

**Vegetation classification and mapping of Peoria Wildlife Area,  
South of New Melones Lake, Tuolumne County, California**

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## INTRODUCTION

The U.S. Bureau of Reclamation (BOR) contracted with the California Native Plant Society (CNPS) and Aerial Information Systems (AIS) to produce a vegetation classification and map of the Peoria Wildlife Area in Tuolumne County, California. This area has a heterogeneous mix of vegetation types within the central Sierra Nevada foothills, including grassland, riparian woody and herbaceous, chaparral, and oak woodland vegetation types. Vegetation resources were assessed quantitatively through field surveys, data analysis, and mapping.

Field survey data were analyzed statistically to come up with a floristically-based vegetation classification. Each vegetation type sampled was classified floristically according to the National Vegetation Classification System to the alliance and association level. The vegetation associations (and alliances) were described floristically and environmentally in standard descriptions, and a final key was produced to quickly differentiate 46 vegetation types.

A vegetation mapping effort was undertaken parallel to the classification effort through interpretation of digital ortho-photographs and true-color aerial photographs for vegetation signatures. A final detailed map was produced through hand-delineation of polygons on color photos, digitization of polygons, and attribution of the vegetation type, overstory cover, and tree diameter at breast height. The map is in a Geographic Information System (GIS) digital format, as is the field database of surveys.

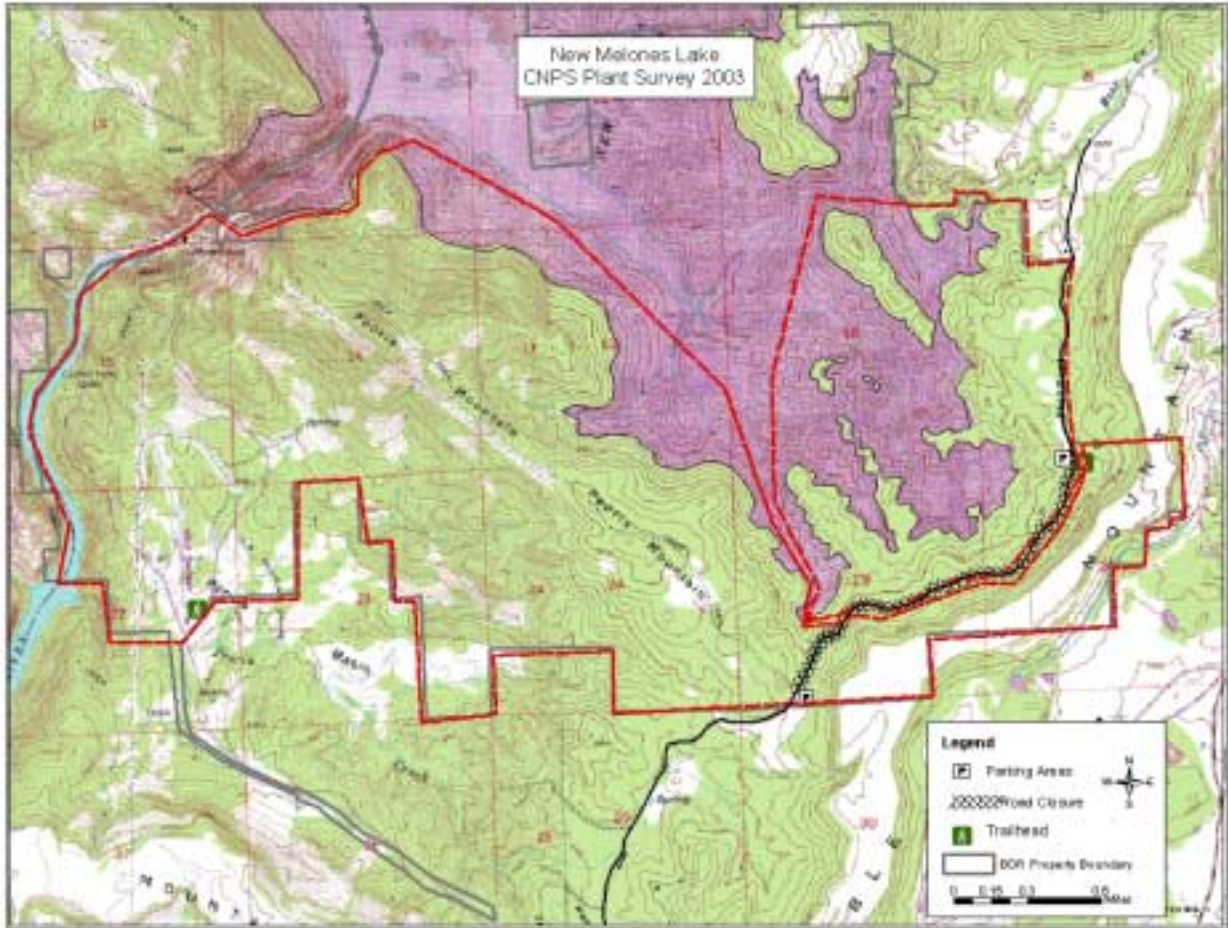
The objective of this study was to distinguish the vegetation types and to provide data for future management of the plant communities. The surveys and map provide a baseline dataset with floristic and ecological detail. Since the region has a variety of human uses, including illegal hunting and off-road vehicle use, illegal camping, dumping, and road maintenance, the final products can assist in resource protection, restoration, monitoring, and the like by reviewing and comparing the vegetation assemblages and site qualities.

## VEGETATION CLASSIFICATION METHODS

### *Study area*

The Peoria Wildlife Area is immediately south of New Melones Lake in Tuolumne County, California. The study area is north of Highway 108 and approximately 8 kilometers (5 miles) southwest of the town of Sonora in the foothills of the Sierra Nevada Mountains (see Figure 1). The climate is Mediterranean, with relatively cool, moist winters and warm, dry summers. The mean annual precipitation is around 65-70 cm (25.6-27.6 in) per year, with a majority falling between October and April. The mean temperatures range from about 0°C in December/January to 38°C in July/August (at New Melones Dam Headquarters per the National Climatic Data Center 1996).

Environmentally and floristically, the study area is diverse. It includes flat expanses along lower to mid slopes and along ridge tops, steep upland slopes, intermittent drainages, perennial watercourses, and seeps. Altitude ranges along the ridge from about 80 to 450 m (or 260 to 1475 ft). The soils include serpentine and plutonic soils in the southwestern section of the study area, metamorphic in the northwestern, marine sedimentary in the northeastern section, and volcanic flow in the southeastern section. The vegetation includes grasslands, oak woodlands and forests, pine and oak forests, chaparral, and deciduous shrublands.



**Figure 1.** Survey area including Peoria Wildlife Area and Table Mountain



## Sampling

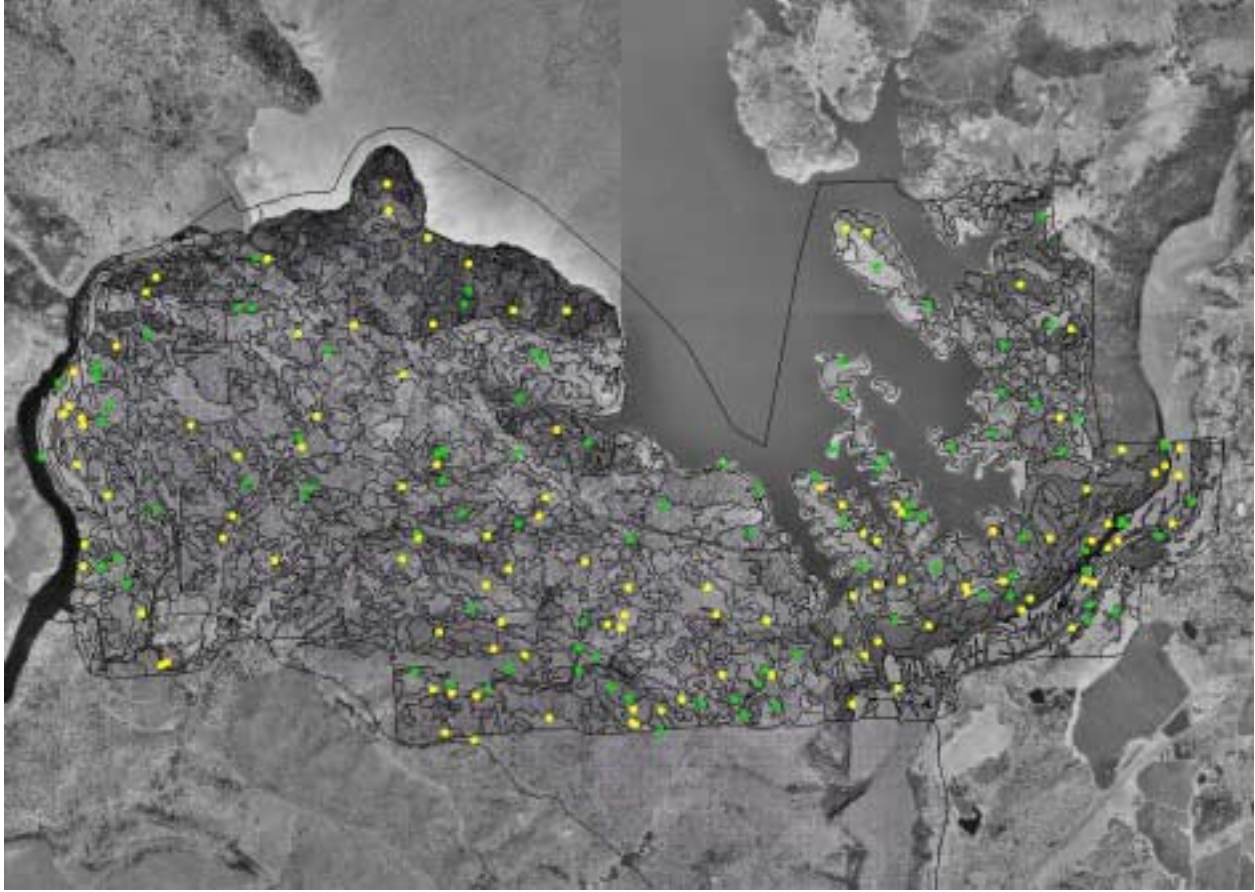
The Peoria Wildlife Area is owned and managed by the U.S. Bureau of Reclamation. A preliminary vegetation classification was developed from an existing California vegetation classification (Sawyer and Keeler-Wolf 1995) and from initial reconnaissance of the study area. The preliminary reconnaissance occurred in early April 2003, with AIS and CNPS staff accompanied by a BOR representative. Upon creating the preliminary classification, a preliminary vegetation map was created using black-and-white digital orthophotos. This map was used to select sampling locations to develop a final, detailed vegetation classification and map. The goal for sampling was to obtain at least three samples of each of the vegetation types that were initially mapped. Thus, samples were stratified by vegetation type and then they were randomly selected across the study area per known vegetation types. In factoring in the number of polygons delineated per vegetation type, around 2-12 samples were selected randomly per mapped type. An additional 10 samples of unknown vegetation signatures also were selected.

Two staff members from the California Native Plant Society (Sau San and Jeanne Taylor) have conducted the majority of field sampling from mid-April 2003 to late July 2003. Other CNPS and Dept. of Fish and Game staff (Julie Evens, Diana Hickson, and Todd Keeler-Wolf) assisted them four separate times. The Relevé protocol was used in tandem with the Vegetation Rapid Assessment protocol to collect 106 complementary samples to classify and describe the vegetation (see the [www.cnps.org](http://www.cnps.org) website for the protocol descriptions and forms), and three additional Rapid Assessments to further assess polygons for an initial total of 109 Assessments. Then 96 additional rapid assessments were collected to test the accuracy of the final mapping effort (see accuracy assessment section) and to complete the floristic classification (see Figure 2 for point locations for all the samples).

The Relevé protocol is a detailed methodology for identifying species and environmental characteristics in defined plot sizes. Plot sizes vary depending on the habit of the vegetation: 100 m<sup>2</sup> (5x20 m<sup>2</sup> or 10x10 m<sup>2</sup>) for grasslands, 400 m<sup>2</sup> (8x50 m<sup>2</sup> or 20x20 m<sup>2</sup>) for shrublands, and 1000 m<sup>2</sup> (20x50 m<sup>2</sup>) for woodlands and forests. Each relevé takes about 2 hours to complete.

The Rapid Assessment protocol is a concise methodology for collecting the salient vegetation and environmental features across an entire stand or polygon of vegetation (not just the confined plot boundary). Each assessment takes about 30 minutes to complete. The survey size varies depending on the size of the stand and the accessibility of the entire stand, and thus could be <1 acre or > 5 acres in size.

With both of these protocols, data were collected on homogeneous "stands" of vegetation, which were identified by locating areas of homogeneous vegetation composition, species abundance, and site history. For each stand identified, a list of tree, shrub, and/or herb species was recorded (on average, each relevé list contained about 10 to 40 native and non-native species, and each rapid assessment list contained 12 native species and any additional non-native species). Each species was designated a height stratum (low=<0.5 m, medium=>0.5 to 5 m, and tall=>5 m), and the abundance or percent cover of each species was assessed by estimating the percentage of ground area covered by living parts. Sometimes, species could be identified and cover estimated in more than one stratum (e.g., *Quercus douglasii* may be recorded in the low, medium and tall layers). The percent cover estimates were transformed into ranked categories similar to the Braun-Blanquet (1932/1951) system for the data analysis (categories: 1=<1%, 2=1-5%, 3=>5-15%, 4=>15-25%, 5=>25-50%, 6=>50-75%, 7=>75%).



**Figure 2.** Locations of the field surveys. The initial 109 initial Rapid Assessment survey locations are in yellow, and the 96 Accuracy Assessment surveys are in green. The backdrop includes the final aerial photo mapping (polygons in black) and black and white digital orthophotos

Along one long-edge of every relevé, a point-intercept also was conducted to count the frequency of species that intercept a tape measure at set intervals. The length of the tape measure and distance of the intervals vary depending on habit of vegetation: 10 m long and 0.1 m intervals for grasslands, and 50 m long and 0.5 m intervals for shrublands, woodlands, and forests. Two 8"-long nails were pounded into the ground (if the ground surface permitted) to mark the start and end of the transect line. A metal detector could be used to later find the two ends. Outside of the line/tape measure, additional species outside of the line were recorded at a distance of 2.5 m on either side of the line. The complementary approach of relevé, rapid assessment and point-intercept sampling was conducted at 106 survey locations. These data may be useful for long-term monitoring of vegetation over time as well as for coming up with a robust classification.

All survey locations were recorded in Universal Transverse Mercator (UTM) and North American 1983 datum using global positioning system (GPS) receivers. One GPS location was recorded within a representative location of each rapid assessment survey. One GPS location was recorded at the northwest corner of each relevé, and two GPS locations were recorded for both ends of the point-intercept. Standard sets of additional variables were collected as part of all field samples. These include altitude, degree aspect, degree slope, total vegetative cover, total overstory cover, total understory cover, geologic substrate, and soil texture.

In August of 2003, unknown plant specimens collected from the surveys were identified using the Jepson Manual (1993) and other related keys. From September to December, 2003, all surveys were entered and quality controlled in standardized databases. The information is archived in two resulting databases. One database is an MS Access for Rapid Assessment surveys, which has a form for entering and viewing the data records. All associated data survey information is in RAPlots, RAPplants, and RAImpacts tables. Other tables are look-up reference tables for the functionality of the forms and data tables. Another MS Access database called CVIS (California Vegetation Information System) stores the relevé and point-intercept data. These data were entered on-line through a secured SQL-connection. Then the data were downloaded into the Access database containing survey information in tables starting with "Plot\_" and the associated look-up tables for codes used in the data entry forms.

Once all the data were digital by early 2004, an involved process of developing a standardized, quantitative classification of the study area was performed. In the following paragraphs a detailed description of the processes and methods involved are described. In brief, the phases can be summarized as follows:

1. Accumulate existing literature and combine into preliminary classification of vegetation types
2. Target the various vegetation types using current field sampling to capture all bio-environments in the study area and fill in the gaps in the existing classification
3. Analyze new samples to develop quantitative classification rules
4. Bring the classification into accordance with the standardized National Vegetation Classification System
5. Develop keys and descriptions to all the alliances of the mapping area

### *Existing Literature Review*

Beginning in early April 2003, information from Sawyer and Keeler-Wolf (1995) and Allen-Diaz et al. (1989) were compiled to obtain the most current view of local vegetation with respect to the National Vegetation Classification (NVC). This information was developed into a preliminary, floristic classification of vegetation at the alliance and association level. The initial inventory suggested that about 20 associations existed in the mapping area.

### *Cluster analyses for vegetation classification*

In 2004, analyses of sample data were undertaken using the PC-ORD software suite of classification and ordination tools (McCune and Mefford 1997). PC-ORD performs multivariate analyses to generate order out of complex biological patterns. It can be used to objectively define groups of samples into a formalized classification of community types, using programs such as TWINSpan (Hill 1979), Cluster Analysis and Ordination (McCune and Mefford 1997).

Classification analyses of cluster analysis and TWINSpan were performed in a complementary approach to objectively classify the samples and to create order out of complex vegetation patterns in the data. The main groups were defined by similarities in species composition and abundance. Through this process, a classification of the different natural communities or vegetation types can be scientifically made, based mainly on floristic and secondarily on environmental factors. When these analyses show similar results, they substantiate each other, providing a consistent, strong analysis (Gauch 1982, Parker 1991).

Following the 2003 sampling effort by the CNPS Vegetation Program staff, 109 relevés and 95 rapid assessment surveys were used for the analysis. The relevé and rapid assessment data were kept separate in two discrete classification analyses, because they are based on different sampling premises (plot-based versus stand-based/plotless, respectively).

In general, the classification of both datasets followed a standard process. First, the classification included all sample-by-species information, which was subjected to two basic cluster analysis runs. The first was based on presence/absence of species with no additional cover data considered. This provided a general impression of the relationships between all the groups based solely on species membership. The second was based on abundance (cover) values converted to 7 different classes using the following modified Braun-Blanquet (1932/1951) cover categories: 1=<1%, 2=1-5%, 3=>5-15%, 4=>15-25%, 5=>25-50%, 6=>50-75%, 7=>75%. The first four cover classes compose the majority of the species values. This second run demonstrated the modifications that cover values can make on the group memberships. Prior to these analyses, data were screened for outliers (extreme values of sample units or species), and they were removed to reduce heterogeneity and increase normality in the dataset. Samples that were more than three standard deviations away from the mean were removed (using outlier analysis in PC-ORD), and species that were in fewer than three samples were removed.

Since plant community datasets are inherently heterogeneous and more than one underlying gradient usually determines the heterogeneity in plant patterns, a hierarchical agglomerative Cluster Analysis was employed (McCune and Grace 2002) with Sorensen distance and flexible beta linkage method at -0.25. A cluster analysis dendrogram is produced using this technique, whereby samples are grouped together hierarchically into clusters of groups (from many nested subgroups to 2 main groups). Depending on the size of the data set, the runs were modified to show from 2 to 15 groups, with the intent to display the natural groupings at the finest level of floristic classification (the association) rather than the alliance level.

After the Cluster Analysis runs, Indicator Species Analysis (ISA) was employed to decide objectively what group level to "cut" the dendrogram and explicitly interpret the groups. Further, ISA was used to designate species that indicate the different groups. ISA produced indicator values for each species in each of groups within the dendrogram, and these species were tested for statistical significance using a Monte Carlo technique (Dufrene and Legendre 1997). ISA was repeated at successive group levels from the 2 main groups of the dendrogram on up to more than 20 groups (i.e., the maximum number of groups allowable, where all groups have at least 2 samples per group). Since single member groups are not allowable in this analysis, ISA was run from 2 to 20 groups for the relevé dendrogram, and from 2 to 24 groups for the rapid assessment dendrogram. At each group level, the analysis was evaluated to obtain the

total number of significant indicator species ( $p$ -value  $\leq 0.5$ ) within each group level and the mean  $p$ -value for all species. The group level that had the highest number of significant indicators and lowest overall mean  $p$ -value was selected for the final evaluations of the community classification (McCune and Grace 2002). At this grouping level, plant community names within floristic classes were applied to the samples of the different groups.

Naming conventions followed the floristic units of "associations", as defined by the National Vegetation Classification System (Grossman et al. 1998) and the California Native Plant Society (Sawyer and Keeler-Wolf 1995). An association is defined by a group of samples that have similar dominant and characteristic species in the overstory and other important and indicator species, whereby these species are distinctive for a particular environmental setting. Further, significant indicator species were drawn from the analysis and applied to the associations. A set of similar associations are grouped hierarchically to the next level in the classification, the alliance-level. For example, different types of blue oak woodland are classified to the association level depending on the characteristic overstory and understory species (e.g., Blue Oak/Poison Oak/Annual Grass-Herb as compared to Blue Oak-Buckeye/Annual Grass-Herb), while there is a blue oak alliance based on the characteristic presence of blue oak in the overstory. Associations are usually differentiated by environmental factors as well as floristic characteristics.

Following each of these analyses, the consistent groupings were identified and compared between Cluster Analysis and TWINSpan. Cluster Analysis with Sorensen distance measure was compared to TWINSpan using Euclidean distance measure (McCune and Mefford 1997), which provides a divisive view of grouping as opposed to the agglomerative grouping in Cluster Analysis. Congruence of groupings between TWINSpan and Cluster Analysis was generally close. Disparities were resolved by reviewing the species composition of individual samples. Most of these uncertain samples either represented transitional forms of vegetation that could be thought of as borderline misclassified samples, or samples with no other similar samples in the data set.

Each sample was revisited within the context of the cluster to which it had been assigned to quantitatively define membership rules for each association. The membership rules were defined by species constancy, indicator species, and species cover values. Upon revisiting each sample, a few samples were misclassified in earlier fusions of the cluster analysis, and these samples were reclassified based on the membership rules. The set of data collected throughout the study area was used as the principal means for defining the association composition and membership rules; however, pre-existing classifications and floras were consulted to locate analogous/similar classifications or descriptions of vegetation. A summary of the analysis process is provided in the following steps:

- a. Screen all sample-by-species data for outliers. Samples that were more than three standard deviations away from the mean were removed, and species that were in fewer than three samples were removed.
- b. Run presence-absence Cluster Analysis to determine general arrangement of samples.
- c. Run cover category Cluster Analysis to display a more specific arrangement of samples based on species presence and abundance.
- d. Run Indicator Species Analysis (ISA) at each of the successive group levels in the Cluster Analysis output, from 2 groups up to the maximum number of groups (all groups have at least 2 samples).
- e. Settle on the final representative grouping level of each Cluster Analysis to use in the preliminary labeling.
- f. Preliminarily label alliance and association for each of the samples, and denote indicator species from the ISA.

- g. Run TWINSpan to test congruence with the subsetted TWINSpan divisions, comparing the general arrangement of samples
- h. Develop decision rules for each association and alliance based on most conservative group membership possibilities based on review of species cover on a sample-by-sample basis
- i. Re-label final alliance labels for each sample and arrange in table of database.
- j. Use decision rules developed in the new data to assign alliance and association names to all analyzed data and all outlier samples removed from dataset.

Because the sampling under-represented some of the rare vegetation types, based on their rare edaphic environments within the study area, these relatively unique samples are considered important and described separately in the results. They were often the only representatives of rare alliances known from areas beyond the boundary of the study, or they were the only representatives of alliances that are more common in other areas of California. In some cases, they represented unusual species groupings here-to-fore undescribed and were viewed as affording perspective into unusual vegetation types that deserve additional sampling.

### *Classification and Key*

The classification and key were produced to identify all vegetation types detected in the fieldwork for this project. They are based on the standard floristic hierarchy of the U.S. National Vegetation Classification as supported by NatureServe (see [www.natureserve.org](http://www.natureserve.org) or NatureServe 2003). They are based on species composition, abundance, and habitat/environment.

The key provides general choices and information on the physiognomy of the vegetation and the different environments based on wetland/upland position. This approach in the key was chosen: 1) to reduce the length and redundancy that is common in dichotomous keys, and 2) to be a guide that can be easily used by non-botanists/plant ecologists. The vegetation key can be used as a stand-alone product, allowing anyone with some basic ecology background and knowledge of the main characteristic plant species to identify the vegetation. It is written from two perspectives: (1) a field team attempting to identify vegetation and (2) an office team attempting to place field samples into the proper category. Thus, heavy reliance is placed on correct identification of characteristic plant species and of estimation of cover of these species.

The key is first broken into major units based on dominant plant life-form: trees, shrubs and herbs. Within these groups, it is further divided by coniferous/broadleaf evergreen, chaparral/soft-leaved shrubs, wetland/upland distinctions, graminoid/forb distinctions, etc. The key and descriptions hopefully will afford further refinement to the understanding of Sierra Foothill vegetation, both from the standpoint of classification and mapping.

### *Description Writing*

Following the analysis of field data and development of the classification and key, brief association-level descriptions were written and based on field data and available literature. Scientific names of plants follow Hickman (1993) and UCB (2004). Common names follow these sources and USDA (2004). The primary writers were Sau San, Julie Evens, and Jeanne Taylor (California Native Plant Society). Todd Keeler-Wolf (California Department of Fish and Game) reviewed and edited the descriptions. When writing the descriptions, the following standards were set:

1. **Dominant or co-dominants species:** Must be in at least 80 percent of the samples, with at least 30 percent relative cover in all samples.

2. **Characteristic/Diagnostic species:** Must be present in at least 80 percent of the samples, with no restriction on cover.
3. **Abundant species:** Must be present in at least 50 percent of the samples, with an average of at least 30 percent relative cover in all samples.
4. **Frequently/often/ usually occurring species:** Must be present in at least 50 percent of the samples, with no restriction on cover.
5. **Minimum sample size for classification and description:**  $n = 3$ . Descriptions of associations with fewer than three samples were attempted if (a) the association was sampled and described by previous authors or (b) the vegetation was confirmed as distinctive and repeatable based on field reconnaissance or by photo-interpretation signature.
6. **Open:** Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where the cover is generally less than 33 percent absolute cover
7. **Intermittent:** Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where there is 33-66 percent absolute cover
8. **Continuous:** Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where there is greater than 66 percent absolute cover
9. **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 percent 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 percent for each stand (sample).
10. **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, *Pinus sabiniana* covers between 5 percent and 10 percent of the stand. Absolute cover of all species or groups if added in a stand or plot may total greater or less than 100 percent because it is not a proportional number.
11. **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:
  - A. 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.
  - B. 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.
12. **Woody plant:** Is any species of plant that has noticeably woody stems. It does not include herbaceous species with woody underground portions such as tubers, roots, or rhizomes.
13. **Tree:** Is a one-stemmed woody plant that normally grows to be greater than 5 meters tall.
14. **Shrub:** Is normally a multi-stemmed woody plant that is usually between 0.2 meters and 5 meters tall. Definitions are blurred at the low and the high ends of the height scales.
15. **Herbaceous plant:** Is any species of plant that has no main woody stem-development, and includes grasses, forbs, and perennial species that die-back seasonally.
16. **Forest:** In the National Vegetation Classification, a forest is defined as a tree-dominated stand of vegetation with 60 percent or greater cover of trees.

17. **Woodland:** In the National Vegetation Classification, a woodland is defined as a tree-dominated stand of vegetation with between 25 percent and 60 percent cover of trees.
18. **Sparsely wooded:** There are stands with trees conspicuous (generally at least 10% absolute cover), but less than 25 percent cover may occur over shrubs as the dominant canopy (sparsely wooded shrubland) or herbaceous cover (sparsely wooded herbaceous).
19. **Rare and endangered plants:** Listed as per CNPS (2003) Online Inventory of Rare and Endangered Plants
20. **Conservation rank:** Listed by the state Nature Conservancy Heritage Programs. All communities were ranked, though ones without much information were ranked with a “?” after the rank to denote that this rank may change with more information, but that the best knowledge to date (sometimes personal) was used in these situations. Otherwise, hard references were used to place rank. These ranks are the “Global” and “State” ranks as seen below:
  - a. **G1** and **S1:** Fewer than 6 viable occurrences worldwide and/or 2000 acres
  - b. **G2** and **S2:** 6-20 viable occurrences worldwide and/or 2000-10,000 acres
  - c. **G3** and **S3:** 21-100 viable occurrences worldwide and/or 10,000-50,000 acres
  - d. **G4** and **S4:** Greater than 100 viable occurrences worldwide and/or greater than 50,000 acres
21. **Sample(s):** Listed by their survey numbers from the vegetation databases, and indicated using the following: Relevé samples begin with the alpha-code “PEOR.”, Rapid Assessments begin with the alpha-code “APEOR”, and Point-Intercepts begin with the alpha-code “PEORT.” Successive numeric codes follow each of the alpha-prefixes.

## VEGETATION MAPPING AND ACCURACY ASSESSMENT METHODS

### *Vegetation Mapping*

A preliminary vegetation map was created by AIS in April 2003 using existing, black-and-white digital orthophotos quarter quadrangles (DOQQs). This map was an approximate delineation of the vegetation types covering the study area. The mapping units were initially defined by the AIS photo-interpreter, John Menke, in concert with the CNPS ecologist, Julie Evens. The mapping units were then modified after the field sampling and final floristic classification occurred. Thus, a final mapping process occurred once the initial 2003 complementary sampling was completed and the data was provided to the photo-interpreters. Further, higher resolution aerial photographs were obtained in May 2003, which allowed for better differentiation of vegetation for mapping as compared to the black-and-white DOQQs. The field sample, final floristic classification, and the new color aerial photography assisted the photo-interpreters in more accurately finding repeated signatures for the final mapping process. See the report from AIS for further information.

### *Constructs of Vegetation Map Accuracy Assessment*

After a vegetation map is completed, reporting the accuracy of a vegetation map is important in the understanding of its usefulness and limitations. Formal accuracy assessments, however, are often not undertaken because they are extremely labor-intensive and expensive. While these factors provide constraints on the intensity of accuracy assessment produced, it is necessary to attempt a partial accuracy assessment and to develop a methodology for others to continue these efforts beyond the scope of this project. The methods and results of a partial accuracy assessment are discussed below.



Formal accuracy assessment entails two perspectives: 1) Accuracy from the standpoint of the producer, where one determines what percentage of a certain type of mapped vegetation is actually that type (this view assesses errors of omission), and 2) user's accuracy (this view assesses errors of commission). From the standpoint of a land-manager, the latter position is more important because it gets at the reliability and usability of the map. In other words, you can get at how likely a particular mapping unit labeled as vegetation type "x" will actually be that type when surveyed on the ground.

Most accuracy assessment sample allocation is based on the binomial distribution (Congalton 1991). To do a thorough accuracy assessment and to meet assumptions of this binomial distribution, it is necessary to have an adequate sample size of every mapping unit. Within the study area of Peoria Wildlife Area, this was not completely possible for various reasons. There are numerous vegetation types that are rare, with fewer than 20 mapped stands in the GIS database. Some of these types are difficult to distinguish from certain similar vegetation types, thus the level of confidence around them is not particularly high. The only way to have confidence that these types are mapped correctly is to survey each of them intensively. On the other hand, there are numerous vegetation-mapping types that are represented by 20 to more than 50 individual polygons. Based on our assessment of the reliability of the photo-interpretation effort, a field sampling regime was devised to collect a relatively sound sample size from these types and check their accuracy.

#### *Random Selection of Locations for Accuracy Assessment*

Accuracy assessment of the photo interpretation occurred to finalize a map product with a strong degree of accuracy by determining the precision in the vegetation polygon delineation and the vegetation mapping unit coding and (e.g., with goal of more than 80% or greater accuracy, see Map Accuracy Assessment section for further information). Since all of the polygons could not be field checked due to time and budget constraints, a random selection was chosen for field sampling visits, so that the results of the samples selected could be an indicator for map accuracy. Due to limited time to perform field studies, only certain classes of vegetation were assessed. The number of polygons selected for each class was based on estimated variance of the proportion correct and the number of polygons delineated per type. The selection process proceeded as follows:

- 1) Select all polygons in the study area that are accessible for sampling.
- 2) Remove as candidates for selection any polygon that have been visited in the field.
- 3) Study area was subdivided into 6 subregions, and 12 polygons were randomly selected in each sub-region. The random selection process is based on records, giving equal probability to both small and large polygons.
- 5) Upon reviewing the random selection, the polygons of more abundant vegetation types (e.g., polygons that were mapped as blue oak woodland) had more randomly selected. Further, every general vegetation type had at least one selection and most at least two, even though some types had only two to five polygons that had not been surveyed yet.
- 6) Centroids for polygons were downloaded into a GPS unit, and maps of selected polygon boundaries and centroids were plotted over aerial photos to provide field crews a means to reconnoiter to the polygon which was checked.
- 7) Further, a few other rapid assessments were done while collecting the randomly selected surveys.

A common accuracy assessment procedure compares the vegetation label assigned to a polygon in the map (mapping unit attribute) with the label assigned to the same polygon using ground-truthing/field sampling. Using a traditional method, only one specific class (considered

to be the best class by an ecology expert) is compared to the map label. However, vegetation map classes do not always lend themselves to specific, unambiguous mapping category. While a map label of the specific oak woodland type, such as *Quercus wislizeni/Heteromeles arbutifolia* may be considered absolutely correct for a particular site, a user might consider moderately acceptable a map label of *Quercus wislizeni/Toxicodendron diversilobum*. An alternative method for evaluating map accuracy, and the one chosen for use in this assessment, is based on the use of fuzzy sets, first developed by Gopal and Woodcock (1994). The use of fuzzy sets to assess accuracy has now occurred in a variety of vegetation map projects, including the Modoc and Lassen National Forests (Milliken et al 1997), the four southern California National Forests (Franklin, et al, 1999), and Suisun Marsh (CDFG 2000). Using the fuzzy logic method of accuracy assessment for each polygon assessed, all map classes including are assigned a ranking based on a linguistic scale as to their degree of match with the field-based data. The linguistic scale, and corresponding numeric score, used in this assessment is shown below:

#### Fuzzy Logic Rules for Table Mountain Accuracy Assessment:

- 0 = completely wrong life-form and very low ecological similarity
- 1 = similar life form and distantly ecologically related in the cluster analysis OR different life-form but slight bit of ecological relationship. (e.g., blue oak woodland versus interior live oak forest type)
- 2 = same sub life-form / habit (e.g., all graminoid types, all deciduous trees), but not necessarily ecologically related in cluster analysis (tall herb/wetland and short grass/upland; buckeye/upland and willow/riparian). Alternatively, this could be different life-form, but share diagnostic species or are somewhat ecologically related (same super cluster). This level would be termed the “super - cluster” level of accuracy.
- 3 = same alliance or similar alliance within same meso- cluster, but diagnostic species not shared for association. This is the “meso-cluster” level of accuracy. (e.g., blue oak/grassland versus grassland)
- 4 = same alliance or similar alliance within same “meso-cluster” and diagnostic species shared, but does not meet key definitions. This is called the “super-alliance” level of accuracy (e.g., dense blue oak, interior live oak and pine versus dense oaks without pine)
- 5 = perfect, meets key definitions for the vegetation type or mapping unit

Using this scoring system, each accuracy assessment location was ranked accordingly with the set of decision rules from 0 to 5. Once every location is assessed, it is then tabulated with respect to its perfect-score mapping unit. For each mapping unit, all the ranked points are summed and then divided by the total number of points for a perfect score (e.g., with 5 field surveys for one mapping unit, the perfect score would be 25). Then percent accuracy is calculated per mapping unit to obtain the accuracy assessment score. Information on accuracy was provided back to the AIS photo-interpreters to make any necessary changes to increase final accuracy of the map product.

## RESULTS

### *Vegetation Sampling Characteristics*

The complementary approach of conducting relevé, rapid assessment and point-intercept protocols occurred at 106 sample locations. An additional 99 rapid assessments were

conducted, of which 93 ultimately were used in the accuracy assessment as valid points. In all surveys, 364 vascular plant species were identified, and general names were given to non-vascular or vascular plant species that were not identified to the species level species (e.g., Moss and Lichen were listed in these general categories). Further, the surveys contained data on 63 herbaceous stands, 42 shrub stands and 100 tree stands.

Appendix 1 provides a complete list of scientific and common names for all the taxa identified in vegetation surveys. For the taxa, the scientific names have been converted to alpha-numeric codes for the data analyses, as recorded in the appendix. *Lomatium congdonii*, a CNPS List 1B plant, is found in two stands within the study area (samples PEOR002 and APEOR209). This species has a limited number of occurrences in California. *Chlorogalum grandiflorum*, also a CNPS List 1B plant, may occur in the study area, but identification in peak flowering is needed to confirm. A table of samples for future identification of *Chlorogalum* is provided in an associated file.

### *Non-native Species*

A total of 74 non-native species were identified with the Peoria Wildlife Area and Table Mountain study area. Of these 74 species, 11 are listed on the California Invasive Plant Council's (Cal-IPC) list of species of ecological concern. Species of ecological concern are those that are highly invasive and if left uncontrolled can alter the ecology of native habitats by displacing native species, reducing species diversity, and displacing native wildlife.

Appendix 2 is a list of the non-native species occurring within the study area. Information is also provided on the ranking of invasiveness and on reference sources leading to control and management of these species. Note that many species have no rating, nor is there any information on their control. Though there may not be information on a particular species listed in the table, there is often information on closely related species. Because of similarities in habit and life-form, the same methods may be effective in controlling those species for which no information is currently available.

In planning any restoration effort, one must first identify the current state of a disturbed area and the desired outcome. Identifying those areas with the worst infestations may be a starting point for developing a restoration plan. Large infestations may take many years of multiple treatments using several different methods to reduce or eradicate the undesired species. Therefore, it is necessary to think of this process as a multi-year, multi-application process. Below is a brief summarization of 6 species that could be targeted for control based on their high degree of invasiveness and their abundance within the region.

#### *Ailanthus altissima* (Ailanthus)

Cal-IPC, List A-2

*Ailanthus altissima* is a perennial tree introduced from China in the mid-1800s. It is a fast growing, prolific seed producer, persistent stump and root sprouter and an aggressive competitor with surrounding vegetation (The Nature Conservancy 2004). This species is considered one of the most invasive wildland pest plants. It is tolerant of harsh conditions and is often found in highly disturbed sites. It is known to invade riparian areas.

*Ailanthus altissima* was found to occur in only two locations within the Peoria Wildlife Area: along the banks of the Stanislaus River south of the New Melones Dam and in a drainage in the central portion of the Peoria Wildlife study area. It is possible that the species occurs elsewhere; however, these were the only two sites where it was recorded. With the population being comprised of only a few individuals, eradication of these few individuals may be possible.

Keeping this species in check at this time will prevent the spread of the species. The banks of the Stanislaus River are prime habitat for this species and may be a focal point for control.

*Carduus pycnocephalus* (Italian Thistle)

Cal-IPC List B.

*Carduus pycnocephalus* is an annual thistle, introduced from the Mediterranean with reports of its occurrence as early as 1912 (Bossard et al. 2000). It is widespread in the grasslands and oak woodlands within the study area. It is considered less invasive than some other species of thistle but once established it can come to dominate a site. It is the most abundant of the exotic thistles within the study area. It was found in 30 associations, ranging in absolute cover from <1% to as high as 40%.

Control may center on identifying those areas of heaviest infestation. Research of the literature seems to indicate that mechanical control and grazing are the most effective methods. Treatment, however, requires being persistent over a period of several years.

*Centaurea melitensis* (Maltese Star-thistle)

Cal-IPC List B

*Centaurea melitensis* is an annual thistle, first introduced to California during the Spanish mission period. Dense infestations can displace native plants and animals (Bossard et al. 2000). Though placed on Cal-IPC List B, it is noted that this species may be more widespread than realized. It is often mistaken for *C. solstitialis*. The plant can be toxic to horses if ingested over long periods. Little work has focused on the control of *C. melitensis* with more focus given to *C. solstitialis*. With similar life-forms and habit, control methods used for *C. solstitialis* may be effective on *C. melitensis* (Bossard et al. 2000).

Control may center on identifying those areas of heaviest infestation. It is the second most abundant of the exotic thistle species. It occurs in 24 associations ranging in absolute cover from <1% to as high as 20%.

*Centaurea solstitialis* (Yellow Star-thistle)

Cal-IPC - List A-2

*Centaurea solstitialis* is considered one of the most noxious weeds in the state. It can form dense impenetrable stands diminishing the quality of rangelands and displacing other vegetation. It has spread rapidly since the mid-1900s and has come to infest 15-20 million acres throughout California. It is believed to have begun invading the Sierra foothills in the 1930s and 1940s (The Nature Conservancy 2004). Like *C. melitensis*, the plant is toxic to horses.

Within the study area, *C. solstitialis* is not as ubiquitous as *C. melitensis*. Control may center on identifying those areas of heaviest infestation. It was found in 11 associations; ranging in absolute cover from as low as <1% to as high as 34%. There were only two stands where its cover was greater than 5%.

### *Ficus carica* (Edible Fig)

Cal-IPC - List A-2

*Ficus carica* is a shrub to small tree often found around old habitations. It typically grows in riparian and streamside habitats. If not controlled, edible fig trees could crowd out native trees and understory shrubs characteristic of California's riparian forests (Bossard et al. 2000).

Within the study area, the species was found in three associations with cover of less than 1%. The proliferation of *F. carica* may require perennially flowing streams. Within the study area, the species occurs in drainages with intermittently flowing streams and occur as scattered individuals rather than dense thickets.

Since the species occurs as scattered individuals, eradication or containment is possible at this time. Efficient control methods of the fig have not been developed, however. It is a vigorous root sprouter and not particularly susceptible to herbicides (Bossard et al. 2000). Experimentation with several control methods is likely to be necessary.

### *Taeniatherum caput-medusae* (Medusahead)

Cal-IPC - List A-1

*Taeniatherum caput-medusae* is an annual grass which invades grassland, oak woodland and chaparral communities (Bossard et al. 2000). Since the 1950s, it has spread rapidly throughout the state now reported to occur in over twenty counties (Bossard et al. 2000).

The species was found in seven associations ranging in absolute cover from less than 1% to 50%. Though widespread across the study area, the highest concentrations occur primarily along the roads and power line corridors on Peoria Ridge. Control could center on identifying those areas of heaviest infestation. Focus may also be on outlying stands where the population is currently small, preventing its continued proliferation.

## CLASSIFICATION

Since the data protocols varied slightly in their methodologies, the classification analysis was performed first for the 106 relevés and then the 106 rapid assessments separately. The analyses were compared, so that the classification of stands between the two methods was congruous. The relevé analysis produced largely comparable results to the rapid assessment analysis, with 42 associations produced. Then the additional rapid assessment surveys were added into a final analysis of all 205 rapid assessments. This analysis produced the final classification of surveys into 46 associations, which included additional unique herbaceous associations which are encompassed within the over-arching "Serpentine Native Wet Perennial Grassland" in the map (See Figure 1 for an example dendrogram output from the relevé classification). Two additional vegetation types were recorded through reconnaissance and mapping only: *Heteromeles arbutifolia* and *Adenostoma fasciculatum-Ceanothus cuneatus* (identified to alliance only, association unknown). Table 1 provides a summary of the final floristic classification, in which the number of samples is denoted per vegetation type. Appendix 3 provides a selection of photos for each of the 46 classified vegetation types.

In the vegetation classification, the stands characterized by trees were divided into 18 different associations within 5 different alliances. The shrub stands were classified into 10

different associations within 6 alliances, and the herbaceous stands were classified into 18 different associations within 12 alliances. Notably, the herb and tree-characterized stands are more diverse than the shrub-dominated stands, which is attributable to the variation of herbaceous vegetation across the study area. Moreover, in the riparian herbaceous stands, 7 unique vegetation units were represented by only one sample with specifically different species composition and abundance.

In general, the blue oak woodlands, savannas and herbaceous stands are substantially more diverse than the chaparral, upper elevation shrublands, and coniferous forests in the Sierra Nevada (e.g., NatureServe et al. 2003b from the Yosemite region). This distinction is partially attributable to the diversity and abundance of non-native plant species and partially attributable to site environmental factors. Interestingly, grazing history may not play a decisive role in this richness and abundance of both non-native and native components, but rather controlling factors such as moisture availability, parent material/substrate, fire disturbance, etc., may be attribute to the variation (Allen-Diaz and Bartolome 1992, Keeley 2002).

There is a variety of associations in the study area being newly defined, based on data from the project area. New associations that have a sample size of 10 are indicated with the statement “(new)” at the end of the association name, while new associations that have less than 10 samples are indicated by “(new provisional)” following the name of the association. In reviewing the classification of associations, this project defines 1 new type and 15 new provisional herbaceous types. The diversity of herbaceous types is remarkably high in the study area, so steps should be taken to protect the natural diversity while focusing on the non-native types for restoration. Further, there were 3 new tree types and 10 new provisional tree types (many based on understory herbaceous associates). Thus, many of the tree and herb associations are being newly identified based on data from this project and future efforts could build upon this work.

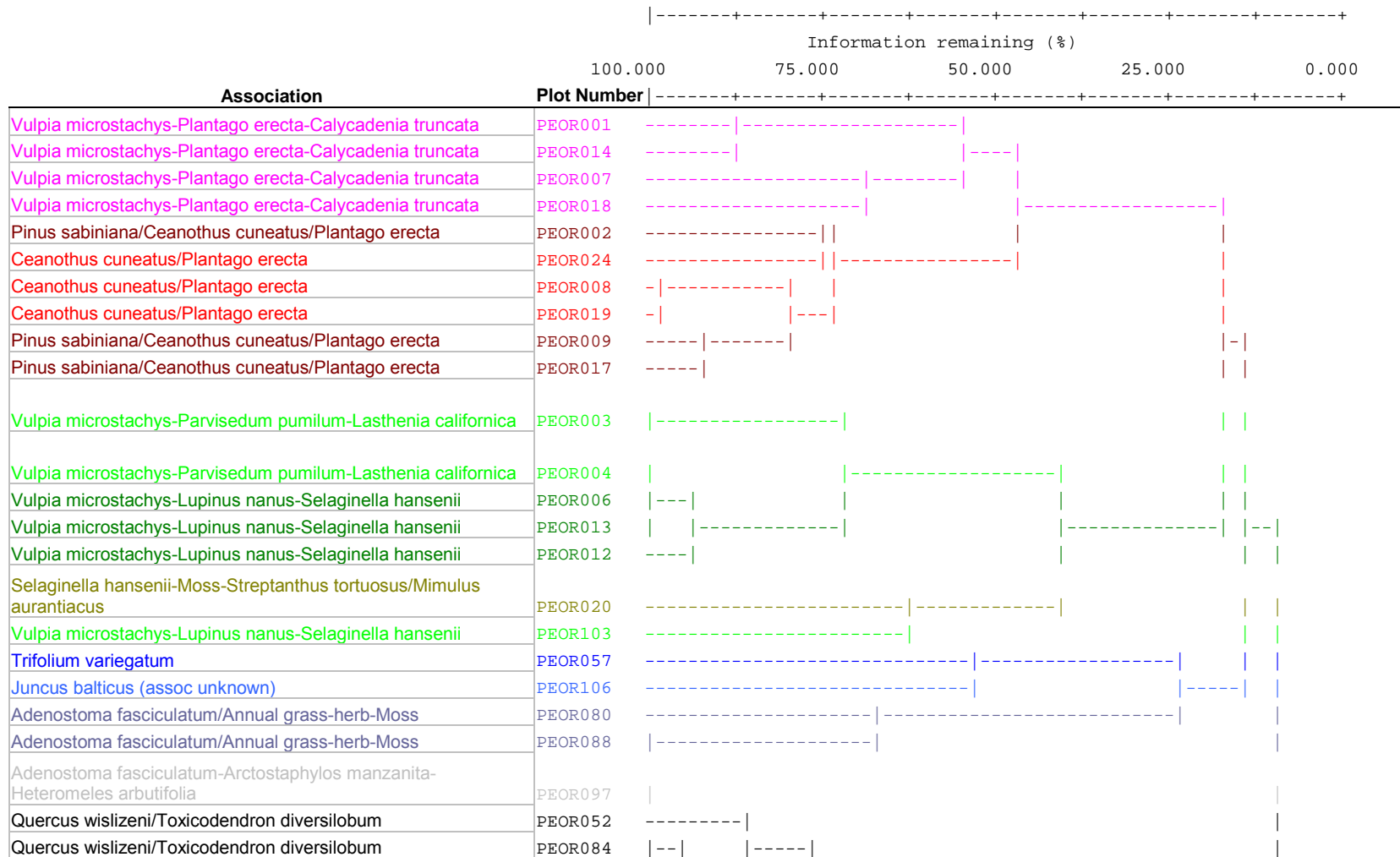
While some associations may have little data available for the classification and description, they have been provisionally defined for three different reasons:

1) to be established as types *in situ* and compared to other areas where the plant community is more common,

2) to be represented as rare communities to be compared to other similar locations, especially the serpentine wetland associations,

3) so future vegetation projects can benefit from the definitions of associations in this project, especially since so little of the Sierra Nevada foothills have actually been surveyed and described (including the grasslands and oak woodlands).

By providing as much information as possible in the classification, key, and descriptions, it is hoped that future efforts could build upon this framework of vegetation classification in the Sierra Nevada foothills, for example by additional sampling in other serpentine and volcanic outcrops. The data, floristic classification, and vegetation mapping in this project provides detailed information for a variety of future research and management efforts. While this project has attempted to describe all the vegetation types in the study area, it is possible that additional vegetation association characteristics could come out through further research after this project.



**Figure 3.** Example of the cluster analysis showing the arrangement and relationship of plots in the clustering diagram and their final names is shown in the following figure. Each differently colored group indicates the cluster analysis groupings

**Table 1.** List of the floristic classification (alliances and associations) with geologic substrate and sample size attributed per association. Substrate codes are as follows: A=alluvium, M=metamorphic, N=not restricted to a particular substrate, MV=metavolcanic, P=plutonic, Sd=Sedimentary, Sp=Serpentine, V=volcanic

Alliance	Association	Geologic Substrate	Sample Size
<b>Tree-Overstory Vegetation</b>			
<b><i>Aesculus californica</i></b>	<i>Aesculus californica/Toxicodendron diversilobum</i> Moss	V, M	6
<b><i>Ceanothus cuneatus</i></b>	<i>Pinus sabiniana/Ceanothus cuneatus/Plantago erecta</i>	Sp	4
<b><i>Pinus sabiniana</i></b>	<i>Pinus sabiniana/Ceanothus cuneatus-Heteromeles arbutifolia</i> /Annual Herb-Grass	P	1
<b><i>Quercus douglasii</i></b>	<i>Quercus douglasii</i> /Annual Grass-Herb ( <i>Brachypodium distachyon</i> )	A	11
	<i>Quercus douglasii</i> /Annual Grass-Herb ( <i>Bromus hordeaceus-Lolium multiflorum</i> )	M, MV	5
	<i>Quercus douglasii</i> /Annual Grass-Herb ( <i>Bromus hordeaceus-Madia gracilis</i> )	A	8
	<i>Quercus douglasii</i> /Annual Grass-Herb ( <i>Bromus hordeaceus-Triteleia laxa</i> )	A	9
	<i>Quercus douglasii/Toxicodendron diversilobum</i> /Annual Grass-Herb	MV, Sd	5
	<i>Quercus douglasii-Aesculus californica</i> /Annual Grass-Herb	M, MV, Sd	5
	<i>Quercus douglasii-Aesculus californica/Asclepias fascicularis/Rorippa</i>	MV, P	2
	<i>Quercus douglasii-Pinus sabiniana</i> /Annual Grass-Herb	N	5
<b><i>Quercus wislizeni</i></b>	<i>Quercus wislizeni/Heteromeles arbutifolia</i>	P, Sd, V	5
	<i>Quercus wislizeni/Toxicodendron diversilobum</i>	M, MV, P, Sd	10
	<i>Quercus wislizeni-Aesculus californica/Toxicodendron diversilobum</i>	N	8
	<i>Quercus wislizeni-Pinus sabiniana</i> /Annual Grass-Herb	V	2
	<i>Quercus wislizeni-Quercus douglasii/Toxicodendron diversilobum</i> /Annual grass	P, Sd, Sp	3
	<i>Quercus wislizeni-Quercus douglasii-Pinus sabiniana/Toxicodendron diversilobum</i> /Annual Grass-Herb	M, MV, P, Sd	6
	<i>Quercus wislizeni-Quercus kelloggii/Heteromeles arbutifolia-Toxicodendron diversilobum</i>	M, MV, P, Sd, V	5
<b>Shrub-Overstory Vegetation</b>			
<b><i>Adenostoma fasciculatum</i></b>	<i>Adenostoma fasciculatum</i> /Annual Grass-Herb-Moss	P, Sd, V	6
	<i>Adenostoma fasciculatum/Castilleja pruinosa</i> /Annual Grass-Herb	V	4



Alliance	Association	Geologic Substrate	Sample Size
	<i>Adenostoma fasciculatum</i> - <i>Arctostaphylos manzanita</i> - <i>Heteromeles arbutifolia</i>	P, Sd	3
<b><i>Adenostoma fasciculatum</i>-<i>Ceanothus cuneatus</i></b>	None (known only from field reconnaissance and mapping)	M, Sd	0
<b><i>Ceanothus cuneatus</i></b>	<i>Ceanothus cuneatus</i> /Annual Grass-Herb	Sd	2
	<i>Ceanothus cuneatus</i> / <i>Plantago erecta</i>	Sp	4
<b><i>Eriodictyon californicum</i></b>	<i>Eriodictyon californicum</i> /Annual Grass-Herb	MV, P, Sp	1
	<i>Eriodictyon californicum</i> - <i>Ceanothus cuneatus</i> /Annual Grass-Herb ( <i>Brachypodium distachyon</i> - <i>Centaurea</i> spp.) Association	M, P, Sp	3
<b><i>Heteromeles arbutifolia</i></b>	None (known only from field reconnaissance and mapping)	MV,Sd,Sp	0
<b><i>Rhamnus tomentella</i></b>	<i>Rhamnus tomentella</i> - <i>Hoita macrostachya</i>	Sp	2
<b><i>Toxicodendron diversilobum</i></b>	<i>Toxicodendron diversilobum</i> / <i>Bromus hordeaceus</i> - <i>Micropus californicus</i>	N (often Sd)	12
	<i>Toxicodendron diversilobum</i> / <i>Bromus hordeaceus</i> - <i>Vicia villosa</i> - <i>Madia gracilis</i>	P, M, MV, Sd	5
<b>Herbaceous Vegetation</b>			
<b><i>Brachypodium distachyon</i></b>	<i>Brachypodium distachyon</i> - <i>Centaurea</i> spp.	P, M, MV	4
<b><i>Bromus hordeaceus</i></b>	<i>Bromus hordeaceus</i> - <i>Clarkia purpurea</i> - <i>Plagiobothrys nothofulvus</i>	often Sd (P, Sp)	6
	<i>Bromus hordeaceus</i> - <i>Holocarpha virgata</i> ( <i>Lolium multiflorum</i> or <i>Vulpia microstachys</i> )	M, MV, P	8
	<i>Bromus hordeaceus</i> - <i>Holocarpha virgata</i> - <i>Taeniatherum caput-medusae</i>	M, MV, P, Sp	10
	<i>Bromus hordeaceus</i> - <i>Lupinus nanus</i> - <i>Trifolium</i> spp.	V, Sp	3
	<i>Bromus hordeaceus</i> - <i>Vicia villosa</i> - <i>Lolium multiflorum</i> - <i>Trifolium hirtum</i>	M, MV, V, Sp	7
<b><i>Carex nudata</i></b>	<i>Carex nudata</i> (alliance only)	A (P, Sp)	1
<b><i>Carex serratodens</i></b>	<i>Carex serratodens</i> - <i>Hordeum brachyantherum</i> - <i>Juncus bufonius</i>	A (Sp)	1
<b><i>Eleocharis macrostachya</i></b>	<i>Eleocharis macrostachya</i> - <i>Sagittaria montevidensis</i> - <i>Paspalum distichum</i>	A (MV)	1
<b><i>Hordeum brachyantherum</i></b>	<i>Hordeum brachyantherum</i> - <i>Polypogon monspeliensis</i> - <i>Juncus oxymeris</i>	P, Sp	3
<b><i>Juncus balticus</i></b>	<i>Juncus balticus</i> (alliance only)	A	1
<b><i>Lolium multiflorum</i></b>	<i>Lolium multiflorum</i> - <i>Hordeum marinum</i> - <i>Ranunculus californicus</i>	Sp	1
<b><i>Selaginella hansenii</i>-Moss</b>			

<b>Alliance</b>	<b>Association</b>	<b>Geologic Substrate</b>	<b>Sample Size</b>
	<i>Selaginella hansenii</i> -Moss- <i>Streptanthus tortuosus</i> / <i>Mimulus aurantiacus</i>	V	2
<b><i>Stachys stricta</i></b>	<i>Stachys stricta</i> - <i>Polypogon monspeliensis</i>	MV	1
<b><i>Trifolium variegatum</i></b>	<i>Trifolium variegatum</i> (alliance only)	M, Sd, V	1
<b><i>Vulpia microstachys</i></b>	<i>Vulpia microstachys</i> - <i>Lupinus nanus</i> - <i>Selaginella hansenii</i>	V	4
	<i>Vulpia microstachys</i> - <i>Parvisedum pumilum</i> - <i>Lasthenia californica</i>	V	2
	<i>Vulpia microstachys</i> - <i>Plantago erecta</i> - <i>Calycadenia truncata</i>	Sp	7

### *Implementation of the mapping classification and accuracy assessment*

The floristic classification was translated into a mapping classification. The total number of mapping units in the final aerial photo mapping approach is 48. They are listed hierarchically by life-form and environmental features (Table 2). While the mapping focused on the finest floristic scale possible, some higher-level mapping units were used (e.g., Interior Live Oak Alliance instead of one of the associations). This is because a map cannot always represent stands of vegetation that may be classified on the ground. As explained in methods section, sometimes the understory or main species cannot be identified through photo interpretation. Thus, a more generalized level of the mapping classification (often termed a mapping unit) may be necessary. Table 3 lists the floristically classified vegetation associations that are included (or lumped) within each mapping unit, and the table also provides information on the number of polygons selected per type for accuracy assessment.

