Alluvial Scrub Vegetation of Southern California, A Focus on the Santa Ana River Watershed In Orange, Riverside, and San Bernardino Counties, California

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INTRODUCTION

The Vegetation Program of the California Native Plant Society (CNPS) has worked collaboratively with the Riverside-Corona Resource Conservation District (RCRCD) to produce a vegetation classification of alluvial scrub habitat within three southern California counties. One objective of this project is to develop a floristic classification of vegetation within this rare habitat and to correlate environmental variables to different types of alluvial scrub. The resulting vegetation classification is supported by two datasets: 49 new vegetation samples from the Santa Ana River Watershed, conducted by RCRCD staff and partners including the Inland Empire RCD (IERCD), U.S. Forest Service (USFS) and CNPS volunteers; and 84 existing surveys from the same region plus 32 surveys from three additional watersheds in a CNPS legacy database (from Wirka 1997). The new field data have been collected in 2010–2011 using standard CNPS protocols (e.g., Vegetation Rapid Assessment and Relevé protocols). The additional legacy field data, collected during the mid-1990s, have been collated and merged with the new data, and a total of 165 surveys have been used to develop a broad classification and ordination analyses.

The vegetation classification has been produced using the National Vegetation Classification System's hierarchy of alliances and associations. The plant communities are floristically and environmentally defined, following the format of the *Manual of California Vegetation* (Sawyer, Keeler Wolf and Evens 2009). In this report, vegetation types are summarized within a key and descriptions that differentiate 12 alliances and 15 finer-level associations. Ordination analyses additionally aided in correlating vegetation patterns to various environmental variables.

BACKGROUND AND STANDARDS

This project is one component of a larger initiative to develop science-based plant lists for restoration of sensitive native plant communities. Results from this report will inform the development of plant palettes based on community patterns and correlative environmental variables. This project will improve the selection of appropriate species and habitat goals in the restoration of alluvial scrub within the Santa Ana River Watershed.

The vegetation classification in this report is based upon the U.S. National Vegetation Classification (NVC). In California, the classification has been developed by NatureServe (2010) in partnership with the State Natural Heritage Program of the Department of Fish and Game (CDFG) and CNPS. The first and second edition of the national classification provides a thorough introduction to the classification, its structure, and the list of vegetation units known in the United States (Grossman et al. 1998, FGDC 2008). Refinements to the classification have occurred during its application, and these refinements are best seen using the NatureServe Web site at http://www.natureserve.org/explorer/.

The alliance and association levels are the finest levels of vegetation groups in the classification hierarchy (Table 1). The scale at these levels is important to the majority of wildland restoration projects occurring in the Southern California Mountains and Valley ecological region.

Table 1. Classification of Vegetation: Example Hierarchy

Class	Shrubland & Grassland
Formation	Mediterranean Scrub
Division	California Scrub
Macrogroup	California Chaparral
Group	Xeric Chaparral
Alliance	*Adenostoma fasciculatum–Salvia apiana*
Association	*Adenostoma fasciculatum–Salvia apiana–Artemisia californica*

A floristic vegetation classification of field surveys has been completed in alluvial scrub habitat within the Upper Santa Ana River Watershed. One purpose of developing this detailed classification is to integrate new data with existing information from California's current vegetation classification and the NVC, and to establish a fuller understanding of alluvial scrub habitat within southern California. Likewise, the NVC supports the development and use of a consistent national vegetation classification to produce uniform statistics about vegetation resources across the nation, based on vegetation data gathered at local, regional or national levels (FGDC 2008).

This report achieves this goal by classifying new data contextually with other existing alluvial scrub data sampled in this region to evaluate floristic and environmental trends. Since ecologists are currently working to more rigorously define the upper levels of the national classification hierarchy through an extensive peer review process, we also provide recommendations for updating the classification scheme with provisional names of new associations and provisional placement of alliances within the relatively new upper levels of the hierarchy, including Macrogroups and Groups (FGDC 2008).

METHODS

Study Area

The study area focused on alluvial scrub habitats of southern California within the Santa Ana River Watershed of Orange, Riverside, and San Bernardino counties (Figure 1). In addition, data from Kern, Los Angeles, and San Diego counties and other watersheds of Riverside County were included to understand the full context of alluvial scrub vegetation (Figure 2).

Field Sampling

Sampling in 2010–2011 was implemented using two different methods: the CNPS Vegetation Rapid Assessment method and the CNPS Relevé method. The CNPS website provides information on these methods (see the Vegetation link on www.cnps.org), and Appendix 1 contains copies of the protocol and field forms.

Two vegetation ecologists, Julie Evens and Kendra Sikes, from the California Native Plant Society trained partners on vegetation sampling methods in April 2010. CNPS volunteers and staff from the IERCD and USFS collaborated with the RCRCD to sample alluvial scrub vegetation in the upper Santa Ana River watershed at the base of the San Bernardino, San Gabriel and Santa Ana Mountains. Field crews sampled from April to June 2010, with additional surveys in April – May 2011, when alluvial scrub vegetation was at peak phenology. Arlee Montalvo (RCRCD Plant Restoration Ecologist) acted as the primary supervisor for the field effort, and the crew usually consisted of two to four people, including the following personnel: James Law (IERCD), Kerry Meyers (USFS), Erika Presley (CNPS), Cody Pynn (CNPS), and Shani Pynn (RCRCD). A second CNPS vegetation sampling training was provided in 2011 at the Irvine Ranch Conservancy for both Conservancy staff and CNPS chapter members. More than 20 volunteers and staff participated in the workshop and conducted surveys of alluvial scrub habitat.

In total, 49 vegetation surveys were completed in alluvial scrub habitats across two years. A majority of the surveys (41 plots) were conducted using the CNPS Relevé protocol. The more streamlined Rapid Assessment method was used to conduct 8 additional surveys. Legacy data, consisting of 116 field surveys from Wirka (1997) conducted in the mid-1990s, were also utilized for the analyses. The legacy data were collected using the CNPS belt transect protocol, described in the first edition of the Manual of California Vegetation (Sawyer and Keeler-Wolf 1995).

Vegetation Classification Data and Analysis

Classification analysis process

Following the 2010–2011 field sampling effort by RCRCD staff and partners, data were compiled and analyzed by CNPS vegetation program staff. The PC-ORD software suite of classification and ordination tools was used to generate multivariate analyses such as Cluster Analysis and Indicator Species Analysis (McCune and Mefford 1997). These analyses were employed to order vegetation surveys into groups related by their species composition and abundance, so that a formalized classification of community types would be created.

Since plant community datasets are inherently complex and multiple environmental variables may determine pattern heterogeneity, Cluster Analysis with a hierarchical agglomerative

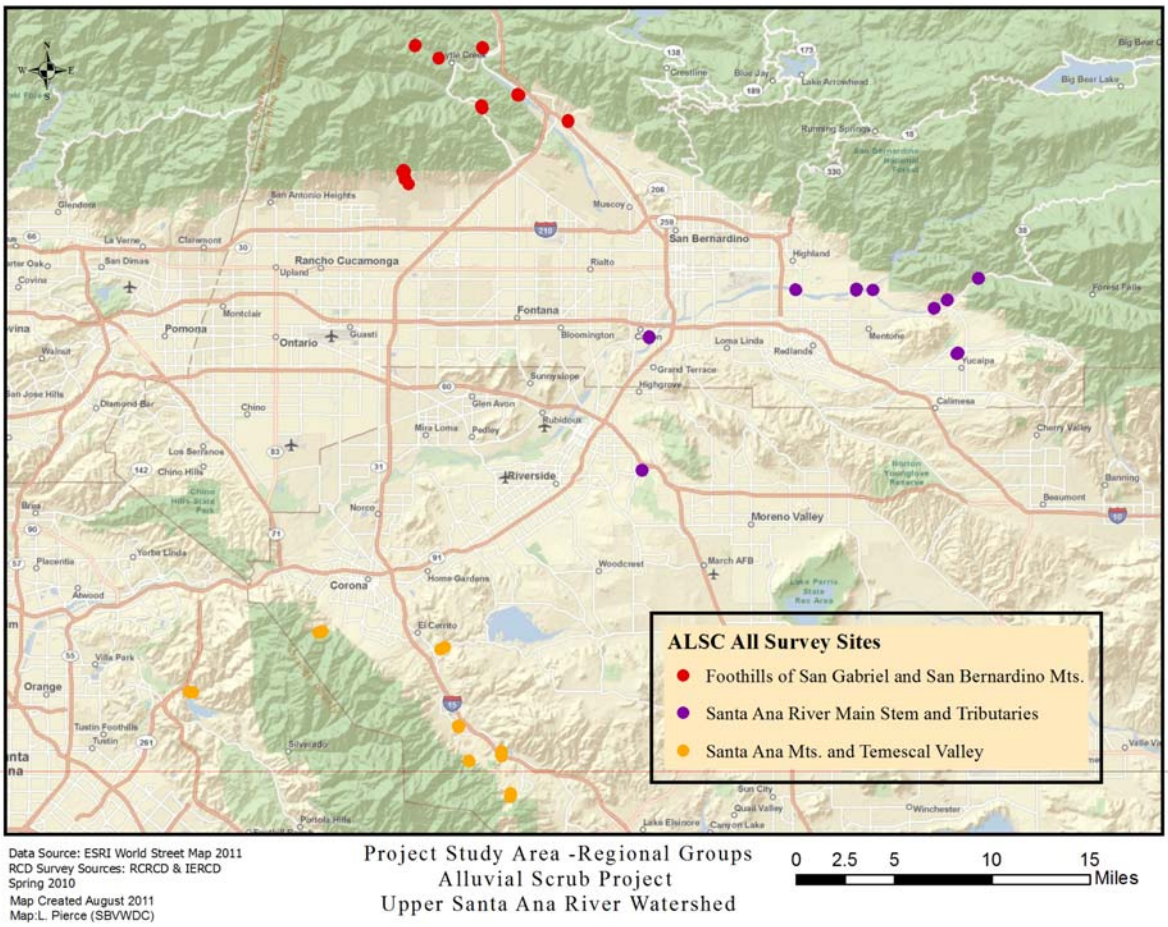


Figure 1. Study area map illustrating new alluvial scrub surveys (sampled in 2010–2011) within the Santa Ana River Watershed of Orange, Riverside, and San Bernardino counties.

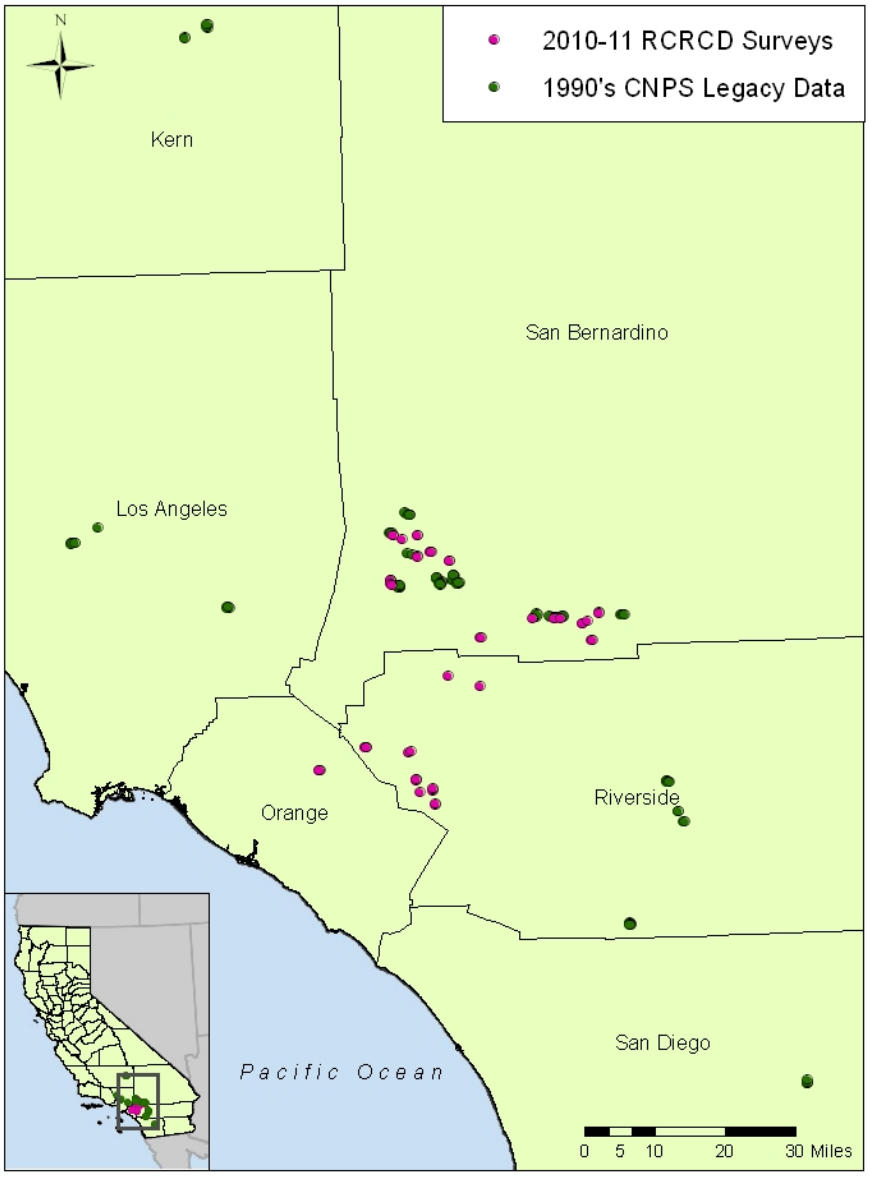


Figure 2. Study area map of both new and existing alluvial scrub surveys.

technique was employed using a Sorenson distance measure and a flexible beta linkage method set at β = -0.25. These parameters are recommended to minimize both spatial distortion and chaining within the cluster analysis. The cluster analysis technique was based on raw estimated cover values relativized by maximum to represent all species within the same scale. We also ran a separate cluster analysis based on abundance classes using modified Braun-Blanquet (1932) cover categories: 1=<1%, 2=1-5%, 3=>5-15%, 4=>15-25%, 5=>25-50%, 6=>50-75%, 7=>75%. In addition, we examined the surveys using TWINSPAN's divisive techniques to compare groups formed under different analysis techniques.

All vegetation surveys were analyzed together, and the cluster analysis groupings were displayed in dendrogram outputs. The dendrograms were interpreted at 2 to 27 cluster group levels. The intent was to display and interpret the groups generated by the cluster analyses first at generic levels (to classify alliances) and subsequently finer levels (to classify associations and distinctive stands).

Prior to the cluster analysis runs, outlier analysis was performed on the dataset using PC-ORD (McCune and Mefford 1997). No surveys had Sorenson distances greater than three standard deviations away from the mean, thus all surveys remained in the final analyses. To reduce heterogeneity, rare species occurring in less than 2 surveys were removed from the dataset.

After groups were generated in the cluster analyses, Indicator Species Analysis (ISA) was employed to objectively decide what number of "groups" or cut levels to explicitly interpret the cluster dendrograms (McCune and Grace 2002). Further, ISA was used to determine which species were characteristic indicators for the different groups. ISA produced indicator values for each species in each of the group levels within the dendrogram, and the statistical significance of the indicator species was evaluated using a Monte Carlo test with 1000 randomizations (Dufrene and Legendre 1997). For this dataset, ISA was repeated from group level 2 to 27. The group analyses were evaluated to determine the total number of significant indicator species (p-value ≤0.5) and the mean p-value for all species within each group level. The group level with 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 (e.g., association names) were applied to each field survey.

Further, each survey was reviewed within the context of the cluster to which it had been assigned to quantitatively define the "membership rules" for each association. The membership rules were defined by species composition, degree of constancy, indicator species, and species cover values. Upon revisiting each survey, some types were misclassified in earlier fusions of the cluster analysis, and these surveys 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 and alliance 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 above analysis process is provided in the following steps:

1. Run Cluster Analysis on abundance relativized by maximum and on abundance classes to display survey groupings based on species presence and abundance.
2. Run Indicator Species Analysis (ISA) at successive group levels for each of the Cluster Analysis dendrograms from 2 groups up to the maximum number of groups (all groups with at least 2 samples).
3. Settle on the final representative grouping level of each Cluster Analysis to use in the

preliminary labeling.

4. Preliminarily label alliance and association for each of the samples, and denote indicator species from the ISA.
5. Develop decision rules for each association and alliance based on review of species cover on a sample-by-sample basis.
6. Re-label final alliance labels for each sample and arrange in a database table.

Additionally, the Multiple Response Permutation Procedure (MRPP), a nonparametric multivariate test of differences between groups, was run to test whether the groups defined from the above analyses were statistically significant. The A statistic describes effect size: when A=0, groups are not different from those expected by chance; when A=1, sample units within each group are identical.

Because the study area focused on a singular habitat type with limiting edaphic factors (e.g., soils and landform), the sampling and subsequent data analyses contain distinctive surveys of under-represented vegetation types. This sampling effort also captures previously un-described vegetation types known only from habitats within this region. In some cases, the types represent unusual species groupings of heretofore un-described plant communities, and they provide perspective on unusual or new vegetation types that deserve additional sampling. These types may be described generically as alliances without any association designations or as provisional associations.

Existing Literature Review

Existing information was reviewed to obtain a current view of the local vegetation nomenclature. Recent publications pertaining specifically to alluvial scrub habitat include studies from Burk et al. (2007), Barbour and Wirka (1997), Magney (1992), and Hanes et al. (1989) as well as the *Manual of California Vegetation* (Sawyer, Keeler-Wolf, and Evens 2009).

Definitions for Classification

The classification was produced to substantiate vegetation types identified though field surveys, based on two floristic and hierarchical levels of the U.S. National Vegetation Classification System (NVCS) per NatureServe (2010) and Grossman et al. (1998). These alliance and association levels are characterized by species composition, abundance, and habitat/environment as described below.

Surveys were classified to the association level, which is the finest unit in vegetation classification per the NVCS and the Manual of California Vegetation (MCV; Sawyer et al. 2009). An association is characterized by multiple stands of vegetation that repeat in the landscape with specific floristic and environmental features. An association is defined by the presence of character and dominant species in the overstory and other important and indicator species in the understory, which are distinctively assembled in a particular environmental setting. Thus, significant indicator species were drawn from the analyses and applied to the determinations of associations by the classification analysis team. Similar associations and/or distinctive, unusual surveys that had similar overstory canopies were classified to the alliance level, which is the next floristic unit of the vegetation classification above association. An alliance is defined as the generic unit that is usually is represented by dominant and/or characteristic plant species in the upper layer of vegetation (such as in the Scalebroom or *Lepidospartum squamatum* Shrubland Alliance).

While some vegetation types have been defined with a limited number of surveys, they are listed here to establish names for these types and to allow comparisons to other locations where the plant community may occur. By providing as much information as possible in this classification, future efforts will build upon this knowledge of vegetation within alluvial scrub habitats.

Environmental Data and Analysis

Environmental Variables

A number of environmental variables were compiled and analyzed at different levels in the sets of data (Table 2). Two data types are represented in this list; quantitative variables (Q) are numerical measurements that can be ranked or arranged in a meaningful linear sequence, while categorical variables (C) can provide qualitative statements about group membership (McCune and Mefford 1997). For example, categorical variables represent assigned Alliance and Association names while species richness represents a quantitative measurement. Categorical variables were used as an overlay on ordination diagrams to visually assess patterns, while quantitative variables were used to interpret correlations along ordination axes. The 2010–2011 field surveys included 28 quantitative and 20 categorical variables available for analysis.

A majority of these environmental variables were collected in the field along with species cover data, while other variables were obtained by intersecting GPS coordinates with GIS layers. Shapefiles used in the generation of environmental variables include a fire perimeter layer capturing known fires between 1878 and 2010, accessed through the California Department of Forestry and Fire Protection's Fire and Resource Assessment Program (FRAP), a geologic layer for the San Bernardino and Santa Ana 30' x 60' quadrangles (Morton and Miller 2006), climate data averaged from 1971 to 2000 available through the PRISM Climate Group at Oregon State University, and digital elevations extracted from a statewide DEM layer.

A variety of analyses were performed to test for significant correlations between species cover/constancy and environmental factors. Analysis tools from the PC-ORD software suite (McCune and Mefford 1997) were used, including the Mantel test, Non-metric Multidimensional Scaling (NMS), Polar ordination (Bray-Curtis), Principal Component Analysis (PCA), and Detrended Correspondence Analysis (DCA). No transformations of environmental variables were used in these analyses.

Table 2. Environmental variables tested for correlations with vegetation survey data. Data types contain both quantitative (Q) and categorical (C) variables.

# of Surveys	Data Type	Variable Name	Metadata
165	C	DatabaseID	Key identifier Database number
165	C	AlliaNum	Final Alliance number (Natural Community List CA code)
165	C	AssocNum	Final Association number (Natural Community List CA code)
165	C	ProjNum	Numeric code for Project ID
165	C	Site	Numeric code for Site Location
165	C	County	Numeric code for Name of County
165	Q	Richness	Species Richness calculated from analysis plant list
151	Q	UTME_final	Final GPS Easting coordinates in UTM, field reading (six digits)
151	Q	UTMN_final	Final GPS Northing coordinates in UTM, field reading (seven digits)

# of Surveys	Data Type	Variable Name	Metadata
151	Q	Large_rock	Percent cover of bedrock, boulder, and stone
151	Q	Small_rock	Percent cover of cobble and gravel
151	Q	Bare_fines	Percent cover of bare soil and fine sediment
151	Q	FireNum	Count of recorded fires since 1878 (per FRAP fire perimeters)
151	Q	YearSinceFire	Number of years since last fire (per FRAP fire perimeters)
151	Q	MinTemp	PRISM data - Minimum annual temperature
151	Q	MaxTemp	PRISM data - Maximum annual temperature
151	Q	AnnPrec	PRISM data - Average annual precipitation
151	Q	DEM	Elevation value - generated from DEM layer
49	Q	Altitude	Elevation value collected in field using GPS unit
49	C	MicroNum	Numeric code for microtopography (see lookup table)
49	C	MacroNum	Numeric code for macrotopography (see lookup table)
49	C	Terr_Position	Numeric code for terrace position (0=Channel, 1=Lower, 2=Middle, 3=Upper, 9=LowerSlope)
49	C	Substrate	Numeric code for geology (see lookup table)
49	C	SoilNum	Numeric code for soil texture (see lookup table)
49	C	SoilBroad	Soil ranking based on permeability of soil
49	Q	Litter	Percentage of litter (bird's eye percent cover)
49	C	AspNum2	Numeric code for specific range in Aspect (1-9)
49	Q	AspMesic	Aspect transformed to mesicness - cos (aspect - 45deg)
49	C	SlopeNum	Numeric code for general slope exposure (see lookup table)
49	Q	SlopeDeg	Actual slope exposure, in degrees
49	Q	SlopeAsp	Aspect transformed and multiplied by slope%
49	C	StndSize	Numeric code for stand size (see lookup table)
49	Q	Lo-MidShrub%	Aerial cover of shrub layer (bird's eye percent cover)
49	Q	Herb%	Aerial cover of herbaceous layer (bird's eye percent cover)
49	Q	Veg%	Total aerial percent cover of vegetation (bird's eye percent cover)
49	C	Low-MidShrub ht	Numeric code for shrub height (see lookup table)
49	C	Herb_ht	Numeric code for herbaceous layer height (see lookup table)
49	C	ShrubWHR	Numeric code for shrub age – based on WHR
49	C	HerbWHR	Numeric code for herbaceous height - based on WHR
49	Q	PlotOther1	Least distance horizontally to ordinary high water mark of active channel
49	Q	PlotOther2	Elevation vertically above channel bottom
49	Q	Bioturbation	Percent cover of fines influenced by soil churning of small mammals
49	Q	Boulders	Percentage of boulders (>60 cm diam.) (bird's eye percent cover)
49	Q	Stones	Percentage of stones (25 - 60 cm) (bird's eye percent cover)
49	Q	Cobbles	Percentage of Cobbles (7.5 - 25 cm) (bird's eye percent cover)
49	Q	Gravels	Percentage of gravels (2 mm - 7.5 cm) (bird's eye percent cover)
49	Q	Non-Vasc_Veg_cover	Total aerial percent cover of non vascular vegetation (bird's eye percent cover)
49	C	FireTime	Time since fire, if known (field estimation) "1";"< 2 yr";"2";"2-5 yr)";"3";"6-10 yr";"4";"> 10 yr"
49	C	FireEvNum	Numeric code for field assessed evidence of fire in the stand, 0 = no evidence, 1 = yes evidence
49	C	GeolNum	Numeric code for geology derived from USGS Geologic map of the San Bernardino and Santa Ana 30' x 60' quadrangles, California

Stand Tables

Following the analysis of field data and the development of a classification and key, association-level stand tables were generated. They were based on field data and available literature. Scientific names of plants follow Hickman (1993), UCB (2011), and USDA-NRCS (2011). Common names follow the USDA-NRCS (2011).

