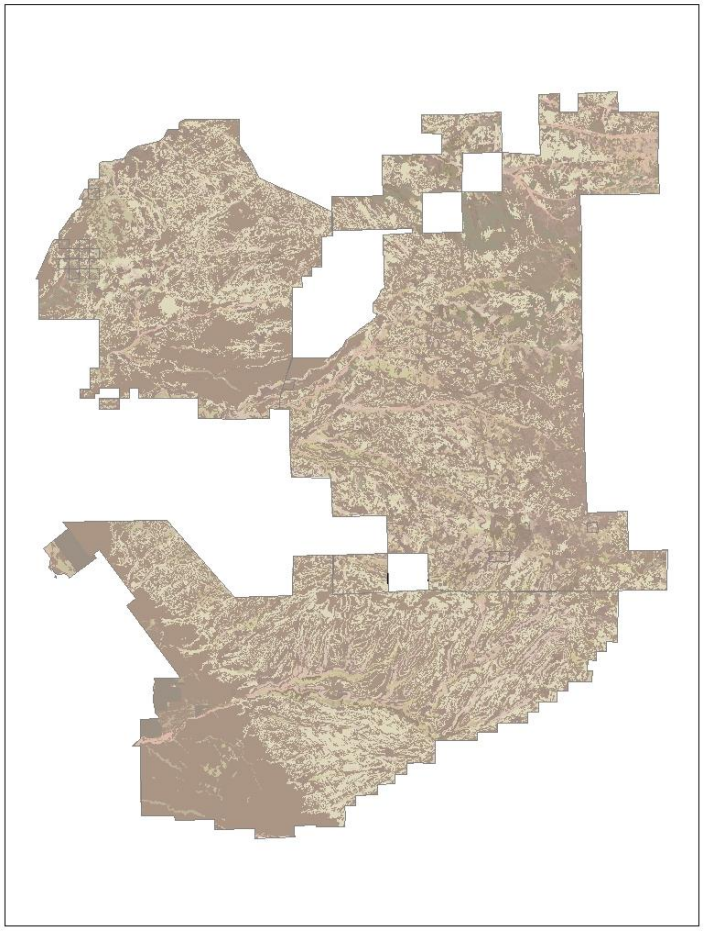
Lassen Foothills Vegetation Mapping Project: Final Vegetation Map and Classification Report

To the
Tehama County Resource Conservation District and
Resources Legacy Fund Foundation



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Introduction

The Tehama County Resource Conservation District contracted with the California Native Plant Society (CNPS) and Aerial Information Systems (AIS) to produce a fine-scale, spatially and floristically accurate vegetation map of the Lassen Foothills project area. This area encompasses a 108,400 acre portion of eastern Tehama County and covers three large parcels: South Denny Ranch, Tehama Wildlife Area, and Dye Creek Preserve. The project area represents a biologically diverse mix of vegetation types including grasslands, riparian, foothill chaparral, and oak woodlands. Vegetation resources were assessed through new and previous field surveys, classification analysis of 35 vegetation alliances, and mapping of 37 vegetation map units.

Objective

A primary objective of this collaborative project was the creation of a detailed vegetation map in the Lassen Foothills project area, along with a vegetation classification at the alliance-level. The resulting field surveys and map provide a baseline dataset with great floristic and ecological detail. This information is being used to develop state and transition models for the vegetation types as well as a fire condition class map. Ultimately, this information will feed into the Lassen Fire Management Plan developed by the Tehama County Resource Conservation District in conjunction with the Tehama-Glenn FireSafe Council.

Methods

The properties within the Lassen Foothills project area are a mix of private and public ownership. A vegetation classification for the northern Sierra Nevada Foothills region was developed recently by the California Native Plant Society (Klein et. al. 2007). A preliminary vegetation map for the Lassen Foothills was created by Aerial Information Systems (AIS) in fall 2007 using color aerial imagery, 180 reconnaissance points, and 143 field surveys to understand and interpret the vegetation components of the area. For a complete report and methods for the vegetation mapping written by AIS, see Appendix A, which includes a crosswalk to vegetation alliances and wildlife habitat relationship (WHR) types.

To validate the vegetation map, an accuracy assessment with field verification was conducted by CNPS field staff. Using an existing field key to the vegetation of this region (Klein et al. 2007) and a sampling plan (Appendix B), field data were collected to assess the user's accuracy of the vegetation map. User's accuracy was calculated by dividing the number of samples that agreed with their

corresponding map class by the total number of samples whose field call belonged to that category.

From November to December, 2007, new surveys were entered into a standardized database and a thorough quality assessment and quality check (QA/QC) was performed prior to analysis. Information is archived in an MS Access database, which has a form for entering and viewing of data records. Associated survey information is stored in tables named AllReports and AllPlants, and other tables are look-up reference tables for the functionality of the forms and data tables. Digital photographs are archived into folders labeled by survey date.

An accuracy assessment helps map users determine how much confidence should be assigned to the mapping units and allows a better understanding of the maps appropriateness for various applications. A fuzzy logic method was used to compare the vegetation label assigned to a polygon in the map (mapping unit attribute) with the label assigned through ground-truth/field sampling. Two scales were used to score polygon attributes for the project area:

Codes for Scoring Vegetation Attribute Accuracy Assessment:

- 1 = completely wrong with low ecological similarity
- 2 = similar life form, ecologically related or shares diagnostic species
- 3 = correct, meets key definitions for the vegetation type or mapping unit

Codes for Scoring Canopy Cover Attribute Accuracy Assessment:

- 1 = incorrect (4 classes off)
- 2 = completely opposite of correct (3 classes off)
- 3 = mostly incorrect (2 classes off)
- 4 = partially incorrect (1 class off)
- 5 = correct class

Each field-verified polygon was ranked according to the set of decision rules in these scoring scales. Then percent accuracy was calculated to obtain accuracy assessment scores. For each mapping unit, polygon ranks were summed and then divided by the total number of polygons for a perfect score (e.g., with 5 field surveys for one mapping unit, the perfect score is 25). Then, percent accuracy is calculated per mapping unit and provided back to the AIS photo-interpreters to reassess units and make any necessary changes. These efforts verify and increase the final accuracy of the map product.

Results

In 450 vegetation surveys of the Lassen Foothills area, 495 vascular plant taxa were identified. General names were given to nonvascular or vascular plant species that were not identified to the species level (e.g., Moss, Lichen).

Appendix C provides a complete list of scientific and family names for all taxa identified. Further, the field surveys contained data on 81 herbaceous stands, 83 shrub stands and 280 tree stands.

The floristic classification for the Lassen Foothills study area includes 35 vegetation alliances, including the more common blue and interior live oak *(Quercus douglasii* and *Quercus wislizeni)* woodland and wedgeleaf ceanothus (*Ceanothus cuneatus*) chaparral alliances. Uncommon vegetation alliances in the region include California Sycamore (*Platanus racemosa*), Oregon Ash (*Fraxinus latifolia),* and Valley Oak (*Quercus lobata)* riparian woodland alliances, which have State rarity rankings of S3. While annual grasslands occur as broad swathes, the area contains many rare and wildflower-rich annual grassland types including those with S3 rarity rankings: Fremont's Tidytips (*Layia fremontii*), Seep Monkeyflower (*Mimulus guttatus*), and Whitetip Clover (*Trifolium variegatum*) alliances.

This detailed floristic classification in the northern Sierra Nevada Foothills was translated into a mapping classification. While the mapping focused on the finest floristic scale possible, some higher-level mapping units were used (e.g., Interior Live Oak Alliance instead of association level units). This is because a map cannot always represent stands of vegetation that may be identified and classified from the ground. The total number of mapping units in the final Lassen Foothills vegetation map is 37, and the average polygon size is 7 acres. Table 1 shows a crosswalk between the 35 alliances and 78 floristically-classified associations that are either mapped or combined within each mapping unit. Appendix D contains a classification of mapping units used in the vegetation map with a nested, hierarchical list of alliance names and their associated map numbers. There were 17 unique Wildlife Habitats found within the study site. Figure 1 illustrates a map of units from the Wildlife Habitat Relationship managed by the CA Department of Fish and Game.

Out of the 450 surveys taken, 307 field verification surveys were used for a rigorous error analysis of the mapped vegetation attributes as well as canopy cover attributes. Thirty vegetation types were evaluated in the accuracy assessment, representing 81% of the total number of mapped types. For every assessment that scored below a value of 3, a CNPS ecologist and an AIS photo-interpreter reviewed the polygon, so that changes could be made to increase the final map product's accuracy. The map classes shown in this document represent those that remained or were created following adjustment of map classes to improve the map accuracy. For the final assessed map units, the overall user's accuracy averaged 85%. Table 2 breaks down the average accuracy for each of the individual map units. The preferred accuracy for fine-scale map products is 80%, and the final map considerably met these expectations.

Another analysis was run on the canopy cover estimates attributed for each polygon in the Lassen Foothills Vegetation Map. Table 3 reports the average accuracy for both the hardwood estimates and conifer estimates of canopy cover. The results show that the denser canopy cover estimates had lower correlations with field data estimates, though the accuracy had a range of 70-98% accuracy. The average total accuracy across all classes for conifer cover was 95%, and for hardwood cover was 83%.

Figure 1. A vegetation map illustrating the wildlife habitat units found in the Lassen project area as well as locations for 450 field survey points.

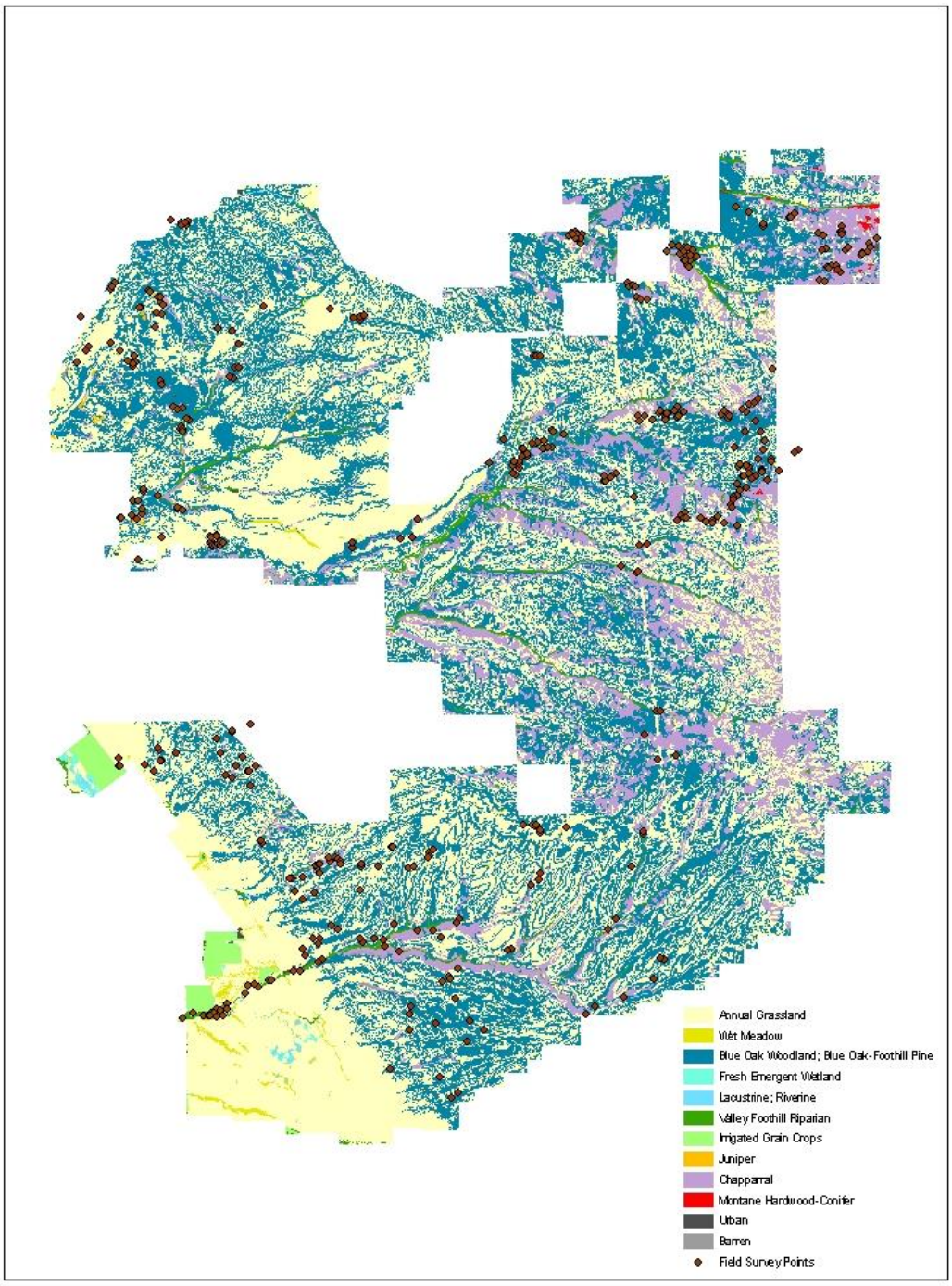

Table 1. Crosswalk between the vegetation types from the CNPS Northern Sierra Nevada Foothills floristic classification with the AIS Map Units used in the Lassen Foothills Vegetation Map.

