Mix of two or more rock types
OTHE	Other than on list

## ROCK SIZE

Boulder	> 60 cm diameter
Stone	25 cm to 60 cm
Cobble	7.5 cm to 25 cm
Gravel	2 mm to 7.5 cm
Fines	< 2 mm

## DISTURBANCE CODES

01	Development
02	ORV activity
03	Agriculture
04	Grazing
05	Competition from exotics
06	Logging
07	Insufficient population/stand size
08	Altered flood/tidal regime
09	Mining
10	Hybridization
11	Groundwater pumping
12	Dam/inundation
13	Other
14	Surface water diversion
15	Road/trail construction/maint.
16	Biocides
17	Pollution
18	Unknown
19	Vandalism/dumping/litter
20	Foot traffic/trampling
21	Improper burning regime
22	Over collecting/poaching
23	Erosion/runoff
24	Altered thermal regime
25	Landfill
26	Degrading water quality
27	Wood cutting
28	Military operations
29	Recreational use (non ORV)
30	Nest parasitism
31	Non-native predators
32	Rip-rap, bank protection
33	Channelization (human caused)
34	Feral pigs
35	Burros
36	Rills
37	Phytogenic mounding
38	Sudden Oak Death

**Simplified Key to Soil Texture**  
(Adapted from Brewer and McCann 1982)

Place about three teaspoons of soil in the palm of your hand. Take out any particles  $\geq 3$  mm in size.

**A. Does soil remain in ball when squeezed in your hand palm?**

Yes, soil does remain in a ball when squeezed..... **B**

No, soil does not remain in a ball when squeezed..... **sand**

	SAND Sand (class unknown)
Very coarse texture.....	COSA Coarse sand
Moderately coarse texture.....	MESN Medium sand
Moderately fine texture.....	FISN Fine sand

**B. Add a small amount of water until the soil feels like putty. Squeeze the ball between your thumb and forefinger, attempting to make a ribbon that you push up over your finger. Does soil make a ribbon?**

Yes, soil makes a ribbon; though it may be very short..... **C**

No, soil does not make a ribbon..... **loamy sand**

Very gritty with coarse particles.....	COLS Coarse, loamy sand
Moderately to slightly gritty with medium to fine particles.....	MELS Medium to very fine, loamy sand

**C. Does ribbon extend more than one inch?**

Yes, soil extends > 1 inch..... **D**

No, soil does not extend > 1 inch.....Add excess water

Soil feels gritty or not smooth..... **sandy loam or loam**

	LOAM Loam (class unknown)
Very gritty with coarse particles.....	MCSL Moderately coarse, sandy loam
Moderately gritty with medium to fine particles.....	MESA Medium to very fine, sandy loam
Slightly gritty .....	MELO Medium loam

Soil feels very smooth..... **silt loam**

MESIL medium silt loam

**D. Does ribbon extend more than 2 inches?**

Yes, ribbon extends more than 2 inches, and does not crack if bent into a ring..... **E**

No, soil breaks when 1–2 inches long; cracks if bent into a ring.....Add excess water

Soil feels gritty or not smooth..... **sandy clay loam or clay loam**

Moderately to very gritty.....	MFSA Moderately fine sandy clay loam
Slightly gritty or not smooth.....	MFCL Moderately fine clay loam

Soil feels very smooth..... **silty clay loam or silt**

Moderately fine texture.....	MFSL Moderately fine silty clay loam
Very fine texture.....	MESI Medium silt

**E. Soil makes a ribbon 2+ inches long; does not crack when bent into a ring.....Add excess water**

Soil feels gritty or not smooth..... **sandy clay or clay**

Moderately to very gritty.....	FISA Fine sandy clay
Slightly gritty or not smooth.....	FICL Fine clay
	CLAY Clay (class unknown)

Soil feels very smooth..... **silty clay**

FISC Fine silty clay

UNKN = UNKNOWN

PEAT = PEAT

MUCK = MUCK