The following definitions and conventions were set in developing the keys and descriptions:

1. **Cover:** The primary metric used to quantify the importance/abundance of a particular species or a particular vegetation layer within a survey. It was measured by estimating the aerial extent of the living plants, or the “bird’s-eye view” looking from above for each category. In this vegetation classification project and other National Park Service projects in California, cover is assessed using the concept of "porosity" or foliar cover rather than "opaque" or crown cover. Thus, field crews were trained to estimate the amount of shade produced by the canopy of a plant or a stratum by taking into account the amount of shade it casts, whereby by the cover estimates exclude the openings it may have in the interstitial spaces (e.g., between leaves or branches). This is assumed to provide a more realistic estimate of the actual amount of cover cast by the individual or stratum, which, in turn relates to the actual amount of light available to individual species or strata beneath it.
2. **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).
3. **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, *Lepidospartum squamatum* 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.
4. **Characteristic/Consistent/Diagnostic species (C)**: Must be present in at least 75 percent of the samples, with no restriction on cover.
5**. Dominant (D)**: Must be in at least 75 percent of the samples, with at least 50 percent relative cover in all samples.
6. **Co-dominant (cD):** Must be in at least 75 percent of the samples, with at least 30 percent relative cover in all samples.
7. **Abundant species (A)**: Must be present in at least 50 percent of the samples, with at least 50 percent relative cover in all samples.
8. **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.

9. **Tree:** Is a one-stemmed woody plant that normally grows to be greater than 5 meters tall. In some cases trees may be multiple-stemmed following ramifying after fire or other disturbance, but size of mature plants is typically greater than 5 m and undisturbed individuals of these species are usually single stemmed.

10. **Shrub:** Is normally a multi-stemmed woody plant that generally has several erect, spreading, or prostrate stems and that is usually between 0.2 meters and 5 meters tall, giving it a bushy appearance. Definitions are blurred at the low and the high ends of the height scales. At the tall end, shrubs may approach trees based on disturbance frequencies (e.g., old-growth re-sprouting chaparral species such as *Cercocarpus betuloides, Heteromeles arbutifolia, Prunus ilicifolia, Sambucus mexicana (nigra)* etc., may frequently attain "tree size"). At the low end, woody perennial herbs or sub-shrubs of various species are often difficult to categorize into a consistent life-form; usually sub-shrubs (per USDA-NRCS 2011) were categorized in the "shrub" category.

11. **Herbaceous plant:** Is any vascular plant species that has no main woody stem-development, and includes grasses, forbs, and perennial species that die-back seasonally.

12. **Cryptogam:** Is a nonvascular plant or plant-like organism without specialized water or fluid conductive tissue (xylem and phloem). Includes mosses, lichens, liverworts, hornworts, and algae.

13. **Con, Avg, Min, Max; C, D, cD, A:** A species table is provided at the end of each association (or alliance) description. The "Con" column provides the overall constancy value for each species within all rapid assessments and relevés classified as that vegetation type. The constancy values are between 0 and 100. Species that occurred with at least 30% constancy and at least 1% cover are listed in the table. The "Avg" column provides the average cover value for each species, as calculated across all samples in that vegetation type. The "Min" and "Max" values denote the minimum and maximum values for estimated cover of species listed in the table. The other coded columns refer to whether each taxon is Characteristic (C), Dominant (D), Co-dominant (cD), and Abundant (A) in the association with these terms defined above.

RESULTS

Species and Survey Data

In the 165 compiled vegetation samples, over 438 vascular plant species were identified to the species or subspecies level. General names were given to non-vascular taxa (i.e., moss and lichen). Appendix 2 provides a complete list of scientific and common names for the taxa identified in the combined field surveys, and includes alpha-numeric codes for the taxa used in the data analyses following USDA-NRCS (2011).

Samples were conducted at 25 sites within the Santa Ana River Watershed and 9 sites within other southern California watersheds and counties. Table 3 provides a summary of the county and site locations as well as number of samples from each area.

Table 3. Location and count of vegetation samples from the Santa Ana River Watershed (highlighted in bold) and samples from three other watersheds within Kern, Los Angeles, and San Diego counties.

County	Site Name	# of Samples
Orange	**Fremont Canyon**	3
Riverside	Arroyo Seco Creek	8
	Bautista Creek	6
	Cajalco Creek	2
	Horsethief Creek	2
	Indian Canyon	3
	Meyhew Canyon	1
	Riverside	1
	San Jacinto River	9
	Santa Ana River	1
	Temescal Wash	3
	Tin Mine Canyon	4
San Bernardino	**Cable Canyon Wash**	2
	Cajon Wash	3
	Day Canyon Wash	2
	East Etiwanda Creek	7
	Etiwanda alluvial fan	3
	Lone Pine Canyon Wash	2
	Lower Cajon Wash	12
	Lower Lytle Creek	10
	Lytle Creek (general)	2
	Lytle Creek Wash	11
	Mill Creek	9
	Santa Ana River	27
	Upper Cajon Wash	6
	Wilson Creek	2

County	Site Name	# of Samples
Kern	Jawbone Canyon	2
	Red Rock Canyon Wash	4
Los Angeles	Bee Canyon	2
	Big Tujunga Wash	6
	Delta Canyon	1
	San Francisquito Canyon	1
	San Gabriel River	4
San Diego	San Felipe Valley	4

Vegetation Data and Analysis

The alluvial scrub surveys collected within the Santa Ana Watershed include 130 shrub-dominated samples and 3 woodland/forest samples. The combined legacy data contributed additional information for 28 shrub stands and 4 woodland/forest stands within three other watersheds. Interpretation of the data with both cluster analysis and indicator species analysis resulted in a floristic classification of vegetation assemblages. Table 4 summarizes the classification and shows the diversity of types occurring in the surveyed alluvial scrub habitats. These types are displayed as a nested hierarchy per the National Vegetation Classification System (NCVS), in which 12 different alliances and 15 finer-level associations are defined. For example, different types of *Lepidospartum squamatum* (California scalebroom) Alliance are classified at the association level depending on co-occurring and characteristic shrub species (e.g., *Lepidospartum squamatum – Eriogonum fasciculatum* as compared to *Lepidospartum squamatum – Eriodictyon trichocalyx – Hesperoyucca whipplei*, while the *Lepidospartum squamatum* alliance is based on the characteristic presence of *Lepidospartum squamatum* in the shrub canopy).

Alliances and associations represented by less than 10 samples are considered provisional and are indicated by "Provisional" following the community type name. A key to the Alliances and Associations and their respective summary stand tables are available in Appendix 3 and 4. Four shrub associations were newly described from this project's data: *Encelia actoni*–alluvial scrub, *Eriodictyon crassifolium, Lepidospartum squamatum/*mixed ephemeral annuals (*Chaenactis glabriuscula*), and *Salvia apiana–Artemisia californica–Ericameria* spp. Associations. We re-described one existing Wirka (1997) type from *Acacia greggii* / *Eriogonum nudum* var*. pauciflorum* to *Acacia greggii* / *Eriogonum davidsonii* and clarified another from *Lepidospartum squamatum /* mixed ephemeral annuals to *Lepidospartum squamatum /* desert ephemeral annuals (*Chaenactis fremontii*). The other associations and alliances listed in Table 4 conform to existing classification names, including those from the previous work of Barbour and Wirka (1997), as listed in Sawyer et al. (2009).

A Multiple Response Permutation Procedure (MRPP) was used to test whether the groups defined in the classification analysis were statistically significant. The MRPP resulted in significant values at both the alliance and association levels (Alliance, $p<0.0001$, $A=0.09$; Association $p<0.0001$, $A=0.15$), which reinforces the validity of the community types identified in Table 4.

Indicator species analysis identified species that were statistically significant ($p <0.05$), i.e. more frequent and abundant in one vegetation type than in others. An Indicator Value (IV) difference among groups of greater than 20 was chosen as the cut-off for determining if a species 'indicated' a particular vegetation type. The indicator values for significant indicator species of the classified vegetation types are presented in Table 5. As an example, the species *Acacia greggii* and *Eriogonum davidsonii* occurred solely in the *Acacia greggii / Eriogonum davidsonii* alliance within this data set (IV 100, $p=0.0002$ for both species). However, not all groups had significant indicator species, including some associations under the *Lepidospartum squamatum* alliance. The *Lepidospartum squamatum* / desert ephemeral annuals association had the most significant indicator species (n=26) illustrating the diversity of unique desert-associated species found within this habitat.

Table 4. Vegetation classification of alluvial scrub habitat in southern California. Alliances and associations are nested within the NVCS classification hierarchy of macrogroups and groups. Types new to the NVCS and MCV are designated by an asterisk (*). Types present within the Santa Ana Watershed are bolded, and numeric codes preceding the classification names follow the CDFG (2010) Natural Communities list codes of alliances and associations.

Macro group	Group	Alliance	Association	# of Survey
MG009. California Forest and Woodland				
	Californian evergreen coniferous forest and woodland			
	8910000	***Juniperus californica* Alliance**		1
MG036. Southwestern North American Riparian, Flooded and Swamp Forest				
	Southwestern North American riparian evergreen and deciduous woodland			
	6113000	*Populus fremontii* Alliance		
		6113016	***Populus fremontii/Baccharis salicifolia***	3
	6131000	***Platanus racemosa* Alliance**		3
MG043. California Chaparral				
	Californian xeric chaparral			
	3710300	*Adenostoma fasciculatum–Salvia apiana* Alliance		
		3710302	***Adenostoma fasciculatum–Salvia apiana–Artemisia californica***	3
	3709000	*Eriodictyon crassifolium* Provisional Alliance		
		3709001	***Eriodictyon crassifolium* Provisional***	2
MG044. California Coastal Scrub				
	Central and South Coastal Californian coastal sage scrub			
	3206500	*Keckiella antirrhinoides* Alliance		
		3206504	***Keckiella antirrhinoides*–mixed chaparral**	1
	3203000	*Salvia apiana* Alliance		
		3203004	***Salvia apiana–Artemisia californica–Ericameria* spp. Provisional***	7
	3202000	*Salvia mellifera* Alliance		
		3202001	***Salvia mellifera–Malosma laurina***	2
	Central and South Coastal Californian seral scrub			
		3207009	***Lepidospartum squamatum–Artemisia californica***	3
		3207008	***Lepidospartum squamatum–Eriodictyon trichocalyx–Hesperoyucca whipplei***	57
		3207006	***Lepidospartum squamatum–Eriogonum fasciculatum***	45
		3207005	***Lepidospartum squamatum–Baccharis salicifolia***	4
		3207003	***Lepidospartum squamatum*/mixed ephemeral annuals *(Chaenactis glabriuscula)* ***	14
	5224000	*Lotus scoparius* Alliance		
		5224001	*Lotus scoparius*	3
MG092. Madrean Warm Semi-Desert Wash Woodland/Scrub				
	Mojavean semi-desert wash scrub			
	3304000	*Acacia greggii* Alliance		
		3304011	*Acacia greggii/Eriogonum davidsonii*	4

Macro group	Group	Alliance	Association	# of Survey
	3207000	*Lepidospartum squamatum* Alliance		
		3207010	*Lepidospartum squamatum*/desert ephemeral annuals *(Chaenactis fremontii)* Provisional	6
MG095. Cool Semi-desert wash and disturbance scrub				
	Intermontane seral shrubland			
	3302500	*Encelia virginensis* Alliance		
		3302503	***Encelia actoni*–alluvial scrub Provisional***	7

Table 5. Indicator values and probabilities for significant indicator species of the classified vegetation types. Representative species named in associations or alliances are highlighted in bold.

Acacia greggii / Eriogonum davidsonii		
Species Name	**IV**	**p**
Acacia greggii	**100**	**0.0002**
Castilleja densiflora	100	0.0002
Cryptantha barbigera	100	0.0002
Eriogonum davidsonii	**100**	**0.0002**
Erodium texanum	100	0.0002
Gutierrezia sarothrae	86	0.0006
Filago depressa	78	0.001
Eriogonum wrightii var. *nodosum*	75	0.0002
Lepidium flavum var. *felipense*	75	0.0008
Opuntia phaeacantha	75	0.0004
Silene laciniata ssp. *major*	75	0.0002
Avena fatua	63	0.0024
Lupinus sp.	57	0.0046
Artemisia ludoviciana ssp. *ludoviciana*	50	0.0016
Pellaea mucronata	48	0.0104
Adenostoma fasciculatum – Salvia apiana – Artemisia californica		
Cryptantha nevadensis	67	0.0018
Adenostoma fasciculatum	**65**	**0.0022**
Cryptantha decipiens	56	0.0058
Camissonia bistorta	41	0.0004
Artemisia californica	**25**	**0.0406**
***Encelia actoni* – alluvial scrub**		
Encelia actoni	**100**	**0.0002**
Stylocline gnaphaloides	25	0.025
Chaenactis glabriuscula	22	0.0488
***Eriodictyon crassifolium* Association**		
Clarkia purpurea	97	0.0002
Claytonia perfoliata	75	0.0002
Eriodictyon crassifolium* var. *crassifolium	**59**	**0.002**
Apiastrum angustifolium	50	0.0236
Hirschfeldia incana	50	0.0258
Daucus pusillus	50	0.0236
Nemophila menziesii	50	0.0236
Pseudognaphalium sp.	50	0.0258
Bromus hordeaceus	49	0.0092
Delphinium parryi	47	0.0156

***Eriodictyon crassifolium* continued**		
Species Name	**IV**	**p**
Sambucus mexicana	46	0.0138
Croton setigerus	43	0.0394
Marrubium vulgare	41	0.0462
Anagallis arvensis	39	0.0442
***Lepidospartum squamatum* Alliance**		
Lepidospartum squamatum	**30**	**0.0002**
Lepidospartum squamatum – Artemisia californica		
Encelia farinosa	37	0.022
Opuntia littoralis	35	0.0034
***Lepidospartum squamatum* / desert ephemeral annuals *(Chaenactis fremontii)* Association**		
Chaenactis fremontii	**100**	**0.0002**
Cryptantha circumscissa	100	0.0002
Gilia brecciarum ssp. *neglecta*	83	0.0012
Langloisia setosissima ssp. *punctata*	83	0.0012
Rafinesquia neomexicana	82	0.0006
Malacothrix glabrata	71	0.0016
Amsinckia tessellata	67	0.001
Chorizanthe brevicornu	67	0.0008
Eschscholzia minutiflora	67	0.0012
Mentzelia nitens	67	0.0014
Phacelia tanacetifolia	65	0.0014
Camissonia boothii	50	0.0036
Hymenoclea salsola	50	0.0052
Lupinus microcarpus var. *horizontalis*	50	0.0036
Nemacladus rubescens	50	0.0042
Coreopsis bigelovii	33	0.0452
Eriogonum inflatum	33	0.0438
Eriogonum reniforme	33	0.0448
Hemizonia arida	33	0.0436
Heliotropium curassavicum	33	0.0436
Lepidium fremontii	33	0.046
Mentzelia eremophila	33	0.0436
Oxytheca perfoliata	33	0.046
Palafoxia arida	33	0.0436
Petalonyx thurberi	33	0.0448
Phacelia pachyphylla	33	0.046

***Lotus scoparius* Association**		
Species Name	**IV**	**p**
Coreopsis californica	67	0.001
Gilia ochroleuca ssp. *bizonata*	67	0.001
Malacothrix clevelandii	67	0.001
Orthocarpus cuspidatus	67	0.001
Silene antirrhina	67	0.001
Townsendia sp.	62	0.002
Rhamnus ilicifolia	59	0.0058
Erigeron foliosus	52	0.007
Sarcostemma cynanchoides ssp. hartwegii	45	0.0104
Camissonia strigulosa	43	0.033
Calystegia macrostegia	43	0.021
Vulpia octoflora	41	0.0188
Microseris lindleyi	32	0.0362
Lotus scoparius* var. *brevialatus	**25**	**0.0012**
***Platanus racemosa* Alliance**		
Platanus racemosa	**62**	**0.0038**
Populus fremontii/Baccharis salicifolia		
Populus fremontii	**95**	**0.0004**
Artemisia douglasiana	75	0.0008
Baccharis salicifolia	**67**	**0.0016**
Senecio flaccidus	47	0.0008
Mimulus cardinalis	38	0.045
***Salvia apiana – Artemisia californica – Ericameria* spp. Association**		
Helianthemum scoparium	43	0.0406
Cryptantha sp.	35	0.0252
Salvia apiana	**33**	**0.0208**
Croton californicus	32	0.02

Salvia mellifera – Malosma laurina		
Species Name	**IV**	**p**
Malacothamnus fasciculatus	74	0.0008
Malosma laurina	**65**	**0.0026**
Keckiella antirrhinoides	56	0.0054
Delphinium cardinale	50	0.0232
Heteromeles arbutifolia	50	0.0256
Helianthus gracilentus	50	0.0256
Salvia mellifera	**50**	**0.0082**
Romneya coulteri	48	0.0272
Marah macrocarpus	47	0.01
Senecio vulgaris	46	0.0324
Centaurea melitensis	40	0.0074

Environmental Data and Analysis

The analyses are presented in the following order; first, new data from the Santa Ana River Watershed are presented, including 49 plots and 48 variables available for analyses. Subsequently, the new and legacy combined data were analyzed against fewer environmental variables.

Before testing the significance of individual environmental factors, the distribution of all quantitative environmental factors were graphed and most were found to be skewed (Figure 3). Because the data did not fit the assumption of normality and could not be transformed to meet this assumption, Non-metric Multidimensional Scaling (NMS) was chosen as an appropriate ordination technique for the analysis of the environmental and vegetation data.

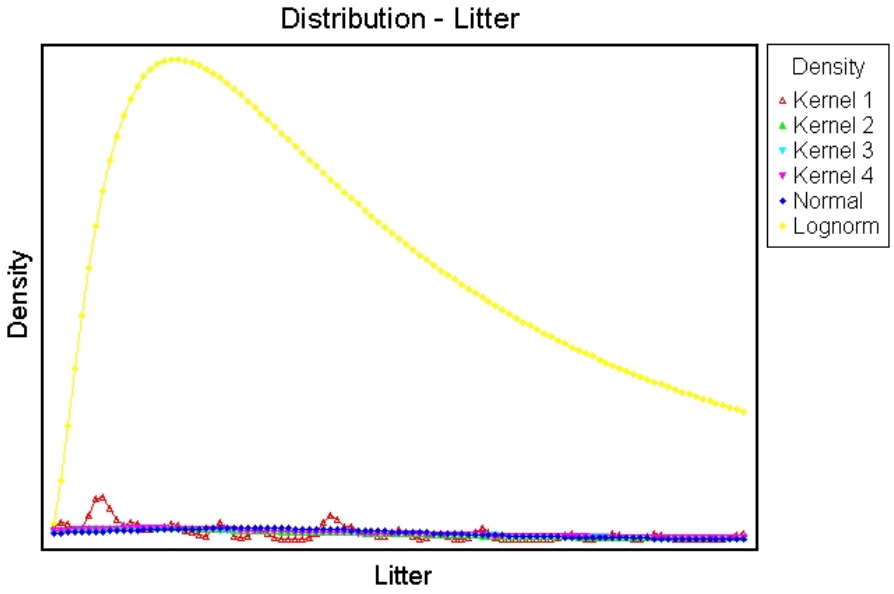


Figure 3. Graph illustrating skewed distribution of the quantitative variable for litter, estimated in the field using bird's eye percent cover. The density axis displays number of observations along a continuous scale (frequency) and uses four kernel smoothing functions to construct a smooth curve. The yellow line graphs log-transformed data.

Dataset – 49 surveys/48 variables

From the 49 surveys in the 2010–2011 dataset, two surveys (ALSCMC1, ALSCHTC2) had Euclidean distances greater than 2 standard deviations from the mean, and were removed. Thus, 47 surveys were analyzed with 28 quantitative and 20 categorical variables. Analysis tools available in PC-ORD (McCune and Mefford 1997) were used to test significant correlations between species cover/constancy and environmental variables. A Mantel Test using Sorensen distances for the species matrix and Euclidean distances for the environmental variable matrix indicated no significant correspondence between the species patterns and the overall variables (p=0.25).

To detect the significance of individual environmental factors, we interpreted a three-dimensional NMS solution with a final stress of 19.70. The proportion of variance for the 47 survey dataset represented by the NMS ordination axis 1 was 23%, while axis 2 represented an additional 38%. The three axes cumulatively represented 81% of the variance within the dataset. Within the 28 quantitative variables analyzed, 9 factors had significant correlations in

the NMS ordination analysis (r^2>0.30). The correlation coefficients (r) are listed below for each significant variable; many of these factors are strongly inter-related (e.g. vegetation cover and litter).

Variable Name	Axis 1 r =	Axis 2 r =	Axis 3 r =
AnnPpt	**0.574**	0.116	-0.282
DEM	**0.658**	0.275	-0.308
Elevation	**0.652**	0.279	-0.303
UTMN_fin	**0.576**	0.506	-0.404
UTME_fin	0.235	**0.578**	-0.235
Litter	-0.160	-0.382	**0.602**
Shrub_cover	0.162	-0.182	**0.591**
Herb_cover	0.015	-0.032	**0.635**
Veg_cover	0.083	-0.075	**0.669**

The gradients of Elevation/DEM and Vegetation cover, as well as other closely related variables, have important correlations with Axis 1 and 3 respectively, see Figure 4. Along Axis 3 both the *Salvia mellifera* and *Eriodictyon crassifolium* Alliances had high values of vegetation cover when compared to associations of the *Lepidospartum squamatum* alliance including the *Lepidospartum squamatum–Eriogonum fasciculatum* and *Lepidospartum squamatum–Eriodictyon trichocalyx–Hesperoyucca whipplei* Associations.

Along Axis 1, Elevation/DEM and Annual precipitation are inter-related, where annual precipitation increases with rising elevation. Types correlated with lower elevations and lower annual precipitation include the *Salvia mellifera–Malosma laurina*, *Lepidospartum squamatum* / mixed ephemeral annuals, and *Lepidospartum squamatum–Artemisia californica* Associations, while mid to higher elevations include other *Lepidospartum squamatum* associations and *Salvia apiana–Artemisia californica–Ericameria* spp. Association. UTMN is also related to Axis 1 where higher latitude surveys are positively associated with higher elevations.