LifeForm	Alliance	Floristic Vegetation Type	Map Unit Type
Tree	*Aesculus californica* Alliance	•Aesculus californica / Toxicodendron diversilobum / Moss •Aesculus californica Riparian	Aesculus californica Alliance
Tree	*Alnus rhombifolia* Alliance	•*Alnus rhombifolia - Quercus chrysolepis* •*Alnus rhombifolia - Salix laevigata* •*Alnus rhombifolia - Salix laevigata - Platanus racemosa* •*Alnus rhombifolia / Carex*	Alnus rhombifolia Alliance
Tree	*Fraxinus latifolia* Alliance	•*Fraxinus latifolia - Alnus rhombifolia*	Northern Sierra Foothills Riparian Mapping Unit
Tree	*Platanus racemosa* Alliance	•*Platanus racemosa (*Alliance*)*	Northern Sierra Foothills Riparian Mapping Unit
Tree	*Quercus wislizeni* Alliance	•*Quercus wislizeni - Salix laevigata / Rhamnus tomentella*	Northern Sierra Foothills Riparian Mapping Unit
Tree	*Salix lasiolepis* Alliance	•*Salix lasiolepis / Rubus spp.*	Northern Sierra Foothills Riparian Mapping Unit
Tree	*Unclassified Riparian Woodland/Forest Stands*	•*Unclassified Riparian Woodland/Forest (Stands)*	Northern Sierra Foothills Riparian Mapping Unit
Tree	*Pinus ponderosa* Alliance	•*Pinus ponderosa (*Alliance*)*	Pinus ponderosa Alliance
Tree	*Pinus sabiniana* Alliance	•*Pinus sabiniana / Ceanothus cuneatus*	Pinus sabiniana / Ceanothus cuneatus Association
Tree	*Populus fremontii* Alliance	•*Populus fremontii - Salix laevigata*	Populus fremontii - Salix laevigata Association
Tree	*Populus fremontii* Alliance	•*Populus fremontii / Vitis californica*	Populus fremontii Alliance

LifeForm	Alliance	Floristic Vegetation Type	Map Unit Type
Tree	*Quercus chrysolepis* Alliance	•*Quercus chrysolepis - Pinus ponderosa* •*Quercus chrysolepis - Quercus kelloggii* •*Quercus chrysolepis - Quercus wislizeni*	Quercus chrysolepis Alliance
Tree	*Quercus chrysolepis* Alliance	•*Quercus chrysolepis - Quercus lobata / Vitis californica* •*Quercus chrysolepis - Umbellularia californica / Vitis californica Riparian*	Quercus chrysolepis Riparian Type
Tree	*Quercus douglasii* Alliance	•*Quercus douglasii - Aesculus californica / Herbaceous*	Quercus douglasii - Aesculus californica / Herbaceous Association
Tree	*Quercus douglasii* Alliance	•*Quercus douglasii - Pinus sabiniana / Ceanothus cuneatus - Cercocarpus betuloides* •*Quercus douglasii - Pinus sabiniana / Herbaceous*	Quercus douglasii - Pinus sabiniana / Herbaceous Mapping Unit
Tree	*Quercus douglasii* Alliance	•*Quercus douglasii / Arctostaphylos manzanita / Herbaceous*	Quercus douglasii / Arctostaphylos manzanita / Herbaceous Association
Tree	*Quercus douglasii* Alliance	•*Quercus douglasii / Ceanothus cuneatus / Herbaceous*	Quercus douglasii / Ceanothus cuneatus / Herbaceous Association
Tree	*Quercus douglasii* Alliance	•*Quercus douglasii / Annual Grass-Herb* •*Quercus douglasii / Perennial Grass-Herb* •*Quercus douglasii / Selaginella hansenii - Navarretia pubescens*	Quercus douglasii / Herbaceous Mapping Unit

LifeForm	Alliance	Floristic Vegetation Type	Map Unit Type
Tree	*Quercus douglasii* Alliance	•*Quercus douglasii / Juniperus californica* •*Quercus douglasii / Juniperus californica - Ceanothus cuneatus*	Quercus douglasii / Juniperus californica / (Ceanothus cuneatus) Mapping Unit
Tree	*Quercus kelloggii* Alliance	•*Quercus kelloggii - Pinus ponderosa* •*Quercus kelloggii - Pinus ponderosa / Ceanothus integerrimus*	Quercus kelloggii - Pinus ponderosa Mapping Unit
Tree	*Quercus kelloggii* Alliance	•*Quercus kelloggii - Pinus sabiniana* •*Quercus kelloggii / Ceanothus integerrimus* •*Quercus kelloggii / Toxicodendron diversilobum / Grass*	Quercus kelloggii Alliance
Tree	*Quercus lobata* Alliance	•*Quercus lobata / Herbaceous Semi-Riparian*	Quercus lobata / Herbaceous Type
Tree	*Quercus lobata* Alliance	•*Quercus lobata - Alnus rhombifolia* •*Quercus lobata - Quercus wislizeni* •*Quercus lobata / Rhus trilobata* •*Quercus lobata / Rubus discolor* •*Quercus lobata / Riparian*	Quercus lobata Riparian Type
Tree	*Quercus wislizeni* Alliance	•*Quercus wislizeni - Aesculus californica* •*Quercus wislizeni - Quercus douglasii - Aesculus californica*	Quercus wislizeni – (Quercus douglasii) / Aesculus californica Association
Tree	*Quercus wislizeni* Alliance	•*Quercus wislizeni - Pinus sabiniana* •*Quercus wislizeni - Pinus sabiniana / Arctostaphylos manzanita* •*Quercus wislizeni - Quercus douglasii - Pinus sabiniana*	Quercus wislizeni - (Quercus douglasii) - Pinus sabinana Association
Tree	*Quercus douglasii* Alliance	•*Quercus douglasii - Quercus wislizeni / Herbaceous*	Quercus wislizeni – Quercus douglasii Super Alliance

LifeForm	Alliance	Floristic Vegetation Type	Map Unit Type
Tree	*Quercus wislizeni* Alliance	•*Quercus wislizeni - Quercus douglasii / Herbaceous*	Quercus wislizeni – Quercus douglasii Super Alliance
Tree	*Quercus wislizeni* Alliance	•*Quercus wislizeni - Mixed Shrub* •*Quercus wislizeni - Quercus kelloggii* •*Quercus wislizeni / Heteromeles arbutifolia* •*Quercus wislizeni / Toxicodendron diversilobum*	Quercus wislizeni Alliance
Tree	*Salix laevigata* Alliance	•*Salix laevigata - Salix lasiolepis*	Salix laevigata Alliance
Tree	*Umbellularia californica* Alliance	•*Umbellularia californica - Alnus rhombifolia* •*Umbellularia californica - Quercus wislizeni*	Umbellularia californica - (Quercus wislizeni) Mapping Unit
Shrub	*Ceanothus cuneatus* Alliance	•*Ceanothus cuneatus - Eriodictyon californicum - (Fremontodendron californicum)*	(Ceanothus cuneatus) – Eriodictyon californicum Mapping Unit
Shrub	*Eriodictyon californicum* Alliance	•*Eriodictyon californicum / Herbaceous*	(Ceanothus cuneatus) – Eriodictyon californicum Mapping Unit
Shrub	*Ceanothus cuneatus* Alliance	•*Ceanothus cuneatus / Herbaceous* •*Ceanothus cuneatus / Plantago erecta*	Ceanothus cuneatus / Herbaceous Association
Shrub	*Ceanothus cuneatus* Alliance	•*Ceanothus cuneatus - Quercus garryana var. fruticosa* •*Ceanothus cuneatus (Alliance)*	Ceanothus cuneatus Alliance
Shrub	*Juniperus californica* Alliance	•*Juniperus californica / Ceanothus cuneatus* •*Juniperus californica / Herbaceous*	Juniperus californica Alliance

LifeForm	Alliance	Floristic Vegetation Type	Map Unit Type
Shrub	*Quercus berberidifolia* Alliance	•*Quercus berberidifolia - Ceanothus cuneatus*	Mixed Scrub Oak Chaparral Super Alliance
Shrub	*Brickellia californica* Alliance	•*Brickellia californica / Herbaceous*	Mixed Shrub Willow Thicket Mapping Unit
Shrub	*Rhamnus tomentella* Alliance	•*Rhamnus tomentella (*Alliance*)*	Mixed Shrub Willow Thicket Mapping Unit
Shrub	*Riparian Shrubland*	•*Riparian Shrubland*	Mixed Shrub Willow Thicket Mapping Unit
Shrub	*Salix exigua* Alliance	•*Salix exigua (*Alliance*)*	Mixed Shrub Willow Thicket Mapping Unit
Shrub	*Cercocarpus betuloides* Alliance	•*Cercocarpus betuloides - Ceanothus cuneatus*	Northern Mixed Mesic Chaparral Mapping Unit
Shrub	*Quercus garryana shrub* Alliance	•*Quercus garryana var. fruticosa shrub*	Quercus garryana Shrub Alliance
Shrub	*Rubus discolor* Alliance	•*Rubus discolor (*Alliance*)*	Vitis – Rubus – Rose Mapping Unit
Herbaceous	*Scirpus acutus* Alliance	•*Scirpus acutus var. occidentalis*	Bullrush – Cattail Marsh Mapping Unit
Herbaceous	*Bromus hordeaceus* Alliance	•*Bromus hordeaceus - Erodium botrys - Plagiobothrys fulvus*	California Annual or Perennial Grassland
Herbaceous	*California Annual or Perennial Grassland Stands*	•*California Annual or Perennial Grassland (Stands)*	California Annual or Perennial Grassland
Herbaceous	*Centaurea solstitialis* Alliance	•*Centaurea solstitialis (*Alliance*)*	California Annual or Perennial Grassland
Herbaceous	*Lasthenia californica-Plantago erecta-Vulpia microstachys Alliance*	•*Vulpia microstachys - Lasthenia californica - Parvisedum pumilum* •*Vulpia microstachys - Navarretia tagetina* •Vulpia microstachys - Plantago erecta - (Calycadenia truncata - Calycadenia multiglandulosa)	California Annual or Perennial Grassland

LifeForm	Alliance	Floristic Vegetation Type	Map Unit Type
Herbaceous	*Lasthenia californica-Plantago erecta-Vulpia microstachys Alliance*	•Vulpia microstachys - Selaginella hansenii	California Annual or Perennial Grassland
Herbaceous	*Nassella pulchra* Alliance	•Nassella pulchra (Alliance*)*	California Annual or Perennial Grassland
Herbaceous	*Plagiobothrys nothofulvus-(Bromus hordeaceus)* Alliance	•Plagiobothrys nothofulvus-(Bromus hordeaceus) (Alliance*)*	California Annual or Perennial Grassland
Herbaceous	*Eleocharis macrostachya* Alliance	•Eleocharis macrostachya - Marsilea vestita	Seasonally or Temporarily Flooded Seeps & Meadows Mapping Unit
Herbaceous	*Juncus effusus* Alliance	•Juncus effusus (Alliance*)*	Seasonally or Temporarily Flooded Seeps & Meadows Mapping Unit
Herbaceous	*Leymus triticoides* Alliance	•Leymus triticoides (Alliance*)*	Seasonally or Temporarily Flooded Seeps & Meadows Mapping Unit
Herbaceous	*Lolium multiflorum* Alliance	•Lolium multiflorum - Centaurium muehlenbergii •Lolium multiflorum - Zigadenus fremontii	Seasonally or Temporarily Flooded Seeps & Meadows Mapping Unit
Herbaceous	*Mimulus guttatus* Alliance	•Mimulus guttatus (Alliance*)*	Seasonally or Temporarily Flooded Seeps & Meadows Mapping Unit
Herbaceous	*Trifolium variegatum* Alliance	•Leonotodon taraxacoides-Hordeum marinum •Trifolium variegatum •Trifolium variegatum - Lolium multiflorum - Leontodon taraxacoides	Seasonally or Temporarily Flooded Seeps & Meadows Mapping Unit
Herbaceous	*Layia fremontii* Alliance	•Layia fremontii - Lasthenia californica - Achyrachaena mollis •Plagiobothrys austiniae - Achyrachaena mollis	Seasonally or Temporarily Flooded Vernal Pools

Table 2. The Average Accuracy for Lassen Foothills Vegetation Map Units.

AIS Map Unit #	Map Unit Name	# Polygons Mapped	# AA Surveys	% User's Accuracy
1210	*Pinus sabiniana* Alliance	18	5	73%
1211	*Pinus sabiniana / Ceanothus cuneatus* Association	102	9	78%
1300	Northern American Temperate Riparian Woodlands & Forests Mapping Unit	188	15	96%
2120	*Quercus wislizeni* Alliance	278	3	78%
2121	*Quercus wislizeni - (Quercus douglasii) - Pinus sabinana* Mapping Unit	113	12	83%
2122	*Quercus wislizeni - (Quercus douglasii) / Aesculus californica* Association	376	11	85%
2123	*Quercus wislizeni - Quercus douglasii* Super Alliance	1337	28	75%
2211	*Quercus douglasii* / Annual - Perennial Herbaceous Mapping Unit	4303	20	88%
2212	*Quercus douglasii - Pinus sabiniana* / Herbaceous Association	220	15	78%
2213	*Quercus douglasii / Juniperus californica / (Ceanothus cuneatus)* Association	184	10	90%
2214	*Quercus douglasii - Aesculus californica* / Herbaceous Association	71	5	100%
2215	*Quercus douglasii / Ceanothus cuneatus* / Herbaceous Association	1420	10	93%
2220	*Aesculus californica* Alliance	25	2	83%
2240	*Quercus kelloggii* Alliance	133	15	87%
2241	*Quercus kelloggii - Pinus ponderosa* Association	15	8	96%
3101	Northern Mixed Mesic Chaparral Mapping Unit	508	14	76%
3102	Mixed Scrub Oak Chaparral Super Alliance	76	8	100%
3130	*Ceanothus cuneatus* Alliance	46	5	73%
3132	*Ceanothus cuneatus* / Herbaceous Association	1182	10	77%
3510	*Quercus garryana* Shrub Alliance	33	11	88%
4201	Seasonally Flooded Wetland Herbaceous Mapping Unit	111	10	100%
4310	California Annual or Perennial Grassland	4552	57	91%

Table 3. The Average Accuracy for Lassen Foothills Map Canopy Cover Estimates

AIS Conifer Cover Class	Average of AA Scores	AA Score
25-40%	3.50	70%
10-25%	4.21	84%
2-10%	4.53	91%
<2%	4.89	98%
95%	Average Total Accuracy	

AIS Hdwd Cover Class	Average of AA Scores	AA Score
>60%	3.59	72%
40-40%	3.74	75%
25-40%	3.93	79%
10-25%	4.33	87%
2-10%	4.48	90%
<2%	4.84	97%
83%	Average Total Accuracy	

References

Klein, A., J. Crawford, J. Evens, T. Keeler-Wolf, and D. Hickson. 2007. Classification of the vegetation alliances and associations of the northern Sierra Nevada Foothills, California. Report prepared for California Department of Fish and Game. California Native Plant Society, Sacramento, CA.

