Vegetation Sampling, Classification, and Mapping Report for the inner Central Coast Ranges of California, including the Ciervo-Panoche Natural Area and the Hubbard Hill Unit

Jennifer Buck-Diaz, Kendra Sikes, Savannah Vu,
Alexis LaFever-Jackson, and Julie Evens
California Native Plant Society, Vegetation Program
2707 K Street, Suite 1
Sacramento, CA 95816

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Prepared By:

Primary Authors
Jennifer Buck-Diaz
Kendra Sikes
Savannah Vu
Alexis LaFever-Jackson
Julie Evens

Report Graphics
Savannah Vu

Cover Page Photo Credits (clockwise from top left):

- *Top left:* Foreground of blue oak (*Quercus douglasii*) on rolling hills, Photo by Alexis LaFever-Jackson
- *Top right:* Chamise (*Adenostoma fasciculatum*) and black sage (*Salvia mellifera*) co-dominating along a rocky slope, Photo by Alexis LaFever-Jackson
- *Bottom right*: Sparse California juniper (*Juniperus californica*) with herbaceous understory: Alexis LaFever-Jackson
- *Bottom left:* Purple owl's clover (*Castilleja exserta)* and native forb grassland: Alexis LaFever-Jackson

California Native Plant Society
2707 K Street, Suite 1
Sacramento, CA 95816

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Abstract

With funding from the Bureau of Land Management (BLM), the California Native Plant Society (CNPS) Vegetation Program has collected and compiled vegetation data, produced a vegetation classification, and produced a fine-scale vegetation map of select BLM land units in the inner Central Coast of California. During this effort, CNPS completed vegetation sampling across the southern portion of the Ciervo-Panoche Natural Area (CPNA), including 21 relevé plots and 52 rapid assessment surveys, that represent 28 vegetation alliances. Building upon previous vegetation sampling and mapping efforts, we also compiled and quality-controlled >1,800 surveys of vegetation data from BLM to develop a robust regional vegetation classification of the inner Central Coast. All new and compiled classification data are stored within a geodatabase and a standardized Access database.

CNPS additionally produced a fine-scale vegetation map for ~7,300 acres across three BLM allotments in San Luis Obispo County: Hubbard Hill, Anderson Canyon, and Freeborn Mt (HUBB). We have employed heads-up digitizing techniques based upon 2020 National Agricultural Imagery Program (NAIP) aerial imagery for San Luis Obispo County. The minimum mapping unit (MMU) is 1 acre, and the map units follow the National Vegetation Classification Standard and State of California Vegetation and Mapping Standards. The map includes 15 vegetation map units, with additional attributes including structural information (e.g., herbaceous, shrub and tree cover), as well as disturbance and site quality information for each polygon. Field reconnaissance and verification enhanced the final map quality. This report provides a summary of the methods and results of field sampling, data compilation, classification, and mapping. The project deliverables include a geodatabase consisting of fine-scale vegetation map polygons and field survey data, a floristic key and descriptions of inner Central Coast vegetation types which provide baseline information for long-term land management, conservation, and wildlife protection.

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Background

The U.S. Bureau of Land Management (BLM) has a goal to develop fine-scale vegetation maps for all the public lands it manages in California. To help meet this goal, BLM contracted with the California Native Plant Society (CNPS) to collect baseline field data, analyze vegetation data, and create a fine-scale vegetation map across BLM lands of the inner central coast of California. This project builds upon previous collaborative vegetation sampling and mapping efforts in this region including the Clear Creek Management Area (Evens et al 2006), Ciervo-Panoche Natural Area (Buck-Diaz 2015), Kettleman Hills, and the Carrizo Plain National Monument (Buck-Diaz & Evens 2011, Stout et al 2013). The project was implemented in four main stages: 1) collect and compile field data to inform a floristic vegetation classification; 2) prepare floristic and mapping keys to the vegetation types based on survey data; 3) create a fine-scale vegetation map based on the vegetation key for three BLM allotments of the Bakersfield Field Office; and 4) post-mapping ground truth data to verify the map's accuracy. The vegetation data compilation and classification will also contribute to a broader ecoregional classification currently underway for the central coast of California. The data presented in this report and the accompanying vegetation map will allow for informed management activities, the identification and maintenance of habitat suitable for federally listed plant and animal species, and an increased understanding of ecosystem functions and processes within BLM lands.

Introduction

Project Location

The southern Ciervo-Panoche Natural Area (CPNA) is located between Pinnacles National Park and Interstate 5, and includes the Ciervo & Griswold Hills, Vallecitos Valley, and a portion of the Tumey Hills. Dominant habitats include oak & juniper woodlands, chaparral & coastal sage scrub, forb grasslands, and riparian shrub types across ~120,000 acres (Figure 1). This area supports more than 20 special status species of mammals, birds, reptiles and plants, and is the northernmost latitude for a host of plant species, including Mormon tea (*Ephedra californica*), chaparral yucca (*Hesperoyucca whipplei*) and San Joaquin woolly threads (*Monolopia congdonii*). The CPNA was designated by the US Fish and Wildlife Service as a core recovery area for the leopard lizard, giant kangaroo rat, woolly threads, and the endangered San Joaquin kit fox. The designation is established in the Recovery Plan for Upland Species of the San Joaquin Valley.

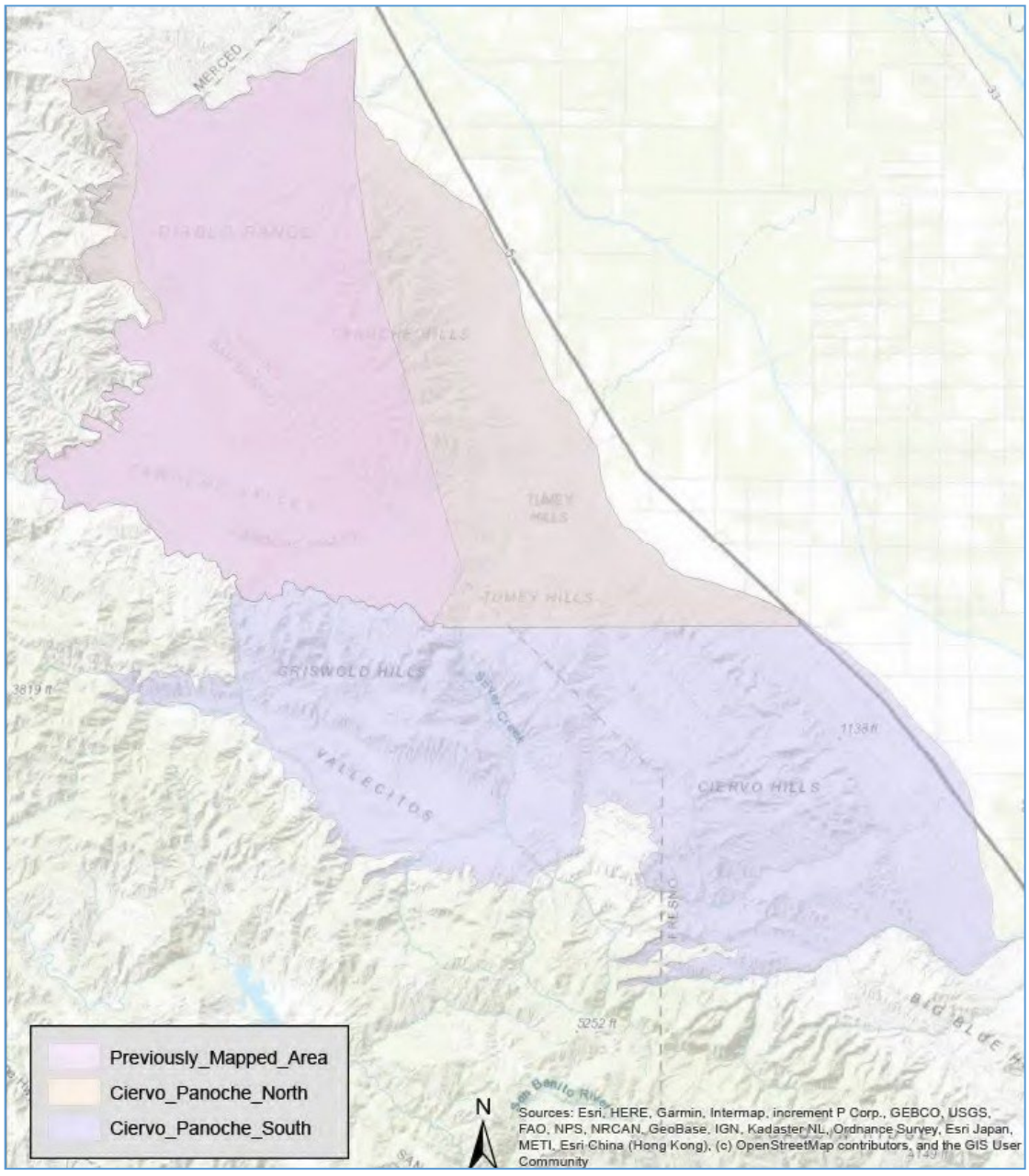


Figure 1. Boundary of the Ciervo-Panoche Natural Area divided into three regions 1) northwest - previous mapping footprint completed in 2015 (shown in pink), 2) northern area previously sampled but not yet mapped (orange) and 3) southern region where new vegetation sampling occurred (purple).

Three adjacent BLM allotments were targeted for fine-scale vegetation mapping: Hubbard Hill, Anderson Canyon, and Freeborn Mt (HUBB). These allotments are in eastern San Luis Obispo County and cover 7,296 acres, just northwest of the larger Carrizo Plain National Monument. This HUBB unit is surrounded by privately owned

land, and therefore does not have public access, roads or trails. The vegetation consists primarily of blue oak/juniper woodland, chaparral, coastal sage scrub, and both annual & perennial grasslands, with bluegrass (*Poa secunda*) and scattered needlegrass (*Stipa* spp.) throughout, as well as native wildflowers and geophytes which are seasonally abundant.

Methods

Field Data Collection

In the southern CPNA, vegetation surveys were collected in 2021 by CNPS staff with assistance from BLM staff in the Central Coast Field Office. The field staff sampled opportunistically in early spring to capture a range of vegetation types across this study area, using the CNPS-CDFW Combined Vegetation Rapid Assessment and Relevé protocol for sampling (see https://www.cnps.org/plant-science/field-protocols-guidelines for copies of the field form and protocol). Protocols comply with state and national standards as defined by the Survey of California Vegetation (SCV; VegCAMP 2022) and the US National Vegetation Classification (USNVC 2023) and are dependent on the recognition of a stand as the basic physical unit of vegetation in a landscape.

A stand has both compositional and structural integrity. Compositional integrity is defined as similarity in species composition and relative cover; structural integrity refers to general regularity in the horizontal and vertical spacing of plant species as a result of topography, soils, geology, climate, slope, exposure, and site or disturbance history. A stand has no set size and may represent patterns as small as zones within a vernal pool, or expansive patches, such as blue oak woodland occupying several hundred acres.

The survey data collection included the date of sampling, GPS location, environmental characteristics of the sampled stands, vegetation strata information, site history, and the field-assessed vegetation type. Additionally, four digital photos were taken in the cardinal directions at the GPS point for each survey location. Complete species lists were recorded for plot-based relevé surveys, while the most dominant and/or characteristic species were recorded for stand-based Rapid Assessment surveys (RA's). Percent cover estimates were recorded for all species listed in relevés and RA's. Data were primarily recorded on paper field forms, while spatial information was captured on GPS-enabled devices running ESRI's Collector application. Survey data from field forms and field devices were entered into a standardized Microsoft Access database and were quality-controlled for accuracy.

Floristic Classification Analysis

CNPS compiled available vegetation datasets from previous sampling, classification, and mapping efforts to develop a floristic vegetation classification for the inner Central Coast from Ciervo-Panoche south to Hubbard Hill and the Kettleman Hills and the Carrizo Plain National Monument. A classification provides a means to organize and catalog the patterning of plant communities, in which a floristic approach has been taken to determine both vegetation alliances and associations, which are plant community stands that occur within a given area.

CNPS uses an integrated set of steps for classification compliant with *A Manual of California Vegetation* (CNPS 2023) and the United States National Vegetation Classification System - USNVC (FGDC 2008). The USNVC hierarchy is composed of eight levels, organized into three upper, three middle, and two lower levels as shown below in Table 1.

Table 1. The levels of the USNVC hierarchy for natural vegetation.

Level	**Example**
Upper	
Level 1 – Formation Class	Forest & Woodland
Level 2 – Formation Subclass	Temperate & Boreal Forest & Woodland
Level 3 – Formation	Warm Temperate Forest & Woodland
Middle	
Level 4 – Division	Californian Forest & Woodland
Level 5 – Macrogroup	Californian Forest & Woodland
Level 6 – Group	Californian Broadleaf Forest & Woodland
Lower	
Level 7 – Alliance	*Quercus douglasii* Woodland Alliance
Level 8 – Association	*Quercus douglasii* / *Ericameria linearifolia* Association

This regional classification defines vegetation at the two finest levels, Alliance and Association. The Alliance is defined by plant species composition, habitat conditions, physiognomy, and diagnostic species; at least one of the diagnostic species is typically found in the uppermost or dominant stratum (Jennings et al. 2009). The Association is the most detailed classification level and reflects more specific characteristics of vegetation such as finer-level differences in species composition, topography, soils, substrate, climate, hydrology, and disturbance regime (FGDC 2008). Associations often

are named to recognize two or more diagnostic species found in different vegetation layers (Sawyer et al. 2009).

Vegetation rapid assessment and relevé data were analyzed by CNPS staff in 2022–20223. Prior to analysis, scientific names of all taxa were first converted to standard alpha-numeric codes used by the PLANTS Database (USDA NRCS 2023). A prefix of "2" was applied to custom codes for taxa recognized by the Jepson eFlora (Jepson Flora Project 2023) or A Manual of California Vegetation (CNPS 2023). General life forms, such as moss and lichen, also have codes beginning with the number 2 (e.g., 2MOSS). Abundance (cover) values for all taxa were converted to seven different classes using the following modified Braun-Blanquet (1932) cover categories: 1=<1%, 2=1–5%, 3=>5–15%, 4=>15–25%, 5=>25–50%, 6=>50–75%, 7=>75%. The data were then screened for outliers using the Sorensen (Bray-Curtis) Distance Measure, and taxa that occur in a small number of plots (i.e., less than 3 plots) were removed to generate additional plot-by-species matrices with lower coefficients of variation for species (typically <300%) and to minimize chaining.

CNPS analyzed the species cover data using PC-Ord and R software (McCune and Mefford 2006, R Core Team 2013). The cluster analysis used the Sørensen Distance Measure and Flexible Beta Linkage method at -0.25 (McCune and Grace 2002). Using this method of agglomerative clustering, surveys were grouped together based on similarities in species composition and abundance (McCune and Mefford 1997). CNPS conducted a cluster analysis including all surveys in the available dataset in order to assign a cluster order to each survey. Indicator species analysis (ISA) was used to select cluster group levels for classification analysis. ISA produced indicator values for each species across different cluster group levels (ranging from 2 to 50), testing for statistical significance using a quantitative/binary response with 4999 randomizations (Dufrêne and Legendre 1997). The cluster group levels that had relatively high numbers of significant indicators and relatively low overall mean p-values were chosen for the final evaluation of the community classification (McCune and Grace 2002).

The initial analysis consisted of the following steps:

1. Import a plot-by-species matrix into PC-Ord with percent cover values of plants converted into Braun-Blanquet cover classes
2. Run summary statistics on the complete dataset and remove taxa occurring in < 2, 3, etc. surveys. Determine the coefficient of variation (CV), and species and plot outliers for each output. Use an output with a CV less than 300%, if possible
3. Decide on an output from step 2 and remove plot and species outliers greater than 3 standard deviations from the mean, using Sorensen Distance Measure

4. Run cluster analysis on the chosen output to determine the arrangement of samples based on species abundance and presence
5. Run indicator species analysis (ISA) at each cluster group level, from 2 groups up to the maximum number possible (all groups must have at least 2 samples)
6. Use ISA results to settle on the best number of subsets to use in subsequent analyses.

During the classification process, samples were partitioned into groups based on cluster membership. Membership rules for assigning samples to Alliance and an Association (if possible) were defined primarily by species constancy and abundance; however, pre-existing classifications and floras were consulted to define analogous/similar types. The resulting floristic classification is compliant with *A Manual of California Vegetation* (CNPS 2023) and the USNVC (FGDC 2008, USNVC 2023). Following the analysis of field data and development of the classification and field key, CNPS engaged peer reviewers including state ecologists at VegCAMP to evaluate the existing alliance and association units to determine types for addition or revision in both the state and national classification systems.

Vegetation Key, Descriptions

CNPS developed a comprehensive field key to vegetation types in the inner Central Coast region. The key is organized first by stratum (e.g., tree, shrub, herb), habitat, Alliance, and then association was the finest level identified. This key guided field staff in assessing vegetation types when performing field reconnaissance, field verification or while photo interpreting and delineating polygons.

CNPS office staff prepared detailed local vegetation descriptions for the inner central coast, in which the descriptions are divided into three sections based on general lifeform (dominance by trees, shrubs, and herbs). They are then organized alphabetically by alliance within each section followed by their respective association descriptions. Alliance descriptions contain a list of associations as well as classification comments, data references, global and state rarity ranks, and sample size. References for datasets in the descriptions may not be included in the Reference section of this report. All references are available for review using the bibliography available through *A Manual of California Vegetation* Online (CNPS 2023).

Each alliance and association description includes a stand table that summarizes species composition by type and lists constancy and cover estimate values (average, minimum and maximum) for all taxa occurring in at least 20% of stands. The definitions

and conventions used to develop the descriptions and the field key are available as a comprehensive glossary in Appendix D.

Field Reconnaissance for Mapping

Field reconnaissance in the HUBB Unit enabled photo interpreters to relate the vegetation on the ground to signatures on aerial imagery and served to answer questions regarding vegetation assemblages that come up during the photointerpretation process. In addition, the photo interpreters become familiar with the vegetation assemblages and local ecology of the study area. At the same time, the floristic key was tested, and vegetation was assessed through the framework of map creation.

The field crew used the Field Maps application for ArcGIS on iPads to facilitate navigation and the CDFW-CNPS reconnaissance protocol (see Appendix A) within Survey123 for data collection. Each reconnaissance survey was digitally photographed in the cardinal directions and marked using GPS to produce a map of the survey data points. The imagery, roads, boundaries, and other pertinent ancillary data were loaded onto the tablet prior to field work. Supplemental data points were reviewed; including rare plant occurrences from the California Natural Diversity Database (CNDDB), plant specimen locations from the California Consortium of Herbaria (CCH), observations exported from CalFlora, and Rapid Assessments collected in 2018 by a BLM contractor (Klamath Wildlife Resources – Brian Shaw). Access within the mapping area was limited due to the surrounding private lands, the lack of roads and the difficult terrain.

Photointerpretion

Photointerpretation is the process of identifying map units based on their photo signature. All land cover features have a photo signature. These signatures are defined by the color, texture, tone, size, and pattern exhibited on the aerial imagery. By observing the context and extent of the photo signatures associated with specific land cover types, the photo interpreter can identify and delineate the boundaries between plant communities.

Vegetation stature, as well as the scale and resolution of the aerial imagery, determine the visibility of individual plants, and the degree to which they can be photo interpreted. Trees and shrubs are usually visible as individuals on high-resolution digital imagery. However, herbaceous species are rarely visible as individual plants. Environmental factors, such as elevation, slope, and aspect, also play an important part in the photointerpretation decision-making process. Knowledge of these factors, and how

plant communities respond to them, guides a photo interpreter in choosing from alliances with similar photo signatures. Beyond this, such knowledge enables vegetation mappers to create biogeographical models of expected vegetation communities where the vegetation types are indistinct on the imagery. This ecological approach produces a more accurate product than would be created by relying solely on extracting information from the imagery, which is subject to variations in clarity, temporal age, and resolution.

Ancillary data sources and field reconnaissance data are used to complement the imagery and assist the mapper in the photointerpretation and attribution process. For example, classification plot point data contains the coordinate location of the plot, as well as miscellaneous data related to the species composition and cover within the stand, abiotic and ecological information, and other site history, such as fire information.

For the mapping effort, the vegetation classification (Appendix B) and accompanying field key (Appendix C) were used to create a mapping classification based on mappable units. Woodlands, shrublands, and herbaceous vegetation types were mapped at the Alliance or Association level following the online Manual of California Vegetation (MCV). Mapping rules were defined to prevent 'over-delineating', or splitting vegetation stands into polygons that lack ecological significance. The following mapping rules were used in this project:

Minimum mapping unit (MMU) – the minimum polygon size allowed:

- 1 acre for upland vegetation types
- 10-meter width for linear polygons meeting the above MMU

Using the survey data available, the photo interpreter reviewed aerial photo signatures (color-texture-tone combinations) of each vegetation type. Correlations between the vegetation units and photo signatures were evaluated to ensure that the map would consistently represent different vegetation types at a fine-scale resolution. After initially mapping the study area, a site visit was conducted in April 2023 to verify signatures.

Vegetation polygons were digitized using ESRI's ArcPro (version 3.0.3) at a scale of approximately 1:3,000. Base imagery for mapping relied on 2020 natural color one-meter aerial imagery from San Luis Obispo County (NAIP 2020). Other ancillary data aided in digitizing polygons and designating map attributes, including color infra-red imagery, CalVeg (Classification and Assessment with Landsat of Visible Ecological Groupings) maps, and an existing San Luis Obispo oak woodland map (AIS 2009). In addition, CNPS reviewed other regional mapping projects, including the Carrizo Plain National Monument (Stout et al 2013) and Walker Ridge (Reyes et al 2023).

Mapping Attributes

This section provides a list of map attributes and definitions for each polygon mapped.

Vegetation Type (MapUnit): Name and numeric code for the vegetation type assigned by the photo interpreter. The types below are Alliance level unless otherwise noted.