To understand the correlation of categorical variables with vegetation patterns in the ordination diagram, Figure 5 depicts a side-by-side overlay of geology and vegetation associations. Young alluvial-fan deposits (4) are clustered along the top and left edge of the diagram while Very young wash deposits (6) group are along the lower right edge. Very young wash deposits represent both the *Lepidospartum squamatum–Eriodictyon trichocalyx–Hesperoyucca whipplei* and the *Lepidospartum squamatum–Eriogonum fasciculatum* Association, and this side of the axis is also correlated to lower vegetative cover.

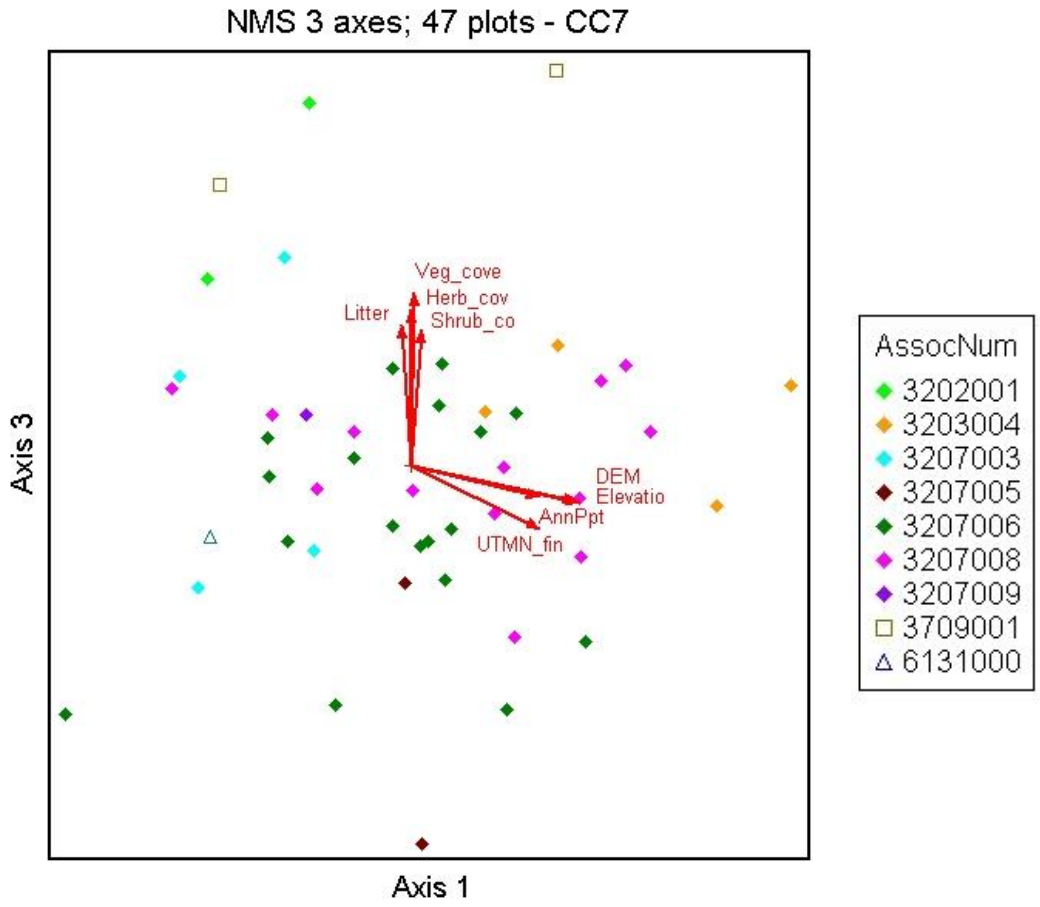
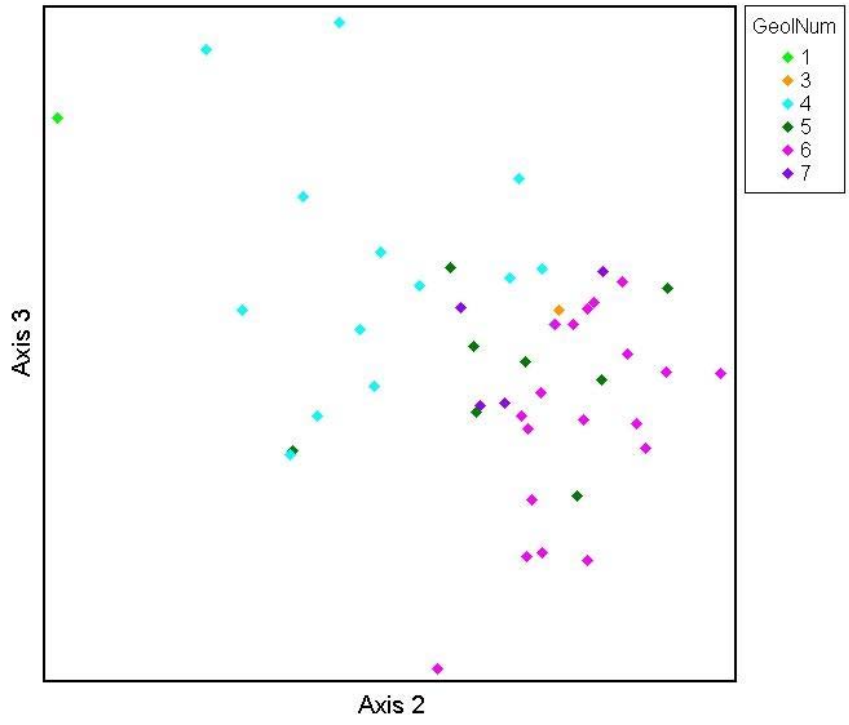


Figure 4. NMS ordination diagram of 47 surveys displaying vegetation association by number. The angles / lengths of the vectors indicate strength and direction of the correlation with the ordination axes.



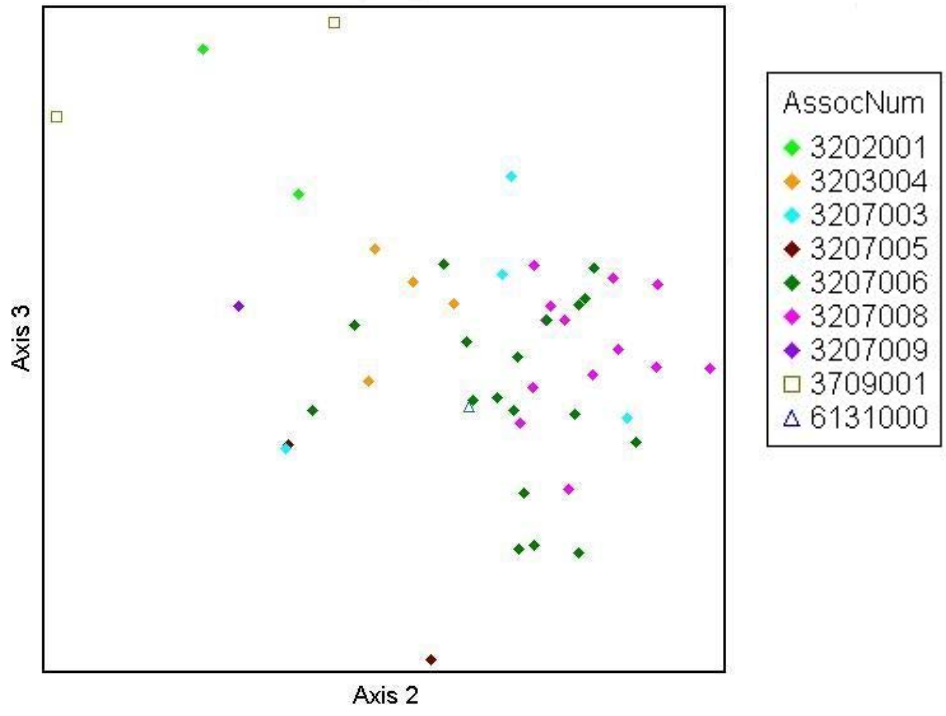


Figure 5. NMS ordination diagrams of 47 surveys displaying an overlay of geology and association.

Dataset – 151 surveys/17 variables

Using all combined samples that have GPS coordinates (151 surveys), 11 quantitative variables and 6 categorical variables were analyzable. A significant (p=0.002) Mantel Test indicated correspondence between the species patterns and all variables (r=0.15). Analysis using polar ordination (Bray-Curtis) of this dataset revealed a correlation of geographic position among the vegetation surveys (Figure 6). This ordination displays a main cluster of surveys in the center of the diagram and a few points grouped near the poles, indicating that a few surveys are having a very significant effect on the analysis. In this case, the cumulative variation described across 3 axes was only 9%. The 10 outlier surveys include the *Lepidospartum squamatum* / desert ephemeral annuals association from Kern County (uppermost part of diagram) and the *Acacia greggii* / *Eriogonum davidsonii* association from San Diego County (lower right of diagram). While the outlier plots identified in this analysis subset were removed from subsequent analyses in order understand differences among the central cluster of alluvial scrub surveys, these two communities are important components showing the diversity of vegetation within alluvial scrub.

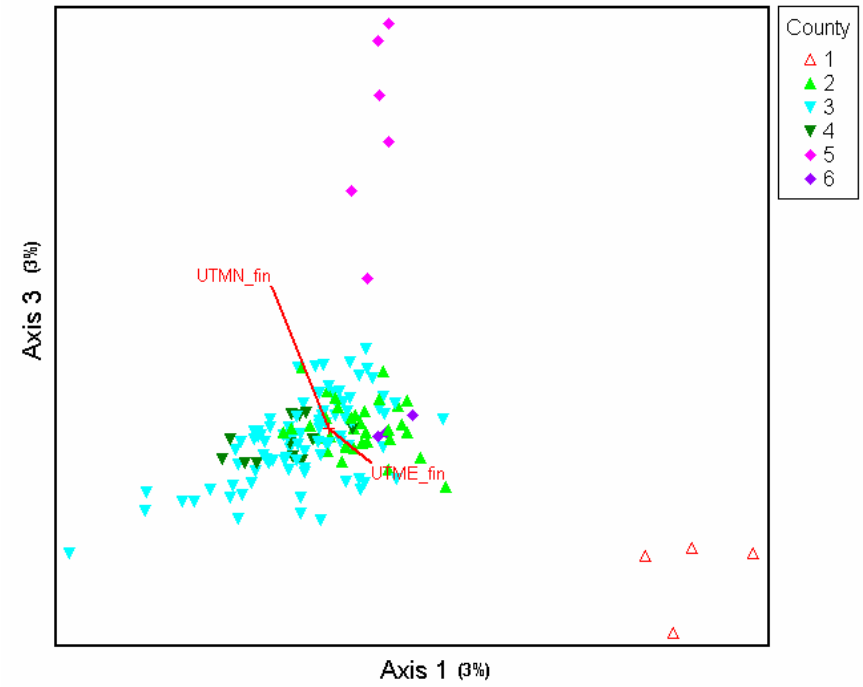


Figure 6. Polar ordination diagram of 151 surveys showing the geographic correlation (red vectors) with two clusters of outlying surveys representing two very distinct vegetation associations. Each axis explains only 3% of the variation within the ordination.

Dataset – 141 surveys/17 variables

We interpreted a new three-dimensional NMS solution using 141 samples with a final stress of 21.41. The proportion of variance for the 141 survey dataset represented by the NMS ordination axis 1 was 20%, while axis 2 represented an additional 31%. The three axes cumulatively represented 70% of the variance within the dataset.

Six quantitative environmental variables had significant correlations along at least one of the three axes, see Figure 7. This ordination diagram was rigidly rotated to align species richness (number of species in a sample) along Axis 3 for display purposes. The correlation coefficients are listed below for each significant variable within the NMS ordination (r^2 >0.15), the significant correlations are highlighted in bold.

Variable Name	Axis 1 r =	Axis 2 r =	Axis 3 r =
FireNum	**0.392**	0.124	0.224
YearSinceFire	**-0.475**	-0.052	-0.236
MnAnTem	0.051	**0.512**	-0.071
Richness	-0.152	-0.009	**0.524**
Small_rock	**0.486**	-0.054	**-0.358**
Bare_fines	**-0.666**	-0.052	-0.089

For the 141 surveys, species richness had a significant correlation along Axis 3 (r = 0.524), (Figure 7). This species richness pattern was similar to those obtained using other PC-ORD analysis tools, including Principal Component Analysis (PCA) and Detrended Correspondence Analysis (DCA). Axis 1 included significant correlations with rock/soil ground cover variables. The percent cover of Bare Ground, a field-assessed quantitative variable strongly associated with Axis 1, is correlated with the *Lepidospartum squamatum–Eriodictyon trichocalyx–Hesperoyucca whipplei* Association. The percent cover of Small Rocks shows an inverse relationship with Bare Ground and is correlated with the *Lepidospartum squamatum–Eriogonum fasciculatum* Association.

Also seen along Axis 1, Fire Number and Year Since Fire are inter-related quantitative variables that both were significant in opposite directions. Fire frequency was highest among surveys of the *Lepidospartum squamatum–Eriogonum fasciculatum* Association, appropriately termed as the 'Pioneer' group by Barbour and Wirka (1997), while the time since fire was highest within the *Lepidospartum squamatum–Eriodictyon trichocalyx–Hesperoyucca whipplei* and *Lepidospartum squamatum* / mixed ephemeral annuals Associations.

For Axis 2, a correlation of Minimum Annual Temperature is seen where lower annual temperatures correspond more with the *Adenostoma fasciculatum–Salvia apiana–Artemisia californica, Lepidospartum squamatum–Artemisia californica,* and *Salvia apiana–Artemisia californica–Ericameria* spp. Associations while higher annual temperatures are correlated with other *Lepidospartum squamatum* Associations.

In order to further evaluate the correlations of Fire frequency with the Associations, an NMS ordination diagram with vegetation association is shown with an overlay of the number of fires at each survey. The *Lepidospartum squamatum–Eriogonum fasciculatum* (closed purple diamonds) and *Salvia apiana–Artemisia californica–Ericameria* spp. (open green triangles) both correspond with histories of numerous repeat fires (Figure 8).

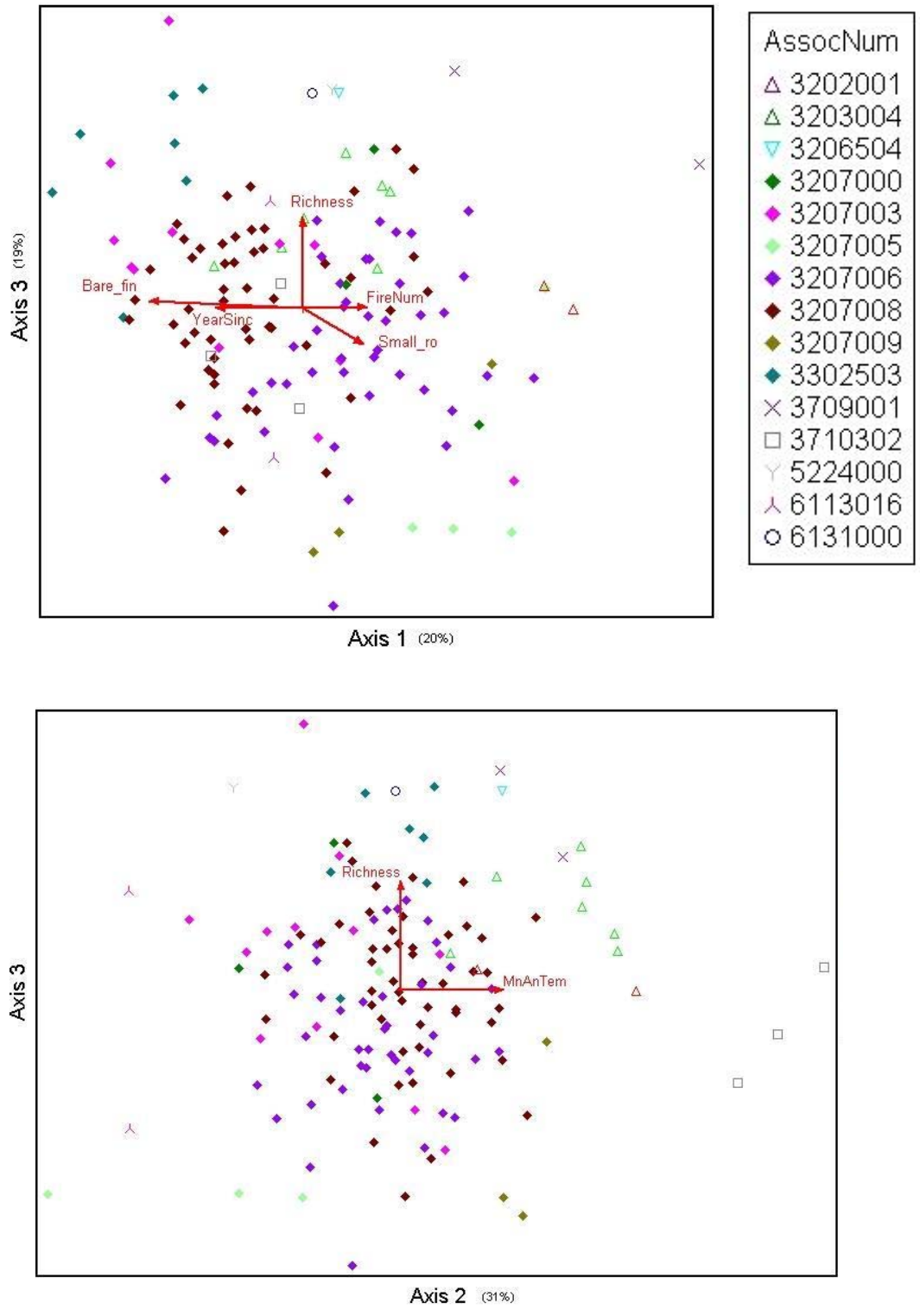


Figure 7. NMS ordination diagram of 141 surveys displaying vectors of quantitative environmental variables with significant correlations along the three ordination axes. The angles / lengths indicate strength and direction of the variable's correlation with the ordination axes.

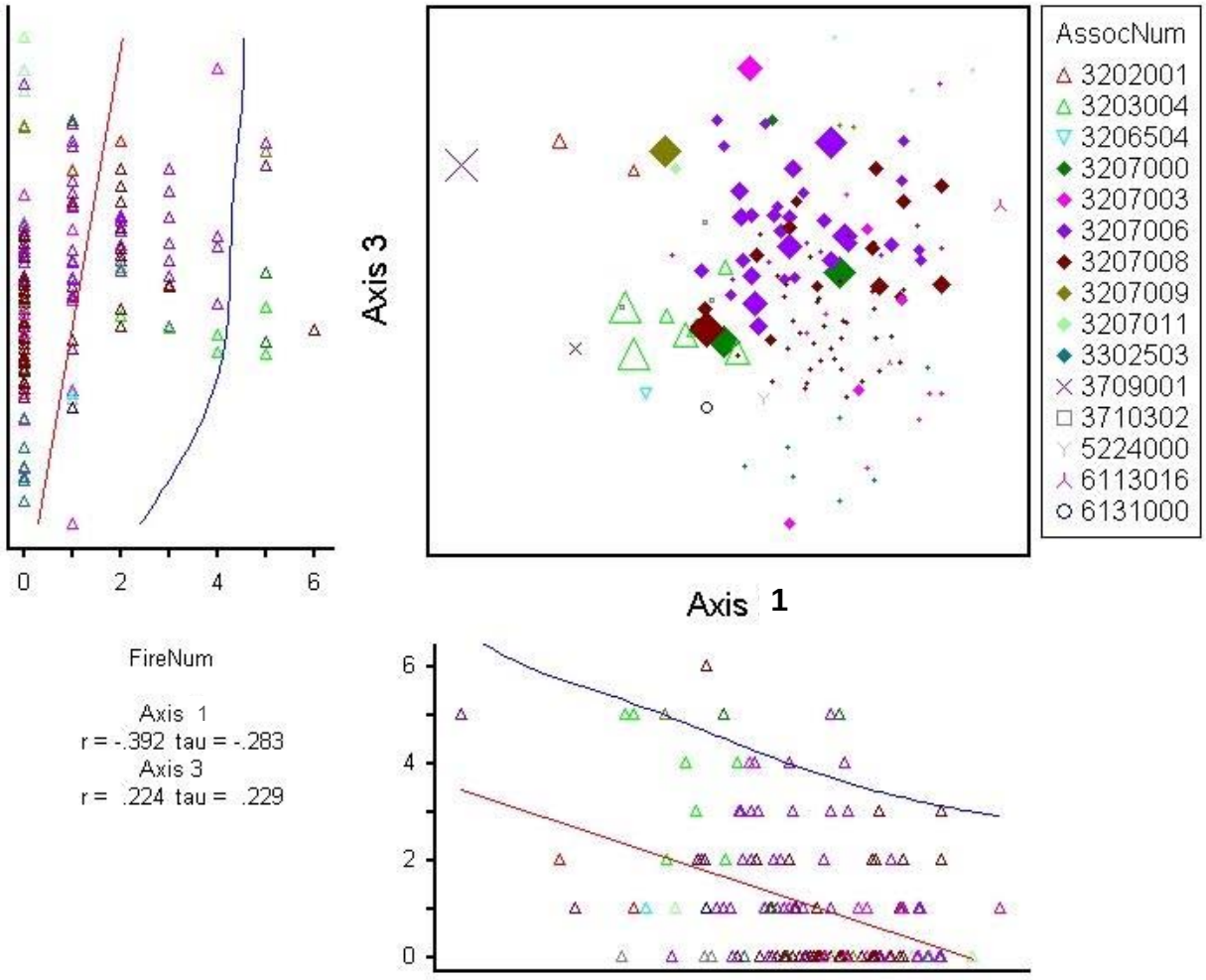
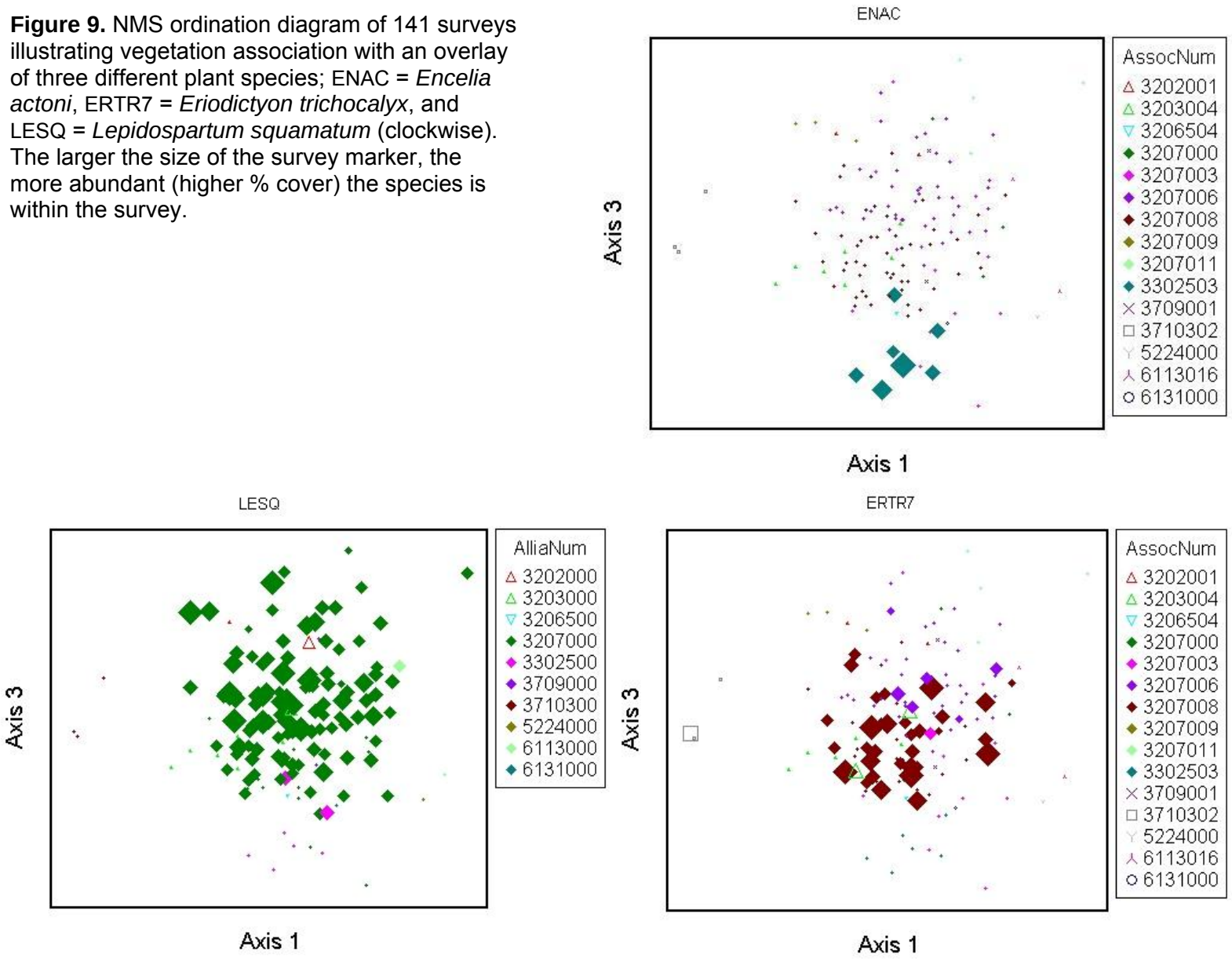


Figure 8. NMS ordination diagram of 141 surveys showing vegetation association with an overlay of the environmental variable depicting the number of fires at a survey. The size of the survey point symbolizes the value for fire number (larger = more fires).