APPENDIX A.

PHOTO INTERPRETIVE AND MAPPING GUIDELINES FOR THE LASSEN FOOTHILLS MAPPING AREA

Prepared for the California Native Plant Society

By

Aerial Information Systems

Summary

In 2007, Aerial Information Systems, Inc. (AIS) was contracted by the California Native Plant Society (CNPS) to produce a vegetation map for approximately 100,000 acres of foothill and valley fringe Lassen Foothills regions west of Lassen National Park. Included within the mapping area are the Dye Creek Preserve and Tehama Wildlife Area, in addition to the Denny Ranch property in the northwestern portion of the study. The final products will assist agencies and other interested organizations in fire modeling, resource protection, and restoration efforts. The Nature Conservancy (TNC) will use the map to help predict changes in vegetation resulting from variations in the frequency of fires as well as help land managers determine where prescribed fires will be of most benefit.

The study area covers a variety of habitats found in the lower elevations of the southern Cascade Range foothills including blue and interior oak woodlands, valley oak riparian forests and several chaparral communities. The vegetation of the region was defined by using existing CNPS survey data and by CNPS collecting additional field surveys (with an additional 180 reconnaissance surveys performed by AIS) for help in photo signature training. This information supports a vegetation mapping classification at units which are discernable using 1-meter imagery.

Timeline and Summary of the Lassen Foothills Mapping Effort

- June 2007 – Contract begins on Lassen Foothills
- June 2007 – AIS review of existing imagery & ancillary data
- June 2007 – Initial 4-day field reconnaissance
- July 2007 – Initial photo interpretation and signature-environmental correlations begin
- September 2007 – First module delivered to CNPS – Initial linework and labels for 19,000 acres in the southwestern portion of the study area
- November 2007 – Second delivery of initial linework & labels for 90% of the study area
- December 2007 – Final Delivery (Pre-Accuracy Assessment) of Lassen Database
- January 2008 – Lassen Foothills AA Review
- January 2008 – Final Delivery of Lassen Foothills Database based on AA review and updates

Vegetation Mapping Criteria & Methodologies

Vegetation mapping procedures include first conducting an initial field reconnaissance. This was a four-day effort and involved the AIS photo

interpreters along with CNPS and local field botanists and ecologists. Approximately 180 GPS points were taken over most of the study area capturing the major floristic variability within the property. The following is a list of primary goals required by a field reconnaissance:

- Establish relationships between plant communities and bio-physical attributes.
- Acquire point data for as many variations in stand characteristics to later correlate to an image or photo signature.
- Acquire ground photos and descriptions of stands to correlate to digital imagery

Using these points, air photo signatures (color-tone-texture combinations that the photo interpreter views on the hard copy or digital photo) were then correlated to their corresponding plant communities or plant species viewed in the field. CNPS vegetation ecologists and AIS photo interpreters evaluated these correlations between the vegetation units and photo signatures and refined them to ensure that the map would be useful at a resolution needed to meet CNPS standards.

A preliminary mapping classification was then developed using information derived from the field reconnaissance and existing field plot data along with a preliminary CNPS floristic classifications developed for the Sierra foothills.

The vegetation units were then interpreted across the entire study area using heads-up digitizing techniques through custom ArcMap tools that AIS has developed for the various vegetation mapping projects conducted throughout the state. As a general rule, common and widespread vegetation units were delineated down to a minimum mapping unit (MMU) of approximately ½ hectare. Small wetlands were delineated in many incidences below the MMU. The ½ hectare MMU applied for all floristic and structural breaks as required by the contract.

Two sets of digital imagery were used in aiding the photo interpreter in delineating and labeling the mapping units:

- 1-Meter Natural Color – Summer 2005 from the National Agricultural Inventory Program (NAIP) (Base for mapped polygons)
- Imagery from the Google-maps software built into to the AIS project

The one-meter natural color was used as base-line imagery for the mapped polygons. Photo interpreters also had a contour layer to help in determining the terrain related features of the stand being mapped. These included slope steepness, position, direction and shape.

The following is a list of supplemental data AIS used in addition to the imagery in helping to determine the final floristic call:

- CNPS Rapid Assessment Plot Data
- CNPS Reconnaissance Plot Data – June 2007
- CNPS Waypoint Data
- Hydrological Layer
- Local Roads Layer
- Vehicle Trails Layer
- Administrative and study area boundary Layers
- DRG's depicting the USGS 7.5' Topographic quads in the study

Vegetation Density and Floristic Assignments

Densities were mapped for each vegetation layer that exists in the stand. Vegetation densities can be assigned for up to four layers of vegetation (conifer, broadleaf, shrub and herbaceous layers). Alliances are normally defined by the dominant overstory vegetation layer if that layer contains at least 8-10% cover. For example; stands of blue oak with 28% tree cover over an understory shrub layer of wedge-leaf ceanothus containing 5% cover would be assigned to an association within the blue oak alliance. This example stand will have a vegetation density assignment of 3 in the hardwood field (25-40%) and a density assignment of 5 in the shrub field (2-10%). All density values are measured in absolute cover, not relative cover. Stands of foothill pine with ~5% cover over dense ceanothus shrubland will be assigned to the *Ceanothus cuneatus* alliance and will receive a density category of 5 (2-10%) in the conifer layer and a density category of 1 (>60%) in the hardwood category. This way, sparse emergent stands of foothill pine (or ponderosa pine in the eastern portions of the study area) can be accounted for without assigning it to a conifer type when there is a strong dominance of hardwood or shrubs in the non-emergent canopy. Detailed descriptions of the mapping units are included in the following section of this report.

Mapping Descriptions

For each mapping unit described below, the following set of descriptions will be addressed:

Mapping Descriptions: These were ascertained by photo interpreters in their mapping and reconnaissance effort along with discussions involving CNPS field ecologists. The map units attempt to correlate to defined Alliances and Associations when possible as described by a CNPS Sierra Nevada Foothills Vegetation Classification. However, some map units may not exactly correlate due

to imagery limitations. The following examples represent possible correlations of the mapping classification to the floristic classification:

- Mapping Unit consists of dominant species occupying different levels in the classification higher than the alliance level. Example: 4201 – Seasonally to Intermittently Flooded Seeps & Meadows Mapping Unit
- Mapping unit consists of dominant species from two or more alliances in the classification within the same formation level. Example: 3101 – Northern Mixed Mesic Chaparral Mapping Unit
- Mapping unit = Alliance
- Mapping unit consists of two or more associations or potential associations within one or more alliances. Example: 2212 – Quercus douglasii – Pinus sabiniana Mapping Unit
- Mapping unit = Association

Environmental & Geographic Settings: Information in this section describes the local environmental conditions and broader geographic range in which photo interpreters mapped the floristic types. Most environmental descriptions are based on slope or terrain related features such as steepness, aspect and direction.

PI Notations: These notations may be useful for other photo interpreters who are mapping adjacent areas or in future mapping efforts in the same area. This section includes descriptions of the difficulties photo interpreters came across in mapping a particular map unit.

Forests & Woodlands:

1210 – *Pinus sabiniana* Alliance

WHR – Blue Oak Woodland
NDDB – Cismontane Woodland

Mapping Description: Mapped where foothill pine *(Pinus sabiniana)* strongly dominates the tree layer, or at greater than 8-10% absolute cover while emergent to a shrub understory. Oaks generally make up less than 20% relative cover in the tree layer. When oaks make up a higher cover, the PI mapped to one of the mixed pine-oak types, either in the blue oak *(Quercus douglasii)* or interior oak *(Quercus wislizeni)* alliances.

Environmental & Geographic Settings: Photo interpreters did not establish any strong correlates between slope related features and the occurrence of this alliance. However, it was generally mapped well above the lower elevation fringes of blue oak occurrence however.

PI Notations: Rarely mapped to an alliance level, usually wedge-leaf ceanothus was the most common understory shrub - where it was mapped to that association. Pine signatures were uniform throughout the mapping area; determining cover was at times difficult in sparse settings.

1211 – *Pinus sabiniana* / *Ceanothus cuneatus* Association

WHR – Blue Oak Woodland
NDDB – Cismontane Woodland

Mapping Description: Mapped where foothill pine *(Pinus sabiniana)* is sole dominant in the tree layer or as a sparse overstory (generally 8-25% cover) to a sparse to occasionally dense chaparral understory composed primarily of wedge-leaf ceanothus *(Ceanothus cuneatus)*. Other shrubs can locally dominate the understory. Mapped where foothill pine contains at least 8% emergent cover to the chaparral understory.

Environmental & Geographic Settings: Photo interpreters did not establish any strong correlation between terrain features or soil conditions to the presence of foothill pine as an emergent to chaparral. Generally mapped well above the lower elevation fringes of blue oak *(Quercus douglasii)* occurrence, often on drier slopes adjacent to stands of northern mixed mesic chaparral (See descriptions for that type on page 17)

PI Notations: Mapped frequently, signature correlates were strongly established for foothill pine with a shrub understory. However, determining the species of understory dominant shrubs at times proved difficult.

1220 – *Juniperus californica* Alliance

WHR – Juniper
NDDB – Pinyon & Juniper Woodland

Mapping Description: This alliance was mapped when California juniper *(Juniperus californica)* was strongly dominant in either the tall shrub or tree layer. Hardwoods make up less than 50% of the relative cover in the tree canopy. Blue oak *(Quercus douglasii)* often make up a small portion of the tree layer. Overall tree cover varies from extremely to moderately sparse, rarely reaching over 25% cover. Understory is often grassy but wedge-leaf ceanothus *(Ceanothus cuneatus)* can be a sparse shrub understory component.

Environmental & Geographic Settings: Mapped in the lower fringes of the blue oak zone, often in dry rocky ravines (correlated with the input of CNPS field ecologists) and adjacent slopes; often adjacent to blue oak grassland communities.

PI Notations: Since California juniper occurs in such sparse settings, PI's found it fairly difficult to ascertain a definitive signature to individual trees. Denser stands did show up greener than the adjacent blue oaks. At times it may have been confused with interior oak *(Quercus wislizeni)* in steeper settings.

1300 – Northern American Temperate Riparian Woodlands & Forests Mapping Unit

WHR – Valley Foothill Riparian
NDDB – Valley Oak Woodlands (In part), Riparian Forests (In Part)

Mapping Descriptions: Mapped where a wide variety of riparian species mix (often as many as five species in a stand). Valley oak *(Quercus lobata)*, Oregon ash *(Fraxinus latifolia),* Fremont cottonwood *(Populus fremontii),* red willow *(Salix laevigata),* California sycamore *(Platanus racemosa)* and/or white alder *(Alnus rhombifolia)* may locally dominate over small areas; however several species usually share dominance over much of the riparian system.

Environmental & Geographic Settings: Mapped adjacent to large perennial river systems including Dye, Salt, Meeker, Antelope and Little Antelope Creeks, among others throughout the study region on temporarily flooded riverine flats and islands.

PI Notations: Photo signature varies widely depending on species composition; areas where signature appears uniform over large areas have been mapped to finer levels in the classification for the most part. Signatures best established for valley oak and white alder.

1320 – *Populus fremontii* Alliance

1321 – *Populus fremontii – Salix laevigata Association*

1330 – *Salix laevigata* Alliance

Note: Polygons delineated to this level in the classification are mapped to a field labeled riparian sub-code; PI code retains the 1300 identity.

WHR – Valley Foothill Riparian
NDDB – Riparian Forests

Mapping Descriptions: Mapped sparingly in small patches where either Fremont cottonwood *(Populus fremontii)* or red willow *(Salix laevigata)* dominate or they share dominance in the riparian canopy. Stands are usually in a forest or dense woodland settings greater than 60% cover. Understory species of shrub willow or wild rose (*Rosa spp.)* were noted in field reconnaissance.

Environmental & Geographic Settings: Mapped sparingly adjacent to the lower elevation slower moving channels in the western third of the Lassen Foothills mapping area. Fremont cottonwoods noted individually on drier floodplains farther away from the active channel.

PI Notations: Signatures for both species were hard to ascertain as continuous stands were infrequent in the mapping area. Larger individual cottonwood trees appeared a bit more blue-green than other riparian species.

1340 – *Alnus rhombifolia* Alliance

WHR – Valley Foothill Riparian
NDDB – Riparian Forests

Note: Polygons delineated to this level in the classification are mapped to a field labeled riparian sub-code; PI code retains the 1300 identity.