Vegetation Type and Codes

Vegetation Name	Code
Juniperus californica	1121
Quercus douglasii	1131
Adenostoma fasciculatum	2223
Adenostoma fasciculatum – Saliva spp.	2226
Arctostaphylos glauca	2231
Artemisia californica – Eriogonum fasciculatum Association	2314
Ericameria linearifolia – Cleome isomeris	2335
Eriogonum fasciculatum	2317
Quercus berberidifolia	2211
Quercus john-tuckeri	2111
Ribes quercetorum Association	2611
Prunus fasciculata Association	4215
Salvia mellifera – (*Artemisia californica*)	2328
Corethrogyne filaginifolia – Eriogonum (*elongatum, nudum*)	5132
Lasthenia californica – Plantago erecta – Vulpia microstachys	5114

Cover: Five attributes estimate cover, defined as the percent “bird’s-eye” cover within a vegetation stand. “Bird’s-eye” cover is what can be seen on an air photo; therefore, it does not include the cover of understory layers that may be obscured by an overstory layer. These include estimates for Conifer (**ConiferCover**), Hardwood (**HdwdCover**), Total Tree (**TreeCover**), which is the combined total cover of conifer and hardwoods, and Shrub (**ShrubCover**). These were estimated in 1% increments from 0-99%. The fifth cover type of Herbaceous (**HerbCover**) is measured with the cover classes shown below.

Herbaceous Cover Classes

Code	Range
1	<2%
2	2-9%
3	10-40%
4	>40%

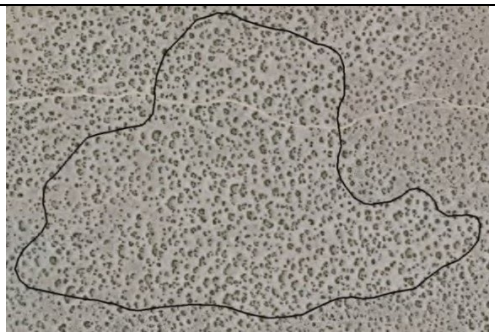
Non-Native Plants (Exotics): Level of impact by exotic or invasive species, broken into the following categories.

Non-Native Plant Impact Levels

Code	Range
0	None visible
1	Patches of exotics visible, but cover not significant (relative cover to total <33%)
2	Exotics (particularly herbaceous) significant and cover may exceed dominant vegetation strata (relative cover >33% and <66%)
3	Stand characterized by exotics (vegetation type is “exotic”) (relative cover >66%)

Roadedness: Level of impact by paved and unpaved roads. Impact is defined by the proportion of polygon vegetation that is roadless. This is broken into the classes shown in the table below.

Map Classes for Roadedness Disturbance

Code	Range	Example
0	None Visible	
1	Low: at least 2/3 (67% to 100%) of the vegetation polygon area is roadless	
2	Moderate: between 1/3 and 2/3 (33% to 66%) of the vegetation polygon is intersected by roads of any kind	

Code	Range	Example
3	High: less than 1/3 (<33%) of the vegetation polygon lacks roads of any kind	

Clearing: Lists the level of clearing within each polygon.

Map Classes for Clearing

Code	Range	Discussion
0	None Visible	No ghost lines of tilling, differential effects of enclosure/exclosure fencing, effects of grazing/browsing, etc. are visible.
1	Low: Less than 33% of polygon is affected and/or impact is seen but does not affect vegetation cover or type	Less than 1/3 of a vegetation polygon has visible evidence of clearing, prior agricultural activity or other effects.
2	Moderate: Between 33% to 66% of polygon is affected	A vegetation polygon has more than 1/3 but less than 2/3 visible effects of clearing, prior agricultural or other effects.
3	High: More than 66% of polygon affected	A vegetation polygon has more than 2/3 visible effects of clearing, prior agricultural or other effects.

CWHR Tree Size Class (CWHRclass): Size class assigned to polygons dominated by trees

CWHR Tree Size Classes

Code	Range
1	Seedling (Less Than 1 ")
2	Sapling (1 to 6 ")
3	Pole (6 to 11 ")
4	Small Tree (11 to 24 ")

Code	Range
5	Medium/Large (Tree Greater Than 24 ")
6	Multi Layered (Size 5 Over Size 4 Or 3; Total Tree Crown Closure Greater Than 60%)

Tree Height Classes (TreeHeight): Height class assigned to polygons dominated by trees

Tree Height Classes

Code	Height
1	< 1/2 meter
2	1/2-1 meter
3	1-2 meters
4	2-5 meters
5	5-10 meters
6	10-15 meters
7	15-20 meters
8	20-35 meters
9	35-50 meters

CWHR Type (CWHRType): Standard acronyms found in California Wildlife Habitat Relationship Descriptions cross-walked to vegetation type.

CWHR Name (CWHRName): Name of California Wildlife Habitat Relationship type that relates to the CWHR acronym.

Methods Used for attribution (MethodID): Identifies what type of field data (if any) supported the vegetation type decision for that polygon or if it was interpreted through aerial imagery.

Methods Used to Identify Polygon

Code	Description
1	Rapid assessment field data
2	Relevé field data
3	Field verification
4	Photo interpretation
5	Adjacent stand info or ground photo
6	Reconnaissance
10	Accuracy Assessment

NVCS_Name: The standardized name of the vegetation description used in the National Vegetation Classification System (see http://usnvc.org/) or the Manual of California Vegetation.

NVCS_Level: The standardized level of the vegetation description used in the National Vegetation Classification System.

CaCode: The official California code of an alliance or association.

NVCSAlliance: The alliance level of the hierarchy assigned to the map unit

NVCSGroup: The group level of the hierarchy assigned to the map unit

NVCSMG: The macrogroup level of the hierarchy assigned to the map unit

CalvegCode: Standard acronyms found in Calveg cross-walked to vegetation type.

Calvegname: Name of Calveg type that relates to the Calveg acronym/code.

Global Rank: A global ranking system indicating rarity of a vegetation type. Each type is assigned a global (G) rank on a scale of 1 to 5. G1 – G3 are considered sensitive plant communities. The global ranks are assigned through a collaborative process involving NatureServe and state Natural Heritage Program scientists.

State Rank: A state ranking system indicating rarity of a vegetation type. Each type is assigned a state (S) rank on a scale of 1 to 5. S1 – S3 are considered sensitive plant communities. State ranks are assigned by scientists within the state Natural Heritage Program, who collaborate with other scientists and knowledgeable individuals.

Field Verification

Upon completing a draft map, it was tested for accuracy using a combination of field data collection and analysis of the results. A subset of stratified polygons was selected to ensure verification of all vegetation types mapped across the study area. The Accuracy Assessment (AA) surveys evaluated the extent of the polygon, the vegetation type, and other map attributes such as cover values and disturbances. For polygons containing more than one vegetation type that meet the MMU requirements, an AA survey was completed for each type to provide sufficient information to divide the polygon.

The field crew used the Field Maps application for ArcGIS on iPads to navigate to allocated polygons and a custom field verification form within Survey123 for data collection (Appendix A). Each survey was digitally photographed in the cardinal directions and marked using GPS to produce a map of the surveyed points. Data from the AA forms was imported into a Microsoft Access database, and the vegetation types

attributed by the mappers were analyzed and scored using AA survey data and accompanying ground photos. Cover and disturbance attributes were not scored but were used to update the final map attributes. A fuzzy logic method was used to compare the vegetation type assigned to each polygon in the map (i.e., the photo-interpreted map unit attribute) with the type assigned during field verification, instead of a straight score of correct or incorrect (Foody 2002, Gopal and Woodcock 1994, Hagen 2003).

For each polygon assessed, a database code having a corresponding numeric score was assigned (see Table 2), based on the accuracy of the vegetation type identified by the mapper. For example, a polygon assigned a correct vegetation type received a score of 5 (code A), while a polygon that was incorrect at the Alliance level but correct at the Group level (or next level up in hierarchy) received a score of 3 (code D). Scores were then summed for each vegetation type, divided by the total possible score for each type, and multiplied by 100 to determine the percent accuracy. The minimum accuracy standard for California is an overall mapping score of 80%.

A field verification/accuracy analysis helps map users determine how much confidence can be assigned to each of the map units and provides an understanding of the map's appropriateness for various applications. Two forms of accuracy, users', and producers' can be estimated from the data (Story and Congalton 1986). Users' accuracy (field verification) is conditional on the mapped classes and is defined as the probability that a location mapped as class 'i' is in fact class 'i'. This provides an estimate of how well spatial mapping data represents what is found on the ground (i.e., if the user goes to a location mapped as class 'i', what is the probability it is in fact vegetation class 'i'). Producers' accuracy (map user), on the other hand, is conditional on the true vegetation class in the field. The producers' accuracy for class 'j' is the probability that a location of vegetation class 'j' in the field is mapped as class 'j'. Producers' accuracy informs producers of remotely mapped data how readily a mapping class may be detected by mapping whenever it occurs on the ground (Story and Congalton 1986).

Table 2. Score code list for Accuracy Assessment analysis.

Code	Reason For Score	Score
A	PI completely correct.	5
B	Correct at the Group level OR the next level up in the hierarchy.	4
C	Threshold/transition between PI call and Final call.	4
D	Correct at the Macrogroup level OR next level up in hierarchy.	3
E	Based on close ecological similarity.	3
F	Correct Division.	2
G	Some floristic/hydrologic similarity.	2
H	Correct only at Lifeform.	1
I	No similarity above Formation and incorrect life form.	0
J	Survey removed because significant change in polygon (e.g., the stand was burned, developed, or cleared since the date of the base imagery).	N/A; no score
K	Survey removed because inadequate portion (<10%) of the polygon was viewed by the AA field crew.	N/A; no score
L	Survey removed because field/PI data is incomplete, inadequate, or confusing.	N/A; no score
M	Supplementary record, not scored.	N/A; no score

Results

Vegetation Sampling & Classification

Between March and May 2021,73 new vegetation classification surveys were collected within the southern Ciervo-Panoche Natural Area (CPNA) to evaluate vegetation resources (Figure 1). These surveys included 21 relevés and 52 rapid assessments, representing 28 vegetation alliances. In addition, 13 reconnaissance surveys were collected to further document vegetation patterns in the area for a total of 86 survey point locations.

CNPS also compiled existing vegetation data from eight previous sampling, classification and mapping projects to develop a robust floristic vegetation classification for the inner Central Coast from Ciervo-Panoche south to Hubbard Hill and the Carrizo Plain National Monument (Table 3). The compiled data were collected between 2002 and 2021 and include 65 rapid assessment surveys collected in 2018 by a BLM Contractor (Klamath Wildlife Resources – Brian Shaw) within the Hubbard Hill study

area. All new and compiled data are stored within a geodatabase and a standardized Access database that contains >1800 surveys, see Figure 2 for spatial locations of the data compilation. Data will be publicly available through CDFW's Biogeographic Information and Observation System upon project completion (BIOS; https://apps.wildlife.ca.gov/bios6/).

Table 3. List of new and previous sampling, classification and mapping projects denoting survey type and count of surveys for each area. Data were compiled into a region-wide classification of the inner central coast of California.

Project Code	Project Area / Entity	Survey Type	Count
CARR	Carrizo Plain National Monument / CNPS & CDFW	RA, Relevé	1224
CCBLM	Clear Creek Management Area / CNPS & BLM	RA	31
CNLM	Panoche Preserve / Center for Natural Lands Management	RA, Transect	57
CVPA	Ciervo – Panoche Natural Area / CNPS & BLM	RA, Recon, Relevé	202
CVPAA	Ciervo – Panoche Natural Area Accuracy Assessment / CNPS & BLM	AA	164
DFGRF	Various Properties / CDFW – Region 4	RA	70
GRASS	CNPS Grassland Initiative / CNPS, NRCS, & BLM	Relevé	45
SHAW	Hubbard Hill / BLM & Klamath Wildlife Resources	RA	65
		SUM	**1,858**

Total count of surveys – 1,858.

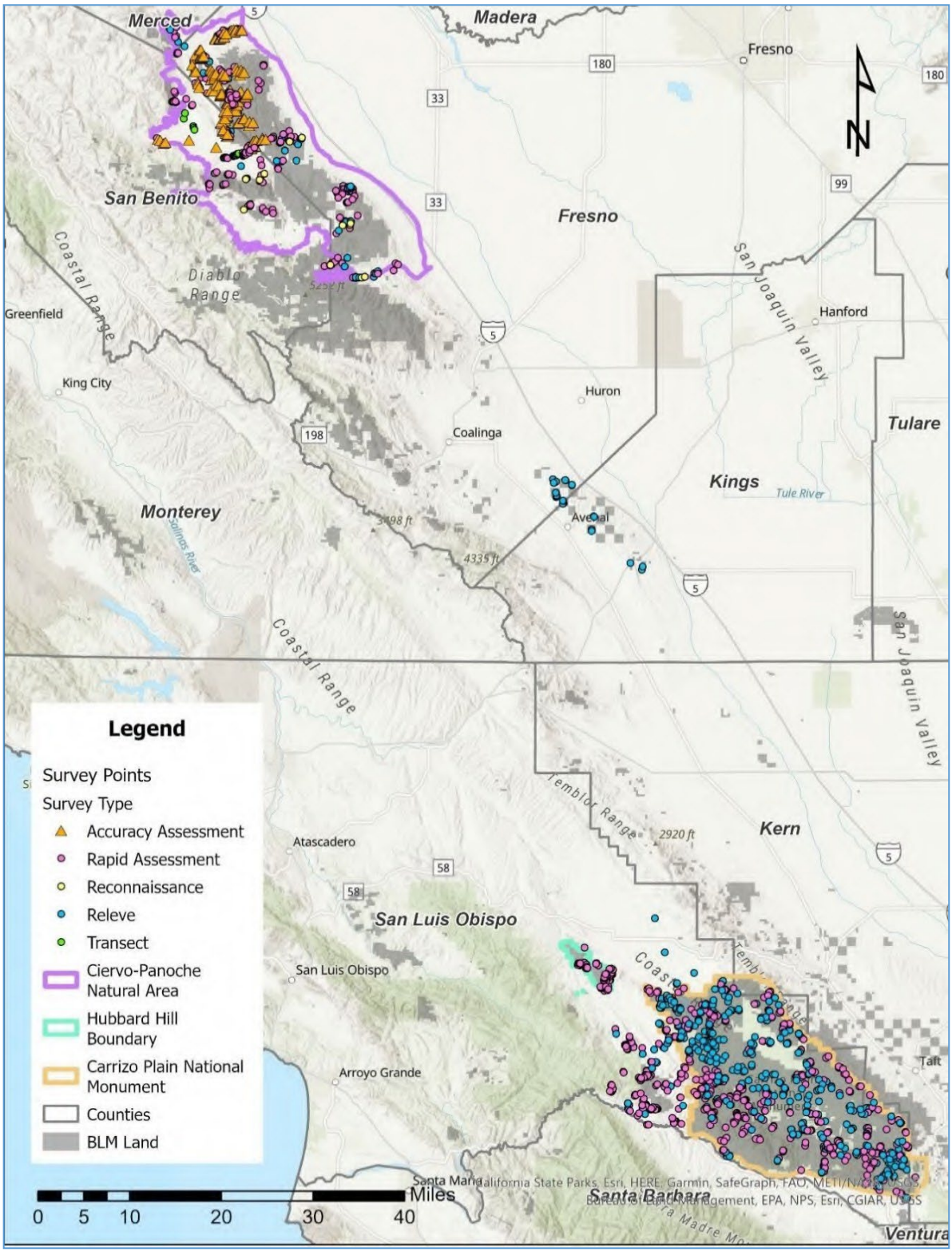


Figure 2. Locations of New and Compiled Vegetation Surveys within the inner Central Coast from the Ciervo Panoche Natural Area to Carrizo Plain National Monument and the Hubbard Hill Unit.

The vegetation classification resulted in recognizing 67 alliances and 165 associations across the region; this includes 5 tree-overstory, 35 shrubland, and 27 herbaceous alliances (Appendix B). Of the alliances, about one-third (21) are considered sensitive plant communities (State Rank S1-S3) and 6 alliances are considered "Semi-Natural" or "Ruderal" because they are dominated and characterized by non-native plants that are reproducing and maintaining populations in the wild (e.g., *Tamarix* spp. Semi-Natural Stands). The data collection, compilation and classification efforts provided updates to statewide alliance and association definitions, including the revision of 9 existing associations and the description of 14 new associations mostly found within coastal sage scrub and herbaceous patterns such as a new *Abronia pogonantha – Oenothera deltoides* Provisional Association in the *Dicoria canescens – Abronia villosa – Panicum urvilleanum* Alliance (see Appendix B).

CNPS has categorized vegetation patterns in a floristic vegetation classification for the inner Central Coast of California. This classification is hierarchical and generally follows the National Vegetation Classification Standard (FGDC 2008, Jennings et al. 2009, USNVC 2023) and *A Manual of California Vegetation* (Sawyer et al. 2009). However, some modifications of this local classification may be needed once further classification and mapping of the Central Coast ecoregion is completed.

Attributes such as species composition, structure, and cover were used to develop a floristic key to the vegetation types (Appendix C) and comprehensive vegetation alliance and association descriptions for each type sampled in the region are presented in Appendix E. Repeat visits to the same survey location and spatially auto-correlated surveys (within 200 m) assessed as the same vegetation type, were removed from the final descriptions in order to avoid over-estimating the count of representative surveys per type. The selection of a final representative survey was driven in part by survey type, where a preference was given to relevés and rapid assessments over accuracy assessment or reconnaissance surveys.

Vegetation Mapping

The floristic key to vegetation types of the inner central coast of California was applied as a foundation to map the BLM Hubbard Hill, Anderson Canyon, Freeborn Mt. Units, based on membership rules utilized in other Central Coast projects including the Carrizo Plain National Monument vegetation map (Stout et al. 2013) and the northern Ciervo Panoche Natural Area mapping (Buck-Diaz 2015).

CNPS developed a fine-scale vegetation map, which contains 15 map units at the alliance or association level. A total of 7,296 acres were delineated and attributed,

including 720 polygons (ranging in size from 1 - 80 acres). See Figure 3 for an illustrated example of the fine-scale delineation and attributes available for each stand of vegetation (polygon). Thirty percent of the map area is dominated by trees; with open canopies of California juniper woodland (*Juniperus californica* Alliance) covering 1,800 acres and blue oak woodland *(Quercus douglasii* Alliance) occurring on ~400 acres in flat low-lying sections.

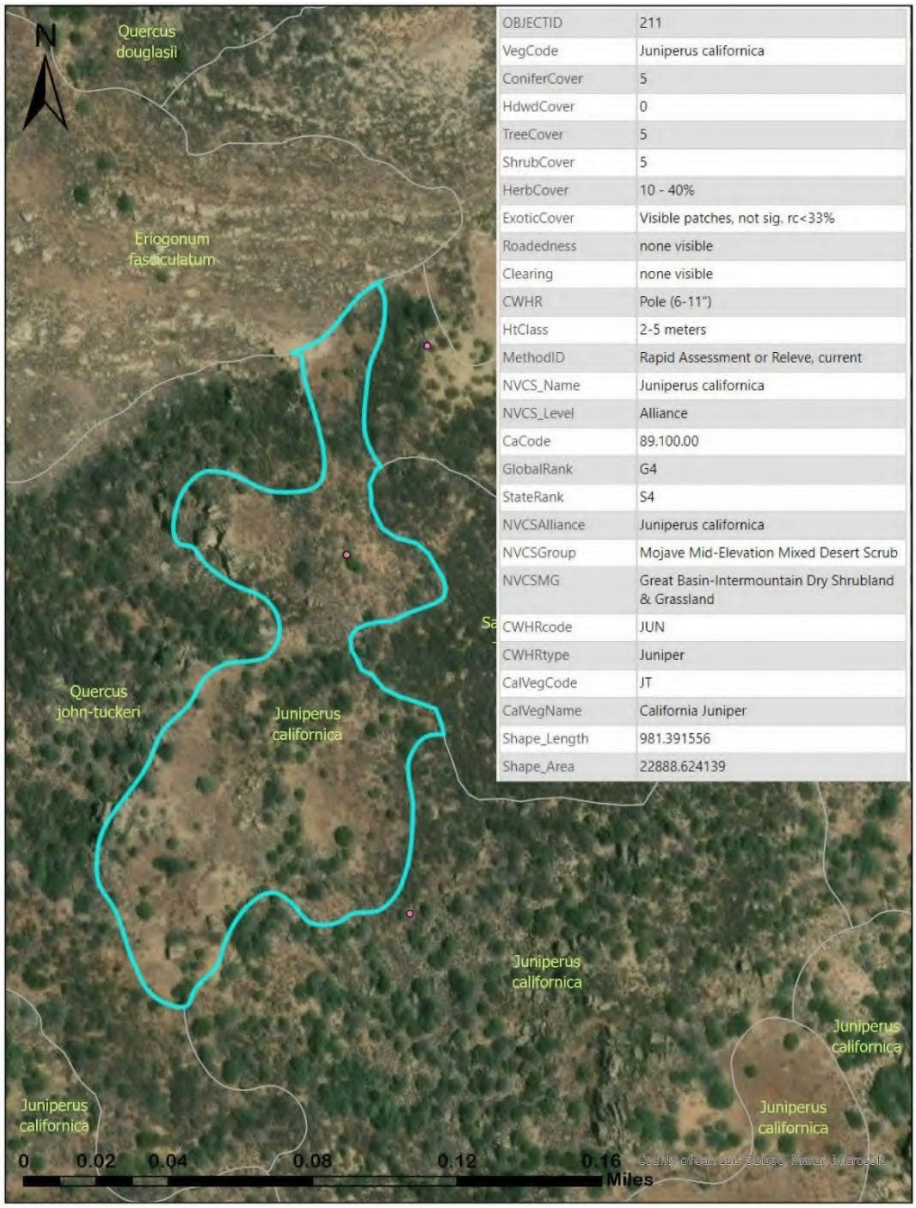


Figure 3. Depiction of the fine-scale delineation of different vegetation types in the Hubbard Hill Unit map and attributes assessed for each polygon.

Shrub types dominate the remaining area with scrub oak (*Quercus berberidifolia* Alliance) on the lowest slopes transitioning to Tucker oak (*Quercus john-tuckeri* Alliance) in the upper slopes of Hubbard Hill and Freeborn Mountain, though both scrubby oaks can co-occur in shallow draws. Dense stands of chamise chaparral (*Adenostoma fasciculatum* Alliance) and mixed chamise – sage chaparral (*Adenostoma fasciculatum – Salvia* spp. Alliance) occur throughout the study area with scattered stands of black sage scrub (*Salvia mellifera* – (*Artemisia californica)* Alliance) and bigberry manzanita chaparral (*Arctostaphylos glauca* Alliance). A small portion of the mapped region consists of herbaceous openings, mostly falling below the minimum map unit, with pockets of native meadows between rock outcrops. See Table 4 for a summary of the vegetation types and acreages mapped in the study area.

Table 4. Frequency (N) and area (acres) of vegetation types mapped within the Hubbard Hill Unit. Types are mapped at the Alliance level, unless noted below.

