

CALIFORNIA NATIVE PLANT SOCIETY –  
VEGETATION RAPID ASSESSMENT PROTOCOL  
CNPS VEGETATION COMMITTEE  
(November 5, 2001, Revised Feb 21, 2007)

## **Introduction**

The rapid assessment protocol is a reconnaissance-level method of vegetation and habitat sampling. It may be used to quickly assess and map the extent of all vegetation types in relatively large, ecologically defined regions. The California Native Plant Society (CNPS) has adopted this method to verify locations of known vegetation types, to gain information about new types, and to acquire general information about their composition, habitat, and site quality. Other agencies, such as California State Parks, the Department of Fish and Game, and the U.S. Forest Service, are also adopting this method for documenting vegetation patterns.

By using this method, biologists and resource managers can gain a broad ecological perspective, as the full range in ecological variation across broad landscapes can be reflected in the vegetation assessments. For example, changes in environmental elements (such as geology, aspect, topographic position) or physical processes (fire, flooding, erosion, and other natural or human-made disturbances) can influence the distribution of plants or patterning of vegetation, which are documented in the rapid assessments. In turn, these vegetation patterns can influence the distribution of animals across the landscape.

The quantitative vegetation data recorded in the rapid assessments can be described with standard classification techniques and descriptions, and they can be depicted in maps across any landscape. Additional information recorded in the assessments, such as disturbance history and anthropogenic impacts, can serve to define habitat quality and integrity for plant and animal distributions. Because this method provides an important means for representing the full array of biological diversity as well as habitat integrity in an area, it can also be an effective and efficient tool for conducting natural resource planning.

## **Purpose**

The Vegetation Program has adopted the rapid assessment method to update the location, distribution, species composition, and disturbance information of vegetation types as identified in the first edition of *A Manual of California Vegetation* (MCV), a CNPS publication. The release of the MCV heralded a new statewide perspective on vegetation classification. The premise of the book – all vegetation can be quantified based on cover, constancy, and composition of plant species, yielding uniform defensible definitions of vegetation units – has proven to be very useful throughout California and the rest of the nation. The MCV has become the standard reference on California vegetation and has been adopted by many agencies such as California Department of Fish and Game, the National Park Service, California State Parks, and the U.S. Forest Service as the standard approach to classify vegetation statewide.

One of the most important purposes of rapid assessments is to verify the locations of each vegetation type because much about the geography of vegetation remains uncertain in this state.

To obtain a more accurate understanding of the location and distribution of the vegetation types, nothing short of systematic inventory will suffice. Using the rapid assessment method, CNPS Chapters and other organizations can work together in selected ecological regions to gather vegetation data over a short time period in a broad area. This geographic inventory of vegetation types can greatly advance the current distribution understanding of vegetation.

In addition, California is working with a new vegetation classification, and its parameters are largely untested. The rapid assessment method will be used to gather additional information on species composition, distribution, disturbance effects, and environmental influences of vegetation. Thus, this method will provide modifications to the existing vegetation classifications and information on new types.

This protocol can also be used in tandem with other resource assessment protocols such as wildlife assessments or aquatic/stream assessments. For example, the California Wildlife Habitat Relationships (CWHR) protocols have been used in conjunction with the vegetation assessment protocol to obtain detailed records on habitat quality and suitability for vertebrate animals in terrestrial habitats. The CWHR protocols can also help test the relationships between the vegetation type and habitat of various animals and thereby refine the understanding and predictability of the distribution of animals. A portion of the CWHR protocols is incorporated into the rapid assessment method to obtain suitability information for vertebrate species.

While people can quickly obtain information on the variety of vegetation types using this method, some of the vegetation types recorded in the rapid assessment process may be poorly defined in the current classification system. These poorly understood or unknown types will be identified and located and then will be prioritized for more detailed assessment using the CNPS relevé protocol. Thus, the rapid assessment method will be used in conjunction with the relevé method to provide large quantities of valuable data on the distribution and the definition of vegetation. These data will be entered into existing databases for summarizing and archiving, and they will be used to modify and improve statewide vegetation classification and conservation information.