Upon completion of the floristic classification (of relevé and rapid assessment surveys) and final draft aerial photo mapping (based on the 109 initial surveys and reconnaissance), an accuracy assessment was conducted for the map with ground-truthing data. With one month of time spent to collect the accuracy assessment data, the field crews used the same rapid assessment forms as the initial complementary surveys. The field crew spent about 30 minutes per assessment describing the vegetation within the individual polygon, and they assessed if the polygon was more than one type of vegetation.

A general assessment of which vegetation types were amenable for assessment was made prior to the surveys. It was calculated that around 90 assessments could be made in the allotted field time, so we selected a set of vegetation types that could be easily sampled based on their expected sample size needed using the normal approximation of the binomial distribution (Cochran 1977), but could be representative of the full range of variation of vegetation known to occur throughout the study area. Thus, types were selected to represent upland and wetland herbaceous vegetation, as well as shrub and forested vegetation. With 96 additional rapid assessments completed for accuracy assessment, 93 were used to assess the degree of accuracy of the photo-interpretation (with both polygon delineation and vegetation mapping unit coding assessed), and three were not used because of survey duplication.

Twenty-seven vegetation types were evaluated in the accuracy assessment, representing about 55% of the total number of mappable types. For these 27 types, the overall accuracy assessment of polygons averaged 84%. See Table 4 for a breakdown of the average accuracy for each of the map units. Because preferred accuracy for map products is between 80-90%, the final draft map was met with these expectations. Nine mapping units scored between 90-100% accurate, and ten mapping units scored between 80-90% accurate. For every assessment point that scored below a value of 5, the CNPS ecologist and AIS photo-interpreter reviewed the points, so that changes could be made to increase the final map product's accuracy.

**Table 2.** Peoria Wildlife Area / Table Mountain - vegetation mapping classification and codes. Bold types are mapped at the AIR PHOTO level

**Codes used in Vegetation Mapping Photo Interpretation:**

FOREST – WOODLAND

1000 – Evergreen Broadleaf Forests & Woodlands

1200 – Xeromorphic Sclerophyll Woodlands

**1201 – Interior Live Oak Alliance**

**1202 – Interior Live Oak – Blue Oak Mapping Unit**

**1203 – Interior Live Oak – Buckeye Mapping Unit (Toyon – Poison Oak)**

**1205 – Interior Live Oak / Poison Oak Mapping Unit**

1206 – Interior Live Oak / Toyon (– Poison Oak) Mapping Unit

2000 – Evergreen Needle-leaf Forests & Woodlands

2100 – Rounded Crown Forests & Woodlands (Pines & Cypress)

**2101 – Foothill Pine Alliance**

**2102 – Foothill Pine – Blue Oak Mapping Unit**

**2103 – Foothill Pine – Interior Live Oak Mapping Unit**

**2104 – Foothill Pine – Blue Oak – Interior Oak Mapping Unit**

**2106 – Foothill Pine / Wedgeleaf Ceanothus (*Ceanothus cuneatus*)**

**Serpentine Mapping Unit**

3000 – Deciduous Forests & Woodlands

3100 – Cold Season Deciduous Forests & Woodlands

**3101 – Black Oak – Interior Live Oak Mapping Unit**

**3102 – Mixed Blue Oak – Buckeye (- Valley Oak – Foothill Pine–Interior Live Oak)**

**Riparian Mapping Unit**

**3103 – Blue Oak / Mixed herbaceous Mapping Unit**

**3105 – Blue Oak / Grass (*Brachypodium distachyon*) Mapping Unit**

**3106 – Blue Oak / Poison Oak / Grass – (Rocky) Mapping Unit**

**3109 – California Buckeye Alliance**

**3110 – Blue Oak – California Buckeye Mapping Unit**

SHRUBLAND - DWARF SHRUBLAND

4000 – Evergreen Shrubland

4300 – Sclerophyllous Shrubland

**4005 – Toyon Mapping Unit**

**4301 – Chamise Alliance**

**4302 – Chamise – Wedgeleaf Ceanothus Alliance (?)**

**4303 – Chamise – Manzanita (e.g., *A. manzanita*, *A. viscida*)**

**4308 – Chamise (volcanic Tabletop) Mapping Unit**

**4304 – Wedge Leaf Ceanothus/Plantago Serpentine Mapping Unit**

**4306 – Wedge Leaf Ceanothus**

**4307 –Mixed Shrubs / Spikemoss on Rock Outcrop (*Mimulus aurantiacus*, *Heteromeles arbutifolia*, etc)**

4400 – Microphollous Shrubland

**4401 – *Eriodictyon* spp.**

5000 – Deciduous Shrubland

5400 - Winter Rain Drought Deciduous Shrubland

**5401 – Poison Oak Alliance**

**5500 – Seasonally Flooded Deciduous Shrubland**

**5501 – Mixed Riparian Shrub Mapping Unit (including *Salix spp.*, *Calycanthus occidentalis*, *Rhamnus tomentella*, etc)**

6000 – Perennial Herbaceous (Graminoid – Forbs)

6100 – Bunch Forming Grasses

**6101 – Serpentine Native Wet Perennial Grassland (*Hordeum brachyantherum*, *Carex spp.*, *Juncus spp.*) Mapping Unit**

HERBACEOUS – UPLAND AND WETLAND

**7000 – Annual Herbaceous (Graminoid – Forbs)**

**7100 – Upland Annual Grasslands & Forbs**

**7101 – California Annual Grasslands Alliance**

**7102 – Volcanic Upland Herbaceous Matrix (Table Mountain top) Mapping Unit (*Lupinus – Selaginella – Vulpia – Parvisedum*)**

**7103 –Serpentine Native Xeric Herbaceous Mapping Unit (including *Vulpia microstachys*, *Calycadenia truncata*, *Plantago erecta*)**

**7106 – Post-burn grasses & forbs (Poison Oak) (?)**

**7110 – Lupine (gray signature on table top) (moved from 7102)**

**7111 – Star thistle mapping unit**

**7200 – Seasonally Flooded Grasslands & Forbs**

**7202 – Marsh vegetation (Cattail – Bulrush – Scirpus)**

**7203 – Wet swales on the Table-top – *Bromus* etc. (green and yellow)**

**9001 – Rock Outcrop**

**9002 – Rocky Streambeds**

**9100 – Urban or Built Up**

**9200 – Agriculture**

9400 – Water

**9401 – Small Farm Ponds**

**9402 – Reservoirs**

**9999 – Unknown**

**Codes used in Vegetation Mapping Density and Size:**

**Density (by Class)**

1 = Greater than 60%

2 = 40-60%

3 = 25-40%

4 = 10-25%

5 = 2-10%

**Size (by Class)**

1 = Seedlings (less than 1")

2 = Saplings (1-6")

3 = Pole (6-11")

4 = Small (11-25")

5 = Medium - Large (Greater than 25")

6 = Multi Layered Medium to Large Trees over smaller trees in Densities >60%

**Table 3.** List of the Mapping Units used in the mapping classification with the translation to the floristic classification and the Accuracy Assessment (AA). “Estimated Percent Correct” refers to the photo-interpreter’s deduction of how accurate each type was mapped

Mapping Unit Code	Mapping Unit Name	Alliance	Association	Estimated Percent Correct	Number of AA Samples	Number of polygons
1201	Interior Live Oak Alliance	<i>Quercus wislizeni</i>	alliance level only	80%	0	47
1202	Interior Live Oak – Blue Oak Mapping Unit	<i>Quercus wislizeni</i>	<i>Quercus wislizeni-Quercus douglasii/Toxicodendron diversilobum/Annual grass</i>	80%	2	48
1203	Interior Live Oak – Buckeye Mapping Unit	<i>Quercus wislizeni</i>	<i>Quercus wislizeni-Aesculus californica/Toxicodendron diversilobum</i>	85%	5	14
1205	Interior Live Oak / Poison Oak	<i>Quercus wislizeni</i>	<i>Quercus wislizeni/Toxicodendron diversilobum</i>	90%	6	31
1206	Interior Live Oak / Toyon	<i>Quercus wislizeni</i>	<i>Quercus wislizeni/Heteromeles arbutifolia</i>	80%	2	0
2101	Foothill Pine Alliance	<i>Pinus sabiniana</i>	<i>Pinus sabiniana/Ceanothus cuneatus-Heteromeles arbutifolia/Annual Herb-Grass</i>	80%	1	7
2102	Foothill Pine – Blue Oak Mapping Unit	<i>Quercus douglasii</i>	<i>Quercus douglasii-Pinus sabiniana/Annual grass-herb</i>	80%	3	26
2103	Foothill Pine – Interior Live Oak Mapping Unit	<i>Quercus wislizeni</i>	<i>Quercus wislizeni-Pinus sabiniana/Selaginella hansenii</i>	80%	2	26
2104	Foothill Pine – Blue Oak – Interior Oak Mapping Unit	<i>Quercus wislizeni</i>	<i>Quercus wislizeni-Quercus douglasii-Pinus sabiniana/Toxicodendron diversilobum/Annual grass</i>	80%	4	32
2106	Foothill Pine / Wedgeleaf Ceanothus ( <i>Ceanothus cuneatus</i> )	<i>Ceanothus cuneatus</i>	<i>Pinus sabiniana/Ceanothus cuneatus/Plantago erecta</i>	90%	1	9
3101	Black Oak – Interior Live Oak Mapping Unit	<i>Quercus wislizeni</i>	<i>Quercus wislizeni-Quercus kelloggii/Heteromeles arbutifolia-Toxicodendron diversilobum</i>	40%	2	3
3103	Blue Oak / Mixed herbaceous Mapping Unit	<i>Quercus douglasii</i>	<i>Quercus douglasii/Annual grass-herb (Bromus hordeaceus-Lolium multiflorum)</i>	90%	2	98
3103	Blue Oak / Mixed herbaceous Mapping Unit	<i>Quercus douglasii</i>	<i>Quercus douglasii/Annual grass-herb (Bromus hordeaceus-Madia gracilis)</i>	90%	4	See above
3103	Blue Oak / Mixed herbaceous Mapping Unit	<i>Quercus douglasii</i>	<i>Quercus douglasii/Annual grass-herb (Bromus hordeaceus-Triteleia laxa)</i>	90%	7	See above
3105	Blue Oak / Grass ( <i>Brachypodium distachyon</i> ) Mapping Unit	<i>Quercus douglasii</i>	<i>Quercus douglasii/Annual grass-herb (Brachypodium distachyon)</i>	90%	6	79
3106	Blue Oak / Poison Oak / Grass – (Rocky) Mapping Unit	<i>Quercus douglasii</i>	<i>Quercus douglasii/Toxicodendron diversilobum/Annual grass-herb</i>	80%	2	30
3110	<i>Quercus douglasii</i> – <i>Aesculus californica</i>	<i>Quercus douglasii</i>	<i>Quercus douglasii-Aesculus californica/Annual grass-herb</i>	70%	2	13

Mapping Unit Code	Mapping Unit Name	Alliance	Association	Estimated Percent Correct	Number of AA Samples	Number of polygons
3102	Mixed Blue Oak – Buckeye – Valley Oak – Foothill Pine– Interior Live Oak) Riparian Mapping Unit	<i>Quercus douglasii</i>	<i>Quercus douglasii</i> - <i>Aesculus californica</i> / <i>Asclepias fascicularis</i> / <i>Rorippa</i> sp.	40%	1	3
3109	California Buckeye Alliance	<i>Aesculus californica</i>	<i>Aesculus californica</i> / <i>Toxicodendron diversilobum</i> /Moss	80%	2	25
4005	Toyon Mapping Unit	<i>Heteromeles arbutifolia</i>	alliance level only	40%	0	3
4301	Chamise Alliance (pure chamise)	<i>Adenostoma fasciculatum</i>	<i>Adenostoma fasciculatum</i> /Annual grass-herb-Moss	80%	4	18
4303	Chamise – Manzanita – (Toyon)	<i>Adenostoma fasciculatum</i>	<i>Adenostoma fasciculatum</i> - <i>Arctostaphylos manzanita</i> - <i>Heteromeles arbutifolia</i>	70%	0	13
4308	Chamise Alliance (volcanic)	<i>Adenostoma fasciculatum</i>	<i>Adenostoma fasciculatum</i> / <i>Castilleja pruinosa</i> /Annual grass-herb	80%	3	7
4304	Wedge Leaf Ceanothus / Plantago Serpentine Map Unit	<i>Ceanothus cuneatus</i>	<i>Ceanothus cuneatus</i> / <i>Plantago erecta</i>	90%	1	11
4306	Wedge Leaf Ceanothus	<i>Ceanothus cuneatus</i>	<i>Ceanothus cuneatus</i> /Annual grass-herb	70%		17
4307	Mixed Shrubs on Rock Outcrop	<i>Selaginella hansenii</i> -Moss	<i>Selaginella hansenii</i> -Moss- <i>Streptanthus tortuosus</i> / <i>Mimulus aurantiacus</i>	20%		2
4401	Eriodictyon spp.	<i>Eriodictyon californicum</i>	<i>Eriodictyon californicum</i> /Annual grass-herb	70%	1	23
4401	Eriodictyon spp.	<i>Eriodictyon californicum</i>	<i>Eriodictyon californicum</i> - <i>Ceanothus cuneatus</i> / <i>Brachypodium distachyon</i> (- <i>Centaurea</i> spp.)	70%	1	See above
5101	Poison Oak Alliance	<i>Toxicodendron diversilobum</i>	<i>Toxicodendron diversilobum</i> / <i>Bromus hordeaceus</i> - <i>Vicia villosa</i> - <i>Madia gracilis</i>	90%	3	101
5101	Poison Oak Alliance	<i>Toxicodendron diversilobum</i>	<i>Toxicodendron diversilobum</i> / <i>Bromus hordeaceus</i> - <i>Micropus californicus</i>	90%	5	5
5500	Seasonally Flooded Deciduous Shrubland	See below for nested type	See below for nested type	-	-	1
5501	Mixed Riparian Shrub Mapping Unit	<i>Rhamnus tomentella</i>	<i>Rhamnus tomentella</i> - <i>Hoita macrostachya</i>	20%	1	See above
6101	Serpentine Native Wet Perennial Grassland	<i>Hordeum brachyantherum</i>	<i>Hordeum brachyantherum</i> - <i>Polypogon monspeliensis</i> - <i>Juncus (oxymeris)</i>	70%	2	7
6101	Serpentine Native Wet Perennial Grassland	<i>Stachys stricta</i>	<i>Stachys stricta</i> - <i>Polypogon monspeliensis</i>	70%	1	See above
6101	Serpentine Native Wet Perennial Grassland	<i>Carex serratodens</i>	<i>Carex serratodens</i> - <i>Hordeum brachyantherum</i> - <i>Juncus bufonius</i>	70%	0	See above
6101	Serpentine Native Wet Perennial Grassland	<i>Carex nudata</i>	<i>Carex nudata</i> (alliance only)	70%	0	See above
7000	Annual Herbaceous (Graminoid)	See types in 7100 series	See types in 7100 series	-	-	1

Mapping Unit Code	Mapping Unit Name	Alliance	Association	Estimated Percent Correct	Number of AA Samples	Number of polygons
	– Forbs)					
7100	Upland Annual Grasslands & Forbs	see types in 7100 series	see types in 7100 series	90%	0	3
7101	California Annual Grasslands Mapping Unit	<i>Bromus hordeaceus</i>	<i>Bromus hordeaceus-Clarkia purpurea-Plagiobothrys nothofulvus</i>	80%	4	90
7101	California Annual Grasslands Mapping Unit	<i>Bromus hordeaceus</i>	<i>Bromus hordeaceus-Holocarpha virgata (Lolium multiflorum or Vulpia microstachys)</i>	80%	2	See above
7101	California Annual Grasslands Mapping Unit	<i>Bromus hordeaceus</i>	<i>Bromus hordeaceus-Holocarpha virgata-Taeniatherum caput-medusae</i>	80%	6	See above
7101 or 7106	California Annual Grasslands Mapping Unit	<i>Bromus hordeaceus</i>	<i>Bromus hordeaceus-Vicia villosa-Lolium multiflorum-Trifolium hirtum</i>	80%	2	10
7102	Volcanic Upland Herbaceous Matrix (Table Mountain top) Mapping Unit	<i>Vulpia microstachys</i>	Mixture of <i>Vulpia microstachys-Lupinus nanus-Selaginella hansenii</i> and <i>Vulpia microstachys-Parvisedum pumilum-Lasthenia californica</i>	80%	0	11
7103	Serpentine Native Xeric Herbaceous Mapping Unit	<i>Vulpia microstachys</i>	<i>Vulpia microstachys-Plantago erecta-Calycadenia truncata</i>	80%	3	18
7110	Lupine (gray signature on table top)	<i>Vulpia microstachys</i>	<i>Vulpia microstachys-Lupinus nanus-Selaginella hansenii</i>	80%	0	10
7111 or 7101	Star thistle mapping unit	<i>Brachypodium distachyon</i>	<i>Brachypodium distachyon-Centaurea spp.</i>	40%		9
7200	Seasonally Flooded Grasslands & Forbs	<i>Eleocharis macrostachya</i>	<i>Eleocharis macrostachya-Sagittaria montevidensis-Paspalum distichum</i>	80%	0	8
7200	Seasonally Flooded Grasslands & Forbs	<i>Trifolium variegatum</i>	<i>Trifolium variegatum</i>	80%	0	See above
7200	Seasonally Flooded Grasslands & Forbs	<i>Lolium multiflorum</i>	<i>Lolium multiflorum-Hordeum marinum-Ranunculus californicus</i>	80%	0	See above
7202	Marsh vegetation (Cattail – Bulrush – Scirpus) - rare 1 type	<i>Juncus balticus</i>	<i>Juncus balticus</i> (assoc unknown)	80%	0	1
7203	Wet swales on the Table-top	<i>Bromus hordeaceus</i>	<i>Bromus hordeaceus-Lupinus nanus-Trifolium spp.</i>	80%	0	20
9001	Rock Outcrop	n/a	n/a	-	-	23
9002	Rocky Streambeds	n/a	n/a	-	-	1
9100	Urban or Built Up	n/a	n/a	-	-	12
9200	Agriculture	n/a	n/a	-	-	1
9400	Water	n/a	n/a	-	-	9
9401	Small Farm Ponds	n/a	n/a	-	-	7
9402	Reservoirs	n/a	n/a	-	-	1



**Table 4.** Average Accuracy Assessment score and number of samples per Mapping Unit

<b>Mapping Unit</b>	<b>Mapping Unit Name</b>	<b>Avg AA Score</b>	<b>No. of Samples</b>
1202	Interior Live Oak – Blue Oak Mapping Unit	70%	2
1203	Interior Live Oak – Buckeye Mapping Unit	88%	5
1205	Interior Live Oak / Poison Oak	83%	6
1206	Interior Live Oak / Toyon	80%	2
2101	Foothill Pine Alliance	80%	1
2102	Foothill Pine – Blue Oak Mapping Unit	80%	3
2103	Foothill Pine – Interior Live Oak Mapping Unit	80%	1
2104	Foothill Pine – Blue Oak – Interior Oak Mapping Unit	85%	4
2106	Foothill Pine / Wedgeleaf Ceanothus ( <i>Ceanothus cuneatus</i> )	100%	1
3101	Black Oak – Interior Live Oak Mapping Unit	90%	2
3103	Blue Oak / Mixed herbaceous Mapping Unit	94%	13
3105	Blue Oak / Grass ( <i>Brachypodium distachyon</i> ) Mapping Unit	77%	6
3106	Blue Oak / Poison Oak / Grass – (Rocky) Mapping Unit	70%	2
3109	California Buckeye Alliance	70%	2
3110	<i>Quercus douglasii</i> – <i>Aesculus californica</i>	70%	2
3102	Mixed Blue Oak – Buckeye (–Valley Oak – Foothill Pine– Interior Live Oak) Riparian Mapping Unit	60%	1
4301	Chamise Alliance (pure chamise)	94%	4
4308	Chamise (volcanic)	87%	3
4304	Wedge Leaf Ceanothus / Plantago Serpentine Mapping Unit	100%	1
4401	<i>Eriodictyon</i> spp.	70%	2
5401-5402	Poison Oak Alliance / Poison Oak / Herbaceous Mapping Unit	100%	8
5501	Mixed Riparian Shrub Mapping Unit	100%	2
6101	Serpentine Native Wet Perennial Grassland	80%	3
7100 or 7101	California Annual Grasslands Mapping Unit	97%	12
7101 or 7106	California Annual Grasslands Mapping Unit	70%	2
7103	Serpentine Native Xeric Herbaceous Mapping Unit	93%	3
7111	Star thistle mapping unit	80%	1

## CROSSWALKS TO OTHER CLASSIFICATIONS

The term “crosswalk” is commonly used in vegetation classification and mapping, referring to the development of relationships between different classification systems. The need for crosswalks arises when there is more than one classification system in use for a given area. In this project, a crosswalk was produced relating the principle state and national classification (c.f. Sawyer and Keeler-Wolf 1995) to the Wildlife Habitat Relationships (Mayer and Laudenslayer 1988) and Holland (1986) classifications.

As an aside, crosswalks are never exactly precise. Assuming that classifications arise independently, the meaning of one classification unit may not always encompass or be nested within the other classification unit(s) to which it is being related. Choices need to be made about those classification units that are partially included within two or more types of another classification system. For example, the Wildlife Habitat Relationships (WHR) classification unit of “freshwater emergent wetland” actually includes many vegetation alliances (see Table 5). Likewise, the National Vegetation Classification’s alliance of *Ceanothus cuneatus* can be partly in the Holland serpentine chaparral or buck brush chaparral.

The complexity and uncertainty of such relationships arise not only from independent evolution of classifications, but also from their imprecise definitions, without quantitative rules for proper interpretation. The best crosswalks are those that have been developed with a good understanding of the meaning and definitions of each classification system.

### KEY

The key for distinguishing vegetation types (Table 6) is not a strictly dichotomous. Due to the diversity of vegetation in the mapping area, and to avoid an excessively long document, a series of paired statements (or couplets) was not developed for each option. Instead, sets of characteristics with choices beneath them are provided. The key will first lead the user to the general options, and the individual selections for the vegetation associations will be listed beneath these options. Simply work through the numbered list of types from the more general to the most specific options until the best fit is reached. The choices are identified by a combination of alphanumeric codes, using capital letters, numerals, upper- and lowercase letters, and decimal points to distinguish the different key levels. The most basic, general levels in the key are on the left side of the alphanumeric code, and the most specific are on the right side. This coding system in the key relates to a series of left indentations. Thus, down the left-hand side of the pages are the major groupings; nested within them are the sub-groupings. The preliminary key will direct you to the major groups, such as forest/woodland, shrubland, and herbaceous, with the more specific choices beneath them. The more specific lists within these are generally based on presence/absence or dominance/sub-ordinance of species until arriving at the optimum choice. Please note: SINCE THERE MAY BE MORE THAN TWO ALTERNATIVES IN A GROUP, BE SURE TO WORK THROUGH ALL OF THE OPTIONS IN A LIST BEFORE YOU DECIDE WHAT IS THE BEST CHOICE.

**Table 5.** Crosswalk of classifications between the Associations in the Floristic National Vegetation Classification (NVC) and potential Holland (1986) and WHR (Mayer and Laudenslayer 1988) types

Lifeform	Association per Floristic NVC	Holland type	WHR type
<b>Wetland Woodlands</b>			
	<i>Quercus douglasii</i> - <i>Aesculus californica</i> / <i>Asclepias fascicularis</i> / <i>Rorippa</i> sp	blue oak woodland	blue oak woodland
<b>Upland and Mesic Woodlands and Forests</b>			
	<i>Aesculus californica</i> / <i>Toxicodendron diversilobum</i> /Moss	blue oak woodland	no match - blue oak woodland, blue oak-digger pine
	<i>Pinus sabiniana</i> / <i>Ceanothus cuneatus</i> / <i>Plantago erecta</i>	serpentine digger pine-chaparral woodland	closed-cone pine-cypress
	<i>Pinus sabiniana</i> / <i>Ceanothus cuneatus</i> - <i>Heteromeles arbutifolia</i> /Annual Herb-Grass	nonserpentine digger-pine-chaparral woodland	closed-cone pine-cypress
	<i>Quercus douglasii</i> /Annual grass-herb ( <i>Brachypodium distachyon</i> )	blue oak woodland	blue oak woodland
	<i>Quercus douglasii</i> /Annual Grass-Herb ( <i>Bromus hordeaceus</i> - <i>Lolium multiflorum</i> )	blue oak woodland	blue oak woodland
	<i>Quercus douglasii</i> /Annual Grass-Herb ( <i>Bromus hordeaceus</i> - <i>Madia gracilis</i> )	blue oak woodland	blue oak woodland
	<i>Quercus douglasii</i> /Annual Grass-Herb ( <i>Bromus hordeaceus</i> - <i>Triteleia laxa</i> )	blue oak woodland	blue oak woodland
	<i>Quercus douglasii</i> / <i>Toxicodendron diversilobum</i> /Annual Grass-Herb	blue oak woodland	blue oak woodland
	<i>Quercus douglasii</i> - <i>Aesculus californica</i> /Annual Grass-Herb	blue oak woodland	blue oak woodland
	<i>Quercus douglasii</i> - <i>Pinus sabiniana</i> /Annual Grass-Herb	blue oak woodland, digger pine-oak woodland	blue oak-digger pine
	<i>Quercus wislizeni</i> / <i>Heteromeles arbutifolia</i>	interior live oak woodland, interior live oak forest	No match - blue oak woodland or montane hardwood
	<i>Quercus wislizeni</i> / <i>Toxicodendron diversilobum</i>	interior live oak woodland, interior live oak forest	No match - blue oak woodland or montane hardwood
	<i>Quercus wislizeni</i> - <i>Aesculus californica</i> / <i>Toxicodendron diversilobum</i>	interior live oak woodland, interior live oak forest	No match - blue oak woodland or montane hardwood
	<i>Quercus wislizeni</i> - <i>Pinus sabiniana</i> /Annual Grass-Herb	interior live oak woodland, digger pine-oak woodland	blue oak-digger pine
	<i>Quercus wislizeni</i> - <i>Quercus douglasii</i> / <i>Toxicodendron diversilobum</i> /Annual grass	interior live oak woodland	No match - blue oak woodland or montane hardwood
	<i>Quercus wislizeni</i> - <i>Quercus douglasii</i> - <i>Pinus sabiniana</i> / <i>Toxicodendron diversilobum</i> /Annual Grass-Herb	interior live oak woodland, interior live oak forest, digger pine-oak woodland	blue oak-digger pine
	<i>Quercus wislizeni</i> - <i>Quercus kelloggii</i> / <i>Heteromeles arbutifolia</i> - <i>Toxicodendron diversilobum</i>	interior live oak woodland, interior live oak forest	montane hardwood
<b>Upland and Mesic Shrublands</b>			
	<i>Adenostoma fasciculatum</i> /Annual Grass-Herb-Moss	chamise chaparral	chamise-redshank chaparral
	<i>Adenostoma fasciculatum</i> / <i>Castilleja pruinosa</i> /Annual Grass-Herb	chamise chaparral	chamise-redshank chaparral

<b>Lifeform</b>	<b>Association per Floristic NVC</b>	<b>Holland type</b>	<b>WHR type</b>
	<i>Adenostoma fasciculatum</i> - <i>Arctostaphylos manzanita</i> - <i>Heteromeles arbutifolia</i>	northern mixed chaparral, chamise chaparral	mixed chaparral, chamise-redshank chaparral
	<i>Adenostoma fasciculatum</i> - <i>Ceanothus cuneatus</i> (alliance only)	northern mixed chaparral, chamise chaparral	mixed chaparral
	<i>Ceanothus cuneatus</i> /Annual Grass-Herb	buck brush chaparral	mixed chaparral
	<i>Ceanothus cuneatus</i> / <i>Plantago erecta</i>	mixed serpentine chaparral	mixed chaparral
	<i>Eriodictyon californicum</i> /Annual Grass-Herb	no match - northern mixed chaparral	mixed chaparral
	<i>Eriodictyon californicum</i> - <i>Ceanothus cuneatus</i> /Annual Grass-Herb ( <i>Brachypodium distachyon</i> - <i>Centaurea</i> spp.) Association	mixed serpentine chaparral	mixed chaparral
	<i>Heteromeles arbutifolia</i> (alliance only)	mixed serpentine chaparral	mixed chaparral
	<i>Rhamnus tomentella</i> - <i>Hoita macrostachya</i>	mixed serpentine chaparral	mixed chaparral
	<i>Toxicodendron diversilobum</i> / <i>Bromus hordeaceus</i> - <i>Micropus californicus</i>	poison oak chaparral	mixed chaparral
	<i>Toxicodendron diversilobum</i> / <i>Bromus hordeaceus</i> - <i>Vicia villosa</i> - <i>Madia gracilis</i>	poison oak chaparral	mixed chaparral
<b>Wetland Herbs</b>			
	<i>Carex nudata</i> (alliance only)	freshwater seep	freshwater emergent wetland
	<i>Carex serratodens</i> - <i>Hordeum brachyantherum</i> - <i>Juncus bufonius</i>	freshwater seep	freshwater emergent wetland
	<i>Eleocharis macrostachya</i> - <i>Sagittaria montevidensis</i> - <i>Paspalum distichum</i>	freshwater seep or montane freshwater marsh	freshwater emergent wetland
	<i>Hordeum brachyantherum</i> - <i>Polypogon monspeliensis</i> - <i>Juncus (oxymeris)</i>	freshwater seep	freshwater emergent wetland
	<i>Juncus balticus</i> (assoc unknown)	freshwater seep	freshwater emergent wetland
	<i>Lolium multiflorum</i> - <i>Hordeum marinum</i> - <i>Ranunculus californicus</i>	freshwater seep	freshwater emergent wetland, annual grassland
	<i>Stachys stricta</i> - <i>Polypogon monspeliensis</i>	freshwater seep	freshwater emergent wetland
	<i>Trifolium variegatum</i> (alliance only)	freshwater seep	freshwater emergent wetland
<b>Short Upland and Mesic Herbs</b>			
	<i>Selaginella hansenii</i> -Moss- <i>Streptanthus tortuosus</i> / <i>Mimulus aurantiacus</i>	no match – wildflower field?	no match - annual grassland or mixed chaparral
	<i>Vulpia microstachys</i> - <i>Lupinus nanus</i> - <i>Selaginella hansenii</i>	wildflower field	annual grassland
	<i>Vulpia microstachys</i> - <i>Parvisedum pumilum</i> - <i>Lasthenia californica</i>	northern basalt vernal pool or wildflower field	annual grassland
	<i>Vulpia microstachys</i> - <i>Plantago erecta</i> - <i>Calycadenia truncata</i>	wildflower field	annual grassland
<b>Medium Upland and Mesic Herbs</b>			
	<i>Brachypodium distachyon</i> - <i>Centaurea</i> spp.	non-native grassland	annual grassland
	<i>Bromus hordeaceus</i> - <i>Clarkia purpurea</i> - <i>Plagiobothrys nothofulvus</i>	non-native grassland	annual grassland
	<i>Bromus hordeaceus</i> - <i>Holocarpha virgata</i> ( <i>Lolium multiflorum</i> or <i>Vulpia microstachys</i> )	non-native grassland	annual grassland
	<i>Bromus hordeaceus</i> - <i>Holocarpha virgata</i> - <i>Taeniatherum caput-medusae</i>	non-native grassland	annual grassland
	<i>Bromus hordeaceus</i> - <i>Lupinus nanus</i> - <i>Trifolium</i> spp.	non-native grassland	annual grassland
	<i>Bromus hordeaceus</i> - <i>Vicia villosa</i> - <i>Lolium multiflorum</i> - <i>Trifolium hirtum</i>	non-native grassland	annual grassland

**Table 6:** Field key to the defined vegetation Associations from Peoria Wildlife Area, Tuolumne County, California

**Key to Main Vegetation Groups and Associations**

**Class A.** Vegetation with an overstory of trees (at least 5 m tall). Tree canopy may be as low as 8% over a denser understory of shrub and/or herbaceous species = **Tree Overstory Vegetation**

**Class B.** Vegetation characterized by woody shrubs in the canopy. Tree species, if present, generally total less than 10% absolute cover. Herbaceous species may total higher cover than shrubs. Shrubs are always at least 8% cover = **Shrubland Vegetation**

**Class C.** Vegetation characterized by non-woody, herbaceous species in the canopy including grass, graminoid, and broad-leaved herbaceous species. Shrubs, if present, compose <8% of the vegetation. Trees, if present, compose <10% cover: = **Herbaceous Vegetation**

**Class A. Tree Overstory Vegetation**

**Group I: Woodlands and forests characterized by needle-leaved coniferous pine (*Pinus*). The pine may only occur intermittently in the overstory associated with oaks or shrubs.**

**IA.** *Pinus sabiniana* (Foothill pine) occurs in the tree layer as an open to intermittent canopy with an abundant understory of shrubs such as *Ceanothus cuneatus* (wedgeleaf ceanothus), *Heteromeles arbutifolia* (toyon), etc. Herbaceous species also may be present ...

**IA1.** Foothill pine occurs with wedgeleaf ceanothus on serpentine parent material with a variety of herbs in the understory, particularly native species...

***Pinus sabiniana/Ceanothus cuneatus/Plantago erecta Association***

**IA2.** Foothill pine occurs with various shrubs, such as wedgeleaf ceanothus, toyon, *Arctostaphylos manzanita* (common manzanita), and *Adenostoma fasciculatum* (chamise), usually off serpentine with various and non-native herb species...

***Pinus sabiniana/Ceanothus cuneatus-Heteromeles arbutifolia/Annual Grass-Herb Association***

**IB.** Foothill pine occurs in low cover in the tree layer with other broad-leaf tree species such as *Quercus wislizeni* (interior live oak), *Quercus douglasii* (blue oak), etc. The canopy is usually intermittent to dense and the understory may contain shrub and herb species...

**IB1.** Foothill pine occurs primarily with blue oak in canopy. An intermittent to dense understory of grasses and herbs such as bromes also occur...

***Quercus douglasii-Pinus sabiniana/Annual Grass-herb Association***

**IB2.** Foothill pine occurs primarily with interior live oak in the canopy. An open to intermittent shrub and herb understory is also present...

***Quercus wislizeni-Pinus sabiniana/Annual Grass-herb Association***

**IB3.** Foothill pine occurs with both blue oak and interior live oak in the canopy. *Toxicodendron diversilobum* (poison oak) and other shrubs usually occur in understory, as do grasses and herbs...

***Quercus wislizeni-Quercus douglasii-Pinus sabiniana/Toxicodendron diversilobum/Annual Grass-Herb Association***

**IB4.** Foothill pine occurs with *Quercus kelloggii* (black oak) and interior live oak in the canopy. Toyon and poison oak are almost always in the understory...

***Quercus wislizeni-Quercus kelloggii/Heteromeles arbutifolia-Toxicodendron diversilobum***  
**Association**

**Group II. Woodlands and forests characterized mainly by broad-leaved evergreen and deciduous species such as oaks (*Quercus* spp.), *Aesculus californica* (California buckeye), etc.**

**IIA.** Blue oak and/or California buckeye are the primary broad-leaf tree species in the overstory. Other broad-leaved tree species may be present, but at relatively lower cover ...

**IIA1.** California buckeye is the primary overstory canopy species as a tree or shrub, usually on very rocky substrates, while oaks may be present but not abundant. Poison oak and herbs characteristically occur in the understory...

***Aesculus californica/Toxicodendron diversilobum/Moss***  
**Association**

**IIA2.** California buckeye and blue oak occur together in the overstory, usually as co-dominants.

**IIA2a.** Blue oak and California buckeye occur in the overstory of upland stands, whereby the understory consists of primarily dryland herb species.

***Quercus douglasii-Aesculus californica/Annual Grass-herb***  
**Association**

**IIA2b.** Blue oak and California buckeye occur in the overstory, sometimes with other trees such as *Quercus lobata* (valley oak) and Foothill pine, whereby the understory contains wetland species...

***Quercus douglasii-Aesculus californica/Asclepias fascicularis/Rorippa sp.***  
**Association**

**IIA3.** Blue oak is the primary overstory canopy oak species. Grasses and herbs occur consistently in understory.

**IIA3a.** Blue oak occurs as dominant, but there is significant presence of Foothill pine in the tree layer. Understory is well-developed with grasses and forbs...

***Quercus douglasii-Pinus sabiniana/Annual Grass-herb***  
**Association**

**IIA3b.** Blue oak occurs in overstory as the main tree species, usually with obvious burned trunks. Herb species occur intermittently to densely in understory, especially non-natives like *Brachypodium distachyon* (purple false-brome)...

***Quercus douglasii/Annual Grass-herb (Brachypodium distachyon)***  
**Association**

**IIA3c.** Blue oak occurs in the overstory as the main tree species, but the understory is dominated by non-native grasses *Bromus hordeaceus* (soft brome) and *Lolium multiflorum* (Italian ryegrass). Native herbs may be less abundant than the grasses...

***Quercus douglasii/Annual Grass-herb (Bromus hordeaceus-Lolium multiflorum)***  
**Association**

**IIA3d.** Blue oak occurs in the overstory as the main tree species, but the understory is dominated by with non-native grass, soft brome. However, there is characteristic presence (>1% absolute cover) of *Madia gracilis* (grassy tarweed), as well as other native herbs...

***Quercus douglasii/Annual Grass-herb (Bromus hordeaceus-Madia gracilis)***  
**Association**

**IIA3e.** Blue oak occurs in the overstory as the main tree species, but the understory is significantly dominant with non-native herbs soft brome. However, there is characteristic presence of *Triteleia laxa* (Ithuriel's spear)...

***Quercus douglasii*/Annual Grass-herb (*Bromus hordeaceus*-*Triteleia laxa*) Association**

**IIA3f.** Blue oak occurs in the overstory as the main tree species; however, the understory is shared in dominance by poison oak in the shrub layer and annual grasses and forbs in the herb layer – both exhibit similar cover...

***Quercus douglasii*/Toxicodendron diversilobum/Annual Grass-herb Association**

**IIB.** Other broad-leaf oaks, not just blue oak, occur in the overstory...

**IIB1.** There is a mixture of two or more oaks that primarily co-dominate (or have at least 15% relative cover) in the overstory...

**IIB1a.** Both blue oak and interior live oak are co-dominant (though interior oak is usually greater in cover), with trace foothill pine. Poison oak and annual grasses-forbs share dominance in the understory...

***Quercus wislizeni*-*Quercus douglasii*/Toxicodendron diversilobum/Annual grass Association**

**IIB1b.** Both blue oak and interior live oak are co-dominant (though interior live oak is usually greater in cover), with noticeable foothill pine. Poison oak and annual grasses-forbs share dominance in the understory...

***Quercus wislizeni*-*Quercus douglasii*-*Pinus sabiniana*/Toxicodendron diversilobum/Annual grass-herb Association**

**IIB1c.** Both interior live oak and black oak are co-dominant (though either can be greater in cover). Other trees may include foothill pine and blue oak. The understory has significant shrub cover with toyon, manzanita, poison oak and others...

***Quercus wislizeni*-*Quercus kelloggii*/Heteromeles arbutifolia-Toxicodendron diversilobum Association**

**IIB2.** Interior live oak occurs as the primary oak in the overstory, while gray pine may also be present...

**IIB2a.** Interior live oak occurs noticeably with gray pine in the overstory, where the pine is usually sub-dominant or co-dominant. The understory may include shrubs such as poison oak and wedgeleaf ceanothus. Herbs such as non-native grasses and forbs can be abundant...

***Quercus wislizeni*-*Pinus sabiniana*/Annual Grass-Herb Association**

**IIB2b.** Interior live oak occurs noticeably with California buckeye in the tree layer, while foothill pine may also be present. The understory includes primarily includes poison oak, but other shrubs may be present. A variety of herb species occur in the stand

***Quercus wislizeni*-*Aesculus californica*/Toxicodendron diversilobum Association**

**IIB2c.** Interior live oak is dominant but black oak is characteristically present in the overstory (black oak can be sub-dominant to co-dominant). The understory includes abundant shrub cover, including toyon, poison oak, manzanita, and other species. Herbs may be present from low to high abundance...

***Quercus wislizeni*-*Quercus kelloggii*/Heteromeles arbutifolia-Toxicodendron diversilobum Association**

**IIB2d.** Interior live oak is the main overstory tree species. The understory includes a significant cover of toyon, as well as other shrubs. Herbs may be low to high in cover...

***Quercus wislizeni/Heteromeles arbutifolia* Association**

**IIB1e.** Interior live oak is the main overstory tree species. The understory has a significant cover of poison oak, while other shrubs may be present in lesser degree such as wedgeleaf ceanothus...

***Quercus wislizeni/Toxicodendron diversilobum* Association**

**Class B. Shrubland Vegetation**

**Group I:** Sclerophyllous temperate broad-leaved shrublands usually dominated by typical chaparral shrub genera; including *Adenostoma fasciculatum* (chamise), *Ceanothus*, *Arctostaphylos* (manzanita), *Quercus* (scrub oaks), *Rhamnus* (Coffeeberry) species etc.

**IA.** Stands occur in riparian habitats, primarily with wetland species including *Rhamnus tomentella* (hoary coffeeberry), *Hoita macrostachya* (large leather root), *Calycanthus occidentalis* (spicebush), and *Salix* (willow) spp...

***Rhamnus tomentella-Hoita macrostachya* Association**

**IB.** Stands occur in mesic to upland habitats, primarily with upland species such as chamise, *Ceanothus*, *Heteromeles arbutifolia* (toyon), *Eriodictyon californicum* (yerba santa)...

**IB1.** Stands have chamise as a significant component (dominant to co-dominant with other shrubs).

**IB1a.** Chamise occurs as the sole dominant in the overstory, usually at high cover. Moss and lichen characteristically present. Herbs are also present but usually sparse compared to chamise...

***Adenostoma fasciculatum/Annual Grass-herb-Moss* Association**

**IB1b.** Chamise occurs as the sole dominant in the overstory but at low to moderate cover. A variety of herbs occur at similar to higher cover than chamise...

***Adenostoma fasciculatum/Castilleja pruinosa/Annual Grass-herb* Association**

**IB1c.** Chamise occurs as a co-dominant with *Arctostaphylos manzanita* (common manzanita) and toyon. Herbs may be present but relatively lower in cover than the shrubs...

***Adenostoma fasciculatum-Arctostaphylos manzanita-Heteromeles arbutifolia* Association**

**IB1c.** Chamise occurs as a co-dominant with *Ceanothus cuneatus* (wedgeleaf ceanothus). Herbs may be present but relatively lower in cover than the shrubs...

***Adenostoma fasciculatum-Ceanothus cuneatus* Alliance (association unknown)**

**IB2.** Stands have ceanothus and/or toyon as a main component (dominant to co-dominant with other shrubs)...

**IB2a.** Wedgeleaf ceanothus occurs as the sole dominant shrub in the overstory, while a variety of non-native annual grasses and herbs such as *Bromus* (bromes) and *Anthriscus caucalis* (burr chervil) occur in the understory, usually off serpentine...

***Ceanothus cuneatus/Annual Grass-herb* Association**

**IB2b.** Wedgeleaf ceanothus occurs as the sole dominant shrub in the overstory, while a variety of both native and non-native herbs occur in the understory such as *Plantago*



*erecta* (dwarf plantain), *Gilia tricolor* (bird's-eye gilia), *Bromus hordeaceus* (soft brome), *Vulpia microstachys* (small fescue), usually on serpentine...

***Ceanothus cuneatus/Plantago erecta* Association**

**IB2c.** Yerba santa occurs with wedgeleaf ceanothus (either may dominate). A significant understory of annual grasses and herbs such as *Brachypodium distachyon* (purple false-brome) and *Centaurea* (star-thistle) occur...

***Eriodictyon californicum-Ceanothus cuneatus/Annual Grass-Herb (Brachypodium distachyon-Centaurea spp.)* Association**

**IB2d.** Toyon occurs as the dominant shrub in the overstory, while other shrubs such as wedgeleaf ceanothus may be present in lower cover. Herbs may be present...

***Heteromeles arbutifolia* Alliance (association unknown)**

**Group II. Scrub dominated mainly by soft-leaved, microphyllous or broad-leaved evergreen or drought-deciduous species – generally considered to be part of deciduous shrub, Coastal Sage, or other more soft-leaved shrub habitats. Chaparral species may be present but sub-dominant. Includes Poison Oak, Bush Monkeyflower, Yerba Santa, etc.**

**IIA.** Stands occur in upland habitats on various substrates with *Toxicodendron diversilobum* (poison oak) as the main shrub species.

**IIA1.** Poison oak occurs characteristically with soft brome, *Micropus californicus* var. *californicus* (q-tips), *Clarkia purpurea* (winecup clarkia), *Trifolium microcephalum* (smallhead clover), and other native and non-native species...

***Toxicodendron diversilobum/Bromus hordeaceus-Micropus californicus* Association**

**IIA2.** Poison oak occurs with *Vicia villosa* (winter vetch), soft brome, *Madia gracilis* (grassy tarweed), and other non-native and native species...

***Toxicodendron diversilobum/Bromus hordeaceus-Vicia villosa-Madia gracilis* Association**

**IIB.** Stands occur in upland habitats on serpentine or mixed and recently disturbed substrates with yerba santa as the main shrub species...

**IIB1.** Yerba santa is the sole dominant shrub, while the herbaceous layer is similar to higher in cover and includes soft brome, *Galium parisiense* (wall bedstraw), and *Trifolium hirtum* (rose clover)...

***Eriodictyon californicum/Annual Grass-herb* Association**

**IIB2.** Yerba santa is dominant to co-dominant with wedgeleaf ceanothus. A significant understory of annual grasses and herbs (e.g., purple false-brome, star-thistle.) occur...

***Eriodictyon californicum-Ceanothus cuneatus/Brachypodium distachyon(-Centaurea spp.)* Association**

**IC.** Stands occur in rocky, usually volcanic substrates, with a minor shrub component characterized by *Mimulus aurantiacus* (monkeyflower). Toyon may also be present. Moss and *Selaginella* (spikemoss) are characteristic while other understory herbs may be present in low abundance...

***Selaginella hansenii-Moss-Streptanthus tortuosus/Mimulus aurantiacus* Association**

**Class C. Herbaceous Vegetation**

**Group I.** Vegetation is dominated by mainly wetland forb species, including rush (*Juncus* spp.), sedge (*Carex* spp.), Spikerush (*Eleocharis*), meadow barley (*Hordeum brachyantherum*), and rabbitfoot grass (*Polypogon*). Woody species cover <2% of the ground surface.

**IA.** Stands are in wet seeps dominated by the native *Trifolium variegatum* (whitetip clover), usually off serpentine. Other herbs and graminoids may be present but in lesser degree overall...

***Trifolium variegatum* Association**

**IB.** Stands are in wet seeps and perennial streamcourses dominated by native sedges or rushes.

**IB1.** *Carex serratodens* (two-tooth sedge) is dominant, or co-dominant with *Juncus* (rushes) and other wetland species, particularly in serpentine seeps...

***Carex serratodens-Hordeum brachyantherum-Juncus bufonius* Association**

**IB2.** *Carex nudata* (naked or torrent sedge) is dominant, or co-dominant with species such as tufts along running streamcourses, with species such as *Lolium multiflorum* (Italian ryegrass), *Paspalum dilatatum* (dallisgrass), and *Stachys stricta* (hedgenettle)...

***Carex nudata* Alliance (association unknown)**

**IB3.** *Eleocharis macrostachya* (common spikerush) is dominant, particularly in non-serpentine seeps and ponds...

***Eleocharis macrostachya-Sagittaria montevidensis-Paspalum distichum* Association**

**IB4.** *Juncus balticus* (baltic rush) is dominant, or co-dominant with Italian ryegrass and other upland species...

***Juncus balticus* Alliance (association unknown)**

**IB5.** *Juncus oxymiris* (pointed rush) is co-dominant with *Paspalum monspeliensis* (rabbitfootgrass), while *Hordeum brachyantherum* (meadow barley) is characteristically present...

***Hordeum brachyantherum-Polypogon monspeliensis-Juncus (oxymiris)* Association**

**IC.** Stands are in seasonally saturated swales or streamcourses with rabbitfootgrass being barely present or as main dominants...

**IC1.** Rabbitfootgrass shares dominance with meadow barley and other wetland species...

***Hordeum brachyantherum-Polypogon monspeliensis-Juncus (oxymiris)* Association**

**IC2.** Rabbitfootgrass shares dominance with hedgenettle, *Asclepias fascicularis* (Mexican whorled milkweed), and other wetland species...

***Stachys stricta-Polypogon monspeliensis* Association**

**IC3.** *Hordeum marinum* (Mediterranean barley) shares dominance with Italian ryegrass and *Ranunculus californicus* (California buttercup), and other wetland and upland species...

***Lolium multiflorum-Hordeum marinum- Ranunculus californicus* Association**

**Group II. Vegetation dominated mainly by upland or mesic herbaceous species, including native and exotic grasses, forbs, and cryptogrammic species. If woody species are present, they cover <2% of the ground surface.**

**IIA.** The main grass species in the overstory is *Brachypodium distachyon* (purple false-brome), while a variety of other non-native and native species occur...

***Brachypodium distachyon-Centaurea spp.* Association**

**IIB.** The main grass species in the overstory is *Bromus hordeaceus* (soft brome). Other bromes and grasses may share dominance with the

**IIB1.** Soft brome occurs with *Trifolium hirtum* (rose clover), *Clarkia purpurea* (winecup clarkia), *Plagiobothrys nothofulvus* (rusty popcornflower), *Daucus pusillus* (wild carrot), and other native herbs...

***Bromus hordeaceus-Clarkia purpurea-Plagiobothrys nothofulvus Association***

**IIB2.** Soft brome occurs primarily with rose clover, Italian ryegrass, *Vicia sativa* ssp. *nigra* and *Vicia villosa* (garden and winter vetch).

***Bromus hordeaceus-Vicia villosa-Lolium multiflorum-Trifolium hirtum Association***

**IIB3.** Soft brome co-dominates with *Holocarpha virgata* (yellowflower tarweed), and a variety of species occur including Italian ryegrass, *Vulpia microstachys* (small fescue), etc...

***Bromus hordeaceus-Holocarpha virgata (Lolium multiflorum or Vulpia microstachys) Association***

**IIB4.** Soft brome co-dominates with yellowflower tarweed and *Taeniatherum caput-medusae* (medusahead grass), and a variety of other herb species occur...

***Bromus hordeaceus-Holocarpha virgata-Taeniatherum caput-medusae Association***

**IIB5.** Soft brome is dominant, though *Lupinus nanus* (sky lupine), is subdominant to co-dominant. Native clovers, *Hypochaeris glabra* (smooth cat's ear), and other herbs are also present...

***Bromus hordeaceus-Lupinus nanus-Trifolium spp. Association***

**IIC.** Italian ryegrass and Mediterranean barley co-occur with California buttercup...

***Lolium multiflorum-Hordeum marinum- Ranunculus californicus Association***

**IID.** The main overstory grass is small fescue (with or without soft brome) and possibly other native grasses such as *Melica californica* (California melicgrass) and *Nassella* (tussockgrass) sp.

**IID1.** Stands are on serpentine substrate with small fescue and native forbs such as dwarf plantain, *Calycadenia* spp. (rosinweed), *Castilleja* spp. (paintbrush), *Gilia tricolor* (bird's-eye gilia), etc.

***Vulpia microstachys-Plantago erecta-Calycadenia truncata Association***

**IID2.** Stands are on volcanic substrate with small fescue and native forbs such as sky lupine, *Minuartia californica* (California sandwort), *Triteleia hyacinthina* (white brodiaea), and spikemoss...

***Vulpia microstachys-Lupinus nanus-Selaginella hansenii Association***

**IID3.** Stands are on volcanic substrate with small fescue and native forbs such as *Parvisedum pumilum* (Sierra mock stonecrop), *Lasthenia californica* (California goldfields), white brodiaea, and *Trifolium depauperatum* var. *truncatum* (balloon sack clover). Soils in these stands are usually have more wetness through the growing season than the one above.

***Vulpia microstachys-Parvisedum pumilum-Lasthenia californica Association***

**IIE.** Herbs and grasses occur sporadically on volcanic rock outcrops with species such as California melicgrass and *Streptanthus tortuosus* (shieldplant). Shrubs are sporadic, including *Mimulus aurantiacus* (Monkeyflower) and toyon. Further, moss and spikemoss are characteristically present...

***Selaginella hansenii-Moss-Streptanthus tortuosus/Mimulus aurantiacus Association***

## VEGETATION DESCRIPTIONS

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### TREE-OVERSTORY VEGETATION

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#### ***Aesculus californica*/*Toxicodendron diversilobum*/Moss Association (new provisional) California Buckeye / Poison Oak / Moss Association**

##### **GENERAL VEGETATION DESCRIPTION**

Stands of *Aesculus californica*/*Toxicodendron diversilobum*/Moss Woodland form a sparse to intermittent tree layer (1-60%, mean 15%) with conifers at 0-20m tall and hardwoods at 2-10m tall, an open to intermittent shrub layer (18-65%, mean 33.8%) at 0-5m tall, and a sparse to intermittent herbaceous layer (0.2-50%, mean 19.4%) at 0.1-1m tall. *Aesculus californica*, *Toxicodendron diversilobum* and unidentified Moss species are dominant in the tree, shrub, and herb layer. *Aesculus californica* are occasionally regenerating in the shrub layer. Total vegetation cover is 45-75%, mean cover is 59.7%.

In this association, the main overstory tree species is *Aesculus californica*. *Quercus wislizeni* consistently occurs but at relatively low cover. A frequent understory shrub layer includes *Toxicodendron diversilobum*, *Mimulus aurantiacus*, and *Keckiella breviflora*. The herbaceous understory frequently includes a diverse mixture of grass and forb species such as *Bromus hordeaceus*, *Bromus madritensis*, *Bromus diandrus*, *Pentagramma triangularis subsp. triangularis*, and *Phacelia cicutaria*.

##### **ENVIRONMENTAL DESCRIPTION**

Elevation: range 597-1785 ft, mean 1353 ft

Aspect: variable but often NW

Slope: gentle to steep, range 3-45 degrees, mean 32.5 degrees

Topography: lower to upper slope; often undulating occasionally concave

Litter Cover: range 6-30%, mean 16.3%

Rock Cover: range 42-85%, mean 61.4%

Bare Ground: range 0.2-12%, mean 4.2%

Parent Material: volcanic extrusives, metamorphic, volcanic flow or plutonic

Soil Texture: often moderately fine sandy clay loam, occasionally medium sand or moderately coarse sandy loam

Stands were found in the NE, NW, and SW portions of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California), particularly where steep rock outcrops and bouldery fields occur, including the talus slopes of Table Mountain and the rocky slopes overlooking New Melones Lake and dam output.

##### **Number of Samples Used in Description: 6**

**Samples:** APEOR060, APEOR065, APEOR095, APEOR101, APEOR264, APEOR266

**Rank:** G3 S3.2

##### **GLOBAL DISTRIBUTION**

*Aesculus californica* Alliance: Inner North Coast Ranges, inner Central Coast Ranges, Sierra Nevada foothills, and montane Transverse Ranges.

Association: unknown, but probably similar range as the alliance.

##### **REFERENCES**

Sawyer and Keeler-Wolf 1995

## RESTORATION INFORMATION

This association has low non-native plant cover (average 19%) relative to native cover. Non-native species with highest cover include *Brachypodium distachyon*, *Bromus hordeaceus*, and *Bromus madritensis*. *Carduus pycnocephalus* and *Centaurea melitensis* are found in two of six stands at less than 1% average cover (see Appendix 2 and Pages 16-18 for restoration references). Roads were recorded in some stands with a high impact to the vegetation, which may contribute to soil compaction and may act as conduits for non-native species. Thus, it is recommended to reduce road disturbance and close/restore unneeded roads to deter any additional spread of non-natives.