Life form	Map Unit Name	N	Acres
Tree	*Juniperus californica*	181	1805
Tree	*Quercus douglasii*	62	395
Shrub	*Adenostoma fasciculatum*	126	1425
Shrub	*Adenostoma fasciculatum – Salvia* spp.	48	543
Shrub	*Arctostaphylos glauca*	3	62
Shrub	*Artemisia californica – Eriogonum fasciculatum* Association	2	6
Shrub	*Ericameria linearifolia – Cleome isomeris*	2	22
Shrub	*Eriogonum fasciculatum*	38	197
Shrub	*Prunus fasciculata* Association	1	2
Shrub	*Quercus berberidifolia*	94	1159
Shrub	*Quercus john-tuckeri*	143	1537
Shrub	*Ribes quercetorum* Association	3	4
Shrub	*Saliva mellifera* – (*Artemisia californica*)	11	90
Herb	*Lasthenia californica – Plantago erecta – Vulpia microstachys*	5	47
Herb	*Corethrogyne filaginifolia – Eriogonum* (*elongatum, nudum*)	1	2

Total Number of Polygons – 720. Total Area Mapped - 7,296 Acres.

Map Reconnaissance & Field Verification

In April 2023, CNPS conducted a field reconnaissance trip to inform the first draft vegetation map, collecting over 40 reconnaissance observations as shown in Figure 4. During reconnaissance, crew members traversed the study area as much as possible using a 4WD, but mainly traveled by foot due to spring storms and road damage. A

single observation point may contain information about two or more stands of vegetation and a given stand may have been assessed from multiple vantage points.

A stratified allocation across the draft vegetation map resulted in the selection of 50 field verification polygons assigned to a priority (High, Med, Low) based on frequency of the vegetation type in the draft map. In April 2023, 19 accuracy assessment surveys (AAs) were collected across eleven of the fifteen vegetation types, see Figure 4.

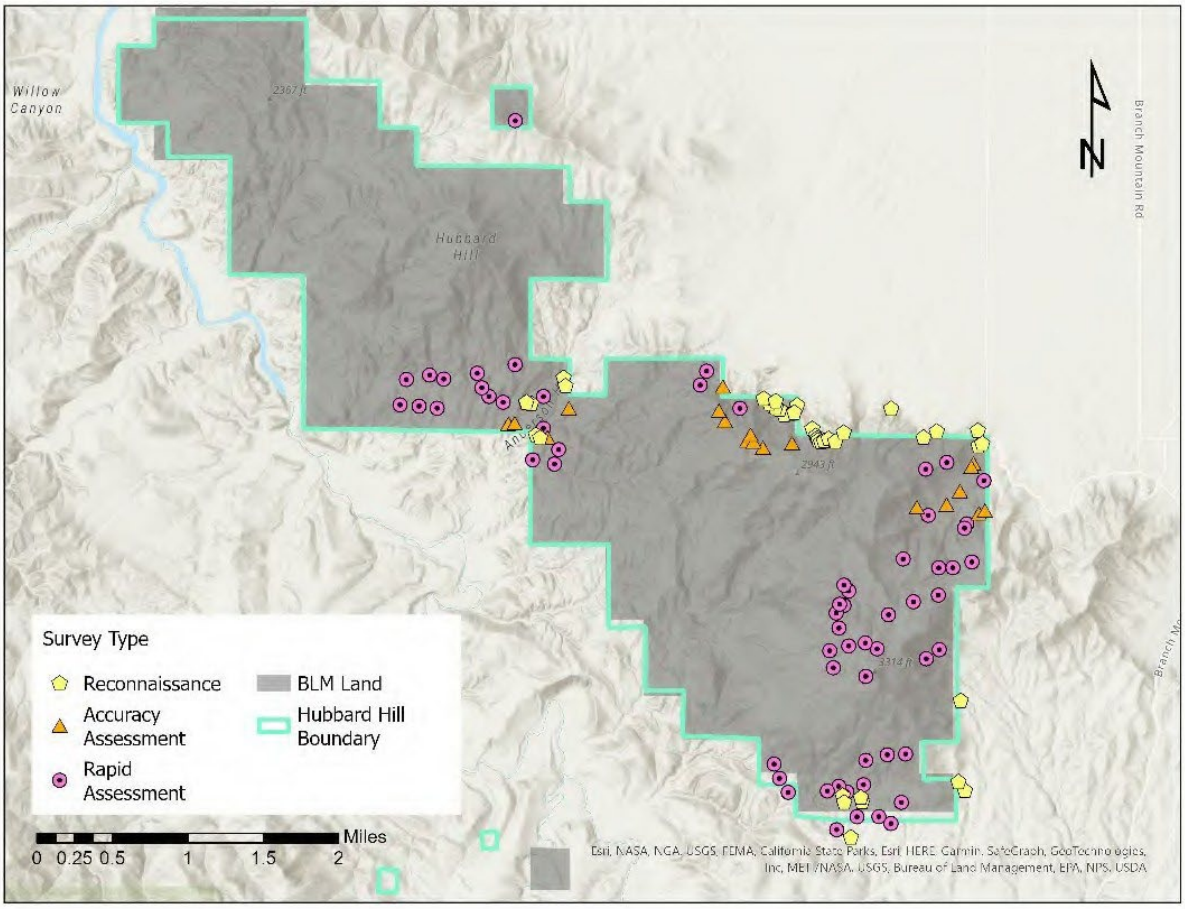


Figure 4. Vegetation map field data collection in the Hubbard Hill map area depicting different survey types within the BLM Hubbard Hill Unit.

CNPS office staff independently analyzed the AA field data against the map polygons to verify the accuracy of the vegetation map. Of the 15 mapped units, 11 were sampled to verify the map. The average producers' map accuracy across all types was 77% and the average users' map accuracy was 73%, these scores fall below the state standard of overall accuracy at 80%. Table 5 provides a summary of the map units assessed through field verification, including average score and associated sample size for both users' and producers' accuracy.

Table 5. Percent accuracy of vegetation map units for both producers and for users with sample size.

Code	Vegetation Type	N-Producer	% Producer	N-Users	% Users
2223	*Adenostoma fasciculatum*	1	60%	4	80%
2226	*Adenostoma fasciculatum – Salvia* spp.	2	90%	0	n/a
2231	*Arctostaphylos glauca*	1	100%	1	100%
2314	*Artemisia californica – (Salvia leucophylla)*	0	n/a	1	40%
2335	*Ericameria linearifolia – Cleome isomeris*	2	60%	0	n/a
2317	*Eriogonum fasciculatum*	1	60%	0	n/a
1121	*Juniperus californica*	4	85%	5	84%
2211	*Quercus berberidifolia*	3	67%	1	40%
1131	*Quercus douglasii*	3	80%	4	80%
2111	*Quercus john-tuckeri*	2	90%	2	80%
2328	*Saliva mellifera – (Artemisia californica)*	0	n/a	1	80%

Overall Polygon Count: 19
Polygons with 60-100% Accuracy (Score 3 or above): 18
Polygons with 80-100% Accuracy (Score 4 or above): 9
Average Fuzzy Score Across All Types: 77% (Producers), 73% (Users)

A few vegetation types in the map had lower accuracy due to several factors including a small sample size with various types containing only 1-2 surveys. Confusion also occurred between scrubby oak patterns because of the misidentification of scrub oak (*Quercus berberidifolia*) in the original baseline data collection conducted by a BLM contractor (Klamath Wildlife Resources), where Tucker oak (*Q. john-tuckeri*) was not recognized in any of the initial rapid assessment surveys. Field reconnaissance and verification surveys revealed that these two scrubby oaks can dominate separately in different ecological positions, with some overlap at mid-elevations. Other map confusion occurred between the gradient of pure chamise, and chamise mixed with sage (*Salvia* spp.) alliances, and among the a variety of coastal sage scrub types of California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), and goldenbush (*Ericameria linearifolia*) alliances.

Table 6 includes a contingency table for the mapping area, which gives perspective of types matching between the mappers (producers) and field-samplers (users) and types

exhibiting confusion in the map. Upon scoring the accuracy assessments, CNPS staff have reviewed all polygons where the field verification name and map unit did not agree, to correct issues in photo interpretation and attribution for the final map.

Table 6. Contingency table for Hubbard Hill mapping area.

		Reference Data Map Class (Producer's)											
Map Unit Code	**Sample Data Map Class (User's)**	*Adenostoma fasciculatum*	*Adenostoma fasciculatum - Salvia* spp.	*Arctostaphylos glauca*	*Artemisia californica - (Salvia leucophylla)*	*Ericameria linearifolia - Cleome isomeris*	*Eriogonum fasciculatum*	*Juniperus californica*	*Quercus berberidifolia*	*Quercus douglasii*	*Quercus john-tuckeri*	*Saliva mellifera*	**Grand Total**
2223	*Adenostoma fasciculatum*							1					1
2226	*Adenostoma fasciculatum - Salvia* spp.	1										1	2
2231	*Arctostaphylos glauca*			1									1
2314	*Artemisia californica-(Salvia leucophylla)*												0
2335	*Ericameria linearifolia - Cleome isomeris*	1								1			2
2317	*Eriogonum fasciculatum*							1					1
1121	*Juniperus californica*				1			3					4
2211	*Quercus berberidifolia*	1								1	1		3
1131	*Quercus douglasii*								1	2			3
2111	*Quercus john-tuckeri*	1									1		2
2328	*Saliva mellifera*												0
	Grand Total	4	0	1	1	0	0	5	1	4	2	1	**19**

Discussion

Additional data collection within the southern Ciervo Panoche Natural Area and the surrounding region has allowed the documentation of 14 new plant communities (associations) and has provided revisions to at least 9 other vegetation types within this biodiverse region. The newly described associations included a diversity of herbaceous types within the inner Central Coast of California. New types include associations with plants that have a limited distribution in California including the new *Amsinckia (furcata, vernicosa)* Provisional Association in the *Amsinckia (menziesii, tessellata) – Phacelia spp.* Alliance, the *Layia (platyglossa, munzii)* Provisional Association in the *Lasthenia californica – Plantago erecta – Vulpia microstachys* Alliance and the *Eschscholzia hypecoides – Monolopia lanceolata* Association in the *Monolopia (lanceolata) – Coreopsis (calliopsidea)* Alliance.

These changes will be incorporated in *A Manual of California Vegetation*, an online resource for tracking statewide vegetation types. Overall, the regional data compilation and analysis within this project identified a stunning diversity of 165 vegetation associations. The classification of the inner Central Coast of California will feed into a larger ecoregion-wide classification and mapping project currently underway through a large partnership of entities including the California Department of Fish and Wildlife, California Coastal Conservancy, California Native Plant Society, Tukman Geospatial, University of California, Santa Cruz, and numerous Resource Conservation Districts (RCD's), among others.

For the vegetation map of the BLM Hubbard Hill Unit that covers three adjacent allotments (Hubbard Hill, Anderson Canyon, and Freeborn Mt.), the entirety of this map area has been delineated as intact, native vegetation. Most of the area is covered by woody vegetation including tree types (e.g., California juniper and blue oak alliances), as well as numerous shrubby types of mesic chaparral (e.g., scrub oak and Tucker oak alliances), xeric chaparral (e.g., chamise and chamise – sage alliances), and coastal sage scrub (e.g., California buckwheat alliance). The map has been improved by both field reconnaissance and field verification resulting in a final geodatabase covering over 7,200 acres of BLM lands west of the California Valley.

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Appendix A – Field Sampling Protocols & Forms

Vegetation Map Reconnaissance Protocol

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE PROTOCOL FOR
RECON FIELD FORM
(March 30, 2017)

This protocol describes the methodology for the reconnaissance technique as recorded in the Recon Field Form dated March 30, 2017. Reconnaissance surveys (recons) are complementary to relevés and rapid assessments, but collect only a small subset of the data gathered using the more detailed methods. Recons are generally used as an aid to digital vegetation mapping, to determine the boundaries of a stand, or to illustrate a particular vegetation signature.

Definitions of fields in the form

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION

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 name 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.

Date: Date of the sampling.

Return?: Check this box if team members should return to this spot at a later date to take a recon or RA/relevé. This can be used if the phenology is not conducive to identification of the major species, or if there is not enough time to take the survey.

Waypoint ID: The Waypoint ID in this format: GPS device name + date (yymmdd) + time (hhmm). For example, for a survey taken on iPad “V” on March 27 at 1:45 in the afternoon, the Waypoint ID will be “V1803271345.”

UID: The ID number of a reference point or polygon which this reconnaissance describes.

Location Name: The name of the property, park, or the location within large holdings (like USFS or BLM properties).

GPS name: The name/number assigned to the GPS unit.

Projected? Yes / No / Base / Digitized: Circle the appropriate option:

> **Yes** - The point is a projected, or offset point. The surveyor used a bearing and distance to project the point to match what they are describing with the survey.
>
> **No** - The surveyors are in the vegetation they are describing and the point is where the observer was standing for photographs. This location can also be used as a base location for an offset survey.

Base - Base point only. This is where a surveyor was standing when taking an offset survey to describe vegetation not at that point. No plant data or vegetation descriptions are associated with this location. However, cardinal photos taken at this point will be stored in a directory of this name.

Digitized – An offset point was created on the GPS unit without taking bearing and distance readings. This option should only be used when the imagery on the GPS unit is unique and unmistakable.

Bearing (°): The compass bearing from the Base point to the Projected point.

Distance (m): The distance in meters from the Base point to the Projected point, determined by use of a range finder.

Inclination (°): The vertical offset from the Base point to the Projected point.

Base Waypoint ID: For a projected or digitized point, this is the location where the surveyor was standing when the information was collected. Cardinal photographs will be taken at this point and will be stored on the computer under this ID. Photographs of the stand vegetation will be taken from this point and will be stored on the computer under the Projected point's ID.

Base / Projected UTMs or Decimal degrees: If the point is projected or digitized, circle whether the coordinates of the base point or the offset point have been recorded. These will generally be for the offset point.

GPS error: ft./m./PDOP: The accuracy of the GPS location. Record the error reading and circle the appropriate units.

GPS coordinates: Record either UTM coordinates, easting (**UTME**) and northing (**UTMN**), or decimal degrees, **LAT** (latitude) and **LONG** (longitude). Record this information from a GPS unit.

Stand Size: Estimate the size of the entire stand in which the sample is taken and circle the appropriate range. As a measure, one acre is similar in size to a football field.

View Radius: Enter the radius, in meters, of the viewable area of the stand from the survey point; the radius should be a minimum of 20 meters.

Camera/Photos: Write the name camera, JPG numbers, and direction of photos. Take four photos in the main cardinal directions (N, E, S, W) clockwise from the north, from the GPS location. A symbol can be used to indicate the cardinal photos. If additional photos are taken, note the JPG numbers and a description of each photo.

II. HABITAT AND VEGETATION DESCRIPTION

Field alliance name: Name of alliance following the most recent Manual of California Vegetation (Sawyer, Keeler-Wolf, and Evens 2009), using scientific nomenclature, *e.g., Quercus agrifolia*. An alliance is based on the dominant or diagnostic species of the stand, and usually reflects 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.

Comments: Briefly describe the stand age/seral stage, disturbance history, nature and extent of land use, and other site environmental and vegetation factors that will aid in the mapping effort.

% Cover:

Conifer: The total cover of all the conifer trees taking into consideration the porosity, or the holes, in the vegetation. This is an estimate of the absolute conifer cover, disregarding the overlap[1] of individual trees.

Hardwood: The total cover of all the hardwood trees taking into consideration the porosity, or the holes, in the vegetation. This is an estimate of the absolute hardwood tree cover, disregarding the overlap[1] of individual trees.

Total Tree: The total cover of all the trees taking into consideration the porosity, or the holes, in the vegetation. This is an estimate of the absolute tree cover, disregarding the overlap[1] of individual trees.

Regen Tree: The total foliar cover of seedlings and saplings, disregarding overlap[1] of individual recruits. See seedling and sapling definitions below.

Shrub: The total cover of all the shrubs taking into consideration the porosity, or the holes, in the vegetation. This is an estimate of the absolute shrub cover, disregarding the overlap[1] of individual shrubs.

Herb: The total cover of all the herbs taking into consideration the porosity, or the holes, in the vegetation. This is an estimate of the absolute herbaceous cover, disregarding the overlap[1] of individual herbs.

Total Veg: The total cover of all vascular vegetation taking into consideration the porosity, or the holes, in the vegetation. This is an estimate of the absolute vegetation cover, disregarding the overlap[1] of the various tree, shrub, and/or herbaceous layers and species.

Exotics (L,M,H): The extent to which the stand is impacted by exotic/non-native species. Divide the total exotic cover (e.g. 25% Bromus diandrus + 8% Bromus madritensis + 5% Centaurea melitensis = 38% total exotics) by the Total Veg cover (e.g. 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.

Species List and Coverage

List the species that are dominant or that are characteristically consistent throughout the stand. This list is used if there is some uncertainty in the field-assessed alliance name,

[1] 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.

so the most common species should be listed. In the interests of time and efficiency, this species list should not be exhaustive.

Strata:

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

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.

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; re-sprouts are not recorded here even if they meet the size requirements.

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.

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

When one or more tree species are regenerating, the Tree, Seedling and/or Sapling strata may be noted on the same line, e.g.:

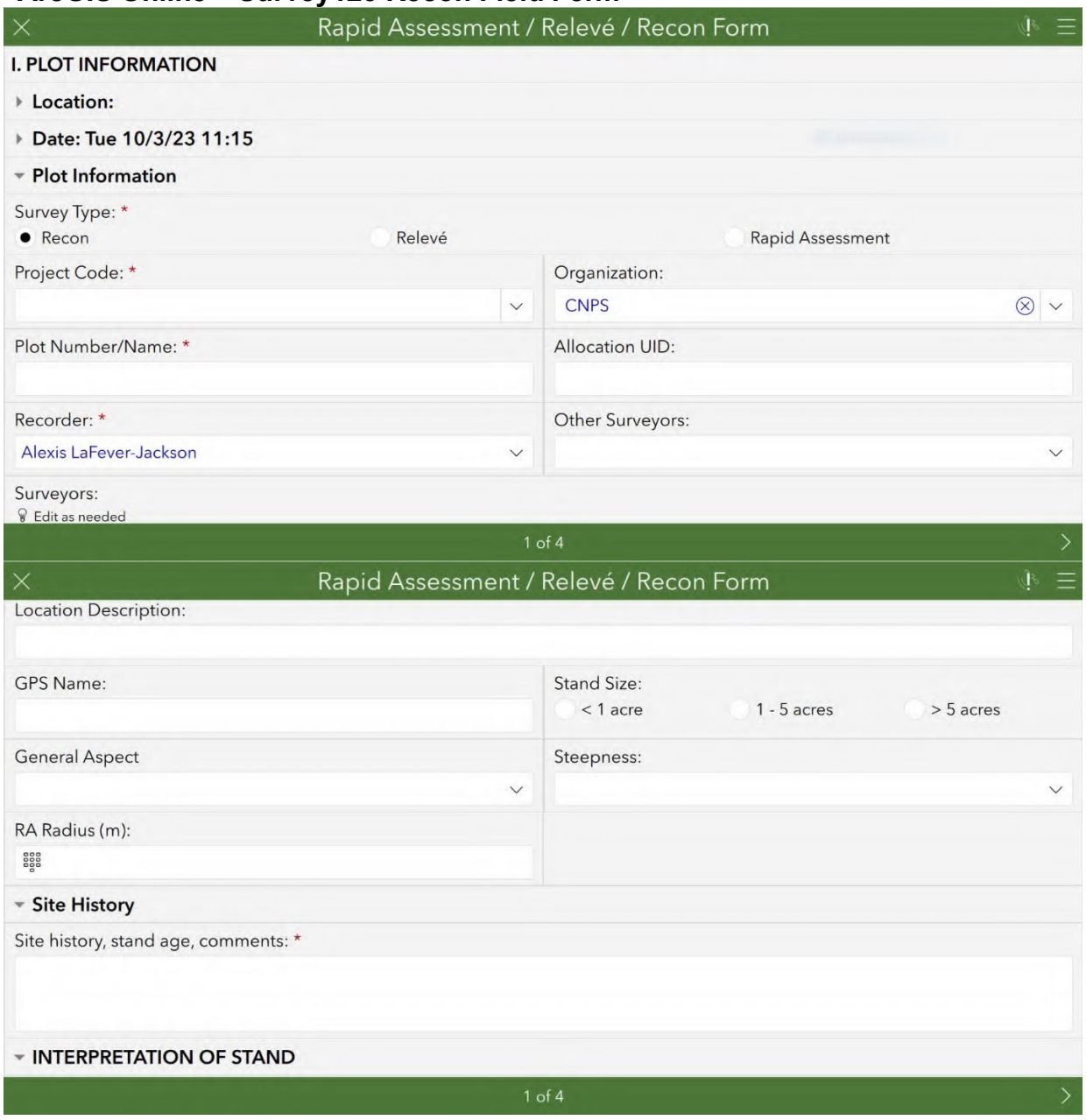
Strata	**Species**	**%Cover**	C
T/A/E	Quercus douglasii	40/<1/<1	

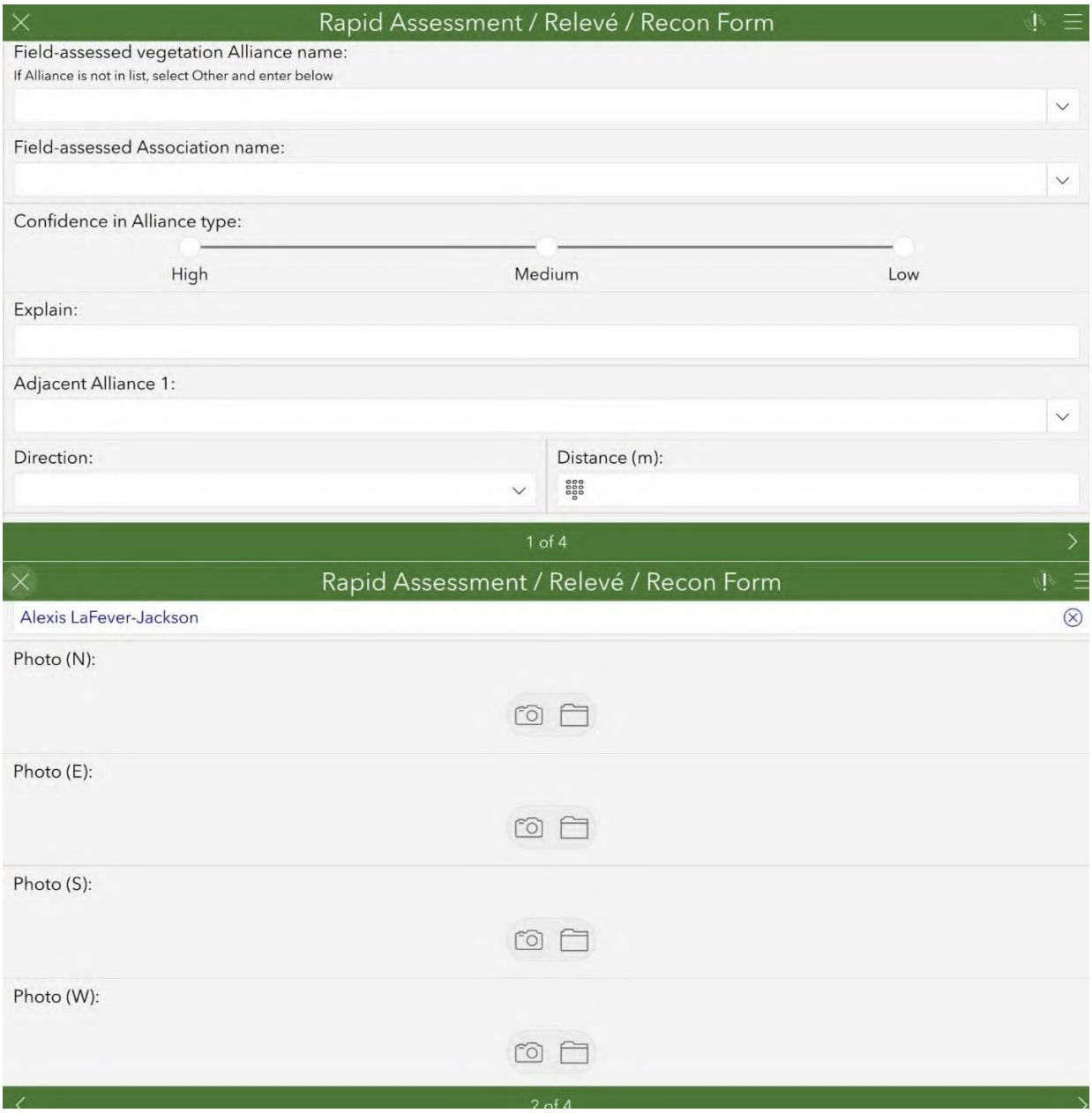
Species: Use Jepson Manual nomenclature. When uncertain of an identification (which you intend to confirm later) use parentheses to indicate what part of the determination needs to be confirmed. For example, write out *Brassica* (*nigra*) if you are sure it is a *Brassica* but you need further clarification on the specific epithet.