#### Why do we need to know about the composition and distribution of vegetation?

- to have a more accurate understanding of the commonness and rarity of different forms of vegetation throughout the state
- to link the distribution of various rare and threatened plant species with the vegetation units
- to provide a clearer picture of relationships between vegetation types
- to help prioritize community-based land conservation goals based on the local representation of unique types, high diversity areas, etc.
- to do the same for regional vegetation throughout the state and the nation.
- to broaden the vegetation knowledge base for California
- to motivate people to do more to help identify, protect, and conserve vegetation in their area
- to link vegetation types with habitat for animals

## **Selecting stands to sample:**

To start the rapid assessment method, stands 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, a 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.

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).

## **Definitions of fields in the protocol**

### **LOCATIONAL/ENVIRONMENTAL DESCRIPTION**

**Polygon/Stand #:** Number assigned either in the field or in the office prior to sampling. It is usually denoted with an abbreviation of the sampling location and then a sequential number of that locale (*e.g.* CRRA-001 for Coyote Ridge rapid assessment number 1).

**Air photo #:** The number given to the aerial photo in a vegetation-mapping project, for which photo interpreters have already done photo interpretation and delineations of polygons. If the sample site has not been photo-interpreted, leave blank.

**Date:** Date of the sampling.

**Name(s) of surveyors:** The full names of each person assisting should be provided for the first rapid assessment. In successive assessments, initials of each person assisting can be recorded. Please note: The person recording the data on the form should circle their name/initials.

**GPS waypoint #:** The waypoint number assigned by a Global Positioning System (GPS) unit when marking and storing a waypoint for the stand location. These waypoints can be downloaded from the GPS into a computer Geographic Information System to depict sample points accurately on a map.

**GPS name:** The name personally assigned to each GPS unit (especially useful if more than one GPS unit is used to mark waypoints for the project).

**GPS datum: (e.g. NAD 83)** The map datum that is chosen for GPS unit to document location coordinates. The default datum for CNPS projects is NAD 83. However, other agencies and organizations may prefer another datum. Please circle NAD83 or write in the appropriate datum.

**UTM zone:** Universal Transverse Mercator zone. Zone 10S for California west of the 120<sup>th</sup> longitude; zone 11S for California east of 120<sup>th</sup> longitude.

**UTM field reading:** Easting (UTME) and northing (UTMN) location coordinates using the Universal Transverse Mercator (UTM) grid. Record using a GPS unit or USGS topographic map.

**Error: ±** The accuracy of the GPS location, when taking the UTM field reading. Please denote feet (ft) or meters (m). It is typical for all commercial GPS units to be accurate to within 5 m (or 16 ft.) of the actual location, because the military's intentional imprecision (known as "selective availability") has been "turned off" as of July 2000. Please become familiar with your GPS unit's method of determining error. Some of the lower cost models do not have this ability. If using one of those, 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, or circle "No" to denote the waypoint was taken at a distance from the stand (such as with a binocular view of the stand).

**If No cite distance (note ft/m), bearing and view from point to stand:** An estimate of the number of feet or meters (please circle appropriate), the compass bearing from the waypoint of GPS to the stand, and the method of view used to verify the plot (*e.g.* binoculars, aerial photo).

**Elevation:** Recorded from the GPS unit or USGS topographic map. Please denote feet (ft) or meters (m), and note if reading is from GPS unit or map. (Please note: Readings taken from a GPS unit can be hundreds of feet off.)

**Photograph #s:** Write the name or initials of the camera owner, JPG/frame number, and direction of photos (note the roll number if using film). Take at least two photographs from different directions, and describe the location and view direction from compass bearings for each frame. Additional photographs of the stand may also be helpful. (Also, if using a digital camera or scanning the image into a computer, positions relative to the polygon/stand number can be recorded digitally.)