To better understand the pattern of species abundance (measured in % cover) within the ordination diagram of 141 surveys, three species were selected for display of their patterns in the NMS overlays, as example species that are important in different vegetation types. Figure 9 depicts the three species overlays paired with color-coded Associations and Alliances. Starting counterclockwise from the top-right, *Encelia actoni* (ENAC) has a trend of decreasing abundance from top to bottom of Axis 3, and plots of its respective association (blue diamonds) are the bottom of the overlay. *Eriodictyon trichocalyx* (ERTR7) is most evident in the center plots, correlated with plots of the *Lepidospartum squamatum–Eriodictyon trichocalyx–Hesperoyucca whipplei* Association (brown diamonds), while *Lepidospartum squamatum* (LESQ) strongly represents the *Lepidospartum squamatum* Alliance (green diamonds) from the center to top plots of the overlay.

Figure 9. NMS ordination diagram of 141 surveys illustrating vegetation association with an overlay of three different plant species; ENAC = *Encelia actoni*, ERTR7 = *Eriodictyon trichocalyx*, and LESQ = *Lepidospartum squamatum* (clockwise). The larger the size of the survey marker, the more abundant (higher % cover) the species is within the survey.



Dataset – 165 surveys/6 variables

A significant Mantel Test statistic (p=0.007) for all the combined surveys (165 surveys) with one quantitative variable and five categorical variables indicates a correspondence between the species patterns and environmental variables (r=0.11). A significant (randomization test p=0.04), three-dimensional NMS solution was interpreted with a final stress of 25.68, after verifying consistency among several NMS solutions. The proportion of variance explained along axis 1 of the NMS ordination was 28%, while axis 2 represented an additional 26%. Three axes cumulatively represented 74% of the variance within the dataset. Though categorical variables are useful as overlays on the ordination diagram, Species richness was the only quantitatively interpretable variable for this full set of plots.

Species richness had a significant correlation along axis 3 (r = 0.463), (Figure 10). This pattern of species richness was similar to those obtained using other PC-ORD analysis tools, including Principal Component Analysis (PCA) and Detrended Correspondence Analysis (DCA), and was consistently significant throughout the different data sets analyzed. *Acacia greggii / Eriogonum davidsonii*, *Lepidospartum /* mixed ephemeral annuals, *Lepidospartum squamatum–Eriodictyon trichocalyx–Hesperoyucca whipplei* and *Encelia actoni* Associations were among the most species-rich habitats while *Lepidospartum squamatum–Artemisia californica* and *Lepidospartum squamatum–Eriogonum fasciculatum* were less species-rich.

Other visual interpretations of the ordination diagram include clustering of stands within certain associations. For example, see the *Lepidospartum squamatum–Eriogonum fasciculatum* association in the lower central area, *Encelia actoni* in the upper right, *Acacia greggii / Eriogonum davidsonii* along the upper edge, *Lepidospartum squamatum /* desert ephemeral annuals along the right edge, and the *Lepidospartum squamatum / Baccharis salicifolius* association along the left edge of the diagram.

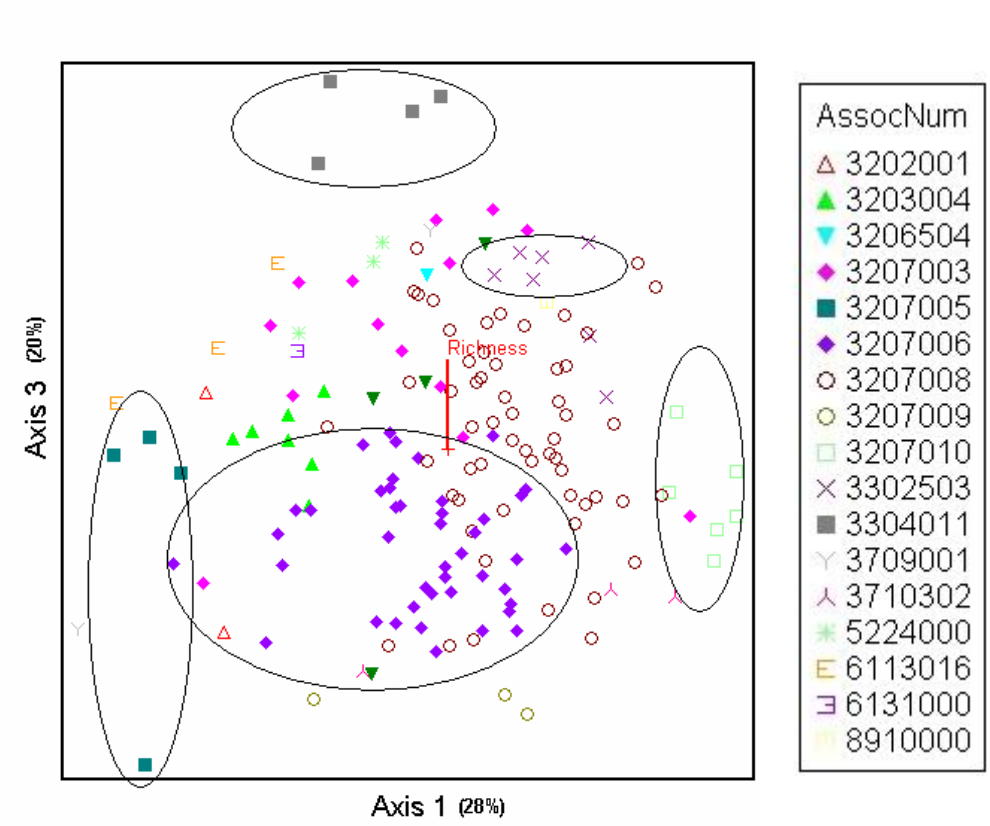


Figure 10. NMS ordination diagram of 165 surveys showing color-coded vegetation association by number, some types are highlighted by ovals. The vector depicts the direction of increasing species richness while the length reflects the magnitude of association of this variable along ordination axis 3.

DISCUSSION

This project developed a standardized floristic classification of vegetation within alluvial scrub habitats of the Santa Ana River Watershed. The floristic key and summary stand tables located in the appendices provide quantitative data to discern differences among vegetation types of alluvial scrub and will assist in the development of restoration palettes based on reference communities. Restoration palettes ideally include a variety of annual and perennial herbs, as well as shrubs, and stand tables provide specific lists of species that consistently occur throughout the stands of different vegetation types.

Surveys from the Santa Ana River Watershed define 10 different alliances and 12 finer-level associations. The majority of new data from 2010–2011 represented the *Lepidospartum squamatum* Alliance (n=39 out of 49 survey points). Ten surveys from 5 additional alliances make up the remaining dataset, mostly mature scrub and woodland types. In particular, this project's effort captured previously un-described vegetation types and represents species groupings of heretofore un-described alluvial scrub associations including *Encelia actoni*–alluvial scrub, *Eriodictyon crassifolium, Lepidospartum squamatum/*mixed ephemeral annuals (*Chaenactis glabriuscula*), and *Salvia apiana–Artemisia californica–Ericameria* spp. Additional sampling of under-represented types could continue to increase our knowledge of the variation and environmental correlations within alluvial scrub vegetation.

After the combination of both new and legacy data to analyze species and environmental data trends, the majority of the 165 field surveys similarly represented numerous associations within the *Lepidospartum squamatum* Alliance (n=129). California Scalebroom is justifiably the definitive alluvial scrub type of southern California, with various permutations at the association level, and this alliance was observed in 5 out of the 6 counties sampled. In particular, *Lepidospartum squamatum–Eriogonum fasciculatum* and *Lepidospartum squamatum–Eriodictyon trichocalyx–Hesperoyucca* Associations dominated the results with 43 and 57 samples, respectively.

This report classifies new data contextually with other existing alluvial scrub data sampled in southern California. Based on these new analyses, we propose an update for the existing NVC hierarchy which is currently under revision. We recommend that the *Lepidospartum squamatum* Alliance be moved from the Mojavean semi-desert wash scrub Group to the Central and South Coastal Californian seral scrub Group; this proposal is based on the primary locations of the alliance, characteristic species associated with *Lepidospartum squamatum*, and the center of distribution and richness of its associations.

Some quantitative environmental variables have significant correlations with species patterns at the association level, while a number of other quantitative and categorical variables did not appear significant. These variables do not appear well-stratified across the surveys in the datasets, which made correlations difficult to extract (e.g. microtopography). Additionally, data collected on soil features through lab analysis (e.g., soil texture differences) could help in evaluating species-environmental correlations. A more thorough understanding of flooding history could also inform correlations with vegetation. In the future, we recommend that sampling locations be stratified across variable types to allow for a more balanced design and a better understanding of species/vegetation correlations with environmental variables.

Species richness was consistently significant throughout the data analysis and reflects the influence of different environmental factors on vegetation. Species richness was higher within

the *Lepidospartum squamatum–Eriodictyon trichocalyx–Hesperoyucca whipplei* Association and lower within the *Lepidospartum squamatum–Eriogonum fasciculatum* (aptly named the "Pioneer" type in Wirka 1997). While the impact of repeat and recent fires may be influencing our ability to obtain strong correlations among other environmental variables (15 surveys had 2–6 fires in the last 9 years), fire along with episodic flooding appear to correlate with the pioneer associations of the *Lepidospartum squamatum* Alliance. In particular, *Lepidospartum squamatum–Eriogonum fasciculatum* stands tend to be correlated with more frequent fires and higher cover of small rocks than the *Lepidospartum squamatum–Eriodictyon trichocalyx–Hesperoyucca whipplei* Association which had fewer fires and more bare ground (fines). Both of these associations occur more frequently on very young wash deposits within alluvial systems.

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APPENDIX 1. Protocol and field forms used by staff and volunteers for vegetation sampling in 2010 and 2011.

CALIFORNIA NATIVE PLANT SOCIETY / DEPARTMENT OF FISH AND GAME PROTOCOL
FOR COMBINED VEGETATION RAPID ASSESSMENT
AND RELEVÉ SAMPLING FIELD FORM
(March 22, 2010)

Introduction

This protocol describes the methodology for both the relevé and rapid assessment vegetation sampling techniques as recorded in the combined relevé and rapid assessment field survey form dated April 30, 2010 for alluvial scrub habitats. The same environmental data are collected for both techniques. However, the relevé sample is plot-based, with each species in the plot and its cover being recorded. The rapid assessment sample is based not on a plot but on the entire stand, with 12-20 of the dominant or characteristic species and their cover values recorded. For more background on the relevé and rapid assessment sampling methods, see the relevé and rapid assessment protocols at www.cnps.org.

Selecting stands to sample:

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

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

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

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

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

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

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

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

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

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

Plot Size

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

Herbaceous communities: 100 sq. m plot
Special herbaceous communities, such as vernal pools, fens: 10 sq m plot
Shrublands and Riparian forest/woodlands: 400 sq. m plot
Open desert and other shrublands with widely dispersed but regularly occurring woody species: 1000 sq. m plot
Upland Forest and woodland communities: 1000 sq. m plot

Plot Shape

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

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

Definitions of fields in the protocol

Relevé or Rapid Assessment Circle the method that you are using.

LOCATIONAL/ENVIRONMENTAL DESCRIPTION

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

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

Date: Date of the sampling.

Name(s) of surveyors: The full names of each person assisting should be provided for the first field form for the day. On successive forms, initials of each person assisting can be recorded. Please note: The person recording the data on the form should circle their name/initials.

GPS waypoint #: The waypoint number assigned by a Global Positioning System (GPS) unit when marking and storing a waypoint for the sample location. Stored points should be downloaded in the office to serve as a check on the written points and to enter into a GIS.

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

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

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

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

UTM coordinates: Easting (UTME) and northing (UTMN) location coordinates using the Universal Transverse Mercator (UTM) grid. Record in writing the information from a GPS unit or a USGS topographic map for each corner of the plot in the appropriate field.

UTM zone: Universal Transverse Mercator zone. Zone 10 is for California west of the 120^{th} longitude, zone 11 is for California east of 120^{th} longitude, which is the same as the straight portion of California's eastern boundary.

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

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

Least distance to active channel: Measure the horizontal distance from the stand to the nearest active channel. Please note feet (ft) or meters (m).

Elevation above channel: Measure the vertical height of the stand above the nearest active channel. Please circle feet (ft) or meters (m).

Photograph #s: Write the name or initials of the camera owner, JPG/frame number, and direction of photos (note the roll number if using film). *Take four photos in the main cardinal directions (N, E, S, W) clockwise from the north, from the GPS location.* Additional photos can be taken facing NE across stand as well as a center shot from the top of the stand to the bottom, from the center long edge towards the bottom, from the center long edge facing NE and from mid plot towards the top and mid plot towards the bottom of the stand.

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

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

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

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

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

Topography: First assess the local (**Micro**) topographic features or the lay of the area (*e.g.*, surface is flat or concave). **Circle only *one* of the microtopographic descriptors**. Then assess the broad (**Macro**) topographic feature or general position of the stand in the surrounding watershed, that is, the stand is at the top, upper (1/3 of slope), middle (1/3 of slope), lower (1/3 of slope), or bottom. **Circle *all* of the positions that apply for macrotopography.** If a bottom position is selected, circle either *channel* or *terrace*. If terrace is selected, circle whether it is a *lower*, *middle*, or *upper* terrace.

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

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

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

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

% Water: Estimate the percent surface cover of running or standing water, ignoring the substrate below the water.
% BA Stems: Percent surface cover of the plant basal area, *i.e.*, the basal area of stems at the ground surface. Note that for most vegetation types BA is 1-3% cover.
% Litter: Percent surface cover of litter, duff, or wood on the ground.
% Bedrock: Percent surface cover of bedrock.
% Boulders: Percent surface cover of rocks > 60 cm in diameter.
% Stone: Percent surface cover of rocks 25-60 cm in diameter.
% Cobble: Percent surface cover of rocks 7.5 to 25 cm in diameter.
% Gravel: Percent surface cover of rocks 2 mm to 7.5 cm in diameter.
% Fines: Percent surface cover of bare ground and fine sediment (e.g. dirt) < 2 mm in diameter.

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

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

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

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

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

Disturbance code / Intensity (L,M,H): List codes for potential or existing impacts on the stability of the plant community. Characterize each impact each as **L** (=Light), **M** (=Moderate), or **H** (=Heavy). For invasive exotics, divide the total exotic cover (e.g. 25% Bromus diandrus + 8% Bromus madritensis + 5% Centaurea melitensis = 38% total exotics) by the total % cover of all the layers when

added up (e.g. 15% tree + 5% low tree + 25% shrub + 40% herbs = 85% total) and multiply by 100 to get the % relative cover of exotics (e.g. 38% total exotics/85% total cover = 45% relative exotic cover). L = 0-33% *relative* cover of exotics; M =34-66% relative cover, and H = > 66% relative cover. *See code list for impacts.*

II. HABITAT AND VEGETATION DESCRIPTION *per California Wildlife-Habitat Relationships (CWHR)*

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

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

Shrub (mark one)**:** Record shrub size classes when shrub canopy closure exceeds 10 percent (except in desert types). You can record shrub size class by circling the class that is predominant in the survey. Shrub size class is based on the average amount of crown decadence (dead standing vegetation on live shrubs when looking across the crowns of the shrubs).

Herb (mark one)**:** Record herb height when herbaceous cover exceeds 2 percent. You can record herb class by the size class that is predominant in the survey (H1 or H2). *This height class is based on the average plant height at maturity, not necessarily at the time of observation.*

Overall cover of vegetation

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

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

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

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

% Cover

% Conifer Tree /Hardwood Tree: The total foliar cover (considering porosity) of all live tree species, disregarding overlap of individual trees. Estimate conifer and hardwood covers separately. **Please note:** These cover values should not include the coverage of regenerating tree species (i.e., tree seedlings and saplings).

% Regenerating Tree: The total foliar cover of seedlings and saplings, disregarding overlap of individual recruits. See seedling and sapling definitions below.

%Shrub: The total foliar cover (considering porosity) of all live shrub species disregarding overlap of individual shrubs.

%Herbaceous: The total cover (considering porosity) of all herbaceous species, disregarding overlap of individual herbs.

Height Class

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

Species list and coverage

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

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

For both sample types, provide the stratum where:
T = Tree. A woody perennial plant that has a single trunk.
S = Shrub. A perennial, woody plant that is multi-branched and doesn't die back to the ground every year.
H = Herb. An annual or perennial that dies down to ground level every year.
E = SEeedling. A tree species clearly of a very young age that is less than 1" dbh.
A = Sapling. 1" - <6" dbh and young in age, OR small trees that are less than 1"diameter at breast height and are clearly of appreciable age and kept short by repeated browsing or burning.
N = Non-vascular. Includes mosses, liverworts, hornworts, cryptogammic crust, lichens, and algae.

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

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

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

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

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

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

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

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

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

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

INTERPRETATION OF STAND

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

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

Field-assessed association name (optional): Name of the species in the alliance and additional dominant/diagnostic species from any strata, as according to CNPS classification. In following naming conventions, species in differing strata are separated with a slash, and species in the uppermost stratum are listed first (*e.g., Quercus douglasii/Toxicodendron diversilobum*). Species in the same stratum are separated with a dash (*e.g., Quercus lobata-Quercus douglasii)*.

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

Adjacent Alliances/direction: Identify other vegetation types that are directly adjacent to the stand being assessed by noting the dominant species (or known type). Also note the distance away in meters from the GPS waypoint and the direction in degrees aspect that the adjacent alliance is found (e.g., *Amsinckia tessellata* / 50m, 360° N *Eriogonum fasciculatum* /100m, 110°).

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

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

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

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

CNPS/CDFG Combined Vegetation Rapid Assessment & Relevé Field Form – Alluvial Scrub

Relevé or Rapid Assessment (circle one) (Revised April 30, 2010)

For Office Use:	**Final database #:**	**Final vegetation type name:**	**Alliance_____ Association**

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION

Polygon/Stand #:	**Air photo:**	**Date:**	**Name(s) of surveyors (circle recorder):**

GPS wypt #: _____ **GPS name:** _____ **Datum:** _____ **or NAD83. Bearing, left axis at SW pt**_____ **(degrees) of Long / Short side**

SW corner UTME__ __ __ __ __ __ **UTMN** __ __ __ __ __ __ __ ; **NW cor UTME** __ __ __ __ __ __ **UTMN** __ __ __ __ __ __ __

NE corner UTME __ __ __ __ __ __ **UTMN** __ __ __ __ __ __ __ ; **SE corner UTME** __ __ __ __ __ __ **UTMN** __ __ __ __ __ __ __
Zone: 11 Error: ±____ **ft / m / pdop; Elevation:** _____ **; Least distance to active channel**_____**; Elev. above channel**_____ **ft / m**

Camera Name: **Photograph #'s from SW corner →** N/_____; E/_____; S/_____; W/_____; NE/_____.
Center sht top→bot_____; Center long edge→bot_____; Center long edge→NE/_____; Mid Pl→top_____; Mid Pl→ bot_____

Stand Size (acres): <1, 1-5, >5 | Plot Size (m²): 10 / 100 / 400 / 1000 | Plot Shape ___ **x**___ **ft / m**

Exposure, Actual °: _____ **NE NW SE SW Flat Variable All | Steepness, Actual °:** _____ **0° 1-5° 5-25° > 25**

Topography: Micro: convex flat concave undulating | Geology code: _____ **Soil Texture code:** _____
Macro: top upper mid lower bottom: channel, terrace (lower, middle, upper) | Upland or **Wetland/Riparian** (circle one)

% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)
H20:____ **BA Stems:**____ **Litter:** ____ **Bedrock:**____ **Boulder:**____ **Stone:**____ **Cobble:**____ **Gravel:**____ **Fines:**____ **=100%**

% Current year bioturbation _____ **Past bioturbation present? Yes / No | % Hoof punch** _____
Fire evidence: Yes / No / Unknown (circle one) If yes, describe in Site history section, including date of fire, if known.

Site history, stand age, comments:

Disturbance code / Intensity (L,M,H): ____/____ ____/____ ____/____ ____/____ ____/____ **"Other"** _____/____

II. HABITAT AND VEGETATION DESCRIPTION

Tree DBH : T1 (<1" dbh), **T2** (1-6" dbh), **T3** (6-11" dbh), **T4** (11-24" dbh), **T5** (>24" dbh), **T6** multi-layered (T3 or T4 layer under T5, >60% cover)
Shrub: S1 seedling (<3 yr. old), **S2** young (<1% dead), **S3** mature (1-25% dead), **S4** decadent (>25% dead)
Herbaceous: H1 (<12" plant ht.), **H2** (>12" ht.) **% Non-Vasc cover:** _____ **Total % Vasc Veg cover:**_____
% Cover - Conifer tree / Hardwood tree: ____/____ **Regenerating Tree:** _____ **Shrub:** _____ **Herbaceous:** _____
Height Class - Conifer tree / Hardwood tree: ____/____ **Regenerating Tree:** _____ **Shrub:** _____ **Herbaceous:** _____
Height classes: 01=<1/2m 02=1/2-1m 03=1-2m 04=2-5m 05=5-10m 06=10-15m 07=15-20m 08=20-35m 09=35-50m 10=>50m

Species, Stratum, and % cover. Stratum categories: T=Tree, S = Shrub, H= Herb, E = SEedling, A = SApling, N= Non-vascular.
% cover intervals for reference: <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, 75%.

Strata	Species	% cover	C	Strata	Species	% cover	C

Unusual species: _____

III. INTERPRETATION OF STAND

Field-assessed vegetation alliance name: _____
Field-assessed association name (optional): _____
Adjacent alliances/direction: _____/_____, _____/_____
Confidence in alliance identification: L M H Explain: _____
Phenology (E,P,L): Herb____ **Shrub**____ **Tree**____ **Other identification or mapping information:**

CNPS and CDFG Combined Vegetation Rapid Assessment and Relevé Field Form
RELEVE SPECIES SHEET (Revised 3/22/2010)

Page ______ of Polygon/Stand #: ___________

Stratum categories: T = Tree, S = Shrub, H = Herb, E = SEedling, A = SApling, and N=Non-vascular
% Cover Intervals for reference: r = trace, <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Strata	Vascular plant name or lichen/bryophyte	% Cover	Collection	Final species determination (or DBH)

APPENDIX 2. List of plants analyzed in all combined alluvial scrub surveys with scientific names and nativity status accepted by UCB (2009) and codes and common names by USDA-NRCS (2011).