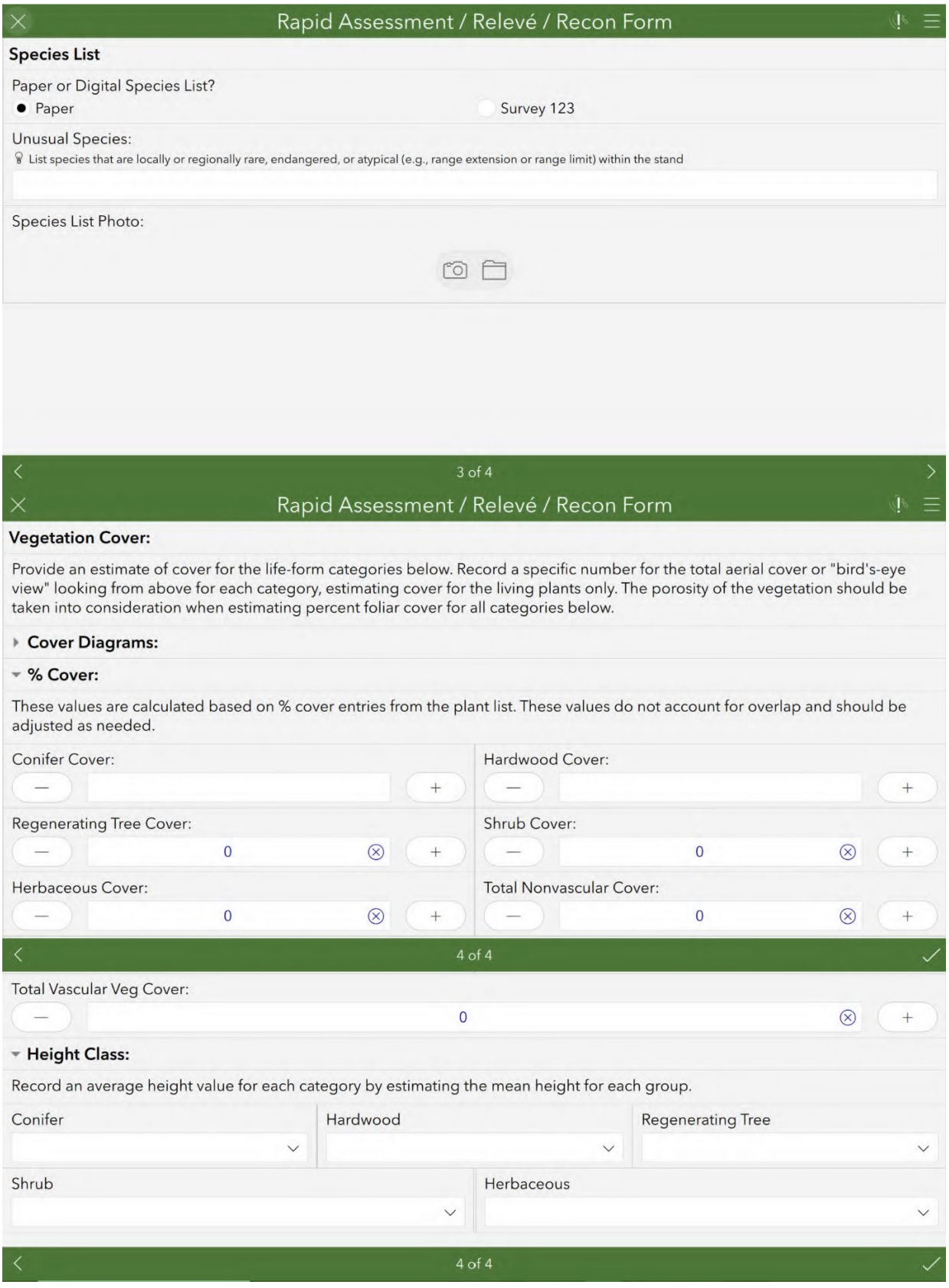
% cover: provide the % absolute aerial cover for each species listed. All species percent covers may total over 100% because of overlap.

Collections: If a species collection is made, it should be indicated in the blank column next to "% cover" 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, add a "T" to the "C" in that column (CT = thrown out after confirmation) or cross out the "C". If the specimen is kept but is still not confidently identified, add a "U" to the "C" (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" (CC = collected and confirmed). If the specimen is later deposited in an herbarium, add a "D" to the existing "C" (CD = collected and deposited) and note the receiving herbarium.

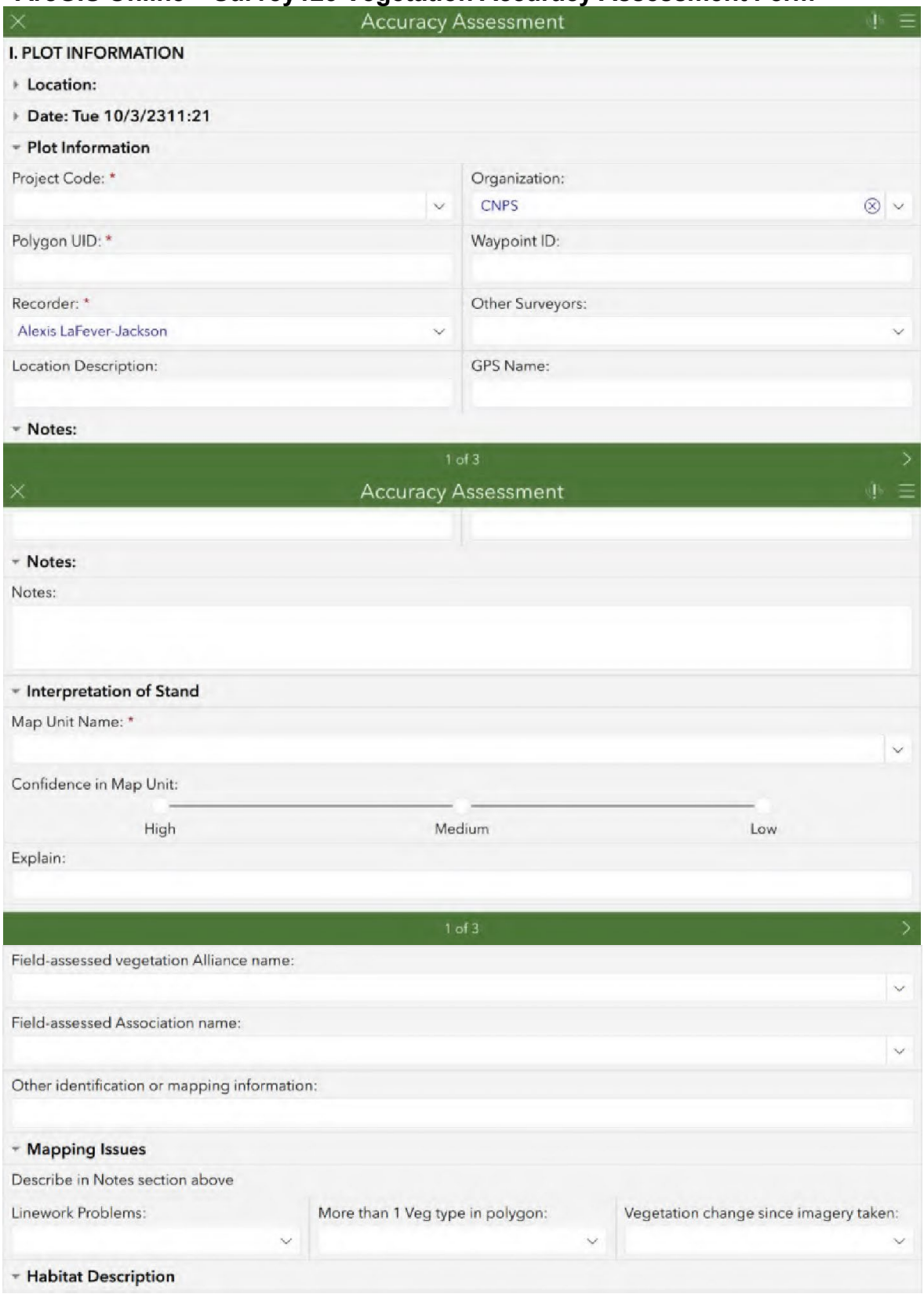
ArcGIS Online – Survey123 Recon Field Form

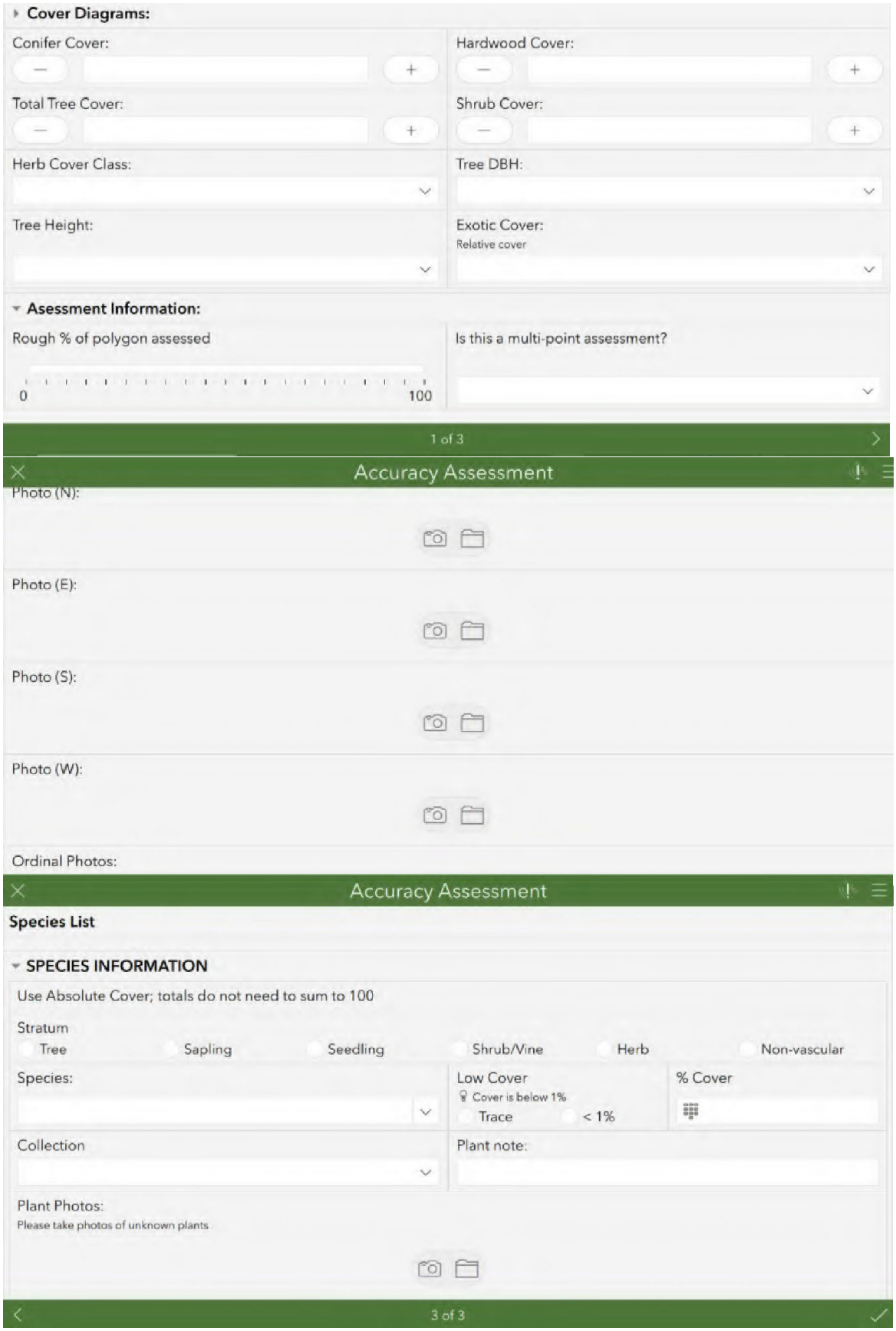



Rapid Assessment / Relevé / Recon Form
Field-assessed vegetation Alliance name:
If Alliance is not in list, select Other and enter below
Field-assessed Association name:
Confidence in Alliance type:
High
Medium
Low
Explain:
Adjacent Alliance 1:
Direction:
Distance (m):
1 of 4
Rapid Assessment / Relevé / Recon Form
Alexis LaFever-Jackson
Photo (N):
Photo (E):
Photo (S):
Photo (W):
2 of 4


Rapid Assessment / Relevé / Recon Form
Species List
Paper or Digital Species List?
Paper
Survey 123
Unusual Species:
List species that are locally or regionally rare, endangered, or atypical (e.g., range extension or range limit) within the stand
Species List Photo:
3 of 4
Rapid Assessment / Relevé / Recon Form
Vegetation Cover:
Provide an estimate of cover for the life-form categories below. 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. The porosity of the vegetation should be taken into consideration when estimating percent foliar cover for all categories below.
Cover Diagrams:
% Cover:
These values are calculated based on % cover entries from the plant list. These values do not account for overlap and should be adjusted as needed.
Conifer Cover:
Hardwood Cover:
Regenerating Tree Cover:
0
Shrub Cover:
0
Herbaceous Cover:
0
Total Nonvascular Cover:
0
4 of 4
Total Vascular Veg Cover:
0
Height Class:
Record an average height value for each category by estimating the mean height for each group.
Conifer
Hardwood
Regenerating Tree
Shrub
Herbaceous
4 of 4

ArcGIS Online – Survey123 Vegetation Accuracy Assessment Form




Cover Diagrams:
Conifer Cover:
Hardwood Cover:
Total Tree Cover:
Shrub Cover:
Herb Cover Class:
Tree DBH:
Tree Height:
Exotic Cover:
Relative cover
Asessment Information:
Rough % of polygon assessed
0
100
Is this a multi-point assessment?
1 of 3
Accuracy Assessment
Photo (N):
Photo (E):
Photo (S):
Photo (W):
Ordinal Photos:
Accuracy Assessment
Species List
SPECIES INFORMATION
Use Absolute Cover; totals do not need to sum to 100
Stratum
Tree
Sapling
Seedling
Shrub/Vine
Herb
Non-vascular
Species:
Low Cover
Cover is below 1%
Trace
< 1%
% Cover
Collection
Plant note:
Plant Photos:
Please take photos of unknown plants
3 of 3

Appendix B – Table of Vegetation Alliances and Associations for the Inner Central Coast of California including Ciervo-Panoche, Carrizo Plain National Monument, Hubbard Hill, and Surrounding Areas. LF = Lifeform, nAl = number of surveys documented within an Alliance, nAs = number of surveys documented within an Association, and stat = Status which denotes new and revised vegetation types defined within this classification.

LF	Alliance	nAl	Association	nAs	stat
T	*Juniperus californica*	103	*Juniperus californica / Adenostoma fasciculatum – Eriogonum fasciculatum*	14	
			Juniperus californica / Ericameria linearifolia / annual – perennial herb	48	
			Juniperus californica / Eriogonum fasciculatum – Artemisia californica	8	
			Juniperus californica / herbaceous	7	
			Juniperus californica / Salvia leucophylla	22	
			Juniperus californica alliance	4	
T	*Populus fremontii – Fraxinus velutina – Salix gooddingii*	12	*Populus fremontii*	5	
			Populus fremontii – Salix laevigata	4	
			Populus fremontii – Salix lasiolepis	1	
			Populus fremontii / Baccharis salicifolia	1	
			Populus fremontii / Salix exigua	1	
T	*Quercus agrifolia*	1	*Quercus agrifolia / Adenostoma fasciculatum – (Salvia mellifera)*	1	
T	*Quercus douglasii*	52	*Quercus douglasii – Juniperus californica / Ceanothus cuneatus – Cercocarpus montanus*	2	
			Quercus douglasii – Juniperus californica / Ericameria linearifolia	8	
			Quercus douglasii – Juniperus californica / Quercus john-tuckeri	2	
			Quercus douglasii – Quercus agrifolia	1	
			Quercus douglasii / Ericameria linearifolia	20	
			Quercus douglasii / Eriogonum fasciculatum / herbaceous	7	
			Quercus douglasii / Mixed herbaceous	11	

LF	Alliance	nAl	Association	nAs	stat
			Quercus douglasii alliance	1	
T	*Salix gooddingii – Salix laevigata*	10	*Salix gooddingii – Salix laevigata* alliance	1	
			Salix laevigata	9	
S	*Adenostoma fasciculatum*	13	*Adenostoma fasciculatum*	11	
			Adenostoma fasciculatum – (Ceanothus cuneatus)	2	
S	*Adenostoma fasciculatum – Salvia spp.*	19	*Adenostoma fasciculatum – Salvia leucophylla*	4	rev
			Adenostoma fasciculatum – Salvia mellifera	15	
S	*Allenrolfea occidentalis*	13	*Allenrolfea occidentalis*	4	
			Allenrolfea occidentalis / Distichlis spicata Provisional	1	
			Allenrolfea occidentalis / Lasthenia gracilis Provisional	8	
S	*Ambrosia salsola – Bebbia juncea*	12	*Ambrosia salsola*	12	
S	*Arctostaphylos glauca*	12	*Arctostaphylos glauca*	5	
			Arctostaphylos glauca – Adenostoma fasciculatum	4	
			Arctostaphylos glauca – Quercus john-tuckeri Provisional	3	
S	*Artemisia californica – (Salvia leucophylla)*	80	*(Artemisia californica) – Eriogonum fasciculatum – Salvia leucophylla*	13	rev
			Artemisia californica	23	
			Artemisia californica – (Salvia leucophylla) alliance	1	
			Artemisia californica – Eriogonum fasciculatum	26	
			Salvia leucophylla	11	

LF	Alliance	nAl	Association	nAs	stat
			Salvia leucophylla – Artemisia californica	6	rev
S	*Artemisia tridentata*	1	*Artemisia tridentata – Eriogonum fasciculatum*	1	
S	*Atriplex canescens*	10	*Atriplex canescens /* herbaceous	10	
S	*Atriplex confertifolia*	1	*Atriplex confertifolia* alliance	1	
S	*Atriplex lentiformis*	7	*Atriplex lentiformis*	7	
S	*Atriplex polycarpa*	91	*Atriplex polycarpa /* Annual Herbaceous	90	
			Atriplex polycarpa alliance	1	
S	*Atriplex spinifera*	33	*Atriplex spinifera /* herbaceous	33	
S	*Baccharis salicifolia*	6	*Baccharis salicifolia*	5	
			Baccharis salicifolia – Pluchea sericea	1	
S	*Ceanothus cuneatus*	6	*Ceanothus cuneatus – Adenostoma fasciculatum*	5	
			Ceanothus cuneatus alliance	1	
S	*Ephedra californica – Ephedra trifurca*	67	*Ephedra californica – Ambrosia salsola*	3	
			Ephedra californica – Gutierrezia californica / Eriastrum pluriflorum	21	
			Ephedra californica / annual – perennial herb	43	
S	*Ephedra nevadensis – Lycium andersonii – Grayia spinosa*	3	*Ephedra nevadensis – Lycium andersonii*	1	
			Lycium andersonii Provisional	2	
S	*Ephedra viridis*	7	*Ephedra viridis – Ericameria linearifolia / (Poa secunda)* Provisional	7	new
S	*Ericameria linearifolia – Cleome isomeris*	214	*Cleome isomeris*	26	
			Eastwoodia elegans	45	