**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:** Record soil texture or series that is characteristic of the site (e.g. sand, silt, clay, coarse loamy sand, sandy clay loam, saline, et.). *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; note that a site need not be officially delineated as a wetland to qualify as such in this context (e.g. seasonally wet meadow).

**Topography:** Check two of the provided features, characterizing both the local relief and the broad topographic position of the area. First assess the broad topographic feature or general position of the area (e.g. stand is at the bottom, lower (1/3 of slope), middle (1/3 of slope), upper (1/3 of slope), or top). Then, assess the minor topographic features or the lay of the area (e.g. surface is flat, concave, etc.).

**% Surface cover (abiotic substrates). Total sums to 100%.**

**Rock: %Large** (optional): Estimate the percent surface cover of large rocks (e.g. stones, boulders, bedrock) that are beyond 25 cm in size.

**Rock: %Small** (optional): Estimate the percent surface cover of small rocks (e.g. gravel, cobbles) that are 2 mm to 25 cm in size.

**%Bare/Fines** (optional): Estimate the percent surface cover of bare ground and fine sediment (e.g. dirt) that is less than 2 mm in size.

**%Litter** (optional): Estimate the percent surface cover of litter, duff, or wood on the ground.

**%BA Stems** (optional): Estimate the percent surface cover of the plant basal area, i.e., the basal area of stems at the ground surface.

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

**General slope exposure** (circle one and enter actual °): Read degree slope from compass (or estimate), using degrees from true north (adjusting for declination). Average the reading over entire stand. “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.

**General slope steepness** (circle one and enter actual °): Read degree aspect from a compass or clinometer (or estimate). Make sure to average the reading across entire stand.

**Size of stand:** Estimate the size of the entire stand in which the rapid assessment is taken. As a measure, one acre is about 0.4 hectares or about 4000 square meters.

**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.

**Type / level of disturbance** (use codes): List codes for potential or existing impacts on the stability of the plant community. Characterize each impact each as L (=Light), M (=Moderate), or H (=Heavy). *See code list for impacts.*

## **II. HABITAT AND VEGETATION DESCRIPTION *per 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:** Record tree size classes when the tree canopy closure exceeds 10 percent of the total cover (except in desert types), or if young tree density indicates imminent tree dominance. Size class is based on the average diameter of at breast height of each trunk (standard breast height is 4.5ft/137cm). You can record tree size class by circling the main size class(es). 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) and total cover should exceed 60%. Stands in the T6 class also need to contain 10% cover or more 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).

**If tree, list 1-3 dominant overstory species:** If tree canopy cover exceeds 10 percent (except in desert types), please list the dominant species that occur in the overstory canopy.

**Shrub** (mark one): Record shrub size classes when shrub canopy closure exceeds 10 percent (except in desert types). You can record shrub size class by circling the class that 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** (mark one): Record herb height when herbaceous cover exceeds 2 percent. You can record herb class by the size class that is predominant in the survey (**H1 or H2**). This height class is based on the average plant height at maturity.

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

### ***Overall cover of vegetation***

Provide an ocular 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.

To come up with a specific number estimate for percent cover, first use to the following CWHR cover intervals as a reference aid to get a generalized cover estimate: <2%, 2-9%, 10-24%, 25-39%, 40-59%, 60-100%. While keeping these intervals in mind, you can then refine your estimate to a specific percentage for each category below.

**% Total Vasc Veg cover:** The total aerial cover of all vascular vegetation. This is an estimate of the absolute vegetation cover, disregarding overlap of the various tree, shrub, and/or herbaceous layers.

**% Total Non-Vasc cover:** The total cover of all lichens and bryophytes (mosses, liverworts, hornworts) on substrate surfaces (not standing or inclined trees).

**%Overstory Conifer/Hardwood Tree:** The total aerial cover (canopy closure) of all live tree species that are specifically in the overstory or are emerging, disregarding overlap of individual trees. Estimate conifer and hardwood covers separately. Please note: These cover values should not include the coverage of suppressed understory trees.