### *Aesculus californica*/*Toxicodendron diversilobum*/Moss

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUWI2-T	<i>Quercus wislizeni</i>	0.7	0.6	0.2	2
	AECA-T	<i>Aesculus californica</i>	0.3	12.5	15	60
<b>Tree Understory</b>						
	AECA-M	<i>Aesculus californica</i>	0.7	12.5	10	40
<b>Shrub</b>						
	TODI-M	<i>Toxicodendron diversilobum</i>	1	10.3	3	18
	KEBR-M	<i>Keckiella breviflora</i>	0.7	2.4	0.2	8
	MIAU-M	<i>Mimulus aurantiacus</i>	0.7	3.2	0.2	12
	HEAR5-M	<i>Heteromeles arbutifolia</i>	0.5	2.3	1	8
	RHTO6-M	<i>Rhamnus tomentella</i>	0.5	0.4	0.2	2
	ERLAG-L	<i>Eriophyllum lanatum var. grandiflorum</i>	0.3	0.2	0.2	1
	LOSC2-M	<i>Lotus scoparius</i>	0.3	0.5	0.2	3
	SAME5-M	<i>Sambucus mexicana</i>	0.3	0.9	0.2	5
<b>Herb</b>						
	BRDI3-L	<i>Bromus diandrus</i>	0.7	1.2	0.2	3
	BRHO2-L	<i>Bromus hordeaceus</i>	0.7	4.4	0.2	15
	BRMA3-L	<i>Bromus madritensis</i>	0.7	1.5	0.2	5
	PETRT-L	<i>Pentagramma triangularis ssp. triangularis</i>	0.7	0.4	0.2	2
	PHCI-L	<i>Phacelia cicutaria</i>	0.7	0.4	0.2	1
	AMME12-L	<i>Amsinckia menziesii var. intermedia</i>	0.5	0.1	0.2	0.2
	AVBA-L	<i>Avena barbata</i>	0.5	0.7	0.2	3
	BRDI2-L	<i>Brachypodium distachyon</i>	0.5	5	0.2	20
	CLUN-L	<i>Clarkia unguiculata</i>	0.5	0.1	0.2	0.2
	DUCYC3-L	<i>Dudleya cymosa ssp. cymosa</i>	0.5	0.1	0.2	0.2
	HERBAC-L	Herbaceous unknown	0.5	0.1	0.2	0.2
	MECA2-L	<i>Melica californica</i>	0.5	0.2	0.2	1
	TOAR-L	<i>Torilis arvensis</i>	0.5	0.6	0.2	3
	TRWI3-L	<i>Trifolium willdenovii</i>	0.5	0.5	0.2	2
	VIVI-L	<i>Vicia villosa</i>	0.5	1.2	0.2	5
	AGHE2-L	<i>Agoseris heterophylla</i>	0.3	0.1	0.2	0.2
	ALPEP2-L	<i>Allium peninsulare var. peninsulare</i>	0.3	0.1	0.2	0.2
	AVFA-L	<i>Avena fatua</i>	0.3	0.7	2	2

**Aesculus californica/Toxicodendron diversilobum/Moss**

Layer	Code	Species Name	Freq	Avg	Min	Max
	BREL-L	<i>Brodiaea elegans</i>	0.3	0.1	0.2	0.2
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.3	0.8	2	3
	CEME2-L	<i>Centaurea melitensis</i>	0.3	0.4	0.2	2
	CHLOR3-L	<i>Chlorogalum</i>	0.3	0.2	0.2	1
	DAPU3-L	<i>Daucus pusillus</i>	0.3	0.5	0.2	3
	DELPH-L	<i>Delphinium</i>	0.3	0.1	0.2	0.2
	DIVO-L	<i>Dichelostemma volubile</i>	0.3	0.1	0.2	0.2
	HYGL2-L	<i>Hypochaeris glabra</i>	0.3	0.1	0.2	0.2
	LUNA3-L	<i>Lupinus nanus</i>	0.3	0.1	0.2	0.2
	MAEX-L	<i>Madia exigua</i>	0.3	0.1	0.2	0.2
	MAGR3-L	<i>Madia gracilis</i>	0.3	0.1	0.2	0.2
	MIAC-L	<i>Microseris acuminata</i>	0.3	0.1	0.2	0.2
	PEAN2-L	<i>Pellaea andromedifolia</i>	0.3	0.1	0.2	0.2
	PEMU-L	<i>Pellaea mucronata</i>	0.3	0.1	0.2	0.2
	PHRA2-L	<i>Phacelia ramosissima</i>	0.3	0.9	0.2	5
	POSE-L	<i>Poa secunda</i>	0.3	0.1	0.2	0.2
	STTOT2-L	<i>Streptanthus tortuosus</i> var. <i>tortuosus</i>	0.3	0.1	0.2	0.2
	THLA3-L	<i>Thysanocarpus laciniatus</i>	0.3	0.1	0.2	0.2
	TRLA16-L	<i>Triteleia laxa</i>	0.3	0.1	0.2	0.2
	TRMI4-L	<i>Trifolium microcephalum</i>	0.3	0.2	0.2	1
	VISAN2-L	<i>Vicia sativa</i> ssp. <i>nigra</i>	0.3	0.1	0.2	0.2
	VUMI-L	<i>Vulpia microstachys</i>	0.3	1.7	0.2	10
	VUMY-L	<i>Vulpia myuros</i>	0.3	0.3	1	1

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***Pinus sabiniana/Ceanothus cuneatus/Plantago erecta* Association (new provisional)  
Foothill Pine / Wedgeleaf Ceanothus / Dwarf Plantain Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Pinus sabiniana/Ceanothus cuneatus/Plantago erecta* Woodland form a sparse to open tree layer (8-10%, mean 9%) with conifers at 10-20m tall and hardwoods at 0-10m tall, an open shrub layer (16-25%, mean 20.3%) at 0-5m tall, and an intermittent herbaceous layer (45-65%, mean 56.3%) at 0.1-0.5m tall. Total vegetation cover is 60-80%, mean cover is 72.5%.

In this association, *Pinus sabiniana* is the main overstory tree species, while *Quercus wislizeni* and/or *Quercus douglasii* show a trace occurrence. *Ceanothus cuneatus* is dominant in the understory shrub layer. *Eriodictyon californicum* and *Eriophyllum lanatum* var. *grandiflorum* are frequently present at low cover, and *Heteromeles arbutifolia* is infrequently occurring. The herbaceous understory includes a diversity of grass and forb species with *Plantago erecta*, *Bromus hordeaceus*, *Daucus pusillus*, *Vulpia microstachys*, *Trifolium willdenovii*, and *Trifolium microcephalum* characteristically occurring. Other frequently occurring herbaceous species include *Pentagramma triangularis*, subsp. *triangularis*, *Lessingia nemaclada*, *Hypochaeris glabra*, *Galium porrigens*, *Lasthenia californica*, and *Avena barbata*.

*Lomatium congdonii*, CNPS List 1B plant, is found in one stand of this association (PEOR002). This species has a limited number of occurrences in California. *Chlorogalum grandiflorum*, CNPS List 1B plant, may occur in the stands, but identification in peak flowering is needed to confirm.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 906-1233 ft, mean 1076 ft

Aspect: variable

Slope: gentle to somewhat steep, range 4-20 degrees, mean 12.8 degrees

Topography: lower slope to mid slope; convex or undulating

Litter Cover: range 1-21%, mean 13%

Rock Cover: range 30-66%, mean 45.8%

Bare Ground: range 7-50%, mean 23.8%

Parent Material: serpentine

Soil Texture: moderately fine sandy clay loam

Stands were found in the SW and lower central portions of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California), particularly on serpentine parent material.

**Number of Samples Used in Description: 4**

**Samples:** APEOR002, APEOR009, APEOR017, APEOR289

**Rank:** G3 S3

**GLOBAL DISTRIBUTION**

*Ceanothus cuneatus* Alliance: North Coast, montane Central Coast Ranges, Klamath Ranges to southern Oregon, Cascade Range, Sierra Nevada, Los Padres National Forest, outer montane Transverse Ranges, and Peninsular Ranges (including W Riverside County) to Baja California  
Association: unknown, but potentially the central to northern Sierra Nevada foothills on serpentine

**REFERENCES**

Evens and San 2004, Sawyer and Keeler-Wolf 1995, Kruckeberg 1984, Sharsmith 1982, Holland 1986

**RESTORATION INFORMATION**

This association has moderate non-native plant cover (average 36.3%) relative to native cover. Non-native species with highest cover mainly include grasses and forbs, such as *Bromus hordeaceus* and *Aira*

*caryophyllea*. *Centaurea melitensis* occurred in three of four stands at less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts were minimal.

***Pinus sabiniana/Ceanothus cuneatus/Plantago erecta***

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	PISA2-T	<i>Pinus sabiniana</i>	1	9	8	10
<b>Tree Understory</b>						
	PISA2-L	<i>Pinus sabiniana</i>	0.5	0.1	0.2	0.2
<b>Shrub</b>						
	CECU-M	<i>Ceanothus cuneatus</i>	1	21.5	15	35
	ERCA6-M	<i>Eriodictyon californicum</i>	0.8	1.3	0.2	4
	ERLAG-L	<i>Eriophyllum lanatum</i> var. <i>grandiflorum</i>	0.8	1.1	0.2	4
<b>Herb</b>						
	BRHO2-L	<i>Bromus hordeaceus</i>	1	36.5	20	50
	DAPU3-L	<i>Daucus pusillus</i>	1	7.3	0.2	16
	PLER3-L	<i>Plantago erecta</i>	1	4.3	2	8
	TRMI4-L	<i>Trifolium microcephalum</i>	1	1.3	0.2	3
	TRWI3-L	<i>Trifolium willdenovii</i>	1	1.5	1	2
	VUMI-L	<i>Vulpia microstachys</i>	1	6.9	0.2	25
	AVBA-L	<i>Avena barbata</i>	0.8	1	1	2
	BRMA3-L	<i>Bromus madritensis</i>	0.8	0.6	0.2	1
	CAAT25-L	<i>Castilleja attenuata</i>	0.8	0.2	0.2	0.2
	CEME2-L	<i>Centaurea melitensis</i>	0.8	0.6	0.2	1
	CLPUQ-L	<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	0.8	0.2	0.2	0.2
	GAPO-L	<i>Galium porrigens</i>	0.8	1	1	2
	HYGL2-L	<i>Hypochaeris glabra</i>	0.8	1.6	0.2	6
	LACA7-L	<i>Lasthenia californica</i>	0.8	1	1	2
	LENE3-L	<i>Lessingia nemaclada</i>	0.8	2.1	0.2	8
	MECA2-L	<i>Melica californica</i>	0.8	0.6	0.2	1
	PETRT-L	<i>Pentagramma triangularis</i> ssp. <i>triangularis</i>	0.8	3.9	0.2	15
	URLI5-L	<i>Uropappus lindleyi</i>	0.8	0.4	0.2	1
	AICA-L	<i>Aira caryophyllea</i>	0.5	6.3	0.2	25
	BRDI3-L	<i>Bromus diandrus</i>	0.5	1.3	0.2	5
	CAOCO-L	<i>Calystegia occidentalis</i> ssp. <i>occidentalis</i>	0.5	2.1	0.2	8
	CHLOR3-L	<i>Chlorogalum</i>	0.5	0.3	0.2	1
	DICA14-L	<i>Dichelostemma capitatum</i>	0.5	0.1	0.2	0.2
	ERNUP4-L	<i>Eriogonum nudum</i> var. <i>pubiflorum</i>	0.5	0.1	0.2	0.2
	ESCA-L	<i>Eschscholzia caespitosa</i>	0.5	0.8	0.2	3
	GAVE3-L	<i>Gastridium ventricosum</i>	0.5	0.1	0.2	0.2
	LICI-L	<i>Linanthus ciliatus</i>	0.5	2	1	7
	LOWR2-L	<i>Lotus wrangelianus</i>	0.5	0.8	0.2	3



***Pinus sabiniana/Ceanothus cuneatus/Plantago erecta***

<b>Layer</b>	<b>Code</b>	<b>Species Name</b>	<b>Freq</b>	<b>Avg</b>	<b>Min</b>	<b>Max</b>
	PLNO-L	<i>Plagiobothrys nothofulvus</i>	0.5	0.1	0.2	0.2
	PTDR-L	<i>Pterostegia drymarioides</i>	0.5	0.3	0.2	1
	THCU-L	<i>Thysanocarpus curvipes</i>	0.5	0.1	0.2	0.2
<b>Cryptogam</b>						
	LICHEN-L	Lichen	0.5	5.3	1	20
	MOSS-L	Moss	0.5	3.3	5	8

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***Pinus sabiniana/Ceanothus cuneatus-Heteromeles arbutifolia*/Annual Grass-Herb Association  
(new provisional)**

**Foothill Pine / Wedgeleaf Ceanothus - Toyon / Annual Grass-Herb Association**

**GENERAL VEGETATION DESCRIPTION**

One stand of *Pinus sabiniana/Ceanothus cuneatus-Heteromeles arbutifolia*/Annual Grass-Herb Woodland forms an open to intermittent tree layer (at about 12-30% cover) with conifers at 15-20m tall. The stand also has a shrub layer (about 25% cover) at 0.5-2m tall, and an herbaceous layer (about 60% cover) at 0.1-0.5m tall. Total vegetation cover is about 85%.

In this association, *Pinus sabiniana* is the sole dominant tree in the canopy, and it is regenerating in the understory. Shrubs may be higher in cover than the pine, and they include a variety of species such as *Ceanothus cuneatus*, *Heteromeles arbutifolia*, *Arctostaphylos manzanita*, and *Adenostoma fasciculatum*. The herbaceous layer includes a diversity of grass and forb species such as *Brachypodium distachyon*, *Bromus hordeaceus*, *Trifolium hirtum*, *Vicia villosa*, *Clarkia* sp., and *Pentagramma triangularis* subsp. *triangularis*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: 525 ft

Aspect: SW

Slope: 28 degrees

Topography: lower slope; undulating surface

Litter Cover: 40%

Rock Cover: 25%

Bare Ground: 20%

Parent Material: mixed Mesozoic plutonic rock

Soil Texture: moderately fine sandy clay loam

This association was found on a steep lower slope just to the E of the Stanislaus River and S of New Melones Dam (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California). The tree layer is open, the shrub layer is open to intermittent, and the herb layer is intermittent and dominated by exotic species. Some fire scars are present in this stand, and the abundance of *Brachypodium distachyon* may be correlated to the recent fire of the 1990's. Other stands are expected.

**Number of Samples Used in Description: 1**

**Sample:** APEOR209

**Rank:** G4 S4? Difficult to rank as more data are needed, but probably common

**GLOBAL DISTRIBUTION**

*Pinus sabiniana* Alliance: North Coast, Central Coast, Sacramento Valley, low elevation Klamath Range and foothills, Cascade Range foothills, Sierra Nevada foothills, montane Transverse Ranges, Modoc Plateau, west Mojave Desert

Association: unknown, but potentially the Sierra Nevada foothills west and north to the Coast Ranges and Klamath Range

**REFERENCES**

Evens and San 2004, Sawyer and Keeler-Wolf 1995, Kruckeberg 1984, Sharsmith 1982, Holland 1986

**RESTORATION INFORMATION**

This association has high non-native plant cover (average 68.9%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Brachypodium distachyon*, *Bromus hordeaceus* and the annual forbs *Trifolium hirtum* and *Vicia villosa*. *Centaurea solstitialis* occurred within

the one stand sampled at a cover of 3%. (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts were minimal.

***Pinus sabiniana/Ceanothus cuneatus-Heteromeles arbutifolia/Annual herb-grass***

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	PISA2-T	<i>Pinus sabiniana</i>	1	12	12	12
<b>Tree Understory</b>						
	PISA2-M	<i>Pinus sabiniana</i>	1	0.2	0.2	0.2
<b>Shrub</b>						
	ADFA-M	<i>Adenostoma fasciculatum</i>	1	0.2	0.2	0.2
	ARMA-M	<i>Arctostaphylos manzanita</i>	1	5	5	5
	CECU-M	<i>Ceanothus cuneatus</i>	1	10	10	10
	ERCA6-M	<i>Eriodictyon californicum</i>	1	0.2	0.2	0.2
	HEAR5-M	<i>Heteromeles arbutifolia</i>	1	10	10	10
	MIAU-M	<i>Mimulus aurantiacus</i>	1	0.2	0.2	0.2
	RHIL-M	<i>Rhamnus ilicifolia</i>	1	0.2	0.2	0.2
	RHTO6-M	<i>Rhamnus tomentella</i>	1	0.2	0.2	0.2
	TODI-M	<i>Toxicodendron diversilobum</i>	1	1	1	1
<b>Herb</b>						
	AVBA-L	<i>Avena barbata</i>	1	1	1	1
	BRDI2-L	<i>Brachypodium distachyon</i>	1	50	50	50
	BRHO2-L	<i>Bromus hordeaceus</i>	1	20	20	20
	CESO3-L	<i>Centaurea solstitialis</i>	1	3	3	3
	CLARK-L	<i>Clarkia</i>	1	0.2	0.2	0.2
	GAPO-L	<i>Galium porrigens</i>	1	0.2	0.2	0.2
	HYGL2-L	<i>Hypochaeris glabra</i>	1	0.2	0.2	0.2
	MECA2-L	<i>Melica californica</i>	1	0.2	0.2	0.2
	PETRT-L	<i>Pentagramma triangularis</i> <i>ssp. triangularis</i>	1	0.2	0.2	0.2
	TRHI4-L	<i>Trifolium hirtum</i>	1	10	10	10
	TRWI3-L	<i>Trifolium willdenovii</i>	1	0.2	0.2	0.2
	VIVI-L	<i>Vicia villosa</i>	1	5	5	5

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***Quercus douglasii*/Annual Grass-Herb (*Brachypodium distachyon*) Association (new)  
Blue Oak / Annual Grass-Herb (Purple False-Brome) Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Quercus douglasii*/Annual Grass-Herb (*Brachypodium distachyon*) Woodland form a sparse to intermittent tree layer (0.2-38%, mean 15.6%) with conifers at 0-20m tall and hardwoods at 5-15m tall, a sparse to open shrub layer (0-10%, mean 3.2%) at 0-2m tall, and an intermittent to continuous herbaceous layer (65-90%, mean 77.9%) at 0.1-1m tall. *Quercus douglasii* dominates the tree layer. Total vegetation cover is 65-93%, mean cover is 81.2%.

In this association, the main overstory tree species is *Quercus douglasii*, and there is trace occurrence of *Pinus sabiniana*, *Quercus wislizeni*, and *Aesculus californica*. A frequent but relatively low abundance of shrubs include *Toxicodendron diversilobum* and *Sambucus mexicana*. The herbaceous layer includes grass and forb species, which is dominated by non-natives *Brachypodium distachyon* and *Bromus hordeaceus*, yet other frequently occurring species are *Trifolium hirtum*, *Vicia villosa*, *Centaurea melitensis*, *Bromus madritensis*, *Carduus pycnocephalus*, *Amsinckia menziesii* var. *intermedia*, and *Brodiaea elegans*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 836-1560 ft, mean 1254 ft

Aspect: SW or Flat

Slope: moderate to somewhat steep, range 11-26 degrees, mean 17.5 degrees

Topography: lower slope to upper slope; often undulating, occasionally concave, convex or linear

Litter Cover: range 22.8-70%, mean 42.2%

Rock Cover: range 3.2-34%, mean 16.8%

Bare Ground: range 0.2-36%, mean 16.2%

Parent Material: metamorphic, metavolcanic, serpentinite, plutonic or sedimentary

Soil Texture: moderately fine sandy clay loam, moderately fine clay loam, moderately coarse sandy loam, moderately fine silty clay loam, or medium to very fine sandy loam

Stands primarily occurred in the SW and NW portions of the study area where fire has recently occurred (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California). Fire damage is evident in the stands with dead, standing tree snags and living charred trunks, and in the lower cover of *Quercus douglasii* than in other blue oak associations. The occurrence of *Brachypodium distachyon* and *Centaurea* spp. are also correlated with the recently burned region of the study area.

**Number of Samples Used in Description: 11**

**Samples:** APEOR028, APEOR029, APEOR038, APEOR044, APEOR061, APEOR214, APEOR219, APEOR239, APEOR243, APEOR251, APEOR252

**Rank:** G3 S3.2

**GLOBAL DISTRIBUTION**

*Quercus douglasii* Alliance: Southern outer North Coast, inner North Coast, inner Central Coast, Klamath foothills, Cascade Range foothills, Sierra Nevada foothills (including Yosemite N.P.), South Coast, west Modoc Plateau

*Quercus douglasii*/Grass Association: Central Valley, Central Coast from Monterey to Santa Barbara County and the North Central Coast from Sonoma to Contra Costa County, Sierra Nevada foothills from Butte to Mariposa County

Similar *Quercus douglasii*/Bromus sp.-*Daucus pusillus* Woodland Association from Yosemite National Park (N.P.)

## REFERENCES

NatureServe et al. 2003b, Sawyer and Keeler-Wolf 1995, Allen et al. 1991, Keeler-Wolf 1990, Allen et al. 1989

## RESTORATION INFORMATION

This association has high non-native plant cover (average 82.5%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Brachypodium distachyon* and *Bromus hordeaceus* and annual forbs, *Trifolium hirtum* and *Vicia villosa*. *Carduus pycnocephalus* and *Centaurea melitensis* occurred between 5 and 6% cover. *Centaurea solstitialis* and *Ficus carica* were at less than 1% cover and each occurred only in 1 of 11 stands sampled (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts included fire and grazing on several stands at moderate to high intensity. The high abundance of non-native species and low diversity of native species may be correlated with the recent fire in the mid 1990's.

### *Quercus douglasii*/Annual Grass-Herb (*Brachypodium distachyon*)

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUDO-T	<i>Quercus douglasii</i>	1	14.1	0.2	35
<b>Shrub</b>						
	TODI-M	<i>Toxicodendron diversilobum</i>	0.8	2.1	0.2	12
<b>Herb</b>						
	BRDI2-L	<i>Brachypodium distachyon</i>	0.9	33.7	1	65
	BRHO2-L	<i>Bromus hordeaceus</i>	0.8	23	10	65
	TRHI4-L	<i>Trifolium hirtum</i>	0.8	1.1	0.2	5
	BRMA3-L	<i>Bromus madritensis</i>	0.7	2.1	0.2	12
	CEME2-L	<i>Centaurea melitensis</i>	0.7	6	0.2	15
	VIVI-L	<i>Vicia villosa</i>	0.7	7.6	0.2	40
	AMMEI2-L	<i>Amsinckia menziesii</i> var. <i>intermedia</i>	0.6	0.1	0.2	0.2
	BREL-L	<i>Brodiaea elegans</i>	0.6	0.3	0.2	2
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.6	5.6	2	20
	AVFA-L	<i>Avena fatua</i>	0.5	6.7	0.2	25
	HYGL2-L	<i>Hypochaeris glabra</i>	0.5	1.6	0.2	8
	AVBA-L	<i>Avena barbata</i>	0.5	4.8	1	30
	BRDI3-L	<i>Bromus diandrus</i>	0.5	3.5	0.2	22
	ERBO-L	<i>Erodium botrys</i>	0.5	0.3	0.2	2
	GAPA5-L	<i>Galium parisiense</i>	0.5	0.2	0.2	1
	PHCI-L	<i>Phacelia cicutaria</i>	0.5	0.1	0.2	0.2
	SIMA3-L	<i>Silybum marianum</i>	0.5	0.3	0.2	2
	LOMU-L	<i>Lolium multiflorum</i>	0.4	1.4	0.2	15
	MEPO3-L	<i>Medicago polymorpha</i>	0.4	0.1	0.2	1
	MICAC2-L	<i>Micropus californicus</i> var. <i>californicus</i>	0.4	0.1	0.2	0.2
	NAPU2-L	<i>Navarretia pubescens</i>	0.4	0.1	0.2	0.2
	NAPU4-L	<i>Nassella pulchra</i>	0.4	0.2	0.2	1
	TRMI4-L	<i>Trifolium microcephalum</i>	0.4	0.1	0.2	0.2
	TRWI3-L	<i>Trifolium willdenovii</i>	0.4	0.1	0.2	1

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***Quercus douglasii*/Annual Grass-Herb (*Bromus hordeaceus*-*Lolium multiflorum*) Association (new provisional)**

**Blue Oak / Annual Grass-Herb (Soft Brome - Italian Ryegrass) Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Quercus douglasii*/Annual Grass-Herb (*Bromus hordeaceus*-*Lolium multiflorum*)

Woodland/Forest form an open to intermittent tree layer (19.2-65%, mean 37.3%) with conifers at 0-20m tall and hardwoods at 5-15m tall, a sparse shrub layer (0-5%, mean 1.5%) at 0-5m tall, and a continuous herbaceous layer (70-85%, mean 78%) at 0.1-0.5m tall. Total vegetation cover is 80-85%, mean cover is 82%.

In this association, the main overstory tree species is *Quercus douglasii*, and occasionally, *Pinus sabiniana*. The shrub layer is rarely present but may include *Toxicodendron diversilobum* and *Symphoricarpos mollis*. The herbaceous layer frequently consists of a diverse understory of grass and forb species. Non-native species are abundant, particularly annual grasses (*Bromus hordeaceus* and *Lolium multiflorum*). Other characteristic non-native grasses and forbs are *Vicia villosa*, *Carduus pycnocephalus*, *Avena barbata*, and *Bromus diandrus*; while frequent native forbs include *Brodiaea elegans*, *Madia gracilis*, *Triteleia laxa*, and *Trifolium willdenovii*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 868-1416 ft, mean 1198 ft

Aspect: variable

Slope: flat to somewhat steep, range 0-18 degrees, mean 5.8 degrees

Topography: bottom slope to upper slope; microtopography varies

Litter Cover: range 36-75%, mean 57.2%

Rock Cover: range 1.2-30%, mean 14.7%

Bare Ground: range 0.2-12%, mean 6.2%

Parent Material: metamorphic or metavolcanic

Soil Texture: often moderately fine sandy clay loam, occasionally medium silt loam or moderately fine silty clay loam

Stands occur across the study area from the NE to NW and SW portions of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California), particularly on well-developed clay loam and silt loam soils whereby moisture can remain into the growing season.

**Number of Samples Used in Description: 5**

**Samples:** APEOR039, APEOR047, APEOR107, APEOR200, APEOR272

**Rank:** G5 S5

**GLOBAL DISTRIBUTION**

*Quercus douglasii* Alliance: Southern outer North Coast, inner North Coast, inner Central Coast, Klamath foothills, Cascade Range foothills, Sierra Nevada foothills (including Yosemite N.P.), South Coast, west Modoc Plateau

*Quercus douglasii*/Grass Association: Central Valley, Central Coast from Monterey to Santa Barbara County and the North Central Coast from Sonoma to Contra Costa County, Sierra Nevada foothills from Butte to Mariposa County

Similar *Quercus douglasii*/Bromus sp.-*Daucus pusillus* Woodland Association from Yosemite N.P.

**REFERENCES**

NatureServe et al. 2003b, Sawyer and Keeler-Wolf 1995, Allen et al. 1991, Keeler-Wolf 1990, Allen et al. 1989

**RESTORATION INFORMATION**

This association has high non-native plant cover (average 67%) relative to native cover. Non-native species with highest cover include grasses, *Bromus hordeaceus*, *Lolium multiflorum*, and the annual forb, *Vicia villosa*. *Carduus pycnocephalus* occurred in all of the stands sampled with an average cover of 4%. Both *Centaurea solstitialis* and *Taeniatherum caput-medusae* infrequently occur at less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts include grazing, roads, and surface water diversion at low intensity. These may contribute to unnatural soil and hydrologic modification and may act as conduits for non-native species. Thus, it is recommended to reduce road disturbance/surface water diversion and close/restore unneeded roads to deter any additional spread of non-natives.

***Quercus douglasii*/Annual Grass-Herb (*Bromus hordeaceus*-*Lolium multiflorum*)**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUDO-T	<i>Quercus douglasii</i>	1	33.2	18	65
	PISA2-T	<i>Pinus sabiniana</i>	0.4	0.1	0.2	0.2
<b>Tree Understory</b>						
	QUDO-L	<i>Quercus douglasii</i>	0.6	0.1	0.2	0.2
	AECA-T	<i>Aesculus californica</i>	0.4	0.4	1	1
<b>Shrub</b>						
	TODI-M	<i>Toxicodendron diversilobum</i>	0.8	1.3	0.2	5
<b>Herb</b>						
	BRHO2-L	<i>Bromus hordeaceus</i>	1	34.4	20	60
	CAPY2-L	<i>Carduus pycnocephalus</i>	1	4.2	1	12
	LOMU-L	<i>Lolium multiflorum</i>	1	25.4	15	40
	VIVI-L	<i>Vicia villosa</i>	1	5.8	0.2	10
	AVBA-L	<i>Avena barbata</i>	0.8	3.6	0.2	12
	BREL-L	<i>Brodiaea elegans</i>	0.8	0.2	0.2	0.2
	BRDI3-L	<i>Bromus diandrus</i>	0.6	6	1	28
	BRMA3-L	<i>Bromus madritensis</i>	0.6	2.2	0.2	10
	GAPA5-L	<i>Galium parisiense</i>	0.6	0.3	0.2	1
	MAGR3-L	<i>Madia gracilis</i>	0.6	0.1	0.2	0.2
	TOAR-L	<i>Torilis arvensis</i>	0.6	2.4	2	8
	TRHI4-L	<i>Trifolium hirtum</i>	0.6	1.1	0.2	5
	TRLA16-L	<i>Triteleia laxa</i>	0.6	0.1	0.2	0.2
	TRWI3-L	<i>Trifolium willdenovii</i>	0.6	0.1	0.2	0.2
	VISAN2-L	<i>Vicia sativa ssp. nigra</i>	0.6	0.1	0.2	0.2
	AMMEI2-L	<i>Amsinckia menziesii var. intermedia</i>	0.4	0.1	0.2	0.2
	AVFA-L	<i>Avena fatua</i>	0.4	1.6	3	5
	BRDI2-L	<i>Brachypodium distachyon</i>	0.4	1.2	1	5
	CEME2-L	<i>Centaurea melitensis</i>	0.4	0.8	0.2	4
	CLPUQ-L	<i>Clarkia purpurea ssp. quadrivulnera</i>	0.4	0.1	0.2	0.2
	DAPU3-L	<i>Daucus pusillus</i>	0.4	0.4	1	1
	GEDI-L	<i>Geranium dissectum</i>	0.4	0.4	0.2	2
	HOVI-L	<i>Holocarpha virgata</i>	0.4	0.1	0.2	0.2
	MEPO3-L	<i>Medicago polymorpha</i>	0.4	0.1	0.2	0.2

**Quercus douglasii/Annual Grass-Herb (*Bromus hordeaceus*-*Lolium multiflorum*)**

Layer	Code	Species Name	Freq	Avg	Min	Max
	PETRT-L	<i>Pentagramma triangularis</i> <i>ssp. triangularis</i>	0.4	0.1	0.2	0.2
	POMO5-L	<i>Polypogon monspeliensis</i>	0.4	0.8	0.2	4
	STME2-L	<i>Stellaria media</i>	0.4	0.1	0.2	0.2
	TRGR2-L	<i>Trifolium gracilentum</i>	0.4	0.1	0.2	0.2
<b>Cryptogam</b>						
	MOSS-L	Moss	0.6	2.6	0.2	7



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***Quercus douglasii*/Annual Grass-Herb (*Bromus hordeaceus*-*Madia gracilis*) Association (new provisional)**

**Blue Oak / Annual Grass-Herb (Soft Brome - Grassy Tarweed) Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Quercus douglasii*/Annual Grass-Herb (*Bromus hordeaceus*-*Madia gracilis*) Woodland/Forest form an open to intermittent tree layer (20-43%, mean 31.4%) with conifers at 0-35m tall and hardwoods at 5-15m tall, often a sparse shrub layer (0-8%, mean 2.4%) at 0-5m tall, and an intermittent to continuous herbaceous layer (55-90%, mean 75.6%) at 0.1-1m tall. *Quercus douglasii* dominates the tree layer. Annual grasses (*Bromus hordeaceus*-*Madia gracilis*) and herbs dominate the herb layer. Total vegetation cover is 60-95%, mean cover is 81.1%.

In this association, the main overstory tree species is *Quercus douglasii*, and minor occurrence of *Quercus wislizeni* and *Pinus sabiniana*. The understory shrub layer is infrequent, including *Toxicodendron diversilobum* and *Rhamnus ilicifolia*. The herbaceous understory is abundant and frequently includes a diversity of species. The grasses *Bromus hordeaceus* and *Avena barbata* are abundant, and the forbs *Madia gracilis* and *Carduus pycnocephalus* are characteristic. Frequently occurring non-natives are *Trifolium hirtum*, *Lolium multiflorum*, *Bromus diandrus*, and *Bromus madritensis*, while frequently occurring natives are *Amsinckia menziesii* var. *intermedia*, *Clarkia purpurea* subsp. *quadrivulnera*, *Daucus pusillus*, and *Micropus californicus* var. *californicus*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 848-1387 ft, mean 1182 ft

Aspect: variable, but more on NE and NW aspects

Slope: moderate to somewhat steep, range 7-18 degrees, mean 12.9 degrees

Topography: bottom slope to upper slope; microtopography varies

Litter Cover: range 3-62%, mean 43.5%

Rock Cover: range 0.4-32%, mean 11.1%

Bare Ground: range 6-42%, mean 21%

Parent Material: metavolcanic, metamorphic, sedimentary, serpentine, or mixed

Soil Texture: often moderately fine sandy clay loam, occasionally moderately coarse sandy loam, medium loam or moderately fine clay loam

Stands of this association occur from the NE to SE and SW portions of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California).

**Number of Samples Used in Description: 8**

**Samples:** APEOR030, APEOR035, APEOR045, APEOR059, APEOR210, APEOR218, APEOR244, APEOR268

**Rank:** G3 S3.2

**GLOBAL DISTRIBUTION**

*Quercus douglasii* Alliance: Southern outer North Coast, inner North Coast, inner Central Coast, Klamath foothills, Cascade Range foothills, Sierra Nevada foothills (including Yosemite N.P.), South Coast, west Modoc Plateau

*Quercus douglasii*/Grass Association: Central Valley, Central Coast from Monterey to Santa Barbara County and the North Central Coast from Sonoma to Contra Costa County, Sierra Nevada foothills from Butte to Mariposa County

Similar *Quercus douglasii*/*Bromus* sp.-*Daucus pusillus* Woodland Association from Yosemite N.P.

## REFERENCES

NatureServe et al. 2003b, Sawyer and Keeler-Wolf 1995, Allen et al. 1991, Keeler-Wolf 1990, Allen et al. 1989

## RESTORATION INFORMATION

This association has high non-native plant cover (average 66.2%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Bromus hordeaceus* and *Avena barbata*, and annual forbs, *Trifolium hirtum* and *Vicia villosa*. *Carduus pycnocephalus* occurred in all of the stands sampled at an average cover of 3.6%. *Centaurea melitensis*, *C. solstitialis*, and *Taeniatherum caput-medusae* infrequently occur at less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts include development, water diversion/damming, roads, grazing, and fire at high to low intensity. These impacts may have contributed to unnatural soil and hydrologic modification, and they may act as conduits for non-native species. Thus, it is recommended to reduce road/hydrologic disturbance and close/restore unneeded roads to deter any additional spread of non-natives.

**Quercus douglasii/Annual Grass-Herb (*Bromus hordeaceus*-*Madia gracilis*)**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUDO-T	<i>Quercus douglasii</i>	1	27	15	35
	QUWI2-T	<i>Quercus wislizeni</i>	0.4	0.9	0.2	5
<b>Tree Understory</b>						
	QUDO-L	<i>Quercus douglasii</i>	0.6	0.1	0.2	0.2
<b>Shrub</b>						
	RHIL-M	<i>Rhamnus ilicifolia</i>	0.4	0.2	0.2	1
	TODI-M	<i>Toxicodendron diversilobum</i>	0.4	0.8	0.2	4
<b>Herb</b>						
	AVBA-L	<i>Avena barbata</i>	1	15.4	3	40
	BRHO2-L	<i>Bromus hordeaceus</i>	1	42	25	65
	CAPY2-L	<i>Carduus pycnocephalus</i>	1	3.6	1	10
	MAGR3-L	<i>Madia gracilis</i>	1	4.3	0.2	15
	BRDI3-L	<i>Bromus diandrus</i>	0.8	2.2	0.2	7
	BRMA3-L	<i>Bromus madritensis</i>	0.8	2	0.2	12
	LOMU-L	<i>Lolium multiflorum</i>	0.8	2.7	0.2	8
	TOAR-L	<i>Torilis arvensis</i>	0.8	0.9	0.2	2
	TRHI4-L	<i>Trifolium hirtum</i>	0.8	4.6	0.2	15
	AMMEI2-L	<i>Amsinckia menziesii</i> var. <i>intermedia</i>	0.6	0.1	0.2	0.2
	CLPUQ-L	<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	0.6	1.3	0.2	8
	DAPU3-L	<i>Daucus pusillus</i>	0.6	1.3	0.2	5
	MICAC2-L	<i>Micropus californicus</i> var. <i>californicus</i>	0.6	0.8	0.2	3
	VIVI-L	<i>Vicia villosa</i>	0.6	5.5	0.2	40
	CEME2-L	<i>Centaurea melitensis</i>	0.5	0.4	0.2	2
	GAPA5-L	<i>Galium parisiense</i>	0.5	0.3	0.2	1
	NAPU2-L	<i>Navarretia pubescens</i>	0.5	0.1	0.2	0.2
	TRDU2-L	<i>Trifolium dubium</i>	0.5	0.5	0.2	3
	TRMI4-L	<i>Trifolium microcephalum</i>	0.5	0.1	0.2	0.2
	VISAN2-L	<i>Vicia sativa</i> ssp. <i>nigra</i>	0.5	0.1	0.2	0.2
	BREL-L	<i>Brodiaea elegans</i>	0.4	0.1	0.2	0.2
	BRMI2-L	<i>Briza minor</i>	0.4	0.3	0.2	1
	DIVO-L	<i>Dichelostemma volubile</i>	0.4	0.1	0.2	0.2
	GAPO-L	<i>Galium porrigens</i>	0.4	0.1	0.2	0.2
	GAVE3-L	<i>Gastridium ventricosum</i>	0.4	0.1	0.2	0.2
	HOMUL-L	<i>Hordeum murinum</i> ssp. <i>leporinum</i>	0.4	0.1	0.2	0.2

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***Quercus douglasii*/Annual Grass-Herb (*Bromus hordeaceus*-*Triteleia laxa*) Association (new)  
Blue Oak / Annual Grass-Herb (Soft Brome - Ithuriel's Spear) Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Quercus douglasii*/Annual Grass-Herb (*Bromus hordeaceus*-*Triteleia laxa*) Woodland/Forest form an open to intermittent tree layer (13-52%, mean 38.6%) with conifers at 0-20m tall and hardwoods at 5-15m tall, occasionally a sparse to open shrub layer (0-10%, mean 2%) at 0-5m tall, and an intermittent to continuous herbaceous layer (65-90%, mean 79.1%) at 0.1-1m tall. *Quercus douglasii* dominates the tree layer. Annual grasses(*Bromus hordeaceus*-*Triteleia laxa*) and herbs dominate the herb layer. Total vegetation cover is 67-95%, mean cover is 84.9%.

In this association, the main overstory tree species are *Quercus douglasii*, *Pinus sabiniana*, and *Quercus wislizeni*. The occasional understory shrub layer includes shrubs such as *Toxicodendron diversilobum*. The herbaceous layer is abundant and includes a diversity of grass and forb species. *Bromus hordeaceus* and *Bromus diandrus* are most abundant, while *Trifolium hirtum*, *Clarkia purpurea* subsp. *quadrivulnera*, *Avena fatua*, *Daucus pusillus*, *Bromus madritensis*, and *Triteleia laxa* are characteristically to frequently occurring.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 860-1315 ft, mean 1052 ft

Aspect: variable

Slope: gentle to somewhat steep, range 5-24 degrees, mean 13.8 degrees

Topography: lower to mid slope; often undulating occasionally convex

Litter Cover: range 52-75%, mean 64.6%

Rock Cover: range 0.4-20%, mean 6.3%

Bare Ground: range 1-15%, mean 7%

Parent Material: sedimentary, metamorphic, serpentine, plutonic, or metavolcanic

Soil Texture: often moderately fine sandy clay loam, occasionally moderately fine clay loam or fine sandy clay

Stands of this association occur from the NE to SE and SW portions of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California).

**Number of Samples Used in Description: 9**

**Samples:** APEOR042, APEOR043, APEOR212, APEOR215, APEOR228, APEOR238, APEOR255, APEOR285, APEOR293

**Rank:** G4 S4

**GLOBAL DISTRIBUTION**

*Quercus douglasii* Alliance: Southern outer North Coast, inner North Coast, inner Central Coast, Klamath foothills, Cascade Range foothills, Sierra Nevada foothills (including Yosemite N.P.), South Coast, west Modoc Plateau

*Quercus douglasii*/Grass Association: Central Valley, Central Coast from Monterey to Santa Barbara County and the North Central Coast from Sonoma to Contra Costa County, Sierra Nevada foothills from Butte to Mariposa County

Similar *Quercus douglasii*/*Bromus* sp.-*Daucus pusillus* Woodland Association from Yosemite N.P.

**REFERENCES**

NatureServe et al. 2003b, Sawyer and Keeler-Wolf 1995, Keeler-Wolf 1990, Allen et al. 1991, Allen et al. 1989

**RESTORATION INFORMATION**

This association has high non-native plant cover (average 63.3%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Bromus hordeaceus*, *B. diandrus* and the annual forbs, *Trifolium hirtum* and *Vicia villosa*. *Carduus pycnocephalus* occurred in five of nine stands sampled at an average cover of 3.7%. *Centaurea melitensis* and *Taeniatherum caput-medusae* infrequently occur at less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts included grazing, development, foot-traffic/trampling, and power lines at low intensity. Fire scars are evident in 3 stands, with significant impact in one stand.

**Quercus douglasii/Annual Grass-Herb (*Bromus hordeaceus*-*Triteleia laxa*)**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUDO-T	<i>Quercus douglasii</i>	1	37.4	15	50
	PISA2-T	<i>Pinus sabiniana</i>	0.7	0.7	0.2	2
	QUWI2-T	<i>Quercus wislizeni</i>	0.4	0.2	0.2	1
<b>Tree Understory</b>						
	QUDO-L	<i>Quercus douglasii</i>	0.4	0.2	0.2	1
	QUDO-M	<i>Quercus douglasii</i>	0.3	0.7	0.2	6
<b>Shrub</b>						
	TODI-M	<i>Toxicodendron diversilobum</i>	0.7	1.1	0.2	3
<b>Herb</b>						
	BRDI3-L	<i>Bromus diandrus</i>	0.9	10	0.2	60
	BRHO2-L	<i>Bromus hordeaceus</i>	0.9	36.1	25	65
	CLPUQ-L	<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	0.8	1.3	0.2	7
	TRHI4-L	<i>Trifolium hirtum</i>	0.8	2.9	0.2	12
	AMMEI2-L	<i>Amsinckia menziesii</i> var. <i>intermedia</i>	0.7	0.1	0.2	0.2
	AVFA-L	<i>Avena fatua</i>	0.7	12	8	25
	BRMA3-L	<i>Bromus madritensis</i>	0.7	1.6	0.2	5
	DAPU3-L	<i>Daucus pusillus</i>	0.7	1.7	0.2	6
	TOAR-L	<i>Torilis arvensis</i>	0.7	0.1	0.2	0.2
	TRLA16-L	<i>Triteleia laxa</i>	0.7	0.4	0.2	1
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.6	3.7	1	20
	MICAC2-L	<i>Micropus californicus</i> var. <i>californicus</i>	0.6	0.7	0.2	3
	NAPU2-L	<i>Navarretia pubescens</i>	0.4	0.1	0.2	0.2
	PLNO-L	<i>Plagiobothrys nothofulvus</i>	0.4	0.2	0.2	1
	TRWI3-L	<i>Trifolium willdenovii</i>	0.4	0.2	0.2	1
	VISAN2-L	<i>Vicia sativa</i> ssp. <i>nigra</i>	0.4	0.8	0.2	6
	VIVI-L	<i>Vicia villosa</i>	0.4	2.4	3	10
	AVBA-L	<i>Avena barbata</i>	0.3	1.3	2	6
	BRDI2-L	<i>Brachypodium distachyon</i>	0.3	1.4	0.2	8
	BREL-L	<i>Brodiaea elegans</i>	0.3	0.1	0.2	0.2
	CEME2-L	<i>Centaurea melitensis</i>	0.3	0.6	0.2	4
	CHLOR3-L	<i>Chlorogalum</i>	0.3	0.1	0.2	0.2
	GAPA5-L	<i>Galium parisiense</i>	0.3	0.2	0.2	1
	HYGL2-L	<i>Hypochaeris glabra</i>	0.3	2	4	8
	MAEX-L	<i>Madia exigua</i>	0.3	0.1	0.2	0.2
	TRMI4-L	<i>Trifolium microcephalum</i>	0.3	0.2	0.2	1

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***Quercus douglasii*/Toxicodendron diversilobum/Annual Grass-Herb Association  
Blue Oak / Poison Oak / Annual Grass-Herb Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Quercus douglasii*/Toxicodendron diversilobum/Annual Grass-Herb Woodland/Forest form an open to intermittent tree layer (15-41%, mean 31.3%) with conifers at 0-20m tall and hardwoods at 10-15m tall, a sparse to open shrub layer (8-30%, mean 15.2%) at 0.5-2m tall, and an intermittent to continuous herbaceous layer (60-85%, mean 77%) at 0.1-1m tall. Total vegetation cover is 75-90%, mean cover is 83%.

In this association, the main overstory tree species is *Quercus douglasii*, while *Quercus wislizeni* and *Pinus sabiniana* infrequently occurred. *Quercus douglasii* is also regenerating frequently. The understory shrub layer is dominated by *Toxicodendron diversilobum*, while other shrubs such as *Rhamnus ilicifolia* and *Lonicera hispidula* may occur. The herbaceous layer is abundant and includes a diverse understory of grass and forb species. *Bromus hordeaceus*, *Avena fatua*, *Carduus pycnocephalus*, and *Bromus diandrus* are dominant. Other species characteristically to frequently occurring include *Madia gracilis*, *Micropus californicus*, *Vicia villosa*, *Bromus madritensis*, *Lolium multiflorum*, and *Trifolium hirtum*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 1130-1581 ft, mean 1284 ft

Aspect: NE, NW or variable

Slope: gentle to somewhat steep, range 2-23 degrees, mean 12.8 degrees

Topography: lower slope to upper slope; often undulating occasionally convex

Litter Cover: range 45-70%, mean 58%

Rock Cover: range 2-20%, mean 9.2%

Bare Ground: range 8-12%, mean 9.6%

Parent Material: often metavolcanic, occasionally sedimentary

Soil Texture: often moderately fine sandy clay loam, occasionally moderately coarse sandy loam

Stands of this association mainly occur in the NE and NW portions of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California), and they have variable oak cover (which may be correlated with time since fire).

**Number of Samples Used in Description: 5**

**Samples:** APEOR063, APEOR076, APEOR079, APEOR204, APEOR231

**Rank:** G4S4

**GLOBAL DISTRIBUTION**

*Quercus douglasii* Alliance: Southern outer North Coast, inner North Coast, inner Central Coast, Klamath foothills, Cascade Range foothills, Sierra Nevada foothills (including Yosemite N.P.), South Coast, west Modoc Plateau

Association: potentially similar to the range of the alliance

**REFERENCES**

NatureServe et al. 2003b, Sawyer and Keeler-Wolf 1995, Allen et al. 1991, Keeler-Wolf 1990, Allen et al. 1989

**RESTORATION INFORMATION**

This association has high non-native plant cover (average 63.9%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Bromus hordeaceus*, *Avena fatua* and *Bromus diandrus*. *Carduus pycnocephalus* occurred in 4 of 5 stands at an average cover of 9%. *Centaurea melitensis* and *C. solstitialis* infrequently occur at less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references). Fire had a moderate impact on one of the five stands.

**Quercus douglasii/Toxicodendron diversilobum/Annual Grass-Herb**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUDO-T	<i>Quercus douglasii</i>	1	28.2	1	40
	QUWI2-T	<i>Quercus wislizeni</i>	0.4	2.2	4	7
<b>Tree Understory</b>						
	QUDO-L	<i>Quercus douglasii</i>	0.6	0.3	0.2	1
	QUDO-M	<i>Quercus douglasii</i>	0.6	0.5	0.2	2
<b>Shrub</b>						
	TODI-M	<i>Toxicodendron diversilobum</i>	1	9.6	2	15
	RHIL-M	<i>Rhamnus ilicifolia</i>	0.4	0.1	0.2	0.2
<b>Herb</b>						
	BRHO2-L	<i>Bromus hordeaceus</i>	1	32	10	40
	AVFA-L	<i>Avena fatua</i>	0.8	12	5	30
	BRDI3-L	<i>Bromus diandrus</i>	0.8	6.8	3	20
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.8	9	0.2	40
	CLPUQ-L	<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	0.8	0.2	0.2	0.2
	MAGR3-L	<i>Madia gracilis</i>	0.8	1	0.2	3
	MICAC2-L	<i>Micropus californicus</i> var. <i>californicus</i>	0.8	0.8	0.2	2
	TRLA16-L	<i>Triteleia laxa</i>	0.8	0.2	0.2	0.2
	BREL-L	<i>Brodiaea elegans</i>	0.6	0.1	0.2	0.2
	BRMA3-L	<i>Bromus madritensis</i>	0.6	3.4	0.2	12
	DELPH-L	<i>Delphinium</i>	0.6	0.1	0.2	0.2
	GEDI-L	<i>Geranium dissectum</i>	0.6	0.1	0.2	0.2
	LOMU-L	<i>Lolium multiflorum</i>	0.6	2.6	1	10
	MECA2-L	<i>Melica californica</i>	0.6	0.1	0.2	0.2
	NAPU2-L	<i>Navarretia pubescens</i>	0.6	0.1	0.2	0.2
	SAGR5-L	<i>Sanicula graveolens</i>	0.6	0.1	0.2	0.2
	TOAR-L	<i>Torilis arvensis</i>	0.6	0.6	0.2	2
	TRHI4-L	<i>Trifolium hirtum</i>	0.6	2.5	0.2	12
	TRMI4-L	<i>Trifolium microcephalum</i>	0.6	0.1	0.2	0.2
	VIVI-L	<i>Vicia villosa</i>	0.6	9	0.2	40
	AICA-L	<i>Aira caryophyllea</i>	0.4	0.1	0.2	0.2
	BRMI2-L	<i>Briza minor</i>	0.4	0.1	0.2	0.2
	CHLOR3-L	<i>Chlorogalum</i>	0.4	0.1	0.2	0.2
	DAPU3-L	<i>Daucus pusillus</i>	0.4	0.1	0.2	0.2
	GAVE3-L	<i>Gastridium ventricosum</i>	0.4	0.1	0.2	0.2
	HOMUL-L	<i>Hordeum murinum</i> ssp. <i>leporinum</i>	0.4	0.1	0.2	0.2
	MAEX-L	<i>Madia exigua</i>	0.4	0.1	0.2	0.2
	NAPU4-L	<i>Nassella pulchra</i>	0.4	0.1	0.2	0.2
	PHCI-L	<i>Phacelia cicutaria</i>	0.4	0.1	0.2	0.2
	POMO5-L	<i>Polypogon monspeliensis</i>	0.4	0.1	0.2	0.2
	SIMA3-L	<i>Silybum marianum</i>	0.4	0.1	0.2	0.2
	TRBI-L	<i>Trifolium bifidum</i>	0.4	0.1	0.2	0.2



**Quercus douglasii/Toxicodendron diversilobum/Annual Grass-Herb**

<b>Layer</b>	<b>Code</b>	<b>Species Name</b>	<b>Freq</b>	<b>Avg</b>	<b>Min</b>	<b>Max</b>
	TRHY3-L	<i>Triteleia hyacinthina</i>	0.4	0.1	0.2	0.2
	TRWI3-L	<i>Trifolium willdenovii</i>	0.4	0.1	0.2	0.2
	VISAN2-L	<i>Vicia sativa ssp. nigra</i>	0.4	0.2	0.2	1
	VUMY-L	<i>Vulpia myuros</i>	0.4	1.6	0.2	8

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***Quercus douglasii*-*Aesculus californica*/Annual Grass-Herb Association (new provisional)  
Blue Oak - California Buckeye / Annual Grass-Herb Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Quercus douglasii*-*Aesculus californica*/Annual Grass-Herb Woodland/Forest form an open to intermittent tree layer (17-49%, mean 32.8%) with conifers at 0-35m tall and hardwoods at 5-15m tall, a sparse to intermittent shrub layer (5-50%, mean 29%) at 0.5-10m tall, and an intermittent to continuous herbaceous layer (50-85%, mean 65.4%) at 0.1-1m tall. *Quercus douglasii* and *Aesculus californica* dominate or co-dominate the tree layer. Annual grasses and herbs dominate in the herb layer. Total vegetation cover is 75-90%, mean cover is 83%.

In this association, the main overstory and understory tree species are *Quercus douglasii* and *Aesculus californica*, while *Quercus wislizeni* and *Pinus sabiniana* may be present in low relative cover. *Toxicodendron diversilobum* is dominant in the shrub layer, while *Rhamnus ilicifolia* and *Lonicera hispidula* are frequently occurring. The herbaceous understory frequently includes a diversity of grass and forb species such as *Bromus hordeaceus*, *Avena fatua*, *Bromus diandrus*, *Bromus madritensis*, *Vicia villosa*, *Torilis arvensis*, *Trifolium willdenovii*, *Triteleia laxa*, and *Dichelostemma volubile*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 1245-1705 ft, mean 1461 ft

Aspect: variable

Slope: somewhat steep to steep, range 18-29 degrees, mean 22 degrees

Topography: lower slope to ridge top; often undulating occasionally linear

Litter Cover: range 42-65%, mean 56%

Rock Cover: range 4-28%, mean 16.2%

Bare Ground: range 1-10%, mean 6.4%

Parent Material: metavolcanic, sedimentary, or metamorphic

Soil Texture: often moderately fine sandy clay loam, occasionally moderately coarse sandy loam or medium loam

Stands of this association mainly occur in the NE and NW portions of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California), particularly on rocky, steep surfaces.

**Number of Samples Used in Description: 5**

**Samples:** APEOR062, APEOR074, APEOR075, APEOR248, APEOR249

**Rank:** G3S3.2

**GLOBAL DISTRIBUTION**

*Quercus douglasii* Alliance: Southern outer North Coast, inner North Coast, inner Central Coast, Klamath foothills, Cascade Range foothills, Sierra Nevada foothills (including Yosemite N.P.), South Coast, west Modoc Plateau

Association: Potentially from the Sierra Nevada foothills east and north to the Coast Ranges and Klamath foothills.

**REFERENCES**

NatureServe et al. 2003b. Sawyer and Keeler-Wolf 1995, Allen et al. 1991, Keeler-Wolf 1990, Allen et al. 1989

**RESTORATION INFORMATION**

This association has high non-native plant cover (average 52%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Bromus hordeaceus*, *Avena fatua* and *Bromus diandrus* and the annual forb, *Vicia villosa*. *Carduus pycnocephalus* and *Centaurea melitensis*

also occur within this association but at low cover (0.12 – 1.6%) (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts were minimal.

***Quercus douglasii*-*Aesculus californica*/Annual Grass-Herb**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUDO-T	<i>Quercus douglasii</i>	1	22.8	15	29
	QUWI2-T	<i>Quercus wislizeni</i>	1	4.5	0.2	15
	PISA2-T	<i>Pinus sabiniana</i>	0.6	1	1	2
	AECA-T	<i>Aesculus californica</i>	0.6	5.2	1	20
<b>Tree Understory</b>						
	AECA-M	<i>Aesculus californica</i>	1	14.4	0.2	45
	PISA2-L	<i>Pinus sabiniana</i>	0.4	0.1	0.2	0.2
	QUDO-L	<i>Quercus douglasii</i>	0.4	0.1	0.2	0.2
<b>Shrub</b>						
	TODI-M	<i>Toxicodendron diversilobum</i>	0.8	16.4	0.2	45
	LOHI2-L	<i>Lonicera hispidula</i>	0.6	0.1	0.2	0.2
	RHIL-M	<i>Rhamnus ilicifolia</i>	0.6	0.3	0.2	1
	AECA-L	<i>Aesculus californica</i>	0.4	0.1	0.2	0.2
	SYMO-L	<i>Symphoricarpos mollis</i>	0.4	0.1	0.2	0.2
<b>Herb</b>						
	AVFA-L	<i>Avena fatua</i>	1	27.4	10	50
	BRDI3-L	<i>Bromus diandrus</i>	1	10.8	1	30
	BRHO2-L	<i>Bromus hordeaceus</i>	1	28	15	45
	BRMA3-L	<i>Bromus madritensis</i>	1	5.2	1	10
	TOAR-L	<i>Torilis arvensis</i>	1	1.1	0.2	2
	VIVI-L	<i>Vicia villosa</i>	1	3.4	2	5
	DIVO-L	<i>Dichelostemma volubile</i>	0.8	0.2	0.2	0.2
	TRLA16-L	<i>Triteleia laxa</i>	0.8	0.2	0.2	0.2
	TRWI3-L	<i>Trifolium willdenovii</i>	0.8	0.5	0.2	1
	AICA-L	<i>Aira caryophyllea</i>	0.6	0.1	0.2	0.2
	AMMEI2-L	<i>Amsinckia menziesii</i> var. <i>intermedia</i>	0.6	0.1	0.2	0.2
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.6	0.1	0.2	0.2
	GAVE3-L	<i>Gastridium ventricosum</i>	0.6	0.1	0.2	0.2
	MAGR3-L	<i>Madia gracilis</i>	0.6	3.3	0.2	16
	MICAC2-L	<i>Micropus californicus</i> var. <i>californicus</i>	0.6	0.3	0.2	1
	PETRT-L	<i>Pentagramma triangularis</i> <i>ssp. triangularis</i>	0.6	0.1	0.2	0.2
	SAGR5-L	<i>Sanicula graveolens</i>	0.6	0.1	0.2	0.2
	TRMI4-L	<i>Trifolium microcephalum</i>	0.6	0.1	0.2	0.2
	ALPEP2-L	<i>Allium peninsulare</i> var. <i>peninsulare</i>	0.4	0.1	0.2	0.2
	BRMI2-L	<i>Briza minor</i>	0.4	0.1	0.2	0.2
	CAAL2-L	<i>Calochortus albus</i>	0.4	0.1	0.2	0.2

**Quercus douglasii-Aesculus californica/Annual Grass-Herb**

<b>Layer</b>	<b>Code</b>	<b>Species Name</b>	<b>Freq</b>	<b>Avg</b>	<b>Min</b>	<b>Max</b>
	CAOCO-L	<i>Calystegia occidentalis ssp. occidentalis</i>	0.4	0.1	0.2	0.2
	CHLOR3-L	<i>Chlorogalum</i>	0.4	0.1	0.2	0.2
	GAAP2-L	<i>Galium aparine</i>	0.4	0.1	0.2	0.2
	GAPO-L	<i>Galium porrigens</i>	0.4	0.1	0.2	0.2
	LATHY-L	<i>Lathyrus</i>	0.4	0.1	0.2	0.2
	LUNA3-L	<i>Lupinus nanus</i>	0.4	0.1	0.2	0.2
	MEIM-L	<i>Melica imperfecta</i>	0.4	0.2	0.2	1
	PHCI-L	<i>Phacelia cicutaria</i>	0.4	0.2	0.2	1
	PIEL4-L	<i>Piperia elongata</i>	0.4	0.1	0.2	0.2
	PLECT-L	<i>Plectritis</i>	0.4	0.1	0.2	0.2
	TROL-L	<i>Trifolium oliganthum</i>	0.4	0.1	0.2	0.2
	VISAN2-L	<i>Vicia sativa ssp. nigra</i>	0.4	0.4	0.2	2
	WYETH-L	<i>Wyethia</i>	0.4	0.1	0.2	0.2
<b>Cryptogam</b>						
	MOSS-L	Moss	0.6	7.4	0.2	22

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***Quercus douglasii*-*Aesculus californica*/*Asclepias fascicularis*/*Rorippa* sp. Association (new provisional)  
Blue Oak - California Buckeye / Narrow-leaf Milkweed / Yellowcress Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Quercus douglasii*-*Aesculus californica*/*Asclepias fascicularis*/*Rorippa* sp. Woodland/Forest form an intermittent tree layer (35-55%, mean 45%) with conifers at 0-20m tall and hardwoods at 10-20m tall, an open shrub layer (15-30%, mean 22.5%) at 0.5-2m tall, and a continuous herbaceous layer (75-85%, mean 80%) at 0.1-0.5m tall. *Quercus douglasii* and *Aesculus californica* are dominant in the tree layer. *Asclepias fascicularis* is characteristic in the shrub layer. *Rorippa* sp. dominates in the herbaceous layer. Total vegetation cover is 85-90%, mean cover is 87.5%.