LF	Alliance	nAl	Association	nAs	stat
			Eastwoodia elegans – Krascheninnikovia lanata	18	
			Ericameria linearifolia	81	
			Ericameria linearifolia – Cleome isomeris alliance	4	
			Gutierrezia californica / Poa secunda	40	rev
S	*Ericameria nauseosa*	8	*Ericameria nauseosa*	8	
S	*Eriogonum fasciculatum*	118	*Eriogonum fasciculatum*	50	
			Eriogonum fasciculatum – Ephedra californica	20	
			Eriogonum fasciculatum var. *foliolosum – Hesperoyucca whipplei*	44	
			Eriogonum fasciculatum var. *polifolium / Eriastrum pluriflorum*	4	
S	*Krascheninnikovia lanata*	7	*Krascheninnikovia lanata*	7	
S	*Lepidospartum squamatum*	7	*Lepidospartum squamatum – Artemisia californica*	3	
			Lepidospartum squamatum / ephemeral annuals	4	
S	*Lotus scoparius – Lupinus albifrons – Eriodictyon spp.*	13	*Lotus scoparius – Lupinus albifrons – Eriodictyon spp.* alliance	1	
			Lupinus albifrons	12	
S	*Malacothamnus fasciculatus – Malacothamnus spp.*	1	*Malacothamnus fasciculatus – Malacothamnus spp.* alliance	1	
S	*Pluchea sericea*	3	*Pluchea sericea* Seasonally Flooded	3	
S	*Prunus fasciculata – Salazaria mexicana*	1	*Prunus fasciculata*	1	
S	*Quercus berberidifolia*	6	*Quercus berberidifolia – Adenostoma fasciculatum*	4	
			Quercus berberidifolia – Ceanothus cuneatus	1	
			Quercus berberidifolia – Cercocarpus montanus	1	

LF	Alliance	nAl	Association	nAs	stat
S	*Quercus john-tuckeri*	35	*Quercus john-tuckeri*	5	
			Quercus john-tuckeri – Adenostoma fasciculatum	2	
			Quercus john-tuckeri – Juniperus californica – Ericameria linearifolia	28	
S	*Rhus trilobata – Crataegus rivularis – Forestiera pubescens*	1	*Forestiera pubescens – Sambucus nigra*	1	
S	*Ribes quercetorum – Rhus trilobata – Frangula californica*	9	*Ribes quercetorum*	9	
S	*Salix lasiolepis*	3	*Salix lasiolepis*	3	
S	*Salvia mellifera – (Artemisia californica)*	6	*Salvia mellifera – Artemisia californica*	2	
			Salvia mellifera – Eriogonum fasciculatum / Bromus rubens	4	
S	*Suaeda moquinii*	24	*Isocoma acradenia* Alkaline Wet	17	
			Suaeda moquinii / Lepidium dictyotum	7	
S	*Tamarix* spp.	5	*Tamarix* spp.	5	
H	*Achnatherum hymenoides*	1	*Achnatherum hymenoides – Oenothera deltoides*	1	
H	*Amsinckia (menziesii, tessellata) – Phacelia* spp.	138	*Amsinckia (furcata, vernicosa)* Provisional	5	new
			Amsinckia (intermedia, menziesii)	1	
			Amsinckia (menziesii, tessellata) – Phacelia spp. alliance	4	
			Amsinckia menziesii – Erodium spp.	3	
			Amsinckia tessellata – Erodium cicutarium	47	
			Astragalus didymocarpus – Lotus wrangelianus	37	

LF	Alliance	nAl	Association	nAs	stat
			Croton setigerus – (Trichostema lanceolatum) Provisional	2	new
			Eriogonum (angulosum, gracillimum) – Amsinckia tessellata Provisional	7	new
			Phacelia ciliata	9	
			Phacelia tanacetifolia	14	
			Salvia columbariae – Chaenactis (fremontii, stevioides) Provisional	10	new
H	*Aristida purpurea – Elymus elymoides – Poa secunda*	49	*Aristida purpurea – Elymus elymoides – Poa secunda* alliance	14	
			Monolopia stricta – Poa secunda	12	
			Poa secunda – (Elymus sp.*) – Clarkia cylindrica*	2	
			Poa secunda – Bromus rubens	21	
H	*Artemisia dracunculus*	1	*Nicotiana quadrivalvis* Provisional	1	new
H	*Avena spp. – Bromus spp.*	13	*Avena barbata – Avena fatua*	4	
			Bromus diandrus – Mixed herbs	6	
			Bromus hordeaceus – Erodium botrys	1	
			Bromus hordeaceus – Hordeum spp. – Medicago polymorpha	2	
H	*Bidens cernua – Euthamia occidentalis – Ludwigia palustris*	1	*Euthamia occidentalis* Provisional	1	
H	*Brassica nigra – Centaurea (solstitialis, melitensis)*	2	*Centaurea melitensis*	2	
H	*Brassica tournefortii – Malcolmia africana*	1	*Sisymbrium irio* Provisional	1	new

LF	Alliance	nAl	Association	nAs	stat
H	*Bromus rubens – Schismus (arabicus, barbatus)*	33	*Bromus (madritensis, rubens) – Erodium cicutarium*	31	rev
			Schismus (arabicus, barbatus) Provisional	2	
H	*Corethrogyne filaginifolia – Eriogonum (elongatum, nudum)*	29	*Corethrogyne filaginifolia*	4	
			Corethrogyne filaginifolia – Eriogonum (elongatum, nudum) alliance	1	
			Eriogonum elongatum	7	
			Eriogonum nudum Provisional	2	
			Eriogonum nudum var. *indictum – Eriogonum vestitum*	14	
			Eriophyllum confertiflorum Provisional	1	new
H	*Dicoria canescens – Abronia villosa – Panicum urvilleanum*	8	*Abronia pogonantha – Oenothera deltoides* Provisional	7	new
			Rumex hymenosepalus Provisional	1	
H	*Distichlis spicata* Interior	32	*Distichlis spicata* Interior	12	rev
			Distichlis spicata – Juncus arcticus var. *balticus (J. mexicanus)* Interior	10	rev
			Frankenia salina	10	rev

LF	Alliance	nAl	Association	nAs	stat
H	*Eschscholzia (californica) – Lupinus (nanus)*	36	*Eschscholzia californica*	8	
			Lupinus (microcarpus, succulentus) Provisional	5	new
			Lupinus bicolor	11	
			Salvia carduacea	12	
H	*Juncus (effusus, patens) – Carex (pansa, praegracilis)*	7	*Eleocharis macrostachya* Lowland	7	
H	*Juncus arcticus (*var. *balticus, mexicanus)*	5	*Juncus arcticus* var. *balticus – (*var. *mexicanus)*	5	
H	*Lasthenia californica – Plantago erecta – Vulpia microstachys*	143	*Erodium cicutarium – Vulpia microstachys*	12	
			Lasthenia (californica, gracilis)	22	
			Lasthenia californica – Plantago erecta – Vulpia microstachys alliance	4	
			Lasthenia gracilis – Plantago erecta – Plagiobothrys canescens	15	
			Lasthenia minor Provisional	3	
			Layia (platyglossa, munzii) Provisional	5	rev
			Lepidium jaredii ssp. *album – Lepidium nitidum* Provisional	2	new
			Lepidium nitidum – Trifolium gracilentum – Vulpia microstachys	59	
			Pectocarya (linearis, penicillata)	17	
			Vulpia microstachys – Plantago erecta	4	

LF	Alliance	nAl	Association	nAs	stat
H	*Lasthenia fremontii – Distichlis spicata*	16	*Atriplex vallicola – Lasthenia ferrisiae – Lepidium jaredii*	12	
			Frankenia salina – Psilocarphus brevissimus Provisional	3	
			Lasthenia fremontii – Distichlis spicata alliance	1	
H	*Lasthenia fremontii – Downingia (bicornuta)*	4	*Plagiobothrys stipitatus – Psilocarphus brevissimus*	4	new
H	*Leymus cinereus – Leymus triticoides*	10	*Leymus triticoides*	9	
			Leymus triticoides – Bromus spp. – Avena spp.	1	
H	*Mimulus guttatus – Cirsium spp. – Stachys spp.*	1	*Mimulus guttatus*	1	
H	*Monolopia (lanceolata) – Coreopsis (calliopsidea)*	57	*Coreopsis calliopsidea – Mentzelia pectinata*	9	
			Eschscholzia hypecoides – Monolopia lanceolata Provisional	1	new
			Monolopia lanceolata	36	
			Monolopia major Provisional	1	new
			Monolopia stricta	10	
H	*Nassella spp. – Melica spp.*	8	*Nassella cernua*	8	
H	*Plagiobothrys nothofulvus*	1	*Plagiobothrys nothofulvus – Castilleja exserta – (Lupinus nanus)* Provisional	1	
H	*Salsola tragus – Isatis tinctoria – Bassia spp.*	1	*Salsola spp.*	1	
H	*Schoenoplectus americanus*	4	*Schoenoplectus americanus*	3	
			Schoenoplectus pungens Provisional	1	new

LF	Alliance	nAl	Association	nAs	stat
H	*Typha (angustifolia, domingensis, latifolia)*	4	*Typha (latifolia, angustifolia)*	4	

Appendix C – Field Key to Vegetation Alliances & Associations

Key to Vegetation Types of Hubbard Hill & Surrounding Areas including the Carrizo Plain National Monument to the Ciervo Panoche Natural Area

This key was originally developed for fine-scale mapping in the Carrizo Plain National Monument (2010-2011) and has been adapted to include vegetation types also found in Hubbard Hill. Additionally, the key includes classification units defined upon compilation of vegetation data from the Ciervo Panoche Natural Area and south along the inner Central Coast range to the Carrizo Plain National Monument. Those types not currently known from or sampled in the study area, but that have a high potential to occur, are sometimes included in the key with an * after the alliance or association name.

Class A. Vegetation characterized by an even distribution of overstory trees. Shrub or herbaceous species may have a higher total cover than trees. The tree overstory may have as low as 5% absolute cover (e.g., in the *Juniperus californica* and *Quercus douglasii* Alliances) when shrubs are insignificant
= **Tree-Overstory (Woodland / Forest) Vegetation, on page C-1**

Class B. Vegetation characterized by an even distribution of woody shrubs in the canopy. Herbaceous species may have a higher total cover than shrubs. The shrub canopy may have less than 10% total cover (i.e., 3% or greater), especially in areas of saline or alkaline soils, along washes, or in desert-transition areas (e.g., *Allenrolfea occidentalis, Atriplex* spp*., Eastwoodia elegans, Ephedra californica, Ericameria nauseosa, Gutierrezia californica, Lepidospartum squamatum, Lycium andersonii,* and *Suaeda*)
= **Shrubland Vegetation, on page C-6**

Class C. Vegetation characterized by non-woody, herbaceous species in the canopy including grasses, graminoids, and broad-leaved herbaceous species. Shrubs, if present, usually comprise <3% of the vegetation. Trees, if present, generally have <6% cover
= Herbaceous Vegetation, on page C-18

Class D. Non-vegetated or urbanized types with <2% total vegetation cover
= **Unvegetated or Urbanized, on page C-29**

Class A. Tree-Overstory (Woodland / Forest) Vegetation

Woodlands and forests characterized by needle or scale-leaved conifer trees and/or broad-leaved evergreen and deciduous tree species. The trees may only occur intermittently in the overstory and may be associated with shrubs.

1.A. Stands are dominated or characterized by riparian winter deciduous trees or tall shrubs, including *Populus fremontii* and/or a species of *Salix…*

I.A.1. *Populus fremontii* is dominant or co-dominant in the tree canopy with >5% absolute cover. Stands occur along streams, springs, and valleys with a subsurface water supply …

***Populus fremontii – Fraxinus velutina – Salix gooddingii* Alliance (1211)**

I.A.1.a. *P. fremontii* is dominant or co-dominant in the overstory with *Salix laevigata* with a variable mix of shrubs, grasses and forbs in the understory…

***Populus fremontii – Salix laevigata* Association (1211)**

I.A.1.b. *P. fremontii* is dominant in the overstory with *Salix exigua* in the shrub layer and a variable mix of grasses and forbs …

***Populus fremontii / Salix exigua* Association (1211)**

I.A.1.c. *P. fremontii* is dominant in the overstory with *Salix lasiolepis* in the shrub layer and a mix of grasses and forbs. *Salix laevigata* is absent or low in cover …

***Populus fremontii / Salix lasiolepis* Association (1211)**

I.A.1.d. *P. fremontii* is dominant or co-dominant in the overstory with *Salix gooddingii* over *Baccharis salicifolia* in the shrub layer and a mix of grasses and forbs …

***Populus fremontii / Baccharis salicifolia* Association (1211)**

I.A.1.e. *P. fremontii* is dominant in the overstory, and the understory has a variable mix of grasses and forbs …

***Populus fremontii* Association (1211)**

I.A.2. *Salix laevigata* dominates with >50% relative cover in the tree canopy, or >30% relative cover when *S. lasiolepis* is present in the sub-canopy…

***Salix laevigata* Association**
In the *Salix gooddingii – Salix laevigata* Alliance (4113)

I.B. The tree overstory is characterized by a species of *Quercus* that is evenly distributed with >5% cover. The oak may be the sole dominant tree or share dominance with *Juniperus californica* …

I.B.1. *Quercus agrifolia* dominates the tree canopy and is an uncommon type in this region that tends to grow on soils with high organic matter. A variety of shrubs such as *Adenostoma fasciculatum, Arctostaphylos glauca, Ericameria linearifolia,*

Eriogonum fasciculatum and *Rhamnus ilicifolia* may be present in the understory …
***Quercus agrifolia* / *Adenostoma fasciculatum* – (*Salvia mellifera*) Association**
In the *Quercus agrifolia* Alliance (1111)

I.B.2. *Quercus douglasii* dominates or co-dominates with *Juniperus californica* or *Quercus agrifolia* in the tree overstory, or *Quercus* x*alvordiana* is the dominant oak species in an open to intermittent tree canopy ...

***Quercus douglasii* Alliance (1131)**

I.B.2.a. *Quercus douglasii* dominates or co-dominates with *Quercus agrifolia* in the tree overstory…

***Quercus douglasii – Quercus agrifolia* Association (1131)**

I.B.2.b. *Juniperus californica* is a sub- to co-dominant tree with *Quercus douglasii*, while *Ceanothus cuneatus* and/or *Cercocarpus betuloides (C. montanus)* is present and dominant or co-dominant in the shrub understory…

Quercus douglasii – Juniperus californica / Ceanothus cuneatus – Cercocarpus montanus Association (1131)

I.B.2.c. *Juniperus californica* is a sub- to co-dominant tree with *Quercus douglasii*, while *Ericameria linearifolia* is generally present and dominant or co-dominant in the shrub understory…

***Quercus douglasii – Juniperus californica / Ericameria linearifolia* Association (1131)**

I.B.2.d. *Juniperus californica* is a sub- to co-dominant tree with *Quercus douglasii*, while *Quercus john-tuckeri* is present and dominant or co-dominant in the shrub understory…

***Quercus douglasii – Juniperus californica / Quercus john-tuckeri* Association (1131)**

I.B.2.e. *Quercus* x*alvordiana* is dominant in the tree canopy, typically with an herbaceous understory…

***Quercus* x*alvordiana* Association (1131)**

I.B.2.f. *Quercus douglasii* is dominant with *Ericameria linearifolia* present in the shrub understory, which may mix with other shrubs such as *Arctostaphylos glauca, Adenostoma fasciculatum, Artemisia californica, Eriogonum fasciculatum, Rhamnus ilicifolia, and Salvia leucophylla*. *Poa secunda* is generally present and *Juniperus californica* is absent or low in cover (<1% absolute cover) …

***Quercus douglasii / Ericameria linearifolia* Association (1131)**

I.B.2.g. *Quercus douglasii* is dominant and *Juniperus californica* is absent or low in cover (<1% absolute cover) with an understory dominated mainly by *Eriogonum fasciculatum*…

***Quercus douglasii / Eriogonum fasciculatum* / herbaceous Association (1131)**

I.B.2.h. *Quercus douglasii* is dominant with annual grasses and forbs dominant

the understory, and shrubs have no or low (<3%) absolute cover. The most common herb species are non-natives *Bromus diandrus, B. hordeaceus, B. rubens,* and *Erodium cicutarium*. Native grasses *Nassella cernua* and *Poa secunda* are often present…

***Quercus douglasii* / Mixed herbaceous Association (1131)**

I.C. *Quercus john-tuckeri* is the dominant oak or it intermixes with similar or higher cover than *Juniperus californica*. A variety of shrubs such as *Ericameria linearifolia, Eriogonum fasciculatum* and *Salvia leucophylla* may be present in the shrub understory …

***Quercus john-tuckeri* Shrubland Alliance (2111)**

I.C.1. *Juniperus californica* occurs in the tree canopy and is similar or lower in cover to *Quercus john-tuckeri*. *Ericameria linearifolia* often intermixes in the shrub layer, and a variety of other sub-dominant shrubs such as *Eriogonum fasciculatum* and *Salvia leucophylla* can also occur…

***Quercus john-tuckeri – Juniperus californica – Ericameria linearifolia* Shrubland Association (2111)**

I.C.2. *Adenostoma fasciculatum* and *Ceanothus cuneatus* are characteristically present and subdominant to *Quercus john-tuckeri*. A variety of other shrubs may be present including *Arctostaphylos glauca* and *Eriogonum fasciculatum.* If *Juniperus californica* is present it is at low cover…

***Quercus john-tuckeri – Adenostoma fasciculatum* Shrubland Association (2111)**

I.C.3. *Quercus john-tuckeri* is the sole dominant in the low tree or tall shrub canopy. Other shrubs may be present at relatively low cover including *Adenostoma fasciculatum, Ceanothus cuneatus* and *Salvia leucophylla*…

***Quercus john-tuckeri* Shrubland Association (2111)**

I.D. The tree canopy is characterized by an even distribution of *Juniperus californica* with >4% absolute cover. *Quercus douglasii* is typically absent in the overstory and soils tend to be shallow and sandy or silty…

***Juniperus californica* Alliance (1121)**

I.D.1. *Juniperus californica* is in the overstory, and *Salvia leucophylla* is present in the shrub understory and other shrubs such as *Eriogonum fasciculatum* may be sub- to co-dominant. If *Ericameria linearifolia* present, it is much lower cover in cover than the *S. leucophylla*…

***Juniperus californica / Salvia leucophylla* Association (1121)**

I.D.2. *Juniperus californica* is in the overstory, and *Ericameria linearifolia* is present in the shrub understory and other shrubs such as *Eriogonum fasciculatum* or *Ephedra viridis* may be present and co-dominant with *E. linearifolia*. If *Salvia leucophylla* is present, it is much lower in cover than *E. linearifolia.* Various herbs are present in the understory…

***Juniperus californica / Ericameria linearifolia* / annual – perennial herb Association (1121)**

I.D.3. *Juniperus californica* is in the overstory, and *Adenostoma fasciculatum* is present in the shrub understory and other shrubs such as *Eriogonum fasciculatum* and *Quercus berberidifolia* may be sub- to co-dominant…

***Juniperus californica / Adenostoma fasciculatum – Eriogonum fasciculatum* Association (1121)**

I.D.4. *Juniperus californica* is in the overstory, and *Ephedra californica* and *Eriogonum fasciculatum* are present and often co-dominant alone or with other shrubs such as *Gutierrezia californica* in the shrub understory…

***Juniperus californica / Ephedra californica – Eriogonum fasciculatum* Provisional Association (1121)**

I.D.5. *Juniperus californica* is in the overstory, and *Artemisia californica* is present in the shrub understory and other shrubs such as *Eriogonum fasciculatum* may be sub- to co-dominant…

***Juniperus californica / Eriogonum fasciculatum – Artemisia californica* Association (1121)**

I.D.6. *Juniperus californica* is in the overstory, and Annual grasses and forbs dominate the understory and shrubs have low cover (<2% absolute cover)…

***Juniperus californica* / herbaceous Association (1121)**

<u>Class B.</u> Shrubland Vegetation

<u>Class B. Group I.</u> Shrublands dominated by sclerophyllous temperate broad-leaved shrubs (with leaves hardened by a waxy cuticle). They are dominated by typical chaparral shrub genera, including chamise (*Adenostoma fasciculatum*), manzanita (*Arctostaphylos*), *Ceanothus*, scrub oaks (*Quercus*), etc.