**%Understory Tree -Tall Shrub** The total aerial cover (canopy closure) of all live understory tree and tall shrub species, disregarding overlap of individual trees and shrubs.

**%Shrub:** The total aerial cover (canopy closure) of all live shrub species (do not include understory tall shrubs, described above), disregarding overlap of individual shrubs.

**%Herbaceous:** The total aerial cover (canopy closure) of all herbaceous species, disregarding overlap of individual herbs.

### ***Modal height for conifer/hardwood tree, shrub, and herbaceous categories*** (optional)

If height values are important in your vegetation survey project, provide an ocular 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=<1/2m, 02=1/2-1m, 03=1-2m, 04=2-5m, 05=5-10m, 06=10-15m, 07=15-20m, 08=20-35m, 09=35-50m, 10=>50m.

### ***Species list and coverage***

**Species (List 12 - 20 major species), Stratum, and Approximate % cover:** (Jepson Manual nomenclature please)

List the 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. Provide a stratum code for each species listed, based on functional life form, where T= Overstory tree, U= Understory tree, S = Shrub, H= Herb, N= Non-vascular.

Also, provide a numerical ocular estimate of aerial coverage for each species. When estimating, it is often helpful to think of coverage in terms of the cover intervals from the CNPS relevé form at first (*e.g.* <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 (*e.g.* the cover of species “x” is somewhere between 25 and 50 percent, but I think it is actually around 30%). Please note: All estimates are to be reported as absolute cover (not relative cover), and all the species percent covers may total over 100% when added up because of overlap.

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.

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

## INTERPRETATION OF STAND

### *Basic alliance and stand description*

**Field-assessed vegetation alliance name:** Name of alliance (series) or habitat following the CNPS classification system (Sawyer and Keeler-Wolf 1995). Please use binomial 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 (and a diagnostic is consistently found in some vegetation types but not others).

Please note: The field-assessed alliance name may not exist in present classification, in which you can provide a new alliance name in this field. If this is the case, also make sure to denote and explain this in the “Cannot identify alliance based on MCV classification” of the “**Problems with Interpretation**” section below.

**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 agrifolia/Toxicodendron diversilobum*). Species in the same stratum are separated with a dash (*e.g.* *Quercus agrifolia-Quercus kelloggii*).

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

**Adjacent Alliances:** Identify other vegetation types that are directly adjacent to the stand being assessed. Specifically, list up to three alliances (or associations or mapping units) by noting the

dominant species; 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. Abies concolor-Pinus ponderosa 50m, 360°/N Arctostaphylos patula 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. 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.

**Explain:** Please elaborate if your “Confidence in Identification” is low or moderate. Similarly, if the field-assessed alliance name is not defined by CNPS’s present Manual of California Vegetation (MCV) classification, note this in the space and describe why. In some instances for specific projects, there may be the benefit of more detailed classifications than what is presented in the first edition of the MCV. If this is the case, be sure to substitute the most appropriate and detailed classification.

**Other identification problems (describe):** Discuss any further problems with the identification of the assessment (e.g. stand is observed with an oblique view using binoculars, so the species list may be incomplete, or the cover percentages may be imperfect).

**Other types:** If “Yes” above, then list the other subordinate vegetation alliances that are included within the polygon. List them in order of their amount of the polygon covered.

**Has the vegetation changed since air photo taken? (Yes, No)** If an aerial photograph is being used for reference, evaluate if the stand of the field-assessed alliance has changed as a result of disturbance or other historic change since the photograph was taken.

**If Yes, how? What has changed (write N/A if so)?** If the photographic signature of the vegetation has changed (e.g. in structure, density, or extent), please detail here.

**Polygon is more than one type (Yes, No)** (Note: type with greatest coverage in polygon should be entered in above section) This is relevant to areas that have been delineated as polygons on aerial photographs for a vegetation-mapping project. In most cases the polygon delineated is intended to represent a single stand, however mapping conventions and the constraints and interpretability of remote images will alter the ability to map actual stands on the ground. “Yes” is noted when the polygon delineated contains the field-assessed alliance and other vegetation type(s), as based on species composition and structure. “No” is noted when the polygon is primarily representative of the field-assessed alliance.