In this association, the main overstory tree species are *Quercus douglasii* and *Aesculus californica*. *Quercus wislizeni*, *Q. lobata*, and *Pinus sabiniana* also may occur at lower cover. The understory shrub layer frequently includes *Toxicodendron diversilobum* and *Ficus carica*. The herbaceous layer frequently includes an understory of grass and forb species such as *Rorippa* sp., *Cynodon dactylon*, *Cynosurus echinatus*, *Stachys stricta*, and *Asclepias fascicularis*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 1007-1109 ft, mean 1058 ft  
Aspect: SE  
Slope: no data  
Topography: lower slope; concave  
Litter Cover: range 40-57%, mean 48.5%  
Rock Cover: range 22-30%, mean 26%  
Bare Ground: range 1-1%, mean 1%  
Parent Material: plutonic or metavolcanic  
Soil Texture: moderately fine sandy clay loam

The stands occur in a riparian corridor in the center of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California).

**Number of Samples Used in Description: 2**

**Samples:** APEOR279, APEOR280

**Rank:** G3 S3? Difficult to rank because more data are needed

**GLOBAL DISTRIBUTION**

*Quercus douglasii* Alliance: Southern outer North Coast, inner North Coast, inner Central Coast, Klamath foothills, Cascade Range foothills, Sierra Nevada foothills (including Yosemite N.P.), South Coast, west Modoc Plateau

Association: Potentially from the Sierra Nevada foothills east and north to the Coast Ranges, Transverse Ranges, and Klamath foothills.

**REFERENCES**

NatureServe et al. 2003b, Sawyer and Keeler-Wolf 1995, Allen et al. 1991, Keeler-Wolf 1990, Allen et al. 1989

**RESTORATION INFORMATION**

This association has low non-native plant cover (average 17.8%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Cynodon dactylon* and *Cynosurus echinatus*. Two exotics tree species, *Ailanthus altissima* and *Ficus carica* occur within this association at a cover of less than 1%. (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts were minimal, but included surface water diversion at low intensity.

***Quercus douglasii*-*Aesculus californica*/*Asclepias fascicularis*/*Rorippa* sp.**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUDO-T	<i>Quercus douglasii</i>	1	26	15	37
	AECA-T	<i>Aesculus californica</i>	1	11.5	3	20
	QUWI2-T	<i>Quercus wislizeni</i>	1	5.1	0.2	10
	PISA2-T	<i>Pinus sabiniana</i>	0.5	2.5	5	5
	QULO-T	<i>Quercus lobata</i>	0.5	0.5	1	1
<b>Tree Understory</b>						
	AECA-M	<i>Aesculus californica</i>	0.5	5	10	10
	AIAL-M	<i>Ailanthus altissima</i>	0.5	0.1	0.2	0.2
<b>Shrub</b>						
	FICA-M	<i>Ficus carica</i>	1	0.2	0.2	0.2
	TODI-M	<i>Toxicodendron diversilobum</i>	1	8.5	2	15
	CAOC5-M	<i>Calycanthus occidentalis</i>	0.5	0.1	0.2	0.2
	HOMA4-M	<i>Hoita macrostachya</i>	0.5	0.1	0.2	0.2
	RHTO6-M	<i>Rhamnus tomentella</i>	0.5	3	6	6
	SALA6-M	<i>Salix lasiolepis</i>	0.5	1.5	3	3
	SAME5-M	<i>Sambucus mexicana</i>	0.5	0.1	0.2	0.2
<b>Herb</b>						
	ASFA-L	<i>Asclepias fascicularis</i>	1	0.2	0.2	0.2
	CYDA-L	<i>Cynodon dactylon</i>	1	17.5	15	20
	CYEC-L	<i>Cynosurus echinatus</i>	1	2	1	3
	RORIP-L	<i>Rorippa</i>	1	22.5	10	35
	STST-L	<i>Stachys stricta</i>	1	0.6	0.2	1
	LEMNA-L	<i>Lemna</i>	0.5	5	10	10
	MIGU-L	<i>Mimulus guttatus</i>	0.5	0.1	0.2	0.2
	PHCI-L	<i>Phacelia cicutaria</i>	0.5	0.1	0.2	0.2
	POMO5-L	<i>Polypogon monspeliensis</i>	0.5	0.1	0.2	0.2
	RUCO2-L	<i>Rumex conglomeratus</i>	0.5	0.1	0.2	0.2
	SIMA3-L	<i>Silybum marianum</i>	0.5	0.1	0.2	0.2
	VIVI-L	<i>Vicia villosa</i>	0.5	0.1	0.2	0.2

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***Quercus douglasii*-*Pinus sabiniana*/Annual Grass-Herb Association**  
**Blue Oak - Foothill Pine / Annual Grass-Herb Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Quercus douglasii*-*Pinus sabiniana*/Annual Grass-Herb Woodland/Forest form an open to intermittent tree layer (10-47%, mean 29.2%) with conifers at 10-35m tall and hardwoods at 5-15m tall, a sparse to open shrub layer (0.2-30%, mean 9.7%) at 0.1-5m tall, and an intermittent to continuous herbaceous layer (50-95%, mean 72%) at 0.1-0.5m tall. *Quercus douglasii* and *Pinus sabiniana* co-dominate in the tree layer. Annual grass and forbs dominate in the herb layer. Total vegetation cover is 70-96%, mean cover is 85.2%.

In this association, the main overstory tree species are *Quercus douglasii* and *Pinus sabiniana*, though sometimes the pine can be low in cover. The understory shrub layer frequently includes *Toxicodendron diversilobum* and *Ceanothus cuneatus*. The herbaceous layer frequently includes a diversity of grasses and forbs such as *Bromus hordeaceus*, *Aira caryophylla*, *Torilis arvensis*, *Daucus pusillus*, *Bromus madritensis*, *Trifolium hirtum*, *Avena barbata*, *Lolium multiflorum*, *Hypochaeris glabra*, *Bromus diandrus*, *Trifolium microcephalum*, and *Trifolium willdenovii*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 897-1643 ft, mean 1240 ft

Aspect: variable

Slope: flat to somewhat steep, range 0-25 degrees, mean 11 degrees

Topography: bottom slope to ridge top; often linear, occasionally concave or undulating

Litter Cover: range 21-64%, mean 36.6%

Rock Cover: range 1-52%, mean 19.1%

Bare Ground: range 7-42%, mean 22%

Parent Material: sedimentary, serpentine, plutonic, or volcanic flow

Soil Texture: often moderately fine sandy clay loam, occasionally medium to very fine loamy sand or moderately fine clay loam

This association occurs across the study area from the NE, SW, and NW portions (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California), on gentle to moderate slopes with variable parent material.

**Number of Samples Used in Description: 5**

**Samples:** APEOR023, APEOR073, APEOR222, APEOR274, APEOR283

**Rank:** G4S4

**GLOBAL DISTRIBUTION**

*Quercus douglasii* Alliance: Southern outer North Coast, inner North Coast, inner Central Coast, Klamath foothills, Cascade Range foothills, Sierra Nevada foothills (including Yosemite N.P.), South Coast, west Modoc Plateau

*Quercus douglasii*-*Pinus sabiniana*/Grass Association: Sierra Nevada foothills and mountains from Placer to Fresno County; Central Coast Range from Monterey to Los Angeles County.

Similar *Quercus douglasii*-*Pinus sabiniana*/Grass Woodland from Sierra Nevada (Yosemite N.P.)

**REFERENCES**

NatureServe et al. 2003b, Sawyer and Keeler-Wolf 1995, Allen et al. 1991, Keeler-Wolf 1990, Allen et al. 1989

**RESTORATION INFORMATION**

This association has high non-native plant cover (average 57.8%) relative to native cover. Non-native species with highest cover include grasses, *Bromus hordeaceus*, *B. madritensis* and *Avena barbata*, and

annual forb, *Trifolium hirtum*. *Carduus pycnocephalus* occurred in two of five stands at less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references).



**Quercus douglasii-Pinus sabiniana/Annual Grass-Herb**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	PISA2-T	<i>Pinus sabiniana</i>	1	6.4	2	15
	QUDO-T	<i>Quercus douglasii</i>	1	21.6	6	35
<b>Tree Understory</b>						
	QUDO-L	<i>Quercus douglasii</i>	0.6	0.1	0.2	0.2
	QUDO-M	<i>Quercus douglasii</i>	0.6	2.1	0.2	10
<b>Shrub</b>						
	TODI-M	<i>Toxicodendron diversilobum</i>	0.6	6.8	0.2	30
	CECU-L	<i>Ceanothus cuneatus</i>	0.4	0.1	0.2	0.2
	CECU-M	<i>Ceanothus cuneatus</i>	0.4	1.8	3	6
<b>Herb</b>						
	AICA-L	<i>Aira caryophyllea</i>	1	1.4	0.2	6
	BRHO2-L	<i>Bromus hordeaceus</i>	1	40.4	30	45
	DAPU3-L	<i>Daucus pusillus</i>	0.8	0.3	0.2	1
	TOAR-L	<i>Torilis arvensis</i>	0.8	1.3	0.2	5
	AVBA-L	<i>Avena barbata</i>	0.6	4.2	0.2	20
	BRDI3-L	<i>Bromus diandrus</i>	0.6	1.2	1	4
	BREL-L	<i>Brodiaea elegans</i>	0.6	0.1	0.2	0.2
	BRMA3-L	<i>Bromus madritensis</i>	0.6	9.2	0.2	40
	HYGL2-L	<i>Hypochaeris glabra</i>	0.6	1.6	0.2	5
	LOMU-L	<i>Lolium multiflorum</i>	0.6	2.4	0.2	10
	PETRT-L	<i>Pentagramma triangularis</i> <i>ssp. triangularis</i>	0.6	0.1	0.2	0.2
	TRHI4-L	<i>Trifolium hirtum</i>	0.6	4.8	0.2	20
	TRMI4-L	<i>Trifolium microcephalum</i>	0.6	1.1	0.2	5
	TRWI3-L	<i>Trifolium willdenovii</i>	0.6	0.3	0.2	1
	BRDI2-L	<i>Brachypodium distachyon</i>	0.4	0.4	0.2	2
	BRMI2-L	<i>Briza minor</i>	0.4	0.2	0.2	1
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.4	0.6	1	2
	CHLOR3-L	<i>Chlorogalum</i>	0.4	0.1	0.2	0.2
	CLARK-L	<i>Clarkia</i>	0.4	0.1	0.2	0.2
	CLPUQ-L	<i>Clarkia purpurea ssp.</i> <i>quadrivulnera</i>	0.4	0.4	1	1
	DICA14-L	<i>Dichelostemma capitatum</i>	0.4	0.1	0.2	0.2
	ERBO-L	<i>Erodium botrys</i>	0.4	0.1	0.2	0.2
	GAPA5-L	<i>Galium parisiense</i>	0.4	0.1	0.2	0.2
	LOMI-L	<i>Lotus micranthus</i>	0.4	0.1	0.2	0.2
	LUNA3-L	<i>Lupinus nanus</i>	0.4	7.4	0.2	37
	MAGR3-L	<i>Madia gracilis</i>	0.4	0.4	0.2	2
	PLNO-L	<i>Plagiobothrys nothofulvus</i>	0.4	0.2	0.2	1
	SIGA-L	<i>Silene gallica</i>	0.4	0.1	0.2	0.2
	TRDU2-L	<i>Trifolium dubium</i>	0.4	0.1	0.2	0.2
	VISAN2-L	<i>Vicia sativa ssp. nigra</i>	0.4	0.1	0.2	0.2
	VUMY-L	<i>Vulpia myuros</i>	0.4	0.1	0.2	0.2
<b>Cryptogam</b>						
	MOSS-L	Moss	0.4	0.6	0.2	3

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***Quercus wislizeni/Heteromeles arbutifolia* Association  
Interior Live Oak / Toyon Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Quercus wislizeni/Heteromeles arbutifolia* Woodland/Forest form an intermittent to continuous tree layer (41-85%, mean 62.7%) with conifers at 0-20m tall and hardwoods at 5-15m tall, an open to intermittent shrub layer (30-60%, mean 42.4%) at 0-10m tall, and a sparse to intermittent herbaceous layer (0.2-45%, mean 9.6%) at 0.1-1m tall. *Heteromeles arbutifolia* dominates in the shrub layer. Total vegetation cover is 65-95%, mean cover is 85.4%.

In this association, the main overstory tree species is *Quercus wislizeni*. *Pinus sabiniana* and *Quercus douglasii* are occasionally present. The understory shrub layer is dominated by *Heteromeles arbutifolia* and *Toxicodendron diversilobum*, yet it is diverse and also includes *Lepechinia calycina*, *Mimulus aurantiacus*, *Arctostaphylos manzanita*, and *Adenostoma fasciculatum*. Moss is also characteristically present. The herbaceous layer is sparse and occasionally includes species such as *Aira caryophyllea*, *Chlorogalum* sp., *Torilis arvensis*, and *Galium andrewsii*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 1162-1677 ft, mean 1483 ft

Aspect: NW, NE or variable

Slope: moderate to steep, range 14-29 degrees, mean 23.2 degrees

Topography: mid to upper slope; undulating, convex or linear

Litter Cover: range 18-80%, mean 52.4%

Rock Cover: range 0.4-75%, mean 25.5%

Bare Ground: range 0-3%, mean 1.1%

Parent Material: sedimentary, plutonic, volcanic flow, or general volcanic extrusives

Soil Texture: moderately fine sandy clay loam, medium to very fine loamy sand, moderately coarse sandy loam, or moderately fine silty clay loam

Stands occur in the NE and NW portions of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California), particularly on the north-facing slope of the volcanic Table Mountain.

**Number of Samples Used in Description: 5**

**Samples:** APEOR089, APEOR098, APEOR099, APEOR236, APEOR259

**Rank:** G4 S4

**GLOBAL DISTRIBUTION**

*Quercus wislizeni* Alliance: South outer North Coast, inner North Coast, Central Coast, Klamath foothills, Cascade Range foothills, Sierra Nevada foothills and lower montane (including Yosemite N.P.), montane Transverse Ranges, montane Peninsular Range (including W Riverside County)

*Quercus wislizeni/Heteromeles arbutifolia* Association: Sierra Nevada and Sierra Nevada foothills from Placer County to Madera County and the interior Coast Ranges

**REFERENCES**

Klein and Evens In publication, NatureServe et al. 2003b, Sawyer and Keeler-Wolf 1995, Gordon and White 1994, Allen et al. 1991, Keeler-Wolf 1990, Allen et al. 1989, Vogl 1976

**RESTORATION INFORMATION**

This association has low non-native plant cover (average 6%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Bromus hordeaceus* and *B. madritensis*. No noxious weed species were recorded as occurring in the stands, so there are no restoration recommendations. Other site impacts were minimal, but included mining in one stand as a minor impact.

**Quercus wislizeni/Heteromeles arbutifolia**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUWI2-T	<i>Quercus wislizeni</i>	1	55	35	70
	PISA2-T	<i>Pinus sabiniana</i>	0.4	0.2	0.2	1
<b>Tree Understory</b>						
	QUWI2-L	<i>Quercus wislizeni</i>	0.6	0.1	0.2	0.2
	QUWI2-M	<i>Quercus wislizeni</i>	0.2	1	5	5
<b>Shrub</b>						
	HEAR5-M	<i>Heteromeles arbutifolia</i>	1	29.8	4	60
	MIAU-M	<i>Mimulus aurantiacus</i>	1	3.1	0.2	10
	TODI-M	<i>Toxicodendron diversilobum</i>	1	16.4	7	45
	LECA3-M	<i>Lepechinia calycina</i>	0.8	5.3	0.2	25
	ADFA-M	<i>Adenostoma fasciculatum</i>	0.6	0.3	0.2	1
	ARMA-M	<i>Arctostaphylos manzanita</i>	0.6	3	1	12
	TODI-L	<i>Toxicodendron diversilobum</i>	0.6	1.6	1	5
	AECA-M	<i>Aesculus californica</i>	0.4	1.4	3	4
	KEBR-M	<i>Keckiella breviflora</i>	0.4	0.6	0.2	3
	RHTO6-M	<i>Rhamnus tomentella</i>	0.4	0.4	0.2	2
<b>Herb</b>						
	AICA-L	<i>Aira caryophyllea</i>	0.4	0.4	0.2	2
	CHLOR3-L	<i>Chlorogalum</i>	0.4	0.1	0.2	0.2
	GAAN-L	<i>Galium andrewsii</i>	0.4	0.1	0.2	0.2
	HEAR5-L	<i>Heteromeles arbutifolia</i>	0.4	0.1	0.2	0.2
	TOAR-L	<i>Torilis arvensis</i>	0.4	0.1	0.2	0.2
<b>Epiphyte</b>						
	PHVI9-E	<i>Phoradendron villosum</i>	0.2	0.2	1	1
<b>Cryptogam</b>						
	MOSS-L	Moss	0.8	9.4	2	30

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***Quercus wislizeni*/*Toxicodendron diversilobum* Association (new)**  
**Interior Live Oak / Poison Oak Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Quercus wislizeni*/*Toxicodendron diversilobum* Woodland/Forest form an open to continuous tree layer (10-70%, mean 52.4%) with conifers at 0-20m tall and hardwoods at 5-15m tall, an open to intermittent shrub layer (15-60%, mean 38.2%) at 0.5-5m tall, and a sparse to intermittent herbaceous layer (0.2-65%, mean 31.4%) at 0.1-0.5m tall. *Quercus wislizeni* dominates the tree layer and is regenerating in the shrub and herb layers. *Toxicodendron diversilobum* dominates in the shrub layer. Total vegetation cover is 70-95%, mean cover is 87.2%.

In this association, *Quercus wislizeni* is the main overstory tree species. *Quercus douglasii* and *Pinus sabiniana* may occur in the overstory but at relatively low cover. The understory shrub layer is dominated by *Toxicodendron diversilobum*, but it can also include a variety of other species such as *Ceanothus cuneatus*, *Heteromeles arbutifolia*, *Rhamnus ilicifolia*, and *Arctostaphylos manzanita*. The herbaceous layer frequently includes a diversity of grasses and forbs in the openings of the canopy, including *Bromus hordeaceus*, *Bromus madritensis*, *Torilis arvensis*, and *Daucus pusillus*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 711-1680 ft, mean 1146 ft

Aspect: often NW, occasionally NE, SE, or flat

Slope: somewhat steep to steep, range 15-28 degrees, mean 20.1 degrees

Topography: lower to mid slope; often undulating, occasionally convex or concave

Litter Cover: range 18-79%, mean 62.7%

Rock Cover: range 0.4-52%, mean 12.3%

Bare Ground: range 0.2-12%, mean 3.8%

Parent Material: sedimentary, metamorphic, metavolcanic or plutonic

Soil Texture: often moderately fine sandy clay loam, occasionally moderately coarse sandy loam or moderately fine clay loam

Stands of this association occur in the NE, SE, and NW portions of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California), usually on somewhat steep, cool slopes.

**Number of Samples Used in Description: 10**

**Samples:** APEOR052, APEOR067, APEOR084, APEOR108, APEOR201, APEOR220, APEOR229, APEOR232, APEOR240, APEOR253

**Rank:** G4S4

**GLOBAL DISTRIBUTION**

*Quercus wislizeni* Alliance: South outer North Coast, inner North Coast, Central Coast, Klamath foothills, Cascade Range foothills, Sierra Nevada foothills and lower montane (including Yosemite N.P.), montane Transverse Ranges, montane Peninsular Range (including W Riverside County)

Association: potentially similar range as the alliance

**REFERENCES**

Klein and Evens In publication, NatureServe et al. 2003b, Sawyer and Keeler-Wolf 1995, Gordon and White 1994, Allen et al. 1991, Keeler-Wolf 1990, Allen et al. 1989, Vogl 1976

**RESTORATION INFORMATION**

This association has low non-native plant cover (average 21.6%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Bromus hordeaceus* and *B. madritensis*. *Carduus pycnocephalus*, *Centaurea melitensis* and *C. solstitialis* also occur in this association but with average cover of less than 1% (see Appendix 2 and Pages 16-18 for restoration references). In one

stand, roads were recorded as a moderate impact, which could be creating an avenue for establishment of these non-native species. Thus, it is recommended to reduce road disturbance and close/restore unneeded roads to deter any additional spread of non-natives.

**Quercus wislizeni/Toxicodendron diversilobum**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUWI2-T	<i>Quercus wislizeni</i>	1	49.6	10	70
	QUDO-T	<i>Quercus douglasii</i>	0.6	0.8	0.2	3
	PISA2-T	<i>Pinus sabiniana</i>	0.4	0.2	0.2	1
<b>Tree Understory</b>						
	QUWI2-L	<i>Quercus wislizeni</i>	0.3	0.1	0.2	0.2
<b>Shrub</b>						
	TODI-M	<i>Toxicodendron diversilobum</i>	1	31.9	12	60
	CECU-M	<i>Ceanothus cuneatus</i>	0.5	3.4	0.2	20
	RHIL-M	<i>Rhamnus ilicifolia</i>	0.5	0.1	0.2	0.2
	HEAR5-M	<i>Heteromeles arbutifolia</i>	0.4	2.7	0.2	25
	TODI-L	<i>Toxicodendron diversilobum</i>	0.4	3.7	2	20
	ARMA-M	<i>Arctostaphylos manzanita</i>	0.3	0.5	0.2	4
	SYMO-L	<i>Symphoricarpos mollis</i>	0.3	0.1	0.2	0.2
<b>Herb</b>						
	BRHO2-L	<i>Bromus hordeaceus</i>	0.8	16	4	45
	BRMA3-L	<i>Bromus madritensis</i>	0.7	2.6	1	7
	DAPU3-L	<i>Daucus pusillus</i>	0.7	0.9	0.2	5
	TOAR-L	<i>Torilis arvensis</i>	0.7	1.8	1	5
	TRMI4-L	<i>Trifolium microcephalum</i>	0.6	0.3	0.2	1
	AICA-L	<i>Aira caryophyllea</i>	0.5	0.7	0.2	5
	MICAC2-L	<i>Micropus californicus var. californicus</i>	0.5	0.4	0.2	2
	AVBA-L	<i>Avena barbata</i>	0.4	0.3	0.2	2
	BRDI3-L	<i>Bromus diandrus</i>	0.4	1	0.2	5
	CAAL2-L	<i>Calochortus albus</i>	0.4	0.1	0.2	0.2
	CLPUQ-L	<i>Clarkia purpurea ssp. quadrivulnera</i>	0.4	0.2	0.2	1
	GAPO-L	<i>Galium porrigens</i>	0.4	0.2	0.2	1
	GAVE3-L	<i>Gastrium ventricosum</i>	0.4	0.4	0.2	2
	MAEX-L	<i>Madia exigua</i>	0.4	0.2	0.2	1
	MAGR3-L	<i>Madia gracilis</i>	0.4	0.3	0.2	2
	SAGR5-L	<i>Sanicula graveolens</i>	0.4	0.1	0.2	0.2
	TRHI4-L	<i>Trifolium hirtum</i>	0.4	0.3	0.2	2
	AVFA-L	<i>Avena fatua</i>	0.3	0.5	0.2	3
	BRMI2-L	<i>Briza minor</i>	0.3	0.1	0.2	0.2
	CEME2-L	<i>Centaurea melitensis</i>	0.3	0.4	0.2	4
	DIVO-L	<i>Dichelostemma volubile</i>	0.3	0.1	0.2	0.2
	HYGL2-L	<i>Hypochaeris glabra</i>	0.3	0.2	0.2	1
	PETRT-L	<i>Pentagramma triangularis ssp. triangularis</i>	0.3	0.1	0.2	1
<b>Cryptogam</b>						
	MOSS-L	Moss	0.3	1.1	0.2	10

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***Quercus wislizeni*-*Aesculus californica*/*Toxicodendron diversilobum* Association (new provisional)**

**Interior Live Oak - California Buckeye / Poison Oak Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Quercus wislizeni*-*Aesculus californica*/*Toxicodendron diversilobum* Woodland/Forest form a sparse to continuous tree layer (9.2-67%, mean 43.2%) with conifers at 0-20m tall and hardwoods at 5-15m tall, an open to intermittent shrub layer (25-65%, mean 39.1%) at 0-5m tall, and an open to continuous herbaceous layer (20-75%, mean 51.3%) at 0.1-1m tall. Total vegetation cover is 65-95%, mean cover is 81.5%.

In this association, *Quercus wislizeni* dominates or co-dominates in the overstory tree layer, and *Aesculus californica* is usually co-dominant with the oak, but is found as either an overstory or understory tree species. *Pinus sabiniana* is characteristically present, and *Quercus douglasii* is frequently present, but both usually have low cover. *Toxicodendron diversilobum* dominates the shrub layer. Other frequently occurring shrubs include *Rhamnus ilicifolia*, *Heteromeles arbutifolia*, *Keckiella breviflora*, and *Sambucus mexicana*. The herbaceous layer frequently includes a diversity of grasses and forbs such as *Torilis arvensis*, *Bromus hordeaceus*, *Brachypodium distachyon*, *Avena barbata*, and *Pentagramma triangularis* subsp. *triangularis*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 512-1675 ft, mean 1244 ft

Aspect: NW, Flat, or NE

Slope: moderate to steep, range 9-30 degrees, mean 22.8 degrees

Topography: lower slope to upper slope; undulating or convex

Litter Cover: range 0.3-75%, mean 50.8%

Rock Cover: range 2.2-70%, mean 26.4%

Bare Ground: range 0.3-15%, mean 4.4%

Parent Material: volcanic extrusives/flow, metavolcanic, plutonic, serpentine, or conglomerate

Soil Texture: moderately coarse sandy loam, moderately fine sandy clay loam, coarse loamy sand, or moderately fine silty clay loam

Stands of this association occur in the SE and NW portions of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California), primarily on somewhat steep, cool slopes with moderately high rockiness. They occur on north-facing slope of the volcanic Table Mountain, and on the metavolcanic slopes overlooking New Melones Lake.

**Number of Samples Used in Description: 8**

**Samples:** APEOR066, APEOR085, APEOR094, APEOR208, APEOR241, APEOR261, APEOR262, APEOR263

**Rank:** Rank: G4S4

**GLOBAL DISTRIBUTION**

*Quercus wislizeni* Alliance: South outer North Coast, inner North Coast, Central Coast, Klamath foothills, Cascade Range foothills, Sierra Nevada foothills and lower montane (including Yosemite N.P.), montane Transverse Ranges, montane Peninsular Range (including W Riverside County)

Association: potentially similar range as the alliance

**REFERENCES**

Klein and Evens In publication, NatureServe et al. 2003b, Sawyer and Keeler-Wolf 1995, Gordon and White 1994, Allen et al. 1991, Keeler-Wolf 1990, Allen et al. 1989, Vogl 1976

## RESTORATION INFORMATION

This association has moderate non-native plant cover (average 39.1%) relative to native cover. Non-native species with highest cover include grasses, *Brachypodium distachyon*, *Bromus hordeaceus* and *Avena barbata*, and the annual forb, *Torilis arvensis*. *Carduus pycnocephalus* occurs in four of eight stands with 2.3% average cover. *Centaurea melitensis* and *C. solstitialis* sometimes occur and with less than 1% cover. *Ailanthus altissima* occurred in one stand at less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references). In one stand, dam/inundation and rip-rap/bank-protection were recorded as a high impact.

### *Quercus wislizeni*-*Aesculus californica*/*Toxicodendron diversilobum*

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUWI2-T	<i>Quercus wislizeni</i>	1	36	2	65
	PISA2-T	<i>Pinus sabiniana</i>	0.8	1.5	0.2	8
	AECA-T	<i>Aesculus californica</i>	0.5	5.4	3	15
	QUDO-T	<i>Quercus douglasii</i>	0.5	3.3	1	22
<b>Tree Understory</b>						
	AECA-M	<i>Aesculus californica</i>	0.8	8.7	0.2	28
<b>Shrub</b>						
	TODI-M	<i>Toxicodendron diversilobum</i>	1	22.3	2	38
	RHIL-M	<i>Rhamnus ilicifolia</i>	0.8	1.3	1	5
	HEAR5-M	<i>Heteromeles arbutifolia</i>	0.6	5.3	1	15
	KEBR-M	<i>Keckiella breviflora</i>	0.5	0.2	0.2	1
	MIAU-M	<i>Mimulus aurantiacus</i>	0.4	0.5	0.2	2
	SAME5-M	<i>Sambucus mexicana</i>	0.4	0.9	1	4
	SYMO-L	<i>Symphoricarpos mollis</i>	0.4	0.7	0.2	5
<b>Herb</b>						
	TOAR-L	<i>Torilis arvensis</i>	0.9	4.1	1	10
	BRHO2-L	<i>Bromus hordeaceus</i>	0.8	8	1	40
	AVBA-L	<i>Avena barbata</i>	0.6	3.9	0.2	15
	BRDI2-L	<i>Brachypodium distachyon</i>	0.6	17.5	10	45
	PETRT-L	<i>Pentagramma triangularis ssp. triangularis</i>	0.6	1.1	0.2	8
	BRMA3-L	<i>Bromus madritensis</i>	0.5	3.6	3	12
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.5	2.3	0.2	18
	CEME2-L	<i>Centaurea melitensis</i>	0.5	0.8	0.2	4
	DIVO-L	<i>Dichelostemma volubile</i>	0.5	0.1	0.2	0.2
	GAPO-L	<i>Galium porrigens</i>	0.5	0.1	0.2	0.2
	MAGR3-L	<i>Madia gracilis</i>	0.5	0.6	0.2	3
	MECA2-L	<i>Melica californica</i>	0.5	0.1	0.2	0.2
	SAGR5-L	<i>Sanicula graveolens</i>	0.5	0.1	0.2	0.2
	TRHI4-L	<i>Trifolium hirtum</i>	0.5	1.7	0.2	8
	AICA-L	<i>Aira caryophyllea</i>	0.4	1.9	0.2	10
	ALPEP2-L	<i>Allium peninsulare var. peninsulare</i>	0.4	0.1	0.2	0.2
	BRDI3-L	<i>Bromus diandrus</i>	0.4	1.4	1	5
	DAPU3-L	<i>Daucus pusillus</i>	0.4	0.1	0.2	0.2



***Quercus wislizeni-Aesculus californica/Toxicodendron diversilobum***

<b>Layer</b>	<b>Code</b>	<b>Species Name</b>	<b>Freq</b>	<b>Avg</b>	<b>Min</b>	<b>Max</b>
	GAPO-M	<i>Galium porrigens</i>	0.4	0.3	0.2	1
	PEMU-L	<i>Pellaea mucronata</i>	0.4	0.1	0.2	0.2
	TRMI4-L	<i>Trifolium microcephalum</i>	0.4	0.1	0.2	0.2
	TRWI3-L	<i>Trifolium willdenovii</i>	0.4	0.1	0.2	0.2
	URLI5-L	<i>Uropappus lindleyi</i>	0.4	0.1	0.2	0.2
	VIVI-L	<i>Vicia villosa</i>	0.4	6.9	0.2	45
<b>Cryptogam</b>						
	MOSS-L	Moss	0.5	3.4	2	20

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***Quercus wislizeni*-*Pinus sabiniana*/Annual Grass-Herb Association**  
**Interior Live Oak - Foothill Pine / Annual Grass-Herb Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Quercus wislizeni*-*Pinus sabiniana*/Annual Grass-Herb Woodland/Forest form an open to continuous tree layer (20-76%, mean 48%) with conifers at 5-15m tall and hardwoods at 5-10m tall, a sparse to open shrub layer (8-12%, mean 10%) at 0-2m tall, and an open to intermittent herbaceous layer (20-50%, mean 35%) at 0.1-1m tall. *Quercus wislizeni* dominates while *Pinus sabiniana* is in lower cover. *Selaginella hansenii* is an indicator species in the herbaceous layer. Total vegetation cover is 45-65%, mean cover is 55%.

In this association, the main overstory tree species are *Quercus wislizeni* and *Pinus sabiniana*. The understory shrub layer characteristically includes *Heteromeles arbutifolia*, *Rhamnus ilicifolia*, *Mimulus aurantiacus*, *Eriodictyon californicum*, *Symphoricarpos mollis*, and *Toxicodendron diversilobum*. The herbaceous layer frequently includes grasses and forbs such as *Bromus hordeaceus*, *Avena barbata*, *Castilleja pruinosa*, *Bromus diandrus*, and *Melica californica*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 1780-1780 ft, mean 1780 ft

Aspect: NW

Slope: very steep, range 48-50 degrees, mean 49 degrees

Topography: upper slope; undulating or convex

Litter Cover: range 2-10%, mean 6%

Rock Cover: range 50-70%, mean 60%

Bare Ground: range 7-30%, mean 18.5%

Parent Material: volcanic extrusives/flow

Soil Texture: moderately fine sandy clay loam or medium to very fine sandy loam

Stands primarily occur in the SE portion of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California), primarily on the north-facing slope of the volcanic Table Mountain, as well as the NW portion.

**Number of Samples Used in Description: 2**

**Samples:** APEOR202, APEOR265

**Rank:** G4S4

**GLOBAL DISTRIBUTION**

*Quercus wislizeni* Alliance: South outer North Coast, inner North Coast, Central Coast, Klamath foothills, Cascade Range foothills, Sierra Nevada foothills and lower montane (including Yosemite N.P.), montane Transverse Ranges, montane Peninsular Range (including W Riverside County)

Association: potentially a similar range as the alliance.

**REFERENCES**

Klein and Evens In publication, NatureServe et al. 2003b, Sawyer and Keeler-Wolf 1995, Gordon and White 1994, Allen et al. 1991, Keeler-Wolf 1990, Allen et al. 1989, Vogl 1976

**RESTORATION INFORMATION**

This association has low non-native plant cover (average 17.7%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Bromus hordeaceus*, *Avena barbata* and *Bromus diandrus*. No noxious weed species were recorded as occurring within the stands, so there are no restoration recommendations. Other site impacts were minimal.

**Quercus wislizeni-Pinus sabiniana/Annual Grass-Herb**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	PISA2-T	<i>Pinus sabiniana</i>	1	5.5	1	10
	QUWI2-T	<i>Quercus wislizeni</i>	1	40	10	70
	QUDO-T	<i>Quercus douglasii</i>	0.5	0.1	0.2	0.2
	AECA-T	<i>Aesculus californica</i>	0.5	3	6	6
<b>Tree Understory</b>						
	QUWI2-M	<i>Quercus wislizeni</i>	0.5	2.5	5	5
<b>Shrub</b>						
	ERCA6-M	<i>Eriodictyon californicum</i>	1	1	1	1
	HEAR5-M	<i>Heteromeles arbutifolia</i>	1	4.5	4	5
	MIAU-M	<i>Mimulus aurantiacus</i>	1	1.5	1	2
	RHIL-M	<i>Rhamnus ilicifolia</i>	1	3	1	5
	ERLAG-L	<i>Eriophyllum lanatum</i> var. <i>grandiflorum</i>	0.5	0.1	0.2	0.2
	LOSC2-M	<i>Lotus scoparius</i>	0.5	0.1	0.2	0.2
	SYMO-L	<i>Symphoricarpos mollis</i>	0.5	0.5	1	1
	TODI-M	<i>Toxicodendron diversilobum</i>	0.5	0.5	1	1
<b>Herb</b>						
	AVBA-L	<i>Avena barbata</i>	1	4.5	1	8
	BRHO2-L	<i>Bromus hordeaceus</i>	1	15.1	0.2	30
	CAPR14-L	<i>Castilleja pruinosa</i>	1	1.1	0.2	2
	BRDI3-L	<i>Bromus diandrus</i>	0.5	4	8	8
	GAPO-L	<i>Galium porrigens</i>	0.5	0.1	0.2	0.2
	HYGL2-L	<i>Hypochaeris glabra</i>	0.5	0.1	0.2	0.2
	LUNA3-L	<i>Lupinus nanus</i>	0.5	0.1	0.2	0.2
	MECA2-L	<i>Melica californica</i>	0.5	0.5	1	1
	PHCI-L	<i>Phacelia cicutaria</i>	0.5	0.1	0.2	0.2
	STTOT2-L	<i>Streptanthus tortuosus</i> var. <i>tortuosus</i>	0.5	0.1	0.2	0.2
	TOAR-L	<i>Torilis arvensis</i>	0.5	0.1	0.2	0.2
	TRWI3-L	<i>Trifolium willdenovii</i>	0.5	0.1	0.2	0.2
<b>Epiphyte</b>						
	PHVI9-E	<i>Phoradendron villosum</i>	1	0.2	0.2	0.2
<b>Cryptogam</b>						
	SEHA2-L	<i>Selaginella hansenii</i>	1	20	20	20
	LICHEN-L	Lichen	0.5	20	40	40
	MOSS-L	Moss	0.5	5	10	10
<b>Cryptogam</b>	MOSS-L	Moss	0.5	5	10	10

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***Quercus wislizeni-Quercus douglasii/Toxicodendron diversilobum/Annual grass Association*  
Interior Live Oak - Blue Oak / Poison Oak / Annual Grass-Herb Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Quercus wislizeni-Quercus douglasii/Toxicodendron diversilobum/Annual grass* Woodland/Forest form an open to intermittent tree layer (20-55%, mean 35.1%) with conifers at 0-20m tall and hardwoods at 5-15m tall, a sparse to intermittent shrub layer (0-35%, mean 13.3%) at 0-5m tall, and an intermittent to continuous herbaceous layer (50-90%, mean 73.3%) at 0-0.5m tall. Total vegetation cover is 85-95%, mean cover is 91.7%.

In this association, *Quercus wislizeni* and *Quercus douglasii* usually co-dominate in the overstory tree layer (usually at least 15% relative cover for each). Both trees are regenerating in the understory. *Pinus sabiniana* and *Aesculus californica* occur in trace amounts if at all. *Toxicodendron diversilobum* is dominant in the shrub layer, and *Rhamnus ilicifolia* is frequently present. The herbaceous layer includes a diversity of grasses and forbs such as *Trifolium hirtum*, *Carduus pycnocephalus*, *Bromus hordeaceus*, *Brachypodium distachyon*, *Bromus diandrus*, *Torilis arvensis*, *Bromus madritensis*, *Gastridium ventricosum*, and *Daucus pusillus*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 790-1297 ft, mean 1068 ft

Aspect: NW and SE

Slope: flat to somewhat steep, range 0-22 degrees, mean 12 degrees

Topography: lower slope to mid slope; undulating or convex

Litter Cover: range 70-80%, mean 75%

Rock Cover: range 0.4-16%, mean 5.9%

Bare Ground: range 2-5%, mean 3.3%

Parent Material: plutonic, sedimentary, serpentine (less common)

Soil Texture: moderately fine sandy clay loam and moderately coarse sandy loam

Stands occur in the NE and NW portions of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California) on neutral slopes that are gentle to somewhat steep.

**Number of Samples Used in Description: 3**

**Samples:** APEOR093, APEOR207, APEOR235

**Rank:** G4 S4

**GLOBAL DISTRIBUTION**

*Quercus wislizeni Alliance:* South outer North Coast, inner North Coast, Central Coast, Klamath foothills, Cascade Range foothills, Sierra Nevada foothills and lower montane (including Yosemite N.P.), montane Transverse Ranges, montane Peninsular Range (including W Riverside County)

*Quercus wislizeni-Quercus douglasii/Toxicodendron diversilobum/Grass Association:* Sierra Nevada from Butte to Kern County

**REFERENCES**

Klein and Evens In publication, Sawyer and Keeler-Wolf 1995, Gordon and White 1994, Allen et al. 1991, Keeler-Wolf 1990, Allen et al. 1989, Vogl 1976

**RESTORATION INFORMATION**

This association has high non-native plant cover (average 59.3%) relative to native cover. Non-native species with highest cover include grasses, mainly *Bromus hordeaceus*, *Brachypodium distachyon* and *Bromus diandrus*, and the annual forb, *Torilis arvensis*. *Carduus pycnocephalus* characteristically occurs and *Centaurea melitensis* infrequently occurs, but both exhibit low cover, less than 1% (see Appendix 2

and Pages 16-18 for restoration references). Other site impacts were minimal, but include potential clearing in one stand.

**Quercus wislizeni-Quercus douglasii/Toxicodendron diversilobum/Annual grass**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUDO-T	<i>Quercus douglasii</i>	1	11	5	15
	QUWI2-T	<i>Quercus wislizeni</i>	1	25	15	40
	PISA2-T	<i>Pinus sabiniana</i>	0.3	0.1	0.2	0.2
<b>Tree Understory</b>						
	AECA-M	<i>Aesculus californica</i>	0.3	0.1	0.2	0.2
	PISA2-L	<i>Pinus sabiniana</i>	0.3	0.1	0.2	0.2
	PISA2-M	<i>Pinus sabiniana</i>	0.3	0.1	0.2	0.2
	QUDO-L	<i>Quercus douglasii</i>	0.3	0.1	0.2	0.2
	QUDO-M	<i>Quercus douglasii</i>	0.3	0.1	0.2	0.2
	QUWI2-L	<i>Quercus wislizeni</i>	0.3	0.1	0.2	0.2
<b>Shrub</b>						
	TODI-M	<i>Toxicodendron diversilobum</i>	1	9.1	0.2	15
	RHIL-M	<i>Rhamnus ilicifolia</i>	0.7	1.1	0.2	3
	ARMA-M	<i>Arctostaphylos manzanita</i>	0.3	0.3	1	1
	CECU-M	<i>Ceanothus cuneatus</i>	0.3	0.3	1	1
	ERCA6-M	<i>Eriodictyon californicum</i>	0.3	0.1	0.2	0.2
	HEAR5-M	<i>Heteromeles arbutifolia</i>	0.3	0.1	0.2	0.2
	LECA3-M	<i>Lepechinia calycina</i>	0.3	0.1	0.2	0.2
	LOHI2-L	<i>Lonicera hispidula</i>	0.3	0.1	0.2	0.2
	TODI-L	<i>Toxicodendron diversilobum</i>	0.3	0.3	1	1
<b>Herb</b>						
	CAPY2-L	<i>Carduus pycnocephalus</i>	1	0.2	0.2	0.2
	TRHI4-L	<i>Trifolium hirtum</i>	1	3.4	0.2	5
	BRDI2-L	<i>Brachypodium distachyon</i>	0.7	6.7	0.2	20
	BRDI3-L	<i>Bromus diandrus</i>	0.7	5.1	0.2	15
	BRHO2-L	<i>Bromus hordeaceus</i>	0.7	13.3	15	25
	BRMA3-L	<i>Bromus madritensis</i>	0.7	4.1	0.2	12
	CLPUQ-L	<i>Clarkia purpurea ssp. quadrivulnera</i>	0.7	0.1	0.2	0.2
	DAPU3-L	<i>Daucus pusillus</i>	0.7	1.4	0.2	4
	GAPO-L	<i>Galium porrigens</i>	0.7	0.1	0.2	0.2
	GAVE3-L	<i>Gastroidium ventricosum</i>	0.7	1.4	0.2	4
	LIMO-L	<i>Linanthus montanus</i>	0.7	0.1	0.2	0.2
	PETRT-L	<i>Pentagramma triangularis ssp. triangularis</i>	0.7	0.1	0.2	0.2
	TOAR-L	<i>Torilis arvensis</i>	0.7	5	3	12
	TRMI4-L	<i>Trifolium microcephalum</i>	0.7	0.4	0.2	1
	AICA-L	<i>Aira caryophyllea</i>	0.3	0.3	1	1
	AMMEI2-L	<i>Amsinckia menziesii var. intermedia</i>	0.3	0.1	0.2	0.2
	ANCA14-L	<i>Anthriscus caucalis</i>	0.3	0.1	0.2	0.2

**Quercus wislizeni-Quercus douglasii/Toxicodendron diversilobum/Annual  
grass**

Layer	Code	Species Name	Freq	Avg	Min	Max
	ASTEXX-L	<i>Asteraceae</i>	0.3	0.1	0.2	0.2
	AVBA-L	<i>Avena barbata</i>	0.3	0.1	0.2	0.2
	AVFA-L	<i>Avena fatua</i>	0.3	28.3	85	85
	BREL-L	<i>Brodiaea elegans</i>	0.3	0.1	0.2	0.2
	BRMI2-L	<i>Briza minor</i>	0.3	0.1	0.2	0.2
	CAAL2-L	<i>Calochortus albus</i>	0.3	0.1	0.2	0.2
	CAOCO-L	<i>Calystegia occidentalis</i> <i>ssp. occidentalis</i>	0.3	0.1	0.2	0.2
	CEME2-L	<i>Centaurea melitensis</i>	0.3	0.1	0.2	0.2
	CLUN-L	<i>Clarkia unguiculata</i>	0.3	0.1	0.2	0.2
	COHE-L	<i>Collinsia heterophylla</i>	0.3	0.1	0.2	0.2
	CYEC-L	<i>Cynosurus echinatus</i>	0.3	0.1	0.2	0.2
	DIVO-L	<i>Dichelostemma volubile</i>	0.3	0.1	0.2	0.2
	GEDI-L	<i>Geranium dissectum</i>	0.3	0.1	0.2	0.2
	LOMI-L	<i>Lotus micranthus</i>	0.3	0.1	0.2	0.2
	LOMU-L	<i>Lolium multiflorum</i>	0.3	0.1	0.2	0.2
	MAEX-L	<i>Madia exigua</i>	0.3	0.1	0.2	0.2
	MAFAF-L	<i>Marah fabaceus var.</i> <i>fabaceus</i>	0.3	0.1	0.2	0.2
	MAGR3-L	<i>Madia gracilis</i>	0.3	0.3	1	1
	MECA2-L	<i>Melica californica</i>	0.3	0.1	0.2	0.2
	MEIM-L	<i>Melica imperfecta</i>	0.3	0.1	0.2	0.2
	MICAC2-L	<i>Micropus californicus var.</i> <i>californicus</i>	0.3	0.1	0.2	0.2
	NAPU2-L	<i>Navarretia pubescens</i>	0.3	0.1	0.2	0.2
	PHCI-L	<i>Phacelia cicutaria</i>	0.3	0.1	0.2	0.2
	PIEL4-L	<i>Piperia elongata</i>	0.3	0.1	0.2	0.2
	SAGR5-L	<i>Sanicula graveolens</i>	0.3	0.1	0.2	0.2
	SCSI-L	<i>Scutellaria</i> <i>siphocampyloides</i>	0.3	0.1	0.2	0.2
	TRDU2-L	<i>Trifolium dubium</i>	0.3	0.1	0.2	0.2
	TRLA16-L	<i>Triteleia laxa</i>	0.3	0.1	0.2	0.2
	URLI5-L	<i>Uropappus lindleyi</i>	0.3	0.1	0.2	0.2
	VISAN2-L	<i>Vicia sativa ssp. nigra</i>	0.3	0.1	0.2	0.2
	VIVI-L	<i>Vicia villosa</i>	0.3	0.1	0.2	0.2
<b>Cryptogam</b>						
	MOSS-L	Moss	0.3	0.1	0.2	0.2

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***Quercus wislizeni-Quercus douglasii-Pinus sabiniana/Toxicodendron diversilobum/Annual Grass-Herb Association (new provisional)***

**Interior Live Oak - Blue Oak - Foothill Pine / Poison Oak / Annual Grass-Herb Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Quercus wislizeni-Quercus douglasii-Pinus sabiniana/Toxicodendron diversilobum/* Annual Grass-Herb Woodland/Forest form an open to continuous tree layer (24-67%, mean 45.2%) with conifers at 5-20m tall and hardwoods at 5-15m tall, a sparse to intermittent shrub layer (2-50%, mean 27.2%) at 0.5-10m tall, and an open to intermittent herbaceous layer (30-75%, mean 58.7%) at 0.1-0.5m tall. Total vegetation cover is 80-90%, mean cover is 85%.

In this association, *Quercus wislizeni* and *Quercus douglasii* are co-dominant in the overstory tree layer and *Pinus sabiniana* is characteristically present and sub-dominant. *Toxicodendron diversilobum* is dominant in the shrub layer, while other shrubs are frequently present including *Rhamnus ilicifolia* and *Arctostaphylos manzanita*. The herbaceous layer frequently includes a diversity of grasses and forbs such as *Torilis arvensis*, *Bromus hordeaceus*, *Bromus diandrus*, *Avena barbata*, *Madia gracilis*, *Aira caryophyllea*, and *Galium porrigens*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 1128-1589 ft, mean 1327 ft

Aspect: NE, NW, or variable

Slope: moderate to steep, range 12-28 degrees, mean 18.5 degrees

Topography: lower slope to upper slope; microtopography varies

Litter Cover: range 45-74%, mean 59.6%

Rock Cover: range 2.6-30%, mean 11.5%

Bare Ground: range 1-30%, mean 11.4%

Parent Material: sedimentary, metavolcanic, metamorphic, or plutonic

Soil Texture: moderately coarse and medium to very fine sandy loam, moderately fine sandy clay loam, moderately fine silty clay loam, moderately fine clay loam

Stands occur across the study area in the NE, SE, and NW portions (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California) that are on moderate northerly or neutral slopes and on various parent materials.

**Number of Samples Used in Description: 6**

**Samples:** APEOR071, APEOR082, APEOR217, APEOR225, APEOR250, APEOR271

**Rank:** G4 S4

**GLOBAL DISTRIBUTION**

*Quercus wislizeni Alliance:* South outer North Coast, inner North Coast, Central Coast, Klamath foothills, Cascade Range foothills, Sierra Nevada foothills and lower montane (including Yosemite N.P.), montane Transverse Ranges, montane Peninsular Range (including W Riverside County)

Similar *Quercus wislizeni-Quercus douglasii-Pinus sabiniana /Grass Association:* Sierra Nevada from Butte to Kern County and the Coast Ranges

Similar *Quercus wislizeni-Quercus douglasii-Pinus sabiniana* Woodland in Yosemite N.P.

**REFERENCES**

Klein and Evens In publication, NatureServe et al. 2003b, Sawyer and Keeler-Wolf 1995, Gordon and White 1994, Allen et al. 1991, Keeler-Wolf 1990, Allen et al. 1989, Vogl 1976

**RESTORATION INFORMATION**

This association has moderate non-native plant cover (average 39.9%) relative to native cover. Non-native species with highest cover include mainly grasses, such as *Bromus hordeaceus*, *Bromus diandrus*

and *Avena barbata*, and the annual forbs, *Torilis arvensis* and *Vicia villosa*. *Carduus pycnocephalus* occurred in three of six stands with 1.4% cover. *Centaurea melitensis* occurred in one of six with less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts were minimal, but included grazing and roads at low intensity. Thus, it is recommended to reduce road disturbance and close/restore unneeded roads to deter any additional spread of non-natives.

***Quercus wislizeni-Quercus douglasii-Pinus sabiniana/Toxicodendron diversilobum/Annual Grass-Herb***

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	PISA2-T	<i>Pinus sabiniana</i>	1	6.8	3	15
	QUWI2-T	<i>Quercus wislizeni</i>	1	29.8	2	70
	QUDO-T	<i>Quercus douglasii</i>	0.8	12	2	40
<b>Shrub</b>						
	TODI-M	<i>Toxicodendron diversilobum</i>	1	21.2	0.2	45
	RHIL-M	<i>Rhamnus ilicifolia</i>	0.8	0.8	0.2	3
	ARMA-M	<i>Arctostaphylos manzanita</i>	0.5	1.7	0.2	10
	MIAU-M	<i>Mimulus aurantiacus</i>	0.3	0.1	0.2	0.2
	TODI-L	<i>Toxicodendron diversilobum</i>	0.3	1.2	2	5
<b>Herb</b>						
	TOAR-L	<i>Torilis arvensis</i>	0.8	7.7	2	20
	AICA-L	<i>Aira caryophyllea</i>	0.7	1.2	0.2	5
	AVBA-L	<i>Avena barbata</i>	0.7	3.5	0.2	15
	BRDI3-L	<i>Bromus diandrus</i>	0.7	6.5	2	30
	BRHO2-L	<i>Bromus hordeaceus</i>	0.7	21.8	1	60
	DIVO-L	<i>Dichelostemma volubile</i>	0.7	0.1	0.2	0.2
	GAPO-L	<i>Galium porrigens</i>	0.7	0.4	0.2	2
	MAGR3-L	<i>Madia gracilis</i>	0.7	1.6	0.2	8
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.5	1.4	0.2	5
	CYEC-L	<i>Cynosurus echinatus</i>	0.5	1.4	0.2	8
	GAVE3-L	<i>Gastridium ventricosum</i>	0.5	0.1	0.2	0.2
	MECA2-L	<i>Melica californica</i>	0.5	0.1	0.2	0.2
	VIVI-L	<i>Vicia villosa</i>	0.5	3.4	0.2	20
	ALPEP2-L	<i>Allium peninsulare</i> var. <i>peninsulare</i>	0.3	0.1	0.2	0.2
	ANCA14-L	<i>Anthriscus caucalis</i>	0.3	0.4	0.2	2
	BRDI2-L	<i>Brachypodium distachyon</i>	0.3	3.5	1	20
	BRMA3-L	<i>Bromus madritensis</i>	0.3	0.7	1	3
	CAAL2-L	<i>Calochortus albus</i>	0.3	0.1	0.2	0.2
	CLUN-L	<i>Clarkia unguiculata</i>	0.3	0.1	0.2	0.2
	LATHY-L	<i>Lathyrus</i>	0.3	0.1	0.2	0.2
	MICAC2-L	<i>Micropus californicus</i> var. <i>californicus</i>	0.3	0.1	0.2	0.2
	PETRT-L	<i>Pentagramma triangularis</i> <i>ssp. triangularis</i>	0.3	0.2	0.2	1
	POSE-L	<i>Poa secunda</i>	0.3	0.1	0.2	0.2
	SAGR5-L	<i>Sanicula graveolens</i>	0.3	0.1	0.2	0.2
	TRDU2-L	<i>Trifolium dubium</i>	0.3	0.1	0.2	0.2



**Quercus wislizeni-Quercus douglasii-Pinus sabiniana/Toxicodendron diversilobum/Annual Grass-Herb**

Layer	Code	Species Name	Freq	Avg	Min	Max
	TRLA16-L	<i>Triteleia laxa</i>	0.3	0.1	0.2	0.2
	TRMI4-L	<i>Trifolium microcephalum</i>	0.3	0.1	0.2	0.2
	TRWI3-L	<i>Trifolium willdenovii</i>	0.3	0.1	0.2	0.2
	VISAN2-L	<i>Vicia sativa ssp. nigra</i>	0.3	0.2	0.2	1
	VUMY-L	<i>Vulpia myuros</i>	0.3	1.7	0.2	10
	WYETH-L	<i>Wyethia</i>	0.3	0.1	0.2	0.2
<b>Cryptogam</b>						
	MOSS-L	Moss	0.3	0.2	0.2	1

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***Quercus wislizeni-Quercus kelloggii/Heteromeles arbutifolia-Toxicodendron diversilobum*  
Association (new provisional)  
Interior Live Oak - Black Oak / Toyon - Poison Oak Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Quercus wislizeni-Quercus kelloggii/Heteromeles arbutifolia-Toxicodendron diversilobum* Woodland/Forest form an intermittent to continuous tree layer (40-75%, mean 61%) with conifers at 1-20m tall and hardwoods at 5-15m tall, an intermittent shrub layer (38-60%, mean 46.6%) at 0.5-10m tall, and a sparse to continuous herbaceous layer (1-85%, mean 39.2%) at 0.1-0.5m tall. Total vegetation cover is 85-96%, mean cover is 92.2%.

In this association, *Quercus wislizeni* and *Q. kelloggii* may be co-dominant or *Q. kelloggii* may be sub-dominant. *Pinus sabiniana* is characteristically present and relatively lower in cover than the oaks. *Heteromeles arbutifolia*, *Toxicodendron diversilobum*, and *Arctostaphylos manzanita* co-dominate in the understory shrub layer. A variety of other shrubs frequently occurs, including *Lonicera hispidula*, *Rhamnus ilicifolia*, and *Symphoricarpos mollis*. The herbaceous layer frequently includes a diverse understory of grasses and forbs such as *Torilis arvensis*, *Galium porrigens*, *Bromus madritensis*, *Vulpia myuros*, *Aira caryophyllea*, and *Bromus laevipes*, *Calochortus albus*, *Pentagramma triangularis subsp. triangularis*, and *Vicia villosa*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 1240-1551 ft, mean 1360 ft

Aspect: NW, NE, or variable

Slope: somewhat steep to steep, range 18-30 degrees, mean 23.4 degrees

Topography: lower to upper slope; often undulating occasionally linear

Litter Cover: range 50-85%, mean 69.4%

Rock Cover: range 0.4-5%, mean 2.6%

Bare Ground: range 0.2-15%, mean 5.8%

Parent Material: metamorphic, plutonic, volcanic flow, sedimentary, or metavolcanic

Soil Texture: moderately fine sandy clay loam, moderately coarse sandy loam, or moderately fine clay loam

Stands occurred from the NE to SE and NW portions of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California), primarily on steep and cool, protected north-facing slopes such as the north-facing slope of the volcanic Table Mountain.