Code	Scientific Name	Common Name	Family	Native
ABVI	*Abronia villosa*	desert sand verbena	Nyctaginaceae	Yes
ACGR	*Acacia greggii*	catclaw acacia	Fabaceae	Yes
ACCO21	*Achnatherum coronatum*	giant ricegrass	Poaceae	Yes
ACSP12	*Achnatherum speciosum*	desert needlegrass	Poaceae	Yes
ADFA	*Adenostoma fasciculatum*	chamise	Rosaceae	Yes
AGSH	*Agave shawii*	coastal agave	Agavaceae	Yes
ALLIU	*Allium* sp.	onion	Liliaceae	Yes
ALRH2	*Alnus rhombifolia*	white alder	Betulaceae	Yes
ALAL3	*Alyssum alyssoides*	pale madwort	Brassicaceae	No
AMAC2	*Ambrosia acanthicarpa*	flatspine bur ragweed	Asteraceae	Yes
AMPS	*Ambrosia psilostachya*	Cuman ragweed	Asteraceae	Yes
AMORP	*Amorpha* sp.	false indigo	Fabaceae	Yes
AMME	*Amsinckia menziesii*	Menzies' fiddleneck	Boraginaceae	Yes
AMTE3	*Amsinckia tessellata*	bristly fiddleneck	Boraginaceae	Yes
ANAR	*Anagallis arvensis*	scarlet pimpernel	Primulaceae	No
ANCA14	*Anthriscus caucalis*	bur chervil	Apiaceae	No
ANCO4	*Antirrhinum coulterianum*	Coulter's snapdragon	Scrophulariaceae	Yes
APAN	*Apiastrum angustifolium*	mock parsley	Apiaceae	Yes
ARSP	*Arabis sparsiflora*	sicklepod rockcress	Brassicaceae	Yes
ARCTO3	*Arctostaphylos* sp.	manzanita	Ericaceae	Yes
ARCA11	*Artemisia californica*	coastal sagebrush	Asteraceae	Yes
ARDO3	*Artemisia douglasiana*	Douglas' sagewort	Asteraceae	Yes
ARDR4	*Artemisia dracunculus*	tarragon	Asteraceae	Yes
ARLUL2	*Artemisia ludoviciana* ssp. *ludoviciana*	white sagebrush	Asteraceae	Yes
ARTR2	*Artemisia tridentata*	big sagebrush	Asteraceae	Yes
ARDO4	*Arundo donax*	giant reed	Poaceae	No
ASCA3	*Asclepias californica*	California milkweed	Asclepiadaceae	Yes
ASER2	*Asclepias erosa*	desert milkweed	Asclepiadaceae	Yes
ASTRA	*Astragalus* sp.	milkvetch	Fabaceae	Yes
ASDI3	*Astragalus didymocarpus*	dwarf white milkvetch	Fabaceae	Yes
ASPO2	*Astragalus pomonensis*	Pomona milkvetch	Fabaceae	Yes
ATPU	*Athysanus pusillus*	common sandweed	Brassicaceae	Yes
ATRIP	*Atriplex* sp.	saltbush	Chenopodiaceae	Unknown
ATCA2	*Atriplex canescens*	fourwing saltbush	Chenopodiaceae	Yes
ATHY	*Atriplex hymenelytra*	desertholly	Chenopodiaceae	Yes
AVBA	*Avena barbata*	slender oat	Poaceae	No
AVFA	*Avena fatua*	wild oat	Poaceae	No
BASA4	*Baccharis salicifolia*	mule-fat	Asteraceae	Yes
BEJU	*Bebbia juncea*	sweetbush	Asteraceae	Yes

Code	Scientific Name	Common Name	Family	Native
BENE	*Berberis nevinii*	Nevin's barberry	Berberidaceae	Yes
BRGE	*Brassica geniculata*	shortpod mustard	Brassicaceae	No
BRNI	*Brassica nigra*	black mustard	Brassicaceae	No
BRCA3	*Brickellia californica*	California brickellbush	Asteraceae	Yes
BRFR	*Brickellia frutescens*	shrubby brickellbush	Asteraceae	Yes
BRAR3	*Bromus arenarius*	Australian brome	Poaceae	No
BRDI3	*Bromus diandrus*	ripgut brome	Poaceae	No
BRHO2	*Bromus hordeaceus*	soft brome	Poaceae	No
BRMAR	*Bromus madritensis* ssp. *rubens*	red brome	Poaceae	No
BRTE	*Bromus tectorum*	cheatgrass	Poaceae	No
BRTR2	*Bromus trinii*	Chilean chess	Poaceae	No
CALOC	*Calochortus*	mariposa lily	Liliaceae	Yes
CACO4	*Calochortus concolor*	goldenbowl mariposa lily	Liliaceae	Yes
CAPL2	*Calochortus plummerae*	Plummer's mariposa lily	Liliaceae	Yes
CAMO5	*Calyptridium monandrum*	common pussypaws	Portulacaceae	Yes
CAMA24	*Calystegia macrostegia*	island false bindweed	Convolvulaceae	Yes
CAMIS	*Camissonia* sp.	suncup	Onagraceae	Yes
CABI12	*Camissonia bistorta*	southern suncup	Onagraceae	Yes
CABO7	*Camissonia boothii*	Booth's evening primrose	Onagraceae	Yes
CACA32	*Camissonia californica*	California suncup	Onagraceae	Yes
CACA33	*Camissonia campestris*	Mojave suncup	Onagraceae	Yes
CACO33	*Camissonia confusa*	San Bernardino suncup	Onagraceae	Yes
CACO34	*Camissonia contorta*	plains evening primrose	Onagraceae	Yes
CAHI13	*Camissonia hirtella*	Santa Cruz Island suncup	Onagraceae	Yes
CAIN23	*Camissonia intermedia*	intermediate suncup	Onagraceae	Yes
CAPA39	*Camissonia parvula*	Lewis River suncup	Onagraceae	Yes
CAST20	*Camissonia strigulosa*	sandysoil suncup	Onagraceae	Yes
CADE29	*Castilleja densiflora*	denseflower Indian paintbrush	Scrophulariaceae	Yes
CAULA	*Caulanthus* sp.	wild cabbage	Brassicaceae	Yes
CECR	*Ceanothus crassifolius*	hoaryleaf ceanothus	Rhamnaceae	Yes
CELE2	*Ceanothus leucodermis*	chaparral whitethorn	Rhamnaceae	Yes
CEPA	*Ceanothus palmeri*	Palmer ceanothus	Rhamnaceae	Yes
CEME2	*Centaurea melitensis*	Maltese star-thistle	Asteraceae	No
CEVE3	*Centaurium venustum*	charming centaury	Gentianaceae	Yes
CEBE3	*Cercocarpus betuloides*	birchleaf mountain mahogany	Rosaceae	Yes
CHFR	*Chaenactis fremontii*	pincushion flower	Asteraceae	Yes
CHGL	*Chaenactis glabriuscula*	yellow pincushion	Asteraceae	Yes
CHAMA15	*Chamaesyce* sp.	sandmat	Euphorbiaceae	Unknown
CHENO	*Chenopodium* sp.	goosefoot	Chenopodiaceae	Unknown
CHAL7	*Chenopodium album*	lambsquarters	Chenopodiaceae	No
CHAM	*Chenopodium ambrosioides*	Mexican tea	Chenopodiaceae	No
CHBO2	*Chenopodium botrys*	Jerusalem oak goosefoot	Chenopodiaceae	No

Code	Scientific Name	Common Name	Family	Native
CHMU2	*Chenopodium murale*	nettleleaf goosefoot	Chenopodiaceae	No
CHPO3	*Chlorogalum pomeridianum*	wavyleaf soap plant	Liliaceae	Yes
CHORI2	*Chorizanthe* sp.	spineflower	Polygonaceae	Yes
CHBR	*Chorizanthe brevicornu*	brittle spineflower	Polygonaceae	Yes
CHLE6	*Chorizanthe leptotheca*	Ramona spineflower	Polygonaceae	Yes
CHPA9	*Chorizanthe parryi*	San Bernardino spineflower	Polygonaceae	Yes
CHST4	*Chorizanthe staticoides*	turkish rugging	Polygonaceae	Yes
CHXAL	*Chorizanthe xanti* var. *leucotheca*	Riverside spineflower	Polygonaceae	Yes
CHRYS9	*Chrysothamnus*	rabbitbrush	Asteraceae	Yes
CHPA12	*Chrysothamnus paniculatus*	Mojave rabbitbrush	Asteraceae	Yes
CIOC	*Cirsium occidentale*	cobwebby thistle	Asteraceae	Yes
CISTA	*Cistanthe* sp.	pussypaws	Portulacaceae	Yes
CLARK	*Clarkia* sp.	clarkia	Onagraceae	Yes
CLBO	*Clarkia bottae*	Botta's clarkia	Onagraceae	Yes
CLPU2	*Clarkia purpurea*	winecup clarkia	Onagraceae	Yes
CLPAP	*Claytonia parviflora* ssp. *parviflora*	streambank springbeauty	Portulacaceae	Yes
CLPE	*Claytonia perfoliata*	miner's lettuce	Portulacaceae	Yes
CLPA2	*Clematis pauciflora*	ropevine clematis	Ranunculaceae	Yes
CNBE	*Cnicus benedictus*	blessed thistle	Asteraceae	No
COHE	*Collinsia heterophylla*	purple Chinese houses	Scrophulariaceae	Yes
COCA5	*Conyza canadensis*	Canadian horseweed	Asteraceae	Yes
COBI	*Coreopsis bigelovii*	Bigelow's tickseed	Asteraceae	Yes
COCA8	*Coreopsis californica*	California tickseed	Asteraceae	Yes
CRCO34	*Crassula connata*	sand pygmyweed	Crassulaceae	Yes
CRCA3	*Crepis capillaris*	smooth hawksbeard	Asteraceae	No
CRCA5	*Croton californicus*	California croton	Euphorbiaceae	Yes
CRSE11	*Croton setigerus*	dove weed	Euphorbiaceae	Yes
CRYPT	*Cryptantha* sp.	cryptantha	Boraginaceae	Yes
CRBA5	*Cryptantha barbigera*	bearded cryptantha	Boraginaceae	Yes
CRCI2	*Cryptantha circumscissa*	cushion cryptantha	Boraginaceae	Yes
CRDE	*Cryptantha decipiens*	gravelbar cryptantha	Boraginaceae	Yes
CRIN7	*Cryptantha incana*	Tulare cryptantha	Boraginaceae	Yes
CRIN8	*Cryptantha intermedia*	Clearwater cryptantha	Boraginaceae	Yes
CRMI	*Cryptantha micrantha*	redroot cryptantha	Boraginaceae	Yes
CRMI3	*Cryptantha microstachys*	Tejon cryptantha	Boraginaceae	Yes
CRMU2	*Cryptantha muricata*	pointed cryptantha	Boraginaceae	Yes
CRNE	*Cryptantha nemaclada*	Colusa cryptantha	Boraginaceae	Yes
CRNE2	*Cryptantha nevadensis*	Nevada cryptantha	Boraginaceae	Yes
CRRE5	*Cryptantha recurvata*	curvenut cryptantha	Boraginaceae	Yes
CUSCU	*Cuscuta* sp.	dodder	Cuscutaceae	Unknown
CUCA	*Cuscuta californica*	chaparral dodder	Cuscutaceae	Yes
CYCAP5	*Cylindropuntia californica*	brownspined pricklypear	Cactaceae	Yes

Code	Scientific Name	Common Name	Family	Native
	var. *parkeri*			
CYDA	*Cynodon dactylon*	Bermudagrass	Poaceae	No
DAGL2	*Datisca glomerata*	Durango root	Datiscaceae	Yes
DATUR	*Datura* sp.	jimsonweed	Solanaceae	Unknown
DAWR2	*Datura wrightii*	sacred thorn-apple	Solanaceae	Yes
DAPU3	*Daucus pusillus*	American wild carrot	Apiaceae	Yes
DELPH	*Delphinium*	larkspur	Ranunculaceae	Yes
DECA2	*Delphinium cardinale*	scarlet larkspur	Ranunculaceae	Yes
DEPA2	*Delphinium parryi*	San Bernardino larkspur	Ranunculaceae	Yes
DERI	*Dendromecon rigida*	tree poppy	Papaveraceae	Yes
DESCU	*Descurainia*	tansymustard	Brassicaceae	Yes
DEPI	*Descurainia pinnata*	western tansymustard	Brassicaceae	Yes
DICH	*Dicentra chrysantha*	golden eardrops	Fumariaceae	Yes
DICHE2	*Dichelostemma*	snakelily	Liliaceae	Yes
DICA14	*Dichelostemma capitatum*	bluedicks	Liliaceae	Yes
DICO19	*Dichelostemma congestum*	ookow	Liliaceae	Yes
DIPU4	*Diplacus puniceus*	red bush monkeyflower	Scrophulariaceae	Yes
DISP	*Distichlis spicata*	saltgrass	Poaceae	Yes
DOLE	*Dodecahema leptoceras*	slenderhorn spineflower	Polygonaceae	Yes
DUAB	*Dudleya abramsii*	Abrams' liveforever	Crassulaceae	Yes
DULA	*Dudleya lanceolata*	lanceleaf liveforever	Crassulaceae	Yes
ELEOC	*Eleocharis* sp.	spikerush	Cyperaceae	Yes
ELMO2	*Eleocharis montevidensis*	sand spikerush	Cyperaceae	Yes
ELELC2	*Elymus elymoides* ssp. *californicus*	squirreltail	Poaceae	Yes
EMPE	*Emmenanthe penduliflora*	whisperingbells	Hydrophyllaceae	Yes
ENCA	*Encelia californica*	California brittlebush	Asteraceae	Yes
ENFA	*Encelia farinosa*	brittlebush	Asteraceae	Yes
ENAC	*Encelia actoni*	Acton’s brittlebush	Asteraceae	Yes
EPCI	*Epilobium ciliatum*	fringed willowherb	Onagraceae	Yes
ERSE3	*Eremocarpus setigerus*	dove weed	Euphorbiaceae	Yes
ERIAS	*Eriastrum* sp.	woollystar	Polemoniaceae	Yes
ERDE2	*Eriastrum densifolium*	giant woollystar	Polemoniaceae	Yes
ERSA	*Eriastrum sapphirinum*	sapphire woollystar	Polemoniaceae	Yes
ERWI	*Eriastrum wilcoxii*	Wilcox's woollystar	Polemoniaceae	Yes
ERAR27	*Ericameria arborescens*	goldenfleece	Asteraceae	Yes
ERLI6	*Ericameria linearifolia*	narrowleaf goldenbush	Asteraceae	Yes
ERPI7	*Ericameria pinifolia*	pinebush	Asteraceae	Yes
ERIGE2	*Erigeron* sp.	fleabane	Asteraceae	Unknown
ERFO2	*Erigeron foliosus*	leafy fleabane	Asteraceae	Yes
ERCA6	*Eriodictyon californicum*	California yerba santa	Hydrophyllaceae	Yes
ERCR2	*Eriodictyon crassifolium*	thickleaf yerba santa	Hydrophyllaceae	Yes
ERTO	*Eriodictyon tomentosum*	woolly yerba santa	Hydrophyllaceae	Yes
ERTR7	*Eriodictyon trichocalyx*	hairy yerba santa	Hydrophyllaceae	Yes

Code	Scientific Name	Common Name	Family	Native
ERIOG	*Eriogonum* sp.	buckwheat	Polygonaceae	Yes
ERDA4	*Eriogonum davidsonii*	Davidson's buckwheat	Polygonaceae	Yes
EREL6	*Eriogonum elongatum*	longstem buckwheat	Polygonaceae	Yes
ERFA2	*Eriogonum fasciculatum*	California buckwheat	Polygonaceae	Yes
ERGR5	*Eriogonum gracile*	slender woolly buckwheat	Polygonaceae	Yes
ERHE	*Eriogonum heermannii*	Heermann's buckwheat	Polygonaceae	Yes
ERIN4	*Eriogonum inflatum*	desert trumpet	Polygonaceae	Yes
ERRE3	*Eriogonum reniforme*	kidneyleaf buckwheat	Polygonaceae	Yes
ERTH3	*Eriogonum thurberi*	Thurber's buckwheat	Polygonaceae	Yes
ERWRN	*Eriogonum wrightii* var. *nodosum*	bastardsage	Polygonaceae	Yes
ERIOP2	*Eriophyllum* sp.	woolly sunflower	Asteraceae	Yes
ERCO25	*Eriophyllum confertiflorum*	golden-yarrow	Asteraceae	Yes
ERMU6	*Eriophyllum multicaule*	manystem woolly sunflower	Asteraceae	Yes
ERPR4	*Eriophyllum pringlei*	Pringle's woolly sunflower	Asteraceae	Yes
ERWA7	*Eriophyllum wallacei*	woolly easterbonnets	Asteraceae	Yes
ERBO	*Erodium botrys*	longbeak stork's bill	Geraniaceae	No
ERCI6	*Erodium cicutarium*	redstem stork's bill	Geraniaceae	No
ERMO7	*Erodium moschatum*	musky stork's bill	Geraniaceae	No
ERTE13	*Erodium texanum*	Texas stork's bill	Geraniaceae	Yes
ERCA14	*Erysimum capitatum*	sanddune wallflower	Brassicaceae	Yes
ESCA	*Eschscholzia caespitosa*	tufted poppy	Papaveraceae	Yes
ESMI	*Eschscholzia minutiflora*	pygmy poppy	Papaveraceae	Yes
EUCH	*Eucrypta chrysanthemifolia*	spotted hideseed	Hydrophyllaceae	Yes
EUPHO	*Euphorbia* sp.	spurge	Euphorbiaceae	Unknown
EUPO3	*Euphorbia polycarpa*	smallseed sandmat	Euphorbiaceae	Yes
FICA2	*Filago californica*	California cottonrose	Asteraceae	Yes
FIDE	*Filago depressa*	dwarf cottonrose	Asteraceae	Yes
FIGA	*Filago gallica*	narrowleaf cottonrose	Asteraceae	No
2FORB	Forb (herbaceous)			Unknown
GAAN2	*Galium angustifolium*	narrowleaf bedstraw	Rubiaceae	Yes
GAAP2	*Galium aparine*	stickywilly	Rubiaceae	Yes
GAST	*Galium stellatum*	starry bedstraw	Rubiaceae	Yes
GAVE2	*Garrya veatchii*	canyon silktassel	Garryaceae	Yes
GADI2	*Gayophytum diffusum*	spreading groundsmoke	Onagraceae	Yes
GILIA	*Gilia* sp.	gilia	Polemoniaceae	Yes
GIAN	*Gilia angelensis*	chaparral gilia	Polemoniaceae	Yes
GIBRN	*Gilia brecciarum* ssp. *neglecta*	Nevada gilia	Polemoniaceae	Yes
GICA5	*Gilia capitata*	bluehead gilia	Polemoniaceae	Yes
GIOCB	*Gilia ochroleuca* ssp. *bizonata*	volcanic gilia	Polemoniaceae	Yes
GNAPH	*Gnaphalium* sp.	cudweed	Asteraceae	Unknown
GNCA	*Gnaphalium californicum*	ladies' tobacco	Asteraceae	Yes

Code	Scientific Name	Common Name	Family	Native
GNCAM2	*Gnaphalium canescens* ssp. *microcephalum*	Wright's cudweed	Asteraceae	Yes
GNLU	*Gnaphalium luteoalbum*	Jersey cudweed	Asteraceae	No
GNST	*Gnaphalium stramineum*	cottonbatting plant	Asteraceae	Yes
GUCA	*Gutierrezia californica*	San Joaquin snakeweed	Asteraceae	Yes
GUSA2	*Gutierrezia sarothrae*	broom snakeweed	Asteraceae	Yes
HALI5	*Haplopappus linearifolius*	narrowleaf goldenbush	Asteraceae	Yes
HECR2	*Hedypnois cretica*	Cretanweed	Asteraceae	No
HESC2	*Helianthemum scoparium*	Bisbee Peak rushrose	Cistaceae	Yes
HEAN3	*Helianthus annuus*	common sunflower	Asteraceae	Yes
HEGR3	*Helianthus gracilentus*	slender sunflower	Asteraceae	Yes
HECU3	*Heliotropium curassavicum*	salt heliotrope	Boraginaceae	Yes
HEAR4	*Hemizonia arida*	Red Rock tarweed	Asteraceae	Yes
HEFA	*Hemizonia fasciculata*	clustered tarweed	Asteraceae	Yes
HEKE	*Hemizonia kelloggii*	Kellogg's tarweed	Asteraceae	Yes
HETE5	*Hesperocnide tenella*	western stinging nettle	Urticaceae	Yes
HEWH	*Hesperoyucca whipplei*	chaparral yucca	Agavaceae	Yes
HEAR5	*Heteromeles arbutifolia*	toyon	Rosaceae	Yes
HEFA4	*Heterotheca fastigiata*	sessileflower false goldenaster	Asteraceae	Yes
HEGR7	*Heterotheca grandiflora*	telegraphweed	Asteraceae	Yes
HEOR2	*Heterotheca oregona*	Oregon false goldenaster	Asteraceae	Yes
HESE	*Heterotheca sessiliflora*	sessileflower false goldenaster	Asteraceae	Yes
HEVI4	*Heterotheca villosa*	hairy false goldenaster	Asteraceae	Yes
HIIN3	*Hirschfeldia incana*	shortpod mustard	Brassicaceae	No
HYSA	*Hymenoclea salsola*	burrobrush	Asteraceae	Yes
HYGL2	*Hypochaeris glabra*	smooth cat's ear	Asteraceae	No
JUCA	*Juglans californica*	Southern California walnut	Juglandaceae	Yes
JUNCU	*Juncus* sp.	rush	Juncaceae	Unknown
JUBU	*Juncus bufonius*	toad rush	Juncaceae	Yes
JUCA7	*Juniperus californica*	California juniper	Cupressaceae	Yes
KEAN	*Keckiella antirrhinoides*	snapdragon penstemon	Scrophulariaceae	Yes
LASE	*Lactuca serriola*	prickly lettuce	Asteraceae	No
LAAU	*Lamarckia aurea*	goldentop grass	Poaceae	No
LAAM	*Lamium amplexicaule*	henbit deadnettle	Lamiaceae	No
LASEP	*Langloisia setosissima*	Great Basin langloisia	Polemoniaceae	Yes
LATR2	*Larrea tridentata*	creosote bush	Zygophyllaceae	Yes
LACO4	*Lastarriaea coriacea*	leather spineflower	Polygonaceae	Yes
LACA7	*Lasthenia californica*	California goldfields	Asteraceae	Yes
LACH2	*Lasthenia chrysantha*	alkalisink goldfields	Asteraceae	Yes
LACO7	*Lasthenia coronaria*	royal goldfields	Asteraceae	Yes
LAGR10	*Lasthenia gracilis*	needle goldfields	Asteraceae	Yes
LAGL5	*Layia glandulosa*	whitedaisy tidytips	Asteraceae	Yes
LEPID	*Lepidium* sp.	pepperweed	Brassicaceae	Unknown