**Other types:** If “Yes” above, then list the other subordinate vegetation alliances that are included within the polygon. List them in order of their amount of the polygon covered.

## Simplified Key to Soil Texture (Brewer and McCann, 1982)

Place about three teaspoons of soil in the palm of your hand. Take out any particles <2mm in size, and use the following key to figure out the soil texture (e.g. loamy sand). Then figure out the texture subclass by using the Code List attached (e.g. coarse loamy sand).

- A1 Soil does not remain in a ball when squeezed..... sand
- A2 Soil remains in a ball when squeezed..... B
- B1 Add a small amount of water. Squeeze the ball between your thumb and forefinger, attempting to make a ribbon that you push up over your finger. Soil makes no ribbon.....loamy sand
- B2 Soil makes a ribbon; may be very short.....C
- C1 Ribbon extends less than 1 inch before breaking.....D
- C2 Ribbon extends 1 inch or more before breaking.....E
- D1 Add excess water to small amount of soil; soil feels gritty or at least slightly gritty (not smooth) .....sandy loam or loam
- D2 Soil feels very smooth.....silt loam
- E1 Soil makes a ribbon that breaks when 1–2 inches long; cracks if bent into a ring.....F
- E2 Soil makes a ribbon 2+ inches long; does not crack when bent into a ring.....G
- F1 Add excess water to small amount of soil; soil feels gritty or at least slightly gritty (not smooth) .....sandy clay loam or clay loam
- F2 Soil feels very smooth.....silty clay loam or silt
- G1 Add excess water to a small amount of soil; soil feels gritty or not smooth.....sandy clay or clay
- G2 Soil feels very smooth.....silty clay

# CALIFORNIA NATIVE PLANT SOCIETY RELEVÉ FIELD FORM CODE LIST

(revised 4/16/06)

## MACRO TOPOGRAPHY

- 00 Bench
- 01 Ridge top (interfluvial)
- 02 Upper 1/3 of slope
- 03 Middle 1/3 of slope
- 04 Lower 1/3 of slope (lowslope)
- 05 Toeslope (alluvial fan/bajada)
- 06 Bottom/plain
- 07 Basin/wetland
- 08 Draw
- 09 Other
- 10 Terrace (former shoreline or floodplain)
- 11 Entire slope
- 12 Wash (channel bed)
- 13 Badland (complex of draws & interfluvial)
- 14 Mesa/plateau
- 15 Dune/sandfield
- 16 Pediment
- 17 Backslope (cliff)

## MICRO TOPOGRAPHY

- 01 Convex or rounded
- 02 Linear or even
- 03 Concave or depression
- 04 Undulating pattern
- 05 Hummock or Swale pattern
- 06 Mounded
- 07 Other

## SITE IMPACTS

- 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 Phylogenetic mounding
- 38 Sudden oak death syndrome (SODS)