Mapping Descriptions: Mapped sparingly where white alder *(Alnus rhombifolia)* dominates the riparian canopy in forest settings, generally with more than 60% cover. Other species such as big leaf maple (*Acer macrophyllum)* and canyon oak (in drier settings) may be a minor component to the canopy.

Environmental & Geographic Settings: Mapped along fast moving perennial streams and larger riparian systems as narrow bands immediately adjacent to the active channel generally in the eastern two thirds of the mapping area.

PI Notations: White alder signatures are best defined by the regular appearing crown in narrow repetitive bands adjacent to water. Generally this occurs over very small areas, often below ½ hectare.

1411- *Umbellaria californica – Quercus wislizeni* Mapping Unit

WHR – Montane Hardwood
NDDB – Broadleaf Upland Forests

Mapping Descriptions: Mapped where California bay *(Umbellaria californica)* dominates or is an important subordinate to interior live oak *(Quercus wislizeni)* in the canopy. Stands are generally dense, usually over 70% cover.

Environmental & Geographic Settings: Mapped on moderate to steep north trending slopes on variable settings from neutral to convex, usually below cliff faces creating a locally mesic environment. Sixteen polygons mapped to this type.

PI Notations: Polygons reduced from original map based on plot data and trends established by CNPS field crews. This type is extremely difficult to map due to the rare dominance of California bay in the study area, it is usually a minor component to the hardwood canopy.

1420 – *Quercus chrysolepis* Alliance

WHR – Montane Hardwood
NDDB – Canyon Oak Forest

Mapping Descriptions: Mapped where canyon Oak *(Quercus chrysolepis)* dominates the hardwood canopy in dense woodland to forest settings; generally over 60% cover. Other hardwoods species such as valley oak *(Quercus lobata)* or interior live oak *(Quercus wislizeni)* may be in the canopy; emergent foothill pine or ponderosa pine also may be present.

Environmental & Geographic Settings: Mapped in steep canyons and occasionally adjacent to major riparian systems just upslope from white alder stands.

PI Notations: An uncommon type within the study, photo interpretation often confused canyon oak with both interior and black oak, as noted by CNPS field crews. Signature varied considerably depending on the crown “flushness” and topographical setting.

2120 – *Quercus wislizeni* Alliance

WHR – Montane Hardwood, Blue Oak - Foothill Pine
NDDB – Cismontane Woodland

Mapping Descriptions: Mapped in both shrub and tree settings where interior live oak *(Quercus wislizeni)* dominates (and is often a strong dominant of 80-90% relative cover) in either layer. In shrub settings, often grades into a northern mixed chaparral containing several chaparral species. In woodland settings, often occurs with blue oak *(Quercus douglasii).* Cover is highly variable in both forms from sparse to dense. Mapped to the alliance level infrequently, usually in shrub like

settings where photo interpreters cannot distinguish to a finer level in the classification.

Environmental & Geographic Settings: Noted in higher elevation areas than pure stands of blue oak; often in steeper more protected or rockier environments. Also mapped strongly dominant interior live oak in narrow bands of mesic settings, usually on steep north-facing aspects or mid to upper slopes above major riparian systems throughout the mapping area.

PI Notations: Can be confused with California juniper in drier settings, and with blue oak where the two mix. In higher elevations, this map unit can be confused with canyon oak signatures. In higher elevation scrub oak settings, it is generally indistinguishable from Brewer's oak *(Quercus garryana var. fruticosa)* and scrub oak (*Quercus berberidifolia)*. Strongly dominant stands tend to have a uniform medium to dark green signature that helped keys photo interpreters to this type. It is difficult to determine blue oak presence in drier settings.

2121 – *Quercus wislizeni – (Quercus douglasii) - Pinus sabiniana* Mapping Unit

WHR – Montane Hardwood, Blue Oak - Foothill Pine
NDDB – Cismontane Woodland

Mapping Descriptions: Mapped in a mixed conifer and hardwood setting where interior live oak *(Quercus wislizeni)* generally dominates with a sparse to moderate emergent overstory of foothill pine *(Pinus sabiniana)*. Canopy cover varies from sparse to over 60% cover at times. Chaparral species are usually present in the understory in varying cover. Blue oak *(Quercus douglasii)* occasionally shares dominance with interior live oak.

Environmental & Geographic Settings: Noted in more mesic settings in somewhat steeper areas than mixed pine and blue oak.

PI Notations: Usually has more of a shrub understory than mixed foothill pine and blue oak and overall has a higher vegetation cover. Interior live oak in the stand is often mixed as both shrubs and trees.

2122 – *Quercus wislizeni – (Quercus douglasii) – Aesculus californica* Mapping Unit

WHR – Montane Hardwood, Blue Oak - Foothill Pine
NDDB – Cismontane Woodland

Mapping Descriptions: Mapped in a mixed conifer and hardwood setting where interior live oak *(Quercus wislizeni)* dominates with California buckeye *(Aesculus californica)* a minor component to the hardwood layer. Blue oak *(Quercus douglasii)* at times is present in the hardwood canopy. Overall tree cover is usually quite dense, often over 60%. Chaparral can be present in the understory along with a sparse cover of emergent foothill pine.

Environmental & Geographic Settings: Mapped in steeper and at times rockier settings than types 2121 or the blue oak types. Aspects vary from north trending to southerly but are more common on north trending slopes.

PI Notations: Photo interpreters mapped to this type when the presence of buckeye (showing up a bright yellow-green) in observed in the stand. At times appears to transition to a northern mixed mesic chaparral community.

2123 – *Quercus wislizeni – Quercus douglasii* Super Alliance

WHR – Montane Hardwood, Blue Oak - Foothill Pine
NDDB – Cismontane Woodland

Mapping Descriptions: Mapped where both interior live oak *(Quercus wislizeni)* and *(Q. douglasii)* is present in a sparse to moderate cover usually over a grassy understory. Either species can dominate but both are present over most of the stand with at least 20% relative cover of both species.

Environmental & Geographic Settings: Mapped in generally a more open setting than pure interior live oak types, often on gentler terrain.

PI Notations: Very commonly mapped type, PI signature varies considerably depending on hardwood cover dominance. Can occur as narrow dense bands of vegetation in dry settings adjacent to pure blue oak; in these stands, interior live oak dominates but blue oak is a significant component to the hardwood canopy.

2210 – *Quercus douglasii* Alliance

WHR – Blue Oak Woodland, Blue Oak - Foothill Pine
NDDB – Cismontane Woodland

Mapping Descriptions: Generally mapped below the alliance level.

2211 – *Quercus douglasii* / Annual - Perennial Herbaceous Mapping Unit

WHR – Blue Oak Woodland
NDDB – Cismontane Woodland

Mapping Descriptions: Mapped where blue oak *(Quercus douglasii)* strongly dominates the canopy in sparse to moderately dense cover. Most stands however are below 40% total canopy cover. Understory grasses are always present in varying cover depending on soil depth and presence of volcanic rock. Some shrubs (under 5% cover) can be present in the stand but not regularly occurring throughout.

Environmental & Geographic Settings: Mapped extensively, especially in the western two thirds of the study area on gentle to moderately sloping terrain of varying aspects.

PI Notations: Can be confused with sparse blue oak & juniper where juniper is a minor component to an already sparse canopy.

2212 – *Quercus douglasii – Pinus sabiniana* Mapping Unit

WHR – Blue Oak - Foothill Pine
NDDB – Cismontane Woodland

Mapping Descriptions: Mapped where foothill pine *(Pinus sabiniana)* is a sparse emergent over a sparse to moderately dense cover of blue oak *(Quercus douglasii)*, generally in a grassy setting. Shrub understory is generally sparse or absent.

Environmental & Geographic Settings: Mapped in areas similar to blue oak stands without pine, except not in the lowest elevations of the blue oak zone. Photo interpreters have not derived any strong correlations to the presence of foothill pine in blue or interior oak woodland.

PI Notations: PI's mapped to this type when emergent pine was sparse but throughout most of the stand (not localized in a small portion of the polygon).

2213 – *Quercus douglasii / Juniperus californica – (Ceanothus cuneatus)* Mapping Unit

WHR – Blue Oak Woodland, Blue Oak - Foothill Pine
NDDB – Cismontane Woodland

Mapping Descriptions: Mapped where either blue oak *(Quercus douglasii)* or California juniper *(Juniperus californica)* dominate the tree layer in very sparse to

sparse settings usually under 20% cover. Wedge-leaf ceanothus *(Ceanothus cuneatus)* is usually a sparse component to the shrub layer. Understory grasses are similar in density to other blue oak types.

Environmental & Geographic Settings: Mapped in very dry settings; usually on the side slopes of small rocky streambeds in the low foothills just within the low-elevation occurrence of blue oak.

PI Notations: Mapped by photo interpreters when they can confidently observe juniper in the stand. Juniper can be very difficult to separate out from blue oak in extremely sparse conditions and determining relative cover is questionable under these circumstances.

2214 – *Quercus douglasii – Aesculus californica* / Herbaceous Association

WHR – Blue Oak Woodland, Blue Oak - Foothill Pine
NDDB – Cismontane Woodland

Mapping Descriptions: Mapped where blue oak *(Quercus douglasii)* is a strong dominant to California buckeye *(Aesculus californica)* in a moderately dense to dense woodland setting over a grassy understory.

Environmental & Geographic Settings: Mapped in small stands by photo interpreters primarily in dense blue oak woodland on moderate to steep upper north trending slopes.

PI Notations: Mapped by photo interpreters when a presence of buckeye is regularly occurring throughout the stand. Buckeye is usually noticeable in this season during drought onset conditions when the leaves are turning color.

2215 – *Quercus douglasii / Ceanothus cuneatus* / Herbaceous Association

WHR – Blue Oak Woodland
NDDB – Cismontane Woodland

Mapping Descriptions: Mapped where blue oak *(Quercus douglasii)* dominates the tree layer in generally sparse settings over a sparse to relatively dense understory shrub layer of wedge-leaf ceanothus *(Ceanothus cuneatus).* Understory herbaceous layer varies in density but is similar to other blue oak types. Other shrubs may be present in the understory in addition to wedge-leaf ceanothus.

Environmental & Geographic Settings: Mapped in extremely dry settings often adjacent to blue oak grasslands. Photo interpreters have not established any

strong terrain or soil correlations to the presence or absence of shrubs but believe it may be related to previous fire occurrence. Extensive blue oak type; mapped to the association level based on previous mapping efforts in foothill communities.

PI Notations: Photo interpreters mapped to this type when they saw sparse shrubs occurring regularly throughout most of the stand. Extremely sparse shrub understory layers are difficult to determine from blue oak grassland types.

2216 – *Quercus douglasii* / *Arctostapylos manzanita* / Herbaceous Association

WHR – Blue Oak Woodland
NDDB – Cismontane Woodland

Mapping Descriptions: Mapped where blue oak *(Quercus douglasii)* dominates the tree layer in sparse to moderate cover over a sparse understory cover of common manzanita *(Arctostaphylos manzanita)*.

Environmental & Geographic Settings: Mapped in the mid to higher elevation zone of blue oak types.

PI Notations: This is an extremely difficult type to map (low confidence). Manzanita in the stand is generally not dense enough to be recognizable by photo interpreters, and no strong environmental correlations were found.

2220 – *Aesculus californica* Alliance

WHR – Blue Oak Woodland
NDDB – Broadleaf Upland Forest

Mapping Descriptions: Mapped where California buckeye *(Aesculus californica)* dominates the tall shrub or small tree canopy in dense to sparse settings; often with a small component of other shrubs.

Environmental & Geographic Settings: Mapped in very steep and rocky settings; stands are usually fairly small size.

PI Notations: Infrequently mapped, buckeye is usually a component of blue oak woodlands or northern mixed mesic chaparral types.

2231 – *Quercus lobata* / Herbaceous Association

WHR – Valley Oak Forest, Valley Foothill Riparian
NDDB – Cismontane Woodland

Note: Polygons delineated to this level in the classification are mapped to a field labeled riparian sub-code; PI code retains the 1300 identity.

Mapping Descriptions: Mapped where valley oak *(Quercus lobata)* dominates the stand in a sparse to dense woodland setting over a grassy understory.

Environmental & Geographic Settings: Mapped only in several occasions where stands are clearly not adjacent or part of the riparian corridor.

2232 – *Quercus lobata* Riparian Mapping Unit

WHR – Valley Oak Forest, Valley Foothill Riparian
NDDB – Riparian Forest

Note: Polygons delineated to this level in the classification are mapped to a field labeled riparian sub-code; PI code retains the 1300 identity.

Mapping Descriptions: Mapped where valley oak *(Quercus lobata)* dominates the riparian stand, usually with other species such as *Fraxinus latifolia* or *Alnus rhombifolia*.

Environmental & Geographic Settings: Mapped along broad riparian floodplains, often along major perennial rivers.

PI Notations: Mapped only where photo interpreters can see significant areas where valley oak dominates. Usually, major riparian corridors could not be split out to different associations because of the amount of species diversity over small areas and therefore most stands are mapped to type 1300.

2240 – *Quercus kelloggii* Alliance

WHR – Montane Hardwood or Hardwood - Conifer
NDDB – Cismontane Woodland

Mapping Descriptions: Mapped where black oak *(Quercus kelloggii)* dominates the stand in moderately dense to dense woodland settings. Stands are limited and generally small. Blue oak *(Quercus douglasii)* can at times be present in the stand.

Understory shrubs may consist of Oregon oak *(Quercus garryana)* and often fringe the stand.