**Number of Samples Used in Description: 5**

**Samples:** APEOR078, APEOR090, APEOR100, APEOR227, APEOR245

**Rank:** G3 S3.2

**GLOBAL DISTRIBUTION**

*Quercus wislizeni Alliance:* South outer North Coast, inner North Coast, Central Coast, Klamath foothills, Cascade Range foothills, Sierra Nevada foothills and lower montane (including Yosemite N.P.), montane Transverse Ranges, montane Peninsular Range (including W Riverside County)

Association: potentially Sierra Nevada Foothills to the central and north Coast Ranges

**REFERENCES**

Klein and Evens In publication, NatureServe et al. 2003b, Sawyer and Keeler-Wolf 1995, Gordon and White 1994, Allen et al. 1991, Keeler-Wolf 1990, Allen et al. 1989, Vogl 1976

## RESTORATION INFORMATION

This association has low non-native plant cover (average 19.6%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Bromus madritensis* and *Vulpia myuros*, and the annual forb, *Vicia villosa*. *Carduus pycnocephalus* occurred in two of the five stands with an average cover of 2% (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts were minimal.

### *Quercus wislizeni-Quercus kelloggii/Heteromeles arbutifolia-Toxicodendron diversilobum*

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUKE-T	<i>Quercus kelloggii</i>	1	20	2	45
	QUWI2-T	<i>Quercus wislizeni</i>	1	37.4	30	40
	PISA2-T	<i>Pinus sabiniana</i>	0.8	6	2	15
<b>Tree Understory</b>						
	QUKE-L	<i>Quercus kelloggii</i>	0.6	0.1	0.2	0.2
	QUWI2-L	<i>Quercus wislizeni</i>	0.6	0.1	0.2	0.2
	AECA-M	<i>Aesculus californica</i>	0.4	0.4	0.2	2
	PISA2-L	<i>Pinus sabiniana</i>	0.4	0.1	0.2	0.2
	QUWI2-M	<i>Quercus wislizeni</i>	0.4	1	0.2	5
<b>Shrub</b>						
	TODI-M	<i>Toxicodendron diversilobum</i>	1	31.4	9	50
	ARMA-M	<i>Arctostaphylos manzanita</i>	0.6	9	2	28
	HEAR5-M	<i>Heteromeles arbutifolia</i>	0.6	10	5	30
	LOHI2-L	<i>Lonicera hispidula</i>	0.6	0.1	0.2	0.2
	RHIL-M	<i>Rhamnus ilicifolia</i>	0.6	0.3	0.2	1
	SYMO-L	<i>Symphoricarpos mollis</i>	0.4	0.1	0.2	0.2
	TODI-L	<i>Toxicodendron diversilobum</i>	0.4	5	5	20
<b>Herb</b>						
	GAPO-L	<i>Galium porrigens</i>	1	0.6	0.2	2
	TOAR-L	<i>Torilis arvensis</i>	1	2.6	0.2	5
	AICA-L	<i>Aira caryophyllea</i>	0.8	0.7	0.2	3
	BRLA3-L	<i>Bromus laevipes</i>	0.8	0.3	0.2	1
	BRMA3-L	<i>Bromus madritensis</i>	0.8	2.3	0.2	8
	CAAL2-L	<i>Calochortus albus</i>	0.8	0.2	0.2	0.2
	LATHY-L	<i>Lathyrus</i>	0.8	0.2	0.2	0.2
	PETRT-L	<i>Pentagramma triangularis</i> <i>ssp. triangularis</i>	0.8	0.2	0.2	0.2
	VUMY-L	<i>Vulpia myuros</i>	0.8	1.1	0.2	5
	BRMI2-L	<i>Briza minor</i>	0.6	0.1	0.2	0.2
	GAAN-L	<i>Galium andrewsii</i>	0.6	0.6	0.2	2
	GAVE3-L	<i>Gastridium ventricosum</i>	0.6	0.1	0.2	0.2
	MAGR3-L	<i>Madia gracilis</i>	0.6	0.3	0.2	1
	SAGR5-L	<i>Sanicula graveolens</i>	0.6	0.1	0.2	0.2
	VIVI-L	<i>Vicia villosa</i>	0.6	18	0.2	50
	ALPEP2-L	<i>Allium peninsulare</i> var. <i>peninsulare</i>	0.4	0.1	0.2	0.2

**Quercus wislizeni-Quercus kelloggii/Heteromeles arbutifolia-Toxicodendron diversilobum**

Layer	Code	Species Name	Freq	Avg	Min	Max
	AVBA-L	<i>Avena barbata</i>	0.4	1	0.2	5
	BRDI2-L	<i>Brachypodium distachyon</i>	0.4	0.1	0.2	0.2
	BRDI3-L	<i>Bromus diandrus</i>	0.4	3	0.2	15
	BRHO2-L	<i>Bromus hordeaceus</i>	0.4	6	0.2	30
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.4	2	0.2	10
	CYEC-L	<i>Cynosurus echinatus</i>	0.4	0.1	0.2	0.2
	DIVO-L	<i>Dichelostemma volubile</i>	0.4	0.1	0.2	0.2
	ELGL-L	<i>Elymus glaucus</i>	0.4	0.1	0.2	0.2
	LIMO-L	<i>Linanthus montanus</i>	0.4	0.1	0.2	0.2
	LOMU-L	<i>Lolium multiflorum</i>	0.4	0.2	0.2	1
	LUCO6-L	<i>Luzula comosa</i>	0.4	0.1	0.2	0.2
	POSE-L	<i>Poa secunda</i>	0.4	0.1	0.2	0.2
<b>Cryptogam</b>						
	MOSS-L	Moss	0.6	2.8	2	8

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## SHRUB-OVERSTORY VEGETATION

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### ***Adenostoma fasciculatum*/Annual Grass-Herb-Moss Association (new provisional) Chamise / Annual Grass-Herb - Moss Association**

#### **GENERAL VEGETATION DESCRIPTION**

Stands of *Adenostoma fasciculatum*/Annual Grass-Herb-Moss Shrubland form a continuous shrub layer (80-95%, mean 90%) at 0.5-5m tall. The herbaceous layer is sparse to open (0.2-15%, mean 7.9%) at 0.1-0.5m tall. Trees occasionally occur in the emergent layer (0-0.2% cover, mean 0.1%) with hardwoods at 0-15m tall. Total vegetation cover is 85-95%, mean cover is 92.5%.

In this association, an infrequent overstory of tree species includes *Quercus wislizeni*, *Quercus douglasii*, and *Pinus sabiniana*. The overstory shrub layer is dominated by *Adenostoma fasciculatum*, and it occasionally includes *Toxicodendron diversilobum*, *Arctostaphylos manzanita*, *Heteromeles arbutifolia*, and *Lotus scoparius*. The herbaceous understory frequently includes a diversity of grasses and forbs, including non-native species *Aira caryophyllea*, *Bromus hordeaceus*, *Vulpia myuros*, and *Bromus diandrus*, and native species *Galium porrigens* and *Pentagramma triangularis* subsp. *triangularis*.

#### **ENVIRONMENTAL DESCRIPTION**

Elevation: range 1090-1350 ft, mean 1212 ft

Aspect: variable but more often NW

Slope: gentle to somewhat steep, range 3-25 degrees, mean 15.2 degrees

Topography: often mid slope (range lower to mid slope); microtopography varies

Litter Cover: range 5-75%, mean 56.3%

Rock Cover: range 2-45%, mean 14.4%

Bare Ground: range 5-30%, mean 11.3%

Parent Material: volcanic flow, sedimentary or plutonic

Soil Texture: coarse loamy sand, moderately coarse sandy loam, moderately fine sandy clay loam, or medium silt

Stands of this almost pure *Adenostoma fasciculatum* with a grass and cryptogam understory occur on various substrates mainly in the NE and NW portion of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California).

#### **Number of Samples Used in Description: 6**

**Samples:** APEOR234, APEOR233, APEOR226, APEOR080, APEOR088, APEOR256

**Rank:** G5 S5

#### **GLOBAL DISTRIBUTION**

*Adenostoma fasciculatum* Alliance: Klamath Range, California south to Baja California, Mexico.

Reports: North Central Coast (Santa Clara County), southern Central Coast (San Benito County, report in process), Red Mountains of the Mount Hamilton Range, Mount Diablo, Mount Tamalpais/Marin, Los Padres National Forest (including Santa Lucia Range), San Gabriel, Santa Ana, San Jacinto, and San Bernardino Mountains, Peninsular ranges (including W Riverside and San Diego Counties), Sierra Nevada (including Yosemite N.P.), Anza-Borrego

*Association:* potentially similar range as the alliance.

#### **REFERENCES**

Klein and Evens In publication, Evens and San 2004. NatureServe et al. 2003a, NatureServe et al. 2003b, Errter and Bowerman 2002, Borchert et al. 2000, CDFG 1998, Sawyer and Keeler-Wolf 1995,

Gordon and White 1994, Keeler-Wolf 1990, Shuford and Timossi 1989, Sharsmith 1982, Hanes 1976, Vogl 1976, Minnich 1976

### RESTORATION INFORMATION

This association has low non-native plant cover (average 7.9%) relative to native cover. Non-native species with highest cover include *Vulpia myuros*, *Aira caryophylla*, and *Bromus hordeaceus*. *Carduus pycnocephalus* is found in one stand with minor impact (see Appendix 2 and Pages 16-18 for restoration references). Some trails (possibly game trails) traverse through some of the stands, which break up the vegetation and could allow for the introduction of non-native species into the stands. Trash dumping also occurred at low intensity.

#### ***Adenostoma fasciculatum*/Annual Grass-Herb-Moss**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUWI2-T	<i>Quercus wislizeni</i>	0.3	0.1	0.2	0.2
<b>Shrub</b>						
	ADFA-M	<i>Adenostoma fasciculatum</i>	1	88.3	75	95
	ARMA-M	<i>Arctostaphylos manzanita</i>	0.7	0.4	0.2	1
	TODI-M	<i>Toxicodendron diversilobum</i>	0.7	0.8	0.2	4
	HEAR5-M	<i>Heteromeles arbutifolia</i>	0.5	0.4	0.2	2
	LOSC2-M	<i>Lotus scoparius</i>	0.5	0.1	0.2	0.2
	MIAU-M	<i>Mimulus aurantiacus</i>	0.3	0.1	0.2	0.2
<b>Herb</b>						
	AICA-L	<i>Aira caryophylla</i>	0.8	2.2	0.2	5
	BRHO2-L	<i>Bromus hordeaceus</i>	0.8	1.2	0.2	4
	BRDI3-L	<i>Bromus diandrus</i>	0.7	0.6	0.2	2
	VUMY-L	<i>Vulpia myuros</i>	0.7	2.9	0.2	10
	BRMA3-L	<i>Bromus madritensis</i>	0.5	0.6	0.2	3
	GAPO-L	<i>Galium porrigens</i>	0.5	0.1	0.2	0.2
	GAVE3-L	<i>Gastroidium ventricosum</i>	0.5	0.7	0.2	3
	PETRT-L	<i>Pentagramma triangularis ssp. triangularis</i>	0.5	0.1	0.2	0.2
	CHLOR3-L	<i>Chlorogalum</i>	0.3	0.1	0.2	0.2
	DAPU3-L	<i>Daucus pusillus</i>	0.3	0.1	0.2	0.2
	FIGA-L	<i>Filago gallica</i>	0.3	0.2	0.2	1
	GAAN-L	<i>Galium andrewsii</i>	0.3	0.1	0.2	0.2
	LOMI-L	<i>Lotus micranthus</i>	0.3	0.2	0.2	1
	TRHI4-L	<i>Trifolium hirtum</i>	0.3	0.2	0.2	1
<b>Cryptogam</b>						
	MOSS-L	<i>Moss</i>	0.8	10.5	0.2	20
	LICHEN-L	<i>Lichen</i>	0.3	3.2	1	18

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***Adenostoma fasciculatum*/*Castilleja pruinosa*-Annual Grass-Herb Association (new provisional)  
Chamise / Frosted Indian paintbrush - Annual Grass-Herb Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Adenostoma fasciculatum*/*Castilleja pruinosa*-Annual Grass-Herb Shrubland form an open to continuous shrub layer (18-75%, mean 47.8%) at 0-5m tall, where *Adenostoma fasciculatum* dominates above *Castilleja pruinosa*, annual grasses, and other herbs. The herbaceous layer is intermittent to continuous (60-72%, mean 68%) at 0.1-1m tall. Trees occasionally occur in the emergent layer (0-0.2% cover, mean 0.1%) with hardwoods at 0-5m tall. Total vegetation cover is 70-95%, mean cover is 84.5%.

In this association, an infrequent overstory of tree species includes *Quercus wislizeni*. The overstory is dominated by *Adenostoma fasciculatum*, but other shrubs are usually present such as *Eriodictyon californicum*, *Eriophyllum lanatum*, *Rhamnus ilicifolia*, and *R. tomentella*. The herbaceous understory frequently includes a diverse understory of grass and forb species such as *Bromus hordeaceus*, *Avena barbata*, *Trifolium willdenovii*, *Aira caryophyllea*, *Castilleja pruinosa*, *Bromus diandrus*, *Torilis arvensis*, *Daucus pusillus*, and *Silene gallica*.

Stands were found in the SE portion of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California) on the volcanic ridge top of Table Mountain.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 1734-1740 ft, mean 1737 ft

Aspect: variable

Slope: flat to gentle, range 0-1 degrees, mean 0.8 degrees

Topography: ridge top; concave, convex, or linear

Litter Cover: range 10-70%, mean 38.5%

Rock Cover: range 13-50%, mean 32.3%

Bare Ground: range 5-30%, mean 12.3%

Parent Material: volcanic flow

Soil Texture: moderately fine sandy clay loam

**Number of Samples Used in Description: 4**

**Samples:** APEOR257, APEOR021, APEOR260, APEOR258

**Rank:** G3S3.2

**GLOBAL DISTRIBUTION**

*Adenostoma fasciculatum* Alliance: Klamath Range, California south to Baja California, Mexico.

Reports: North Central Coast (Santa Clara County), southern Central Coast (San Benito County, report in process), Red Mountains of the Mount Hamilton Range, Mount Diablo, Mount Tamalpais/Marin, Los Padres National Forest (including Santa Lucia Range), San Gabriel, Santa Ana, San Jacinto, and San Bernardino Mountains, Peninsular ranges (including W Riverside and San Diego Counties), Sierra Nevada (including Yosemite N.P.), Anza-Borrego

Association: unknown, as currently only defined from this location. Potentially occurs on other volcanic, rocky surfaces in the Sierra Nevada Foothills.

**REFERENCES**

Klein and Evens In publication, Evens and San 2004, NatureServe et al. 2003a, Errter and Bowerman 2002, Borchert et al. 2000, CDFG 1998, Sawyer and Keeler-Wolf 1995, Gordon and White 1994, Keeler-Wolf 1990, Shuford and Timossi 1989, Sharsmith 1982, Hanes 1976, Vogl 1976, Minnich 1976

**RESTORATION INFORMATION**

This association has moderate non-native plant cover (average 42.7%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Bromus hordeaceus*, *Avena barbata*

and *Bromus diandrus*. *Carduus pycnocephalus* occurred in half of the stands at low cover (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts were minimal, but included trash dumping at low intensity.

***Adenostoma fasciculatum*/*Castilleja pruinosa*/Annual Grass-Herb**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Shrub</b>	ADFA-M	<i>Adenostoma fasciculatum</i>	1	48.5	14	75
	ERCA6-M	<i>Eriodictyon californicum</i>	0.8	1.1	0.2	4
	ERLAG-L	<i>Eriophyllum lanatum</i> var. <i>grandiflorum</i>	0.5	0.1	0.2	0.2
	RHIL-M	<i>Rhamnus ilicifolia</i>	0.5	0.3	0.2	1
<b>Herb</b>	AICA-L	<i>Aira caryophyllea</i>	1	3.8	0.2	6
	AVBA-L	<i>Avena barbata</i>	1	20.3	0.2	65
	BRHO2-L	<i>Bromus hordeaceus</i>	1	29	6	50
	CAPR14-L	<i>Castilleja pruinosa</i>	1	2.3	0.2	6
	TRWI3-L	<i>Trifolium willdenovii</i>	1	5	1	10
	BRDI3-L	<i>Bromus diandrus</i>	0.8	8.5	1	18
	CHLOR3-L	<i>Chlorogalum</i>	0.8	0.2	0.2	0.2
	DAPU3-L	<i>Daucus pusillus</i>	0.8	2.8	0.2	6
	SIGA-L	<i>Silene gallica</i>	0.8	1.6	0.2	6
	TOAR-L	<i>Torilis arvensis</i>	0.8	8	1	16
	BRMA3-L	<i>Bromus madritensis</i>	0.5	1.8	3	4
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.5	0.1	0.2	0.2
	CLPUQ-L	<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	0.5	0.5	1	1
	ERNUP4-L	<i>Eriogonum nudum</i> var. <i>pubiflorum</i>	0.5	0.8	0.2	3
	GAPO-M	<i>Galium porrigens</i>	0.5	0.8	1	2
	HYGL2-L	<i>Hypochaeris glabra</i>	0.5	1.6	0.2	6
	LACA7-L	<i>Lasthenia californica</i>	0.5	0.3	0.2	1
	LUNA3-L	<i>Lupinus nanus</i>	0.5	3.1	0.2	12
	PETRT-L	<i>Pentagramma triangularis</i> ssp. <i>triangularis</i>	0.5	0.1	0.2	0.2
	POSE-L	<i>Poa secunda</i>	0.5	0.3	0.2	1
	TRHI4-L	<i>Trifolium hirtum</i>	0.5	0.3	0.2	1
	TRMI4-L	<i>Trifolium microcephalum</i>	0.5	0.3	0.2	1
VUMI-L	<i>Vulpia microstachys</i>	0.5	6.5	1	25	
<b>Cryptogam</b>	LICHEN-L	<i>Lichen</i>	0.8	8.5	8	16
	MOSS-L	<i>Moss</i>	0.8	4.3	1	8
	SEHA2-L	<i>Selaginella hansenii</i>	0.5	9.6	0.2	38



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***Adenostoma fasciculatum*-*Arctostaphylos manzanita*-*Heteromeles arbutifolia* Association (new provisional)**

**Chamise - Common Manzanita - Toyon Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Adenostoma fasciculatum*-*Arctostaphylos manzanita*-*Heteromeles arbutifolia* Shrubland form an intermittent to continuous shrub layer (48-90%, mean 72.7%) at 0-10m tall, where *Adenostoma fasciculatum*, *Arctostaphylos manzanita*, and *Heteromeles arbutifolia* co-dominate. The herbaceous layer is sparse to intermittent (1-50%, mean 20.3%) at 0.1-0.5m tall. Trees occur in the emergent layer (0.2-5% cover, mean 2.4%) with hardwoods at 2-10m tall. Total vegetation cover is 80-90%, mean cover is 86.7%.

In this association, an infrequent overstory of tree species includes *Quercus douglasii* and *Quercus wislizeni* tree species. The overstory is characterized by shrubs, in which *Adenostoma fasciculatum* is usually dominant while *Heteromeles arbutifolia* and *Arctostaphylos manzanita* are sub-dominant to co-dominant with *Adenostoma*. While sparsely covering the ground, the herbaceous layer includes a diversity of grasses and forbs such as *Bromus madritensis*, *Aira caryophyllea*, *Vulpia myuros*, *Gastridium ventricosum*, *Chlorogalum* sp., and many others.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 1370-1457 ft, mean 1427 ft

Aspect: variable but often NW

Slope: gentle to somewhat steep, range 3-18 degrees, mean 11 degrees

Topography: mid slope; often convex, occasionally undulating

Litter Cover: range 55-65%, mean 60%

Rock Cover: range 3-12%, mean 6.7%

Bare Ground: range 5-10%, mean 7.7%

Parent Material: sedimentary or plutonic

Soil Texture: moderately fine sandy clay loam, medium loam, or moderately fine silty clay loam

Stands were found primarily in the NE portion of the study area and in the NW portion (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California).

**Number of Samples Used in Description: 3**

**Samples:** APEOR083, APEOR097, APEOR096

**Rank:** G4 S4? Probably widespread in inner North Coast Ranges as well as foothills of Sierra Nevada

**GLOBAL DISTRIBUTION**

*Adenostoma fasciculatum* Alliance: Klamath Range, California south to Baja California, Mexico.

Reports: North Central Coast (Santa Clara County), southern Central Coast (San Benito County, report in process), Red Mountains of the Mount Hamilton Range, Mount Diablo, Mount Tamalpais/Marin, Los Padres National Forest (including Santa Lucia Range), San Gabriel, Santa Ana, San Jacinto, and San Bernardino Mountains, Peninsular ranges (including W Riverside and San Diego Counties), Sierra Nevada (including Yosemite N.P.), Anza-Borrego

Association: potentially the Sierra Nevada Foothills and the California North Coast Ranges

**REFERENCES**

Klein and Evens In publication, Evens and San 2004, NatureServe et al. 2003a, NatureServe et al. 2003b, Errter and Bowerman 2002, Borchert et al. 2000, CDFG 1998, Sawyer and Keeler-Wolf 1995, Gordon and White 1994, Keeler-Wolf 1990, Shuford and Timossi 1989, Sharsmith 1982, Hanes 1976, Vogl 1976, Minnich 1976.

**RESTORATION INFORMATION**

This association has low non-native plant cover (average 18.8%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Bromus hordeaceus*, *Bromus madritensis* and *Aira caryophylla*. *Centaurea melitensis* occurred in two of three stands while *Carduus pycnocephalus* occurred in one stand (see Appendix 2 and Pages 16-18 for restoration references). Both species had less than 1% average cover. Other site impacts were minimal.

***Adenostoma fasciculatum*-*Arctostaphylos manzanita*-*Heteromeles arbutifolia***

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUDO-T	<i>Quercus douglasii</i>	0.3	3.3	10	10
	QUWI2-T	<i>Quercus wislizeni</i>	0.3	0.1	0.2	0.2
<b>Tree Understory</b>						
	AECA-M	<i>Aesculus californica</i>	0.3	0.3	1	1
	QUWI2-L	<i>Quercus wislizeni</i>	1.3	1.5	0.2	3
	QUDO-L	<i>Quercus douglasii</i>	0.7	0.1	0.2	0.2
	QUDO-M	<i>Quercus douglasii</i>	0.3	0.1	0.2	0.2
<b>Shrub</b>						
	ADFA-M	<i>Adenostoma fasciculatum</i>	1	54.3	25	83
	HEAR5-M	<i>Heteromeles arbutifolia</i>	1	6.3	2	15
	ARMA-M	<i>Arctostaphylos manzanita</i>	0.7	7.3	2	20
	RHIL-M	<i>Rhamnus ilicifolia</i>	0.7	1.1	0.2	3
	AECA-L	<i>Aesculus californica</i>	0.3	0.1	0.2	0.2
	CECU-M	<i>Ceanothus cuneatus</i>	0.3	1.7	5	5
	ERCA6-M	<i>Eriodictyon californicum</i>	0.3	0.1	0.2	0.2
	LECA3-M	<i>Lepechinia calycina</i>	0.3	0.7	2	2
	LOHI2-L	<i>Lonicera hispidula</i>	0.3	0.1	0.2	0.2
	LOSC2-M	<i>Lotus scoparius</i>	0.3	0.7	2	2
	MIAU-M	<i>Mimulus aurantiacus</i>	0.3	0.1	0.2	0.2
	RHIL-L	<i>Rhamnus ilicifolia</i>	0.3	0.1	0.2	0.2
	RIMA-M	<i>Ribes malvaceum</i>	0.3	0.1	0.2	0.2
	TODI-M	<i>Toxicodendron diversilobum</i>	0.3	1.7	5	5
<b>Herb</b>						
	AICA-L	<i>Aira caryophylla</i>	1	2.7	1	4
	BRMA3-L	<i>Bromus madritensis</i>	1	3.4	0.2	8
	CHLOR3-L	<i>Chlorogalum</i>	1	0.8	0.2	2
	GAVE3-L	<i>Gastrium ventricosum</i>	1	1.7	0.2	4
	VUMY-L	<i>Vulpia myuros</i>	1	1.7	0.2	3
	BRHO2-L	<i>Bromus hordeaceus</i>	0.7	7.7	3	20
	BRMI2-L	<i>Briza minor</i>	0.7	0.1	0.2	0.2
	CEME2-L	<i>Centaurea melitensis</i>	0.7	0.1	0.2	0.2
	DAPU3-L	<i>Daucus pusillus</i>	0.7	0.1	0.2	0.2
	GAPO-L	<i>Galium porrigens</i>	0.7	0.4	0.2	1
	MAGR3-L	<i>Madia gracilis</i>	0.7	0.1	0.2	0.2
	NALE2-L	<i>Nassella lepida</i>	0.7	0.7	1	1
	PETRT-L	<i>Pentagramma triangularis</i> <i>ssp. triangularis</i>	0.7	0.4	0.2	1
	SAGR5-L	<i>Sanicula graveolens</i>	0.7	0.1	0.2	0.2

**Adenostoma fasciculatum-Arctostaphylos manzanita-Heteromeles arbutifolia**

Layer	Code	Species Name	Freq	Avg	Min	Max
	TOAR-L	<i>Torilis arvensis</i>	0.7	0.4	0.2	1
	ADJO-L	<i>Adiantum jordanii</i>	0.3	0.1	0.2	0.2
	AGHE2-L	<i>Agoseris heterophylla</i>	0.3	0.1	0.2	0.2
	ANAR-L	<i>Anagallis arvensis</i>	0.3	0.1	0.2	0.2
	ANCA14-L	<i>Anthriscus caucalis</i>	0.3	0.1	0.2	0.2
	AVBA-L	<i>Avena barbata</i>	0.3	0.3	1	1
	BRDI3-L	<i>Bromus diandrus</i>	0.3	0.3	1	1
	BREL-L	<i>Brodiaea elegans</i>	0.3	0.1	0.2	0.2
	CAAL2-L	<i>Calochortus albus</i>	0.3	0.1	0.2	0.2
	CAAT25-L	<i>Castilleja attenuata</i>	0.3	0.1	0.2	0.2
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.3	0.1	0.2	0.2
	DIVO-L	<i>Dichelostemma volubile</i>	0.3	0.1	0.2	0.2
	FIGA-L	<i>Filago gallica</i>	0.3	0.1	0.2	0.2
	GAPA5-L	<i>Galium parisiense</i>	0.3	0.1	0.2	0.2
	HEAR5-L	<i>Heteromeles arbutifolia</i>	0.3	0.1	0.2	0.2
	HYGL2-L	<i>Hypochaeris glabra</i>	0.3	0.1	0.2	0.2
	LIMO-L	<i>Linanthus montanus</i>	0.3	0.1	0.2	0.2
	MAHO-L	<i>Marah horridus</i>	0.3	0.1	0.2	0.2
	MECA2-L	<i>Melica californica</i>	0.3	0.1	0.2	0.2
	TRDU2-L	<i>Trifolium dubium</i>	0.3	0.1	0.2	0.2
	TRHI4-L	<i>Trifolium hirtum</i>	0.3	0.1	0.2	0.2
	TRHY3-L	<i>Triteleia hyacinthina</i>	0.3	0.1	0.2	0.2
	TRMI4-L	<i>Trifolium microcephalum</i>	0.3	0.3	1	1
	TRWI3-L	<i>Trifolium willdenovii</i>	0.3	0.1	0.2	0.2
<b>Cryptogam</b>						
	MOSS-L	Moss	0.7	1.1	0.2	3
	LICHEN-L	Lichen	0.3	0.1	0.2	0.2

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***Adenostoma fasciculatum-Ceanothus cuneatus* Alliance (not full description)  
Chamise-Wedgeleaf Ceanothus Alliance**

**GENERAL VEGETATION DESCRIPTION** (per Borchert et al. 2000, Gordon and White 1994)

Stands of *Adenostoma fasciculatum-Ceanothus cuneatus* Shrubland form an intermittent to continuous shrub layer at 0-5m tall, where *Adenostoma fasciculatum* co-dominates with *Ceanothus cuneatus*. *A. fasciculatum* may be somewhat higher in cover, though both species are at least 30% relative cover. Depending on fire frequency, local extinction of *C. cuneatus* (an obligate seeder) is expected if there are frequent fire intervals.

**ENVIRONMENTAL DESCRIPTION** (per Borchert et al. 2000, Gordon and White 1994)

Elevation: usually below 1400m

Aspect: Variable, but often E to S to WNW-facing slopes

Slope: moderately steep to steep slopes, usually below 45 degrees

Topography: lower, middle, and upper slopes.

Litter, Rock, and Bare Ground cover: no data

Parent Material: diverse, metamorphic, sandstone, etc.

Soil texture: usually loamy sands and sandy loams.

Only one polygon was mapped as this type in the NE portion of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California), and it is unknown if it occurs as a repeatable type.

**Number of Samples Used in Description: 0**

Insufficient data for full description.

**Rank:** G4 S4

**GLOBAL DISTRIBUTION**

*Adenostoma fasciculatum-Ceanothus cuneatus* Alliance: Inner North Coast Ranges California east to the Sierra Nevada, south to the South Coast and Peninsular Ranges. Reports: Los Padres National Forest (including Santa Lucia Range), San Gabriel, Santa Ana, San Jacinto, and San Bernardino Mountains, Peninsular ranges (including W Riverside County), Sierra Nevada (including Yosemite N.P.)

*Association:* unknown

**REFERENCES**

Klein and Evens In publication, NatureServe et al. 2003b, Borchert et al. 2000, Sawyer and Keeler-Wolf 1995, Gordon and White 1994

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***Ceanothus cuneatus*/Annual Grass-Herb Association  
Wedgeleaf Ceanothus / Annual Grass-Herb Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Ceanothus cuneatus*/Annual Grass-Herb Shrubland form an intermittent to continuous shrub layer (50-75%, mean 62.5%), where *Ceanothus cuneatus* dominates above an herbaceous layer of annual grasses and herbs. Shrubs occasionally occur in two different strata, with low shrubs at 1-2m tall and tall shrubs at 2-5m tall. The herbaceous layer is sparse to intermittent (7-65%, mean 36%) at 01-0.5m tall. Trees occur in the emergent layer (0.2% cover, mean 0.2%) with hardwoods at 5-10m tall. Total vegetation cover is 80-85%, mean cover is 82.5%.

In this association, the overstory is characterized by shrubs, particularly *Ceanothus cuneatus* and *Toxicodendron diversilobum*. The herbaceous understory typically includes a diverse understory of grass and forb species such as *Bromus hordeaceus*, *Bromus madritensis*, *Anthriscus caucalis*, and *Daucus pusillus*. Occasional, emergent trees may include *Quercus wislizeni* and *Quercus douglasii* at low cover.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 1161-1185 ft, mean 1173 ft

Aspect: variable

Slope: moderate to somewhat steep, range 14-24 degrees, mean 19 degrees

Topography: lower slope to upper slope; concave or undulating

Litter Cover: range 60-64%, mean 62%

Rock Cover: range 1.2-2%, mean 1.7%

Bare Ground: range 5-10%, mean 7.5%

Parent Material: sedimentary

Soil Texture: moderately fine sandy clay loam or coarse loamy sand

Stands occur across the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California) but particularly the NW and SE portions on variable slopes in localized chaparral stands and in openings of oak woodlands.

**Number of Samples Used in Description: 2**

**Samples:** APEOR086, APEOR087

**Rank:** G4 S4

**GLOBAL DISTRIBUTION**

*Ceanothus cuneatus* Alliance: North Coast, montane Central Coast Ranges, Klamath Ranges to southern Oregon, Cascade Range, Sierra Nevada, Los Padres National Forest, outer montane Transverse Ranges, and Peninsular Ranges (including W Riverside County) to Baja California Association: potentially the range of the alliance.

**REFERENCES**

Klein and Evens In publication, Borchert et al. 2000, Sawyer and Keeler-Wolf 1995, Keeler-Wolf 1990

**RESTORATION INFORMATION**

This association has moderate non-native plant cover (average 44.2%) relative to native cover. Non-native species with highest cover include annual grasses, such as *Bromus hordeaceus* and *B. madritensis*, and the annual forb, *Anthriscus caucalis*. *Centaurea melitensis* occurred in one of two stands at less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts were minimal.

**Ceanothus cuneatus/Annual Grass-Herb**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUWI2-T	<i>Quercus wislizeni</i>	1	0.6	0.2	1
	QUDO-T	<i>Quercus douglasii</i>	0.5	0.5	1	1
<b>Tree Understory</b>						
	QUDO-L	<i>Quercus douglasii</i>	1	0.2	0.2	0.2
	QUWI2-L	<i>Quercus wislizeni</i>	0.5	0.1	0.2	0.2
	QUWI2-M	<i>Quercus wislizeni</i>	0.5	0.5	1	1
<b>Shrub</b>						
	CECU-M	<i>Ceanothus cuneatus</i>	1	56	40	72
	TODI-M	<i>Toxicodendron diversilobum</i>	1	3.1	0.2	6
<b>Herb</b>						
	AICA-L	<i>Aira caryophyllea</i>	1	0.6	0.2	1
	ANCA14-L	<i>Anthriscus caucalis</i>	1	4.5	1	8
	BRHO2-L	<i>Bromus hordeaceus</i>	1	35	15	55
	BRMA3-L	<i>Bromus madritensis</i>	1	5	5	5
	CAVE3-L	<i>Calochortus venustus</i>	1	0.2	0.2	0.2
	DAPU3-L	<i>Daucus pusillus</i>	1	1	1	1
	GAPO-L	<i>Galium porrigens</i>	1	0.2	0.2	0.2
	GAVE3-L	<i>Gastroidium ventricosum</i>	1	0.6	0.2	1
	TOAR-L	<i>Torilis arvensis</i>	1	0.2	0.2	0.2
	TRHI4-L	<i>Trifolium hirtum</i>	1	0.2	0.2	0.2
	TRMI4-L	<i>Trifolium microcephalum</i>	1	0.6	0.2	1
	VUMY-L	<i>Vulpia myuros</i>	1	0.2	0.2	0.2
	AGHE2-L	<i>Agoseris heterophylla</i>	0.5	0.1	0.2	0.2
	AVBA-L	<i>Avena barbata</i>	0.5	0.1	0.2	0.2
	AVFA-L	<i>Avena fatua</i>	0.5	0.5	1	1
	BRDI3-L	<i>Bromus diandrus</i>	0.5	2.5	5	5
	BREL-L	<i>Brodiaea elegans</i>	0.5	0.1	0.2	0.2
	CALU9-L	<i>Calochortus luteus</i>	0.5	0.1	0.2	0.2
	CEME2-L	<i>Centaurea melitensis</i>	0.5	0.1	0.2	0.2
	CHLOR3-L	<i>Chlorogalum</i>	0.5	0.1	0.2	0.2
	CLARK-L	<i>Clarkia</i>	0.5	0.1	0.2	0.2
	CLPUQ-L	<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	0.5	0.1	0.2	0.2
	CLUN-L	<i>Clarkia unguiculata</i>	0.5	0.1	0.2	0.2
	ERBO-L	<i>Erodium botrys</i>	0.5	0.5	1	1
	FICA2-L	<i>Filago californica</i>	0.5	0.1	0.2	0.2
	FIGA-L	<i>Filago gallica</i>	0.5	0.5	1	1
	GAPA5-L	<i>Galium parisiense</i>	0.5	0.1	0.2	0.2
	HYGL2-L	<i>Hypochaeris glabra</i>	0.5	0.1	0.2	0.2
	LOMI-L	<i>Lotus micranthus</i>	0.5	0.1	0.2	0.2
	MAGR3-L	<i>Madia gracilis</i>	0.5	0.1	0.2	0.2
	MAHO-L	<i>Marah horridus</i>	0.5	0.1	0.2	0.2
	PLNO-L	<i>Plagiobothrys nothofulvus</i>	0.5	0.1	0.2	0.2
	SIGA-L	<i>Silene gallica</i>	0.5	0.1	0.2	0.2

**Ceanothus cuneatus/Annual Grass-Herb**

VERI-L	<i>Velezia rigida</i>	0.5	0.5	1	1
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***Ceanothus cuneatus*/*Plantago erecta* Association (new provisional)  
Wedgeleaf Ceanothus / Dwarf Plantain Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Ceanothus cuneatus*/*Plantago erecta* Shrubland form an open to intermittent shrub layer (15-39%, mean 24.8%) at 0-2m tall, where *Ceanothus cuneatus* dominates above *Plantago erecta*. The herbaceous layer is open to intermittent (25-45%, mean 35.5%) at 01-0.5m tall. Trees occasionally occur in the emergent layer (0-0.2% cover, mean 0.1%) with conifers at 0-15m tall. Total vegetation cover is 38-65%, mean cover is 51%.

In this association, the overstory shrub layer is dominated by *Ceanothus cuneatus*. Occasional shrub associates include *Eriodictyon californicum*. The herbaceous understory frequently includes a diverse understory of grass and forb species such as *Plantago erecta*, *Bromus hordeaceus*, *Bromus madritensis*, *Daucus pusillus*, *Vulpia microstachys*, *Gastridium ventricosum*, *Astragalus gambelianus*, *Gilia tricolor*, *Trifolium microcephalum*, and many others. Occasionally, emergent trees of *Pinus sabiniana* may occur at relatively low cover.

There is a potential that *Lomatium congdonii*, a CNPS List 1B plant, occurs in this association. This species has a limited number of occurrences in California. *Chlorogalum grandiflorum*, also a CNPS List 1B plant, may occur in the stands, but identification in peak flowering is needed to confirm.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 966-1224 ft, mean 1103 ft

Aspect: variable

Slope: gentle to somewhat steep, range 4-18 degrees, mean 13.3 degrees

Topography: often lower slope, occasionally mid slope; undulating, convex, and linear

Litter Cover: range 1.2-15%, mean 5.8%

Rock Cover: range 48-70%, mean 61.1%

Bare Ground: range 10-45%, mean 22.7%

Parent Material: serpentine

Soil Texture: moderately fine sandy clay loam, moderately coarse sandy loam, or medium to very fine sandy loam

Stands occur in the SW and S-center portions of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California) on serpentine parent material with gently to moderately sloping surface and sandy loam soils.

**Number of Samples Used in Description: 4**

**Samples:** APEOR008, APEOR019, APEOR024, APEOR291

**Rank:** G3 S3.2

**GLOBAL DISTRIBUTION**

*Ceanothus cuneatus* Alliance: North Coast, montane Central Coast Ranges, Klamath Ranges to southern Oregon, Cascade Range, Sierra Nevada, Los Padres National Forest, outer montane Transverse Ranges, and Peninsular Ranges (including W Riverside County) to Baja California  
Association: potentially other clay-rich (serpentine) soils in the Sierra Nevada foothills, east to the Central Coast Ranges

**REFERENCES**

Klein and Evens In publication, Borchert et al. 2000, Sawyer and Keeler-Wolf 1995



## RESTORATION INFORMATION

This association has low to moderate non-native plant cover (average 29%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Bromus hordeaceus* and *B. madritensis*. *Centaurea melitensis* occurred in three of four stands at less than 1% cover. (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts were minimal, but included low intensity of grazing, roads, and vandalism/trash dumping. Thus, it is recommended to reduce road disturbance and close/restore unneeded roads to deter any additional spread of non-natives.

### *Ceanothus cuneatus/Plantago erecta*

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Shrub</b>						
	CECU-M	<i>Ceanothus cuneatus</i>	1	28.3	20	48
	CECU-L	<i>Ceanothus cuneatus</i>	0.8	0.4	0.2	1
	ERCA6-M	<i>Eriodictyon californicum</i>	0.5	0.8	1	2
<b>Herb</b>						
	ASGA-L	<i>Astragalus gambelianus</i>	1	0.2	0.2	0.2
	BRHO2-L	<i>Bromus hordeaceus</i>	1	20	5	45
	BRMA3-L	<i>Bromus madritensis</i>	1	3.1	0.2	10
	DAPU3-L	<i>Daucus pusillus</i>	1	0.8	0.2	1
	GAVE3-L	<i>Gastroidium ventricosum</i>	1	0.6	0.2	1
	PLER3-L	<i>Plantago erecta</i>	1	10.5	2	15
	VUMI-L	<i>Vulpia microstachys</i>	1	0.7	0.2	2
	CALA68-L	<i>Castilleja lacera</i>	0.8	0.2	0.2	0.2
	CEME2-L	<i>Centaurea melitensis</i>	0.8	0.8	0.2	2
	ERCI6-L	<i>Erodium cicutarium</i>	0.8	0.2	0.2	0.2
	ESCA-L	<i>Eschscholzia caespitosa</i>	0.8	0.4	0.2	1
	GAPO-L	<i>Galium porrigens</i>	0.8	0.2	0.2	0.2
	GITR2-L	<i>Gilia tricolor</i>	0.8	2.6	0.2	10
	LACA7-L	<i>Lasthenia californica</i>	0.8	0.9	0.2	3
	LENE3-L	<i>Lessingia nemaclada</i>	0.8	0.6	0.2	2
	PETRT-L	<i>Pentagramma triangularis</i> ssp. <i>triangularis</i>	0.8	0.2	0.2	0.2
	PTDR-L	<i>Pterostegia drymarioides</i>	0.8	0.2	0.2	0.2
	SIGA-L	<i>Silene gallica</i>	0.8	0.4	0.2	1
	TRMI4-L	<i>Trifolium microcephalum</i>	0.8	3	1	10
	TRWI3-L	<i>Trifolium willdenovii</i>	0.8	0.6	0.2	1
	AGHE2-L	<i>Agoseris heterophylla</i>	0.5	0.1	0.2	0.2
	AICA-L	<i>Aira caryophyllea</i>	0.5	0.1	0.2	0.2
	ASTEXX-L	<i>Asteraceae</i>	0.5	0.1	0.2	0.2
	AVBA-L	<i>Avena barbata</i>	0.5	0.6	0.2	2
	CACI2-L	<i>Calandrinia ciliata</i>	0.5	0.1	0.2	0.2
	CAMU3-L	<i>Calycadenia multiglandulosa</i>	0.5	0.3	0.2	1
	CATR3-L	<i>Calycadenia truncata</i>	0.5	0.1	0.2	0.2
	CHLOR3-L	<i>Chlorogalum</i>	0.5	0.3	0.2	1
	CHME2-L	<i>Chorizanthe membranacea</i>	0.5	0.1	0.2	0.2
	CLARK-L	<i>Clarkia</i>	0.5	2.1	0.2	8
	DICA14-L	<i>Dichelostemma capitatum</i>	0.5	0.1	0.2	0.2

**Ceanothus cuneatus/Plantago erecta**

Layer	Code	Species Name	Freq	Avg	Min	Max
	GIPUS-L	<i>Githopsis pulchella</i> ssp. <i>serpentinicola</i>	0.5	0.1	0.2	0.2
	LIF12-L	<i>Linanthus filipes</i>	0.5	2.6	0.2	10
	LOWR2-L	<i>Lotus wrangelianus</i>	0.5	0.1	0.2	0.2
	MICAC2-L	<i>Micropus californicus</i> var. <i>californicus</i>	0.5	0.1	0.2	0.2
	PLNO-L	<i>Plagiobothrys nothofulvus</i>	0.5	0.3	0.2	1
	STPO2-L	<i>Streptanthus polygaloides</i>	0.5	0.1	0.2	0.2
	VUMY-L	<i>Vulpia myuros</i>	0.5	0.6	0.2	2
<b>Cryptogam</b>						
	LICHEN-L	Lichen	0.5	0.3	0.2	1
	MOSS-L	Moss	0.5	0.3	0.2	1

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***Eriodictyon californicum*/Annual Grass-Herb Association (new provisional)  
California Yerba Santa / Annual Grass-Herb Association**

**GENERAL VEGETATION DESCRIPTION**

One stand of *Eriodictyon californicum*/Annual Grass-Herb Shrubland forms an intermittent shrub layer (about 50% cover). Shrubs occur in one main stratum at 1-2 m tall. The herbaceous layer is continuous (about 85%) at 01-0.5m tall. Trees may be emergent in the overstory or understory but low in cover (less than 1% cover). Total vegetation cover is 96%.

In this association, the overstory is characterized by shrubs with *Eriodictyon californicum* dominant, but other shrubs may include *Lotus scoparius* and *Toxicodendron diversilobum*. Emergent tree species may be present in low cover, including *Pinus sabiniana*, *Quercus douglasii*, or *Q. wislizeni*. The herbaceous layer may include a diversity of grasses and forbs, including *Bromus hordeaceus*, *Trifolium hirtum*, *Galium parisiense*, *Lupinus nanus*, *Micropus californicus*, *Lotus wrangelianus*, *Hypochaeris glabra*, *Clarkia* sp., and *Phacelia* spp.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 795-795 ft, mean 795 ft

Aspect: variable, especially SW

Slope: moderate to steep, 22 degrees

Topography: Lower to middle 1/3 of slope; convex or rounded

Litter Cover: 35%

Rock Cover: 25%

Bare Ground: 20%

Parent Material: serpentine, metavolcanic, plutonic rock

Soil Texture: Moderately fine sandy clay loam

Stands of pure *Eriodictyon californicum* with grass-herb understory occur in the SW to NW portions of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California) particularly on serpentine, and on metamorphic and volcanic substrates, which probably have been disturbed by fire and/or clearing.

**Number of Samples Used in Description: 1**

**Samples:** APEOR211

**Rank:** G4 S4? Probably widespread, but little substantiating data on distribution at this point

**GLOBAL DISTRIBUTION**

*Eriodictyon californicum* Alliance: To be defined from recent data analyses, Sierra Nevada foothills and lower montane, east to the Central Coast Ranges and North Coast Ranges, and potentially Klamath Mountains.

Association: potentially similar range as the alliance

**REFERENCES**

Stewart and Sawyer 2001

**RESTORATION INFORMATION**

This association has high non-native plant cover (average 57.1%) relative to native cover. Non-native species with highest cover mainly include grasses, e.g., *Bromus hordeaceus*, and annual forbs, *Trifolium hirtum* and *Galium parisiense*. No noxious weed species occurred within the one stand sampled, so there are no restoration recommendations. Other site impacts were minimal.

***Eriodictyon californicum*/Annual Grass-Herb**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Understory</b>						
	QUWI2-M	<i>Quercus wislizeni</i>	1	0.2	0.2	0.2
<b>Shrub</b>						
	ERCA6-M	<i>Eriodictyon californicum</i>	1	35	35	35
	LOSC2-M	<i>Lotus scoparius</i>	1	0.2	0.2	0.2
	TODI-M	<i>Toxicodendron diversilobum</i>	1	0.2	0.2	0.2
<b>Herb</b>						
	BRHO2-L	<i>Bromus hordeaceus</i>	1	15	15	15
	CAAT25-L	<i>Castilleja attenuata</i>	1	0.2	0.2	0.2
	CLARK-L	<i>Clarkia</i>	1	0.2	0.2	0.2
	GAPA5-L	<i>Galium parisiense</i>	1	4	4	4
	HYGL2-L	<i>Hypochaeris glabra</i>	1	0.2	0.2	0.2
	LOWR2-L	<i>Lotus wrangelianus</i>	1	0.2	0.2	0.2
	LUNA3-L	<i>Lupinus nanus</i>	1	0.2	0.2	0.2
	MICAC2-L	<i>Micropus californicus</i> var. <i>californicus</i>	1	0.2	0.2	0.2
	PHCI-L	<i>Phacelia cicutaria</i>	1	0.2	0.2	0.2
	TRHI4-L	<i>Trifolium hirtum</i>	1	30	30	30
	TRWI3-L	<i>Trifolium willdenovii</i>	1	0.2	0.2	0.2

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***Eriodictyon californicum*-*Ceanothus cuneatus*/Annual Grass-Herb (*Brachypodium distachyon*-*Centaurea* spp.) Association (new provisional)**  
**California Yerba Santa - Wedgeleaf Ceanothus / Annual Grass - Herb (Purple False-Brome -Star Thistle) Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Eriodictyon californicum*-*Ceanothus cuneatus*/Annual Grass-Herb (*Brachypodium distachyon*-*Centaurea* spp.) Shrubland form a sparse to intermittent shrub layer (8-65%, mean 31%) at 0.5-2m tall. *Eriodictyon californicum* and *Ceanothus cuneatus* are dominant or co-dominant in the shrub layer. *Brachypodium distachyon* dominates or co-dominates in the herb layer. The herbaceous layer is open to continuous (30-90%, mean 68.3%) at 0.1-0.5m tall. Trees occasionally occur in the emergent layer (0-1% cover, mean 0.5%) with conifers at 0-2m tall and hardwoods at 0-1m tall. Total vegetation cover is 78-95%, mean cover is 87.7%.

In this association, the overstory is characterized by shrubs with *Eriodictyon californicum* as dominant or co-dominant with *Ceanothus cuneatus*. Other frequent shrub species include *Sambucus mexicana* and *Mimulus aurantiacus*. *Brachypodium distachyon* is dominant in the herbaceous layer. Other non-native herbs frequently occur and include *Bromus hordeaceus*, *Centaurea melitensis*, *Trifolium hirtum*, *Carduus pycnocephalus*, *Hypochaeris glabra*, *Avena barbata*, and *Vulpia myuros*. Native herbs also frequently occur but in lower cover. Occasionally, emergent trees may include *Pinus sabiniana*, *Quercus wislizeni*, and *Quercus douglasii*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 897-1004 ft, mean 943 ft

Aspect: SW or NW

Slope: moderate to steep, range 19-28 degrees, mean 25 degrees

Topography: lower to mid slope; convex, linear or undulating

Litter Cover: range 24-55%, mean 36.3%

Rock Cover: range 13-24%, mean 19.1%

Bare Ground: range 7-25%, mean 18.7%

Parent Material: metamorphic, serpentine, or plutonic

Soil Texture: moderately coarse sandy loam

Stands occur mainly in the SW portion of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California). Their occurrence appears to be correlated with recent fire or other significant disturbance activity, as *Eriodictyon californicum* and non-native herbs have a tendency to establish easily after disturbance.

**Number of Samples Used in Description: 3**

**Samples:** APEOR069, APEOR070, APEOR281

**Rank:** G3 S3? Difficult to rank because of limited reference information

**GLOBAL DISTRIBUTION**

*Eriodictyon californicum* Alliance: To be defined from recent data analyses, Sierra Nevada foothills and lower montane, east to the Central Coast Ranges and North Coast Ranges, and potentially Klamath Mountains.

Association: potentially similar range as the alliance

**REFERENCES**

Stewart and Sawyer 2001

**RESTORATION INFORMATION**

This association has high non-native plant cover (71.2% average cover) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Brachypodium distachyon* and *Bromus*

*hordeaceus*. Both *Centaurea melitensis* and *Carduus pycnocephalus* frequently occur with 9.3% cover, and *Centaurea solstitialis* occurs in one stand at less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references). Further, roads had moderate to high impact within two of the three stands sampled, which may contribute to soil compaction and may act as conduits for non-native species. Thus, it is recommended to reduce road disturbance and close/restore unneeded roads to deter any additional spread of non-natives.

***Eriodictyon californicum*-*Ceanothus cuneatus*/Annual Grass-Herb  
(*Brachypodium distachyon*-*Centaurea* spp.) Association**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Understory</b>						
	PISA2-M	<i>Pinus sabiniana</i>	0.7	0.1	0.2	0.2
	QUWI2-M	<i>Quercus wislizeni</i>	0.7	0.1	0.2	0.2
	PISA2-L	<i>Pinus sabiniana</i>	0.3	0.1	0.2	0.2
	QUDO-L	<i>Quercus douglasii</i>	0.3	0.1	0.2	0.2
	QUWI2-L	<i>Quercus wislizeni</i>	0.3	0.1	0.2	0.2
<b>Shrub</b>						
	ERCA6-M	<i>Eriodictyon californicum</i>	1	13	6	18
	CECU-M	<i>Ceanothus cuneatus</i>	0.7	16.7	0.2	50
	MIAU-M	<i>Mimulus aurantiacus</i>	0.7	0.1	0.2	0.2
	SAME5-M	<i>Sambucus mexicana</i>	0.7	0.1	0.2	0.2
	CECU-L	<i>Ceanothus cuneatus</i>	0.3	0.1	0.2	0.2
	RHTO6-M	<i>Rhamnus tomentella</i>	0.3	0.1	0.2	0.2
<b>Herb</b>						
	BRDI2-L	<i>Brachypodium distachyon</i>	1	43.3	20	65
	BRHO2-L	<i>Bromus hordeaceus</i>	1	12	1	30
	CEME2-L	<i>Centaurea melitensis</i>	1	9.3	5	15
	TRHI4-L	<i>Trifolium hirtum</i>	1	0.2	0.2	0.2
	AVBA-L	<i>Avena barbata</i>	0.7	3.7	1	10
	BREL-L	<i>Brodiaea elegans</i>	0.7	0.1	0.2	0.2
	BRMA3-L	<i>Bromus madritensis</i>	0.7	0.1	0.2	0.2
	CAOCO-L	<i>Calystegia occidentalis</i> ssp. <i>occidentalis</i>	0.7	0.1	0.2	0.2
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.7	9.3	13	15
	DAPU3-L	<i>Daucus pusillus</i>	0.7	0.1	0.2	0.2
	ERBO-L	<i>Erodium botrys</i>	0.7	0.4	0.2	1
	GAPA5-L	<i>Galium parisiense</i>	0.7	0.4	0.2	1
	GAVE3-L	<i>Gastroidium ventricosum</i>	0.7	0.1	0.2	0.2
	HYGL2-L	<i>Hypochaeris glabra</i>	0.7	4.3	3	10
	LOWR2-L	<i>Lotus wrangelianus</i>	0.7	0.1	0.2	0.2
	PLER3-L	<i>Plantago erecta</i>	0.7	0.1	0.2	0.2
	SIGA-L	<i>Silene gallica</i>	0.7	0.1	0.2	0.2
	SOOL-L	<i>Sonchus oleraceus</i>	0.7	0.1	0.2	0.2
	VUMY-L	<i>Vulpia myuros</i>	0.7	1.1	0.2	3
	AICA-L	<i>Aira caryophyllea</i>	0.3	0.1	0.2	0.2
	AMMEI2-L	<i>Amsinckia menziesii</i> var. <i>intermedia</i>	0.3	0.1	0.2	0.2
	ANAR-L	<i>Anagallis arvensis</i>	0.3	0.1	0.2	0.2

***Eriodictyon californicum*-*Ceanothus cuneatus*/Annual Grass-Herb  
(*Brachypodium distachyon*-*Centaurea* spp.) Association**

Layer	Code	Species Name	Freq	Avg	Min	Max
	AVFA-L	<i>Avena fatua</i>	0.3	0.7	2	2
	BRMI2-L	<i>Briza minor</i>	0.3	0.1	0.2	0.2
	CAAT25-L	<i>Castilleja attenuata</i>	0.3	0.1	0.2	0.2
	CESO3-L	<i>Centaurea solstitialis</i>	0.3	0.1	0.2	0.2
	CHLOR3-L	<i>Chlorogalum</i>	0.3	0.1	0.2	0.2
	CLARK-L	<i>Clarkia</i>	0.3	0.1	0.2	0.2
	CLPUQ-L	<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	0.3	0.1	0.2	0.2
	DICA14-L	<i>Dichelostemma capitatum</i>	0.3	0.1	0.2	0.2
	FICA2-L	<i>Filago californica</i>	0.3	0.1	0.2	0.2
	FIGA-L	<i>Filago gallica</i>	0.3	0.1	0.2	0.2
	GAPO-L	<i>Galium porrigens</i>	0.3	0.1	0.2	0.2
	HEFI-L	<i>Hemizonia fitchii</i>	0.3	0.1	0.2	0.2
	LOMI-L	<i>Lotus micranthus</i>	0.3	0.1	0.2	0.2
	MAGR3-L	<i>Madia gracilis</i>	0.3	0.1	0.2	0.2
	NAPU2-L	<i>Navarretia pubescens</i>	0.3	0.1	0.2	0.2
	PEDU2-L	<i>Petrorhagia dubia</i>	0.3	0.1	0.2	0.2
	TRDU2-L	<i>Trifolium dubium</i>	0.3	0.1	0.2	0.2
	TRLA16-L	<i>Triteleia laxa</i>	0.3	0.1	0.2	0.2
	TRMI4-L	<i>Trifolium microcephalum</i>	0.3	0.1	0.2	0.2
	URLI5-L	<i>Uropappus lindleyi</i>	0.3	0.1	0.2	0.2
	VERI-L	<i>Velezia rigida</i>	0.3	0.3	1	1
	VIVI-L	<i>Vicia villosa</i>	0.3	0.1	0.2	0.2

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***Heteromeles arbutifolia* Alliance (not full description)**  
**Toyon Alliance**

**GENERAL VEGETATION DESCRIPTION** (per reconnaissance in 2003, Klein and Evens In publication)  
Stands of *Heteromeles arbutifolia* Shrubland form an open to intermittent to shrub layer at 0-5m tall, where *Heteromeles arbutifolia* usually dominates. Other shrubs, including *Ceanothus cuneatus* and *A. fasciculatum* may be present but in lower cover.

**ENVIRONMENTAL DESCRIPTION** (per reconnaissance in 2003, Klein and Evens In publication)

Elevation: usually below 1200m  
Aspect: often N-facing slopes  
Slope: moderate to steep, usually below 45 degrees  
Topography: lower, middle, and upper slopes  
Litter, Rock, and Bare Ground cover: variable  
Parent Material: serpentine, sedimentary, metavolcanic  
Soil texture: sandy loam to loam

Stands are small and localized, occurring in the SW portion of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California).

**Number of Samples Used in Description: 0**

Insufficient data for full description.

**Rank:** G4 S4

**GLOBAL DISTRIBUTION**

*Heteromeles arbutifolia* Alliance: Insufficient data to determine, but likely to occur from the Inner North Coast Ranges California east to the Sierra Nevada and south to the South Coast and Peninsular Ranges.  
Reports: Peninsular ranges (including W Riverside County)  
Association: unknown

**REFERENCES**

Klein and Evens In publication



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***Rhamnus tomentella*-*Hoita macrostachya* Association (new provisional)  
Hoary Coffeeberry - Large Leather-root Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Rhamnus tomentella*-*Hoita macrostachya* Shrubland form an intermittent shrub layer (55-65%, mean 60%) at 2-5m tall, where *Rhamnus tomentella* and *Hoita macrostachya* co-dominate. The herbaceous layer is open to intermittent (20-35%, mean 27.5%) at 0.5-1m tall. Trees occasionally occur in the emergent layer (0-9% cover, mean 4.5%) with hardwoods at 0-15m tall. Total vegetation cover is 70-75%, mean cover is 72.5%.