I.A. *Ribes quercetorum* is the dominant shrub in the canopy, often growing clonally on steep north-facing slopes, which have resprouted recently after fire…

***Ribes quercetorum* Association (2611)**

In the *Ribes quercetorum – Rhus trilobata – Frangula californica* Alliance

I.B. *Quercus berberidifolia* is dominant to co-dominant with other shrubs in the canopy. Trees may be emergent but have relatively low cover compared to shrubs. Stands are found on north-facing slopes with well- to extensively-drained soils…

***Quercus berberidifolia* Alliance (2211)**

I.B.1. *Quercus berberidifolia* and *Adenostoma fasciculatum* are co-dominant in the shrub canopy. and other chaparral shrubs may be present to sub-dominant…

***Quercus berberidifolia – Adenostoma fasciculatum* Association (2211)**

I.B.2. *Quercus berberidifolia* is dominant in the shrub canopy and *Arctostaphylos glauca* is present to co-dominant…

***Quercus berberidifolia – Arctostaphylos glauca* Association (2211)**

I.B.3. *Ceanothus cuneatus* and *Quercus berberidifolia* form an open to continuous shrub canopy with other chaparral shrubs…

***Quercus berberidifolia – Ceanothus cuneatus* Association (2211)**

I.B.4. *Quercus berberidifolia* and *Cercocarpus betuloides (C. montanus)* are co-dominant in the shrub canopy…

***Quercus berberidifolia – Cercocarpus montanus* Association (2211)**

I.B.5. *Quercus berberidifolia* is the sole dominant in the shrub canopy…

***Quercus berberidifolia* Association (2211)**

I.C. *Quercus john-tuckeri* is dominant or it intermixes with similar or higher cover than *Juniperus californica*. A variety of other shrubs such as *Ericameria linearifolia, Eriogonum fasciculatum* and *Salvia leucophylla* may be present. If *Arctostaphylos glauca* is co-dominant in the shrub canopy, key to the *A. glauca* Alliance. Stands are found primarily on north-facing slopes with well-drained soils…

***Quercus john-tuckeri* Alliance (2111)**

I.C.1. *Juniperus californica* occurs in the tree canopy and is similar or lower in cover to *Quercus john-tuckeri*. *Ericameria linearifolia* often intermixes in the shrub layer,

and a variety of other sub-dominant shrubs such as *Eriogonum fasciculatum* and *Salvia leucophylla* can also occur…

***Quercus john-tuckeri – Ericameria linearifolia/Juniperus californica* Association (2111)**

I.C.2. *Adenostoma fasciculatum* and *Ceanothus cuneatus* are characteristically present and subdominant to *Quercus john-tuckeri*. A variety of other shrubs may be present including *Arctostaphylos glauca* and *Eriogonum fasciculatum.* If *Juniperus californica* is present it is at low cover…

***Quercus john-tuckeri – Adenostoma fasciculatum* Association (2111)**

I.C.3. *Quercus john-tuckeri* is the sole dominant shrub in the shrub canopy. Other shrubs may be present at relatively low cover including *Adenostoma fasciculatum, Ceanothus cuneatus* and *Salvia leucophylla*…

***Quercus john-tuckeri* Association (2111)**

I.D. *Cercocarpus betuloides* (*C. montanus*) intermixes as a co-dominant to dominant shrub with other chaparral species. Stands occur in mesic scrub settings on north-facing, protected slopes and are rare in the region…

***Cercocarpus montanus* Alliance* (2212)**

I.E. *Ceanothus cuneatus* is dominant or shares dominance with *Adenostoma fasciculatum* or other shrubs (e.g. *Artemisia californica, Malacothamnus* sp.) in the canopy. Soils are often sandy and well-drained…

***Ceanothus cuneatus* Alliance (2227)**

I.E.1. *Adenostoma fasciculatum* co-dominates in the shrub canopy, sometimes having twice as much cover as *Ceanothus cuneatus.* Other shrubs may occur at low cover including *Arctostaphylos glauca…*

***Ceanothus cuneatus – Adenostoma fasciculatum* Association (2227)**

I.F. *Arctostaphylos glauca* is the sole dominant or is co-dominant with *Quercus john-tuckeri* and/or *Adenostoma fasciculatum* in the shrub canopy. Emergent trees may be present at low cover including *Quercus douglasii* and *Juniperus californica*…

***Arctostaphylos glauca* Alliance (2231)**

I.F.1. *Arctostaphylos glauca* is the sole dominant in the shrub canopy, and other shrubs if present are low in cover…

***Arctostaphylos glauca* Association (2231)**

I.F.2. *Quercus john-tuckeri* is sub- to co-dominant in the shrub canopy with *Arctostaphylos glauca*…

***Arctostaphylos glauca – Quercus john-tuckeri* Provisional Association (2231)**

I.F.3. *Adenostoma fasciculatum* co-dominates in the shrub canopy, sometimes having twice as much cover as *Arctostaphylos glauca…*

***Arctostaphylos glauca – Adenostoma fasciculatum* Association (2231)**

I.G. *Adenostoma fasciculatum* shares dominance in the shrub canopy with *Saliva mellifera* and/or a mix of coastal sage scrub species including *Artemisia californica*, *Eriogonum fasciculatum,* and *Salvia leucophylla* where the combined relative cover of coastal sage scrub species exceeds 33%…

***Adenostoma fasciculatum – Salvia* spp. Alliance (2226)**

I.G.1. *Salvia mellifera* is co-dominant with *Adenostoma fasciculatum* in the shrub canopy, with *A. fasciculatum* sometimes having twice as much cover as *S. mellifera.* Found on slopes of all aspects, but especially those with south-facing exposure…

***Adenostoma fasciculatum – Salvia mellifera* Association (2226)**

I.G.2. *Salvia leucophylla* is sub- to co-dominant with *Adenostoma fasciculatum* in the shrub canopy in combination with other coastal sage scrub species including *Eriogonum fasciculatum.*

***Adenostoma fasciculatum – Salvia leucophylla* Association (2226)**

I.H. *Adenostoma fasciculatum* dominates the shrub canopy with >50% relative cover…

***Adenostoma fasciculatum* Alliance (2223)**

I.H.1. *Adenostoma fasciculatum* is strongly dominant in the shrub canopy and *Ceanothus cuneatus* is present at higher cover than other shrubs, though still sub-dominant to *A. fasciculatum…*

***Adenostoma fasciculatum –* (*Ceanothus cuneatus)* Association (2223)**

I.H.2. *Adenostoma fasciculatum* is the sole dominant shrub, and generally has greater than 20% absolute cover. A variety of shrubs can occur as sub-dominants with sparse or low cover, including *Arctostaphylos glauca, Eriogonum fasciculatum, Ericameria linearifolia,* and others…

***Adenostoma fasciculatum* Association (2223)**

I.I. *Prunus ilicifolia* is dominant or co-dominant in the shrub layer with other shrubs including *Ribes* spp. and the twining *Marah fabaceus*…

***Prunus ilicifolia* ssp. *ilicifolia* Association**

In the *Prunus ilicifolia – Heteromeles arbutifolia – Ceanothus spinosus* Alliance

I.J. *Adenostoma sparsifolium* is dominant or co-dominant in the shrub layer with other chaparral or coastal scrub species. Scattered, uncommon stands occur in the CDFW Gifford unit and possibly other areas in the southwest portion of the Chimineas Ranch...

***Adenostoma sparsifolium* Alliance* (2112)**

<u>Class B. Group II.</u> Shrublands dominated by scale-like, microphyllous, or broad-leaved species, including drought-deciduous, cold-deciduous, or seral species. These are generally considered to be part of desert transition, riparian, coastal sage scrub or other more soft-leaved shrub habitats. Includes species of *Allenrolfea, Artemisia, Atriplex, Baccharis, Ephedra, Ericameria, Pluchea, Salix, Salvia,* and others.

II.A. Shrublands characterized by species that can tolerate saline or alkaline soils but are not necessarily restricted to these conditions. Includes *Allenrolfea, Atriplex, Frankenia,* and *Suaeda…*

II.A.1. *Allenrolfea occidentalis* dominates with >2% absolute cover on seasonally saturated soils, and other alkaline-tolerant shrubs such as *Atriplex* spp. may be present at low cover. Annual herbs are often present and variable in cover…

***Allenrolfea occidentalis* Alliance (4311)**

II.A.1.a. *Allenrolfea occidentalis* dominates the shrub canopy and *Lasthenia gracilis* and/or *L. ferrisiae* is characteristic to co-dominant with other herbs including *Bromus rubens, B. hordeaceus, Delphinium recurvatum,* and others in the herb layer …

***Allenrolfea occidentalis / Lasthenia gracilis* Provisional Association (4311)**

II.A.1.b. *Allenrolfea occidentalis* dominates the shrub canopy over an understory of herbs including salt grass (*Distichlis spicata*) and *Frankenia salina*…

***Allenrolfea occidentalis / Distichlis spicata* Provisional Association (4311)**

II.A.1.c. *Allenrolfea occidentalis* dominates the shrub canopy without the above indicator species in the herbaceous layer. Other herbs may be present including *Erodium cicutarium* and *Bromus madritensis* …

***Allenrolfea occidentalis* Association (4311)**

II.A.2. *Suaeda nigra (S. moquinii)* or *Isocoma acradenia* dominates the shrub canopy with >2% absolute cover and no other native shrub has higher cover.

***Suaeda moquinii* Alliance**

II.A.2.a. *Suaeda nigra (S. moquinii)* dominates the shrub canopy. *Lepidium dictyotum, Atriplex* spp.*, Frankenia salina, Hordeum murinum,* and other alkaline-tolerant species may be present…

***Suaeda moquinii – Lepidium dictyotum* Association (4314)**

II.A.2.b. *Isocoma acradenia* is dominant to patchy on flat to gentle slopes with a variety of herbs…

***Isocoma acradenia* Alkaline Wet Association (2323)**

II.A.3. *Frankenia salina* dominates as a sub-shrub or herb with > 30% relative cover and >2% absolute cover, though non-native herbs may be high in cover during some

years. Occurs in playas, alkaline depressions with seasonally moist, poorly drained soils…

***Frankenia salina* Association (4317)**
In the *Distichlis spicata* Interior Alliance

II.A.4. A species of *Atriplex* is dominant or co-dominant in the shrub canopy with >50% relative cover and generally >2% absolute cover. Other shrubs such as *Eastwoodiae elegans, Ericameria linearifolia,* or *Eriogonum fasciculatum* may be present at lower cover…

II.A.4.a. *Atriplex spinifera* dominates the shrub canopy. The herb layer has open to intermittent cover including *Bromus rubens, Erodium cicutarium, Poa secunda,* and *Lepidium nitidum*…

***Atriplex spinifera* / Herbaceous Association**
In the *Atriplex spinifera* Alliance (4312)

II.A.4.b. *Atriplex canescens* dominates the shrub canopy and other shrubs if present have low cover. Herbs such as *Erodium cicutarium, Malacothrix coulteri, Monolopia lanceolata, Phacelia* spp. and *Schismus* are present and may be higher in cover than the shrub layer…

***Atriplex canescens* / Herbaceous Provisional Association**
In the *Atriplex canescens* Alliance (2413)

II.A.4.c. *Atriplex polycarpa* dominates the shrub canopy. Herbs such as *Amsinckia tessellata, Bromus rubens, Eremalche parryi, Erodium cicutarium,* and *Monolopia lanceolata* are present and can be higher in cover than the shrub layer…

***Atriplex polycarpa*/Annual Association**
In the *Atriplex polycarpa* Alliance (2411)

II.A.4.d. *Atriplex lentiformis* dominates the shrub canopy over various herbs including *Distichlis spicata* and *Frankenia salina* …

***Atriplex lentiformis* Association**
In the *Atriplex* lentiformis Alliance

II.A.4.e *Atriplex confertifolia* dominates the shrub canopy …

***Atriplex confertifolia* Association**
In the *Atriplex* confertifolia Alliance

II.A.5. Shrublands in alkaline basins and high marshes with dominant plants or mixture of plants not like above…

North American Desert Alkaline-Saline Wet Scrub Group (4300) in the Warm & Cool Desert Alkali-Saline Marsh, Playa & Shrubland Macrogroup (6200 and 6400)

II.B. Shrublands characterized by species that grow in seasonally or intermittently flooded habitats on alluvial soils. Stands often occur along riparian and stream corridors, lake margins, permanent springs, marshes, or washes. Includes *Baccharis salicifolia, Lepidospartum, Pluchea, Salix* and others*...*

II.B.1. *Lepidospartum squamatum* characterizes an open shrub canopy along alluvial streams, washes, or fans, and may have as little as 2% absolute cover. Other shrubs such as *Artemisia californica* or *Ericameria nauseosa* may intermix as co-dominants …

***Lepidospartum squamatum* Alliance (4213)**

II.B.1.a. *Artemisia californica* is sub-dominant to co-dominant in the shrub canopy…

***Lepidospartum squamatum – Artemisia californica* Association (4213)**

II.B.1.b. Other shrubs if present occur at low cover, and a variety of herbs are present in the understory …

***Lepidospartum squamatum* / ephemeral annuals Association (4213)**

II.B.2. *Salix exigua* is dominant or co-dominant in the shrub canopy with >50% relative cover or >30% relative cover when *S. lasiolepis* is present...

***Salix exigua* Alliance* (4112)**

II.B.3. *Salix lasiolepis* is dominant in the shrub or tree canopy, typically with >50% relative cover…

***Salix lasiolepis* Association**
In the *Salix lasiolepis* Alliance (4114)

II.B.4. *Pluchea sericea* is present in the canopy with >2% absolute cover and no other shrub species have equal or greater cover. Stands occur around springs, seeps, irrigation ditches, canyon bottoms, streamsides, and seasonally flooded washes. May include *Baccharis salicifolia, Atriplex, Ericameria nauseosa,* and others. If *Baccharis salicifolia* is co-dominant key to that alliance …

***Pluchea sericea* Seasonally Flooded Association**
In the *Pluchea sericea* Alliance (4221)

II.B.5. *Baccharis salicifolia* is dominant or co-dominant in the shrub canopy usually with >3% cover. Stands occur along canyon bottoms, floodplains, irrigation ditches, lake margins, or stream channels and they may include a variety of other shrub species…

***Baccharis salicifolia* Alliance (4111)**

II.B.5.a. Other shrubs if present are low cover, and annual herbs including *Bromus rubens*, *Centaurea melitensis*, *Melilotus indicus,* and *Erodium* spp. are usually present and may be abundant in the understory…

***Baccharis salicifolia* Association (4111)**

II.B.5.b. *Pluchea sericea* is sub- to co-dominant in the shrub canopy (usually with lower cover than *Baccharis salicifolia*)…

***Baccharis salicifolia – Pluchea sericea* Association (4111)**

II.B.6. Stands not as above and characterized by any combination of *Salix exigua*, *Salix lasiolepis,* and *Baccharis salicifolia. Populus fremontii* and other *Salix* species may intermix. No clear dominance or co-dominance by any of these species. …

Warm Desert Lowland Freshwater Marsh & Bosque Macrogroup (4110)

II.B.7. *Forestiera pubescens* has >50% relative cover in the shrub canopy and grows in steep ravines and washes…

***Forestiera pubescens – Sambucus nigra* Provisional Association (4114)**
In the *Rhus trilobata – Crataegus rivularis – Forestiera pubescens* Alliance

II.B.8. *Prunus fasciculata* is the dominant shrub in the canopy, often occurring in riparian areas and steep moist slopes. *Ribes quercetorum* and *Juniperus californicus* may be present and low in cover…

***Prunus fasciculata* Association (4215)**
In the *Prunus fasciculata – Salazaria mexicana* Alliance

II.B.9. *Tamarix* sp. has >75% relative cover in the shrub canopy in riparian areas…

***Tamarix* spp. Semi-natural Association**
In the *Tamarix* spp. Semi-natural Alliance (9141)

II.C. Shrublands not as above and characterized by desert or desert-transition shrubs. Includes *Ambrosia, Eastwoodia, Ephedra, Ericameria, Peritoma (Cleome), Krascheninnikovia* and *Lycium…*

II.C.1. *Ephedra californica* has >2% absolute cover in an open shrub canopy on low elevation uplands and washes, with sandy soils. Other shrubs may be sub- to co-dominant, such as *Ambrosia salsola* or *Gutierrezia…*

***Ephedra californica – Ephedra trifurca* Alliance (4211)**

II.C.1.a. Stands occur in uplands where other shrubs are absent or low in cover. The herb layer is open to dense and may include *Amsinckia tessellata, Bromus rubens, Poa secunda* and others…

***Ephedra californica* / annual – perennial herb Association (4211)**

II.C.1.b. Stands occur in washes where *Ambrosia salsola* is typically present as a sub- to co-dominant. The herb layer is variable…

***Ephedra californica – Ambrosia salsola* Association (4211)**

II.C.1.c. *Ephedra californica* is codominant with *Gutierrezia californica* in the shrub layer …

***Ephedra californica – Gutierrezia californica* / *Eriastrum pluriflorum*
Association (4211)**

II.C.2. *Ephedra californica* occurs at >2% cover and usually co-dominates with *Eriogonum fasciculatum* in the shrub canopy. Often found on southern exposures with herbs such as *Amsinckia tessellata, Erodium cicutarium, Schismus* and others…

***Eriogonum fasciculatum – Ephedra californica* Provisional Association
In the *Eriogonum fasciculatum* Alliance (2317)**

II.C.3. *Ambrosia salsola* (*Hymenoclea salsola* var. *salsola*) characterizes an open to intermittent shrub canopy on sandy alluvial soils with >4% absolute cover. Other shrubs, such as *Eriogonum fasciculatum* and *Ericameria linearifolia,* may be present at lower cover in the canopy…

***Ambrosia salsola* Association
In the *Ambrosia salsola – Bebbia juncea* Alliance (2416)**

II.C.4. *Lycium andersonii* dominates the shrub canopy or co-dominates with *Ephedra nevadensis* on low elevation uplands or near washes. The shrub layer may include *Ephedra californica, Eriogonum fasciculatum, Gutierrezia californica*, *Krascheninnikovia lanata,* and others…

***Ephedra nevadensis – Lycium andersonii – Grayia spinosa* Alliance**

II.C.4.a. *Lycium andersonii* is dominant in the shrub canopy and other shrubs are absent or present at low cover*…*

***Lycium andersonii* Provisional Association (2522)**

II.C.4.b. *Lycium andersonii* shares dominance with *Ephedra nevadensis* in the shrub canopy*…*

***Ephedra nevadensis – Lycium andersonii* Association**

II.C.5. *Artemisia tridentata* is dominant or co-dominant on sandy alluvial soils in the lower Cuyama River drainage and in disjunct stands of the Ciervo-Panoche Natural Area. Stands tend to be small and scattered...

***Artemisia tridentata – Eriogonum fasciculatum* Association
In the *Artemisia tridentata* Alliance (2711)**

II.C.6. *Ericameria linearifolia, Eastwoodiae elegans, Peritoma arborea* (*Cleome isomeris*) and/or *Gutierrezia californica* dominant to co-dominant with each other or other shrubs in the shrub canopy. The shrub layer may also include *Ephedra californica, Eriogonum fasciculatum, Krascheninnikovia lanata* and others. The herb layer can be well-developed, and *Poa secunda* is characteristically present…

***Ericameria linearifolia – Cleome isomeris* Alliance (2335)**

II.C.6.a. *Eastwoodia elegans* is dominant or shares dominance with *Ericameria linearifolia…*

***Eastwoodia elegans* Association (2335)**

II.C.6.b. *Krascheninnikovia lanata* and/or *Eriogonum fasciculatum* are sub- to co-dominant in the shrub canopy with *Eastwoodia elegans…*

***Eastwoodia elegans – Krascheninnikovia lanata* Association (2335)**

II.C.6.c. *Peritoma arborea (Cleome isomeris)* is primarily dominant or shares dominance with *Ericameria linearifolia* in the shrub canopy…

***Cleome isomeris* Association (2335)**

II.C.6.d. *Ericameria linearifolia* is primarily dominant or co-dominant with other shrubs in the shrub overstory…

***Ericameria linearifolia* Association (2335)**

II.C.6.e. *Gutierrezia californica* dominates an open shrub canopy, and other shrubs may occur at low cover. The herb layer is usually well-developed, including natives such as *Poa secunda* and non-natives such as *Bromus* and *Erodium* species…

***Gutierrezia californica / Poa secunda* Association (2321)**

II.C.7. *Krascheninnikovia lanata* is dominant in the shrub canopy. Other shrub species may include *Eastwoodia elegans, Eriogonum fasciculatum* and *Gutierrezia californica …*

***Krascheninnikovia lanata* Association**
In the *Krascheninnikovia lanata* Alliance (2521)

II.C.8. *Ericameria nauseosa* has >50% relative cover in the shrub canopy and grows on well-drained soils in washes, stream terraces or slopes. The shrub layer may include *Ericameria linearifolia, Gutierrezia californica, Ambrosia salsola* and others, which are typically low in cover…

***Ericameria nauseosa* Association**
***In the Ericameria nauseosa* Alliance (2511)**

II.C.9. *Ephedra viridis* is dominant or sometimes can be co-dominant with *Ericameria linearifolia* or *Eriogonum fasciculatum*. The shrub layer may also include *Peritoma arborea* (*Cleome* i*someris)* and others, and the herb understory is well-developed with *Poa secunda* characteristically present…

***Ephedra viridis – Ericameria linearifolia/(Poa secunda)* Provisional Association**
In the *Ephedra viridis* Alliance (2525)

II.D. Shrublands characterized by coastal sage shrub species or disturbance followers, includes *Artemisia californica, Eriogonum fasciculatum, Eriodictyon, Lupinus albifrons, Malacothamnus,* and *Salvia* spp.*...*

II.D.1. *Salvia mellifera* is dominant or shares dominance with other coastal scrub species such as *Eriogonum fasciculatum* and/or *Artemisia californica* in the shrub overstory. Typically occurs on steep slopes…

Salvia mellifera – (Artemisia californica) **Alliance (2328)**

II.D.1.a. *Eriogonum fasciculatum* is sub- to co-dominant with *Salvia mellifera* in the shrub canopy and various herbs including *Bromus rubens* and *Salvia columbariae* are present in the understory…

Salvia mellifera – Eriogonum fasciculatum / Bromus rubens **Association (2328)**

II.D.1.b. *Salvia mellifera* is co-dominant with *Artemisia californica* in the shrub canopy…

Salvia mellifera – Artemisia californica **Association (2328)**

II.D.1.c. *Salvia mellifera* is the sole dominant in the shrub canopy…

Salvia mellifera **Association (2328)**

II.D.2. *Salvia leucophylla* and/or *Artemisia californica* dominant or co-dominate together or with *Eriogonum fasciculatum* and/or *Ericameria linearifolia…*

Artemisia californica – (Salvia leucophylla) **Alliance (2325)**

II.D.2.a. *Salvia leucophylla* is the sole dominant (>60% relative cover) in the shrub canopy…

Salvia leucophylla **Association (2325)**

II.D.2.b. *Artemisia californica* is co-dominant with *Salvia leucophylla*, and *Eriogonum fasciculatum* and *Hesperoyucca whipplei* are often present…

Salvia leucophylla – Artemisia californica **Association (2325)**

II.D.2.c. *Eriogonum fasciculatum* is sub- to co-dominant with *Salvia leucophylla* and the two species characterize the shrub canopy. Sometimes other shrubs such as *Artemisia californica* or the short-lived *Malacothamnus* can be present and co-dominant…

(Artemisia californica) – Salvia leucophylla – Eriogonum fasciculatum **Association (2325)**

II.D.2.d. *Artemisia californica* and *Eriogonum fasciculatum* are co-dominant in the shrub canopy, with both having >30% relative cover. Stands tend to occur on relatively hot and steep slopes. The shrub layer may include *Hesperoyucca whipplei, Salvia leucophylla, Malacothamnus* spp. or other shrubs*....*

Artemisia californica – Eriogonum fasciculatum **Association (2314)**

II.D.2.e. *Artemisia californica* dominates (with >60% relative cover) in the shrub canopy while other shrubs have sparse or low cover. Often found on relatively steep slopes…

***Artemisia californica* Association (2312)**

II.D.3. *Eriogonum fasciculatum* and/or *Hesperoyucca whipplei* dominant or co-dominate together in the shrub canopy. Soils are usually sandy and well-drained…

***Eriogonum fasciculatum* Alliance (2317)**

II.D.3.a. *Eriogonum fasciculatum* is dominant in the shrub layer, and other shrub species have sparse or low cover…

***Eriogonum fasciculatum* Association (2317)**

II.D.3.b. *Eriogonum fasciculatum* var. *polifolium* is dominant in the shrub layer, and *Eriastrum pluriflorum* is present in the understory along with other native herbs such as *Chorizanthe* spp. and *Salvia columbariae.* Defined from the Clear Creek area…

***Eriogonum fasciculatum* var. *polifolium* / *Eriastrum pluriflorum* Association**

II.D.3.c. *Hesperoyucca whipplei* occurs at >2% cover and usually co-dominates with *Eriogonum fasciculatum* in the shrub canopy. Sometimes *E. fasciculatum* is low in cover and *H. whipplei* has a much higher relative cover. Often found on southern exposures with native herbs such as *Amsinckia tessellata, Dichelostemma capitatum, Salvia columbariae, Uropappus lindleyi* and others…

***Eriogonum fasciculatum* var. *foliolosum* – *Hesperoyucca whipplei* Association (2317)**

II.D.3.d. *Ephedra californica* occurs at >2% cover and usually co-dominates with *Eriogonum fasciculatum* in the shrub canopy. Often found on southern exposures with herbs such as *Amsinckia tessellata, Erodium cicutarium, Schismus* and others…

***Eriogonum fasciculatum* – *Ephedra californica* Association (2317)**

II.D.4. *Eriodictyon crassifolium* is dominant in an open shrub canopy. This uncommon type often occurs in chaparral stands that that have had recent fire or similar disturbance.