Code	Scientific Name	Common Name	Family	Native
LEFLF	*Lepidium flavum* var. *felipense*	yellow pepperweed	Brassicaceae	Yes
LEFR2	*Lepidium fremontii*	desert pepperweed	Brassicaceae	Yes
LENI	*Lepidium nitidum*	shining pepperweed	Brassicaceae	Yes
LEVI3	*Lepidium virginicum*	Virginia pepperweed	Brassicaceae	Yes
LESQ	*Lepidospartum squamatum*	California broomsage	Asteraceae	Yes
LEFI11	*Lessingia filaginifolia*	common sandaster	Asteraceae	Yes
LEGL18	*Lessingia glandulifera*	valley lessingia	Asteraceae	Yes
LECO12	*Leymus condensatus*	giant wildrye	Poaceae	Yes
2LICHN	Lichen			Unknown
LIDI	*Linanthus dianthiflorus*	fringed linanthus	Polemoniaceae	Yes
LILE	*Linanthus lemmonii*	Lemmon's linanthus	Polemoniaceae	Yes
LIPA4	*Linanthus parryae*	sandblossoms	Polemoniaceae	Yes
LOMA	*Lobularia maritima*	sweet alyssum	Brassicaceae	No
LOSQ	*Loeflingia squarrosa*	spreading pygmyleaf	Caryophyllaceae	Yes
LOMA10	*Loeseliastrum matthewsii*	desert calico	Polemoniaceae	Yes
LOHA2	*Lotus hamatus*	San Diego bird's-foot trefoil	Fabaceae	Yes
LOHU2	*Lotus humistratus*	foothill deervetch	Fabaceae	Yes
LOSC2	*Lotus scoparius*	common deerweed	Fabaceae	Yes
LOST4	*Lotus strigosus*	strigose bird's-foot trefoil	Fabaceae	Yes
LOWR2	*Lotus wrangelianus*	Chilean bird's-foot trefoil	Fabaceae	Yes
LUPIN	*Lupinus* sp.	lupine	Fabaceae	Yes
LUBI	*Lupinus bicolor*	miniature lupine	Fabaceae	Yes
LUCO	*Lupinus concinnus*	bajada lupine	Fabaceae	Yes
LUEX	*Lupinus excubitus*	grape soda lupine	Fabaceae	Yes
LUHI3	*Lupinus hirsutissimus*	stinging annual lupine	Fabaceae	Yes
LUMIH4	*Lupinus microcarpus* var. *horizontalis*	sunset lupine	Fabaceae	Yes
LUNE	*Lupinus nevadensis*	Nevada lupine	Fabaceae	Yes
LUSP2	*Lupinus sparsiflorus*	Coulter's lupine	Fabaceae	Yes
LUTR2	*Lupinus truncatus*	collared annual lupine	Fabaceae	Yes
MALAC2	*Malacothamnus* sp.	bushmallow	Malvaceae	Yes
MAFA	*Malacothamnus fasciculatus*	Mendocino bushmallow	Malvaceae	Yes
MACL2	*Malacothrix clevelandii*	Cleveland's desertdandelion	Asteraceae	Yes
MAGL3	*Malacothrix glabrata*	smooth desertdandelion	Asteraceae	Yes
MASAT	*Malacothrix saxatilis* var. *tenuifolia*	cliff desertdandelion	Asteraceae	Yes
MALA6	*Malosma laurina*	laurel sumac	Anacardiaceae	Yes
MAPA5	*Malva parviflora*	cheeseweed mallow	Malvaceae	Yes
MAFA3	*Marah fabaceus*	California manroot	Cucurbitaceae	Yes
MAMA8	*Marah macrocarpus*	Cucamonga manroot	Cucurbitaceae	Yes
MAVU	*Marrubium vulgare*	horehound	Lamiaceae	No
MEFR	*Melica frutescens*	woody melicgrass	Poaceae	Yes
MEIM	*Melica imperfecta*	smallflower melicgrass	Poaceae	Yes

Code	Scientific Name	Common Name	Family	Native
MELIL	*Melilotus* sp.	sweetclover	Fabaceae	Unknown
MEAL2	*Melilotus albus*	yellow sweetclover	Fabaceae	No
MEIN2	*Melilotus indicus*	annual yellow sweetclover	Fabaceae	No
MENTZ	*Mentzelia* sp.	blazingstar	Loasaceae	Yes
MEAF2	*Mentzelia affinis*	yellowcomet	Loasaceae	Yes
MEER2	*Mentzelia eremophila*	pinyon blazingstar	Loasaceae	Yes
MEMI3	*Mentzelia micrantha*	San Luis blazingstar	Loasaceae	Yes
MENI2	*Mentzelia nitens*	shining blazingstar	Loasaceae	Yes
MICRO6	*Microseris* sp.	silverpuffs	Asteraceae	Yes
MILI5	*Microseris lindleyi*	Lindley's silverpuffs	Asteraceae	Yes
MIBI6	*Mimulus bigelovii*	Bigelow's monkeyflower	Scrophulariaceae	Yes
MICA3	*Mimulus cardinalis*	scarlet monkeyflower	Scrophulariaceae	Yes
MIGU	*Mimulus guttatus*	seep monkeyflower	Scrophulariaceae	Yes
MIPI8	*Mimulus pilosus*	false monkeyflower	Scrophulariaceae	Yes
MIDO3	*Minuartia douglasii*	Douglas' stitchwort	Caryophyllaceae	Yes
MIBIB	*Mirabilis bigelovii*	wishbone-bush	Nyctaginaceae	Yes
MICA6	*Mirabilis californica*	desert wishbone-bush	Nyctaginaceae	Yes
MILA6	*Mirabilis laevis*	desert wishbone-bush	Nyctaginaceae	Yes
MONAR2	*Monardella* sp.	monardella	Lamiaceae	Yes
2MOSS	Moss			Unknown
MUCA3	*Mucronea californica*	California spineflower	Polygonaceae	Yes
MURI2	*Muhlenbergia rigens*	deergrass	Poaceae	Yes
MUMA2	*Muilla maritima*	sea muilla	Liliaceae	Yes
NADED	*Nama demissum*	purplemat	Hydrophyllaceae	Yes
NAHA2	*Navarretia hamata*	hooked pincushionplant	Polemoniaceae	Yes
NELO	*Nemacladus longiflorus*	longflower threadplant	Campanulaceae	Yes
NERU	*Nemacladus rubescens*	desert threadplant	Campanulaceae	Yes
NEME	*Nemophila menziesii*	baby blue eyes	Hydrophyllaceae	Yes
NIAT	*Nicotiana attenuata*	coyote tobacco	Solanaceae	Yes
NIBI	*Nicotiana bigelovii*	Bigelow's tobacco	Solanaceae	Yes
NIGL	*Nicotiana glauca*	tree tobacco	Solanaceae	No
OECA2	*Oenothera californica*	California evening primrose	Onagraceae	Yes
OLLI	*Oligomeris linifolia*	lineleaf whitepuff	Resedaceae	Yes
OPUNT	*Opuntia* sp.	pricklypear	Cactaceae	Unknown
OPBA2	*Opuntia basilaris*	beavertail pricklypear	Cactaceae	Yes
OPLI3	*Opuntia littoralis*	coastal pricklypear	Cactaceae	Yes
OPPA2	*Opuntia parryi*	brownspined pricklypear	Cactaceae	Yes
OPPH	*Opuntia phaeacantha*	tulip pricklypear	Cactaceae	Yes
ORFA	*Orobanche fasciculata*	clustered broomrape	Orobanchaceae	Yes
ORCU	*Orthocarpus cuspidatus*	toothed owl's-clover	Scrophulariaceae	Yes
OXPE2	*Oxytheca perfoliata*	roundleaf oxytheca	Polygonaceae	Yes
PACA2	*Paeonia californica*	California peony	Paeoniaceae	Yes
PAAR8	*Palafoxia arida*	desert palafox	Asteraceae	Yes

Code	Scientific Name	Common Name	Family	Native
PAUR	*Panicum urvilleanum*	desert panicgrass	Poaceae	Yes
PECTO	*Pectocarya* sp.	combseed	Boraginaceae	Yes
PELI	*Pectocarya linearis*	sagebrush combseed	Boraginaceae	Yes
PEPE26	*Pectocarya penicillata*	sleeping combseed	Boraginaceae	Yes
PEPL	*Pectocarya platycarpa*	broadfruit combseed	Boraginaceae	Yes
PERE	*Pectocarya recurvata*	curvenut combseed	Boraginaceae	Yes
PESE	*Pectocarya setosa*	moth combseed	Boraginaceae	Yes
PEAN2	*Pellaea andromedifolia*	coffee cliffbrake	Pteridaceae	Yes
PEMU	*Pellaea mucronata*	birdfoot cliffbrake	Pteridaceae	Yes
PESE3	*Pennisetum setaceum*	crimson fountaingrass	Poaceae	No
PEGR8	*Penstemon grinnellii*	Grinnell's beardtongue	Scrophulariaceae	Yes
PETRT	*Pentagramma triangularis* ssp. *triangularis*	goldback fern	Pteridaceae	Yes
PETH4	*Petalonyx thurberi*	Thurber's sandpaper plant	Loasaceae	Yes
PHACE	*Phacelia* sp.	phacelia	Hydrophyllaceae	Yes
PHAF	*Phacelia affinis*	limestone phacelia	Hydrophyllaceae	Yes
PHCI	*Phacelia cicutaria*	caterpillar phacelia	Hydrophyllaceae	Yes
PHDI	*Phacelia distans*	distant phacelia	Hydrophyllaceae	Yes
PHMI	*Phacelia minor*	wild canterbury bells	Hydrophyllaceae	Yes
PHPA	*Phacelia pachyphylla*	blacktack phacelia	Hydrophyllaceae	Yes
PHRA2	*Phacelia ramosissima*	branching phacelia	Hydrophyllaceae	Yes
PHTA	*Phacelia tanacetifolia*	lacy phacelia	Hydrophyllaceae	Yes
PHCA8	*Phoradendron californicum*	mesquite mistletoe	Viscaceae	Yes
PICO3	*Pinus coulteri*	Coulter pine	Pinaceae	Yes
PIMI3	*Piptatherum miliaceum*	smilograss	Poaceae	No
PLANT	*Plantago* sp.	plantain	Plantaginaceae	Unknown
PLER3	*Plantago erecta*	dotseed plantain	Plantaginaceae	Yes
PLOV	*Plantago ovata*	desert Indianwheat	Plantaginaceae	Yes
PLPA2	*Plantago patagonica*	woolly plantain	Plantaginaceae	Yes
PLRA	*Platanus racemosa*	California sycamore	Platanaceae	Yes
POSE	*Poa secunda*	Sandberg bluegrass	Poaceae	Yes
POTE	*Polycarpon tetraphyllum*	fourleaf manyseed	Caryophyllaceae	No
POCA12	*Polypodium californicum*	California polypody	Polypodiaceae	Yes
POMO5	*Polypogon monspeliensis*	annual rabbitsfoot grass	Poaceae	No
POFR2	*Populus fremontii*	Fremont cottonwood	Salicaceae	Yes
PRFR	*Prunus fremontii*	desert apricot	Rosaceae	Yes
PRIL	*Prunus ilicifolia*	hollyleaf cherry	Rosaceae	Yes
PSEUD43	*Pseudognaphalium* sp.	cudweed	Asteraceae	Unknown
PSARS	*Psorothamnus arborescens*	California indigobush	Fabaceae	Yes
PTDR	*Pterostegia drymarioides*	woodland pterostegia	Polygonaceae	Yes
PUTRG	*Purshia tridentata* var. *glandulosa*	desert bitterbrush	Rosaceae	Yes
QUAG	*Quercus agrifolia*	California live oak	Fagaceae	Yes
QUBE5	*Quercus berberidifolia*	scrub oak	Fagaceae	Yes
RACA	*Rafinesquia californica*	California plumeseed	Asteraceae	Yes

Code	Scientific Name	Common Name	Family	Native
RANE	*Rafinesquia neomexicana*	New Mexico plumeseed	Asteraceae	Yes
RASA2	*Raphanus sativus*	cultivated radish	Brassicaceae	No
RHCA	*Rhamnus californica*	California buckthorn	Rhamnaceae	Yes
RHCR	*Rhamnus crocea*	redberry buckthorn	Rhamnaceae	Yes
RHIL	*Rhamnus ilicifolia*	hollyleaf redberry	Rhamnaceae	Yes
RHIN2	*Rhus integrifolia*	lemonade sumac	Anacardiaceae	Yes
RHOV	*Rhus ovata*	sugar sumac	Anacardiaceae	Yes
RHTR	*Rhus trilobata*	skunkbush sumac	Anacardiaceae	Yes
RIAU	*Ribes aureum*	golden currant	Grossulariaceae	Yes
RICO3	*Ricinus communis*	castorbean	Euphorbiaceae	Yes
ROCO	*Romneya coulteri*	Coulter's Matilija poppy	Papaveraceae	Yes
RUMEX	*Rumex* sp.	dock	Polygonaceae	Unknown
RUSAS	*Rumex salicifolius* var. *salicifolius*	willow dock	Polygonaceae	Yes
SAEX	*Salix exigua*	narrowleaf willow	Salicaceae	Yes
SALA3	*Salix laevigata*	red willow	Salicaceae	Yes
SALA6	*Salix lasiolepis*	arroyo willow	Salicaceae	Yes
SATR12	*Salsola tragus*	prickly Russian thistle	Chenopodiaceae	No
SAAP2	*Salvia apiana*	white sage	Lamiaceae	Yes
SACO6	*Salvia columbariae*	chia	Lamiaceae	Yes
SAME3	*Salvia mellifera*	black sage	Lamiaceae	Yes
SAME5	*Sambucus mexicana*	American black elderberry	Caprifoliaceae	Yes
SACYH2	*Sarcostemma cynanchoides* ssp. *hartwegii*	Hartweg's twinevine	Asclepiadaceae	Yes
SCAR	*Schismus arabicus*	Arabian schismus	Poaceae	Yes
SCBA	*Schismus barbatus*	common Mediterranean grass	Poaceae	No
SCCAF2	*Scrophularia californica* ssp. *floribunda*	California figwort	Scrophulariaceae	Yes
SELAG	*Selaginella* sp.	spikemoss	Selaginellaceae	Yes
SEBI	*Selaginella bigelovii*	bushy spikemoss	Selaginellaceae	Yes
SEER	*Selaginella eremophila*	desert spikemoss	Selaginellaceae	Yes
SEHA2	*Selaginella hansenii*	Hansen's spikemoss	Selaginellaceae	Yes
SEFLD	*Senecio flaccidus* var. *douglasii*	Douglas' ragwort	Asteraceae	Yes
SEVU	*Senecio vulgaris*	old-man-in-the-Spring	Asteraceae	No
SEAR8	*Senna armata*	desertsenna	Fabaceae	Yes
SILEN	*Silene* sp.	catchfly	Caryophyllaceae	Unknown
SIAN2	*Silene antirrhina*	sleepy silene	Caryophyllaceae	Yes
SILAM	*Silene laciniata* ssp. *major*	cardinal catchfly	Caryophyllaceae	Yes
SISYM	*Sisymbrium* sp.	hedgemustard	Brassicaceae	No
SIAL2	*Sisymbrium altissimum*	tall tumblemustard	Brassicaceae	No
SIER5	*Sisymbrium erysimoides*	Mediterranean rocket	Brassicaceae	No
SIIR	*Sisymbrium irio*	London rocket	Brassicaceae	No
SIOF	*Sisymbrium officinale*	hedgemustard	Brassicaceae	No
SIOR4	*Sisymbrium orientale*	Indian hedgemustard	Brassicaceae	No

Code	Scientific Name	Common Name	Family	Native
SOAM	*Solanum americanum*	American black nightshade	Solanaceae	Yes
SOXA	*Solanum xanti*	chaparral nightshade	Solanaceae	Yes
SOOL	*Sonchus oleraceus*	common sowthistle	Asteraceae	No
STEPH	*Stephanomeria* sp.	wirelettuce	Asteraceae	Yes
STEX	*Stephanomeria exigua*	small wirelettuce	Asteraceae	Yes
STPA4	*Stephanomeria pauciflora*	brownplume wirelettuce	Asteraceae	Yes
STVI2	*Stephanomeria virgata*	rod wirelettuce	Asteraceae	Yes
STGN	*Stylocline gnaphalioides*	mountain neststraw	Asteraceae	Yes
TARA	*Tamarix ramosissima*	saltcedar	Tamaricaceae	No
TECO2	*Tetradymia comosa*	hairy horsebrush	Asteraceae	Yes
THCU	*Thysanocarpus curvipes*	sand fringepod	Brassicaceae	Yes
TOWNS	*Townsendia* sp.	Townsend daisy	Asteraceae	Yes
TODI	*Toxicodendron diversilobum*	Pacific poison oak	Anacardiaceae	Yes
TRIFO	*Trifolium* sp.	clover	Fabaceae	Unknown
URLI5	*Uropappus lindleyi*	Lindley's silverpuffs	Asteraceae	Yes
VIEX	*Vicia exigua*	Louisiana vetch	Fabaceae	Yes
VULPI	*Vulpia* sp.	fescue	Poaceae	Unknown
VUMI	*Vulpia microstachys*	small fescue	Poaceae	Yes
VUMY	*Vulpia myuros*	rat-tail fescue	Poaceae	No
VUOC	*Vulpia octoflora*	sixweeks fescue	Poaceae	Yes
XAST	*Xanthium strumarium*	rough cocklebur	Asteraceae	Yes
YUSC2	*Yucca schidigera*	Mojave yucca	Agavaceae	Yes

APPENDIX 3. Field key to vegetation types of alluvial scrub habitat in Kern, Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties, California.

Class A. Vegetation with an overstory of trees (at least 5 m tall). Tree canopy may be as low as 10% 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 at least 5% absolute cover in desert habitats and at least 10% cover in coastal and montane habitats = **Shrub Overstory Vegetation**

Class A. Tree-Overstory Vegetation

Group I. Woodlands and forests characterized by broad-leaved deciduous trees in riparian, canyon bottom, or wetland habitats including *Platanus racemosa*, *Populus fremontii*, or *Salix* spp, dominant or co-dominant.

I. 1. *Platanus racemosa* provides an open to intermittent tree canopy and occurs as the sole dominant tree or co-dominant with *Quercus agrifolia* in the overstory. Shrubs such as *Eriogonum fasciculatum, Lepidospartum squamatum, Lotus scoparius,* and a variety of herbs may be abundant (>10% cover) in the understory. Stands found in Riverside County, including Temescal Wash and Arroyo Seco Creek, and observed in other counties …

***Platanus racemosa* Alliance**

I. 1' *Populus fremontii* provides an open to intermittent tree overstory canopy and occurs as the dominant tree. *Salix* and/or other riparian species may occur in the sub-canopy as co-dominants …

***Populus fremontii* Alliance**

> **2.** *Populus fremontii* is a dominant tree in the canopy though *Quercus agrifolia* may be sub- to co-dominant. *Baccharis salicifolia* is abundant in the understory, sometimes with *Eriogonum fasciculatum* and *Lotus scoparius.* Stands found in Riverside County including Arroyo Seco Creek and Bautista Creek, and observed in other counties…
>
> ***Populus fremontii / Baccharis salicifolia* Association**

Group II. Woodlands characterized by scale-leaved coniferous trees and other broad-leaved deciduous trees in alluvial terraces and upland habitats, including *Juniperus* or *Quercus agrifolia* as dominant.

II. 1. *Juniperus californica* occurs as a dominant species in an open to intermittent overstory of small trees. Stand found in San Bernardino County along Santa Ana River…

***Juniperus californica* Alliance**

II. 1' *Quercus agrifolia* occurs as the dominant species in an open to dense canopy of trees. Stands found across the region in various terraces above creeks and rivers…

***Quercus agrifolia* Alliance**

Class B. Shrub-Overstory Vegetation

Group I: Shrublands dominated by sclerophyllous temperate broad-leaved shrubs (with leaves hardened by a waxy cuticle) including typical chaparral genera such as *Adenostoma fasciculatum, Cercocarpus montanus (=betuloides),* and *Eriodictyon crassifolium*, etc.

I. 1. Chaparral in which *Adenostoma fasciculatum* is dominant or co-dominant with coastal scrub species in an open to continuous shrub canopy.

2. *Adenostoma fasciculatum* and *Salvia apiana* are both characteristic and usually co-dominant or *S. apiana* is sub-dominant and other coastal sage species such as *Artemisia californica* are co-dominant with *A. fasciculatum*…

***Adenostoma fasciculatum – Salvia apiana* Alliance**

3. *Salvia apiana* and *Artemisia californica* are sub- to co-dominant with *Adenostoma fasciculatum* (though *A. californica* may be higher in cover than *S. apiana*)…

***Adenostoma fasciculatum – Salvia apiana – Artemisia californica* Association**

I. 1' Chaparral and shrublands with other shrub species dominant.

4. Mature shrublands with *Cercocarpus montanus (=betuloides)* or *Keckiella antirrhinoides* dominant to co-dominant in stands.

5. *Cercocarpus montanus (=betuloides)* dominant or co-dominant with *Eriogonum fasciculatum* and *Lepidospartum squamatum.* Stands found in San Bernardino County including Upper Lytle Creek…

***Cercocarpus montanus* Phase of the *Lepidospartum squamatum – Eriogonum fasciculatum* Association**

5' Shrubland in which *Keckiella antirrhinoides* is co-dominant with a mix of chaparral species including *Adenostoma fasciculatum, Rhamnus crocea,* and *Salvia apiana.* Stand found in Riverside County including Horsethief Creek…

***Keckiella antirrhinoides* – Mixed chaparral Association**

4' Post-burn and alluvial scrub shrublands with *Eriodictyon crassifolium* dominant. Other shrub species may occur with low cover such as *Artemisia californica,* over annual forbs and grasses. Stands found in Orange and Riverside counties including Fremont Canyon and Horsethief Creek…

***Eriodictyon crassifolium* Provisional Association of the *Eriodictyon crassifolium* Provisional Alliance**

Group II. Shrublands dominated mainly by soft-leaved or succulent shrubs that are microphyllus or broad-leaved, including cactus, drought-deciduous, and cold-deciduous species. These are generally considered to be part of alluvial sage scrub, coastal sage scrub, desert scrub or other more soft-leaved shrub habitats. Chaparral species may be present but not dominant. Includes *Lepidospartum*, *Lotus, Keckiella*, *Salvia*, and others.

II. 1. Scrublands characterized by desert riparian and disturbance species, including *Acacia greggii* and *Encelia actoni.*

2. *Acacia greggii,* as a tall shrub while other shrubs may occur as sub- to co-dominants…
***Acacia greggii* Alliance**

3. *Acacia greggii* is usually dominant in the canopy as a tall shrub, while other shrubs may be sub-dominant to co-dominant, including *Eriogonum davidsonii* and *Gutierrezia sarothrae.* The understory is dominated by grasses and/or forbs such as *Avena fatua*, *Cryptantha barbigera* and *Erodium texanum*. Stands occur on broad alluvial fans. Stands classified to this type are found in washes and rocky uplands in San Diego County including San Felipe Wash...
***Acacia greggii / Eriogonum davidsonii* Association**

2' Shrubland with *Encelia actoni* dominant or co-dominant in the canopy…
***Encelia actoni* Alliance**

4. Shrubland in which *Encelia actoni* is dominant or co-dominant, occurring with other scrub species such as *Lepidospartum squamatum* and *Eriogonum fasciculatum.* Stands found in washes of Riverside County, including along the San Jacinto River*…*
***Encelia actoni* – alluvial scrub Association**

II. 1' Scrublands characterized by other inland and coastal species, including soft-leaved shrubs, cacti, and other plants, in upland and alluvial environments.