In this association, an occasional overstory of tree species includes *Quercus wislizeni* and *Quercus douglasii*. The overstory is characterized by shrubs, particularly *Rhamnus tomentella*, *Hoita macrostachya*, and *Toxicodendron diversilobum*. The herbaceous layer frequently includes a diverse understory of grass and forb species such as *Bromus hordeaceus*, *Carduus pycnocephalus*, *Rorippa sp.*, *Centaurea melitensis*, *Stachys stricta*, *Mimulus guttatus*, *Brachypodium distachyon*, and *Asclepias fascicularis*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 1000 ft, mean 1000 ft  
Aspect: SW  
Slope: gentle, range 4-5 degrees, mean 4.5 degrees  
Topography: bottom slope; concave  
Litter Cover: 40%, mean 40%  
Rock Cover: range 30-40%, mean 35%  
Bare Ground: range 15-20%, mean 17.5%  
Parent Material: serpentine  
Soil Texture: moderately fine sandy clay loam

Stands occurred in two forks of a small riparian corridor that had perennial water flow and saturated soils in the SW portion of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California), though other localized stands may occur in riparian serpentine and metavolcanic drainages.

**Number of Samples Used in Description: 2**

**Samples:** APEOR286, APEOR287

**Rank:** G3 S3? Probably occurs as small, localized stands in riparian settings in the Sierra Nevada foothills and Coast Ranges, as suggested from unpublished CNPS data.

**GLOBAL DISTRIBUTION**

*Rhamnus tomentella* Alliance: being newly defined from North Central Coast (Santa Clara County), southern Central Coast (San Benito County, personal observation), North Coast, Southern California coast/Peninsular Range (San Diego County), Southern California Peninsular Range (W Riverside County). Full range not well documented.

*Association:* potentially the Sierra Nevada foothills east to the Central and North Coast Ranges particularly in riparian, serpentine settings

**REFERENCES**

Evens and San 2004, Evens and San In publication 2004, Klein and Evens In publication.

**RESTORATION INFORMATION**

This association has moderate non-native plant cover (average 44.6%) relative to native cover. Non-native species with highest cover mainly include grasses, *Bromus hordeaceus*, *Avena barbata* and *Lolium multiflorum*. *Carduus pycnocephalus* occurred in both stands at average cover of 6%. *Centaurea melitensis* occurred in both stands with average cover of 2.6% (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts included minor impact from grazing.

**Rhamnus tomentella-Hoita macrostachya**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUDO-T	<i>Quercus douglasii</i>	0.5	2	4	4
	QUWI2-T	<i>Quercus wislizeni</i>	0.5	2.5	5	5
<b>Shrub</b>						
	HOMA4-M	<i>Hoita macrostachya</i>	1	11	6	16
	RHTO6-M	<i>Rhamnus tomentella</i>	1	37.5	30	45
	TODI-M	<i>Toxicodendron diversilobum</i>	1	8	8	8
	CAOC5-M	<i>Calycanthus occidentalis</i>	0.5	3	6	6
	ERCA6-M	<i>Eriodictyon californicum</i>	0.5	0.5	1	1
	HEAR5-M	<i>Heteromeles arbutifolia</i>	0.5	3	6	6
	SALA6-M	<i>Salix lasiolepis</i>	0.5	2.5	5	5
	SAME5-L	<i>Sambucus mexicana</i>	0.5	0.5	1	1
	SAME5-M	<i>Sambucus mexicana</i>	0.5	1.5	3	3
<b>Herb</b>						
	ASFA-M	<i>Asclepias fascicularis</i>	1	1	1	1
	BRDI2-L	<i>Brachypodium distachyon</i>	1	1	1	1
	BRHO2-L	<i>Bromus hordeaceus</i>	1	43	16	70
	CAPY2-L	<i>Carduus pycnocephalus</i>	1	6	6	6
	CEME2-L	<i>Centaurea melitensis</i>	1	2.6	0.2	5
	LASE-L	<i>Lactuca serriola</i>	1	0.6	0.2	1
	MIGU-L	<i>Mimulus guttatus</i>	1	1.6	0.2	3
	RORIP-L	<i>Rorippa</i>	1	3	1	5
	STST-L	<i>Stachys stricta</i>	1	2	1	3
	AGVI11-L	<i>Agrostis viridis</i>	0.5	0.1	0.2	0.2
	AVBA-L	<i>Avena barbata</i>	0.5	8	16	16
	BRDI3-L	<i>Bromus diandrus</i>	0.5	1	2	2
	BRMA3-L	<i>Bromus madritensis</i>	0.5	0.1	0.2	0.2
	BRMI2-L	<i>Briza minor</i>	0.5	1	2	2
	CAREX-M	<i>Carex</i>	0.5	0.1	0.2	0.2
	CYER-L	<i>Cyperus eragrostis</i>	0.5	0.5	1	1
	DAPU3-L	<i>Daucus pusillus</i>	0.5	0.1	0.2	0.2
	HEFI-L	<i>Hemizonia fitchii</i>	0.5	0.5	1	1
	HEPU2-L	<i>Helenium puberulum</i>	0.5	0.5	1	1
	JUBU-L	<i>Juncus bufonius</i>	0.5	0.1	0.2	0.2
	LENE3-L	<i>Lessingia nemaclada</i>	0.5	0.5	1	1
	LOMU-L	<i>Lolium multiflorum</i>	0.5	4	8	8
	LYCA4-L	<i>Lythrum californicum</i>	0.5	0.1	0.2	0.2
	MAGR3-L	<i>Madia gracilis</i>	0.5	0.1	0.2	0.2
	MICA3-M	<i>Mimulus cardinalis</i>	0.5	1.5	3	3
	NAPU4-L	<i>Nassella pulchra</i>	0.5	0.1	0.2	0.2
	PADI6-L	<i>Paspalum distichum</i>	0.5	0.5	1	1
	POMO5-L	<i>Polypogon monspeliensis</i>	0.5	2	4	4
	RUCR-L	<i>Rumex crispus</i>	0.5	0.5	1	1
<b>Cryptogam</b>						
	MOSS-L	Moss	0.5	1.5	3	3

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***Toxicodendron diversilobum/Bromus hordeaceus-Micropus californicus* Association (new)  
Poison Oak / Soft Brome - Slender Cottonweed Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Toxicodendron diversilobum/Bromus hordeaceus-Micropus californicus* Shrubland form an open to continuous shrub layer (30-67%, mean 45.6%). Shrubs occasionally occur in two different strata, with low shrubs at 01-2m tall and tall shrubs at 0.5-5m tall. The herbaceous layer is open to continuous (15-70%, mean 50.2%) at 01-1m tall. Trees often occur in the emergent layer (0-5% cover, mean 1%) with conifers at 0-15m tall and hardwoods at 0-10m tall. Total vegetation cover is 65-95%, mean cover is 83.8%.

In this association, shrubs of *Toxicodendron diversilobum* characterize the overstory. The herbaceous layer frequently includes a diversity of grass and forb species such as *Bromus hordeaceus*, *Bromus madritensis*, *Trifolium microcephalum*, *Micropus californicus* var. *californicus*, *Bromus diandrus*, *Torilis arvensis*, *Daucus pusillus*, and *Clarkia purpurea* subsp. *quadrivulnera*. Emergent trees occur infrequently, including *Quercus wislizeni*, *Quercus douglasii*, and *Pinus sabiniana*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 742-1729 ft, mean 1225 ft

Aspect: variable

Slope: moderate to steep, range 9-30 degrees, mean 17.3 degrees

Topography: lower to upper slope, convex, linear or undulating

Litter Cover: range 10-80%, mean 59.4%

Rock Cover: range 0.4-60%, mean 10.7%

Bare Ground: range 0.2-14%, mean 7.6%

Parent Material: more often sedimentary, occasionally metavolcanic, metamorphic, plutonic, or serpentine

Soil Texture: more often moderately fine sandy clay loam, occasionally moderately coarse sandy loam, moderately fine clay loam, medium to very fine sandy loam, medium silt, or fine sand

Stands of this association occur commonly across the study area in all portions (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California). Thus, stands appear to be long-lasting, and probably stimulated by fire and other disturbances.

**Number of Samples Used in Description: 12**

**Samples:** APEOR027, APEOR034, APEOR055, APEOR077, APEOR091, APEOR092, APEOR109, APEOR213, APEOR223, APEOR230, APEOR242, APEOR254

**Rank:** G4 S4? Probably widespread in Sierra Nevada foothills

**GLOBAL DISTRIBUTION**

*Toxicodendron diversilobum* Alliance: currently being defined from the Central Coast Ranges and South Coast Ranges, east to the Sierra Nevada (from multiple vegetation projects). Could also occur in the North Coast Range, Klamath Range, and Cascade Range in California, north to British Columbia. Full distribution is not known.

*Association:* Sierra Nevada Foothills potentially west to the Coast Ranges of California

**REFERENCES**

Stewart and Sawyer 2001

**RESTORATION INFORMATION**

This association has moderate to high non-native plant cover (average 50.2%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Bromus hordeaceus*, *Avena fatua* and *Bromus madritensis*. *Carduus pycnocephalus* occurred in 7 of 12 stands but had an average cover of less than 1%. *Centaurea melitensis* occurred in 4 of 12 stands with an average cover of 2.3% (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts were minimal.

Poison oak responds vigorously after fire and other mechanical disturbances; thus part of its distribution could be an effect of past and/or frequent fire disturbance. Removal treatments can include shading, grazing, and herbicides (though the latter is not recommended). Deer and other animals browse on poison oak leaves, and birds eat its seeds. Further, the stands have a high diversity of native herbs, and trees are emerging (probably due to fire). Thus, removal is not highly recommended.

***Toxicodendron diversilobum/Bromus hordeaceus-Micropus californicus***

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Shrub</b>	TODI-M	<i>Toxicodendron diversilobum</i>	1	46.3	20	67
<b>Herb</b>	BRHO2-L	<i>Bromus hordeaceus</i>	0.9	32.3	5	60
	BRMA3-L	<i>Bromus madritensis</i>	0.8	5.6	1	15
	TRMI4-L	<i>Trifolium microcephalum</i>	0.8	0.3	0.2	1
	BRDI3-L	<i>Bromus diandrus</i>	0.8	1.7	0.2	6
	CLPUQ-L	<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	0.8	0.9	0.2	6
	DAPU3-L	<i>Daucus pusillus</i>	0.8	0.9	0.2	4
	MICAC2-L	<i>Micropus californicus</i> var. <i>californicus</i>	0.8	2.7	0.2	15
	TOAR-L	<i>Torilis arvensis</i>	0.8	1.6	0.2	8
	DIVO-L	<i>Dichelostemma volubile</i>	0.7	0.1	0.2	0.2
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.6	0.9	0.2	5
	GAVE3-L	<i>Gastroidium ventricosum</i>	0.6	0.1	0.2	0.2
	VIVI-L	<i>Vicia villosa</i>	0.6	4.4	1	20
	AICA-L	<i>Aira caryophyllea</i>	0.5	0.2	0.2	1
	AVFA-L	<i>Avena fatua</i>	0.5	8.5	0.2	35
	GAPA5-L	<i>Galium parisiense</i>	0.5	0.2	0.2	1
	GEDI-L	<i>Geranium dissectum</i>	0.5	0.4	0.2	2
	TRLA16-L	<i>Triteleia laxa</i>	0.5	0.1	0.2	0.2
	TRWI3-L	<i>Trifolium willdenovii</i>	0.5	0.4	0.2	3
	MAGR3-L	<i>Madia gracilis</i>	0.4	0.7	0.2	6
	TRHI4-L	<i>Trifolium hirtum</i>	0.4	1.1	0.2	10
	AVBA-L	<i>Avena barbata</i>	0.3	1.6	0.2	18
	BRMI2-L	<i>Briza minor</i>	0.3	0.1	0.2	0.2
	CEME2-L	<i>Centaurea melitensis</i>	0.3	2.3	2	20
	CHLOR3-L	<i>Chlorogalum</i>	0.3	0.1	0.2	0.2
	GAPO-L	<i>Galium porrigens</i>	0.3	0.1	0.2	0.2
	MAEX-L	<i>Madia exigua</i>	0.3	0.2	0.2	1
	SAGR5-L	<i>Sanicula graveolens</i>	0.3	0.1	0.2	0.2
	VUMY-L	<i>Vulpia myuros</i>	0.3	0.2	0.2	1

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***Toxicodendron diversilobum/Bromus hordeaceus-Vicia villosa-Madia gracilis* Association (new provisional)**  
**Poison Oak / Soft Brome - Winter Vetch Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Toxicodendron diversilobum/Bromus hordeaceus-Vicia villosa-Madia gracilis* Shrubland form an open to intermittent shrub layer (15-55%, mean 34%) at 0.5-5m tall, where *Toxicodendron diversilobum* is dominant in the shrub layer. *Bromus hordeaceus*, *Vicia villosa*, and *Madia gracilis* dominate in the herb layer. The herbaceous layer is intermittent to continuous (45-80%, mean 65%) at 0.1-1m tall. Trees typically occur in the emergent layer (0.2-3% cover, mean 2%) with conifers at 0-20m tall and hardwoods at 0.1-10m tall. Total vegetation cover is 76-90%, mean cover is 83.8%.

In this association, *Toxicodendron diversilobum* is dominant in the overstory as a shrub, and *Rhamnus ilicifolia* is characteristically present. The herbaceous layer frequently includes a diverse understory of grasses and forbs such as *Vicia villosa*, *Bromus hordeaceus*, *Madia gracilis*, *Torilis arvensis*, and *Dichelostemma volubile*. Emergent trees may occur occasionally, including *Quercus wislizeni*, *Quercus douglasii*, and *Pinus sabiniana*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 745-1805 ft, mean 1232 ft

Aspect: NE or SW

Slope: moderate to steep, range 12-28 degrees, mean 19.6 degrees

Topography: lower to upper slope; convex

Litter Cover: range 34-72%, mean 52.4%

Rock Cover: range 0.2-30%, mean 14%

Bare Ground: range 1-26%, mean 10.5%

Parent Material: sedimentary, metavolcanic, metamorphic, or plutonic

Soil Texture: moderately coarse sandy loam, moderately fine sandy clay loam, or moderately fine silty clay loam

Stands occur mainly localized in the NW portion and center of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California). They are probably stimulated by fire and may naturally trend to oak stands.

**Number of Samples Used in Description: 5**

**Samples:** APEOR064, APEOR068, APEOR246, APEOR247, APEOR276

**Rank:** G3 S3?

**GLOBAL DISTRIBUTION**

*Toxicodendron diversilobum Alliance:* currently being defined from the Central Coast Ranges and South Coast Ranges, east to the Sierra Nevada (from multiple projects). Could also occur in the North Coast Range, Klamath Range, and Cascade Range in California, north to British Columbia. Full distribution is not known.

*Association:* Sierra Nevada Foothills, potentially west to Central and North Coast Ranges

**REFERENCES**

Stewart and Sawyer 2001

**RESTORATION INFORMATION**

This association has high non-native plant cover (average 64.3%) relative to native cover. Non-native species with highest cover include grasses, such as *Bromus hordeaceus* and *B. diandrus*, and the annual forb, *Vicia villosa*. *Carduus pycnocephalus* occurred in three of five stands at an average of 5.2% cover. *Centaurea melitensis* occurred in two of five stands at less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts were minimal.

Poison oak responds vigorously after fire and other mechanical disturbances; thus part of its distribution could be an effect of past and/or frequent fire disturbance. Removal treatments can include shading, grazing, and herbicides (though the latter is not recommended). Deer and other animals browse on poison oak leaves, and birds eat its seeds. Further, the stands have a high diversity of native herbs, and trees are emerging and regenerating (probably due to fire). Thus, removal is not highly recommended, as stands will regenerate probably naturally to oak stands.

***Toxicodendron diversilobum/Bromus hordeaceus-Vicia villosa-Madia gracilis***

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	QUDO-T	<i>Quercus douglasii</i>	0.4	0.6	1	2
	QUWI2-T	<i>Quercus wislizeni</i>	0.4	1	2	3
<b>Tree Understory</b>						
	AECA-M	<i>Aesculus californica</i>	0.4	0.4	1	1
	QUWI2-M	<i>Quercus wislizeni</i>	0.4	0.2	0.2	1
<b>Shrub</b>						
	TODI-M	<i>Toxicodendron diversilobum</i>	1	26.6	15	40
	RHIL-M	<i>Rhamnus ilicifolia</i>	0.8	0.3	0.2	1
<b>Herb</b>						
	BRHO2-L	<i>Bromus hordeaceus</i>	1	30	15	50
	VIVI-L	<i>Vicia villosa</i>	1	32.6	8	60
	DIVO-L	<i>Dichelostemma volubile</i>	0.8	0.2	0.2	0.2
	MAGR3-L	<i>Madia gracilis</i>	0.8	6.4	0.2	12
	TOAR-L	<i>Torilis arvensis</i>	0.8	1.5	0.2	5
	AVBA-L	<i>Avena barbata</i>	0.6	0.1	0.2	0.2
	BRDI3-L	<i>Bromus diandrus</i>	0.6	1.2	0.2	5
	BRMA3-L	<i>Bromus madritensis</i>	0.6	1.2	1	4
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.6	5.2	1	13
	DAPU3-L	<i>Daucus pusillus</i>	0.6	0.4	0.2	1
	TRMI4-L	<i>Trifolium microcephalum</i>	0.6	0.1	0.2	0.2
	TRWI3-L	<i>Trifolium willdenovii</i>	0.6	0.1	0.2	0.2
	AICA-L	<i>Aira caryophyllea</i>	0.4	0.6	1	2
	BREL-L	<i>Brodiaea elegans</i>	0.4	0.1	0.2	0.2
	CEME2-L	<i>Centaurea melitensis</i>	0.4	0.2	0.2	1
	CLPUQ-L	<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	0.4	0.1	0.2	0.2
	GAPO-L	<i>Galium porrigens</i>	0.4	0.1	0.2	0.2
	GEDI-L	<i>Geranium dissectum</i>	0.4	0.1	0.2	0.2
	LOMU-L	<i>Lolium multiflorum</i>	0.4	1	0.2	5
	MICAC2-L	<i>Micropus californicus</i> var. <i>californicus</i>	0.4	0.1	0.2	0.2
	PETRT-L	<i>Pentagramma triangularis</i> ssp. <i>triangularis</i>	0.4	0.1	0.2	0.2
	PHCI-L	<i>Phacelia cicutaria</i>	0.4	0.1	0.2	0.2
	POSE-L	<i>Poa secunda</i>	0.4	0.1	0.2	0.2
	TRHI4-L	<i>Trifolium hirtum</i>	0.4	0.1	0.2	0.2
	TRLA16-L	<i>Triteleia laxa</i>	0.4	0.1	0.2	0.2

***Toxicodendron diversilobum/Bromus hordeaceus-Vicia villosa-Madia gracilis***

<b>Layer</b>	<b>Code</b>	<b>Species Name</b>	<b>Freq</b>	<b>Avg</b>	<b>Min</b>	<b>Max</b>
	VUMY-L	<i>Vulpia myuros</i>	0.4	0.1	0.2	0.2
	WYETH-L	<i>Wyethia</i>	0.4	0.1	0.2	0.2
<b>Cryptogam</b>						
	MOSS-L	Moss	0.4	2.4	1	11

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## HERBACEOUS VEGETATION

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### ***Brachypodium distachyon*-*Centaurea* spp. Association (new provisional) Purple False-Brome - Star-thistle Association**

#### **GENERAL VEGETATION DESCRIPTION**

Stands of *Brachypodium distachyon*-*Centaurea* spp. form a continuous herbaceous layer (75-88%, mean 79.5%) at 0-1m tall. The shrub layer is occasionally emergent (0-0.2%, mean 0.1%) at 0-3m tall. Total vegetation cover is 75-88%, mean cover is 79.5%.

In this association, the herbaceous layer is dominated by non-native grasses and forbs such as *Brachypodium distachyon*, *Centaurea* spp., *Vicia villosa*, *Bromus diandrus*, *B. hordeaceus*, *Trifolium hirtum*, and *Carduus pycnocephalus*. Native forbs frequently occur at low cover, including *Amsinckia menziesii* var. *intermedia* and *Plagiobothrys nothofulvus*. An infrequent shrub layer at low cover includes *Toxicodendron diversilobum* and *Melilotus indicus*, and emergent tree species are found infrequently at low cover, including *Quercus douglasii*.

#### **ENVIRONMENTAL DESCRIPTION**

Elevation: range 607-1658 ft, mean 1100 ft

Aspect: variable but more often SW

Slope: moderate to steep, range 12-28 degrees, mean 20.3 degrees

Topography: lower to upper slope; often undulating occasionally linear, or convex

Litter Cover: range 20-72%, mean 45%

Rock Cover: range 0.5-30%, mean 16.5%

Bare Ground: range 3.6-30%, mean 14.6%

Parent Material: plutonic, metamorphic, or metavolcanic

Soil Texture: often moderately fine sandy clay loam, occasionally moderately fine clay loam

Stands were found primarily in the NE and NW portion of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California), particularly correlated with areas being recently burned in the mid 1990's fire.

#### **Number of Samples Used in Description: 4**

**Samples:** APEOR037, APEOR040, APEOR050, APEOR269

**Rank:** G5 S5

#### **GLOBAL DISTRIBUTION**

*Brachypodium distachyon* Alliance: Full distribution is not known, but *Brachypodium distachyon* and *Centaurea* spp. have localized abundances across California where disturbance has occurred. A *Brachypodium distachyon* association has been defined from Marin Co. Samples dominated by *Brachypodium* have also been sampled in Santa Cruz Mountains (CNPS database query 2004).  
Association: unknown

#### **REFERENCES**

Nature Serve 2003

#### **RESTORATION INFORMATION**

This association has high non-native plant cover (average 94.9%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Brachypodium distachyon*, *Bromus diandrus* and *B. hordeaceus* and the annual forb, *Vicia villosa*. *Centaurea melitensis* occurs in 3 of 4 stands and has high impact with an average cover of 10.3%. This association shows a high degree of disturbance by the presence of several other noxious weeds, including *Carduus pycnocephalus* in 3 stands with 2%



average cover. *Taeniatherum caput-medusae* and *Centaurea solstitialis* each occur in one stand with 1% and 4% cover, respectively (see Appendix 2 and Pages 16-18 for restoration references).

The expression of this association in the study area (with the high abundance and type of non-natives and occasional remnant *Quercus douglasii* and *Toxicodendron diversilobum* species in the stands) appears correlated with past fire history. Other impacts include a power line corridor which was recorded as having moderate impact in several stands, which may contribute to soil compaction and may act as conduits for non-native species. Reducing any corridors (e.g., roads, power lines, etc) is recommended to deter any additional spread of non-natives.

***Brachypodium distachyon*-*Centaurea* spp.**

Layer	Code	Species Name	Freq	Avg	Min	Max
Herb						
	BRHO2-L	<i>Bromus hordeaceus</i>	1	8.1	0.2	25
	TRHI4-L	<i>Trifolium hirtum</i>	1	0.4	0.2	1
	VIVI-L	<i>Vicia villosa</i>	1	28.3	0.2	75
	AMMEI2-L	<i>Amsinckia menziesii</i> var. <i>intermedia</i>	0.8	1.1	0.2	4
	BRDI2-L	<i>Brachypodium distachyon</i>	0.8	38.8	35	60
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.8	2.1	0.2	8
	CEME2-L	<i>Centaurea melitensis</i>	0.8	10.3	6	20
	PLNO-L	<i>Plagiobothrys nothofulvus</i>	0.8	0.2	0.2	0.2
	AVBA-L	<i>Avena barbata</i>	0.5	4.5	5	13
	AVFA-L	<i>Avena fatua</i>	0.5	1.3	0.2	5
	BRDI3-L	<i>Bromus diandrus</i>	0.5	12.6	0.2	50
	BREL-L	<i>Brodiaea elegans</i>	0.5	0.3	0.2	1
	GAPA5-L	<i>Galium parisiense</i>	0.5	0.1	0.2	0.2
	GEDI-L	<i>Geranium dissectum</i>	0.5	0.8	1	2
	HYGL2-L	<i>Hypochaeris glabra</i>	0.5	0.6	0.2	2
	LOWR2-L	<i>Lotus wrangelianus</i>	0.5	0.1	0.2	0.2
	MAGR3-L	<i>Madia gracilis</i>	0.5	0.8	0.2	3
	SIGA-L	<i>Silene gallica</i>	0.5	0.1	0.2	0.2
	CESO3-L	<i>Centaurea solstitialis</i>	0.3	4.5	18	18

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***Bromus hordeaceus*-*Clarkia purpurea*-*Plagiobothrys nothofulvus* Association (new provisional)  
Soft Brome - Winecup Clarkia - Popcornflower Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Bromus hordeaceus*-*Clarkia purpurea*-*Plagiobothrys nothofulvus* form an intermittent to continuous herbaceous layer (65-90%, mean 80%) at 0.1-1m tall, where *Bromus hordeaceus*, *Clarkia purpurea*, and *Plagiobothrys nothofulvus* co-dominate. The shrub layer, when present, is sparse (0-5%, mean 1%) at 0-5m tall. Trees infrequently occur in the emergent layer (0-8% cover, mean 1.3%) with hardwoods at 0-5m tall. Total vegetation cover is 70-91%, mean cover is 81.8%.

In this association, the herbaceous layer is diverse and characterized by non-native and native species such as *Bromus hordeaceus*, *Clarkia purpurea*, *Plagiobothrys nothofulvus*, *Trifolium hirtum*, *Daucus pusillus*, *Bromus diandrus*, *Amsinckia menziesii* var. *intermedia*, and *Vicia villosa*. An occasional shrub layer includes *Toxicodendron diversilobum* and *Sambucus mexicana*. Infrequently, emergent trees such as *Quercus douglasii* are found in low cover.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 1008-1225 ft, mean 1121 ft

Aspect: variable

Slope: flat to somewhat steep, range 0-21 degrees, mean 9.7 degrees

Topography: lower slope to ridge top

Litter Cover: range 7-77%, mean 53.3%

Rock Cover: range 0.6-14%, mean 4%

Bare Ground: range 7-62%, mean 19.8%

Parent Material: often sedimentary, occasionally serpentine, or plutonic

Soil Texture: moderately coarse sandy loam or moderately fine sandy clay loam

Stands are primarily found in the SE and NE portions of the study area (where fire is not as evident), and sometimes in the SW portion (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California). It is probable that some stands of *Brachypodium distachyon*-*Centaurea spp.* could trend to this association over time.

**Number of Samples Used in Description: 6**

**Samples:** APEOR053, APEOR054, APEOR224, APEOR237, APEOR278, APEOR295

**Rank:** G4 S4? Probably common in the Sierra Foothills region.

**GLOBAL DISTRIBUTION**

*Bromus hordeaceus* Alliance: North Coast Range, north Central Coast (Santa Clara County), southern Central Coast (San Benito County, personal observation), Sacramento Valley, Outer Central Coast (San Mateo County), Central Valley (Merced County, personal observation)).

*Association:* potentially the Sierra Nevada Foothills region.

**REFERENCES**

Evens and San 2004, Jimerson et al. 2000, Hobbs and Mooney 1991, CDFG 2000.

**RESTORATION INFORMATION**

This association has high non-native plant cover (average 72.1%) relative to native cover. Non-native species with highest cover include the annual grasses *Bromus hordeaceus* and *B. diandrus* and the annual forb, *Trifolium hirtum*. *Carduus pycnocephalus* and *Taeniatherum caput-medusae* occur within this association but at covers of less than 1%. (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts were minimal, but included grazing sometimes as a moderate impact, though, this impact may be positive if non-native grasses are impacted. Further research on this would need to be completed.

***Bromus hordeaceus-Clarkia purpurea-Daucus pusillus-Plagiobothrys nothofulvus***

Layer	Code	Species Name	Freq	Avg	Min	Max
Shrub	SAME5-M	<i>Sambucus mexicana</i>	0.3	0.1	0.2	0.2
	TODI-M	<i>Toxicodendron diversilobum</i>	0.3	0.3	1	1
Herb	BRDI3-L	<i>Bromus diandrus</i>	1	3	0.2	10
	BRHO2-L	<i>Bromus hordeaceus</i>	1	45.8	25	70
	DAPU3-L	<i>Daucus pusillus</i>	1	5	0.2	17
	TRHI4-L	<i>Trifolium hirtum</i>	1	12.6	0.2	30
	AMMEI2-L	<i>Amsinckia menziesii var. intermedia</i>	0.8	2.1	0.2	6
	CLPUQ-L	<i>Clarkia purpurea ssp. quadrivulnera</i>	0.8	6.5	0.2	16
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.7	0.1	0.2	0.2
	PLNO-L	<i>Plagiobothrys nothofulvus</i>	0.7	3.5	0.2	15
	VIVI-L	<i>Vicia villosa</i>	0.7	2	1	5
	AVFA-L	<i>Avena fatua</i>	0.5	1.2	1	3
	ERSE3-L	<i>Eremocarpus setigerus</i>	0.5	0.7	0.2	4
	MAGR3-L	<i>Madia gracilis</i>	0.5	0.1	0.2	0.2
	NAPU2-L	<i>Navarretia pubescens</i>	0.5	0.2	0.2	1
	TRDU2-L	<i>Trifolium dubium</i>	0.5	1.4	0.2	8
	TRMI4-L	<i>Trifolium microcephalum</i>	0.5	0.2	0.2	1
	BREL-L	<i>Brodiaea elegans</i>	0.3	0.1	0.2	0.2
	BRMA3-L	<i>Bromus madritensis</i>	0.3	0.5	1	2
	CAAT25-L	<i>Castilleja attenuata</i>	0.3	0.3	1	1
	ERBO-L	<i>Erodium botrys</i>	0.3	0.3	1	1
	EUCR2-L	<i>Euphorbia crenulata</i>	0.3	0.1	0.2	0.2
	HYGL2-L	<i>Hypochaeris glabra</i>	0.3	0.2	0.2	1
	TACA8-L	<i>Taeniatherum caput-medusae</i>	0.3	0.1	0.2	0.2
	TRLA4-L	<i>Trichostema lanceolatum</i>	0.3	0.4	0.2	2
	TRWI3-L	<i>Trifolium willdenovii</i>	0.3	0.1	0.2	0.2

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***Bromus hordeaceus*-*Holocarpha virgata* (*Lolium multiflorum* or *Vulpia microstachys*) Association  
(new provisional)**

**Soft Brome - Yellowflower Tarweed (Italian Ryegrass or Small Fescue) Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Bromus hordeaceus*-*Holocarpha virgata* (*Lolium multiflorum* or *Vulpia microstachys*) form an intermittent to continuous herbaceous layer (45-93%, mean 77.1%) at 01-1m tall, where *Bromus hordeaceus* and *Holocarpha virgata* (*Lolium multiflorum* or *Vulpia microstachys*) co-dominate. The shrub layer, when present, is sparse (0-1%, mean 0.2%) at 0-2m tall. Trees infrequently occur in the emergent layer (0-2% cover, mean 0.5%) with hardwoods at 0-15m tall. Total vegetation cover is 45-93%, mean cover is 77.1%.

In this association, the diverse herbaceous layer is dominated by grass and forb species such as *Bromus hordeaceus*, *Holocarpha virgata*, *Lolium multiflorum*, *Vulpia microstachys*, *Vicia villosa*, and *Trifolium hirtum*. An infrequent shrub layer includes *Toxicodendron diversilobum*. Occasionally, emergent trees of *Quercus douglasii* are found in low cover in the shrub and tree layers (as well as snags).

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 770-1503 ft, mean 1318 ft

Aspect: variable

Slope: flat to somewhat steep, range 0-19 degrees, mean 7.8 degrees

Topography: bottom slope to upper slope (or entire slope); variable but often linear

Litter Cover: range 24-84%, mean 54.8%

Rock Cover: range 2-18%, mean 8%

Bare Ground: range 0.3-30%, mean 13.1%

Parent Material: often metavolcanic, metamorphic, plutonic including gabbro, mixed

Soil Texture: often moderately fine sandy clay loam, occasionally medium loam or moderately fine silty clay loam

Stands were primarily found in the SE portion of the study area, but also in the SW and center (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California). Roads and power lines may be influencing the expression of *Bromus hordeaceus* and *Holocarpha virgata* (which are two commonly co-occurring species in the Sierra Nevada foothills), potentially increasing their co-occurrence with *Lolium multiflorum*. These impacts also may contribute to soil compaction as well as act as conduits for non-native species. Thus, it is recommended to reduce road/power line disturbance and close/restore unneeded corridors to deter any additional spread of non-natives.

**Number of Samples Used in Description: 8**

**Samples:** APEOR025, APEOR032, APEOR041, APEOR048, APEOR056, APEOR058, APEOR267, APEOR273

**Rank:** G4 S4? Probably occurs across the Sierra Nevada foothills region

**GLOBAL DISTRIBUTION**

*Bromus hordeaceus* Alliance: North Coast Range, north Central Coast (Santa Clara County), southern Central Coast (San Benito County, personal observation), Sacramento Valley, Outer Central Coast (San Mateo County), Central Valley (Merced County, personal observation).

Association: potentially the Sierra Nevada Foothills region.

**REFERENCES**

Evens and San 2004, Jimerson et al. 2000, Hobbs and Mooney 1991, CDFG 2000.

**RESTORATION INFORMATION**

This association has high non-native plant cover (average 78.4%) relative to native cover. Non-native species with highest cover include the annual grasses *Bromus hordeaceus*, *Lolium multiflorum* and

*Avena barbata*, and the annual forb, *Vicia villosa*. *Carduus pycnocephalus* and *Taeniatherum caput-medusae* occur within this association at covers of between 3 and 4%. *Centaurea melitensis* and *C. solstitialis* also occur within this association but at covers of less than 1% (see Appendix 2 and Pages 16-18 for restoration references). Roads, fences, and power line corridors had low to high impact on several stands within this association, which may contribute to soil compaction and may act as conduits for non-native species. Thus, it is recommended to reduce road and power line disturbance and close/restore unneeded roads.

***Bromus hordeaceus*-*Holocarpha virgata* (*Lolium multiflorum* or *Vulpia microstachys*)**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Herb</b>						
	BRHO2-L	<i>Bromus hordeaceus</i>	1	46.9	30	70
	LOMU-L	<i>Lolium multiflorum</i>	1	8.4	0.2	33
	BREL-L	<i>Brodiaea elegans</i>	0.9	0.2	0.2	0.2
	HOVI-L	<i>Holocarpha virgata</i>	0.9	9.8	1	33
	TRHI4-L	<i>Trifolium hirtum</i>	0.9	1.1	0.2	4
	VIVI-L	<i>Vicia villosa</i>	0.9	11.2	0.2	60
	AVBA-L	<i>Avena barbata</i>	0.8	7.2	0.2	22
	BRDI3-L	<i>Bromus diandrus</i>	0.8	5.9	0.2	28
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.8	3.2	0.2	18
	GAPA5-L	<i>Galium parisiense</i>	0.8	0.2	0.2	0.2
	TRDU2-L	<i>Trifolium dubium</i>	0.8	1.7	0.2	8
	CLPUQ-L	<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	0.6	1.5	0.2	8
	HYGL2-L	<i>Hypochaeris glabra</i>	0.6	2.5	0.2	8
	TOAR-L	<i>Torilis arvensis</i>	0.6	0.1	0.2	0.2
	VISAN2-L	<i>Vicia sativa</i> ssp. <i>nigra</i>	0.6	0.8	0.2	3
	BRMA3-L	<i>Bromus madritensis</i>	0.5	0.4	0.2	2
	CAAT25-L	<i>Castilleja attenuata</i>	0.5	0.2	0.2	1
	GEDI-L	<i>Geranium dissectum</i>	0.5	0.7	0.2	4
	HOMAG-L	<i>Hordeum marinum</i> ssp. <i>gussoneanum</i>	0.5	3.8	0.2	15
	LUNA3-L	<i>Lupinus nanus</i>	0.5	0.1	0.2	0.2
	TACA8-L	<i>Taeniatherum caput-medusae</i>	0.5	4	1	25
	TRMI4-L	<i>Trifolium microcephalum</i>	0.5	0.1	0.2	0.2
	BRMI2-L	<i>Briza minor</i>	0.4	0.3	0.2	2
	CEME2-L	<i>Centaurea melitensis</i>	0.4	0.2	0.2	1
	JUBU-L	<i>Juncus bufonius</i>	0.4	0.3	0.2	1
	MAGR3-L	<i>Madia gracilis</i>	0.4	3.6	0.2	28
	NAPU2-L	<i>Navarretia pubescens</i>	0.4	0.4	0.2	2
<b>Cryptogam</b>						
	MOSS-L	Moss	0.5	0.4	0.2	2
	LICHEN-L	Lichen	0.4	1.1	0.2	8

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***Bromus hordeaceus*-*Holocarpha virgata*-*Taeniatherum caput-medusae* Association (new)  
Soft Brome - Yellowflower Tarweed - Medusahead Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Bromus hordeaceus*-*Holocarpha virgata*-*Taeniatherum caput-medusae* form an intermittent to continuous herbaceous layer (48-88%, mean 72.4%) at 01-1m tall, where *Bromus hordeaceus*, *Holocarpha virgata*, and *Taeniatherum caput-medusae* co-dominate. Trees infrequently occur in the emergent layer (0-0.2% cover, mean 0.1%) with hardwoods at 0-15m tall. Total vegetation cover is 48-88%, mean cover is 72.4%.

In this association, the herbaceous layer is co-dominated by non-natives such as *Bromus hordeaceus*, *Holocarpha virgata*, and *Taeniatherum caput-medusae*. Other characteristic non-natives include *Hypochaeris glabra*, *Trifolium hirtum*, *Vicia sativa* subsp. *nigra*, and *Vicia villosa*. Native herb species frequently occur but in lower abundance, including *Brodiaea elegans*, *Agoseris heterophylla*, *Castilleja attenuata*, *Amsinckia menziesii* var. *intermedia*, and *Micropus californicus* var. *californicus*. In rare occasions, emergent tree species *Quercus douglasii* are found in low cover.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 779-1400 ft, mean 1240 ft

Aspect: variable but often SW

Slope: flat to moderate, range 0-14 degrees, mean 6.4 degrees

Topography: bottom slope to ridge top; microtopography varies

Litter Cover: range 17-65%, mean 42.2%

Rock Cover: range 0.6-14%, mean 7.4%

Bare Ground: range 8-51%, mean 27.6%

Parent Material: metavolcanic, plutonic, metamorphic, or ultramafic

Soil Texture: more often moderately fine sandy clay loam, occasionally moderately coarse sandy loam, or moderately fine clay loam

Stands were found in across the entire study area on a variety of substrates.

**Number of Samples Used in Description: 10**

**Samples:** APEOR026, APEOR046, APEOR051, APEOR072, APEOR221, APEOR270, APEOR275, APEOR277, APEOR292, APEOR294

**Rank: G4S4**

**GLOBAL DISTRIBUTION**

*Bromus hordeaceus* Alliance: North Coast Range, north Central Coast (Santa Clara County), southern Central Coast (San Benito County, personal observation), Sacramento Valley, Outer Central Coast (San Mateo County), Central Valley (Merced County, personal observation).

*Association:* potentially the Sierra Nevada Foothills region to the Sacramento Valley.

**REFERENCES**

Evens and San 2004, Jimerson et al. 2000, Hobbs and Mooney 1991, CDFG 2000.

**RESTORATION INFORMATION**

This association has high non-native plant cover (average 75.7%) relative to native cover. Non-native species with highest cover include annual grasses *Bromus hordeaceus*, *caput-medusae* and *Avena barbata* and the annual forb, *Trifolium hirtum*. *Carduus pycnocephalus* and *Centaurea melitensis* occasionally occur at less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references). Roads/trail construction are recorded as having low to high impact on several stands, which could be acting as conduits for the non-native species. Thus, it is recommended to reduce road disturbance and close/restore unneeded roads.

***Bromus hordeaceus-Holocarpha virgata-Taeniatherum caput-medusae***

Layer	Code	Species Name	Freq	Avg	Min	Max
Herb						
	HYGL2-L	<i>Hypochaeris glabra</i>	1	9.1	0.2	20
	TACA8-L	<i>Taeniatherum caput-medusae</i>	1	19.5	1	50
	TRHI4-L	<i>Trifolium hirtum</i>	1	4.3	0.2	20
	HOVI-L	<i>Holocarpha virgata</i>	0.9	15.8	10	25
	BRHO2-L	<i>Bromus hordeaceus</i>	0.8	21.3	1	50
	VISAN2-L	<i>Vicia sativa ssp. nigra</i>	0.8	1.1	0.2	5
	BREL-L	<i>Brodiaea elegans</i>	0.7	0.3	0.2	2
	BRMI2-L	<i>Briza minor</i>	0.7	0.4	0.2	3
	VIVI-L	<i>Vicia villosa</i>	0.7	1.2	0.2	7
	AGHE2-L	<i>Agoseris heterophylla</i>	0.6	1.8	0.2	8
	CAAT25-L	<i>Castilleja attenuata</i>	0.6	0.2	0.2	1
	LOMU-L	<i>Lolium multiflorum</i>	0.6	1.9	0.2	12
	AMMEI2-L	<i>Amsinckia menziesii var. intermedia</i>	0.5	0.3	0.2	1
	AVBA-L	<i>Avena barbata</i>	0.5	4	0.2	30
	MICAC2-L	<i>Micropus californicus var. californicus</i>	0.5	0.3	0.2	2
	CEME2-L	<i>Centaurea melitensis</i>	0.4	0.1	0.2	0.2
	DAPU3-L	<i>Daucus pusillus</i>	0.4	0.3	0.2	2
	GAPA5-L	<i>Galium parisiense</i>	0.4	0.1	0.2	0.2
	NAPU2-L	<i>Navarretia pubescens</i>	0.4	0.2	0.2	1
	PLNO-L	<i>Plagiobothrys nothofulvus</i>	0.4	0.1	0.2	0.2
	TRLA16-L	<i>Triteleia laxa</i>	0.4	0.1	0.2	0.2
	TRMI4-L	<i>Trifolium microcephalum</i>	0.4	0.1	0.2	0.2
	AVFA-L	<i>Avena fatua</i>	0.3	3.5	0.2	35
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.3	0.1	0.2	1
	CLARK-L	<i>Clarkia</i>	0.3	0.2	0.2	2
	CLPUQ-L	<i>Clarkia purpurea ssp. quadrivulnera</i>	0.3	0.1	0.2	1
	ERSE3-L	<i>Eremocarpus setigerus</i>	0.3	0.1	0.2	0.2
	MAGR3-L	<i>Madia gracilis</i>	0.3	1.5	0.2	10
	TOAR-L	<i>Torilis arvensis</i>	0.3	0.1	0.2	1
	TRDU2-L	<i>Trifolium dubium</i>	0.3	0.1	0.2	1

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***Bromus hordeaceus-Lupinus nanus-Trifolium* spp. Association (new provisional)**  
**Soft Brome - Sky Lupine - Clover Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Bromus hordeaceus-Lupinus nanus-Trifolium* spp. form an intermittent to continuous herbaceous layer (62-85%, mean 75%) at 01-0.5m tall, where *Bromus hordeaceus*, *Lupinus nanus*, and *Trifolium* spp. co-dominate. Trees occasionally occur in the emergent layer (0-5% cover, mean 1.7%) with conifers at 0-15m tall and hardwoods at 0-10m tall. Total vegetation cover is 62-85%, mean cover is 76.3%.

In this association, the herbaceous layer consists of a diverse mixture of non-native and native species such as *Bromus hordeaceus*, *Lupinus nanus*, *Trifolium* spp., *Hypochaeris glabra*, *Lupinus nanus*, *Castilleja attenuata*, *Triphysaria eriantha* subsp. *eriantha*, *Lolium multiflorum*, *Erodium botrys*, *Aira caryophyllea*, *Lotus micranthus*, and *Galium parisiense*. Occasionally, emergent tree species *Quercus douglasii* and *Pinus sabiniana* are found in low cover.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 907-1770 ft, mean 1466 ft

Aspect: variable but more often SE

Slope: flat to gentle, range 0-5 degrees, mean 1.7 degrees

Topography: ridge top or bottom slope, linear or concave

Litter Cover: range 56-70%, mean 64.7%

Rock Cover: range 0.6-7%, mean 3.1%

Bare Ground: range 1-14%, mean 8.4%

Parent Material: more often volcanic flow, occasionally serpentine

Soil Texture: moderately coarse sandy loam or medium to very fine sandy loam

Stands were found in the SE and SW portions of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California). They are particularly on relatively gentle volcanic and serpentine substrates, specifically the long, narrow draws on the ridge top of Table Mountain that collect more soil than the surrounding more exposed rocky areas of the ridge top.

**Number of Samples Used in Description: 3**

**Samples:** APEOR005, APEOR011, APEOR015

**Rank:** G3 S3.2? Probably in the Sierra Nevada foothills on basalt/volcanic flows and serpentine – poorly developed soils

**GLOBAL DISTRIBUTION**

*Bromus hordeaceus* Alliance: North Coast Range, north Central Coast (Santa Clara County), southern Central Coast (San Benito County, personal observation), Sacramento Valley, Outer Central Coast (San Mateo County), Central Valley (Merced County, personal observation).

*Association:* potentially the Sierra Nevada Foothills region.

**REFERENCES**

Evens and San 2004, Jimerson et al. 2000, Hobbs and Mooney 1991, CDFG 2000.

**RESTORATION INFORMATION**

This association has high non-native plant cover (average 79.7%) relative to native cover. Non-native species with highest cover include the annual grasses *Bromus hordeaceus*, *B. diandrus* and *Lolium multiflorum*. Non-native forbs with the highest cover include *Hypochaeris glabra* and *Trifolium hirtum*. *Carduus pycnocephalus* occurs within this association at a cover of less than 1% (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts within this association were minimal.

***Bromus hordeaceus-Lupinus nanus-Trifolium* spp.**



Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Overstory</b>						
	PISA2-T	<i>Pinus sabiniana</i>	0.3	1.3	4	4
	QUDO-T	<i>Quercus douglasii</i>	0.3	1.3	4	4
<b>Tree Understory</b>						
	QUDO-L	<i>Quercus douglasii</i>	0.3	0.1	0.2	0.2
<b>Herb</b>						
	BRHO2-L	<i>Bromus hordeaceus</i>	1	50	45	55
	CAAT25-L	<i>Castilleja attenuata</i>	1	0.2	0.2	0.2
	HYGL2-L	<i>Hypochaeris glabra</i>	1	11.7	2	30
	LUNA3-L	<i>Lupinus nanus</i>	1	4.7	2	7
	TRERE2-L	<i>Triphysaria eriantha ssp. eriantha</i>	1	0.2	0.2	0.2
	AICA-L	<i>Aira caryophyllea</i>	0.7	2.3	1	6
	CLPUQ-L	<i>Clarkia purpurea ssp. quadrivulnera</i>	0.7	0.7	1	1
	ERBO-L	<i>Erodium botrys</i>	0.7	3.3	3	7
	GAPA5-L	<i>Galium parisiense</i>	0.7	1.3	2	2
	LACA7-L	<i>Lasthenia californica</i>	0.7	0.1	0.2	0.2
	LOMI-L	<i>Lotus micranthus</i>	0.7	1.7	0.2	5
	LOMU-L	<i>Lolium multiflorum</i>	0.7	6.1	0.2	18
	PAPU10-L	<i>Parvisedum pumilum</i>	0.7	0.1	0.2	0.2
	TRHI4-L	<i>Trifolium hirtum</i>	0.7	3.4	0.2	10
	TRMI4-L	<i>Trifolium microcephalum</i>	0.7	7	1	20
	TRWI3-L	<i>Trifolium willdenovii</i>	0.7	0.4	0.2	1
	VUMI-L	<i>Vulpia microstachys</i>	0.7	0.1	0.2	0.2
	AVBA-L	<i>Avena barbata</i>	0.3	0.1	0.2	0.2
	BRDI2-L	<i>Brachypodium distachyon</i>	0.3	0.1	0.2	0.2
	BRDI3-L	<i>Bromus diandrus</i>	0.3	6.7	20	20
	CALA68-L	<i>Castilleja lacera</i>	0.3	0.1	0.2	0.2
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.3	0.1	0.2	0.2
	DAPU3-L	<i>Daucus pusillus</i>	0.3	1.3	4	4
	ERNUP4-L	<i>Eriogonum nudum var. pubiflorum</i>	0.3	0.1	0.2	0.2
	GITR2-L	<i>Gilia tricolor</i>	0.3	0.1	0.2	0.2
	HOMUL-L	<i>Hordeum murinum ssp. leporinum</i>	0.3	0.1	0.2	0.2
	LENE3-L	<i>Lessingia nemaclada</i>	0.3	0.1	0.2	0.2
	LENI-L	<i>Lepidium nitidum</i>	0.3	0.1	0.2	0.2
	LICI-L	<i>Linanthus ciliatus</i>	0.3	0.1	0.2	0.2
	LIMO-L	<i>Linanthus montanus</i>	0.3	0.1	0.2	0.2
	LOPU3-L	<i>Lotus purshianus</i>	0.3	0.1	0.2	0.2
	LOWR2-L	<i>Lotus wrangelianus</i>	0.3	0.1	0.2	0.2
	LUST2-L	<i>Lupinus stiversii</i>	0.3	0.1	0.2	0.2
	MICAC2-L	<i>Micropus californicus var. californicus</i>	0.3	0.1	0.2	0.2
	NAPU2-L	<i>Navarretia pubescens</i>	0.3	0.1	0.2	0.2
	PLAGI-L	<i>Plagiobothrys</i>	0.3	0.1	0.2	0.2
	RUCR-L	<i>Rumex crispus</i>	0.3	0.1	0.2	0.2
	SIDI-L	<i>Sidalcea diploscypha</i>	0.3	0.1	0.2	0.2

**Bromus hordeaceus-Lupinus nanus-Trifolium spp.**

Layer	Code	Species Name	Freq	Avg	Min	Max
	SIMA3-L	<i>Silybum marianum</i>	0.3	0.1	0.2	0.2
	TRAL5-L	<i>Trifolium albopurpureum</i>	0.3	0.3	1	1
	TRDET-L	<i>Trifolium depauperatum</i> <i>var. truncatum</i>	0.3	2.3	7	7
	TRDU2-L	<i>Trifolium dubium</i>	0.3	0.7	2	2
	TRHY3-L	<i>Triteleia hyacinthina</i>	0.3	0.1	0.2	0.2
	TRLA16-L	<i>Triteleia laxa</i>	0.3	0.1	0.2	0.2
	VIVI-L	<i>Vicia villosa</i>	0.3	0.7	2	2
	VUMY-L	<i>Vulpia myuros</i>	0.3	0.1	0.2	0.2
<b>Cryptogam</b>						
	LICHEN-L	Lichen	0.3	0.1	0.2	0.2
	MOSS-L	Moss	0.3	0.1	0.2	0.2

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***Bromus hordeaceus*-*Vicia villosa*-*Lolium multiflorum*-*Trifolium hirtum* Association (new provisional)**

**Soft Brome - Winter Vetch - Italian Ryegrass - Rose Clover Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Bromus hordeaceus*-*Vicia villosa*-*Lolium multiflorum*-*Trifolium hirtum* form an intermittent to continuous herbaceous layer (65-95%, mean 79.3%) at 01-1m tall. Total vegetation cover is 65-95%, mean cover is 79.3%.

In this association, the herbaceous layer consists of a majority of non-native species such as *Bromus hordeaceus*, *Trifolium hirtum*, *Vicia villosa*, and *Lolium multiflorum*, which exhibit greatest abundance usually as co-dominants. Occasionally occurring non-natives are *Vicia sativa* subsp. *nigra*, *Avena fatua*, *Erodium botrys*, *Bromus diandrus*, *Carduus pycnocephalus*, and *Hypochaeris glabra*. Native species are frequently to occasionally occurring and low in abundance, including *Amsinckia menziesii* var. *intermedia*, *Brodiaea elegans*, and *Trifolium microcephalum*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 673-1607 ft, mean 1257 ft

Aspect: variable but often SW

Slope: gentle to somewhat steep, range 2-23 degrees, mean 12.6 degrees

Topography: lower slope to ridge top; linear or convex

Litter Cover: range 9.5-75%, mean 47.1%

Rock Cover: range 0.4-38%, mean 14.5%

Bare Ground: range 0-30%, mean 12.3%

Parent Material: more often metavolcanic, occasionally metamorphic, volcanic flow, or serpentine

Soil Texture: more often moderately coarse sandy loam, occasionally medium loam or moderately fine clay loam

Stands primarily occur in SE and SW portions of the study area on variable parent material (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California).

**Number of Samples Used in Description: 7**

**Samples:** APEOR022, APEOR031, APEOR033, APEOR036, APEOR049, APEOR203, APEOR206

**Rank:** G4 S4 (not a strictly native community, but some native forbs occur in the stand)

**GLOBAL DISTRIBUTION**

*Bromus hordeaceus* Alliance: North Coast Range, north Central Coast (Santa Clara County), southern Central Coast (San Benito County, personal observation), Sacramento Valley, Outer Central Coast (San Mateo County), Central Valley (Merced County, personal observation).

*Association:* potentially the Sierra Nevada Foothills region and the Coast Ranges of California.

**REFERENCES**

Evens and San 2004, Jimerson et al. 2000, Hobbs and Mooney 1991, CDFG 2000.

**RESTORATION INFORMATION**

This association has extremely high non-native plant cover (average 97.4%) relative to native cover. Non-native species with highest cover include annual grasses *Bromus hordeaceus* and *Lolium multiflorum*. Non-native forbs with the highest cover include *Trifolium hirtum* and *Vicia villosa*. *Carduus pycnocephalus* and *Centaurea solstitialis* occur between 2% and 4% cover, respectively. *C. melitensis* also occurs at less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts within this association include low to high impact from grazing, dam/inundation, and road/trail construction. Thus, stands appear to have moderately significant impacts, which may contribute to unnatural soil and hydrologic modification and may act as conduits for non-native species. Thus, it is

recommended to reduce road/hydrologic disturbance and close/restore unneeded roads to deter any additional spread of non-natives.

***Bromus hordeaceus-Vicia villosa-Lolium multiflorum-Trifolium hirtum***

Layer	Code	Species Name	Freq	Avg	Min	Max
Herb	BRHO2-L	<i>Bromus hordeaceus</i>	1	37.1	10	68
	AMMEI2-L	<i>Amsinckia menziesii</i> var. <i>intermedia</i>	0.9	0.2	0.2	0.2
	TRHI4-L	<i>Trifolium hirtum</i>	0.9	19.3	0.2	58
	BRDI3-L	<i>Bromus diandrus</i>	0.7	3.6	0.2	20
	BREL-L	<i>Brodiaea elegans</i>	0.7	0.1	0.2	0.2
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.7	2.2	0.2	8
	HYGL2-L	<i>Hypochaeris glabra</i>	0.7	1.2	0.2	6
	LOMU-L	<i>Lolium multiflorum</i>	0.7	13.2	0.2	45
	VIVI-L	<i>Vicia villosa</i>	0.7	15.3	7	53
	ERBO-L	<i>Erodium botrys</i>	0.6	2.3	0.2	15
	TRMI4-L	<i>Trifolium microcephalum</i>	0.6	0.1	0.2	0.2
	AGHE2-L	<i>Agoseris heterophylla</i>	0.4	0.1	0.2	0.2
	AVFA-L	<i>Avena fatua</i>	0.4	2.9	1	18
	BRDI2-L	<i>Brachypodium distachyon</i>	0.4	1.3	0.2	8
	BRMA3-L	<i>Bromus madritensis</i>	0.4	0.7	0.2	4
	CEME2-L	<i>Centaurea melitensis</i>	0.4	0.5	0.2	2
	ERCI6-L	<i>Erodium cicutarium</i>	0.4	0.1	0.2	0.2
	GAPA5-L	<i>Galium parisiense</i>	0.4	0.8	0.2	5
	MAGR3-L	<i>Madia gracilis</i>	0.4	0.1	0.2	0.2
	PLNO-L	<i>Plagiobothrys nothofulvus</i>	0.4	0.1	0.2	0.2
	VISAN2-L	<i>Vicia sativa</i> ssp. <i>nigra</i>	0.4	5.8	0.2	40

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**Carex nudata Alliance (no association determined)  
Naked Sedge (or Torrent Sedge) Alliance**

**GENERAL VEGETATION DESCRIPTION**

One stand of *Carex nudata* was recorded with a continuous herbaceous layer (around 85% cover) at 0.5-1m tall. The shrub layer is open (1-5%) at 1-5m tall. Trees may occur as an emergent layer (1-5% cover) with hardwoods at 5-10m tall. Total vegetation cover is around 90%.

In this association, the herbaceous layer is dominated by *Carex nudata*; however, *Carex* may co-dominate with other graminoid or herb species such as *Typha domingensis*, *Paspalum dilatatum*, and *Stachys stricta*. An open overstory shrub and tree layer may include *Quercus douglasii* and *Salix laevigata*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: 790 ft

Aspect: None

Slope: Flat, 0 degrees

Topography: Bottom riparian; concave or depression

Litter Cover: 0.5%

Rock Cover: 55%

Bare Ground: 25%

Parent Material: Mesozoic plutonic rock and potentially serpentine

Soil Texture: Moderately coarse sandy loam

This is a riparian stand found in a wet seep in the SW portion of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California), just S of the correctional facility. Most of the stand is herbaceous, but some *Salix laevigata* trees are present in a portion of the stand.

**Number of Samples Used in Description: 1**

**Sample:** PEOR104

**Rank:** G3 S3? Known from localized stream corridors in the Sierra Nevada foothills, though full distribution not well-known

**GLOBAL DISTRIBUTION**

*Carex nudata Alliance*: southern to northern Sierra Foothills up to 4000 ft in small stands (usually less than 150 ft) along streams and rivers. It also potentially occurs in the Central to Northern Coast Ranges to the Klamath Mountains.