***Eriodictyon crassifolium* Provisional Association* (2228)**
In the *Lotus scoparius* – *Lupinus albifrons* – *Eriodictyon* spp. Alliance

II.D.5. *Lupinus albifrons* dominates in the shrub canopy and grows on slopes that may be disturbed, steep, and unstable. A variety of coastal sage shrubs may be present, including *Ericameria linearifolia, Eriogonum fasciculatum,* and others…

***Lupinus albifrons* Association**
In the *Lotus scoparius* – *Lupinus albifrons* – *Eriodictyon* spp. Alliance

II.D.6. *Malacothamnus* jonesii dominates in the shrub canopy with low cover of other shrubs including *Eriogonum fasciculatum* and *Salvia leucophylla* …

***Malacothamnus* (*aboriginum, fremontii, hallii*) Provisional Association**

In the *Malacothamnus fasciculatus – Malacothamnus* spp. Alliance

Class C. Herbaceous Vegetation

Vegetation characterized by non-woody, herbaceous species in the canopy including grass, graminoid, and broad-leaved herbaceous species. Woody species may be emergent, typically with <5% cover.

I.A. Vegetation is characterized mainly by wetland graminoid, playa or vernal pool species, including graminoids such as *Distichlis, Juncus*, *Eleocharis*, *Schoenoplectus,* and forbs such as *Atriplex, Lasthenia, Lepidium* and *Mimulus.*

I.A.1. *Mimulus guttatus (Erythranthe guttata)* or related *Mimulus* species, a wetland forb, is dominant or characterizes stands along with other herbs such as *Stachys albens*…

***Mimulus guttatus* Association**
In the *Mimulus guttatus* – *Cirsium* spp. – *Stachys* spp. Alliance

I.A.2. *Eleocharis macrostachya* is dominant along lakeshores, streambeds, swales, pastures, ditches, and ponds. *Juncus arcticus* (var. *mexicanus* or *balticus*)*, Polypogon monspeliensis, Rumex crispus, Distichlis spicata,* and a variety of other wetland herbs may be present…

***Eleocharis macrostachya* Lowland Association (6312)**
In the *Juncus* (*effusus*, *patens*) – *Carex* (*pansa*, *praegracilis*) Alliance

I.A.3. *Juncus arcticus* var. *balticus* is dominant or co-dominant along edges of streams, lakes, and ponds. A variety of wetland graminoids or forbs intermix in the herbaceous layer, and *Rorippa nasturtium-aquaticum* and *Polypogon monspeliensis* may have similar or higher cover than *Juncus*…

***Juncus arcticus* var. *balticus* – (var. *mexicanus*) Association**
In the *Juncus arcticus* (var. *balticus*, *mexicanus*) Alliance (6211)

I.A.4. *Schoenoplectus americanus* or *S. pungens* dominates or co-dominates along streams, around ponds and lakes, marshes, and roadside ditches. Soils are poorly drained. *Typha* spp.*, Distichlis spicata, Eleocharis* spp.*, Polypogon monspeliensis, Schoenoplectus maritimus* and a variety of other wetland herbs may be present…

***Schoenoplectus americanus* Alliance (6111)**

I.A.4.a. *Schoenoplectus pungens* dominates, and other herbs are lower in cover…

***Schoenoplectus pungens* Provisional Association (6111)**

I.A.4.b. *Schoenoplectus americanus* dominates, and other herbs are lower in cover…

***Schoenoplectus americanus* Association (6111)**

I.A.5. *Typha* spp. dominates in the tall herb layer…

***Typha* (*latifolia*, *angustifolia*) Association**
In the *Typha* (*angustifolia*, *domingensis*, *latifolia*) Alliance

I.A.6. *Euthamia occidentalis* dominates the herb layer along with subdominant *Typha angustifolia* in wet meadow settings…

***Euthamia occidentalis* Provisional Association**
In the *Bidens cernua – Euthamia occidentalis – Ludwigia palustris* Alliance

I.A.7. *Nicotiana quadrivalvis* dominates the herb layer along stream beds, terraces and basin bottoms with low cover of other native herbs such as *Atriplex argentea* and *Croton setiger*…

***Nicotiana quadrivalvis* Provisional Association**
In the *Artemisia dracunculus* Alliance

I.A.8. Vegetation not as above and characterized by vernal pool, playa, and swale species such as *Distichlis spicata, Eleocharis*, *Eryngium, Lasthenia, Layia, Downingia, Plagiobothrys*, *Psilocarphus,* and others. Restricted to winter-flooded or at least winter-saturated substrates watered by ambient precipitation; not of convex or upland slopes.

Western North American Vernal Pool Macrogroup (6300)
Californian Vernal Pool / Swale Bottomland Group (6310)

I.A.8.a. Shallow alkaline or saline vernal pools and playas…

***Lasthenia fremontii – Distichlis spicata* Alliance (6313)**

I.A.8.a.i. Native annual species *Atriplex vallicola, Lasthenia ferrisiae,* and/or *Lepidium jaredii* ssp. *jaredii* dominate, co-dominate, or are characteristically present in stands. Sometimes, *Lepidium nitidum* or *L. dictyotum* may be higher cover than the indicator species of the association, and other native herbs such as *Spergularia marina* are often present and variable in cover. ...

***Atriplex vallicola – Lasthenia ferrisiae – Lepidium jaredii* Association**

I.A.8.a.ii. Native annual and perennial species such as *Frankenia salina, Myosurus minimus, Psilocarphus brevissimus,* and *Plagiobothrys* spp. dominate, co-dominate, or are characteristically present in stands. If *Frankenia salina* dominates in other settings without vernal pool indicators, key to the *Frankenia salina* Association under the *Distichlis spicata* Interior Alliance…

***Frankenia salina – Psilocarphus brevissimus* Provisional Association**

I.A.8.b. Vernal pools and playas dominated by ephemeral annuals that are variable across seasons. No diagnostic vernal pool species present (e.g., *Lasthenia fremontii* or *Downingia* sp.), but other characteristic plants of vernal pools such as *Plagiobothrys* and *Psilocarphus* dominate or co-dominant with other herbs. …

***Plagiobothrys stipitatus – Psilocarphus brevissimus* Provisional Association**
In the *Lasthenia fremontii – Downingia (bicornuta)* Alliance

I.A.9. Native perennial grasses and forbs are characteristic and evenly distributed across the herbaceous layer, though non-native herbs sometimes are dominant. Diagnostic species include *Distichlis spicata, Elymus (Leymus) triticoides, Isocoma acradenia* and *Frankenia salina* in alkaline wetlands, playas, intermittently flooded terraces, and other similar locations…

I.A.9.a. *Distichlis spicata* and/or *Frankenia salina* is dominant or co-dominant with >30% relative cover in the herb layer. Soils are often deep, alkaline or saline, and poorly drained. *Erodium cicutarium* and *Hordeum murinum* as well as a variety of other native and non-native forbs and grasses may be present…
***Distichlis spicata* Interior Alliance (6411)**

I.A.9.a.i. *Frankenia salina* dominates as a sub-shrub or herb with > 30% relative cover and >2% absolute cover, though non-native herbs may be high in cover during some years. Occurs in playas, alkaline depressions with seasonally moist, poorly drained soils…
***Frankenia salina* Association (4317)**

I.A.9.a.ii. *Distichlis spicata* dominant (>50% relative cover) in the herb layer, though various annual and perennial forbs may be present…
***Distichlis spicata* Interior Association (6411)**

I.A.9.a.iii. *Distichlis spicata* is co-dominant with *Juncus arcticus* var. *balticus* in the herbaceous layer and other perennial species may be present including *Schoenoplectus americanus*, and *Typha* sp…
***Distichlis spicata – Juncus arcticus var. balticus (J. mexicanus)* Interior Association**

I.A.9.b. *Elymus (Leymus) triticoides* is dominant on poorly drained floodplains, pond/lake margins, drainages and valley bottoms. *Hordeum murinum, Erodium cicutarium, Bromus, Distichlis spicata,* and a variety of other native and non-native forbs and grasses may be present…
***Leymus cinereus – Leymus triticoides* Alliance (6213)**

I.A.9.b.i. *Elymus (Leymus) triticoides* is dominant in the herb layer…
***Leymus triticoides* Association**

I.A.9.b.ii. *Elymus (Leymus) triticoides* is characteristic in the herb layer while other non-native grasses dominate including *Bromus diandrus, B. rubens, B. hordeaceus*, and *Avena* spp…
***Leymus triticoides – Bromus* spp. – *Avena* spp. Association**

I.A.10. Stands with low cover of alkaline/saline adapted herbaceous plants (like *Distichlis spicata, Frankenia salina,* and *Leymus triticoides)* and not like above…

North American Desert Alkaline-Saline Marsh & Playa Group in the Warm & Cool Desert Alkali-Saline Marsh, Playa & Shrubland Macrogroup (4300, 6200 and 6400)

I.B. Vegetation is characterized mainly by upland and mesic herbaceous or sub-shrub species, including native and non-native grasses and forbs…

I.B.1. Annual native herbs are characteristic and evenly distributed across the herbaceous layer with at least 10% relative cover, though non-native forbs and grasses may be dominant. Diagnostic species include *Amsinckia*, *Coreopsis calliopsidea, Eschscholzia, Lasthenia, Layia, Monolopia*, *Phacelia*, *Plantago erecta, Festuca (Vulpia) microstachys…*

Californian Annual Grassland & Forb Meadow Group (5110)

I.B.1.a. Native annual species including *Festuca (Vulpia) microstachys*, *Plantago erecta* and/or *Lasthenia californica* (or *L. gracilis)* characteristically present in stands. Other native species such as *Acmispon wrangelianus*, *Castilleja exserta, Crassula connata, Lepidium nitidum, Lupinus,* and *Trifolium* species are often well-represented (and sometimes co-dominant to dominant). Non-natives such as *Erodium cicutarium* and *Bromus rubens* may also be sub-dominant to dominant in stands, along with a variety of other herbs. Soils may be clayey, wet to moist in spring and dry by summer…

***Lasthenia californica – Plantago erecta – Vulpia microstachys* Alliance (5114)**

I.B.1.a.i. *Festuca* (*Vulpia) microstachys* and *Plantago erecta* or *P. ovata* co-dominate in the herbaceous layer with a diverse mix of native and non-native herbs…

***Vulpia microstachys – Plantago erecta* Association (5114)**

I.B.1.a.ii. *Festuca* (*Vulpia) microstachys* co-dominates with non-natives such as *Erodium cicutarium* and *Schismus*, as well as a diverse mix of native herbs at lower cover including *Amsinckia tessellata, Astragalus didymocarpus, Eriogonum gracillimum, Lasthenia gracilis* and *Microseris elegans* and a variety of other herbs…

***Erodium cicutarium – Vulpia microstachys* Association (5114)**

I.B.1.a.iii. *Lepidium nitidum* and/or *Trifolium gracilentum* are characteristically present to co-dominate in stands with *Festuca* (*Vulpia) microstachys* along with other native and non-native herbs…

***Lepidium nitidum – Trifolium gracilentum – Vulpia microstachys* Association (5114)**

I.B.1.a.iv. *Plagiobothrys canescens* is characteristically present along with *Lasthenia* spp., *Plantago erecta, Crassula connata, Festuca* (*Vulpia) microstachys,* and *Lepidium nitidum* along with a variety of other native herbs…

Lasthenia gracilis – Plantago erecta – Plagiobothrys canescens **Association (5114)**

I.B.1.a.v. *Lasthenia gracilis* is dominant or co-dominant with other herbs on vernal alkaline flats…

Lasthenia (californica, gracilis) **Association (5114)**

I.B.1.a.vi. *Lasthenia minor* is dominant with other herbs on vernal alkaline flats of the valley floor of Carrizo Plain. Stands are rare in the region …

Lasthenia minor **Provisional Association (5114)**

I.B.1.a.vii. *Layia platyglossa or L. munzii* is dominant on flats with a rich mix of other native and non-native herbs including *Lasthenia gracilis* …

Layia **(*platyglossa*, *munzii*) Provisional Association (5114)**

I.B.1.a.viii. *Pectocarya linearis, P. penicillata* or *P. heterocarpa* is seasonally co-dominant to dominant on sandy flats with *Calandrinia ciliata, Camissonia campestris, Lasthenia gracilis, Leptosiphon liniflorus, Schismus* sp., *Vulpia microstachys,* and other herbs. Stands interdigitate with *Amsinckia* herb stands and *Ephedra* shrub stands …

Pectocarya **(*linearis, penicillata*) Association (5114)**

I.B.1.b. *Lepidium jaredii* ssp. *album* and *L. nitidum* are characteristic and co-dominant on upland clay soils of the Ciervo-Panoche Natural Area along with other native herbs including *Plagiobothrys acanthocarpus*…

Lepidium jaredii **ssp. *album – Lepidium nitidum*** **Provisional Association In the *Lasthenia californica – Plantago erecta – Vulpia microstachys*** **Alliance (5114)**

I.B.1.c. *Micropus californicus* is dominant in the herbaceous layer with a rich diversity of native geophytes including *Dipterostemon capitatus* and other herbaceous species…

Micropus californicus **Provisional Association In the *Lasthenia californica – Plantago erecta – Vulpia microstachys*** **Alliance (5114)**

I.B.1.d. *Eschscholzia californica, Lupinus* spp., and/or *Salvia carduacea* are seasonally dominant on upland slopes or flats with sandy to loamy soils that are well drained. *Amsinckia*, *Avena, Bromus rubens*, *Castilleja exserta, Erodium cicutarium, Uropappus lindleyi* and a variety of other native and non-native forbs and grasses may be present…

Eschscholzia (californica) – Lupinus (nanus) **Alliance (5113)**

I.B.1.d.i. *Eschscholzia californica* is seasonally dominant on upland slopes or flats…

***Eschscholzia californica* Association (5113)**

I.B.1.d.ii. *Lupinus bicolor* is seasonally dominant on grazed flats…

***Lupinus bicolor* Association (5113)**

I.B.1.d.iii. *Lupinus microcarpus* and/or *L. succulentus* dominates or co-dominates with other herbs on mesic north-facing slopes…

***Lupinus bicolor (microcarpus, succulentus)* Provisional Association**

I.B.1.d.iv. *Salvia carduacea* is dominant or co-dominant on moist alluvial toeslopes and terraces adjacent to washes with well-drained sandy soils and alluvium. *Camissonia campestris, Chaenactis glabriuscula, Erodium cicutarium, Malacothrix californica, Leptosiphon liniflorus, Pectocarya penicillata, Schismus* and others also occur in the herb layer, and *Gutierrezia californica* typically occurs at low cover in the shrub layer...

***Salvia carduacea* Association (5116)**

I.B.1.e. A species of *Amsinckia* or *Phacelia ciliata* and/or *P. tanacetifolia* is/are seasonally characteristic to dominant in the herbaceous layer. Soils are often well-drained and loamy and may have high levels of bioturbation (e.g., kangaroo rat precincts), high levels of (past/current) grazing and/or other disturbance...

***Amsinckia (menziesii, tessellata) – Phacelia* spp. Alliance (5111)**

I.B.1.e.i. *Amsinckia furcata* or *A. vernicosa* are present and dominant alone or they co-dominant with other herbs including *Eriogonum* spp. on loose shale barrens…

***Amsinckia (furcata, vernicosa)* Provisional Association (5111)**

I.B.1.e.ii. *Amsinckia tessellata* is co-dominant to dominant in the herb layer with *Erodium cicutarium*. *Astragalus didymocarpus, Bromus rubens, Caulanthus (Guillenia) lasiophylla, Acmispon wrangelianus,* and *Vulpia microstachys* may also be present with a variety of other native and non-native herbs…

***Amsinckia tessellata – Erodium cicutarium* Association (5111)**

I.B.1.e.iii. *Amsinckia menziesii* is co-dominant to dominant in the herb layer with *Erodium* spp. *Amsinckia tessellata* and emergent shrubs may also be present at low cover. *Astragalus didymocarpus, Bromus rubens, Caulanthus inflatus,* and *C. (Guillenia) lasiophylla* may also be present with a variety of other native and non-native herbs…

***Amsinckia menziesii – Erodium* spp. Association (5111)**

I.B.1.e.iv. *Amsinckia intermedia* is sub-dominant to dominant with a variety of other native and non-native herbs including *Bromus diandrus*…

***Amsinckia (intermedia, menziesii)* Association (5111)**

I.B.1.e.v. *Phacelia ciliata* is present and sub-dominant to dominant with *Amsinckia* spp., *Bromus rubens, Caulanthus (Guillenia) lasiophylla, Erodium cicutarium* and other species. Stands occur on terraces, flats and toeslopes usually adjacent to *Amsinckia* stands, on well-drained soils and on grazed lands…

***Phacelia ciliata* Herbaceous Association (5111)**

I.B.1.e.vi. *Phacelia tanacetifolia* is seasonally dominant or co-dominant on steep, dry slopes of siltstone derived soils. A variety of other herbs such as *Amsinckia tessellata, Malacothrix coulteri* and *Monolopia lanceolata* are present. Stands typically on moderate to steep slopes facing southeast and southwest...

***Phacelia tanacetifolia* Herbaceous Association (5115)**

I.B.1.f. Not as above and a native herbaceous species including *Astragalus didymocarpus, Acmispon wrangelianus, Croton setiger, Trichostema lanceolatum, Salvia columbariae, Chaenactis* spp., or an annual *Eriogonum* spp. is present and seasonally characteristic to dominant in the herbaceous layer…

***Amsinckia (menziesii, tessellata) – Phacelia* spp. Alliance (5111)**

I.B.1.f.i. *Acmispon (Lotus) wrangelianus* and/or *Astragalus didymocarpus* are seasonally dominant or co-dominant in the herbaceous layer. A variety of other herbs such as *Amsinckia tessellata, Castilleja exserta,* and *Lupinus microcarpus* may also occur…

***Astragalus didymocarpus – Lotus wrangelianus* Association**

I.B.1.f.ii. *Croton setiger* or *Trichostema lanceolatum* are dominant or co-dominant in the herbaceous layer late in the season. A variety of other native herbs may be present including *Lagophylla ramosissima* and other non-native species…

***Croton setigerus* – (*Trichostema lanceolatum*) Provisional Association**

I.B.1.f.iii. An annual *Eriogonum* species including *Eriogonum angulosum, E. gracillimum,* or *E. clavatum* is dominant alone or co-dominates with a variety of other native and non-native species including *Acmispon wrangelianus, Amsinckia tessellata* and *Plantago erecta…*

***Eriogonum* (*angulosum*, *gracillimum*) – *Amsinckia tessellata* Provisional Association**

I.B.1.f.iv. *Salvia columbariae*, *Chaenactis fremontii,* and/or *C. stevioides* is dominant alone or co-dominates with each other and a variety of other native

and non-native forbs and grasses including *Amsinckia tessellata, Phacelia tanacetifolia, Eremothera boothii,* and *Malacothrix coulteri…*

***Salvia columbariae – Chaenactis* (*fremontii, stevioides*) Provisional Association**

I.B.1.g. *Plagiobothrys nothofulvus* is dominant or characteristic with a variety of native and non-native forbs and grasses including *Castilleja exserta, Primula clevelandii* and *Viola douglasii* …

***Plagiobothrys nothofulvus – Castilleja exserta –* (*Lupinus nanus*) Provisional Association**
In the *Plagiobothrys nothofulvus* Alliance

I.B.1.h. *Holocarpha virgata* or *H. obconica* dominate the herbaceous layer with a diverse mix of native forbs including *Chorizanthe* spp…

***Holocarpha* (*heermannii*, *virgata*) Alliance**
***Holocarpha virgata* Association**

I.B.1.i. *Leptosyne (Coreopsis) calliopsidea, Monolopia* spp*,* and/or *Mentzelia pectinata* is/are seasonally dominant or co-dominant on steep, dry slopes. A variety of other native herbs such as *Amsinckia tessellata, Caulanthus (Guillenia) lasiophylla,* and *Malacothrix coulteri* are often present…

***Monolopia (lanceolata) – Coreopsis (calliopsidea)* Alliance (5115)**

I.B.1.i.i. *Leptosyne (Coreopsis) calliopsidea* and/or *Mentzelia pectinata* are seasonally dominant on steep, dry slopes with siltstone and gypsum-derived soils. A variety of other herbs such as *Amsinckia tessellata, Caulanthus inflatus, Chaenactis stevioides, Caulanthus (Guillenia) lasiophylla, Erodium cicutarium,* and *Phacelia* spp. are present…

***Coreopsis calliopsidea – Mentzelia pectinata* Association (5115)**

I.B.1.i.ii. *Eschscholzia hypecoides* is seasonally dominant to co-dominant with *Monolopia lanceolata* and *Erodium cicutarium* on sandy slopes, while other native annual forbs have lower cover…

***Eschscholzia hypecoides – Monolopia lanceolata* Provisional Association**

I.B.1.i.iii. *Monolopia lanceolata* is seasonally dominant or co-dominant with *Amsinckia tessellata* and other native and non-native species on fine-textured, moderate to steep slopes …

***Monolopia lanceolata* Herbaceous Association (5115)**

I.B.1.i.iv. *Monolopia stricta* is seasonally dominant on clay and silty hill slopes with *Amsinckia tessellata, Erodium cicutarium* and other forbs and grasses…

***Monolopia stricta* Association (5115)**

I.B.1.i.v. *Monolopia major* is seasonally dominant or co-dominant with other annual forbs and grasses on light clayey slopes…

***Monolopia major* Provisional Association**

I.B.2. Perennial native grasses or native forbs are characteristic and evenly distributed across the herbaceous layer, though non-native forbs and grasses may be dominant. Diagnostic species include *Achnatherum hymenoides, Corethrogyne filaginifolia, Eriogonum* spp., *Eriophyllum confertiflorum, Poa secunda* and *Stipa cernua…*

Californian Perennial Grassland Group (5120)

I.B.2.a. *Poa secunda* characterizes the herbaceous layer and is evenly distributed throughout the stand along with numerous native and non-native forbs and grasses…