5. Shrublands characterized by the presence of *Lepidospartum squamatum* and/or *Eriogonum fasciculatum,* where *L. squamatum* is dominant, co-dominant, or characteristically present with other shrubs. Stands are generally found in rocky, flooded washes or alluvial plains, and shrubs vary from 2 to over 30% absolute cover…
***Lepidospartum squamatum* Alliance**

6. *Lepidospartum squamatum* is the dominant shrub over an understory of annual herbaceous species, where the herb layer may be much higher in cover than the shrub layer.

7. *Lepidospartum squamatum* dominates the open shrub canopy over sparse to intermittent cover of desert ephemeral annuals including *Chaenactis fremontii, Cryptantha circumscissa,* and *Schismus barbatus.* Stands classified to this type are found in Kern County, including Jawbone Canyon and Red Rock Canyon Wash…
***Lepidospartum squamatum / desert ephemeral annuals (Chaenactis fremontii)* Association**

7' *Lepidospartum squamatum* is characteristically present with other shrubs including *Bebbia juncea, Brickellia,* and *Encelia* spp*.,* in an open shrub layer over a relatively dense and species rich understory of ephemeral annuals including *Bromus diandrus, B. rubens*, *Chaenactis glabriuscula, Cryptantha intermedia,* and *Hirschfeldia incana.* Stands of this type are found in Orange, Riverside and San Bernardino counties, including in Cajalco Creek floodplain, Bautista Creek, Fremont Canyon, Santa Ana River, and San Jacinto River…
***Lepidospartum squamatum / mixed ephemeral annuals* (*Chaenactis glabriuscula*) Association**

6' *Lepidospartum squamatum* is the dominant, co-dominant or characteristically present shrub with other shrub usually species present including *Artemisia californica, Baccharis* spp., *Eriogonum fasciculatum, Eriodictyon trichocalyx, Hesperoyucca whipplei,* and *Salix* spp.

8. *Lepidospartum squamatum* is subdominant to other shrubs, namely *Artemisia californica* or *Cercocarpus montanus (=betuloides).*

9. *Lepidospartum squamatum* is sub-dominant to *Artemisia californica* which dominates the shrub canopy. *Eriogonum fasciculatum* may also be present with low cover. Stands are found in more mature alluvial scrub floodplain terraces of Los Angeles and Orange counties including along the San Gabriel River and Fremont Canyon…

***Lepidospartum squamatum – Artemisia californica* Association**

9' *Cercocarpus montanus (=betuloides)* dominant or co-dominant with *Eriogonum fasciculatum* and *Lepidspartum squamatum.* Stands are mature alluvial fan shrublands found in San Bernardino County including Upper Lytle Creek*..*

***Cercocarpus montanus* Phase of the**
***Lepidospartum squamatum – Eriogonum fasciculatum* Association**

8' *Lepidospartum squamatum* is dominant, co-dominant or characteristically present with other shrubs such as *Baccharis salicifolia, Eriodictyon trichocalyx, Eriogonum fasciculatum,* and various cactus species.

10. *Lepidospartum squamatum* is dominant, co-dominant or characteristically present with *Eriogonum fasciculatum, Eriodictyon trichocalyx, Cylindropuntia* spp., and other shrubs. If *Artemisia californica* is present it occurs with lower cover than other shrubs…

11. *Lepidospartum squamatum* is characteristically present with a diverse mix of species including the presence of one or more of the following species, *Eriodictyon trichocalyx, Hesperoyucca whipplei,* and *Cylindropuntia* spp. Stands occur on more recently disturbed alluvial fans, with disturbance from fire and flood. Stands commonly found across the region, including in Big Tujunga Wash, Lower Cajon Wash, Lytle Creek Wash, Mill Creek, San Gabriel River, Santa Ana River, and Wilson Creek …

***Lepidospartum squamatum – Eriodictyon trichocalyx – Hesperoyucca whipplei* Association**

11' *Lepidospartum squamatum* is dominant or co-dominant with *Eriogonum fasciculatum* in an open shrub canopy. Stands usually are less sandy and have higher cover of boulders, cobbles and gravel, on recently disturbed alluvial fans. Stands commonly found across the region, including sites listed in above association plus East Etiwanda Creek, Indian Canyon, and Tin Mine Canyon…

***Lepidospartum squamatum – Eriogonum fasciculatum* Association**

10' *Lepidospartum squamatum* is present at low cover with one or more riparian species including *Alnus rhombifolia, Artemisia dracunculus, Salix* spp, *Baccharis*

salicifolia, as well as herbs such as *Heterotheca sessiliflora* and *Mimulus cardinalis.* Stands are found in San Bernardino County, including Mill Creek, and in Orange County, including Indian Creek…

***Lepidospartum squamatum – Baccharis salicifolia* Association**

5' Stands where other shrub species are dominant or co-dominant.

12. *Lotus scoparius* is the sole dominant shrub species in the canopy, usually in a post-fire or disturbance transition scrub. Other shrubs may occur as sub-dominants, including *Eriogonum fasciculatum.* Stands sampled in Riverside County, including Arroyo Seco Creek, though they are found commonly across the region in disturbance areas…

***Lotus scoparius* Association**
of the *Lotus scoparius* Alliance

12' Other shrubs are dominant in the canopy in regularly disturbed alluvial scrub to more mature shrubland settings.

13. Shrubland with *Keckiella antirrhinoides* dominant or co-dominant in the canopy with a mix of chaparral species including *Adenostoma fasciculatum* and *Salvia apiana.* Stands found on older alluvial fans and on upland slopes, with one stand sampled in Riverside County at Horsethief Creek…

***Keckiella antirrhinoides* – Mixed chaparral Association**
of the *Keckiella antirrhinoides* Alliance

13' Shrubland in which a *Artemisia californica* and/or *Salvia* spp. are dominant in the canopy or co-dominant with *Malosma laurina* and/or *Eriogonum fasciculatum*…

14. *Artemisia californica* is dominant and *Lepidospartum squamatum* is sub-dominant in the shrub canopy. *Eriogonum fasciculatum* may be present with low cover. Stands found in more mature alluvial scrub floodplain terraces of Los Angeles and Orange counties including along the San Gabriel River and Fremont Canyon… ***Lepidospartum squamatum – Artemisia californica* Association**
of the *Lepidospartum squamatum* Alliance

14' *Salvia mellifera* or *Salvia apiana* is dominant or co-dominant with other shrubs.

15. *Salvia mellifera* is sub- to co-dominant in the shrub canopy with *Malosma laurina*, *Artemisia californica*, or *Malacothamnus fasciculatus.* Stands found in more mature upper alluvial terraces and in uplands of Riverside County including Tin Mine Canyon…

***Salvia mellifera – Malosma laurina* Association**
of the *Salvia mellifera* Alliance

15' *Salvia apiana* is usually dominant or co-dominant with *Artemisia californica* and *Ericameria linearifolia* and/or *E. pinifolia,* though other shrub species may have high cover. Stands found in broad alluvial fan washes with recent history of burns in San Bernardino County, including Etiwanda Creek…

***Salvia apiana – Artemisia californica – Ericameria* spp. Association**
of the *Salvia apiana* Alliance

APPENDIX 4. Stand tables summarizing the environmental, vegetation and plant constancy/cover data for alliances and associations.

A. Tree Overstory Types

Juniperus californica Alliance

No Association Defined

LOCATION SAMPLED: Santa Ana River

SAMPLE USED TO DESCRIBE ALLIANCE: n=1

REFERENCES: Evens et al. 2006, Sawyer et al. 2009

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Tree										
	JUCA7	*Juniperus californica*	100	11.0	11	11	X	X		X
Shrub										
	ERFA2	*Eriogonum fasciculatum*	100	1.0	1	1	X			
	LESQ	*Lepidospartum squamatum*	100	1.0	1	1	X			
	LOSC2	*Lotus scoparius*	100	1.0	1	1	X			
	OPPA2	*Opuntia parryi*	100	1.0	1	1	X			
	HEWH	*Hesperoyucca whipplei*	100	1.0	1	1	X			
Herb										
	BRMAR	*Bromus rubens*	100	30.0	30	30	X			
	ERCI6	*Erodium cicutarium*	100	17.0	17	17	X			
	PLER3	*Plantago erecta*	100	14.0	14	14	X			
	CRCO34	*Crassula connata*	100	8.0	8	8	X			
	FICA2	*Filago californica*	100	7.0	7	7	X			
	STGN	*Stylocline gnaphalioides*	100	7.0	7	7	X			
	VUMY	*Vulpia myuros*	100	4.0	4	4	X			
	ATPU	*Athysanus pusillus*	100	3.0	3	3	X			
	BRTE	*Bromus tectorum*	100	2.0	2	2	X			
	HIIN3	*Hirschfeldia incana*	100	2.0	2	2	X			
	AVFA	*Avena fatua*	100	1.0	1	1	X			
	BRDI3	*Bromus diandrus*	100	1.0	1	1	X			
	CABI12	*Camissonia bistorta*	100	1.0	1	1	X			
	COCA5	*Conyza canadensis*	100	1.0	1	1	X			
	CRIN8	*Cryptantha intermedia*	100	1.0	1	1	X			
	ERSA	*Eriastrum sapphirinum*	100	1.0	1	1	X			
	ERGR5	*Eriogonum gracile*	100	1.0	1	1	X			
	LACO4	*Lastarriaea coriacea*	100	1.0	1	1	X			
	LOST4	*Lotus strigosus*	100	1.0	1	1	X			
	MAFA3	*Marah fabaceus*	100	1.0	1	1	X			
	PHDI	*Phacelia distans*	100	1.0	1	1	X			
	PLOV	*Plantago ovata*	100	1.0	1	1	X			
	SCBA	*Schismus barbatus*	100	1.0	1	1	X			
	STVI2	*Stephanomeria virgata*	100	1.0	1	1	X			

Platanus racemosa Alliance

No Association Defined

LOCAL ENVIRONMENTAL TABLE (AVERAGES)
Elevation: 470.5 m
Large Rock Cover: 5.4%
Small Rock Cover: 27%
Bare Ground: 63%

LOCATIONS SAMPLED: Arroyo Seco Creek, Temescal Wash

SAMPLES USED TO DESCRIBE ALLIANCE: n=3

REFERENCES: Sawyer et al. 2009

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Tree										
	PLRA	*Platanus racemosa*	100	13.7	6	19	X	X		X
	QUAG	*Quercus agrifolia*	33	5.0	15	15				
Shrub										
	LOSC2	*Lotus scoparius*	100	5.7	0.2	16	X			
	ERFA2	*Eriogonum fasciculatum*	67	9.4	0.2	28				
	ERPI7	*Ericameria pinifolia*	67	1.7	0.01	5				
	CRCA5	*Croton californicus*	67	1.3	2	2				
	HEWH	*Hesperoyucca whipplei*	67	0.7	1	1				
	LESQ	*Lepidospartum squamatum*	33	3.7	11	11				
	LUEX	*Lupinus excubitus*	33	1.7	5	5				
	SEFLD	*Senecio flaccidus* var. *douglasii*	33	1.3	4	4				
Herb										
	BRMAR	*Bromus rubens*	100	26.0	2	63	X		X	
	HIIN3	*Hirschfeldia incana*	100	1.4	0.2	3	X			
	FICA2	*Filago californica*	100	0.7	0.2	1	X			
	BRDI3	*Bromus diandrus*	67	4.7	0.2	14				
	ARDR4	*Artemisia dracunculus*	67	3.1	0.2	9				
	AVBA	*Avena barbata*	67	2.3	3	4				
	CEME2	*Centaurea melitensis*	67	2.1	0.2	6				
	ERTH3	*Eriogonum thurberi*	67	2.0	2	4				
	CRIN8	*Cryptantha intermedia*	67	1.7	1	4				
	CHGL	*Chaenactis glabriuscula*	67	1.3	2	2				
	BRHO2	*Bromus hordeaceus*	67	1.1	0.2	3				
	AMPS	*Ambrosia psilostachya*	67	0.7	1	1				
	VUMY	*Vulpia myuros*	67	0.4	0.2	1				
	LENI	*Lepidium nitidum*	33	2.0	6	6				

Populus fremontii Alliance

Populus fremontii/Baccharis salicifolia Association
Fremont cottonwood / Mule-Fat Association

LOCAL ENVIRONMENTAL TABLE (AVERAGES)
Elevation: 542.5 m
Large Rock Cover: 35%
Small Rock Cover: 27.5%
Bare Ground: 37.5%

LOCATIONS SAMPLED: Arroyo Seco Creek, Bautista Creek

SAMPLES USED TO DESCRIBE ASSOCIATION: n=3

REFERENCES: Sawyer et al. 2009

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Tree										
	POFR2	*Populus fremontii*	100	9.7	4	17	X	X		X
	QUAG	*Quercus agrifolia*	67	2.7	1	7				
	SALA6	*Salix lasiolepis*	33	1.0	3	3				
	PLRA	*Platanus racemosa*	33	0.3	1	1				
	TARA	*Tamarix ramosissima*	33	0.3	1	1				
Shrub										
	BASA4	*Baccharis salicifolia*	100	6.0	1	10	X		X	
	SEFLD	*Senecio flaccidus* var. *douglasii*	100	2.7	1	5	X			
	ERFA2	*Eriogonum fasciculatum*	100	2.0	1	4	X			
	LOSC2	*Lotus scoparius*	67	8.7	3	23				
	LESQ	*Lepidospartum squamatum*	67	0.7	1	1				
	SAEX	*Salix exigua*	33	1.0	3	3				
	ADFA	*Adenostoma fasciculatum*	33	0.3	1	1				
	AGSH	*Agave shawii*	33	0.3	1	1				
	ARTR2	*Artemisia tridentata*	33	0.3	1	1				
	SAME3	*Salvia mellifera*	33	0.3	1	1				
Herb										
	BRMAR	*Bromus rubens*	100	9.7	5	14	X			
	ARDO3	*Artemisia douglasiana*	100	1.3	1	2	X			
	BRDI3	*Bromus diandrus*	100	1.3	1	2	X			
	LOST4	*Lotus strigosus*	67	2.7	1	7				
	HIIN3	*Hirschfeldia incana*	67	2.3	1	6				
	CHGL	*Chaenactis glabriuscula*	67	1.0	1	2				
	CRIN8	*Cryptantha intermedia*	67	0.7	1	1				
	ERCI6	*Erodium cicutarium*	67	0.7	1	1				
	MICA3	*Mimulus cardinalis*	67	0.7	1	1				
	PHMI	*Phacelia minor*	67	0.7	1	1				
Non-Vascular										
	2MOSS	Moss	33	0.3	1	1				

B. Shrubland Overstory Types

Acacia greggii Alliance

Acacia greggii/Eriogonum davidsonii Association
Catclaw Acacia / Davidson's Buckwheat Association

LOCAL ENVIRONMENTAL TABLE (AVERAGES)
Elevation: 853.4 m
Large Rock Cover: 15%
Small Rock Cover: 40%
Bare Ground: 45%

LOCATIONS SAMPLED: San Felipe Valley

SAMPLES USED TO DESCRIBE ASSOCIATION: n=4

REFERENCES: Barbour and Wirka 1997, Sawyer et al. 2009, Wirka 1997

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Shrub										
	ACGR	*Acacia greggii*	100	18.0	14	24	X	X		X
	GUSA2	*Gutierrezia sarothrae*	100	2.5	1	4	X			
	ERWRN	*Eriogonum wrightii*	75	1.3	1	3	X			
	OPPH	*Opuntia phaeacantha*	75	0.8	1	1	X			
	LOSC2	*Lotus scoparius*	50	1.8	3	4				
	HEWH	*Hesperoyucca whipplei*	50	0.5	1	1				
Herb										
	ERDA4	*Eriogonum davidsonii*	100	24.3	1	39	X			
	CRBA5	*Cryptantha barbigera*	100	22.3	10	37	X			
	AVFA	*Avena fatua*	100	20.5	12	35	X			
	BRMAR	*Bromus rubens*	100	20.5	10	29	X			
	ERTE13	*Erodium texanum*	100	6.0	1	17	X			
	CADE29	*Castilleja densiflora*	100	1.0	1	1	X			
	FIDE	*Filago depressa*	100	1.0	1	1	X			
	SILAM	*Silene laciniata* ssp. *major*	75	2.3	1	4	X			
	BRDI3	*Bromus diandrus*	75	2.0	1	6	X			
	LUPIN	*Lupinus*	75	2.0	1	4	X			
	LEFLF	*Lepidium flavum* var. *felipense*	75	1.3	1	2	X			
	PEMU	*Pellaea mucronata*	75	0.8	1	1	X			
	ARLUL2	*Artemisia ludoviciana* ssp. *ludoviciana*	50	1.3	1	4				
	ERGR5	*Eriogonum gracile*	50	0.8	1	2				
	GAAP2	*Galium aparine*	50	0.8	1	2				
	AMPS	*Ambrosia psilostachya*	50	0.5	1	1				
	STEX	*Stephanomeria exigua*	50	0.5	1	1				

Adenostoma fasciculatum–Salvia apiana Alliance

Adenostoma fasciculatum–Salvia apiana–Artemisia californica Association
Chamise – White Sage – California Sagebrush Association

LOCAL ENVIRONMENTAL TABLE (AVERAGES)
Elevation: 540.5 m
Large Rock Cover: 15%
Small Rock Cover: 26.6%
Bare Ground: 58.3%

LOCATIONS SAMPLED: Lower Lytle Creek

SAMPLES USED TO DESCRIBE ASSOCIATION: n=3

REFERENCES: Evens and San 2006, Klein and Evens 2006, Sawyer et al. 2009, Barbour and Wirka 1997

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Shrub										
	ADFA	*Adenostoma fasciculatum*	100	65.3	52	83	X	X		X
	ARCA11	*Artemisia californica*	100	45.0	39	48	X		X	
	SAAP2	*Salvia apiana*	100	2.7	1	4	X			
	ERTR7	*Eriodictyon trichocalyx*	33	4.3	13	13				
	TECO2	*Tetradymia comosa*	33	1.3	4	4				
	ERFA2	*Eriogonum fasciculatum*	33	0.7	2	2				
	RHTR	*Rhus trilobata*	33	0.3	1	1				
	SAME3	*Salvia mellifera*	33	0.3	1	1				
	SOXA	*Solanum xanti*	33	0.3	1	1				
Herb										
	SCBA	*Schismus barbatus*	100	4.3	1	8	X			
	CABI12	*Camissonia bistorta*	100	1.0	1	1	X			
	CRDE	*Cryptantha decipiens*	67	3.3	4	6				
	CRNE2	*Cryptantha nevadensis*	67	1.7	1	4				
	PTDR	*Pterostegia drymarioides*	67	0.7	1	1				
	CRMI	*Cryptantha micrantha*	33	2.3	7	7				
	CUCA	*Cuscuta californica*	33	0.3	1	1				
	EMPE	*Emmenanthe penduliflora*	33	0.3	1	1				
	GNCA	*Gnaphalium californicum*	33	0.3	1	1				
	MAMA8	*Marah macrocarpus*	33	0.3	1	1				
	PEPE26	*Pectocarya penicillata*	33	0.3	1	1				
	SACO6	*Salvia columbariae*	33	0.3	1	1				
Non-Vascular										
	2MOSS	Moss	33	0.7	2	2				

Encelia virginensis Alliance

Encelia actoni–alluvial scrub Provisional Association
Acton's Brittlebush – Alluvial Scrub Provisional Association

LOCAL ENVIRONMENTAL TABLE (AVERAGES)
Elevation: 548.6 m
Large Rock Cover: 1%
Small Rock Cover: 2.6%
Bare Ground: 96.4%

LOCATIONS SAMPLED: San Jacinto River

SAMPLES USED TO DESCRIBE ASSOCIATION: n=7

REFERENCES: Sawyer et al. 2009

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Shrub										
	ENAC	*Encelia actoni*	100	14.9	3	30	X		X	
	ERFA2	*Eriogonum fasciculatum*	71	3.7	1	13				
	CRCA5	*Croton californicus*	71	2.0	1	6				
	OPPA2	*Opuntia parryi*	57	0.6	1	1				
	PSARS	*Psorothamnus arborescens*	43	2.3	1	14				
	LOSC2	*Lotus scoparius*	43	1.0	1	5				
Herb										
	BRMAR	*Bromus rubens*	100	32.6	16	47	X		X	
	CHGL	*Chaenactis glabriuscula*	100	4.3	1	12	X			
	STGN	*Stylocline gnaphaloides*	86	6.3	1	28	X			
	SCBA	*Schismus barbatus*	86	1.9	1	5	X			
	CRIN8	*Cryptantha intermedia*	71	5.3	1	12				
	NELO	*Nemacladus longiflorus*	71	3.6	1	13				
	LACO4	*Lastarriaea coriacea*	71	3.0	1	10				
	ERCI6	*Erodium cicutarium*	71	1.7	1	4				
	ACSP12	*Achnatherum speciosum*	57	4.4	1	24				
	VUMY	*Vulpia myuros*	57	3.9	1	15				
	PHDI	*Phacelia distans*	57	3.0	1	13				
	CABI12	*Camissonia bistorta*	57	2.6	1	11				
	DOLE	*Dodecahema leptoceras*	57	1.4	1	5				
	ERTH3	*Eriogonum thurberi*	57	1.3	2	3				
	BRDI3	*Bromus diandrus*	57	1.0	1	3				
	SACO6	*Salvia columbariae*	57	1.0	1	4				
	ERWA7	*Eriophyllum wallacei*	43	2.6	1	15				
	PHRA2	*Phacelia ramosissima*	43	1.7	1	8				
	FICA2	*Filago californica*	43	1.0	1	3				
	DULA	*Dudleya lanceolata*	43	0.6	1	2				
	RACA	*Rafinesquia californica*	43	0.6	1	2				
	ERGR5	*Eriogonum gracile*	43	0.4	1	1				

Eriodictyon crassifolium Provisional Alliance

Eriodictyon crassifolium Provisional Association
Thickleaf Yerba Santa Provisional Association

LOCAL ENVIRONMENTAL TABLE (AVERAGES)
Elevation: 396.4 m
Large Rock Cover: 0.1%
Small Rock Cover: 9.6%
Bare Ground: 15%

LOCATIONS SAMPLED: Fremont Canyon, Horsethief Creek

SAMPLES USED TO DESCRIBE ASSOCIATION: n=2

REFERENCES: Klein and Evens 2006, Sawyer et al. 2009

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Shrub										
	ERCR2	*Eriodictyon crassifolium*	100	25.0	25	25	X	X		X
	ARCA11	*Artemisia californica*	100	4.0	2	6	X			
	SAME5	*Sambucus mexicana*	100	1.1	0.2	2	X			
	TECO2	*Tetradymia comosa*	50	7.0	14	14				
	RHTR	*Rhus trilobata*	50	5.0	10	10				
	KEAN	*Keckiella antirrhinoides*	50	3.0	6	6				
	ADFA	*Adenostoma fasciculatum*	50	2.5	5	5				
	LUEX	*Lupinus excubitus*	50	1.0	2	2				
Herb										
	VUMY	*Vulpia myuros*	100	13.5	2	25	X			
	BRMAR	*Bromus rubens*	100	10.1	0.2	20	X			
	CLPE	*Claytonia perfoliata*	100	3.5	2	5	X			
	BRHO2	*Bromus hordeaceus*	100	0.6	0.2	1	X			
	CLPU2	*Clarkia purpurea*	100	0.6	0.2	1	X			
	CEME2	*Centaurea melitensis*	100	0.2	0.2	0.2	X			
	PHDI	*Phacelia distans*	50	7.5	15	15				
	AMME	*Amsinckia menziesii*	50	2.5	5	5				
	PACA2	*Paeonia californica*	50	1.0	2	2				
	CRIN8	*Cryptantha intermedia*	50	0.5	1	1				
	ERIAS	*Eriastrum* sp.	50	0.5	1	1				
	LEFI11	*Lessingia filaginifolia*	50	0.5	1	1				
	MEIM	*Melica imperfecta*	50	0.5	1	1				