## PARENT MATERIAL

- IGTU Igneous (type unknown)
- VOLC General volcanic extrusives
- RHYO Rhyolite
- ANDE Andesite
- BASA Basalt
- ASHT Ash (of any origin)
- OBSI Obsidian
- PUMI Pumice
- PYFL Pyroclastic flow
- VOFL Volcanic flow
- VOMU Volcanic mud
- INTR General igneous intrusives
- GRAN Granitic (generic)
- MONZ Monzonite
- QUDI Quartz diorite
- DIOR Diorite
- GABB Gabbro
- DIAB Diabase
- PERI Peridotite
- METU Metamorphic (type unknown)
- GNBG Gneiss/biotite gneiss
- SERP Serpentine
- SCHI Schist
- SESC Semi-schist
- PHYL Phyllite
- SLAT Slate
- HORN Hornfels
- BLUE Blue schist
- MARB Marble
- SETU Sedimentary (type unknown)
- BREC Breccia (non-volcanic)
- CONG Conglomerate
- FANG Fanglomerate
- SAND Sandstone
- SHAL Shale
- SILT Siltstone
- CACO Calcareous conglomerate
- CASA Calcareous sandstone
- CASH Calcareous shale
- CASI Calcareous siltstone
- DOLO Dolomite
- LIME Limestone
- CALU Calcareous (origin unknown)
- CHER Chert
- FRME Franciscan melange
- GREE Greenstone
- ULTU Ultramafic (type unknown)
- MIIG Mixed igneous
- MIME Mixed metamorphic
- MISE Mixed sedimentary
- MIRT Mix of two or more rock types
- GLTI Glacial till, mixed origin, moraine
- LALA Large landslide (unconsolidated)
- DUNE Sand dunes
- LOSS Loess
- CLAL Clayey alluvium
- GRAL Gravelly alluvium
- MIAL Mixed alluvium
- SAAL Sandy alluvium (most alluvial fans and washes)
- SIAL Silty alluvium
- OTHE Other than on list

## SOIL TEXTURE

- COSA Coarse sand
- MESN Medium sand
- FISN Fine sand
- COLS Coarse, loamy sand
- MELS Medium to very fine, loamy sand
- MCSL Moderately coarse, sandy loam
- MESA Medium to very fine, sandy loam
- MELO Medium loam
- MESL Medium silt loam
- MESI Medium silt
- MFCL Moderately fine clay loam
- MFSA Moderately fine sandy clay loam
- MFSL Moderately fine silty clay loam
- FISA Fine sandy clay
- FISC Fine silty clay
- FICL Fine clay
- SAND Sand (class unknown)
- LOAM Loam (class unknown)
- CLAY Clay (class unknown)
- UNKN Unknown
- PEAT Peat
- MUCK Muck

## DOMINANT VEGETATION GROUP

### Trees:

- TBSE Temperate broad-leaved seasonal evergreen forest
- TNLE Temperate or subpolar needle-leaved evergreen forest
- CDF Cold-deciduous forest
- MNDF Mixed needle-leaved evergreen-cold deciduous forest
- TBEW Temperate broad-leaved evergreen woodland
- TNEW Temperate or subpolar needle-leaved evergreen woodland
- EXEW Extremely xeromorphic evergreen woodland
- CDW Cold-deciduous woodland
- EXDW Extremely xeromorphic deciduous woodland
- MBED Mixed broad-leaved evergreen-cold deciduous woodland
- MNDW Mixed needle-leaved evergreen-cold deciduous woodland

### Shrubs:

- TBES Temperate broad-leaved evergreen shrubland
- NLES Needle-leaved evergreen shrubland
- MIES Microphyllus evergreen shrubland
- EXDS Extremely xeromorphic deciduous shrubland
- CDS Cold-deciduous shrubland
- MEDS Mixed evergreen-deciduous shrubland
- XMED Extremely xeromorphic mixed evergreen-deciduous shrubland

### Dwarf Shrubland:

- NMED Needle-leaved or microphyllous evergreen dwarf shrubland
- XEDS Extremely xeromorphic evergreen dwarf shrubland
- DDDS Drought-deciduous dwarf shrubland
- MEDD Mixed evergreen cold-deciduous dwarf shrubland

### Herbaceous:

- TSPG Temperate or subpolar grassland
- TGST Temperate or subpolar grassland with sparse tree
- TGSS Temperate or subpolar grassland with sparse shrublayer
- TGSD Temperate or subpolar grassland with sparse dwarf shrub layer
- TFV Temperate or subpolar forb vegetation
- THRV Temperate or subpolar hydromorphic rooted vegetation
- TAGF Temperate or subpolar annual grassland or forb vegetation

### Sparse Vegetation:

- SVSD Sparsely vegetated sand dunes
- SVCS Sparsely vegetated consolidated substrates