*Association*: unknown

**REFERENCES**

UCB 2004, Potter 2003

**RESTORATION INFORMATION**

This association has low non-native plant cover (average 16.7%) relative to native cover. Non-native species with highest cover include the annual grass *Lolium multiflorum* and the perennial grass, *Paspalum dilatatum*. No noxious weed species occurred within the stands, so there are no restoration recommendations. Other site impacts were minimal.

**Carex nudata**

Layer	Code	Species	SpeciesName	Freq	Avg	Min	Max
<b>Tree Overstory</b>							
	SALA3-T		<i>Salix laevigata</i>	1	1	1	1
<b>Tree Understory</b>							
	QUDO-M		<i>Quercus douglasii</i>	1	0.2	0.2	0.2
<b>Herb</b>							
	ASFA-L		<i>Asclepias fascicularis</i>	1	0.2	0.2	0.2
	BRMA3-L		<i>Bromus madritensis</i>	1	0.2	0.2	0.2
	CANU5-M		<i>Carex nudata</i>	1	35	35	35
	CYER-L		<i>Cyperus eragrostis</i>	1	0.2	0.2	0.2
	EPDE4-L		<i>Epilobium densiflorum</i>	1	0.2	0.2	0.2
	JUEF-M		<i>Juncus effusus</i>	1	0.2	0.2	0.2
	LASE-L		<i>Lactuca serriola</i>	1	0.2	0.2	0.2
	LOMU-L		<i>Lolium multiflorum</i>	1	4	4	4
	LOPU3-L		<i>Lotus purshianus</i>	1	0.2	0.2	0.2
	MIFL2-L		<i>Mimulus floribundus</i>	1	0.2	0.2	0.2
	PADI3-L		<i>Paspalum dilatatum</i>	1	7	7	7
	POMO5-L		<i>Polypogon monspeliensis</i>	1	0.2	0.2	0.2
	RUCO2-L		<i>Rumex conglomeratus</i>	1	0.2	0.2	0.2
	RUCR-L		<i>Rumex crispus</i>	1	0.2	0.2	0.2
	STST-L		<i>Stachys stricta</i>	1	18	18	18
	TRRU-L		<i>Trichostema rubisepalum</i>	1	0.2	0.2	0.2
	TYDO-M		<i>Typha domingensis</i>	1	6	6	6
	VUMY-L		<i>Vulpia myuros</i>	1	0.2	0.2	0.2
	XAST-L		<i>Xanthium strumarium</i>	1	0.2	0.2	0.2

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***Carex serratodens*-*Hordeum brachyantherum*-*Juncus bufonius* Association (new provisional)  
Twotooth Sedge - Meadow Barley - Toad Rush Association**

**GENERAL VEGETATION DESCRIPTION**

One stand of *Carex serratodens*-*Hordeum brachyantherum*-*Juncus bufonius* forms a continuous herbaceous layer (80%) at 0.5-1m tall. No trees or shrubs occurred in the overstory. Total vegetation cover is 80%.

In this association, *Carex serratodens* dominates or it co-dominates with other native, graminoid species such as *Hordeum brachyantherum* and *Juncus bufonius*. The herbaceous layer is relatively simple, with common wetland species such as *Mimulus guttatus*, *Sisyrinchium bellum*, and *Deschampsia danthonioides*. Shrub and tree layers are absent.

**ENVIRONMENTAL DESCRIPTION**

Elevation: 1128 ft

Aspect: NW

Slope: gentle, range 1-4 degrees, mean 3 degrees

Topography: Edge of basin/ wetland; concave or depression

Litter Cover: 6%

Rock Cover: 48.2%

Bare Ground: 24%

Parent Material: Serpentine

Soil Texture: unknown

This stand occurs in a saturated, V-shaped seep in the SW portion of the study area on serpentine (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California), which has seasonal flooding and a flowing stream between upland grasslands. The stand is just north of the BOR boundary fence in the Peoria Flat Wildlife Area. All non-native species occur in one small patch along fence. Presence of cattle is apparent both within and outside of the fence, with hoof prints evident.

**Number of Samples Used in Description: 1**

**Sample:** PEOR010

**Rank:** G3 S3? Stands have been observed from localized stream corridors in the Sierra Nevada foothills, Central Coast Ranges and North Coast Ranges, though full distribution not well known

**GLOBAL DISTRIBUTION**

*Alliance and association:* possibly occur in other locations on serpentine in the Sierra Foothills and Central and North Coast Ranges, California. For example, CNPS surveys in the North Coast Ranges include the *Carex serratodens* and *Hordeum brachyantherum* in riparian, serpentine stands.

**REFERENCES**

CNPS unpublished surveys

**RESTORATION INFORMATION**

This association has low non-native plant cover (average 0.2%) relative to native cover. No noxious weed species occur within the stand, so there are no restoration recommendations. Trampling by cattle may be responsible for a small presence of exotics on the edge of the stand that are along a fence; thus, efforts should be made to keep cattle at a further distance from the stand while being careful not to mediate more weed spread in the area.

**Carex serratodens-Hordeum brachyantherum-Juncus bufonius**

Layer	Species	SpeciesName	Freq	Avg	Min	Max
<b>Herb</b>						
	ALLIU-L	<i>Allium</i> sp.	1	1	1	1
	CASE2-L	<i>Carex serratodens</i>	1	60	60	60
		<i>Deschampsia</i>				
	DEDA-L	<i>danthonioides</i>	1	0.2	0.2	0.2
	HERBAC-L	Herbaceous unknown	1	5	5	5
		<i>Hordeum</i>				
	HOBR2-L	<i>brachyantherum</i>	1	7	7	7
	JUBU-L	<i>Juncus bufonius</i>	1	5	5	5
	LOPU3-L	<i>Lotus purshianus</i>	1	0.2	0.2	0.2
	MIGU-L	<i>Mimulus guttatus</i>	1	2	2	2
	SIBE-L	<i>Sisyrinchium bellum</i>	1	1	1	1
<b>Cryptogam</b>						
	MOSS-L	Moss	1	0.2	0.2	0.2



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***Eleocharis macrostachya*-*Sagittaria montevidensis*-*Paspalum distichum* Association (new provisional)**

**Pale Spikerush - Hooded Arrowhead - Knotgrass Association**

**GENERAL VEGETATION DESCRIPTION**

One stand of *Eleocharis macrostachya*-*Sagittaria montevidensis*-*Paspalum distichum* forms an intermittent herbaceous layer (45-45%, mean 45%) at 01-0.5m tall, where *Eleocharis macrostachya* dominates. No trees or shrubs occurred in the overstory. Total vegetation cover is about 45%.

This is a wetland association with a simple herbaceous layer is dominated by *Eleocharis macrostachya*. Other wetland species include *Sagittaria montevidensis* subsp. *calycina*, *Paspalum distichum*, *Crypsis vaginiflora*, *Alisma plantago-aquatica* subsp. *subcordatum*, *Gnaphalium palustre*, *Gratiola ebracteata*, and *Polypogon monspeliensis*. Shrub and tree species are not present.

**ENVIRONMENTAL DESCRIPTION**

Elevation: 1416 ft

Aspect: None

Slope: Flat; 0 degrees

Topography: Pond at middle 1/3 of slope; concave or depression

Litter Cover: 1.4%

Rock Cover: 1.7%

Bare Ground: 74.2%

Parent Material: metavolcanic/alluvium

Soil Texture: Moderately fine sandy clay loam to fine sandy clay

The stand occurs in a wetland band surrounding a small man-made pond in the center of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California). The band of vegetation varies between 3-8 m wide, and it is bordered by upland annual grassland. The open water is approximately 1/4 acre, which is a stock pond with a fence surrounding it. Stands of *Eleocharis macrostachya* usually occur in sites with permanent flooding or saturation, sometimes seasonally flooded or saturated, such as shallow lake margins, ponds, and depressions in meadow systems.

**Number of Samples Used in Description: 1**

**Sample:** PEOR081

**Rank:** G3 S3? Potentially in other localized lake/pond margins and wet meadow depression in the Sierra Nevada foothills and beyond.

**GLOBAL DISTRIBUTION**

*Eleocharis macrostachya* Alliance: Found from the Southern California Peninsular Range (W Riverside County) to the Central Coast (San Benito County, personal observation) and Sierra foothills to upper montane zone in wetland areas such as pooling seeps and creeks.

Association: unknown

**REFERENCES**

Klein and Evens In publication. Potter 2003

**RESTORATION INFORMATION**

This association has low non-native plant cover (average 11.9%) relative to native cover. Non-native species with highest cover mainly include annual grass, *Polypogon monspeliensis* and *Crypsis vaginiflora*. No noxious weed species occurred within the stand, so there are no restoration recommendations. Other site impacts were minimal, but do include bullfrogs (*Buto boreas*), which should be removed.

***Eleocharis macrostachya-Sagittaria montevidensis-Paspalum distichum***

Layer Herb	Code	Species Name	Freq	Avg	Min	Max
	ALPLS-L	<i>Alisma plantago-aquatica</i> ssp. <i>subcordatum</i>	1	0.2	0.2	0.2
	CRVA2-L	<i>Crypsis vaginiflora</i>	1	0.2	0.2	0.2
	ECCR-L	<i>Echinochloa crus-galli</i>	1	0.2	0.2	0.2
	ELMA5-L	<i>Eleocharis macrostachya</i>	1	45	45	45
	GNPA-L	<i>Gnaphalium palustre</i>	1	1	1	1
	GREB-L	<i>Gratiola ebracteata</i>	1	0.2	0.2	0.2
	LYHY2-L	<i>Lythrum hyssopifolia</i>	1	0.2	0.2	0.2
	PADI6-L	<i>Paspalum distichum</i>	1	3	3	3
	PLST-L	<i>Plagiobothrys stipitatus</i>	1	0.2	0.2	0.2
	POLYG4-L	<i>Polygonum</i>	1	0.2	0.2	0.2
	POMO5-L	<i>Polypogon monspeliensis</i>	1	1	1	1
	POOL-L	<i>Portulaca oleracea</i>	1	0.2	0.2	0.2
	RUCO2-L	<i>Rumex conglomeratus</i>	1	0.2	0.2	0.2
	SAMOC2-L	<i>Sagittaria montevidensis</i> ssp. <i>calycina</i>	1	1	1	1
	VEPEX2-L	<i>Veronica peregrina</i> ssp. <i>xalapensis</i>	1	0.2	0.2	0.2

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***Hordeum brachyantherum*-*Polypogon monspeliensis*-*Juncus oxymeris* Association (new provisional)**

**Meadow Barley - Annual Beard Grass - Pointed rush Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Hordeum brachyantherum*-*Polypogon monspeliensis*-*Juncus oxymeris* form a continuous herbaceous layer (50-95%, mean 71.7%) at 01-0.5m tall. The shrub and tree layers are basically absent. Total vegetation cover is 50-95%, mean cover is 71.7%.

In this association, the herbaceous layer is dominated to co-dominated by graminoid species, including *Polypogon monspeliensis*, *Hordeum brachyantherum*, and *Juncus oxymeris*. A variety of other native species characteristically occur in the stands, including *Lotus purshianus*, *Helianthella californica*, *Hemizonia fitchii*, *Mimulus guttatus*, *Trifolium willdenovii*, and *Triteleia hyacinthina*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 869-908 ft, mean 883 ft

Aspect: SE

Slope: flat, 0 degrees, mean 0 degrees

Topography: bottom slope; concave or linear

Litter Cover: range 5-65%, mean 38.3%

Rock Cover: range 0.2-30%, mean 10.4%

Bare Ground: range 5-74%, mean 28%

Parent Material: plutonic, potentially serpentine

Soil Texture: coarse loamy sand, moderately fine silty clay loam

Stands occur in the SW portion of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California). They are in shallow stream courses that are dry by mid-summer and that are surrounded by upland grasslands; thus, they contain a mixture of both upland and wetland species.

**Number of Samples Used in Description: 3**

**Samples:** APEOR105, APEOR205, APEOR284

**Rank:** G3 S3? Difficult to rank, as more data are needed

**GLOBAL DISTRIBUTION**

*Hordeum brachyantherum* Alliance: Western States from Alaska to New Mexico

Association: potentially other serpentine riparian settings in the Sierra Nevada and Coast Ranges of California

Association: unknown

**REFERENCES**

Smith 1998

**RESTORATION INFORMATION**

This association has moderate non-native plant cover (average 39%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Polypogon monspeliensis*, *Hordeum murinum* subsp. *leporinum* and *Lolium multiflorum*. *Cynodon dactylon* occurred in two of three stands sampled at 1.3% average cover, and *Carduus pycnocephalus* occurred in one stand at less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references). Grazing had high impact on one stand sampled, particularly just outside of the BOR boundary fence, including significant impact to the *Juncus* and *Sisyrinchium bellum*.

***Hordeum brachyantherum*-*Polypogon monspeliensis*-*Juncus oxymeris***

Layer	Code	Species Name	Freq	Avg	Min	Max
Herb						
	HECA-L	<i>Helianthella californica</i>	1	1.1	0.2	2
	HEFI-L	<i>Hemizonia fitchii</i>	1	0.7	0.2	1
	HOB2-L	<i>Hordeum brachyantherum</i>	1	6.1	0.2	15
	LOPU3-L	<i>Lotus purshianus</i>	1	7.4	0.2	20
	MIGU-L	<i>Mimulus guttatus</i>	1	0.5	0.2	1
	POMO5-L	<i>Polypogon monspeliensis</i>	1	20.7	10	30
	TRHY3-L	<i>Triteleia hyacinthina</i>	1	0.2	0.2	0.2
	TRWI3-L	<i>Trifolium willdenovii</i>	1	0.5	0.2	1
	JUOX-L	<i>Juncus oxymeris</i>	0.7	20	10	50
	CYDA-L	<i>Cynodon dactylon</i>	0.7	1.3	2	2
	LOMU-L	<i>Lolium multiflorum</i>	0.7	4	2	10
	JUBU-L	<i>Juncus bufonius</i>	0.7	2	1	5
	TRRU-L	<i>Trichostema rubisepalum</i>	0.7	1.7	0.2	5
	HOMUL-L	<i>Hordeum murinum</i> ssp. <i>leporinum</i>	0.3	3.3	10	10
	SIBE-L	<i>Sisyrinchium bellum</i>	0.3	2.3	7	7
	BRHO2-L	<i>Bromus hordeaceus</i>	0.3	0.7	2	2
	STST-L	<i>Stachys stricta</i>	0.3	0.7	2	2
	MAGR3-L	<i>Madia gracilis</i>	0.3	0.3	1	1
	POA-L	<i>Poa</i>	0.7	0.1	0.2	0.2
	AICA-L	<i>Aira caryophylla</i>	0.3	0.1	0.2	0.2
	ALGAE-L	Algae	0.3	0.1	0.2	0.2
	BLOOM-L	<i>Bloomeria</i>	0.3	0.1	0.2	0.2
	BRMI2-L	<i>Briza minor</i>	0.3	0.1	0.2	0.2
	CAPY2-L	<i>Carduus pycnocephalus</i>	0.3	0.1	0.2	0.2
	CAREX-L	<i>Carex</i>	0.3	0.1	0.2	0.2
	CASTI2-L	<i>Castilleja</i>	0.3	0.1	0.2	0.2
	CENTA2-L	<i>Centaurium</i>	0.3	0.1	0.2	0.2
	GAVE3-L	<i>Gastridium ventricosum</i>	0.3	0.1	0.2	0.2
	RAMU2-L	<i>Ranunculus muricatus</i>	0.3	0.1	0.2	0.2
	RUCR-L	<i>Rumex crispus</i>	0.3	0.1	0.2	0.2
	STVI2-L	<i>Stephanomeria virgata</i>	0.3	0.1	0.2	0.2

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***Juncus balticus* Alliance (no association determined)  
Baltic Rush Association**

**GENERAL VEGETATION DESCRIPTION**

One stand of *Juncus balticus* (association unknown) forms a continuous herbaceous layer (about 95% cover) at 0.5-1m tall. The shrub and tree layers are basically absent. Total vegetation cover is 95%.

In this association, the herbaceous layer is moderately diverse, and it is dominated by *Juncus balticus*. Non-native species may co-dominate with the native *Juncus*, including *Lolium multiflorum* and *Bromus hordeaceus*. A variety of other wetland and upland herbs also occur in the stand at lower cover, including *Carduus pycnocephalus*, *Juncus effusus*, *Cynodon dactylon*, *Cyperus eragrostis*, etc.

**ENVIRONMENTAL DESCRIPTION**

Elevation: 915 ft  
Aspect: unknown  
Slope: 1 degree  
Topography: lower slope; convex or rounded  
Litter Cover: 60%  
Rock Cover: 0.4%  
Bare Ground: 10%  
Parent Material: alluvium  
Soil Texture: Fine silty clay

Stand occurs in the NW portion of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California) in a temporarily saturated seep that is surrounded by upland grassland. Dryland species are particularly found on the edge of the wet soil including *Lolium multiflorum*, and *Juncus balticus* or *Carduus pycnocephalus* dominate in the most saturated soils.

**Number of Samples Used in Description: 1**

**Samples:** APEOR106

**Rank:** G5 S4

**GLOBAL DISTRIBUTION**

*Juncus balticus* Alliance: Across California in moderately alkaline, temporarily saturated to inundated wetlands from the Great Basin to the Coast Ranges, including the Central Valley and Suisun Marsh.

**REFERENCES**

CDFG 2000, Sawyer and Keeler-Wolf 1995

**RESTORATION INFORMATION**

This association has high non-native plant cover (average 52.7%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Lolium multiflorum* and *Bromus hordeaceus*. *Centaurea solstitialis* and *Carduus pycnocephalus* occur within the stand at a cover of 4-5%, and *Cynodon dactylon* was also present but at less than 1% (see Appendix 2 and Pages 16-18 for restoration references). Evidence of grazing has a moderate impact on the stand, and an historic cement cattle trough occurs in the center of the stand. A portion of the stand is fenced though the seep extends beyond fence.

**Juncus balticus**

Layer	Code	Species Name	Freq	Avg	Min	Max
Herb						
	BRHO2-L	<i>Bromus hordeaceus</i>	1	5	5	5
	BRMA3-L	<i>Bromus madritensis</i>	1	0.2	0.2	0.2
	BRMI2-L	<i>Briza minor</i>	1	0.2	0.2	0.2
	CAPY2-L	<i>Carduus pycnocephalus</i>	1	4	4	4
	CENTA2-L	<i>Centaurium</i>	1	0.2	0.2	0.2
	CESO3-L	<i>Centaurea solstitialis</i>	1	5	5	5
	CYDA-L	<i>Cynodon dactylon</i>	1	0.2	0.2	0.2
	CYER-L	<i>Cyperus eragrostis</i>	1	0.2	0.2	0.2
	ERBO-L	<i>Erodium botrys</i>	1	0.2	0.2	0.2
	GAVE3-L	<i>Gastidium ventricosum</i>	1	0.2	0.2	0.2
	GEDI-L	<i>Geranium dissectum</i>	1	0.2	0.2	0.2
	GNLU-L	<i>Gnaphalium luteo-album</i>	1	0.2	0.2	0.2
	HOMAG-L	<i>Hordeum marinum ssp. gussoneanum</i>	1	0.2	0.2	0.2
	JUBA-L	<i>Juncus balticus</i>	1	40	40	40
	JUEF-M	<i>Juncus effusus</i>	1	0.2	0.2	0.2
	LASE-L	<i>Lactuca serriola</i>	1	0.2	0.2	0.2
	LOMU-L	<i>Lolium multiflorum</i>	1	30	30	30
	PADI6-L	<i>Paspalum distichum</i>	1	0.2	0.2	0.2
	POMO5-L	<i>Polypogon monspeliensis</i>	1	0.2	0.2	0.2
	RUCR-L	<i>Rumex crispus</i>	1	0.2	0.2	0.2
	STVI2-L	<i>Stephanomeria virgata</i>	1	0.2	0.2	0.2

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***Lolium multiflorum*-*Hordeum marinum*-*Ranunculus californicus* Association (new provisional)  
Italian Ryegrass - Mediterranean Barley - California Buttercup Association**

**GENERAL VEGETATION DESCRIPTION**

The stand of *Lolium multiflorum*-*Hordeum marinum*-*Ranunculus californicus* forms a continuous herbaceous layer (85-85%, mean 85%) at 01-0.5m tall. The shrub layer is absent to sparse (0.2%) at 1-5m tall. Trees are absent. Total vegetation cover is 85%.

In this association, the herbaceous layer is moderately diverse, whereby *Ranunculus californicus*, *Lolium multiflorum*, *Hordeum marinum* co-dominate. Other upland and wetland species occur in the stand, including *Trifolium dubium*, *Trifolium willdenovii*, *Allium* sp., *Asclepias fascicularis*, *Anagallis arvensis*, and *Phalaris aquatica*. *Sambucus mexicana* is present on the edge of the stand.

**ENVIRONMENTAL DESCRIPTION**

Elevation: 965 ft  
Aspect: SW  
Slope: 4 degrees  
Topography: bottom riparian, linear  
Litter Cover: 28%  
Rock Cover: range 0.6%  
Bare Ground: range 42%  
Parent Material: serpentine  
Soil Texture: fine sandy clay

Stand occurs in the S-center of the study area at the bottom of a drainage that runs E to W (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California) in the on serpentine. A seasonal creek borders the south side of the stand.

**Number of Samples Used in Description: 1**

**Samples:** APEOR016

**Rank:** G3 S3? Difficult to rank, but it is potentially localized along riparian borders in foothills of California

**GLOBAL DISTRIBUTION**

*Lolium multiflorum* Alliance: Commonly found in California within lowlands that have periodic flooding such as Suisun Marsh and Elkhorn Slough, within disked fields and managed uplands, and within coastal serpentine slopes that have well-developed clay soils with nitrogen deposition. May extend into Alaska and eastern North America, while it is native to Europe.

*Association:* unknown

**REFERENCES**

CDFG 2000, UCB 2004

**RESTORATION INFORMATION**

This association has moderate non-native plant cover (average 39.8%) relative to native cover. Non-native species with highest cover mainly include the annual grass, *Lolium multiflorum* and *Hordeum marinum* subsp. *gussoneanum*, and the annual forb, *Trifolium dubium*. *Phalaris aquatica* occurs within this association at a cover of less than 1% (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts were minimal, but the power lines occurring at the bottom of the stand may have compacted the soil and may be a conduit for non-native species.

***Lolium multiflorum-Hordeum marinum-Ranunculus californicus***

Layer	Code	Species Name	Freq	Avg	Min	Max
Herb						
	ALLIU-L	<i>Allium</i>	1	2	2	2
	ANAR-L	<i>Anagallis arvensis</i>	1	4	4	4
	ASFA-L	<i>Asclepias fascicularis</i>	1	0.2	0.2	0.2
	ASTEXX-L	<i>Asteraceae</i>	1	0.2	0.2	0.2
	BRMI2-L	<i>Briza minor</i>	1	0.2	0.2	0.2
	HOMAG-L	<i>Hordeum marinum ssp. gussoneanum</i>	1	52	52	52
	HYGL2-L	<i>Hypochaeris glabra</i>	1	2	2	2
	LETAL-L	<i>Leontodon taraxacoides ssp. longirostris</i>	1	1	1	1
	LOMU-L	<i>Lolium multiflorum</i>	1	40	40	40
	LOPU3-L	<i>Lotus purshianus</i>	1	2	2	2
	PHAQ-L	<i>Phalaris aquatica</i>	1	0.2	0.2	0.2
	RACA2-L	<i>Ranunculus californicus</i>	1	20	20	20
	RUCR-L	<i>Rumex crispus</i>	1	0.2	0.2	0.2
	SIBE-L	<i>Sisyrinchium bellum</i>	1	0.2	0.2	0.2
	SOOL-L	<i>Sonchus oleraceus</i>	1	0.2	0.2	0.2
	TRDU2-L	<i>Trifolium dubium</i>	1	6	6	6
	TRHI4-L	<i>Trifolium hirtum</i>	1	0.2	0.2	0.2
	TRWI3-L	<i>Trifolium willdenovii</i>	1	5	5	5



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***Selaginella hansenii*-Moss-*Streptanthus tortuosus*/*Mimulus aurantiacus* Association (new provisional)**

**Hansen's Spikemoss - Moss - Shieldplant / Bush Monkeyflower Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Selaginella hansenii*-Moss-*Streptanthus tortuosus*/*Mimulus aurantiacus* Shrubland form a sparse to open shrub layer (1-11%, mean 6%). *Selaginella hansenii*, Moss, and *Streptanthus tortuosus* co-dominate in the cryptogram and herb layers. Shrubs occasionally occur in two different strata, with low shrubs at 0.5-1m tall and tall shrubs at 0-2m tall. The herbaceous layer is open to intermittent (10-55%, mean 32.5%) at 0.1-0.5m tall. Trees infrequently occur in the emergent layer (0-0.4% cover, mean 0.2%) with conifers at 0-10m tall and hardwoods at 0-5m tall. Total vegetation cover is 22-55%, mean cover is 38.5%.

In this association, *Selaginella hansenii* and Moss are dominant cryptogamic components. An infrequent overstory of tree species includes *Quercus wislizeni*, *Pinus sabiniana*, and *Quercus douglasii*. The overstory is characterized by a sparse shrub layer, particularly *Mimulus aurantiacus*, *Heteromeles arbutifolia*, and *Eriophyllum lanatum* var. *grandiflorum*, which are growing out of rock crevices. The herbaceous layer is sparse and includes grasses and forbs such *Streptanthus tortuosus*, *Vulpia myuros*, *Melica californica*, *Bromus madritensis*, *Bromus hordeaceus*, *Phacelia cicutaria*, and *Pentagramma triangularis* subsp. *triangularis*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 1570-1688 ft, mean 1629 ft

Aspect: variable and NW

Slope: steep to abrupt, range 30-90 degrees, mean 60 degrees

Topography: mid to upper slope; linear or undulating

Litter Cover: range 0.2-0%, mean 0.2%

Rock Cover: range 70.3-98%, mean 84.1%

Bare Ground: range 0.2-0%, mean 0.2%

Parent Material: volcanic flow

Soil Texture: medium to very fine sandy loam or moderately fine silty clay loam

Stands occur on volcanic rock outcrops in the SE portion of the study area on steep to vertical slopes of the Table Mountain (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California).

**Number of Samples Used in Description: 2**

**Samples:** APEOR020, APEOR102

**Rank:** G3 S3? Uncertain due to limited reference information, but probably localized on expansive rock outcrops, such as volcanic table mountains in the Sierra Nevada Foothills.

**GLOBAL DISTRIBUTION**

*Selaginella hansenii* Alliance: being newly defined, potentially occurs in the Central Coast Ranges to the inner North Coast Ranges east to the Sierra Nevada foothills and montane, north to the Cascade Range. Range not well documented

Association: potentially the Sierra Nevada foothills to the Central Coast Ranges and inner North Coast Ranges

**REFERENCES**

UCB 2004

**RESTORATION INFORMATION**

This association has low non-native plant cover (average 4.2%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Vulpia myuros*, *Bromus hordeaceus* and *B.*

*madritensis*. No noxious weed species were recorded within the stands, so there are no restoration recommendations. Other site impacts were minimal.

***Selaginella hansenii*-Moss-*Streptanthus tortuosus*/*Mimulus aurantiacus***

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Tree Understory</b>						
	AECA-M	<i>Aesculus californica</i>	0.5	0.5	1	1
	PISA2-M	<i>Pinus sabiniana</i>	0.5	0.1	0.2	0.2
	QUDO-L	<i>Quercus douglasii</i>	0.5	0.1	0.2	0.2
	QUWI2-M	<i>Quercus wislizeni</i>	0.5	2.5	5	5
<b>Shrub</b>						
	ERLAG-L	<i>Eriophyllum lanatum</i> var. <i>grandiflorum</i>	1	0.6	0.2	1
	HEAR5-M	<i>Heteromeles arbutifolia</i>	1	2.5	1	4
	MIAU-M	<i>Mimulus aurantiacus</i>	1	1.5	1	2
	ARMA-M	<i>Arctostaphylos manzanita</i>	0.5	2	4	4
	KEBR-L	<i>Keckiella breviflora</i>	0.5	0.1	0.2	0.2
	KEBR-M	<i>Keckiella breviflora</i>	0.5	0.5	1	1
	LOSC2-M	<i>Lotus scoparius</i>	0.5	0.1	0.2	0.2
	RHIL-M	<i>Rhamnus ilicifolia</i>	0.5	0.5	1	1
	SYMO-L	<i>Symphoricarpos mollis</i>	0.5	0.1	0.2	0.2
	TODI-M	<i>Toxicodendron</i> <i>diversilobum</i>	0.5	0.1	0.2	0.2
<b>Herb</b>						
	BRHO2-L	<i>Bromus hordeaceus</i>	1	0.6	0.2	1
	BRMA3-L	<i>Bromus madritensis</i>	1	0.6	0.2	1
	CHLOR3-L	<i>Chlorogalum</i>	1	0.2	0.2	0.2
	DICA14-L	<i>Dichelostemma</i> <i>capitatum</i>	1	0.2	0.2	0.2
	ERFOH-L	<i>Erigeron foliosus</i> var. <i>hartwegii</i>	1	0.2	0.2	0.2
	HERBAC-L	Herbaceous unknown	1	0.2	0.2	0.2
	MECA2-L	<i>Melica californica</i>	1	1.1	0.2	2
	PETRT-L	<i>Pentagramma triangularis</i> <i>ssp. triangularis</i>	1	0.6	0.2	1
	PHCI-L	<i>Phacelia cicutaria</i>	1	0.6	0.2	1
	STTOT2-L	<i>Streptanthus tortuosus</i> <i>var. tortuosus</i>	1	2.1	0.2	4
	VUMY-L	<i>Vulpia myuros</i>	1	1.1	0.2	2
	ALPEP2-L	<i>Allium peninsulare</i> var. <i>peninsulare</i>	0.5	0.5	1	1
	AVBA-L	<i>Avena barbata</i>	0.5	0.1	0.2	0.2
	BRDI3-L	<i>Bromus diandrus</i>	0.5	0.1	0.2	0.2
	CACI2-L	<i>Calandrinia ciliata</i>	0.5	0.1	0.2	0.2
	CAPR14-L	<i>Castilleja pruinosa</i>	0.5	0.5	1	1
	CLPE-L	<i>Claytonia perfoliata</i>	0.5	0.1	0.2	0.2
	DAPU3-L	<i>Daucus pusillus</i>	0.5	0.1	0.2	0.2
	DRAR3-L	<i>Dryopteris arguta</i>	0.5	0.1	0.2	0.2
	ERNUP4-L	<i>Eriogonum nudum</i> var. <i>pubiflorum</i>	0.5	1	2	2

***Selaginella hansenii*-Moss-*Streptanthus tortuosus*/*Mimulus aurantiacus***

Layer	Code	Species Name	Freq	Avg	Min	Max
	ESCHS-L	<i>Eschscholzia</i>	0.5	0.1	0.2	0.2
	GAPO-L	<i>Galium porrigens</i>	0.5	0.1	0.2	0.2
	HEAR5-L	<i>Heteromeles arbutifolia</i>	0.5	0.1	0.2	0.2
	HYGL2-L	<i>Hypochaeris glabra</i>	0.5	0.1	0.2	0.2
	LACA7-L	<i>Lasthenia californica</i>	0.5	0.1	0.2	0.2
	LOCA5-L	<i>Lomatium caruifolium</i>	0.5	0.1	0.2	0.2
	LUNA3-L	<i>Lupinus nanus</i>	0.5	0.1	0.2	0.2
	LUST2-L	<i>Lupinus stiversii</i>	0.5	0.1	0.2	0.2
	MAGR3-L	<i>Madia gracilis</i>	0.5	0.1	0.2	0.2
	MAHO-L	<i>Marah horridus</i>	0.5	0.1	0.2	0.2
	MOVIV-L	<i>Monardella villosa</i> ssp. <i>villosa</i>	0.5	0.1	0.2	0.2
	PEMU-L	<i>Pellaea mucronata</i>	0.5	0.1	0.2	0.2
	POLYP-L	<i>Polypodium</i>	0.5	0.1	0.2	0.2
	POSE-L	<i>Poa secunda</i>	0.5	0.5	1	1
	PTDR-L	<i>Pterostegia drymarioides</i>	0.5	0.1	0.2	0.2
	SANIC-L	<i>Sanicula</i>	0.5	0.1	0.2	0.2
	SIGA-L	<i>Silene gallica</i>	0.5	0.1	0.2	0.2
	SOOL-L	<i>Sonchus oleraceus</i>	0.5	0.1	0.2	0.2
	TOAR-L	<i>Torilis arvensis</i>	0.5	0.1	0.2	0.2
	TRLA16-L	<i>Triteleia laxa</i>	0.5	0.1	0.2	0.2
	TRMI4-L	<i>Trifolium microcephalum</i>	0.5	0.1	0.2	0.2
	TRWI3-L	<i>Trifolium willdenovii</i>	0.5	0.1	0.2	0.2
	VUMI-L	<i>Vulpia microstachys</i>	0.5	0.5	1	1
<b>Epiphyte</b>						
	PHVI9-E	<i>Phoradendron villosum</i>	0.5	0.1	0.2	0.2
<b>Cryptogam</b>						
	MOSS-L	Moss	1	23.5	2	45
	SEHA2-L	<i>Selaginella hansenii</i>	1	22.6	0.2	45

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***Stachys stricta*-*Polypogon monspeliensis* Association (new provisional)**  
**Sonoma Hedgenettle - Annual Beard Grass Association**

**GENERAL VEGETATION DESCRIPTION**

This stand of *Stachys stricta*-*Polypogon monspeliensis* forms a continuous herbaceous layer (90%, mean 90%) at 01-0.5m tall. The shrub and tree layers are absent. Total vegetation cover is 90%.

In this association, *Stachys stricta* and *Polypogon monspeliensis* co-dominate in the herbaceous layer with a variety of other species, including *Cyperus eragrostis*, *Asclepias fascicularis*, *Carduus pycnocephalus*, and *Rorippa* sp. No shrubs or trees occur.

**ENVIRONMENTAL DESCRIPTION**

Elevation: 1019 ft  
Aspect: none  
Slope: 0 degrees  
Topography: lower slope, concave  
Litter Cover: range 77%  
Rock Cover: 2%  
Bare Ground: 1%  
Parent Material: metavolcanic  
Soil Texture: moderately fine sandy clay loam

Stand is a small seasonal wetland in the SW portion of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California). The stand is along a NE-SW flowing streambed, which has an historic octagonal cement water trough in center of stand, and a road cuts through the stand whereby the stand south of the road is drier in nature.

**Number of Samples Used in Description:** 1

**Samples:** APEOR216

**Rank:** G3 S3? Difficult to rank, as more data are needed

**GLOBAL DISTRIBUTION**

*Alliance and Association:* Unknown, but potentially in other serpentine and metamorphic riparian habitats in the Sierra Nevada foothills to the Central and North Coast Ranges of California.

**REFERENCES**

**RESTORATION INFORMATION**

This association has high non-native plant cover (average 62.3%) relative to native cover. Non-native species with highest cover mainly included the annual grass *Polypogon monspeliensis*. *Carduus pycnocephalus* occurs at cover of 7% cover, and *Ficus carica* also occurs at less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts were minimal, but included development (cement water trough) and road/trail construction at low intensity, which may contribute to past soil or hydrologic modification and may have acted as conduits for non-native species. Thus, it is recommended to reduce disturbance and close/restore unneeded roads to deter any additional spread of non-natives.

**Stachys stricta-Polypogon monspeliensis**

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Shrub</b>						
	FICA-M	<i>Ficus carica</i>	1	0.2	0.2	0.2
<b>Herb</b>						
	ASFA-L	<i>Asclepias fascicularis</i>	1	7	7	7
	CAPY2-L	<i>Carduus pycnocephalus</i>	1	7	7	7
	CENTA2-L	<i>Centaurium</i>	1	1	1	1
	CYER-L	<i>Cyperus eragrostis</i>	1	10	10	10
	GNLU-L	<i>Gnaphalium luteo-album</i>	1	1	1	1
	HEPU2-L	<i>Helenium puberulum</i>	1	0.2	0.2	0.2
	JUEF-M	<i>Juncus effusus</i>	1	1	1	1
	LOPU3-L	<i>Lotus purshianus</i>	1	0.2	0.2	0.2
	PADI6-L	<i>Paspalum distichum</i>	1	0.2	0.2	0.2
	POMO5-L	<i>Polypogon monspeliensis</i>	1	45	45	45
	RORIP-L	<i>Rorippa</i>	1	3	3	3
	RUCO2-L	<i>Rumex conglomeratus</i>	1	0.2	0.2	0.2
	STST-L	<i>Stachys stricta</i>	1	10	10	10
	TOAR-L	<i>Torilis arvensis</i>	1	0.2	0.2	0.2
	TYDO-M	<i>Typha domingensis</i>	1	0.2	0.2	0.2

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***Trifolium variegatum* Association (provisional new)  
Whitetip Clover Association**

**GENERAL VEGETATION DESCRIPTION**

This stand of *Trifolium variegatum* forms a continuous herbaceous layer (70-70%, mean 70%) at 01-0.5m tall, where *Trifolium variegatum* mainly dominates. No trees or shrubs occurred in the overstory. Total vegetation cover is 70%, mean cover is 70%.

In this association, the herbaceous layer may be diverse with both wetland and upland species. While dominated by *Trifolium variegatum*, other native and non-native herb species include *Glyceria borealis*, *Eleocharis macrostachya*, *Mimulus guttatus*, *Cynodon dactylon*, *Cyperus eragrostis*, *Lolium multiflorum*, and *Polypogon monspeliensis*. Shrub and tree species were not present in the stand, though *Quercus douglasii* and *Quercus wislizeni* are directly adjacent as tree stands.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 1000-1500 ft, mean 1326 ft

Aspect: NE to NW

Slope: gentle to moderate, range 2-5 degrees, mean 3.5 degrees

Topography: middle 1/3 of slope; linear surfaces

Litter Cover: 65%

Rock Cover: 14%

Bare Ground: 3%

Parent Material: marine sedimentary rock, metamorphic, volcanic

Soil Texture: fine sandy clay, fine silty clay

This stand is found in a small wetland/seep with standing water and large rocks (boulders) in the NE portion of the study area (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California). It occurs in an area that is about 5 m wide and 60 m long. Grazing and trampling (e.g., cattle hoofs) are observed. This association is also found in the SE portion on the N-slope up to the Table Mountain on volcanic sediments, in small seeps.

**Number of Samples Used in Description: 1**

**Sample:** PEOR057

**Rank:** G3 S3? Difficult to rank as more data are needed (see below)

**GLOBAL DISTRIBUTION**

*Trifolium variegatum* Alliance: Not known outside of the study area, but potentially in the central and northern Sierra Nevada Foothills. Other small stands of *Trifolium variegatum* have been reported from vernal wet to moist seeps and swales in the Central and North Coast Ranges (Keeler-Wolf pers comm. 2004). More sampling is needed to verify formal types.

**REFERENCES**

UCB 2004.

**RESTORATION INFORMATION**

This association has low non-native plant cover (average 12.3%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Lolium multiflorum*, *Cynodon dactylon* and *Polypogon monspeliensis*. *Carduus pycnocephalus* occurred in the stand at less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts include fence and road/trail construction as low intensity impacts, which may contribute to soil compaction and may act as conduits for non-native species. Thus, it is recommended to reduce road disturbance and close/restore unneeded roads to deter any additional spread of non-natives. Further, grazing has a high impact to the stand (particularly to the native vegetation).

**Trifolium variegatum**

Layer	Code	Species Name	Freq	Avg	Min	Max
Herb						
	AICA-L	<i>Aira caryophylla</i>	1	0.2	0.2	0.2
	ALGAE-L	Algae	1	0.2	0.2	0.2
	BRDI3-L	<i>Bromus diandrus</i>	1	0.2	0.2	0.2
	BRHO2-L	<i>Bromus hordeaceus</i>	1	0.2	0.2	0.2
	BRMI2-L	<i>Briza minor</i>	1	0.2	0.2	0.2
	CAPY2-L	<i>Carduus pycnocephalus</i>	1	0.2	0.2	0.2
	CYDA-L	<i>Cynodon dactylon</i>	1	3	3	3
	CYER-L	<i>Cyperus eragrostis</i>	1	6	6	6
	ELMA5-L	<i>Eleocharis macrostachya</i>	1	6	6	6
	ERSE3-L	<i>Eremocarpus setigerus</i>	1	0.2	0.2	0.2
	GEDI-L	<i>Geranium dissectum</i>	1	0.2	0.2	0.2
	GLBO-L	<i>Glyceria borealis</i>	1	17	17	17
	HOMUL-L	<i>Hordeum murinum</i> ssp. <i>leporinum</i>	1	0.2	0.2	0.2
	LOMU-L	<i>Lolium multiflorum</i>	1	6	6	6
	LYHY2-L	<i>Lythrum hyssopifolia</i>	1	0.2	0.2	0.2
	MIGU-L	<i>Mimulus guttatus</i>	1	0.2	0.2	0.2
	POMO5-L	<i>Polypogon monspeliensis</i>	1	2	2	2
	RAMU2-L	<i>Ranunculus muricatus</i>	1	0.2	0.2	0.2
	RORIP-L	<i>Rorippa</i>	1	0.2	0.2	0.2
	RUCR-L	<i>Rumex crispus</i>	1	0.2	0.2	0.2
	TRVA-L	<i>Trifolium variegatum</i>	1	55	55	55
Cryptogam						
	LICHEN-L	Lichen	1	2	2	2
	MOSS-L	Moss	1	6	6	6

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***Vulpia microstachys*-*Lupinus nanus*-*Selaginella hansenii* Association (provisional new)  
Small Fescue - Sky Lupine - Hansen's Spikemoss Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Vulpia microstachys*-*Lupinus nanus*-*Selaginella hansenii* form an intermittent to continuous herbaceous layer (45-75%, mean 58.3%) at 0.1-0.5m tall. The shrub layer, when present, is sparse (0-2%, mean 0.6%) at 0-2m tall. Total vegetation cover is 45-75%, mean cover is 58.8%.

In this association, the herbaceous layer is diverse, particularly in native species. *Vulpia microstachys*, *Lupinus nanus*, and *Selaginella hansenii* basically co-dominate. Other characteristically occurring herb species include *Hypochaeris glabra*, *Minuartia californica*, and *Dichelostemma capitatum*. An occasional shrub layer includes *Eriodictyon californicum* and *Eriophyllum lanatum* var. *grandiflorum*.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 1636-1754 ft, mean 1711 ft

Aspect: SE or SW

Slope: flat to steep, range 0-40 degrees, mean 10 degrees

Topography: ridge top; linear or convex

Litter Cover: range 0.2-11%, mean 4.2%

Rock Cover: range 27-70%, mean 56.8%

Bare Ground: range 2.8-42%, mean 17%

Parent Material: volcanic flow

Soil Texture: medium to very fine loamy sand, moderately coarse sandy loam, or medium to very fine sandy loam

Stands occur in the SE portion of the study area on the volcanic ridge top expanse of Table Mountain (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California). The stands occur in temporarily wet, rocky meadows that have little soil development.

**Number of Samples Used in Description: 4**

**Samples:** APEOR006, APEOR012, APEOR013, APEOR103

**Rank:** G3 S3?

**GLOBAL DISTRIBUTION**

*Vulpia microstachys* Alliance: North Central Coast (Santa Clara County), Central Valley (personal observation), North Coast Range (personal observation)

Association: potentially across the Sierra Nevada foothills such as on rocky, volcanic substrates and shallow soils

**REFERENCES**

Evens and San 2004

**RESTORATION INFORMATION**

This association has low non-native plant cover (average 5.3%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Bromus hordeaceus*, *B. madritensis* and *Vulpia myuros*. No noxious weed species were recorded within the stands, so there are no restoration recommendations. Other site impacts were minimal.



***Vulpia microstachys-Lupinus nanus-Selaginella hansenii***

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Shrub</b>	ERCA6-L	<i>Eriodictyon californicum</i>	0.5	0.6	0.2	2
	ERLAG-L	<i>Eriophyllum lanatum</i> var. <i>grandiflorum</i>	0.5	0.3	0.2	1
<b>Herb</b>	DICA14-L	<i>Dichelostemma capitatum</i>	1	0.2	0.2	0.2
	HYGL2-L	<i>Hypochaeris glabra</i>	1	0.9	0.2	2
	LUNA3-L	<i>Lupinus nanus</i>	1	7.8	0.2	15
	MICA7-L	<i>Minuartia californica</i>	1	0.2	0.2	0.2
	VUMI-L	<i>Vulpia microstachys</i>	1	22.3	4	35
	BRHO2-L	<i>Bromus hordeaceus</i>	0.8	0.4	0.2	1
	BRMA3-L	<i>Bromus madritensis</i>	0.8	0.4	0.2	1
	CLPUQ-L	<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	0.8	0.2	0.2	0.2
	ERNUP4-L	<i>Eriogonum nudum</i> var. <i>pubiflorum</i>	0.8	0.8	0.2	2
	LACA7-L	<i>Lasthenia californica</i>	0.8	0.6	0.2	2
	POCA7-L	<i>Polygonum californicum</i>	0.8	0.4	0.2	1
	PSTEG-L	<i>Psilocarphus tenellus</i> var. <i>globiferus</i>	0.8	0.2	0.2	0.2
	TRERE2-L	<i>Triphysaria eriantha</i> ssp. <i>eriantha</i>	0.8	0.2	0.2	0.2
	TRHY3-L	<i>Triteleia hyacinthina</i>	0.8	0.2	0.2	0.2
	VUMY-L	<i>Vulpia myuros</i>	0.8	0.6	0.2	1
	CHLOR3-L	<i>Chlorogalum</i>	0.5	0.1	0.2	0.2
	CRCOE-L	<i>Crassula connata</i> var. <i>erectoides</i>	0.5	0.1	0.2	0.2
	ERCI6-L	<i>Erodium cicutarium</i>	0.5	0.1	0.2	0.2
	PAPU10-L	<i>Parvisedum pumilum</i>	0.5	0.3	0.2	1
	PLER3-L	<i>Plantago erecta</i>	0.5	1	2	2
	SIGA-L	<i>Silene gallica</i>	0.5	0.1	0.2	0.2
	TRDET-L	<i>Trifolium depauperatum</i> var. <i>truncatum</i>	0.5	0.6	0.2	2
	TRWI3-L	<i>Trifolium willdenovii</i>	0.5	2.1	0.2	8
<b>Cryptogam</b>	SEHA2-L	<i>Selaginella hansenii</i>	1	34.5	1	55
	MOSS-L	Moss	0.8	6.3	2	20
	LICHEN-L	Lichen	0.5	4	4	12

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***Vulpia microstachys*-*Parvisedum pumilum*-*Lasthenia californica* Association (provisional new)  
Small Fescue - Sierra Mock Stonecrop - California Goldfields Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Vulpia microstachys*-*Parvisedum pumilum*-*Lasthenia californica* form an intermittent to continuous herbaceous layer (55-72%, mean 63.5%) at 01-0.5m tall, where *Vulpia microstachys*, *Parvisedum pumilum*, and *Lasthenia californica* co-dominate. Total vegetation cover is 55-72%, mean cover is 63.5%.

In this association, the herbaceous layer is diverse and has a co-dominance of *Vulpia microstachys*, *Parvisedum pumilum*, and *Lasthenia californica*. Other herbaceous species include *Triteleia hyacinthina*, *Polygonum californicum*, *Clarkia purpurea* subsp. *quadrivulnera* and *Erodium botrys*. *Lupinus nanus* is occasionally in high cover. Lichen, Moss and *Selaginella hansenii* are important in this association.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 1791-1802 ft, mean 1797 ft

Aspect: SE

Slope: flat, 0 degrees, mean 0 degrees

Topography: ridge top; linear

Litter Cover: range 3.6-13%, mean 8.3%

Rock Cover: range 45.6-46%, mean 45.8%

Bare Ground: range 30-32%, mean 31%

Parent Material: volcanic flow

Soil Texture: medium to very fine loamy sand or medium to very fine sandy loam

Stands occur in the SE portion of the study area on the volcanic ridge top expanse of Table Mountain (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California). The stands occur in seasonally wet to saturated, rocky meadows that have slight soil development.

**Number of Samples Used in Description: 2**

**Samples:** APEOR003, APEOR004

**Rank:** G2 S2? Too limited to rank, but likely to be rare as probably restricted to volcanic flows in the Sierra foothills.

**GLOBAL DISTRIBUTION**

*Vulpia microstachys* Alliance: North Central Coast (Santa Clara County), Central Valley (personal observation), North Coast Range (personal observation)

Association: potentially Sierra Nevada foothills on mixed rocky and seasonally flooded substrates of basalt/volcanic flows.

**REFERENCES**

Evens and San 2004

**RESTORATION INFORMATION**

This association has low non-native plant cover (average 5.6%) relative to native cover. Non-native species with highest cover mainly include the annual grass, *Bromus hordeaceus* and the annual forb, *Erodium botrys*. No noxious weed species were recorded as occurring within the stands, so there are no restoration recommendations. Other site impacts were minimal.

***Vulpia microstachys-Parvisedum pumilum-Lasthenia californica***

Layer	Code	Species Name	Freq	Avg	Min	Max
Herb						
	BRHO2-L	<i>Bromus hordeaceus</i>	1	1.6	0.2	3
	CLPUQ-L	<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	1	3	3	3
	ERBO-L	<i>Erodium botrys</i>	1	3	1	5
	HYGL2-L	<i>Hypochaeris glabra</i>	1	1.6	0.2	3
	LACA7-L	<i>Lasthenia californica</i>	1	11	2	20
	LENI-L	<i>Lepidium nitidum</i>	1	0.6	0.2	1
	PAPU10-L	<i>Parvisedum pumilum</i>	1	16	12	20
	PLER3-L	<i>Plantago erecta</i>	1	0.6	0.2	1
	POCA7-L	<i>Polygonum californicum</i>	1	3	1	5
	TRDET-L	<i>Trifolium depauperatum</i> var. <i>truncatum</i>	1	0.2	0.2	0.2
	TRERE2-L	<i>Triphysaria eriantha</i> ssp. <i>eriantha</i>	1	2.5	2	3
	TRHY3-L	<i>Triteleia hyacinthina</i>	1	4.5	2	7
	VUMI-L	<i>Vulpia microstachys</i>	1	42.5	30	55
	AICA-L	<i>Aira caryophyllea</i>	0.5	0.1	0.2	0.2
	BRMA3-L	<i>Bromus madritensis</i>	0.5	0.1	0.2	0.2
	DICA14-L	<i>Dichelostemma capitatum</i>	0.5	0.1	0.2	0.2
	ERBR14-L	<i>Erodium brachycarpum</i>	0.5	0.1	0.2	0.2
	ERNUP4-L	<i>Eriogonum nudum</i> var. <i>pubiflorum</i>	0.5	0.1	0.2	0.2
	JUBU-L	<i>Juncus bufonius</i>	0.5	0.1	0.2	0.2
	LUBI-L	<i>Lupinus bicolor</i>	0.5	0.1	0.2	0.2
	LUNA3-L	<i>Lupinus nanus</i>	0.5	10	20	20
	MIAC-L	<i>Microseris acuminata</i>	0.5	1	2	2
	MICA7-L	<i>Minuartia californica</i>	0.5	0.1	0.2	0.2
	NALE-L	<i>Navarretia leucocephala</i>	0.5	0.5	1	1
	PSTEG-L	<i>Psilocarphus tenellus</i> var. <i>globiferus</i>	0.5	0.1	0.2	0.2
	SIGA-L	<i>Silene gallica</i>	0.5	0.1	0.2	0.2
	TRDED-L	<i>Trifolium depauperatum</i> var. <i>depauperatum</i>	0.5	0.1	0.2	0.2
	TRHI4-L	<i>Trifolium hirtum</i>	0.5	1	2	2
Cryptogam						
	LICHEN-L	Lichen	1	15	15	15
	MOSS-L	Moss	1	8.1	0.2	16
	SEHA2-L	<i>Selaginella hansenii</i>	1	5.5	4	7
	LIVER-L	Liverwort	0.5	0.5	1	1

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***Vulpia microstachys-Plantago erecta-Calycadenia truncata* Association (new provisional)  
Small Fescue - Dwarf Plantain - Rosin Weed Association**

**GENERAL VEGETATION DESCRIPTION**

Stands of *Vulpia microstachys-Plantago erecta-Calycadenia truncata* form an open to continuous herbaceous layer (30-75%, mean 46%) at 0.1-1m tall. The shrub layer is sparse (0-5%, mean 1.8%) at 0-2m tall. Trees occasionally occur in the emergent layer (0-4% cover, mean 0.6%) with conifers at 0-15m tall. Total vegetation cover is 33-75%, mean cover is 46.9%.

In this association, *Vulpia microstachys*, *Plantago erecta*, and *Calycadenia truncata* usually co-dominate as native herbaceous species with the non-native species *Bromus hordeaceus* and *Avena barbata*. A variety of other herb species occurs in the stands, including *Castilleja lacera*, *Calycadenia truncata*, *Lasthenia californica*, *Trifolium microcephalum*, and *Gilia tricolor*. An occasional shrub layer includes *Ceanothus cuneatus* and *Eriodictyon californicum*. Rarely, emergent tree species *Pinus sabiniana*, *Quercus wislizeni*, and *Quercus douglasii* are also found in low cover.

*Lomatium congdonii*, a CNPS List 1B plant, is found in one stand of this association (APEOR290). This species has a limited number of occurrences in California. *Chlorogalum grandiflorum*, also a CNPS List 1B plant, may occur in the stands, but identification in peak flowering is needed to confirm.

**ENVIRONMENTAL DESCRIPTION**

Elevation: range 898-1268 ft, mean 1062 ft

Aspect: variable

Slope: flat to somewhat steep, range 0-18 degrees, mean 7.1 degrees

Topography: bottom slope to ridge top; microtopography varies

Litter Cover: range 2.8-64%, mean 15.5%

Rock Cover: range 1-80%, mean 46%

Bare Ground: range 5-60%, mean 24%

Parent Material: serpentine

Soil Texture: medium to very fine sandy loam, moderately fine clay loam, or moderately fine sandy clay loam

Stands occur in the S-central portion of the study area on serpentine with well-developed clay loam soils (Peoria Wildlife Area, Sierra Nevada Foothills [Section M261F], central-western Tuolumne County, California).

**Number of Samples Used in Description: 7**

**Samples:** APEOR001, APEOR007, APEOR014, APEOR018, APEOR282, APEOR288, APEOR290

**Rank:** G3 S3? Probably relatively common in sterile rocky sites in Sierra Nevada and elsewhere, thus, it may not be expressly endemic to serpentine.

**GLOBAL DISTRIBUTION**

*Alliance:* North Central Coast (Santa Clara County), Central Valley (personal observation), North Coast Range (personal observation)

*Association:* potentially Sierra Nevada foothills on serpentine and other nutrient-poor substrates.

**REFERENCES**

Evens and San 2004

**RESTORATION INFORMATION**

This association has moderate non-native plant cover (average 34.5%) relative to native cover. Non-native species with highest cover mainly include grasses, such as *Bromus hordeaceus*, *Avena barbata* and the annual forbs, *Trifolium hirtum* and *Hypochaeris glabra*. *Centaurea melitensis* occurred in 4 of 7

stands at less than 1% cover (see Appendix 2 and Pages 16-18 for restoration references). Other site impacts were minimal.

***Vulpia microstachys-Plantago erecta-Calycadenia truncata***

Layer	Code	Species Name	Freq	Avg	Min	Max
<b>Shrub</b>						
	CECU-M	<i>Ceanothus cuneatus</i>	0.4	0.2	0.2	1
<b>Herb</b>						
	BRHO2-L	<i>Bromus hordeaceus</i>	1	15.6	0.2	50
	PLER3-L	<i>Plantago erecta</i>	0.9	4.6	1	10
	TRWI3-L	<i>Trifolium willdenovii</i>	0.9	1.6	0.2	6
	VUMI-L	<i>Vulpia microstachys</i>	0.9	6.7	1	18
	CALA68-L	<i>Castilleja lacera</i>	0.7	1.3	0.2	3
	AVBA-L	<i>Avena barbata</i>	0.6	6.2	0.2	25
	CATR3-L	<i>Calycadenia truncata</i>	0.6	9.3	10	30
	CEME2-L	<i>Centaurea melitensis</i>	0.6	0.1	0.2	0.2
	GAVE3-L	<i>Gastridium ventricosum</i>	0.6	0.1	0.2	0.2
	LACA7-L	<i>Lasthenia californica</i>	0.6	1.9	0.2	12
	LOWR2-L	<i>Lotus wrangelianus</i>	0.6	0.1	0.2	0.2
	TRMI4-L	<i>Trifolium microcephalum</i>	0.6	1.4	1	5
	CHME2-L	<i>Chorizanthe membranacea</i>	0.4	0.2	0.2	1
	DAPU3-L	<i>Daucus pusillus</i>	0.4	0.1	0.2	0.2
	GITR2-L	<i>Gilia tricolor</i>	0.4	2.7	3	8
	HYGL2-L	<i>Hypochaeris glabra</i>	0.4	2.2	0.2	15
	SIGA-L	<i>Silene gallica</i>	0.4	0.2	0.2	1
	TRAL5-L	<i>Trifolium albopurpureum</i>	0.4	0.1	0.2	0.2
<b>Cryptogam</b>						
	MOSS-L	Moss	0.6	0.2	0.2	1
	LICHEN-L	Lichen	0.4	0.8	0.2	5

## LITERATURE CITED

- Allen, B.H., B.A. Holtzman, and R.R. Evett. 1991. A classification system for California's hardwood rangelands. *Hilgardia* 59:1-45.
- Allen, B.H., R.R. Evett, B.A. Holtzman, and A.J. Martin. 1989. Report on rangeland cover type description for California hardwood rangelands. Department of Forestry and Fire Protection and Department of Forestry and Resource Management. Berkeley, CA.
- Allen-Diaz, B.H. and J.W. Bartolome. 1992. Survival of *Quercus douglasii* (Fagaceae) seedlings under the influence of fire and grazing. *Madrono*, 39: 47-53.
- Borchert, M., A. Lopez, C. Bauer and T. Knowl. 2000. Field Guide to Coastal Sage Scrub and Chaparral Series of Los Padres National Forest. Department of Agriculture-U.S. National Forest Service. Unpublished report.
- Bossard, C.C., J.M. Randall, and M.C. Hoshovsky, editors. 2000. Invasive Plants of California Wildlands. ([http://groups.ucanr.org/ceppc/Invasive\\_Plants\\_of\\_California's\\_Wildlands](http://groups.ucanr.org/ceppc/Invasive_Plants_of_California's_Wildlands)) University of California Press: Berkeley, CA. (Accessed September 2004)
- Braun-Blanquet, J. 1932/1951. Plant Sociology: the Study of Plant Communities. McGraw-Hill, New York, NY.
- California Department of Fish and Game (CDFG). 1998. Vegetation Mapping of Anza-Borrego Desert State Park and Environs. A report to the California Department of Parks and Recreation. Natural Heritage Division. Sacramento, CA.
- California Department of Fish and Game (CDFG). 2000. Vegetation Mapping of Suisun Marsh, Solano County California. Report prepared for California Department of Water Resources. Wildlife and Habitat Data Analysis Branch. Sacramento, CA.
- California Department of Food and Agriculture. 2004. List of California Noxious Weeds. ([http://www.cdffa.ca.gov/phpps/ipc/encycloweed/encycloweed\\_hp.htm](http://www.cdffa.ca.gov/phpps/ipc/encycloweed/encycloweed_hp.htm)) Encycloweed Home page. Sacramento, CA. (Accessed: September 2004)
- California Invasive Plant Council. 1999. Exotic Pest Plants of Greatest Ecological Concern in California. (<http://ucce.ucdavis.edu/files/filelibrary/5319/4898.pdf>) The CalEPPC List. Petaluma, CA. (Accessed September 2004)
- Dufrene, M. and P. Legendre. 1997. Species assemblages and indicator species: the need for a flexible asymmetrical approach. *Ecological Monographs* 67:345-366.
- Elkhorn Slough National Estuarine Research Reserve. 2000. Weed Control by Species. (<http://www.elkhornslough.org/plants/weeds.PDF>) Watsonville, CA. (Accessed September 2004)
- Ertter, B. and M.L. Bowerman. 2002. The flowering plants and ferns of Mount Diablo California. California Native Plant Society. Berkeley, CA.