Environmental & Geographic Settings: Mapped only in the highest elevations of the study on gentle to level terrain.

PI Notations: At times may be confused with higher elevation blue oak types which can yield a similar signature.

2241 – *Quercus kelloggii – Pinus ponderosa* Association

WHR – Montane Hardwood or Hardwood- Conifer
NDDB – Lower Montane Coniferous Forest

Mapping Descriptions: Mapped where either ponderosa pine *(Pinus ponderosa)* or black oak *(Quercus kelloggii)* co-dominate the stand, generally in a woodland to dense woodland setting.

Environmental & Geographic Settings: Mapped in the northeastern portions of the study area, above 2200' on gentle to moderately sloping terrain.

PI Notations: Stands are generally small and limited to the highest elevations in the mapping area. *Note – all *Pinus ponderosa* were moved to the black oak alliance – Code updated to 2241 after AA analysis.

Shrublands:

3101 – Northern Mixed Mesic Chaparral Mapping Unit

WHR – Mixed Chaparral
NDDB – Chaparral

Mapping Descriptions: Mapped where any number of chaparral species including scrubby interior scrub oak *(Quercus wislizeni),* birch leaf mountain mahogany *(Cercocarpus betuloides)*, Silk tassel *(Fremontodendron californicum)*, chaparral ash *(Fraxinus dipetala)* or wedge-leaf ceanothus *(Ceanothus cuneatus)* can locally dominate a mixed community of dense chaparral. Foothill pine *(Pinus sabiniana)* may occur as a sparse emergent (generally below 8% cover) to the chaparral understory. In extremely disturbed settings (post fire), shrub canopy cover can be relatively sparse. Normally, most stands contain at least three or four species of shrubs, any of which may locally dominate.

Environmental & Geographic Settings: Mapped generally on mid to upper north trending aspects in fairly steep settings. Often noted in post fire settings where the crown cover and size is highly variable.

PI Notations: Mapped where photo interpreters see a high degree of variability in the signature over small areas. This type can often be confused with dense shrubby stands of pure or near pure interior live oak or mixed scrub oak at higher elevations in the mapping area.

3102 – Mixed Scrub Oak Chaparral Super Alliance

WHR – Mixed Chaparral
NDDB – Chaparral

Mapping Descriptions: Mapped where either scrub oak *(Quercus berberidifolia)* or brewer oak *(Quercus garryana* var*. fruticosa)* dominate or share dominance in the stand. Other chaparral species such as wedge-leaf ceanothus *(Ceanothus cuneatus)* may be present in the stand. Emergent foothill pine *(Pinus sabiniana)* may be a sparse emergent to the shrub canopy but is generally under 8% cover. Stands generally have a dense shrub cover except in recently disturbed settings.

Environmental & Geographic Settings: Noted on gentle to moderate slopes on the higher elevations of the mapping area.

PI Notations: Photo interpreters created this mapping unit for areas where it is not possible to reliably distinguish the three scrub oak species using the 1-meter NAIP imagery.

3130 – *Ceanothus cuneatus* Alliance

WHR – Mixed Chaparral
NDDB – Chaparral

Mapping Descriptions: Generally mapped to finer levels in the classification (unless mixed with other chaparral species where it is then mapped to an alliance level).

3131 – *Ceanothus cuneatus – Eriodictyon californicum* Mapping Unit

WHR – Mixed Chaparral
NDDB – Chaparral

Mapping Descriptions: Mapped where both wedge-leaf ceanothus *(Ceanothus cuneatus)* and Yerba Santa *(Eriodictyon californicum)* occur in a sparse to moderately dense shrub layer, generally with a significant grassy understory. Either species can locally dominate.

Environmental & Geographic Settings: Generally noted on gentle upper slopes, spurs and ridgelines in post disturbance settings.

PI Notations: Photo interpreters mapped this type generally as small patches not much larger than ½ hectare in size. Difficult to distinguish from highly disturbed northern mixed mesic chaparral stands.

3132 – *Ceanothus cuneatus* / Herbaceous Association

WHR – Mixed Chaparral
NDDB – Chaparral

Mapping Descriptions: Mapped where wedge-leaf ceanothus dominates the shrub layer in sparse to dense settings. Other chaparral species can be found in the stand in addition to trace amounts (less than 5%) of foothill pine irregularly distributed throughout the mapped polygon.

Environmental & Geographic Settings: Mapped on xeric trending slopes; possibly associated with variable post fire disturbance history.

PI Notations: Photo interpreters mapped extremely sparse stands of shrubs (below 5-8%) into a grassland community with a shrub component as a density modifier.

3402 – Mixed Shrub Willow Thicket Mapping Unit

WHR – Valley Foothill Riparian
NDDB – Riparian Scrub

Mapping Descriptions: Mapped where any number of true shrub willows such as narrowleaf willow *(Salix exigua)* or tree willows in shrubby form dominate the riparian canopy. Other young tree species such as Fremont Cottonwood *(Populus fremontii)* can be present in the canopy. Also mapped where any three species of brambles, wild grape *(Vitas spp.),* blackberry *(Rubus spp.)* or California Wild Rose *(Rosa californica)* share dominance or is a sole dominant to the shrub layer, usually in dense cover.

Environmental & Geographic Settings: Mapped where photo interpreters see predominantly shrub stature plants in riparian areas trending towards the stream edge (wetter areas) of the riparian system, or along the drier fringes of major riparian zones in the lowest elevations of the mapping area, often adjacent to type 1301.

PI Notations: Photo interpreters use this mapping unit for willows and young riparian species that are indistinguishable on the 1-meter NAIP imagery. Stands are extremely narrow and often adjacent to water. Includes extremely small stands of Vitis-Rubus-Rose.

3510 – *Quercus garryana* Shrub Alliance

WHR – Mixed Chaparral, Montane Chaparral
NDDB – Chaparral

Mapping Descriptions: Mapped where brewer oak *(Quercus garryana* var. *fruticosa)* dominates the shrub layer in dense stands, often adjacent to black oak *(Quercus kelloggii)* woodlands.

Environmental & Geographic Settings: Mapped in the higher elevations of the mapping area (exclusively in the northeast portions) on nearly level to gently sloping terrain.

PI Notations: Photo interpreters have distinguished this scrub oak species by its overall greener signature and its proximity to black oak woodlands. Overall, it is a difficult type to map, especially adjacent to mixed scrub oak types.

Herbaceous:

4101 – Bulrush – Cattail Marsh Mapping Unit

WHR – Freshwater Emergent Wetland
NDDB - Marsh

Mapping Descriptions: Mapped where either species dominate or share dominance in the freshwater marsh.

Environmental & Geographic Settings: Mapped in extremely small patches along the fringes of small lakes and along some canals.

4201 – Seasonally Flooded Wetland Herbaceous Mapping Unit

WHR – Wet Meadow
NDDB – Meadows & Seeps

Mapping Descriptions: Mapped where wetland grasses and or forbs dominate the herbaceous layer in intermittently to seasonally flooded, or saturated conditions. Stand sizes are often well below the ½ hectare minimum mapping unit (exceptions to the MMU include wetland features detectable by photo interpreters).

4202 – Vernal Pool Mapping Unit

WHR – Annual Grassland
NDDB – Vernal Pool

Mapping Descriptions: Mapped only in several locations and not with high confidence at this time. Most examples were not detectable on the imagery or were extremely small. Additional AA surveys may help in correlating signatures.

PI Notations: Stands containing tidy tips *(Layia spp.)* are generally not separable on the NAIP imagery unless co-occurring with a minor presence of sedges or rushes. Most of these small patches are probably inclusions in type 4310.

4310 – California Annual or Perennial Grassland Mapping Unit

WHR – Annual Grassland, Perennial Grassland
NDDB – Valley & Foothill Grasslands

Mapping Descriptions: Mapped where annual grasses dominate the herbaceous layer; forbs may locally dominate over small areas. Woody vegetation (trees and or shrubs) are generally under 5-8% cover. Perennial grasses and forbs can locally dominate the stand in a variety of settings.

9000 – Land Use – Sparsely- or Un-vegetated

9100 – Built Up
9200 - Agriculture
9300 – Restoration Sites *Note: Polygons delineated to this level in the classification are mapped to a field labeled riparian sub-code; PI code retains the 1300 identity.*
9400 Sparsely Vegetated or Unvegetated Areas
9410 – Landslides
9420 – Cliffs – Rock Outcroppings – Steep Eroded Slopes

9430 – Streambeds & Flats
9500 – Water
9999 – Field Questions or Unknown

Cover Class Density Values in Map

Cover class categories for Conifers, Hardwoods and Shrubs (Attributes in the vegetation map):

1 = >60%
2 = 40-60%
3 = 25-40%
4 = 10-25%
5 = 2-10%
9 = Cover Class Density Less than 2%

Herbaceous Categories Density Values (Attributes found in the vegetation map):

1 = >60%
2 = 40-60%
3 = Under 40% Cover
9 = Cover Class Density Not Known (Higher stature canopies often hide herbaceous understory)

Other Metadata for Map

Minimum Mapping Unit (MMU): Standard unit of approximately ½ hectare in the vegetation map; Wetland types map below MMU when visible on the imagery.

Riparian Sub-class Field: Created for riparian calls that PI's feel confident they can map to finer levels than the 1300 category. The 1300 category is retained in the field labeled PI.

Appendix B.

Accuracy Assessment Sampling Plan for
Lassen Foothills Vegetation Mapping Project
(October 31, 2007)

Introduction
This sampling plan clarifies the accuracy assessment objectives for the Lassen Foothills vegetation mapping project. It defines the protocol, sampling level, and sample size in order to provide the most efficient conduct of fieldwork. This protocol feeds into the design of the accuracy assessment, which will measure the truth of the sampling units selected to a level of 80%.

Description of area to be assessed:
The study area encompasses approximately 108,400 acres in eastern Tehama County, covering three large parcels including South Denny Ranch, Tehama Wildlife Area, and the Dye Creek Preserve. The Lassen foothills feature a biologically diverse array of blue oak woodlands, foothill chaparral, grasslands and vernal pools.

Objectives of assessment:
CNPS will independently assess the accuracy of a polygon-based alliance and association level vegetation classification map produced by AIS photo interpreters, through a two-stage field sampling method. The sample accuracy goal is to reach a confidence level of 80% or greater.

Sampling plan:

The number of samples per association will vary according to the rarity of the vegetation type. Sample locations will first be spatially stratified within 11 modules provided by AIS. Polygons will be selected separately within each module using the following rules: if < 20 map units within module, then all are selected; if between 20 and 100 map units within module, then select 10 at random using the random number generator function in Microsoft Excel; if > 100 map units were mapped within a module, none were selected, as samples will likely be picked up during field visits. After all modules are received, all assigned map units will be combined and reassessed for selection. Polygons will be selected using a complete tally of all map units using the same selection rules as above. This protocol will result in a cost-effective and well-distributed sample.

Field crews will use Global Positioning Systems (GPS) to locate themselves within a selected sample polygon. Ground visits will be conducted by traversing enough of a sample polygon area to assess the composition and proportions of the map entities. Selected polygons will be sampled in one of three ways; Rapid Assessment, Long Reconnaissance form, or Short Reconnaissance form. The Rapid Assessment protocol is a concise methodology for collecting salient

vegetation and environmental features across an entire stand or polygon of vegetation (not just a confined plot boundary). Each assessment takes about 30 minutes to complete. The survey size varies depending on the size of the stand and the accessibility of the entire stand, and thus could be <1 acre or > 5 acres in size. The Reconnaissance forms are abbreviated for the quick confirmation of a vegetation type and collects minimal ecological information.

Excluded from the Accuracy Assessment are the categories of Built-up, Agriculture, and Water. Attributes collected at each sample point include at the minimum: Air photo # assigned by AIS, Date, Surveyor name, GPS unit, waypoint #, Distance/Bearing, photo number, size of stand, field alliance name, and comments. A vegetation classification produced through a previous CNPS Sierra Foothills project will be used to key out vegetation within the study area.

Data Analysis:

The results of the validation and assessment will take the form of an error analysis which reports mapping accuracy. A fuzzy logic approach will be employed. Fuzzy sets allowed for the recognition that plots did not always fit unambiguously into a single map class. For each polygon assessed, the vegetation attribute will be given a rating between absolutely wrong (1) and absolutely right (3). For canopy cover attributes, all estimated values will be given a rating between absolutely wrong (1) and absolutely right (5).

When the results of the map validation demonstrate that particular classes cannot meet an 80 percent class accuracy federal standard, three possible situations can arise:
(1) The accuracy for a particular class is less than 80 percent we determine that the documented level of error for that particular class is acceptable.
(2) The accuracy for a particular class is less than 80 percent and the error is not acceptable. Supplemental correlation to environmental variables and further analysis of the photo signature will be required to elevate the accuracy level up to the project standard.
(3) The accuracy for a particular class is less than 80 percent and the error is not acceptable. If supplemental correlation to environmental variables and further analysis of the photo signature does not enable a higher level of class accuracy, the type will be classified at a coarser level in the hierarchy to meet the class accuracy requirements[1].

Conclusion

This plan provides the protocol to assess the mapping accuracy of the Lassen Foothills vegetation mapping project.

References:

[1] Field Methods for Vegetation Mapping. 1994. USGS/Biological Resources Division, Center for Biological Informatics. Denver, Co. Accessed online in October, 2007 at USGS http://biology.usgs.gov/npsveg/fieldmethods/sect7.html.

Appendix C.

List of scientific names for species occurring in vegetation surveys of the Lassen Foothills study area. Botanical reference information is from Hickman (1993) and USDA (2004).