***Aristida purpurea – Elymus elymoides – Poa secunda* Alliance (5122)**

I.B.2.a.i. *Poa secunda* dominants or co-dominates with *Monolopia stricta, M. lanceolata* and/or *Coreopsis calliopsidea* in the Soda Lake basin associated with *Erodium cicutarium, Layia munzii* and other herbs…

***Monolopia stricta – Poa secunda* Association (5122)**

I.B.2.a.ii. *Poa secunda* is dominant or co-dominant with *Bromus rubens* on clayey soils of both flats and north-facing hillslopes along with *Amsinckia tessellata, Erodium cicutarium, Dipterostemon capitatus* and other herbs …

***Poa secunda – Bromus rubens* Association (5122)**

I.B.2.a.iii. *Poa secunda* is dominant and other native forbs and grasses co-occur including *Clarkia cylindrica, C. tembloriensis, Elymus elymoides,* and *Eriogonum cithariforme*…

***Poa secunda – (Elymus sp.) – Clarkia cylindrica* Association (5122)**

I.B.2.b. *Nassella cernua* characterizes the herbaceous layer with >2% absolute cover on well-drained soils. *Erodium cicutarium* is usually present and co-dominant to dominant. Other herbs including *Castilleja exserta, Bromus rubens, Lasthenia californica, Acmispon wrangelianus, Trifolium albopurpureum,* and *Pectocarya penicillata* are often present…

***Nassella cernua* Association**
In the *Nassella* spp. – *Melica* spp. Alliance (5121)

I.B.2.c *Corethrogyne filaginifolia, Eriogonum nudum*, *E. elongatum*, or *Eriophyllum confertiflorum* characterizes the sub-shrub / herb layer on shallow soils, stands are often co-dominated by native and non-native grasses and annual forbs and typically have grazing or other disturbance history…

***Corethrogyne filaginifolia – Eriogonum (elongatum, nudum)* Alliance**

I.B.2.a. *Eriogonum nudum* or *E. elongatum* is dominant on low hills, mound, and toeslopes that usually have exposed bare ground and rocky soils, which may be disturbed by small mammals or grazing animals …

I.B.2.a.i. *Eriogonum elongatum* is characteristic and often co-dominates with *Bromus rubens* and other native and non-native herbs on low hills and mounds…

***Eriogonum elongatum* Association (5132)**

I.B.1.a.ii. *Eriogonum nudum* is co-dominant with non-native grasses and other herbs such as *Stipa cernua* and *Amsinckia tessellata*…

***Eriogonum nudum* Provisional Association (5132)**

I.B.1.a.iii. *Eriogonum nudum* var. *indictum* is dominant or co-dominant with *Bromus rubens*, and *Eriogonum vestitum* is characteristically present. Stands occur on rock-derived sedimentary substrates and slate…

***Eriogonum nudum* var. *indictum* – *Eriogonum vestitum* Association**

I.B.1.b. *Corethrogyne filaginifolia* is dominant or co-dominant on gentle to moderate slopes with sandy soils growing with *Castilleja exserta, Erodium cicutarium* and other herbs…

***Corethrogyne filaginifolia* Association (5131)**

I.B.1.c. *Eriophyllum confertiflorum* is dominant and characteristic in the sub-shrub or herb layer with *Amsinckia tessellata…*

***Eriophyllum confertiflorum* Association**

I.B.3. *Achnatherum hymenoides* is characteristic in the herb layer on sandy soils and usually greater than 10% absolute cover …

***Achnatherum hymenoides – Oenothera deltoides* Association**
In the *Achnatherum hymenoides* Alliance

I.B.4. Vegetation not as above and characterized or dominated by a pure to mixed assemblage of annual or perennial herbs and grasses. Adapted to winter precipitation and summer drought, typically not of bottomland or concave conditions, but of uplands. Stands may have significant non-native herbaceous cover, but they contain diagnostic presence native species of forbs and/or grasses…

Californian Annual & Perennial Grassland Macrogroup (5100)

I.B.5. Vegetation not as above and strongly dominated by non-native annual herbaceous and/or grass species including *Aegilops triuncialis, Avena* spp*., Brachypodium distachyon, Brassica nigra, Bromus* spp*., Centaurea melitensis, Cynosurus echinatus, Festuca perennis, Salsola tragus, Schismus, Sisymbrium irio* and other mustards. Native plants, if present, are trace in presence and abundance.

Often in heavily disturbed or developed areas, including past agricultural and livestock areas…

Californian Ruderal Grassland, Meadow & Scrub Group (5200)
Great Basin & Intermountain Ruderal Shrubland & Grassland Group
Western North American Cool Semi-Desert Ruderal Scrub & Grassland Macrogroup

I.B.5.a. *Avena*, *Bromus*, and/or *Erodium* spp. dominate individually or in combination, with overall non-native herbs > 90% relative cover…

***Avena* spp. – *Bromus* spp. Semi-natural Alliance**

I.B.5.a.i. *Avena barbata* and/or *A. fatua* is strongly dominant with other non-native grasses and forbs such as *Erodium cicutarium* and *Hordeum murinum*…

***Avena barbata – Avena fatua* Semi-natural Association**

I.B.5.a.ii. *Bromus diandrus* is strongly dominant with other non-native grasses and forbs such as *Avena* spp. and *Erodium cicutarium…*

***Bromus diandrus* – Mixed herbs Semi-natural Association**

I.B.5.a.iii. *Erodium botrys* is strongly dominant with other non-native grasses / forbs including *Bromus hordeaceus* and *Vicia benghalensis …*

***Bromus hordeaceus – Erodium botrys* Semi-natural Association**

I.B.5.a.iv. *Hordeum murinum* is co-dominant with other non-native grasses and forbs including *Bromus hordeaceus, B. diandrus*, *Festuca myuros,* and *Medicago polymorpha…*

***Bromus hordeaceus – Hordeum* spp. – *Medicago polymorpha* Semi-natural Association**

I.B.5.b. *Brassica nigra*, *Raphanus sativus, Carduus pycnocephalus, Carthamus lanatus, Centaurea melitensis, C. solstitialis, Picris echioides, Silybum marianum,* or another non-native forb dominates in the herbaceous layer, often in old or active agriculture lands with overall non-native herbs > 90% relative cover.

***Brassica nigra – Centaurea (solstitialis, melitensis)* Semi-natural Alliance**

I.B.5.b.i. *Centaurea melitensis* dominates the herbaceous layer with other non-native grasses and forbs including *Erodium cicutarium, Festuca myuros,* and *Avena* spp…

***Centaurea melitensis* Semi-natural Association**

I.B.5.c. *Sisymbrium irio* is dominant on dry, flat sandy soils that include disturbed and cleared areas…

***Sisymbrium irio* Provisional Semi-natural Association**
In the *Brassica tournefortii – Malcolmia africana* Provisional Semi-natural Alliance

I.B.5.d. *Bromus rubens, B. madritensis, Schismus arabicus*, *S. barbatus* and/or *Erodium cicutarium* strongly dominant in stands, and native plants, if present, are trace (<1%) in cover.

***Bromus rubens – Schismus* (*arabicus, barbatus*) Semi-natural Alliance (5200)**

I.B.5.d.i. *Bromus madritensis, B. rubens* and/or *Erodium cicutarium* dominate the herbaceous layer with other non-native grasses and forbs including *Hordeum murinum...*

***Bromus (madritensis, rubens) – Erodium cicutarium* Semi-natural Association**

I.B.5.d.ii. *Schismus arabicus* and/or *S. barbatus* dominate the herbaceous layer with other non-native grasses including *Hordeum murinum* and *Bromus rubens*...

***Schismus* (*arabicus*, *barbatus*) Provisional Semi-natural Association**

I.B.5.e. *Lolium perenne* dominates or co-dominates with other non-natives in the herbaceous layer. Native species are typically less than 10% relative cover…

Lolium perenne* Semi-natural Alliance

I.B.5.f. *Salsola tragus* is strongly dominant in the herbaceous layer …

***Salsola* spp. Semi-natural Association**

In the *Salsola tragus – Isatis tinctoria – Bassia* spp. Semi-natural Alliance

I.C. Vegetation is characterized by dune plants including *Oenothera deltoides, Abronia pogonantha,* and/or *Rumex hymenosepalus*…

***Dicoria canescens – Abronia villosa – Panicum urvilleanum* Alliance**

I.C.1. *Oenothera deltoides* and/or *Abronia pogonantha* occur as dominants alone or co-dominants with other herbs including native and non-native species such as *Deinandra kelloggii* in sand dunes and sand flats…

***Abronia pogonantha – Oenothera deltoides* Provisional Association**

I.C.2. *Rumex hymenosepalus* dominates alone or co-dominates in the herbaceous layer with *Ambrosia acanthicarpa*…

***Rumex hymenosepalus* Provisional Association**

Class D. Unvegetated or Urbanized

I.A. Unvegetated (9110)

I.A.1. Developed (9111)

I.A.2. Road (9112)

I.A.3. Cliff & Rock Outcrops (9113)

I.A.4. River & Lacustrine Flats & Streambeds (9114)

I.A.5. Playa (9115)

I.B. Agriculture (9120)

I.C. Water (9130)

I.C.1. Perennial Stream Channel (9131)

I.C.2. Reservoirs & Ponds (9132)

I.D. Exotic trees and shrubs (9140)

I.D.1. *Tamarix* (9141)

I.E. Unknown (9999)

Appendix D – Glossary

The following terms with their respective definitions have been established in developing the vegetation classification, field keys, and descriptions.

- **Taxon** – Species names defined in the PLANTS Database (USDA NRCS 2023), except in two cases: When a more current name has been assigned in the Jepson eflora (Jepson Flora Project 2023), or for general vegetation terms such as moss and lichen.
- **Lifeform terms:**
  - **Tree** – Is a one-stemmed woody plant that normally grows to be greater than 5 meters tall. In some cases, trees may be multiple-stemmed (ramifying) after fire or other disturbance, but size of mature plants is typically greater than 5 m and undisturbed individuals of these species are usually single stemmed.
  - **Regenerating tree** – seedlings and saplings defined as follows:
    - *Seedlings* – trees clearly of a young age that have less than 1" diameter at breast height (dbh) or have not reached breast height. Applies only to trees propagating from seed; resprouts are not recorded here even if they meet the size requirements.
    - *Saplings* – trees with 1" – 6" dbh and young in age, OR small trees that are less than 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 greater than 6" dbh, then the re-sprouts would be recorded under the "Tree" stratum.
  - **Understory tree** – trees that grow beneath the main canopy of a forest/woodland.
  - **Shrub** – Is normally a multi-stemmed woody plant that generally has several erect, spreading, or prostrate stems and that is usually between 0.2 meters and 5 meters tall, giving it a bushy appearance. Definitions are blurred at the low and the high ends of the height scales. At the tall end, shrubs may approach trees based on disturbance frequencies (e.g., old-growth re-sprouting species such as *Quercus wislizeni,* etc., may frequently attain "tree size"). At the low end, woody perennial herbs or sub-shrubs of various species are often difficult to categorize into a single life-form; usually sub-shrubs (per USDA-NRCS 2023) were categorized in the "shrub" category.
  - **Herb** – Is any vascular plant species that has no main woody stem-development, and includes grasses, forbs, and perennial species that die-back seasonally.
  - **Cryptogam –** Is a nonvascular plant or plant-like organism without specialized water or fluid conducting vascular tissue (i.e., xylem and phloem). Includes mosses, lichens, liverworts, hornworts, and algae.
- **Cover** – The primary metric used to quantify the abundance of a particular species or a particular vegetation layer within a plot. It was measured by estimating the aerial

extent of the living plants, or the “bird’s-eye view” looking from above for each category. Various subcategories of cover for species and vegetation are defined as follows:

- **Absolute cover** – Refers to the actual percentage of the ground (surface of the plot or stand) that is covered by a species or group of species. For example, *Pseudotsuga menziesii* covers between 5% and 10% of the stand. Absolute cover of all species or groups if added in a stand or plot may total greater or less than 100% because it is not a proportional number.
- **Relative cover** – Refers to the amount of the surface of the plot or stand sampled that is covered by one species (or physiognomic group) as compared to (relative to) the amount of surface of the plot or stand covered by all species (in that group). Thus, 50% relative cover means that half of the total cover of all species or physiognomic groups is composed of the single species or group in question. Relative cover values are proportional numbers and, if added, total 100% for each stand (sample).
- **Dense/Continuous cover** – Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where there is greater than 66 percent absolute cover.
- **Intermittent cover** – Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where there is 33-66 percent absolute cover.
- **Open cover** – Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where the cover is less than 33 percent absolute cover.
- **Sparse cover** – Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where the *average* cover value is <2% absolute cover (though the range in cover could be <1-9% cover).
- **Emergent** – A plant (or vegetation layer) is considered emergent if it includes plants that rises above a predominant vegetation layer, but that are sparse in cover. It is considered as a member of the next tallest layer, but typically has an absolute cover < 10%.

- **Constancy, Cover-Abundance, and Related Terms** – Used in the key, descriptions and the vegetation constancy tables for the species summarized within all stands of the alliance or association (codes from tables in parentheses):
  - **Constancy** (Con) – Number of occurrences divided by the number of samples X 100%
  - **Diagnostic** – A species or group of species whose relative constancy or abundance differentiates one vegetation type from another; the term can include character, constant, differential, and indicator species (Jennings et al. 2006).
  - **Dominant** (D) – Must be in at least 75% of the samples, with at least 50% relative cover in all samples.
  - **Co-dominant** (cD) – Must be in at least 75% of the samples, with at least 30% relative cover in all samples.
  - **Characteristic** (Char) – Present in at least 75% of the samples for that vegetation type, with no restriction on cover.
  - **Abundant** – Present in 50 to 75% of the samples, with at least 50% relative cover.

- **Usually/Often** (Often) – Present in 50 to 75% of the samples, with no restriction on cover.
- **Sometimes** – Present in 25 to 50% of the samples, with no restriction on cover.
- **Average** (Avg) **and Relative Cover** (RelCov) – Average cover for a taxon in a vegetation type is calculated as the sum of its 'absolute' cover values divided by the total sample size; relative cover is calculated as the comparative sum of cover values for one taxon compared to the sum of cover values of other taxa, in which proportional numbers are derived (see **Cover** section for more details).
- **Minimum** (Min) and **Maximum** (Max) – The minimum and maximum cover values that a taxon had from the surveys of a vegetation type. Values could be an absolute cover value (e.g., 1%) and/or a mid-point value of a cover class (e.g., 2.5% for a cover class of 1–5 %) depending on data available

- **Stand** – Is the basic physical unit of vegetation in a landscape. It has no set size. Some vegetation stands are very small such as wetland seeps, and some may be several square kilometers in size such as desert or forest types. A stand is defined by two main unifying characteristics:
  - 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 gradual.
  - It has *structural* integrity. It has a similar history or environmental setting, affording relatively similar horizontal and vertical spacing of plant species. For example, a hillside forest formerly dominated by the same species, but that has burned on the upper part of the slope and not the lower is divided into two stands. Likewise, a sparse woodland occupying a slope with shallow rocky soils is considered a different stand from an adjacent slope of a denser woodland/forest with deep moister soil and the same species.

- **Vegetation:**
  - **Woodland and forest vegetation**: In the National Vegetation Classification, a woodland is defined as a tree-dominated stand of vegetation with between 25 and 60 percent cover of trees and a forest is defined as a tree-dominated stand of vegetation with 60 percent or greater cover of trees.
  - **Shrubland vegetation**: Shrubs (including dwarf-shrubs) are evenly distributed throughout the stand, providing a consistent (even if sparse) structural component, and one or both of the following criteria are met: (1) Shrubs influence the distribution or population dynamics of other plant species; (2) Shrubs play an important role in ecological processes within the stand.
  - **Herbaceous vegetation**: Herbs are evenly distributed throughout the stand, providing a consistent (even if sparse) structural component, and play an important role in ecological processes within the stand, and the stand cannot be characterized as a tree or shrub stand.
  - **Nonvascular vegetation**: Nonvascular organisms provide a consistent (even if sparse) structural component and play an important role in ecological processes within the stand.
  - **Semi-natural/ruderal vegetation**: Stands characterized by naturalized non-native species. Examples include *Tamarix* spp., and *Brassica* spp. Note: the

terminology for semi-natural versus ruderal plant communities is still under discussion with ESA Vegetation Panel and Hierarchy Review Working Group, and in the last 5 years the classification names have gone back and forth between these two terms.

- **US National Vegetation Classification (USNVC, or NVC) Hierarchy Levels:**
  - **Class** – A vegetation classification unit of high rank (1st level) defined by a broad combination of dominant general growth forms adapted to basic moisture, temperature, and/or substrate or aquatic conditions (FGDC 2008).
  - **Subclass –** A vegetation classification unit of high rank (2nd level) defined by a combination of general dominant and diagnostic growth forms that reflect global mega- or macroclimatic factors driven primarily by latitude and continental position, or that reflect overriding substrate or aquatic conditions (FGDC 2008).
  - **Formation –** A vegetation classification unit of high rank (3rd level) defined by a Combination of dominant and diagnostic growth forms that reflect global macroclimatic conditions as modified by altitude, seasonality of precipitation, substrates, and hydrologic conditions (FGDC 2008).
  - **Division –** A vegetation classification unit of intermediate rank (4th level) defined by a combination of dominant and diagnostic growth forms and a broad set of diagnostic plant species that reflect biogeographic differences in composition and continental differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes (FGDC 2008).
  - **Macrogroup** – A vegetation classification unit of intermediate rank (5th level) defined by a moderate set of diagnostic plant species and diagnostic growth forms that reflect biogeographic differences in composition and sub-continental to regional differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes (FGDC 2008).
  - **Group** – A vegetation classification unit of intermediate rank (6th level) defined by combinations of relatively narrow sets of diagnostic plant species (including dominants and co-dominants), broadly similar composition, and diagnostic growth forms that reflect biogeographic differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes (FGDC 2008).
  - **Alliance** – A classification unit of vegetation of low rank (7th level), containing one or more associations and defined by one or more diagnostic species, often of high cover, in the uppermost layer or the layer with the highest canopy cover. Alliances reflect physiognomy as well as regional to subregional climates, substrates, hydrology, and disturbance regimes (Jennings et al. 2006, FGDC 2008). The USNVC assigns Alliances a database code and scientific name.
  - **Association** – A vegetation classification unit of low rank (8th level) defined by a diagnostic species, a characteristic range of species composition, physiognomy, and distinctive habitat conditions (Jennings et al. 2006). Associations reflect local topo-edaphic climates, substrates, hydrology, and disturbance regimes**.**
- **Other Classification Terms:**
  - **Provisional Type –** A vegetation type that is not yet formally described, but expected to be an addition to the existing list of USNVC types for a project area. The type may be represented by plot samples (e.g., <10 samples), while it may

or may not be particularly common or because it is localized in extent; however, it could be documented in additional location(s) outside of the study area.

- **Conservation Rank** – The California Department of Fish and Wildlife's Vegetation Classification and Mapping Program's Survey of California Vegetation (SCV) uses the state Heritage Program methodology per NatureServe for natural community conservation ranks as defined below (and see http://www.natureserve.org). "G" indicates the alliance's rarity and threat globally, and "S" indicates the alliance's rarity and threat in California:
  - **G1 and S1** – Critically Imperiled—At very high risk of extinction due to extreme rarity. Often 5 or fewer viable occurrences and/or up to 518 hectares.
  - **G2 and S2** – Imperiled—At high risk of extinction due to very restricted range, very few occurrences, steep declines, or other factors. Often 6–20 viable occurrences, and/or 518–2,590 hectares
  - **G3 and S3** – Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations, recent and widespread declines, or other factors. Often 21–100 viable occurrences and/or 2,590–12,950 hectares.
  - **G4 and S4** – Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors. Often greater than 100 viable occurrences and/or more than 12,950 hectares.
  - **G5 and S5** – Secure—Common; widespread and abundant.
    - If a vegetation type (i.e., alliance or association) is marked with a G1 through a G3 code, it is rare and threatened throughout its range. A type marked with a G5 and an S1 through an S3 code is secure through its range outside the state but is rare and threatened in California. A G4/S4 type may or may not be endemic to the state and is secure statewide.
    - Semi-natural alliances and associations are not ranked.
- **Abbreviations and Other Characters:**
  - **Parentheses ( )** – When parentheses are used around a species name within a vegetation type name, it indicates that the species is often present as an indicator of that association or alliance, but it does not meet a threshold of 75% or more constancy. The parentheses may be used around the full scientific name or only around the species epithet. An example is the *Pinus muricata – (Arbutus menziesii – Notholithocarpus densiflorus) / Vaccinium ovatum* Association. If parentheses are only around the species epithet, it means that the genus is consistently present but another species could also be present from that genus. An example is the *Artemisia californica / Nassella (pulchra)* Association, where the genus may be represented by one or more species found within the parentheses.
  - **NVC Alliance Code:** The assigned database code and scientific name for the Alliances in the USNVC.
- **Local Environmental Attributes –** Used in the alliance and association descriptions.

- **Macrotopography** – broad topographic term to describe general position of a stand in the surrounding watershed (e.g., top, upper third, middle third, lower third, and/or bottom) followed by the number of surveys noted in parentheses within each position.
- **% Surface cover:** The abiotic ground surface substrates of the plot/survey.
    - **Large rock** – percent cover of rocks on the ground with a diameter greater than 25 cm. Includes rocks that were recorded in the field as bedrock, boulder (>60 cm in diameter) and stone (>25 cm – 60 cm in diameter).
    - **Small rock** – percent cover of rocks on the ground with a diameter ranging from 2 mm to 25 cm. Includes rocks that were recorded in the field as gravel (2 mm – 7.5 cm in diameter) and cobble (>7.5 cm – 25 cm in diameter).
    - **Fines Cover** – percent (exposed) cover of fine sediment or soil particles with a diameter less than 2 mm; i.e., ground that is not covered by litter, small rock, or large rock.
    - **Litter Cover** – percent cover of litter, duff, and/or unattached wood on the ground.
- **County Watersheds** – List of county-wide distribution by watershed unit followed by the number of surveys noted in parentheses within each unit (CalWater 2004).

Site Impacts – Used in the alliance and association descriptions to depict the degree of non-native plant cover and most frequent or abundant non-native plant species. Categories for the average non-native plant cover relative to native cover include low (≤20% relative cover), moderate (20-50% relative cover), and high (>50% relative cover).

Appendix E – Vegetation Descriptions of Alliance & Associations

See separate electronic file for the local Alliance and Association descriptions to the inner Central Coast of California.