Keckiella antirrhinoides Alliance

Keckiella antirrhinoides–mixed chaparral Association
Bush Penstemon – Mixed Chaparral Association

LOCAL ENVIRONMENTAL TABLE (AVERAGES)
Elevation: 550.2 m
Large Rock Cover: 5%
Small Rock Cover: 32%
Bare Ground: 31%

LOCATIONS SAMPLED: Horsethief Creek

SAMPLES USED TO DESCRIBE ASSOCIATION: n=1

REFERENCES: Evens and San 2005, Klein and Evens 2006, Sawyer et al. 2009

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Shrub										
	KEAN	*Keckiella antirrhinoides*	100	12.0	12	12	X		X	
	ADFA	*Adenostoma fasciculatum*	100	7.0	7	7	X			
	RHCR	*Rhamnus crocea*	100	4.0	4	4	X			
	SAAP2	*Salvia apiana*	100	4.0	4	4	X			
	RHTR	*Rhus trilobata*	100	3.0	3	3	X			
	ERFA2	*Eriogonum fasciculatum*	100	2.0	2	2	X			
	LOSC2	*Lotus scoparius*	100	1.0	1	1	X			
	GAAN2	*Galium angustifolium*	100	0.2	0.2	0.2	X			
	LUEX	*Lupinus excubitus*	100	0.2	0.2	0.2	X			
	TECO2	*Tetradymia comosa*	100	0.2	0.2	0.2	X			
	HEWH	*Hesperoyucca whipplei*	100	0.2	0.2	0.2	X			
Herb										
	BRMAR	*Bromus rubens*	100	22.0	22	22	X	X		X
	PACA2	*Paeonia californica*	100	3.0	3	3	X			
	PHDI	*Phacelia distans*	100	3.0	3	3	X			
	STGN	*Stylocline gnaphalioides*	100	3.0	3	3	X			
	VUMY	*Vulpia myuros*	100	3.0	3	3	X			
	CRIN8	*Cryptantha intermedia*	100	2.0	2	2	X			
	CLPA2	*Clematis pauciflora*	100	1.0	1	1	X			
	ERSA	*Eriastrum sapphirinum*	100	1.0	1	1	X			
	MEIM	*Melica imperfecta*	100	1.0	1	1	X			

Lepidospartum squamatum Alliance

Lepidospartum squamatum–Artemisia californica Association
California Scalebroom – California Sagebrush Association

LOCAL ENVIRONMENTAL TABLE (AVERAGES)
Elevation: 184.8 m
Large Rock Cover: 3.5%
Small Rock Cover: 49.7%
Bare Ground: 45.7%

LOCATIONS SAMPLED: Fremont Canyon, Fremont Canyon

SAMPLES USED TO DESCRIBE ASSOCIATION: n=3

REFERENCES: Evens et al. 2006, Sawyer et al. 2009

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Shrub										
	ARCA11	*Artemisia californica*	100	38.3	12	53	X	X		X
	LESQ	*Lepidospartum squamatum*	100	17.4	0.2	32	X			
	ERFA2	*Eriogonum fasciculatum*	100	2.0	1	3	X			
	OPLI3	*Opuntia littoralis*	100	0.7	0.2	1	X			
	ENFA	*Encelia farinosa*	67	4.3	3	10				
	SAME3	*Salvia mellifera*	67	1.1	0.2	3				
	MALA6	*Malosma laurina*	67	1.0	1	2				
	HEWH	*Hesperoyucca whipplei*	67	1.0	1	2				
	BRCA3	*Brickellia californica*	67	0.4	0.2	1				
	OPPA2	*Opuntia parryi*	33	0.3	1	1				
	RIAU	*Ribes aureum*	33	0.3	1	1				
	LOSC2	*Lotus scoparius*	33	0.1	0.2	0.2				
Herb										
	STGN	*Stylocline gnaphalioides*	67	0.7	1	1				
	ERBO	*Erodium botrys*	33	1.7	5	5				
	FIGA	*Filago gallica*	33	1.0	3	3				
Non-Vascular										
	2MOSS	Moss	67	2.7	1	7				

Lepidospartum squamatum–Baccharis salicifolia Association

California Scalebroom – Mule-Fat Association

LOCAL ENVIRONMENTAL TABLE (AVERAGES)

Elevation: 964.3 m
Large Rock Cover: 13.8%
Small Rock Cover: 51%
Bare Ground: 33%

LOCATIONS SAMPLED: Indian Canyon, Mill Creek

SAMPLES USED TO DESCRIBE ASSOCIATION: n=4

REFERENCES: Klein and Evens 2006, Sawyer et al. 2009

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Tree										
	SALA6	*Salix lasiolepis*	50	0.3	0.2	1				
	ALRH2	*Alnus rhombifolia*	25	1.0	4	4				
	SALA3	*Salix laevigata*	25	0.3	1	1				
Shrub										
	LESQ	*Lepidospartum squamatum*	100	1.1	0.2	2	X		X	
	ERFA2	*Eriogonum fasciculatum*	75	2.0	1	4	X		X	
	BASA4	*Baccharis salicifolia*	50	0.8	1	2				
	LOSC2	*Lotus scoparius*	25	0.8	3	3				
	ARCA11	*Artemisia californica*	25	0.3	1	1				
	CECR	*Ceanothus crassifolius*	25	0.3	1	1				
	ERLI6	*Ericameria linearifolia*	25	0.3	1	1				
	BEJU	*Bebbia juncea*	25	0.1	0.2	0.2				
	BRCA3	*Brickellia californica*	25	0.1	0.2	0.2				
	DIPU4	*Diplacus puniceus*	25	0.1	0.2	0.2				
	ERCO25	*Eriophyllum confertiflorum*	25	0.1	0.2	0.2				
	HEWH	*Hesperoyucca whipplei*	25	0.1	0.2	0.2				
Herb										
	HIIN3	*Hirschfeldia incana*	100	1.3	0.01	4	X			
	HESE	*Heterotheca sessiliflora*	75	0.6	0.2	1	X			
	BRMAR	*Bromus rubens*	75	0.3	0.01	1	X			
	MICA3	*Mimulus cardinalis*	50	0.5	1	1				
	STVI2	*Stephanomeria virgata*	50	0.3	0.2	1				
	BRDI3	*Bromus diandrus*	50	0.3	0.01	1				
	BRTE	*Bromus tectorum*	50	0.3	0.01	1				
	PIMI3	*Piptatherum miliaceum*	50	0.1	0.2	0.2				

Lepidospartum squamatum–Eriodictyon trichocalyx–Hesperoyucca whipplei Association

California Scalebroom – Hairy Yerba Santa – Chaparral Yucca Association

LOCAL ENVIRONMENTAL TABLE (AVERAGES)

Elevation: 523.9 m
Large Rock Cover: 7%
Small Rock Cover: 22.5%
Bare Ground: 64.7%

LOCATIONS SAMPLED: Bee Canyon, Big Tujunga Wash, Cajon Wash, Lone Pine Canyon Wash, Lower Cajon Wash, Lower Lytle Creek, Lytle Creek Wash, Mill Creek, Riverside, San Gabriel River, Santa Ana River, Temescal Wash, Upper Cajon Wash, Wilson Creek

SAMPLES USED TO DESCRIBE ASSOCIATION: n=57

REFERENCES: Barbour and Wirka 1997, Sawyer et al. 2009, Wirka 1997

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Shrub										
	ERFA2	*Eriogonum fasciculatum*	96	10.4	1	51	X			
	LESQ	*Lepidospartum squamatum*	81	7.4	1	33	X			
	HEWH	*Hesperoyucca whipplei*	81	3.2	0.2	23	X			
	OPLI3	*Opuntia littoralis*	58	4.1	0.2	55				
	ERTR7	*Eriodictyon trichocalyx*	56	6.7	0.2	34				
	LOSC2	*Lotus scoparius*	54	1.3	0.01	17				
	GUCA	*Gutierrezia californica*	39	1.7	1	21				
	OPPA2	*Opuntia parryi*	35	0.8	1	7				
Herb										
	BRMAR	*Bromus rubens*	95	19.6	0.2	57	X		X	
	SCBA	*Schismus barbatus*	82	3.9	0.2	40	X			
	HIIN3	*Hirschfeldia incana*	67	2.3	0.01	21				
	VUMY	*Vulpia myuros*	65	4.3	0.2	39				
	ERCI6	*Erodium cicutarium*	63	2.4	0.2	34				
	FICA2	*Filago californica*	63	1.0	0.01	7				
	CRIN8	*Cryptantha intermedia*	60	1.1	0.01	10				
	ERGR5	*Eriogonum gracile*	54	0.9	0.01	9				
	STGN	*Stylocline gnaphaloides*	51	2.1	0.2	19				
	CRCO34	*Crassula connata*	51	1.9	0.01	30				
	PHDI	*Phacelia distans*	47	1.5	0.2	13				
	SACO6	*Salvia columbariae*	47	0.7	0.2	13				
	ERDE2	*Eriastrum densifolium*	44	0.9	0.2	13				
	LACO4	*Lastarriaea coriacea*	42	0.9	0.01	10				
Non-Vascular										
	2MOSS	Moss	70	4.1	0.2	37				X

Lepidospartum squamatum–Eriogonum fasciculatum Association

California Scalebroom – California Buckwheat Association

LOCAL ENVIRONMENTAL TABLE (AVERAGES)

Elevation: 658.1 m
Large Rock Cover: 11.1%
Small Rock Cover: 35.8%
Bare Ground: 42.5%

LOCATIONS SAMPLED: Big Tujunga Wash, Cable Canyon Wash, Cajon Wash, Day Canyon Wash, Delta Canyon, East Etiwanda Creek, Indian Canyon, Lone Pine Canyon Wash, Lower Cajon Wash, Lower Lytle Creek, Lytle Creek Wash, Meyhew Canyon, Mill Creek, San Francisquito Canyon, Santa Ana River, Temescal Wash, Tin Mine Canyon, Upper Cajon Wash, Wilson Creek

SAMPLES USED TO DESCRIBE ASSOCIATION: n=43

REFERENCES: Barbour and Wirka 1997, Sawyer et al. 2009, Wirka 1997

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Shrub										
	ERFA2	*Eriogonum fasciculatum*	100	14.9	0.2	54	X		X	
	LESQ	*Lepidospartum squamatum*	100	13.0	0.2	50	X		X	
	HEWH	*Hesperoyucca whipplei*	67	0.9	0.2	6				
	LOSC2	*Lotus scoparius*	47	0.8	0.2	6				
	ARCA11	*Artemisia californica*	44	1.9	0.2	19				
	ERCO25	*Eriophyllum confertiflorum*	21	0.2	0.2	2				
Herb										
	BRMAR	*Bromus rubens*	98	7.1	0.2	38	X		X	
	HIIN3	*Hirschfeldia incana*	65	1.4	0.01	17				
	CRIN8	*Cryptantha intermedia*	60	0.9	0.01	13				
	ERCI6	*Erodium cicutarium*	60	0.8	0.2	5				
	VUMY	*Vulpia myuros*	58	1.5	0.2	17				
	FICA2	*Filago californica*	58	0.6	0.2	5				
	AVBA	*Avena barbata*	56	1.2	0.01	11				
	SCBA	*Schismus barbatus*	56	0.7	0.2	8				
	BRDI3	*Bromus diandrus*	53	0.8	0.2	15				
	BRTE	*Bromus tectorum*	42	0.5	0.2	6				
	SACO6	*Salvia columbariae*	42	0.4	0.01	3				
Non-Vascular										
	2MOSS	Moss	51	0.7	0.2	5				

Lepidospartum squamatum / desert ephemeral annuals *(Chaenactis fremontii)* Association

California Scalebroom / Desert Ephemeral Annuals (Pincushion flower) Association

LOCAL ENVIRONMENTAL TABLE (AVERAGES)

Elevation: 665 m
Large Rock Cover: 1%
Small Rock Cover: 12%
Bare Ground: 87%

LOCATIONS SAMPLED: Jawbone Canyon, Red Rock Canyon Wash

SAMPLES USED TO DESCRIBE ASSOCIATION: n=6

REFERENCES: Barbour and Wirka 1997, Sawyer et al. 2009, Wirka 1997

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Shrub										
	LESQ	*Lepidospartum squamatum*	100	16.0	8	24	X	X		X
	HYSA	*Hymenoclea salsola*	50	1.0	1	3				
	PSARS	*Psorothamnus arborescens*	33	0.7	1	3				
	ATCA2	*Atriplex canescens*	33	0.3	1	1				
Herb										
	BRMAR	*Bromus rubens*	100	4.7	1	7	X			
	SCBA	*Schismus barbatus*	100	4.7	1	8	X			
	CHFR	*Chaenactis fremontii*	100	2.5	1	6	X			
	CRCI2	*Cryptantha circumscissa*	100	2.3	1	9	X			
	FICA2	*Filago californica*	83	4.7	1	13	X			
	BRTE	*Bromus tectorum*	83	1.8	1	4	X			
	ERCI6	*Erodium cicutarium*	83	1.2	1	3	X			
	GIBRN	*Gilia brecciarum* ssp. *neglecta*	83	0.8	1	1	X			
	LASEP	*Langloisia setosissima*	83	0.8	1	1	X			
	MAGL3	*Malacothrix glabrata*	83	0.8	1	1	X			
	RANE	*Rafinesquia neomexicana*	83	0.8	1	1	X			
	AMAC2	*Ambrosia acanthicarpa*	67	0.7	1	1				
	AMTE3	*Amsinckia tessellata*	67	0.7	1	1				
	CHBR	*Chorizanthe brevicornu*	67	0.7	1	1				
	ESMI	*Eschscholzia minutiflora*	67	0.7	1	1				
	MENI2	*Mentzelia nitens*	67	0.7	1	1				
	PHTA	*Phacelia tanacetifolia*	67	0.7	1	1				
	STEX	*Stephanomeria exigua*	50	1.0	1	4				
	CABO7	*Camissonia boothii*	50	0.5	1	1				
	LUMIH4	*Lupinus microcarpus* var. *horizontalis*	50	0.5	1	1				
	NERU	*Nemacladus rubescens*	50	0.5	1	1				

Lepidospartum squamatum / mixed ephemeral annuals (*Chaenactis glabriuscula*) Association

California Scalebroom / Mixed Ephemeral Annuals (Yellow Pincushion) Association

LOCAL ENVIRONMENTAL TABLE (AVERAGES)

Elevation: 546.4 m
Large Rock Cover: 4.0%
Small Rock Cover: 22.2%
Bare Ground: 71.2%

LOCATIONS SAMPLED: Arroyo Seco Creek, Bautista Creek, Cajalco Creek floodplain, Fremont Canyon, San Jacinto River, Santa Ana River, Upper Cajon Wash

SAMPLES USED TO DESCRIBE ASSOCIATION: n=13

REFERENCES: Barbour and Wirka 1997, Sawyer et al. 2009, Wirka 1997

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Shrub										
	LESQ	*Lepidospartum squamatum*	77	4.7	1	25	X			
	LOSC2	*Lotus scoparius*	77	3.5	0.2	18	X			
	ERFA2	*Eriogonum fasciculatum*	69	1.0	0.2	5				
	CRCA5	*Croton californicus*	46	1.0	0.2	6				
	ENFA	*Encelia farinosa*	38	1.5	1	8				
	SEFLD	*Senecio flaccidus var. douglasii*	38	0.9	0.2	8				
	OPPA2	*Opuntia parryi*	31	0.5	1	3				
	SAAP2	*Salvia apiana*	31	0.3	0.1	2				
Herb										
	BRMAR	*Bromus rubens*	100	24.6	0.11	60	X		X	
	HIIN3	*Hirschfeldia incana*	69	1.6	0.01	6				
	ERCI6	*Erodium cicutarium*	62	3.8	0.2	20				
	BRDI3	*Bromus diandrus*	62	1.8	1	7				
	AVBA	*Avena barbata*	54	1.8	0.1	8				
	VUMY	*Vulpia myuros*	54	1.5	0.01	10				
	BRTE	*Bromus tectorum*	54	1.5	0.2	6				
	CHGL	*Chaenactis glabriuscula*	46	3.4	1	32				
	CRIN8	*Cryptantha intermedia*	46	2.4	1	22				
	STGN	*Stylocline gnaphalioides*	46	0.6	0.2	2				
	DOLE	*Dodecahema leptoceras*	38	0.6	1	3				
	FICA2	*Filago californica*	38	0.5	1	2				
	SCBA	*Schismus barbatus*	38	0.4	0.2	2				
	ERDE2	*Eriastrum densifolium*	31	2.5	2	15				
	STEX	*Stephanomeria exigua*	31	1.0	0.2	7				
Non-Vascular										
	2MOSS	Moss	46	1.5	1	9				

Lotus scoparius Alliance

Lotus scoparius Association
California Broom Association

LOCAL ENVIRONMENTAL TABLE (AVERAGES)
Elevation: 542.5 m
Large Rock Cover: 15%
Small Rock Cover: 35%
Bare Ground: 50%

LOCATIONS SAMPLED: Arroyo Seco Creek

SAMPLES USED TO DESCRIBE ASSOCIATION: n=3

REFERENCES: Evens and San 2005, Sawyer et al. 2009

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Tree										
	QUAG	*Quercus agrifolia*	67	3.3	1	9				X
	PLRA	*Platanus racemosa*	33	0.3	1	1				
Shrub										
	LOSC2	*Lotus scoparius*	100	45.3	37	61	X	X		X
	ERFA2	*Eriogonum fasciculatum*	100	14.3	6	25	X			
	GAAN2	*Galium angustifolium*	67	1.0	1	2				
	LUEX	*Lupinus excubitus*	67	0.7	1	1				
	RHIL	*Rhamnus ilicifolia*	67	0.7	1	1				
	ERTO	*Eriodictyon tomentosum*	33	1.0	3	3				
Herb										
	BRMAR	*Bromus rubens*	100	43.0	42	45	X		X	
	ERCI6	*Erodium cicutarium*	100	5.3	3	10	X			
	CHGL	*Chaenactis glabriuscula*	100	1.0	1	1	X			
	VUMY	*Vulpia myuros*	67	30.3	44	47				
	VUOC	*Vulpia octoflora*	67	4.7	3	11				
	AVFA	*Avena fatua*	67	4.0	1	11				
	LEFI11	*Lessingia filaginifolia*	67	3.7	1	10				
	HYGL2	*Hypochaeris glabra*	67	2.7	4	4				
	LOST4	*Lotus strigosus*	67	2.7	4	4				
	SACYH2	*Sarcostemma cynanchoides* ssp. *hartwegii*	67	1.7	1	4				
	FICA2	*Filago californica*	67	1.3	1	3				
	ERFO2	*Erigeron foliosus*	67	1.0	1	2				
	LACO4	*Lastarriaea coriacea*	67	1.0	1	2				
	PTDR	*Pterostegia drymarioides*	67	1.0	1	2				
Non-Vascular										
	2MOSS	Moss	33	1.0	3	3				

Salvia apiana Alliance

Salvia apiana–*Artemisia californica*–*Ericameria* spp. Association
White Sage – California Sagebrush – Goldenbush Association

LOCAL ENVIRONMENTAL TABLE (AVERAGES)
Elevation: 658.6 m
Large Rock Cover: 12.5%
Small Rock Cover: 48%
Bare Ground: 22.7%

LOCATIONS SAMPLED: Etiwanda alluvial fan, Cable Canyon Wash, East Etiwanda Creek

SAMPLES USED TO DESCRIBE ASSOCIATION: n=7

REFERENCES: Evens and San 2005, Klein and Evens 2006, Sawyer et al. 2009

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Shrub										
	LOSC2	*Lotus scoparius*	100	19.7	6	52	X			
	SAAP2	*Salvia apiana*	100	16.6	5	43	X			
	ERFA2	*Eriogonum fasciculatum*	100	4.9	0.2	10	X			
	CRCA5	*Croton californicus*	100	3.3	0.2	8	X			
	ARCA11	*Artemisia californica*	86	6.9	0.2	19	X			
	ERLI6	*Ericameria linearifolia*	57	4.1	2	17				
	ERPI7	*Ericameria pinifolia*	43	4.3	4	14				
	HESC2	*Helianthemum scoparium*	43	0.2	0.2	1				
	ERTR7	*Eriodictyon trichocalyx*	29	2.9	10	10				
	ERCO25	*Eriophyllum confertiflorum*	29	0.2	0.2	1				
Herb										
	BRMAR	*Bromus rubens*	100	4.1	1	11	X			
	HIIN3	*Hirschfeldia incana*	100	2.1	0.2	7	X			
	LEFI11	*Lessingia filaginifolia*	86	3.6	0.2	11	X			
	BRTE	*Bromus tectorum*	86	2.6	0.2	6	X			
	PTDR	*Pterostegia drymarioides*	86	1.5	0.2	6	X			
	PHDI	*Phacelia distans*	71	0.5	0.2	1				
	ACCO21	*Achnatherum coronatum*	57	1.5	0.2	7				
	CRYPT	*Cryptantha* sp.	57	0.6	1	1				
	SCBA	*Schismus barbatus*	57	0.5	0.2	1				
	CEME2	*Centaurea melitensis*	57	0.3	0.2	1				
	CABI12	*Camissonia bistorta*	57	0.1	0.01	0.2				
	VUMY	*Vulpia myuros*	43	1.3	1	7				
	CRMU2	*Cryptantha muricata*	43	0.5	0.2	3				
	CRIN8	*Cryptantha intermedia*	43	0.4	1	1				
	ERCI6	*Erodium cicutarium*	43	0.3	0.2	1				
	FICA2	*Filago californica*	43	0.3	0.2	1				
	ARDR4	*Artemisia dracunculus*	43	0.2	0.2	1				

Salvia mellifera Alliance

Salvia mellifera–Malosma laurina Association
Black Sage – Laurel Sumac Association

LOCAL ENVIRONMENTAL TABLE (AVERAGES)
Elevation: 371.7 m
Large Rock Cover: 0.2%
Small Rock Cover: 17.5%
Bare Ground: 13.5%

LOCATIONS SAMPLED: Tin Mine Canyon

SAMPLES USED TO DESCRIBE ASSOCIATION: n=2

REFERENCES: Sawyer et al. 2009

PLANT CONSTANCY/COVER SUMMARY TABLE

Stratum	Code	Species Name	Con	Avg	Min	Max	C	D	cD	A
Shrub										
	MALA6	*Malosma laurina*	100	11.5	4	19	X			
	SAME3	*Salvia mellifera*	100	9.5	8	11	X			
	MAFA	*Malacothamnus fasciculatus*	100	8.0	4	12	X			
	ERFA2	*Eriogonum fasciculatum*	100	5.6	0.2	11	X			
	ARCA11	*Artemisia californica*	100	3.5	2	5	X			
	KEAN	*Keckiella antirrhinoides*	100	3.1	0.2	6	X			
	ERCR2	*Eriodictyon crassifolium*	100	2.1	0.2	4	X			
	ENCA	*Encelia californica*	50	4.0	8	8				
	LESQ	*Lepidospartum squamatum*	50	1.5	3	3				
	TECO2	*Tetradymia comosa*	50	1.0	2	2				
Herb										
	CEME2	*Centaurea melitensis*	100	10.0	10	10	X		X	
	VUMY	*Vulpia myuros*	100	2.0	1	3	X			
	MAMA8	*Marah macrocarpus*	100	1.5	1	2	X			
	HIIN3	*Hirschfeldia incana*	100	0.6	0.2	1	X			
	BRMAR	*Bromus rubens*	50	17.5	35	35				
	LECO12	*Leymus condensatus*	50	1.0	2	2				
Non-Vascular										
	2MOSS	Moss	100	0.2	0.2	0.2	X	X		X