Code Species	Species Name	Family
ACLE8	Achnatherum lemmonii (Swallen) Barkworth	Poaceae
ACMA3	Acer macrophyllum Pursh	Aceraceae
ACMI2	Achillea millefolium L.	Asteraceae
ACMO2	Achyrachaena mollis Schauer	Asteraceae
ADJO	Adiantum jordanii C. Muell.	Pteridaceae
AECA	Aesculus californica (Spach) Nutt.	Hippocastanaceae
AETR	Aegilops triuncialis L.	Poaceae
AGGR	Agoseris grandiflora (Nutt.) Greene	Asteraceae
AGHE2	Agoseris heterophylla (Nutt.) Greene	Asteraceae
AGRE	Agoseris retrorsa (Benth.) Greene	Asteraceae
AICA	Aira caryophyllea L.	Poaceae
ALAM2	Allium amplectens Torr.	Liliaceae
ALGAE	Algae	
ALLIU	Allium L.	Liliaceae
ALRH2	Alnus rhombifolia Nutt.	Betulaceae
ALSA3	Alopecurus saccatus Vasey	Poaceae
AMAR2	Ambrosia artemisiifolia L.	Asteraceae
AMBL	Amaranthus blitoides S. Wats.	Amaranthaceae
AMME	Amsinckia menziesii (Lehm.) A. Nels. & J.F. Macbr.	Boraginaceae
AMMEI2	Amsinckia menziesii (Lehm.) A. Nels. & J.F. Macbr. var. intermedia (Fisch & C.A. Mey.) Ganders	Boraginaceae
AMSIN	Amsinckia Lehm.	Boraginaceae
ANAR	Anagallis arvensis L.	Primulaceae
ANCA14	Anthriscus caucalis Bieb.	Apiaceae
ANCO2	Anthemis cotula L.	Asteraceae
ANDRO2	Andropogon L.	Poaceae
ANVI2	Andropogon virginicus L.	Poaceae
APCA	Apocynum cannabinum L.	Apocynaceae
APOC	Aphanes occidentalis (Nutt.) Rydb.	Rosaceae
ARCA10	Aristolochia californica Torr.	Aristolochiaceae
ARDO3	Artemisia douglasiana Bess.	Asteraceae
ARMA	Arctostaphylos manzanita Parry	Ericaceae
ARVI4	Arctostaphylos viscida Parry	Ericaceae
ASCLE	Asclepias L.	Asclepiadaceae
ASFA	Asclepias fascicularis Dcne.	Asclepiadaceae
ASPA15	Astragalus pauperculus Greene	Fabaceae
ASSP	Asclepias speciosa Torr.	Asclepiadaceae

ASTEXX	Asteraceae	Asteraceae
AVBA	Avena barbata Pott ex Link	Poaceae
AVENA	Avena L.	Poaceae
AVFA	Avena fatua L.	Poaceae
BASA4	Baccharis salicifolia (Ruiz & Pavón) Pers.	Asteraceae
BEAQD	Berberis aquifolium Pursh var. dictyota (Jepson) Jepson	Berberidaceae
BIFR	Bidens frondosa L.	Asteraceae
BLNAN	Blennosperma nanum (Hook.) Blake var. nanum	Asteraceae
BRASXX	Brassicaceae	Brassicaceae
BRCA3	Brickellia californica (Torr. & Gray) Gray	Asteraceae
BRCA4	Brodiaea californica Lindl.	Liliaceae
BRCA5	Bromus carinatus Hook. & Arn.	Poaceae
BRCO3	Brodiaea coronaria (Salisb.) Engl.	Liliaceae
BRDI2	Brachypodium distachyon (L.) Beauv.	Poaceae
BRDI3	Brachypodium distachyon (L.) Beauv.	Poaceae
BRDI3	Bromus diandrus Roth	Poaceae
BREL	Brodiaea elegans Hoover	Liliaceae
BRELE	Brodiaea elegans Hoover ssp. elegans	Liliaceae
BRHO	Brodiaea howellii S. Wats.	Liliaceae
BRHO2	Bromus hordeaceus L.	Poaceae
BRLA3	Bromus laevipes Shear	Poaceae
BRMA3	Bromus madritensis L.	Poaceae
BRMAR	Bromus madritensis L. ssp. rubens (L.) Husnot	Poaceae
BRMI2	Briza minor L.	Poaceae
BRNI	Brassica nigra (L.) W.D.J. Koch	Brassicaceae
BRODI	Brodiaea Sm.	Liliaceae
BROMU	Bromus L.	Poaceae
BRST2	Bromus sterilis L.	Poaceae
BRTE	Bromus tectorum L.	Poaceae
CAAF	Castilleja affinis Hook. & Arn.	Scrophulariaceae
CAAT25	Castilleja attenuata (Gray) Chuang & Heckard	Scrophulariaceae
CABA4	Carex barbarae Dewey	Cyperaceae
CACI4	Calycadenia ciliosa Greene	Asteraceae
CADE27	Calocedrus decurrens (Torr.) Florin	Cupressaceae
CAFR	Calycadenia fremontii Gray	Asteraceae
CAFR2	Carex fracta Mackenzie	Cyperaceae
CALOC	Calochortus Pursh	Liliaceae
CALU9	Calochortus luteus Dougl. ex Lindl.	Liliaceae
CALYC	Calycadenia DC.	Asteraceae
CANU5	Carex nudata W. Boott	Cyperaceae
CAOC5	Calycanthus occidentalis Hook. & Arn.	Calycanthaceae
CAOC6	Calystegia occidentalis (Gray) Brummitt	Convolvulaceae
CAOL	Cardamine oligosperma Nutt.	Brassicaceae
CAREX	Carex L.	Cyperaceae

CASU3	Calochortus superbus Purdy ex J.T. Howell	Liliaceae
CATR3	Calycadenia truncata DC.	Asteraceae
CEBE3	Cercocarpus betuloides Nutt.	Rosaceae
CECAO	Cercis canadensis L. var. orbiculata (Greene) Barneby	Fabaceae
CECU	Ceanothus cuneatus (Hook.) Nutt.	Rhamnaceae
CEGL2	Cerastium glomeratum Thuill.	Caryophyllaceae
CEIN3	Ceanothus integerrimus Hook. & Arn.	Rhamnaceae
CEME2	Centaurea melitensis L.	Asteraceae
CEMU2	Centaurium muehlenbergii (Griseb.) W. Wight ex Piper	Gentianaceae
CEOC2	Cephalanthus occidentalis L.	Rubiaceae
CEOCC2	Cephalanthus occidentalis L. var. californicus Benth.	Rubiaceae
CEOCO	Cercis occidentalis Torr. ex Gray var. orbiculata (Greene) Tidestrom	Fabaceae
CESO3	Centaurea solstitialis L.	Asteraceae
CEVE3	Centaurium venustum (Gray) B.L. Robins.	Gentianaceae
CHAN2	Chlorogalum angustifolium Kellogg	Liliaceae
CHENO	Chenopodium L.	Chenopodiaceae
CHLOR3	Chlorogalum Kunth	Liliaceae
CHME2	Chorizanthe membranacea Benth.	Polygonaceae
CHPO3	Chlorogalum pomeridianum (DC.) Kunth	Liliaceae
CHPO4	Chorizanthe polygonoides Torr. & Gray	Polygonaceae
CHPOP5	Chorizanthe polygonoides Torr. & Gray var. polygonoides	Polygonaceae
CHST5	Chorizanthe stellulata Benth.	Polygonaceae
CIQU3	Cicendia quadrangularis (Lam.) Griseb.	Gentianaceae
CIVU	Cirsium vulgare (Savi) Ten.	Asteraceae
CLARK	Clarkia Pursh	Onagraceae
CLLA3	Clematis lasiantha Nutt.	Ranunculaceae
CLLI2	Clematis ligusticifolia Nutt.	Ranunculaceae
CLPA5	Claytonia parviflora Dougl. ex Hook.	Portulacaceae
CLPAP	Claytonia parviflora Dougl. ex Hook. ssp. parviflora	Portulacaceae
CLPE	Claytonia perfoliata Donn ex Willd.	Portulacaceae
CLPU2	Clarkia purpurea (W. Curtis) A. Nels. & J.F. Macbr	Onagraceae
CLPUQ	Clarkia purpurea (W. Curtis) A. Nels. & J.F. Macbr. ssp. quadrivulnera (Dougl. ex Lindl.) H.F. & M.E. Lewis	Onagraceae
CLRH	Clarkia rhomboidea Dougl. ex Hook.	Onagraceae
CLUN	Clarkia unguiculata Lindl.	Onagraceae
COCA5	Conyza canadensis (L.) Cronq.	Asteraceae
COHE	Collinsia heterophylla Buist ex Graham	Scrophulariaceae
COLLI	Collinsia Nutt.	Scrophulariaceae
COPA3	Collinsia parviflora Lindl.	Scrophulariaceae
COSE16	Cornus sericea L.	Cornaceae
COTE3	Cordylanthus tenuis Gray	Scrophulariaceae
COUM	Comandra umbellata (L.) Nutt.	Santalaceae
CRAN11	Crucianella angustifolia L.	Rubiaceae

CRCO34	Crassula connata (Ruiz & Pavón) Berger	Crassulaceae
CRCR4	Cryptantha crinita Greene	Boraginaceae
CRTI	Crassula tillaea Lester-Garland	Crassulaceae
CYDA	Cynodon dactylon (L.) Pers.	Poaceae
CYEC	Cynosurus echinatus L.	Poaceae
CYER	Cyperus eragrostis Lam.	Cyperaceae
CYPER	Cyperus L.	Cyperaceae
DACA12	Damasonium californicum Torr. ex Benth.	Alismataceae
DAPE	Darmera peltata (Torr. ex Benth.) Voss	Saxifragaceae
DAPU3	Daucus pusillus Michx.	Apiaceae
DEDA	Deschampsia danthonioides (Trin.) Munro	Poaceae
DELPH	Delphinium L.	Ranunculaceae
DEVAV	Delphinium variegatum Torr. & Gray ssp. variegatum	Ranunculaceae
DICA14	Dichelostemma capitatum (Benth.) Wood	Liliaceae
DICAC5	Dichelostemma capitatum (Benth.) Wood ssp. capitatum	Liliaceae
DICHE2	Dichelostemma Kunth	Liliaceae
DIFO	Dicentra formosa (Haw.) Walp.	Fumariaceae
DIMU5	Dichelostemma multiflorum (Benth.) Heller	Liliaceae
DIVO	Dichelostemma volubile (Kellogg) Heller	Liliaceae
DOCLP	Dodecatheon clevelandii Greene ssp. patulum (Greene) H.J. Thompson	Primulaceae
DOCU	Downingia cuspidata (Greene) Greene ex Jepson	Campanulaceae
DRAR3	Dryopteris arguta (Kaulfuss) Watt	Dryopteridaceae
ELAC	Eleocharis acicularis (L.) Roemer & J.A. Schultes	Cyperaceae
ELEL5	Elymus elymoides (Raf.) Swezey	Poaceae
ELGL	Elymus glaucus Buckl.	Poaceae
ELMA5	Eleocharis macrostachya Britt.	Cyperaceae
ELMU3	Elymus multisetus M.E. Jones	Poaceae
EPBR3	Epilobium brachycarpum K. Presl	Onagraceae
EPCI	Epilobium ciliatum Raf.	Onagraceae
EPDE4	Epilobium densiflorum (Lindl.) Hoch & Raven	Onagraceae
EPGI	Epipactis gigantea Dougl. ex Hook.	Orchidaceae
EPILO	Epilobium L.	Onagraceae
EPPA7	Epilobium pallidum (Eastw.) Hoch & Raven	Onagraceae
EQUIS	Equisetum L.	Equisetaceae
ERBO	Erodium botrys (Cav.) Bertol.	Geraniaceae
ERBR14	Erodium brachycarpum (Godr.) Thellung	Geraniaceae
ERCA33	Eryngium castrense Jepson	Apiaceae
ERCA6	Eriodictyon californicum (Hook. & Arn.) Torr.	Hydrophyllaceae
ERCI6	Erodium cicutarium (L.) LHér. ex Ait.	Geraniaceae
ERCI6	Erodium cicutarium (L.) L'Hér. ex Ait.	Geraniaceae
ERCO25	Eriophyllum confertiflorum (DC.) Gray	Asteraceae
ERLA6	Eriophyllum lanatum (Pursh) Forbes	Asteraceae
ERLAG	Eriophyllum lanatum (Pursh) Forbes var. grandiflorum	Asteraceae