- Evens, J.M. and S. San. 2004. Vegetation associations of a serpentine area: Coyote Ridge, Santa Clara County, California. California Native Plant Society, Sacramento, CA.
- Evens, J.M. and S. San. In publication (2004). Vegetation classification of the San Dieguito River Park, San Diego CA. California Native Plant Society, Sacramento, CA.
- Gauch, H.G. 1982. *Multivariate Analysis in Community Ecology*. Cambridge University Press. Cambridge, U.K.
- Gordon, H.J. and T.C. White. 1994. Ecological guide to southern California chaparral plant series. Technical Publication R5-ECOL-TP-005. USDA Forest Service, Pacific Southwest Region, San Francisco, CA.
- Grossman, D. H., K. Goodin, M. Anderson, P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakley. 1998. International classification of ecological communities: Terrestrial vegetation of the United States. The Nature Conservancy, Arlington, VA.
- Hanes, T.L. 1976. Vegetation Types of the San Gabriel Mountains. Pages 65-76 *In*: J. Latting, editor. *Plant Communities of Southern California*. California Native Plant Society. Berkeley, CA.
- Hickman, J.C., editor. 1993. *The Jepson Manual: Higher Plants of California*. University of California Press, Berkeley, CA.
- Hill, M.O. 1979. TWINSPAN: a Fortran program for arranging multivariate data in an ordered two-way table by classification of the individuals and attributes. Section of ecology and systematics, Cornell University, Ithaca, NY.
- Hobbs, R. J. and H. A. Mooney. 1991. Effects of rainfall variability and gopher disturbance on serpentine annual grassland dynamics. *Ecology* 72:59-68.
- Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California. Unpublished document, California Department of Fish and Game Natural Heritage Division, Sacramento, CA.
- Jimerson, T.M, J.W. Menke, S.K. Carothers, M.P. Murray, V. VanSickle, and K.H. McClellan. 2000. Field Guide to the Rangeland Vegetation Types of the Northern Province. General Technical Report R5-ECOL-TP-014. USDA Forest Service, Pacific Southwest Region, Berkeley, CA.
- Keeler-Wolf, T. 1990 Ecological Surveys of Forest Service Research Natural Areas in California. General Technical Report. PSW-125. USDA Forest Service, Pacific Southwest Research Station. Berkeley, CA.
- Keeley, J.E. 2002. Plant diversity and invasives in blue oak savannas of the southern Sierra Nevada. USDA Forest Service General Technical Report. PSW-GTR-194. Pacific Southwest Research Station. Berkeley, CA.

- Klein, A. and J.M. Evens. In publication. Vegetation classification and mapping of Western Riverside County, California. California Native Plant Society, Sacramento, CA.
- Kruckeberg 1984. California Serpentine: Flora, Vegetation, Geology, Soils, and Management Problems. University of California Press, Berkeley, CA.
- Mayer, K. E. and W.F. Laudenslayer, editors. 1988. A guide to wildlife habitats of California. California Department of Forestry. Sacramento, CA.
- McCune, B. and J.B. Grace. 2002. Analysis of Ecological Communities. MjM Software, Glenden Beach, OR.
- McCune, B. and M.J. Mefford. 1997. Multivariate analysis of ecological data. Version 3.14. MJM Software Glenden Beach, OR.
- Minnich, R.A. 1976. Vegetation of the San Bernardino Mountains. Pages 99-125 *In*: J. Latting, editor. Plant Communities of Southern California. California Native Plant Society. Berkeley, CA.
- National Climatic Data Center. 1996. climate1 Station Summaries (mm/C). EarthInfo Corporation.. Geospatial\_Data\_Presentation\_Form: vector digital data.
- NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. (<http://www.natureserve.org/explorer>). NatureServe, Arlington, VA. (Accessed: August 2004).
- NatureServe (Association for Biodiversity Information), California Native Plant Society, and California Department of Fish and Game. 2003a. Classification of the Vegetation of Point Reyes National Seashore Golden Gate National Recreation Area, Samuel P. Taylor, Mount Tamalpais, and Tomales State Parks, Marin, San Francisco, and San Mateo Counties, California. California Department of Fish and Game-Wildlife and Habitat Data Analysis Branch. Sacramento, CA.
- NatureServe (Association for Biodiversity Information), California Native Plant Society, and California Department of Fish and Game. 2003b. Classification of the Vegetation of Yosemite National Park and Surrounding Environs in Tuolumne, Mariposa, Madera and Mono Counties, California. California Department of Fish and Game-Wildlife and Habitat Data Analysis Branch. Sacramento, CA.
- The Nature Conservancy. 2004. The Nature Conservancy's Elemental Abstracts. (<http://tncweeds.ucdavis.edu/esadocs.html>) The Invasive Species Initiative, The University of California, Davis. (Accessed: September 2004)
- Parker, K.C. 1991. Topography, substrate, and vegetation patterns in the northern Sonoran Desert *Journal of Biogeography* 18:151-163.
- Potter, D.A. 2003. Riparian Community Type Classification for the West Slope Central and Southern Sierra Nevada, California. DRAFT. Pacific Southwest Region. Berkeley, CA.
- Sawyer, J.O. and T. Keeler-Wolf. 1995. A Manual of California Vegetation. California Native Plant Society. Sacramento, CA.



- Sharsmith H.K. 1982. Flora of the Mount Hamilton Range of California (special publication number 6). California Native Plant Society. Berkeley, CA.
- Shuford, W.D. and I.C. Timossii. 1989. Plant Communities of Marin County. California Native Plant Society, Sacramento, CA.
- Smith, S. 1998. Riparian Community Type Classification for National Forest in Northeastern California: First Approximation. USDA Forest Service, Pacific Southwest Research Station, Berkeley, CA
- Stewart, J.D. and J.O. Sawyer, 2001. Trees and shrubs of California. University of California Press, Berkeley, CA.
- University of California at Berkeley and Regents of the University of California (UCB). 2004. Jepson Online Interchange for California Floristics. (<http://ucjeps.berkeley.edu/interchange.html>). Jepson Flora Project, Berkeley, CA. (Accessed September 2004).
- USDA. 2004. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA. (Accessed September 2004).
- Vogl, R.J. 1976. An Introduction to the Plant Communities of the Santa Ana and San Jacinto Mountains. Pages 77-98 *In*: J. Latting, editor. Plant Communities of Southern California. California Native Plant Society. Berkeley, CA.

**APPENDIX 1.** List of scientific and common names for species occurring in vegetation surveys of the Peoria Wildlife Area and Table Mountain study area. Botanical reference information is from Hickman (1993) and USDA (2004)

Code Species	SpeciesName	CommonName	Synonymy	Family	Non-native
ACM12	<i>Achillea millefolium</i>	common yarrow		Asteraceae	No
ADFA	<i>Adenostoma fasciculatum</i>	chamise		Rosaceae	No
ADJO	<i>Adiantum jordanii</i>	California maidenhair fern		Pteridaceae	No
AECA	<i>Aesculus californica</i>	California buckeye		Hippocastanaceae	No
AGGR	<i>Agoseris grandiflora</i>	bigflower agoseris		Asteraceae	No
AGHE2	<i>Agoseris heterophylla</i>	annual agoseris		Asteraceae	No
AGOSE	<i>Agoseris</i>	agoseris		Asteraceae	No
AGVI11	<i>Agrostis viridis</i>	beardless rabbitsfoot grass	= <i>Polypogon viridis</i>	Poaceae	Yes
AIAL	<i>Ailanthus altissima</i>	ailanthus		Simaroubaceae	Yes
AICA	<i>Aira caryophylla</i>	silver hairgrass		Poaceae	Yes
ALGAE	Algae	Algae		Unknown	No
ALLIU	<i>Allium</i>	wild onion		Liliaceae	No
ALPEP2	<i>Allium peninsulare</i> var. <i>peninsulare</i>	peninsula onion		Liliaceae	No
ALPLS	<i>Alisma plantago-aquatica</i> subsp. <i>subcordatum</i>	American water plantain	= <i>Alisma subcordatum</i>	Alismataceae	No
AMMEI2	<i>Amsinckia menziesii</i> var. <i>intermedia</i>	common fiddleneck		Boraginaceae	No
ANAR	<i>Anagallis arvensis</i>	pimpernel		Primulaceae	Yes
ANCA14	<i>Anthriscus caucalis</i>	burr chervil		Apiaceae	Yes
ANCO2	<i>Anthemis cotula</i>	stinking chamomile		Asteraceae	Yes
APIAXX	Apiaceae	unknown		Apiaceae	Unknown
ARABI2	<i>Arabis</i>	rockcress		Brassicaceae	No
ARCTO3	<i>Arctostaphylos</i>	manzanita		Ericaceae	No
ARGL4	<i>Arctostaphylos glauca</i>	bigberry manzanita		Ericaceae	No
ARMA	<i>Arctostaphylos manzanita</i>	whiteleaf manzanita		Ericaceae	No
ASCO	<i>Asclepias cordifolia</i>	heartleaf milkweed		Asclepiadaceae	No
ASFA	<i>Asclepias fascicularis</i>	Mexican whorled milkweed		Asclepiadaceae	No
ASGA	<i>Astragalus gambelianus</i>	Gambel's dwarf milkvetch		Fabaceae	No
ASTEXX	Asteraceae	unknown		Asteraceae	No
AVBA	<i>Avena barbata</i>	slender oat		Poaceae	Yes
AVFA	<i>Avena fatua</i>	wild oat		Poaceae	Yes
BADE2	<i>Balsamorhiza deltoidea</i>	deltoid balsamroot		Asteraceae	No
BARESOL	Bare soil	Bare soil		N/A	No
BEAQD	<i>Berberis aquifolium</i>	shining netvein barberry	= <i>Mahonia dictyota</i>	Berberidaceae	No
BLOOM	<i>Bloomeria</i>	goldenstar		Liliaceae	No
BRAR3	<i>Bromus arenarius</i>	Australian brome		Poaceae	Yes
BRASS2	<i>Brassica</i>	mustard		Brassicaceae	Unknown
BRDI2	<i>Brachypodium distachyon</i>	purple false brome		Poaceae	Yes
BRDI3	<i>Bromus diandrus</i>	ripgut grass		Poaceae	Yes

Code Species	SpeciesName	CommonName	Synonymy	Family	Non-native
BREL	<i>Brodiaea elegans</i>	harvest brodiaea		Liliaceae	No
BRHO2	<i>Bromus hordeaceus</i>	soft brome		Poaceae	Yes
BRLA3	<i>Bromus laevipes</i>	Chinook brome		Poaceae	No
BRMA3	<i>Bromus madritensis</i>	Spanish brome		Poaceae	Yes
BRMI2	<i>Briza minor</i>	little quakinggrass		Poaceae	Yes
BRTE	<i>Bromus tectorum</i>	cheatgrass		Poaceae	Yes
CAAL2	<i>Calochortus albus</i>	white globelily		Liliaceae	No
CAAT25	<i>Castilleja attenuata</i>	valley tassels		Scrophulariaceae	No
CACI2	<i>Calandrinia ciliata</i>	red maids		Portulacaceae	No
CALA68	<i>Castilleja lacera</i>	cutleaf Indian paintbrush		Scrophulariaceae	No
CALU9	<i>Calochortus luteus</i>	yellow mariposa lily		Liliaceae	No
CAMU3	<i>Calycadenia multiglandulosa</i>	sticky western rosinweed		Asteraceae	No
CANU5	<i>Carex nudata</i>	naked sedge, torrent sedge		Cyperaceae	No
CAOC5	<i>Calycanthus occidentalis</i>	sweet-shrub		Calycanthaceae	No
CAOCO	<i>Calystegia occidentalis</i> subsp. <i>occidentalis</i>	chaparral false bindweed		Convolvulaceae	No
CAPR14	<i>Castilleja pruinosa</i>	frosted Indian paintbrush		Scrophulariaceae	No
CAPY2	<i>Carduus pycnocephalus</i>	Italian thistle		Asteraceae	Yes
CARDA	<i>Cardamine</i>	bittercress		Brassicaceae	No
CAREX	<i>Carex</i>	carex		Cyperaceae	No
CASE2	<i>Carex serratodens</i>	twotooth sedge		Cyperaceae	No
CAST12	<i>Castilleja</i>	Indian paintbrush		Scrophulariaceae	No
CATR3	<i>Calycadenia truncata</i>	rosin weed		Asteraceae	No
CAVE3	<i>Calochortus venustus</i>	butterfly mariposa lily		Liliaceae	No
CEBE3	<i>Cercocarpus betuloides</i>	mountain mahogany		Rosaceae	No
CECU	<i>Ceanothus cuneatus</i>	wedgeleaf ceanothus, buckbrush		Rhamnaceae	No
CEEX	<i>Centaurium exaltatum</i>	desert centaury		Gentianaceae	No
CEGL2	<i>Cerastium glomeratum</i>	sticky chickweed		Caryophyllaceae	Yes
CEME2	<i>Centaurea melitensis</i>	Maltese star-thistle		Asteraceae	Yes
CENTA2	<i>Centaurium</i>	centaury		Gentianaceae	No
CEOCO	<i>Cercis occidentalis</i> var. <i>orbiculata</i>	western redbud	= <i>Cercis orbiculata</i>	Fabaceae	No
CESO3	<i>Centaurea solstitialis</i>	yellow star-thistle		Asteraceae	Yes
CETR2	<i>Centaurium trichanthum</i>	alkali centaury		Gentianaceae	No
CHGR3	<i>Chlorogalum grandiflorum</i>	red hills soap plant		Liliaceae	No
CHLOR3	<i>Chlorogalum</i>	soapplant		Liliaceae	No
CHME2	<i>Chorizanthe membranacea</i>	pink spineflower		Polygonaceae	No
CHOC3	<i>Chamomilla occidentalis</i>	valley mayweed	= <i>Matricaria occidentalis</i>	Asteraceae	No
CIOCC4	<i>Cirsium occidentale</i> var. <i>californicum</i>	cobwebby thistle		Asteraceae	No
CIVU	<i>Cirsium vulgare</i>	bull thistle		Asteraceae	Yes
CLARK	<i>Clarkia</i>	clarkia		Onagraceae	No
CLBI	<i>Clarkia biloba</i>	twolobe clarkia		Onagraceae	No

Code Species	SpeciesName	CommonName	Synonymy	Family	Non-native
CLDU	<i>Clarkia dudleyana</i>	Dudley's clarkia		Onagraceae	No
CLLA3	<i>Clematis lasiantha</i>	pipestem clematis		Ranunculaceae	No
CLPE	<i>Claytonia perfoliata</i>	miner's lettuce		Portulacaceae	No
CLPUQ	<i>Clarkia purpurea</i> subsp. <i>quadrivulnera</i>	winecup clarkia		Onagraceae	No
CLUN	<i>Clarkia unguiculata</i>	elegant clarkia		Onagraceae	No
COHE	<i>Collinsia heterophylla</i>	purple Chinese houses		Scrophulariaceae	No
COLLI	<i>Collinsia</i>	blue eyed Mary		Scrophulariaceae	No
CRCOE	<i>Crassula connata</i> var. <i>erectoides</i>	sand pygmyweed		Crassulaceae	No
CRVA2	<i>Crypsis vaginiflora</i>	African pricklegress		Poaceae	Yes
CUCA	<i>Cuscuta californica</i>	chaparral dodder		Cuscutaceae	No
CUPE3	<i>Cuscuta pentagona</i>	fiveangled dodder		Cuscutaceae	No
CYDA	<i>Cynodon dactylon</i>	bermudagrass		Poaceae	Yes
CYEC	<i>Cynosurus echinatus</i>	bristly dogstail grass		Poaceae	Yes
CYER	<i>Cyperus eragrostis</i>	tall flatsedge		Cyperaceae	No
DAPU3	<i>Daucus pusillus</i>	American wild carrot		Apiaceae	No
DEDA	<i>Deschampsia danthonioides</i>	annual hairgrass		Poaceae	No
DELPH	<i>Delphinium</i>	larkspur		Ranunculaceae	No
DEVA	<i>Delphinium variegatum</i>	royal larkspur		Ranunculaceae	No
DICA14	<i>Dichelostemma capitatum</i>	bluedicks		Liliaceae	No
DICHE2	<i>Dichelostemma</i>	snakelily		Liliaceae	No
DIVO	<i>Dichelostemma volubile</i>	twining snakelily		Liliaceae	No
DOHE	<i>Dodecatheon hendersonii</i>	mosquito bills		Primulaceae	No
DRAR3	<i>Dryopteris arguta</i>	coastal woodfern		Dryopteridaceae	No
DUCYC3	<i>Dudleya cymosa</i> subsp. <i>cymosa</i>	canyon liveforever		Crassulaceae	No
ECCR	<i>Echinochloa crus-galli</i>	barnyardgrass		Poaceae	Yes
ELEL5	<i>Elymus elymoides</i>	squirreltail		Poaceae	No
ELGL	<i>Elymus glaucus</i>	blue wildrye		Poaceae	No
ELMA5	<i>Eleocharis macrostachya</i>	common spikerush	= <i>Eleocharis palustris</i>	Cyperaceae	No
ELMU3	<i>Elymus multisetus</i>	big squirreltail		Poaceae	No
EPBR3	<i>Epilobium brachycarpum</i>	tall annual willowherb		Onagraceae	No
EPDE4	<i>Epilobium densiflorum</i>	denseflower willowherb		Onagraceae	No
EPILO	<i>Epilobium</i>	willowherb		Onagraceae	No
ERBO	<i>Erodium botrys</i>	longbeak stork's bill		Geraniaceae	Yes
ERBR14	<i>Erodium brachycarpum</i>	shortfruit stork's bill		Geraniaceae	Yes
ERCA6	<i>Eriodictyon californicum</i>	California yerba santa		Hydrophyllaceae	No
ERCAC	<i>Erysimum capitatum</i> var. <i>capitatum</i>	sanddune wallflower		Brassicaceae	No
ERC16	<i>Erodium cicutarium</i>	redstem stork's bill		Geraniaceae	Yes
ERFOH	<i>Erigeron foliosus</i> var. <i>hartwegii</i>	Hartweg's fleabane		Asteraceae	No
ERIOG	<i>Eriogonum</i>	buckwheat		Polygonaceae	No
ERLA5	<i>Eriogonum latifolium</i>	seaside buckwheat		Polygonaceae	No

Code Species	SpeciesName	CommonName	Synonymy	Family	Non-native
ERLAG	<i>Eriophyllum lanatum</i> var. <i>grandiflorum</i>	common woolly sunflower		Asteraceae	No
ERMO7	<i>Erodium moschatum</i>	musky stork's bill		Geraniaceae	Yes
ERNUP4	<i>Eriogonum nudum</i> var. <i>pubiflorum</i>	naked buckwheat		Polygonaceae	No
ERODI	<i>Erodium</i>	stork's bill		Geraniaceae	Yes
ERSE3	<i>Eremocarpus setigerus</i>	dove weed, turkey mullein	= <i>Croton setigerus</i>	Euphorbiaceae	No
ESCA	<i>Eschscholzia caespitosa</i>	tufted poppy		Papaveraceae	No
ESCHS	<i>Eschscholzia</i>	California poppy		Papaveraceae	No
ESLO	<i>Eschscholzia lobbii</i>	fryingpans		Papaveraceae	No
EUCR2	<i>Euphorbia crenulata</i>	Chinese caps		Euphorbiaceae	Yes
EUCRY	<i>Eucrypta</i>	hideseed		Hydrophyllaceae	No
FICA	<i>Ficus carica</i>	edible fig		Moraceae	Yes
FICA2	<i>Filago californica</i>	California cottonrose		Asteraceae	No
FIGA	<i>Filago gallica</i>	narrowleaf cottonrose	= <i>Logfia gallica</i>	Asteraceae	Yes
GAAN	<i>Galium andrewsii</i>	phloxleaf bedstraw		Rubiaceae	No
GAAP2	<i>Galium aparine</i>	stickywilly		Rubiaceae	No
GALIU	<i>Galium</i>	bedstraw		Rubiaceae	No
GAPA5	<i>Galium parisiense</i>	wall bedstraw		Rubiaceae	Yes
GAPO	<i>Galium porrigens</i>	graceful bedstraw		Rubiaceae	No
GATR3	<i>Galium triflorum</i>	fragrant bedstraw		Rubiaceae	No
GAVE3	<i>Gastridium ventricosum</i>	nit grass	= <i>Gastridium phleoides</i>	Poaceae	Yes
GEDI	<i>Geranium dissectum</i>	cutleaf geranium		Geraniaceae	Yes
GEMO	<i>Geranium molle</i>	dovefoot geranium		Geraniaceae	Yes
GICAP2	<i>Gilia capitata</i> subsp. <i>pedemontana</i>	bluehead gilia		Polemoniaceae	No
GILIA	<i>Gilia</i>	gilia		Polemoniaceae	No
GIPU2	<i>Githopsis pulchella</i>	Sierra bluecup		Campanulaceae	No
GIPUS	<i>Githopsis pulchella</i> subsp. <i>serpenticola</i>	Sierra bluecup		Campanulaceae	No
GITR2	<i>Gilia tricolor</i>	bird's-eye gilia		Polemoniaceae	No
GLBO	<i>Glyceria borealis</i>	small floating mannagrass		Poaceae	No
GNAPH	<i>Gnaphalium</i>	cudweed		Asteraceae	No/Yes
GNCA	<i>Gnaphalium californicum</i>	ladies' tobacco	= <i>Pseudognaphalium californicum</i>	Asteraceae	No
GNLU	<i>Gnaphalium luteo-album</i>	Jersey cudweed	= <i>Pseudognaphalium luteoalbum</i>	Asteraceae	Yes
GNPA	<i>Gnaphalium palustre</i>	western marsh cudweed		Asteraceae	No
GREB	<i>Gratiola ebracteata</i>	bractless hedgehyssop		Scrophulariaceae	No
GRHI	<i>Grindelia hirsutula</i>	hairy gumweed		Asteraceae	No
HEAR5	<i>Heteromeles arbutifolia</i>	toyon		Rosaceae	No
HECA	<i>Helianthella californica</i>	California helianthella		Asteraceae	No
HECR2	<i>Hedynois cretica</i>	Cretanweed		Asteraceae	Yes

Code Species	SpeciesName	CommonName	Synonymy	Family	Non-native
HEFI	<i>Hemizonia fitchii</i>	Fitch's tarweed		Asteraceae	No
HEMIZ	<i>Hemizonia</i>	tarweed		Asteraceae	No
HEPU2	<i>Helenium puberulum</i>	rosilla		Asteraceae	Yes
HERBAC	Herbaceous unknown	unknown		Unknown	No
HOB2	<i>Hordeum brachyantherum</i>	meadow barley		Poaceae	No
HODI	<i>Holodiscus discolor</i>	oceanspray		Rosaceae	No
HOMA4	<i>Hoita macrostachya</i>	large leather-root		Fabaceae	No
HOMAG	<i>Hordeum marinum</i> subsp. <i>gussoneanum</i>	Mediterranean barley		Poaceae	No
HOMUL	<i>Hordeum murinum</i> subsp. <i>leporinum</i>	leporinum barley		Poaceae	Yes
HOVI	<i>Holocarpa virgata</i>	yellowflower tarweed		Asteraceae	No
HYDRO4	<i>Hydrophyllum</i>	waterleaf		Hydrophyllaceae	No
HYGL2	<i>Hypochaeris glabra</i>	smooth catsear		Asteraceae	Yes
ISNU	<i>Isoetes nuttallii</i>	Nuttall's quillwort		Isoetaceae	No
JUBA	<i>Juncus balticus</i>	Baltic rush		Juncaceae	No
JUBU	<i>Juncus bufonius</i>	toad rush		Juncaceae	No
JUEF	<i>Juncus effusus</i>	common rush		Juncaceae	No
JUNCU	<i>Juncus</i>	rush		Juncaceae	No
JUOX	<i>Juncus oxymers</i>	pointed rush		Juncaceae	No
JUTE	<i>Juncus tenuis</i>	poverty rush		Juncaceae	No
KEBR	<i>Keckiella breviflora</i>	bush beardtongue		Scrophulariaceae	No
LACA7	<i>Lasthenia californica</i>	California goldfields		Asteraceae	No
LASE	<i>Lactuca serriola</i>	prickly lettuce		Asteraceae	Yes
LATHY	<i>Lathyrus</i>	pea		Fabaceae	No
LECA3	<i>Lepechinia calycina</i>	woodbalm		Lamiaceae	No
LEFI11	<i>Lessingia filaginifolia</i>	California-aster, common sandaster	= <i>Corethrogyne filaginifolia</i> var. <i>filaginifolia</i>	Asteraceae	No
LEMNA	<i>Lemna</i>	duckweed		Lemnaceae	No
LENE3	<i>Lessingia nemaclada</i>	slenderstem lessingia		Asteraceae	No
LENI	<i>Lepidium nitidum</i>	shining pepperweed		Brassicaceae	No
LESSI	<i>Lessingia</i>	lessingia		Asteraceae	No
LETAL	<i>Leontodon taraxacoides</i> subsp. <i>longirostris</i>	lesser hawkbit		Asteraceae	Yes
LICHEN	Lichen	Lichen		Unknown	No
LICI	<i>Linanthus ciliatus</i>	whiskerbrush		Polemoniaceae	No
LIDI2	<i>Linanthus dichotomus</i>	eveningsnow		Polemoniaceae	No
LIFI2	<i>Linanthus filipes</i>	thread linanthus		Polemoniaceae	No
LIMO	<i>Linanthus montanus</i>	mustang clover		Polemoniaceae	No
LINAN2	<i>Linanthus</i>	linanthus		Polemoniaceae	No
LIPAT	<i>Lithophragma parviflorum</i> var. <i>trifoliatum</i>	prairie woodland-star		Saxifragaceae	No
LITT	Litter	Litter		N/A	N/A
LIVER	Liverwort	Liverwort		Unknown	No

Code Species	SpeciesName	CommonName	Synonymy	Family	Non-native
LOCA5	<i>Lomatium caruifolium</i>	alkali desertparsley		Apiaceae	No
LOCO3	<i>Lomatium congdonii</i>	Mariposa desertparsley		Apiaceae	No
LOHI2	<i>Lonicera hispidula</i>	pink honeysuckle		Caprifoliaceae	No
LOMAT	<i>Lomatium</i>	desertparsley		Apiaceae	No
LOMI	<i>Lotus micranthus</i>	desert deervetch		Fabaceae	No
LOMU	<i>Lolium multiflorum</i>	Italian ryegrass	= <i>Lolium perenne</i> subsp. <i>Multiflorum</i>	Poaceae	Yes
LOPU3	<i>Lotus purshianus</i>	American bird's-foot trefoil	= <i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i>	Fabaceae	No
LOSC2	<i>Lotus scoparius</i>	common deerweed		Fabaceae	No
LOST4	<i>Lotus strigosus</i>	strigose bird's-foot trefoil		Fabaceae	No
LOTUS	<i>Lotus</i>	trefoil		Fabaceae	No
LOWR2	<i>Lotus wrangelianus</i>	Chilean bird's-foot trefoil		Fabaceae	No
LUAL4	<i>Lupinus albilfrons</i>	silver lupine		Fabaceae	No
LUBE	<i>Lupinus benthamii</i>	spider lupine		Fabaceae	No
LUBI	<i>Lupinus bicolor</i>	miniature lupine		Fabaceae	No
LUCO6	<i>Luzula comosa</i>	Pacific woodrush		Juncaceae	No
LUMID3	<i>Lupinus microcarpus</i> var. <i>densiflorus</i>	chick lupine, whitewhorl lupine	= <i>Lupinus densiflorus</i> var. <i>densiflorus</i>	Fabaceae	No
LUNA3	<i>Lupinus nanus</i>	sky lupine		Fabaceae	No
LUPIN	<i>Lupinus</i>	lupine		Fabaceae	No
LUST2	<i>Lupinus stiversii</i>	harlequin annual lupine		Fabaceae	No
LYCA4	<i>Lythrum californicum</i>	California loosestrife		Lythraceae	No
LYHY2	<i>Lythrum hyssopifolia</i>	hyssop loosestrife		Lythraceae	Yes
MADI11	<i>Mahonia dictyota</i>	shining netvein barberry		Berberidaceae	No
MADIA	<i>Madia</i>	tarweed		Asteraceae	No
MAEX	<i>Madia exigua</i>	small tarweed		Asteraceae	No
MAFA3	<i>Marah fabaceus</i>	California manroot		Cucurbitaceae	No
MAFAF	<i>Marah fabaceus</i> var. <i>fabaceus</i>	California manroot		Cucurbitaceae	No
MAGR3	<i>Madia gracilis</i>	grassy tarweed		Asteraceae	No
MAHO	<i>Marah horridus</i>	Sierra manroot		Cucurbitaceae	No
MARAH	<i>Marah</i>	manroot		Cucurbitaceae	No
MECA2	<i>Melica californica</i>	California melicgrass		Poaceae	No
MEIM	<i>Melica imperfecta</i>	smallflower melicgrass		Poaceae	No
MEIN2	<i>Melilotus indicus</i>	annual yellow sweetclover		Fabaceae	Yes
MEPO3	<i>Medicago polymorpha</i>	burclover		Fabaceae	Yes
MIAC	<i>Microseris acuminata</i>	Sierra foothill silverpuffs		Asteraceae	No
MIAU	<i>Mimulus aurantiacus</i>	orange bush monkeyflower	= <i>Diplacus aurantiacus</i> subsp. <i>aurantiacus</i>	Scrophulariaceae	No
MICA2	<i>Microseris campestris</i>	San Joaquin silverpuffs		Asteraceae	No

Code Species	SpeciesName	CommonName	Synonymy	Family	Non-native
MICA3	<i>Mimulus cardinalis</i>	scarlet monkeyflower		Scrophulariaceae	No
MICA7	<i>Minuartia californica</i>	California sandwort		Caryophyllaceae	No
MICAC2	<i>Micropus californicus</i> var. <i>californicus</i>	q tips		Asteraceae	No
MIDO2	<i>Mimulus douglasii</i>	brownies		Scrophulariaceae	No
MIDO3	<i>Minuartia douglasii</i>	Douglas' stitchwort		Caryophyllaceae	No
MIFL2	<i>Mimulus floribundus</i>	manyflowered monkeyflower		Scrophulariaceae	No
MIGU	<i>Mimulus guttatus</i>	seep monkeyflower		Scrophulariaceae	No
MOSS	Moss	Moss		Unknown	No
MOVIV	<i>Monardella villosa</i> subsp. <i>villosa</i>	coyote mint		Lamiaceae	No
NAIN2	<i>Navarretia intertexta</i>	needleleaf navarretia		Polemoniaceae	No
NALE	<i>Navarretia leucocephala</i>	whitehead navarretia		Polemoniaceae	No
NALE2	<i>Nassella lepida</i>	smallflower tussockgrass		Poaceae	No
NAPU2	<i>Navarretia pubescens</i>	downy pincushionplant		Polemoniaceae	No
NAPU4	<i>Nassella pulchra</i>	purple tussockgrass		Poaceae	No
OROBA	<i>Orobanche</i>	broomrape		Orobanchaceae	No
PADI3	<i>Paspalum dilatatum</i>	dallisgrass		Poaceae	Yes
PADI6	<i>Paspalum distichum</i>	knotgrass		Poaceae	No
PAPU10	<i>Parvisedum pumilum</i>	Sierra mock stonecrop	= <i>Sedella pumila</i>	Crassulaceae	No
PEAN2	<i>Pellaea andromedifolia</i>	coffee cliffbrake		Pteridaceae	No
PEDU2	<i>Petrorhagia dubia</i>	hairypink		Caryophyllaceae	Yes
PEMU	<i>Pellaea mucronata</i>	birdfoot cliffbrake		Pteridaceae	No
PETRT	<i>Pentagramma triangularis</i> subsp. <i>triangularis</i>	goldback fern		Pteridaceae	No
PHAQ	<i>Phalaris aquatica</i>	bulbous canarygrass		Poaceae	Yes
PHCI	<i>Phacelia cicutaria</i>	caterpillar phacelia		Hydrophyllaceae	No
PHHEV	<i>Phacelia heterophylla</i> subsp. <i>virgata</i>	varileaf phacelia		Hydrophyllaceae	No
PHIM	<i>Phacelia imbricata</i>	imbricate phacelia		Hydrophyllaceae	No
PHRA2	<i>Phacelia ramosissima</i>	branching phacelia		Hydrophyllaceae	No
PHVI9	<i>Phoradendron villosum</i>	Pacific mistletoe		Viscaceae	No
PIEL4	<i>Piperia elongata</i>	denseflower rein orchid		Orchidaceae	No
PIMI6	<i>Piperia michaelii</i>	Michael's piperia		Orchidaceae	No
PISA2	<i>Pinus sabiniana</i>	California foothill pine		Pinaceae	No
PLAGI	<i>Plagiobothrys</i>	popcornflower		Boraginaceae	No
PLCA5	<i>Platystemon californicus</i>	creamcups		Papaveraceae	No
PLECT	<i>Plectritis</i>	seablush		Valerianaceae	No
PLER3	<i>Plantago erecta</i>	Dwarf plantain or dotseed plantain		Plantaginaceae	No
PLNO	<i>Plagiobothrys nothofulvus</i>	rusty popcornflower		Boraginaceae	No
PLST	<i>Plagiobothrys stipitatus</i>	stalked popcornflower		Boraginaceae	No
POA	<i>Poa</i>	bluegrass		Poaceae	No
POBU	<i>Poa bulbosa</i>	bulbous bluegrass		Poaceae	Yes
POCA7	<i>Polygonum californicum</i>	California knotweed		Polygonaceae	No



Code Species	SpeciesName	CommonName	Synonymy	Family	Non-native
POCOC	<i>Polygala cornuta</i> var. <i>cornuta</i>	Sierra milkwort		Polygalaceae	No
POLYG4	<i>Polygonum</i>	knotweed		Polygonaceae	No
POLYP	<i>Polypodium</i>	polypody		Polypodiaceae	No
POMO5	<i>Polypogon monspeliensis</i>	rabbitfootgrass		Poaceae	Yes
POOL	<i>Portulaca oleracea</i>	little hogweed		Portulacaceae	Yes
POSE	<i>Poa secunda</i>	Sandberg bluegrass		Poaceae	No
POTE5	<i>Poa tenerrima</i>	delicate bluegrass		Poaceae	No
PRSU2	<i>Prunus subcordata</i>	Klamath plum		Rosaceae	No
PRVI	<i>Prunus virginiana</i>	chokecherry		Rosaceae	No
PSHE	<i>Pseudobahia heermannii</i>	foothill sunburst		Asteraceae	No
PSTEG	<i>Psilocarphus tenellus</i> var. <i>globiferus</i>	slender woollyheads		Asteraceae	No
PTDR	<i>Pterostegia drymarioides</i>	woodland pterostegia		Polygonaceae	No
QUDO	<i>Quercus douglasii</i>	blue oak		Fagaceae	No
QUKE	<i>Quercus kelloggii</i>	California black oak		Fagaceae	No
QULO	<i>Quercus lobata</i>	California white oak		Fagaceae	No
QUWI2	<i>Quercus wislizeni</i>	interior live oak		Fagaceae	No
RACA2	<i>Ranunculus californicus</i>	California buttercup		Ranunculaceae	No
RAMU2	<i>Ranunculus muricatus</i>	spinyfruit buttercup		Ranunculaceae	No
RHCA	<i>Rhamnus californica</i>	California coffeeberry, California buckthorn	= <i>Frangula californica</i> subsp. <i>californica</i>	Rhamnaceae	No
RHIL	<i>Rhamnus ilicifolia</i>	hollyleaf redberry		Rhamnaceae	No
RHTO6	<i>Rhamnus tomentella</i>	Hoary coffeeberry, California coffeeberry	= <i>Frangula californica</i> subsp. <i>tomentella</i>	Rhamnaceae	No
RHTR	<i>Rhus trilobata</i>	skunkbush sumac		Anacardiaceae	No
RIMA	<i>Ribes malvaceum</i>	chaparral currant		Grossulariaceae	No
RIROR	<i>Ribes roezlii</i> var. <i>roezlii</i>	Sierra gooseberry		Grossulariaceae	No
ROCK	Rock	Rock		N/A	N/A
RORIP	<i>Rorippa</i>	yellowcress		Brassicaceae	No
RUCO2	<i>Rumex conglomeratus</i>	clustered dock		Polygonaceae	Yes
RUCR	<i>Rumex crispus</i>	curly dock		Polygonaceae	Yes
RUDI2	<i>Rubus discolor</i>	Himalayan blackberry		Rosaceae	No
SABI2	<i>Sanicula bipinnata</i>	poison sanicle		Apiaceae	No
SABI3	<i>Sanicula bipinnatifida</i>	purple sanicle		Apiaceae	No
SAGR5	<i>Sanicula graveolens</i>	northern sanicle		Apiaceae	No
SALA3	<i>Salix laevigata</i>	red willow		Salicaceae	No
SALA6	<i>Salix lasiolepis</i>	arroyo willow		Salicaceae	No
SAME5	<i>Sambucus mexicana</i>	blue elderberry, common elderberry	= <i>Sambucus nigra</i> subsp. <i>canadensis</i>	Caprifoliaceae	No
SAMOC2	<i>Sagittaria montevidensis</i> subsp. <i>calycina</i>	hooded arrowhead	= <i>Sagittaria calycina</i> var. <i>calycina</i>	Alismataceae	No
SANIC	<i>Sanicula</i>	sanicle		Apiaceae	No

Code Species	SpeciesName	CommonName	Synonymy	Family	Non-native
SATU	<i>Sanicula tuberosa</i>	turkey pea		Apiaceae	No
SCPE	<i>Scandix pecten-veneris</i>	shepherdsneedle		Apiaceae	Yes
SCSI	<i>Scutellaria siphocampyloides</i>	grayleaf skullcap		Lamiaceae	No
SEHA2	<i>Selaginella hansenii</i>	Hansen's spikemoss		Selaginellaceae	No
SEVU	<i>Senecio vulgaris</i>	old-man-in-the-Spring		Asteraceae	Yes
SIBE	<i>Sisyrinchium bellum</i>	western blue-eyed grass		Iridaceae	No
SIDAL	<i>Sidalcea</i>	checkerbloom		Malvaceae	No
SIDI	<i>Sidalcea diploscypha</i>	fringed checkerbloom		Malvaceae	No
SIGA	<i>Silene gallica</i>	common catchfly		Caryophyllaceae	Yes
SIHI2	<i>Sidalcea hirsuta</i>	hairy checkerbloom		Malvaceae	No
SIMA3	<i>Silybum marianum</i>	blessed milkthistle		Asteraceae	Yes
SIOF	<i>Sisymbrium officinale</i>	hedgemustard		Brassicaceae	Yes
SKY	Sky	Sky		N/A	N/A
SNAG	Snag	standing snag		Unknown	No
SNAG	<i>Standing snag</i>	unknown		unknown	No
SOAS	<i>Sonchus asper</i>	spiny sowthistle		Asteraceae	Yes
SOLID	<i>Solidago</i>	goldenrod		Asteraceae	No
SOOL	<i>Sonchus oleraceus</i>	common sowthistle		Asteraceae	Yes
SOXA	<i>Solanum xanti</i>	chaparral nightshade		Solanaceae	No
SPAR	<i>Spergula arvensis</i>	corn spurry		Caryophyllaceae	Yes
SPERG2	<i>Spergularia</i>	sandspurry		Caryophyllaceae	Yes
STEPH	<i>Stephanomeria</i>	wirelettuce		Asteraceae	No
STME2	<i>Stellaria media</i>	common chickweed		Caryophyllaceae	Yes
STPO2	<i>Streptanthus polygaloides</i>	milkwort jewelflower		Brassicaceae	No
STST	<i>Stachys stricta</i>	Sonoma hedgenettle		Lamiaceae	No
STTOT2	<i>Streptanthus tortuosus</i> var. <i>tortuosus</i>	shieldplant		Brassicaceae	No
STVI2	<i>Stephanomeria virgata</i>	rod wirelettuce		Asteraceae	No
SYMO	<i>Symphoricarpos mollis</i>	creeping snowberry		Caprifoliaceae	No
TACA8	<i>Taeniatherum caput-medusae</i>	medusahead		Poaceae	Yes
TAHA2	<i>Tauschia hartwegii</i>	Hartweg's umbrellawort		Apiaceae	No
THCU	<i>Thysanocarpus curvipes</i>	sand fringedpod		Brassicaceae	No
THLA3	<i>Thysanocarpus laciniatus</i>	mountain fringedpod		Brassicaceae	No
TOAR	<i>Torilis arvensis</i>	spreading hedgeparsley		Apiaceae	Yes
TODI	<i>Toxicodendron diversilobum</i>	Pacific poison oak		Anacardiaceae	No
TONO	<i>Torilis nodosa</i>	knotted hedgeparsley		Apiaceae	Yes
TRAL5	<i>Trifolium albopurpureum</i>	rancheria clover		Fabaceae	No
TRBI	<i>Trifolium bifidum</i>	notchleaf clover		Fabaceae	No
TRDED	<i>Trifolium depauperatum</i> var. <i>depauperatum</i>	cowbag clover		Fabaceae	No
TRDET	<i>Trifolium depauperatum</i> var. <i>truncatum</i>	balloon sack clover	= <i>Trifolium depauperatum</i> var. <i>stenophyllum</i>	Fabaceae	No

Code Species	SpeciesName	CommonName	Synonymy	Family	Non-native
TRDU2	<i>Trifolium dubium</i>	suckling clover		Fabaceae	Yes
TRERE2	<i>Triphysaria eriantha</i> subsp. <i>eriantha</i>	johnny-tuck		Scrophulariaceae	No
TRGR2	<i>Trifolium gracilentum</i>	pinpoint clover		Fabaceae	No
TRHI4	<i>Trifolium hirtum</i>	rose clover		Fabaceae	Yes
TRHY3	<i>Triteleia hyacinthina</i>	white brodiaea		Liliaceae	No
TRIFO	<i>Trifolium</i>	clover		Fabaceae	Unknown
TRLA16	<i>Triteleia laxa</i>	Ithuriel's spear		Liliaceae	No
TRLA4	<i>Trichostema lanceolatum</i>	vinegarweed		Lamiaceae	No
TRMI4	<i>Trifolium microcephalum</i>	smallhead clover		Fabaceae	No
TROB2	<i>Trifolium obtusiflorum</i>	clammy clover		Fabaceae	No
TROL	<i>Trifolium oliganthum</i>	fewflower clover		Fabaceae	No
TRRU	<i>Trichostema rubisepalum</i>	Hernandez's bluecurls		Lamiaceae	No
TRVA	<i>Trifolium variegatum</i>	whitetip clover		Fabaceae	No
TRWI3	<i>Trifolium willdenovii</i>	tomcat clover	= <i>Trifolium willdenowii</i>	Fabaceae	No
TYDO	<i>Typha domingensis</i>	southern cattail		Typhaceae	No
URLI5	<i>Uropappus lindleyi</i>	Lindley's silverpuffs		Asteraceae	No
VEPEX2	<i>Veronica peregrina</i> subsp. <i>xalapensis</i>	hairy purslane speedwell		Scrophulariaceae	No
VERI	<i>Velezia rigida</i>	velezia		Caryophyllaceae	Yes
VICA5	<i>Vitis californica</i>	California wild grape		Vitaceae	No
VISAN2	<i>Vicia sativa</i> subsp. <i>nigra</i>	garden vetch		Fabaceae	Yes
VIVI	<i>Vicia villosa</i>	winter vetch		Fabaceae	Yes
VUBR	<i>Vulpia bromoides</i>	brome fescue		Poaceae	Yes
VULPI	<i>Vulpia</i>	fescue		Poaceae	Unknown
VUMI	<i>Vulpia microstachys</i>	small fescue		Poaceae	No
VUMY	<i>Vulpia myuros</i>	rat-tail fescue		Poaceae	Yes
WYETH	<i>Wyethia</i>	mule-ears		Asteraceae	No
XAST	<i>Xanthium strumarium</i>	rough cocklebur		Asteraceae	Yes
YAMI	<i>Yabea microcarpa</i>	false carrot		Apiaceae	No

**APPENDIX 2.** List of non-native species in the study area and references for additional information

Species name	Abundance Value <sup>1</sup>	Grass (G) Forb (F) Tree (T)	Annual (A) Biennial (B) Perennial (P)	Noxious Weed Ranking <sup>1a</sup>	Encyclo- weedia <sup>2</sup>	TNC- Elemental Abstracts <sup>3</sup>	Invasive Plants of California <sup>4</sup>	Elkhorn Slough Reserve <sup>5</sup>	Cal-IPC - Ranking <sup>6a</sup>
<i>Agrostis viridis</i>	0.0	G	P	not listed	No	No	No	No	No
<i>Ailanthus altissima</i>	0.0	T	P	not listed	No	Yes	Yes	No	List A-2 <sup>6c</sup>
<i>Aira caryophylla</i>	3.2	G	A	not listed	No	No	No	No	No
<i>Anagallis arvensis</i>	0.0	F	A	not listed	No	No	No	No	No
<i>Anthemis cotula</i>	0.0	F	A	not listed	No	No	No	Yes	No
<i>Anthriscus caucalis</i>	0.2	F	A	not listed	No	No	No	No	No
<i>Avena barbata</i>	5.9	G	A	not listed	No	No	No	Yes	Annual Grass List <sup>6e</sup>
<i>Avena fatua</i>	4.6	G	A	not listed	No	No	No	Yes	Annual Grass List <sup>6e</sup>
<i>Brachypodium distachyon</i>	6.5	G	A	not listed	No	No	No	No	Annual Grass List <sup>6e</sup>
<i>Briza minor</i>	0.2	G	A	not listed	No	No	No	No	No
<i>Bromus arenarius</i>	0.0	G	A	not listed	No	No	No	No	No
<i>Bromus diandrus</i>	5.1	G	A	not listed	No	No	No	Yes	Annual Grass List <sup>6e</sup>
<i>Bromus hordeaceus</i>	35.1	G	A	not listed	No	No	No	No	No
<i>Bromus madritensis</i>	5.0	G	A	not listed	No	Yes	Yes	No	List A-2 <sup>6c</sup>
<i>Bromus tectorum</i>	0.2	G	A	not listed	No	Yes	Yes	No	List A-1 <sup>6b</sup>
<i>Carduus pycnocephalus</i>	2.1	F	B	C <sup>1b</sup>	Yes	Yes	Yes	Yes	List B <sup>6d</sup>
<i>Centaurea melitensis</i>	1.4	F	A	not rated	Yes	No	Yes	Yes	List B <sup>6d</sup>
<i>Centaurea solstitialis</i>	0.3	F	A	C	Yes	Yes	Yes	Yes	List A-2 <sup>6c</sup>
<i>Cerastium glomeratum</i>	0.0	F	A	not listed	No	No	No	No	No
<i>Cirsium vulgare</i>	0.0	F	B	not rated	Yes	No	Yes	Yes	List B <sup>6d</sup>
<i>Crypsis vaginiflora</i>	0.5	G	A	not listed	No	Yes	No	No	No
<i>Cynodon dactylon</i>	1.0	G	P	C	Yes	Yes	No	Yes	List A-2 <sup>6c</sup>
<i>Cynosurus echinatus</i>	0.2	G	A	not listed	No	No	No	No	No
<i>Echinochloa crus-galli</i>	0.0	G	A	not listed	No	No	No	No	No
<i>Erodium botrys</i>	0.6	F	A	not listed	No	No	No	No	No
<i>Erodium brachycarpum</i>	0.1	F	A	not listed	No	No	No	No	No
<i>Erodium cicutarium</i>	0.2	F	A	not listed	No	No	No	Yes	No
<i>Erodium moschatum</i>	0.0	F	A	not listed	No	No	No	No	No

Species name	Abundance Value <sup>1</sup>	Grass (G) Forb (F) Tree (T)	Annual (A) Biennial (B) Perennial (P)	Noxious Weed Ranking <sup>1a</sup>	Encyclo- weedia <sup>2</sup>	TNC- Elemental Abstracts <sup>3</sup>	Invasive Plants of California <sup>4</sup>	Elkhorn Slough Reserve <sup>5</sup>	Cal-IPC - Ranking <sup>6a</sup>
<i>Euphorbia crenulata</i>	0.0	F	A	not listed	No	No	No	No	No
<i>Ficus carica</i>	0.0	T	P	not listed	No	<b>Yes</b>	<b>Yes</b>	No	<b>List A-2<sup>6c</sup></b>
<i>Filago gallica</i>	0.2	F	A	not listed	No	No	No	No	No
<i>Galium parisiense</i>	0.2	F	A	not listed	No	No	No	No	No
<i>Gastroidium ventricosum</i>	1.3	G	A	not listed	No	No	No	No	No
<i>Geranium dissectum</i>	0.1	F	A	not listed	No	No	No	No	No
<i>Geranium molle</i>	0.0	F	A	not listed	No	No	No	No	No
<i>Gnaphalium luteo-album</i>	0.0	F	A	not listed	No	No	No	No	No
<i>Hedypnois cretica</i>	0.0	F	A	not listed	No	No	No	No	No
<i>Hordeum marinum</i> subsp. <i>gussoneanum</i>	0.4	G	A	not listed	No	No	No	No	No
<i>Hordeum murinum</i> subsp. <i>leporinum</i>	0.2	G	A	not listed	No	<b>Yes</b>	No	<b>Yes</b>	No
<i>Hypochaeris glabra</i>	2.8	F	A	not listed	No	No	No	No	No
<i>Lactuca serriola</i>	0.0	F	A	not listed	No	No	No	<b>Yes</b>	No
<i>Leontodon taraxacoides</i> subsp. <i>longirostris</i>	0.0	F	A	not listed	No	No	No	No	No
<i>Lolium multiflorum</i>	3.2	G	A	not listed	No	No	No	<b>Yes</b>	Annual Grass List <sup>6e</sup>
<i>Lythrum hyssopifolium</i>	0.0	F	A	<b>not rated</b>	<b>Yes</b>	No	No	No	No
<i>Medicago polymorpha</i>	0.1	F	A	not listed	No	No	No	No	No
<i>Melilotus indicus</i>	0.0	F	A	not listed	No	No	No	No	No
<i>Paspalum dilatatum</i>	0.3	G	F	not listed	No	No	No	No	No
<i>Petrorhagia dubia</i>	0.0	F	A	not listed	No	No	No	No	No
<i>Phalaris aquatica</i>	0.0	G	P	not listed	No	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>List B<sup>6d</sup></b>
<i>Poa bulbosa</i>	0.0	G	P	not listed	No	No	No	No	No
<i>Polypogon monspeliensis</i>	1.6	G	P	not listed	No	No	No	No	No
<i>Portulaca oleracea</i>	0.0	F	A	not listed	No	No	No	No	No
<i>Ranunculus muricatus</i>	0.0	F	A	not listed	No	No	No	No	No
<i>Rumex conglomeratus</i>	0.2	F	P	not listed	No	No	No	No	No
<i>Rumex crispus</i>	0.0	F	P	not listed	No	No	No	<b>Yes</b>	No
<i>Scandix pecten-veneris</i>	0.0	F	A	not listed	No	No	No	No	No
<i>Senecio vulgaris</i>	0.0	F	A	<b>not rated</b>	<b>Yes</b>	No	No	<b>Yes</b>	Have <i>Senecio jacobea</i>

Species name	Abundance Value <sup>1</sup>	Grass (G) Forb (F) Tree (T)	Annual (A) Biennial (B) Perennial (P)	Noxious Weed Ranking <sup>1a</sup>	Encyclo- weedia <sup>2</sup>	TNC- Elemental Abstracts <sup>3</sup>	Invasive Plants of California <sup>4</sup>	Elkhorn Slough Reserve <sup>5</sup>	Cal-IPC - Ranking <sup>6a</sup>
<i>Silene gallica</i>	0.4	F	A	not listed	No	No	No	No	No
<i>Silybum marianum</i>	0.0	F	A or B	not listed	No	Yes	No	Yes	No
<i>Sisymbrium officinale</i>	0.0	F	A	not listed	No	No	No	No	No
<i>Sonchus asper</i>	0.0	F	A	not listed	No	No	No	Yes	No
<i>Sonchus oleraceus</i>	0.1	F	A	not listed	No	No	No	Yes	No
<i>Spergula arvensis</i>	0.0	F	A	not listed	No	No	No	No	No
<i>Stellaria media</i>	0.0	F	A	not listed	No	No	No	Yes	No
<i>Taeniatherum caput-medusae</i>	1.5	G	A	<b>C</b>	Yes	Yes	Yes	No	List A-1 <sup>6b</sup>
<i>Torilis arvensis</i>	3.0	F	A	not listed	No	No	No	No	No
<i>Torilis nodosa</i>	0.0	F	A	not listed	No	No	No	No	No
<i>Trifolium dubium</i>	0.2	F	A	not listed	No	No	No	No	No
<i>Trifolium hirtum</i>	3.3	F	A	not listed	No	No	No	No	No
<i>Velezia rigida</i>	0.0	F	A	not listed	No	No	No	No	No
<i>Vicia sativa</i> subsp. <i>nigra</i>	0.4	F	A	not listed	No	No	No	No	No
<i>Vicia villosa</i>	5.5	F	A	not listed	No	No	No	No	No
<i>Vulpia bromoides</i>	0.0	G	A	not listed	No	No	No	No	No
<i>Vulpia myuros</i>	2.1	G	A	not listed	No	No	No	No	No

<sup>1</sup>Based on ratio of the overall % cover of individual non-native species over the total % cover of all non-native species (thus the sum of all abundance values equal 100%)

<sup>1a</sup> California Department of Food and Agriculture. March, 2004. Encycloweediea. <[http://www.cdfa.ca.gov/phpps/ipc/encycloweediea/winfo\\_weedratings.htm](http://www.cdfa.ca.gov/phpps/ipc/encycloweediea/winfo_weedratings.htm)>

<sup>1b</sup> California Department of Food & Agriculture. Noxious Weed Rating "C". Weeds that are so widespread that the agency does not endorse state or county-funded eradication or containment efforts except in nurseries or seed lots

<sup>2</sup> California Department of Food and Agriculture. March, 2004. Encycloweediea. <<http://www.cdfa.ca.gov/phpps/ipc/weedinfo>>

<sup>3</sup> The Nature Conservancy. July, 2004. The Nature Conservancy's Elemental Abstracts. <<http://tncweeds.ucdavis.edu/esadocs.html>>

<sup>4</sup> Bossard, C.C., J.M. Randall, and M.C. Hoshovsky, editors. 2000. Invasive Plants of California Wildlands. University of California Press: Berkeley, California. <[http://groups.ucanr.org/ceppc/Invasive\\_Plants\\_of\\_California's\\_Wildlands/](http://groups.ucanr.org/ceppc/Invasive_Plants_of_California's_Wildlands/)>

<sup>5</sup> Elkhorn Slough National Estuarine Research Reserve. 2000. Weed Control by Species. <<http://www.elkhornslough.org/plants/weeds.PDF>>

<sup>6a</sup> California Invasive Plant Council (Cal-IPC). 1999. CalEPPC List: Exotic Pest Plants of Greatest Ecological Concern in California. <<http://ucce.ucdavis.edu/files/filelibrary/5319/4898.pdf>>

<sup>6b</sup> Cal-IPC - Ranking: List A-1 - Most invasive wildland pest plants, widespread

<sup>6c</sup> Cal-IPC - Ranking: List A-2 - Most invasive wildland pest plants, regional

<sup>6d</sup> Cal-IPC - Ranking: List B - Wildland pest plants of lesser invasiveness; plants spread less rapidly and cause lesser degree of habitat disruption; widespread or regional

<sup>6e</sup> Cal-IPC - Annual Grass List - Grasses that are abundant and widespread in California, pose significant threats to wildlands, but currently have no treatment information

**APPENDIX 3.** Selected photos of vegetation associations from the Peoria Wildlife Area, Tuolumne County, California. For the digital version, see separate documents (Appendix3\_FinalReport\_SelectedPhotos1-3.doc)