	(Gray) Jepson	
ERNU3	Eriogonum nudum Dougl. ex Benth.	Polygonaceae
ERODI	Erodium L'Hér. ex Ait.	Geraniaceae
ERSE3	Eremocarpus setigerus (Hook.) Benth.	Euphorbiaceae
ESCA	Eschscholzia caespitosa Benth.	Papaveraceae
ESCA2	Eschscholzia californica Cham.	Papaveraceae
ESLO	Eschscholzia lobbii Greene	Papaveraceae
EUOC4	Euthamia occidentalis Nutt.	Asteraceae
EUPE6	Euphorbia peplus L.	Euphorbiaceae
EUPHO	Euphorbia L.	Euphorbiaceae
EUSP	Euphorbia spathulata Lam.	Euphorbiaceae
FICA	Ficus carica L.	Moraceae
FIGA	Filago gallica L.	Asteraceae
FILAG	Filago L.	Asteraceae
FRAFA2	Fritillaria affinis (Schultes) Sealy var. affinis	Liliaceae
FRCA6	Fremontodendron californicum (Torr.) Coville	Sterculiaceae
FRDI2	Fraxinus dipetala Hook. & Arn.	Oleaceae
FRLA	Fraxinus latifolia Benth.	Oleaceae
FRPL	Fritillaria pluriflora Torr. ex Benth.	Liliaceae
GAAP2	Galium aparine L.	Rubiaceae
GACO9	Garrya congdonii Eastw.	Garryaceae
GAFR	Garrya fremontii Torr.	Garryaceae
GALIU	Galium L.	Rubiaceae
GAPA5	Galium parisiense L.	Rubiaceae
GAPO	Galium porrigens Dempster	Rubiaceae
GARRY	Garrya Dougl. ex Lindl.	Garryaceae
GAVE3	Gastridium ventricosum auct. non (Gouan) Schinz & Thellung	Poaceae
GEDI	Geranium dissectum L.	Geraniaceae
GEMO	Geranium molle L.	Geraniaceae
GITR2	Gilia tricolor Benth.	Polemoniaceae
GNLU	Gnaphalium luteoalbum L.	Asteraceae
GRCA	Grindelia camporum Greene	Asteraceae
GRHI	Grindelia hirsutula Hook. & Arn.	Asteraceae
GRHID2	Grindelia hirsutula Hook. & Arn. var. davyi (Jepson) M.A. Lane	Asteraceae
GRIND	Grindelia Willd.	Asteraceae
HEAC8	Hesperevax acaulis (Kellogg) Greene	Asteraceae
HEAR5	Heteromeles arbutifolia (Lindl.) M. Roemer	Rosaceae
HECA11	Hesperolinon californicum (Benth.) Small	Linaceae
HEFI	Hemizonia fitchii Gray	Asteraceae
HEGR7	Heterotheca grandiflora Nutt.	Asteraceae
HERBAC	Herbaceous spp. - type unknown	unknown
HIIN3	Hirschfeldia incana (L.) Lagrèze-Fossat	Brassicaceae
HOFI	Holozonia filipes (Hook. & Arn.) Greene	Asteraceae

HOLA	Holcus lanatus L.	Poaceae
HOMA	Holocarpha macradenia (DC.) Greene	Asteraceae
HOMA2	Hordeum marinum Huds.	Poaceae
HOMAG	Hordeum marinum Huds. ssp. gussonianum (Parl.) Thellung	Poaceae
HOMU	Hordeum murinum L.	Poaceae
HOMUL	Hordeum murinum L. ssp. leporinum (Link) Arcang.	Poaceae
HORDE	Hordeum L.	Poaceae
HOVI	Holocarpha virgata (Gray) Keck	Asteraceae
HOVIV	Holocarpha virgata (Gray) Keck ssp. virgata	Asteraceae
HYGL2	Hypochaeris glabra L.	Asteraceae
HYMU	Hypericum mutilum L.	Clusiaceae
HYPE	Hypericum perforatum L.	Clusiaceae
HYPOC	Hypochaeris L.	Asteraceae
HYRA3	Hypochaeris radicata L.	Asteraceae
ISOR	Isoetes orcuttii A.A. Eat.	Isoetaceae
JUBA	Juncus balticus Willd.	Juncaceae
JUBU	Juncus bufonius L.	Juncaceae
JUCA	Juglans californica S. Wats.	Juglandaceae
JUCA5	Juncus capitatus Weigel	Juncaceae
JUCA7	Juniperus californica Carr.	Cupressaceae
JUEF	Juncus effusus L.	Juncaceae
JUNCU	Juncus L.	Juncaceae
JUOX	Juncus oxymeris Engelm.	Juncaceae
KEBR	Keckiella breviflora (Lindl.) Straw	Scrophulariaceae
KECKI	Keckiella Straw	Scrophulariaceae
KOPH	Koeleria phleoides (Vill.) Pers.	Poaceae
LACA7	Lasthenia californica DC. ex Lindl.	Asteraceae
LAFR2	Layia fremontii (Torr. & Gray) Gray	Asteraceae
LASA	Lactuca saligna L.	Asteraceae
LASE	Lactuca serriola L.	Asteraceae
LASU	Lathyrus sulphureus Brewer ex Gray	Fabaceae
LENI	Lepidium nitidum Nutt.	Brassicaceae
LETA	Leontodon taraxacoides (Vill.) Mérat	Asteraceae
LETR5	Leymus triticoides (Buckl.) Pilger	Poaceae
LEVI8	Lessingia virgata Gray	Asteraceae
LIALA	Limnanthes alba Hartw. ex Benth. ssp. alba	Limnanthaceae
LIBI	Linanthus bicolor (Nutt.) Greene	Polemoniaceae
LICHEN	Lichen	
LICI	Linanthus ciliatus (Benth.) Greene	Polemoniaceae
LILIXX	Liliaceae	Liliaceae
LINAN2	Linanthus Benth.	Polemoniaceae
LOCA5	Lomatium caruifolium (Hook. & Arn.) Coult. & Rose	Apiaceae
LOHI2	Lonicera hispidula (Lindl.) Dougl. ex Torr. & Gray	Caprifoliaceae
LOHIV	Lonicera hispidula (Lindl.) Dougl. ex Torr. & Gray var.	Caprifoliaceae

	vacillans (Benth.) Gray	
LOIN4	Lonicera interrupta Benth.	Caprifoliaceae
LOMAT	Lomatium Raf.	Apiaceae
LOMI	Lotus micranthus Benth.	Fabaceae
LOMU	Lolium multiflorum Lam.	Poaceae
LONIC	Lonicera L.	Caprifoliaceae
LOPU3	Lotus purshianus F.E. & E.G. Clem.	Fabaceae
LOUT	Lomatium utriculatum (Nutt. ex Torr. & Gray) Coult. & Rose	Apiaceae
LOWR2	Lotus wrangelianus Fisch. & C.A. Mey.	Fabaceae
LUBI	Lupinus bicolor Lindl.	Fabaceae
LUCO6	Luzula comosa E. Mey.	Juncaceae
LUNA3	Lupinus nanus Dougl. ex Benth.	Fabaceae
LUPIN	Lupinus L.	Fabaceae
LYCA4	Lythrum californicum Torr. & Gray	Lythraceae
LYHY2	Lythrum hyssopifolia L.	Lythraceae
MADIA	Madia Molina	Asteraceae
MAEL	Madia elegans D. Don ex Lindl.	Asteraceae
MAEX	Madia exigua (Sm.) Gray	Asteraceae
MAFA3	Marah fabaceus (Naud.) Naud. ex Greene	Cucurbitaceae
MAGR3	Madia gracilis (Sm.) Keck & J. Clausen ex Applegate	Asteraceae
MARA7	Maianthemum racemosum (L.) Link	Liliaceae
MARSI	Marsilea L.	Marsileaceae
MASU	Madia subspicata Keck	Asteraceae
MEAL2	Melilotus albus Medik.	Fabaceae
MECA2	Melica californica Scribn.	Poaceae
MEDIC	Medicago L.	Fabaceae
MELIC	Melica L.	Poaceae
MEPO3	Medicago polymorpha L.	Fabaceae
MEPR	Medicago praecox DC.	Fabaceae
MEPU	Mentha pulegium L.	Lamiaceae
MESP3	Mentha spicata L.	Lamiaceae
METO	Melica torreyana Scribn.	Poaceae
MIAC	Microseris acuminata Greene	Asteraceae
MICA	Micropus californicus Fisch. & C.A. Mey.	Asteraceae
MICA7	Minuartia californica (Gray) Mattf.	Caryophyllaceae
MICAC2	Micropus californicus Fisch. & C.A. Mey. var. californicus	Asteraceae
MICRO6	Microseris D. Don	Asteraceae
MIDO	Microseris douglasii (DC.) Schultz-Bip.	Asteraceae
MIGL2	Mimulus glaucescens Greene	Scrophulariaceae
MIGU	Mimulus guttatus DC.	Scrophulariaceae
MIMO3	Mimulus moschatus Dougl. ex Lindl.	Scrophulariaceae
MINUA	Minuartia L.	Caryophyllaceae
MOFO	Montia fontana L.	Portulacaceae

MONAR2	Monardella Benth.	Lamiaceae
MOSS	Moss	
MOVI2	Monardella villosa Benth.	Lamiaceae
MURI2	Muhlenbergia rigens (Benth.) A.S. Hitchc.	Poaceae
NAHE	Navarretia heterandra Mason	Polemoniaceae
NAIN2	Navarretia intertexta (Benth.) Hook.	Polemoniaceae
NAINI	Navarretia intertexta (Benth.) Hook. ssp. intertexta	Polemoniaceae
NALE	Navarretia leucocephala Benth.	Polemoniaceae
NAPU2	Navarretia pubescens (Benth.) Hook. & Arn.	Polemoniaceae
NAPU4	Nassella pulchra (A.S. Hitchc.) Barkworth	Poaceae
NATA3	Navarretia tagetina Greene	Polemoniaceae
NAVAR	Navarretia Ruiz & Pavón	Polemoniaceae
NEHE	Nemophila heterophylla Fisch. & C.A. Mey.	Hydrophyllaceae
NEMOP	Nemophila Nutt.	Hydrophyllaceae
NEPA	Nemophila parviflora Dougl. ex Benth.	Hydrophyllaceae
NEPE	Nemophila pedunculata Dougl. ex Benth.	Hydrophyllaceae
ODHA	Odontostomum hartwegii Torr.	Liliaceae
ONAGXX	Onagraceae	Onagraceae
ORTE	Orcuttia tenuis A.S. Hitchc.	Poaceae
OSCH	Osmorhiza chilensis Hook. & Arn.	Apiaceae
PAAC5	Panicum acuminatum Sw.	Poaceae
PAAH	Paronychia ahartii Ertter	Caryophyllaceae
PADI3	Paspalum dilatatum Poir.	Poaceae
PADI6	Paspalum distichum L.	Poaceae
PAPU10	Parvisedum pumilum (Benth.) Clausen	Crassulaceae
PEBA5	Perideridia bacigalupii Chuang & Constance	Apiaceae
PEDU2	Petrorhagia dubia (Raf.) G. López & Romo	Caryophyllaceae
PEHE3	Penstemon heterophyllus Lindl.	Scrophulariaceae
PEKE	Perideridia kelloggii (Gray) Mathias	Apiaceae
PEMU	Pellaea Link	Pteridaceae
PEMU	Pellaea mucronata (D.C. Eat.) D.C. Eat.	Pteridaceae
PENST	Penstemon Schmidel	Scrophulariaceae
PERID	Perideridia Reichenb.	Apiaceae
PETR7	Pentagramma triangularis (Kaulfuss) Yatskievych, Windham & Wollenweber	Pteridaceae
PETRM	Pentagramma triangularis (Kaulfuss) Yatskievych, Windham & Wollenweber ssp. maxonii (Weatherby) Yatskievych, Windham & Wollenweber	Pteridaceae
PETRT	Pentagramma triangularis (Kaulfuss) Yatskievych, Windham & Wollenweber ssp. triangularis	Pteridaceae
PHACE	Phacelia Juss.	Hydrophyllaceae
PHAR3	Phalaris arundinacea L.	Poaceae
PHLE4	Philadelphus lewisii Pursh	Hydrangeaceae
PHPA5	Phalaris paradoxa L.	Poaceae
PHVI9	Phoradendron villosum (Nutt.) Nutt.	Viscaceae
PIPO	Pinus ponderosa P.& C. Lawson	Pinaceae

PISA2	Pinus sabiniana Dougl. ex Dougl.	Pinaceae
PLAU	Plagiobothrys austiniae (Greene) I.M. Johnston	Boraginaceae
PLCA2	Plagiobothrys canescens Benth.	Boraginaceae
PLEL	Plantago elongata Pursh	Plantaginaceae
PLER3	Plantago erecta Morris	Plantaginaceae
PLFU	Plagiobothrys fulvus (Hook. & Arn.) I.M. Johnston	Boraginaceae
PLGL2	Plagiobothrys glyptocarpus (Piper) I.M. Johnston	Boraginaceae
PLGLG	Plagiobothrys glyptocarpus (Piper) I.M. Johnston var. glyptocarpus	Boraginaceae
PLGR	Plagiobothrys greenei (Gray) I.M. Johnston	Boraginaceae
PLLA	Plantago lanceolata L.	Plantaginaceae
PLMA4	Plectritis macrocera Torr. & Gray	Valerianaceae
PLNO	Plagiobothrys nothofulvus (Gray) Gray	Boraginaceae
PLRA	Platanus racemosa Nutt.	Platanaceae
PLSH	Plagiobothrys shastensis Greene ex Gray	Boraginaceae
PLSTM	Plagiobothrys stipitatus (Greene) I.M. Johnston var. micranthus (Piper) I.M. Johnston	Boraginaceae
PLTE	Plagiobothrys tenellus (Nutt. ex Hook.) Gray	Boraginaceae
POA	Poa L.	Poaceae
POACXX	Poaceae	Poaceae
POAN	Poa annua L.	Poaceae
POBI4	Polygonum bidwelliae S. Wats.	Polygonaceae
POBO3	Polygonum bolanderi Brewer	Polygonaceae
POBU	Poa bulbosa L.	Poaceae
POCA26	Polypodium calirhiza S. Whitmore & A.R. Sm.	Polypodiaceae
POCA7	Polygonum californicum Meisn.	Polygonaceae
PODO2	Pogogyne douglasii Benth.	Lamiaceae
PODO3	Polanisia dodecandra (L.) DC.	Capparaceae
PODO4	Polygonum douglasii Greene	Polygonaceae
POFR2	Populus fremontii S. Wats.	Salicaceae
POGL9	Potentilla glandulosa Lindl.	Rosaceae
POGLG4	Potentilla glandulosa Lindl. ssp. glandulosa	Rosaceae
POIN7	Polypogon interruptus Kunth	Poaceae
POMA10	Polypogon maritimus Willd.	Poaceae
POMO5	Polypogon monspeliensis (L.) Desf.	Poaceae
POPE3	Polygonum persicaria L.	Polygonaceae
POPU5	Polygonum punctatum Ell.	Polygonaceae
POSE	Poa secunda J. Presl	Poaceae
POZI	Pogogyne ziziphoroides Benth.	Lamiaceae
PREM	Prunus emarginata (Dougl. ex Hook.) D. Dietr.	Rosaceae
PRSU2	Prunus subcordata Benth.	Rosaceae
PSBR	Psilocarphus brevissimus Nutt.	Asteraceae
PTCR3	Ptelea crenulata Greene	Rutaceae
PTDR	Pterostegia drymarioides Fisch. & C.A. Mey.	Polygonaceae
PYCA	Pycnanthemum californicum Torr.	Lamiaceae

QUBE5	Quercus berberidifolia Liebm.	Fagaceae
QUCH2	Quercus chrysolepis Liebm.	Fagaceae
QUDO	Quercus douglasii Hook. & Arn.	Fagaceae
QUGAB	Quercus garryana Dougl. ex Hook. var. fruticosa	Fagaceae
QUGAG2	Quercus garryana Dougl. ex Hook. var. garryana	Fagaceae
QUKE	Quercus kelloggii Newberry	Fagaceae
QULO	Quercus lobata Née	Fagaceae
QUWI2	Quercus wislizeni A. DC.	Fagaceae
RABO	Ranunculus bonariensis Poir.	Ranunculaceae
RAMU2	Ranunculus muricatus L.	Ranunculaceae
RANUN	Ranunculus L.	Ranunculaceae
RAOC	Ranunculus occidentalis Nutt.	Ranunculaceae
RHAMN	Rhamnus L.	Rhamnaceae
RHCA	Rhamnus californica Eschsch.	Rhamnaceae
RHIL	Rhamnus ilicifolia Kellogg	Rhamnaceae
RHTO6	Rhamnus tomentella Benth.	Rhamnaceae
RHTR	Rhus trilobata Nutt.	Anacardiaceae
ROCA2	Rosa californica Cham. & Schlecht.	Rosaceae
RONA2	Rorippa nasturtium-aquaticum (L.) Hayek	Brassicaceae
RORIP	Rorippa Scop.	Brassicaceae
RUCO2	Rumex conglomeratus Murr.	Polygonaceae
RUCR	Rumex crispus L.	Polygonaceae
RUDI2	Rubus discolor Weihe & Nees	Rosaceae
RUPU3	Rumex pulcher L.	Polygonaceae
RUSA	Rumex salicifolius Weinm.	Polygonaceae
RUUR	Rubus ursinus Cham. & Schlecht.	Rosaceae
SABI2	Sanicula bipinnata Hook. & Arn.	Apiaceae
SABI3	Sanicula bipinnatifida Dougl. ex Hook.	Apiaceae
SACR2	Sanicula crassicaulis Poepp. ex DC.	Apiaceae
SADEO	Sagina decumbens (Ell.) Torr. & Gray ssp. occidentalis (S. Wats.) Crow	Caryophyllaceae
SAEX	Salix exigua Nutt.	Salicaceae
SAIN4	Saxifraga integrifolia Hook.	Saxifragaceae
SALA3	Salix laevigata Bebb	Salicaceae
SALA6	Salix lasiolepis Benth.	Salicaceae
SALIX	Salix L.	Salicaceae
SAME5	Sambucus mexicana K. Presl ex DC.	Caprifoliaceae
SANI4	Sambucus nigra L.	Caprifoliaceae
SAOF4	Saponaria officinalis L.	Caryophyllaceae
SCACO4	Scirpus acutus Muhl. ex Bigelow var. occidentalis (S. Wats.) Beetle	Cyperaceae
SCAN2	Scleranthus annuus L.	Caryophyllaceae
SCBO	Scribneria bolanderi (Thurb.) Hack.	Poaceae
SCCA3	Scutellaria californica Gray	Lamiaceae
SCPE	Scandix pecten-veneris L.	Apiaceae

SCUTE	Scutellaria L.	Lamiaceae
SEHA2	Selaginella hansenii Hieron.	Selaginellaceae
SELAG	Selaginella Beauv.	Selaginellaceae
SEVU	Senecio vulgaris L.	Asteraceae
SHAR2	Sherardia arvensis L.	Rubiaceae
SICA4	Silene californica Dur.	Caryophyllaceae
SIGA	Silene gallica L.	Caryophyllaceae
SIHA	Sidalcea hartwegii Gray ex Benth.	Malvaceae
SILE2	Silene lemmonii S. Wats.	Caryophyllaceae
SIMA3	Silybum marianum (L.) Gaertn.	Asteraceae
SIOF	Sisymbrium officinale (L.) Scop.	Brassicaceae
SMCA2	Smilax californica (A. DC.) Gray	Smilacaceae
SNAG	Standing snag	Unknown
SOAS	Sonchus asper (L.) Hill	Asteraceae
SOCA5	Solidago californica Nutt.	Asteraceae
SOHA	Sorghum halepense (L.) Pers.	Poaceae
SOLID	Solidago L.	Asteraceae
STACH	Stachys L.	Lamiaceae
STME2	Stellaria media (L.) Vill.	Caryophyllaceae
STOFR	Styrax officinalis L. var. redivivus (Torr.) Howard	Styracaceae
STST	Stachys stricta Greene	Lamiaceae
SYAL	Symphoricarpos albus (L.) Blake	Caprifoliaceae
SYMO	Symphoricarpos mollis Nutt.	Caprifoliaceae
SYMPH	Symphoricarpos Duham.	Caprifoliaceae
TACA8	Taeniatherum caput-medusae (L.) Nevski	Poaceae
TAHA2	Tauschia hartwegii (Gray) J.F. Macbr.	Apiaceae
THCU	Thysanocarpus curvipes Hook.	Brassicaceae
TOAR	Torilis arvensis (Huds.) Link	Apiaceae
TOCA	Torreya californica Torr.	Taxaceae
TODI	Toxicodendron diversilobum (Torr. & Gray) Greene	Anacardiaceae
TONO	Torilis nodosa (L.) Gaertn.	Apiaceae
TORIL	Torilis Adans.	Apiaceae
TRAL5	Trifolium albopurpureum Torr. & Gray	Fabaceae
TRBI	Trifolium bifidum Gray	Fabaceae
TRBR7	Triteleia bridgesii (S. Wats.) Greene	Liliaceae
TRCI	Trifolium ciliolatum Benth.	Fabaceae
TRDE	Trifolium depauperatum Desv.	Fabaceae
TRDED	Trifolium depauperatum Desv. var. depauperatum	Fabaceae
TRDET	Trifolium depauperatum Desv. var. truncatum (Greene) McDermott ex Isely	Fabaceae
TRDU	Tragopogon dubius Scop.	Asteraceae
TRDU2	Trifolium dubium Sibthorp	Fabaceae
TRER6	Triphysaria eriantha (Benth.) Chuang & Heckard	Scrophulariaceae
TRERE2	Triphysaria eriantha (Benth.) Chuang & Heckard ssp. eriantha	Scrophulariaceae

TRGL4	Trifolium glomeratum L.	Fabaceae
TRHI4	Trifolium hirtum All.	Fabaceae
TRHY3	Triteleia hyacinthina (Lindl.) Greene	Liliaceae
TRIFO	Trifolium L.	Fabaceae
TRITE	Triteleia Dougl. ex Lindl.	Liliaceae
TRLA16	Triteleia laxa Benth.	Liliaceae
TRLA4	Trichostema lanceolatum Benth.	Lamiaceae
TRLI8	Triteleia lilacinum Greene	Liliaceae
TRMI4	Trifolium microcephalum Pursh	Fabaceae
TRSU3	Trifolium subterraneum L.	Fabaceae
TRVA	Trifolium variegatum Nutt.	Fabaceae
TRWI	Trifolium willdenowii Spreng.	Fabaceae
TRWI3	Trifolium willdenovii Sprengel	Fabaceae
TYAN	Typha angustifolia L.	Typhaceae
TYDO	Typha domingensis Pers.	Typhaceae
TYLA	Typha latifolia L.	Typhaceae
TYPHA	Typha L.	Typhaceae
UMCA	Umbellularia californica (Hook. & Arn.) Nutt.	Lauraceae
URDI	Urtica dioica L.	Urticaceae
URLI5	Uropappus lindleyi (DC.) Nutt.	Asteraceae
VEBL	Verbascum blattaria L.	Scrophulariaceae
VICA5	Vitis californica Benth.	Vitaceae
VICIA	Vicia L.	Fabaceae
VIVI	Vicia villosa Roth	Fabaceae
VUBR	Vulpia bromoides (L.) S.F. Gray	Poaceae
VULPI	Vulpia K.C. Gmel.	Poaceae
VUMI	Vulpia microstachys (Nutt.) Munro	Poaceae
VUMY	Vulpia myuros (L.) K.C. Gmel.	Poaceae
WOFI	Woodwardia fimbriata Sm.	Blechnaceae
WYAN	Wyethia angustifolia (DC.) Nutt.	Asteraceae
XAST	Xanthium strumarium L.	Asteraceae
YAMI	Yabea microcarpa (Hook. & Arn.) K.-Pol.	Apiaceae
ZIFR	Zigadenus fremontii (Torr.) Torr. ex S. Wats.	Liliaceae

Appendix D.

Lassen Vegetation Mapping Classification
(February, 2008)

CLASS
Formation
Alliance or Mapping Unit – *Defined Alliances (Italicized)*
Associations or Mapping Unit – *Defined Associations (Italicized)*

1000 – 2000 FORESTS & WOODLANDS

1200 – Temperate Needleleaf Evergreen Forests & Woodlands
1210 – *Pinus sabiniana Alliance*
1211 - *Pinus sabiniana* / *Ceanothus cuneatus Association*
1220 – *Juniperus californica Alliance*

1300 – North American Temperate Riparian Woodlands & Forests Mapping Unit
1320 – *Populus fremontii Alliance*
1321 - *Populus fremontii - Salix laevigata Association*
1330 – *Salix laevigata Alliance*
1340 – *Alnus rhombifolia Alliance*

1400 – Temperate Broadleaf Sclerophyll Evergreen Forests
1410 – *Umbellaria californica Alliance*
1411 – Umbellaria californica – Quercus wislizeni Mapping Unit
1420 – *Quercus chrysolepis Alliance*

2100 – Xeric Sclerophyll Evergreen Woodland
2120 – *Quercus wislizeni Alliance*
2121 – Quercus wislizeni – (Quercus douglasii) – Pinus sabiniana Mapping Unit
2122 – Quercus wislizeni – (Quercus douglasii) – Aesculus californica Mapping Unit
2123 – Quercus wislizeni – Quercus douglasii Super Alliance

2200 – Cold Season Deciduous Forests & Woodlands
2210 – *Quercus douglasii Alliance*
2211 – Quercus douglasii / Annual - Perennial Herbaceous Mapping Unit
2212 – Quercus douglasii - Pinus sabiniana Mapping Unit
2213 – Quercus douglasii / Juniperus californica – (Ceanothus cuneatus) Mapping Unit
2214 – *Quercus douglasii* / *Aesculus californica* / *Herbaceous Association*
2215 – *Quercus douglasii* / *Ceanothus cuneatus* / *Herbaceous Association*

2216 – *Quercus douglasii / Arctostaphylos manzanita / Herbaceous Association*
2220 – *Aesculus californica Alliance*
2230 – *Quercus lobata Alliance*
2231 – *Quercus lobata / Herbaceous Association*
2232 – Quercus lobata Riparian Mapping Unit
2240 – *Quercus kelloggii Alliance*
2241 *Quercus kelloggii – Pinus Ponderosa Association*

3000 – SHRUBLANDS

3100 – Temperate Broadleaf Sclerophyll Evergreen Shrublands
3101 – Northern Mixed Mesic Chaparral Mapping Unit
3102 – Mixed Scrub Oak Chaparral Super Alliance
3130 – *Ceanothus cuneatus Alliance*
3131 – Ceanothus cuneatus – Eriodictyon californicum Mapping Unit
3132 – *Ceanothus cuneatus / Herbaceous Association*

3400 – Temporarily Flooded Cold Season Deciduous Shrubland
3402 – Mixed shrub willow thicket Mapping Unit

3500 – Cold Season Deciduous Shrubland
3510 – *Quercus garryana* Shrub Alliance

4000 – HERBACEOUS

4100 – Saturated Temperate Perennial Graminoids
4101 – Bulrush – Cattails Mapping Unit

4200 – Seasonally or Temporarily Flooded Graminoids
4201 – Seasonally Flooded Wetland Herbaceous Mapping Unit
4202 – Vernal Pools Mapping Unit

4300 –Temperate Annual Grasslands or Forbs
4310 – California Annual or Perennial Grassland Mapping Unit

9000 – LAND USE - SPARSELY or UNVEGETATED

9100 – Built-up
9200 – Agriculture (Irrigated grains for feeding)
9300 – Restoration Sites
9400 – Sparsely Vegetated or Unvegetated Areas
9410 – Landslides
9420 – Cliffs – Rock Outcrops – Steep eroded slopes
9430 – Stream Beds and Flats

9500 – Water
9999 – Field questions or Unknown