

Final Report on the Digitization of Historic, 1930's Wieslander Vegetation Type Maps for Pinnacles National Monument

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Need for mapping & overview

Resource management at Pinnacles National Monument has recognized the utility of assembling information about the vegetation of the lands it serves. Such information can be used to inform decision making for a wide range of management activities. One source of historic data that covers the National Monument is the 1930s era Wieslander Vegetation Type Map survey. The University of California, Davis, has completed a project for PINN to digitize these maps. This report provides a brief summary of the information developed. The digital materials have all been submitted to PINN.

Historic Wieslander Vegetation Map Background and Production

The Wieslander Vegetation Type Map (VTM) Project was a United States Forest Service (USFS) effort to record California's vegetation between 1928 and 1940 (Wieslander 1935a, 1935b, 1985; Griffin and Critchfield 1972). Headed by Albert Wieslander, the group took over 3,000 photographs of vegetation, surveyed over 17,000 vegetation plots, recorded field notes, and mapped patterns of vegetation across 35% of the state, about 155,000 km² (Colwell 1977). Lands mapped were predominantly USFS lands, but extensive tracks of private land, and three national parks (Lassen, Yosemite, and Sequoia/Kings Canyon), were also included (Wieslander 1985; Griffin and Critchfield 1972). The VTM survey covered California's coast ranges from San Francisco to the Mexican border. The project also collected 25,000 plant voucher specimens, which are housed at the Jepson Herbarium, University of California, Berkeley. These data collections are an important vegetation legacy; and all components except the vegetation maps have been digitized for preservation and are available for state-wide analyses (Erter 2000; Kelly et al. 2005; the vegetation plot data have been digitized and are available at <http://vtm.berkeley.edu>; the photographs are also available at <http://www.lib.berkeley.edu/BIOS/vtm/>). The vegetation maps for the central and northern Sierra Nevada have been digitized (Thorne et al. 2006; http://cain.nbio.org/plants_animals/plants/wieslander). VTM data are the most authoritative source of information on the extent of dominant vegetation species available in California for the 1930s.

The VTM project data provides the foundation for much of the current knowledge of vegetation in California. Already published biogeographic works include elevational transect maps of vegetation (Critchfield 1971), the distribution of California's trees (Griffin and Critchfield 1972), and the distribution of range brushlands and shrubs (Sampson and Jespersen 1963). The vegetation plot data have been used in numerous

studies, including community classifications (Jensen 1947; Allen et al. 1991; Allen-Diaz and Holzman 1991), and vegetation change (Bradbury 1974; Minnich 1978; Minnich et al. 1995; Minnich and Dezzani 1998; Bouldin 1999; Taylor 2000; Taylor 2004a, b; Franklin et al. 2004). Since 80 years have elapsed since the VTM survey, the data also provide us with a way to examine both human-induced and natural change on the landscape, such as assessing the extent to which different habitats have already been lost, which can be used to inform priorities for resource management in the National Monument, as has been done for a single quadrangle in the Sierra Nevada (Thorne et al. 2008).

UC Davis developed a systematic approach to rendering the old maps. This report details the result of digitizing the maps for Pinnacles National Monument, located in the central coast ranges of California (Figure 1).

The steps to process the historic maps are outlined in detail in the attached methods manual (Morgan et al. 2007; http://cain.nbii.org/plants_animals/plants/wieslander), but generally run as follows for each quadrangle listed above:

- 1) Scan the original VTM maps at 300 Dots per inch- because each VTM map was cut in pieces, all pieces are scanned;
- 2) Scan identical editions of the United States Geological Survey topographic maps that the VTM vegetation maps were drawn on;
- 3) Geo-rectify the USGS topographic maps (Figure 2a);
- 4) Register the VTM vegetation map pieces onto the USGS topographic (Figure 2b). Once a VTM vegetation map is geo-referenced, it can then be;
- 5) Traced using an on-screen digitizing technique that combines ArcInfo GIS software (ESRI 2005) with a WaCom tablet and digital pen (WaCom 2004) (Figure 3d). When the polygons are completed, they are;
- 6) Attributed with the species codes written on the original VTM vegetation maps for each polygon. These species codes are used to;
- 7) Assign species names (from over 1700 species recorded in the VTM project statewide, using the Jepson Manual (Hickman 1993) naming conventions. Each polygon can then be;
- 8) Represented by an aggregate string of dominant plant species that each occupied at least 20% of the polygon's area. Finally, we;
- 9) Assign the species aggregations to California Wildlife Habitat Relationship (WHR) Models (California Department of Fish and Game 2004) and California Manual of Vegetation classes (Sawyer and Keeler-wolf 2009), which are habitat descriptors, using a combination of species and seral information (Figure 4).

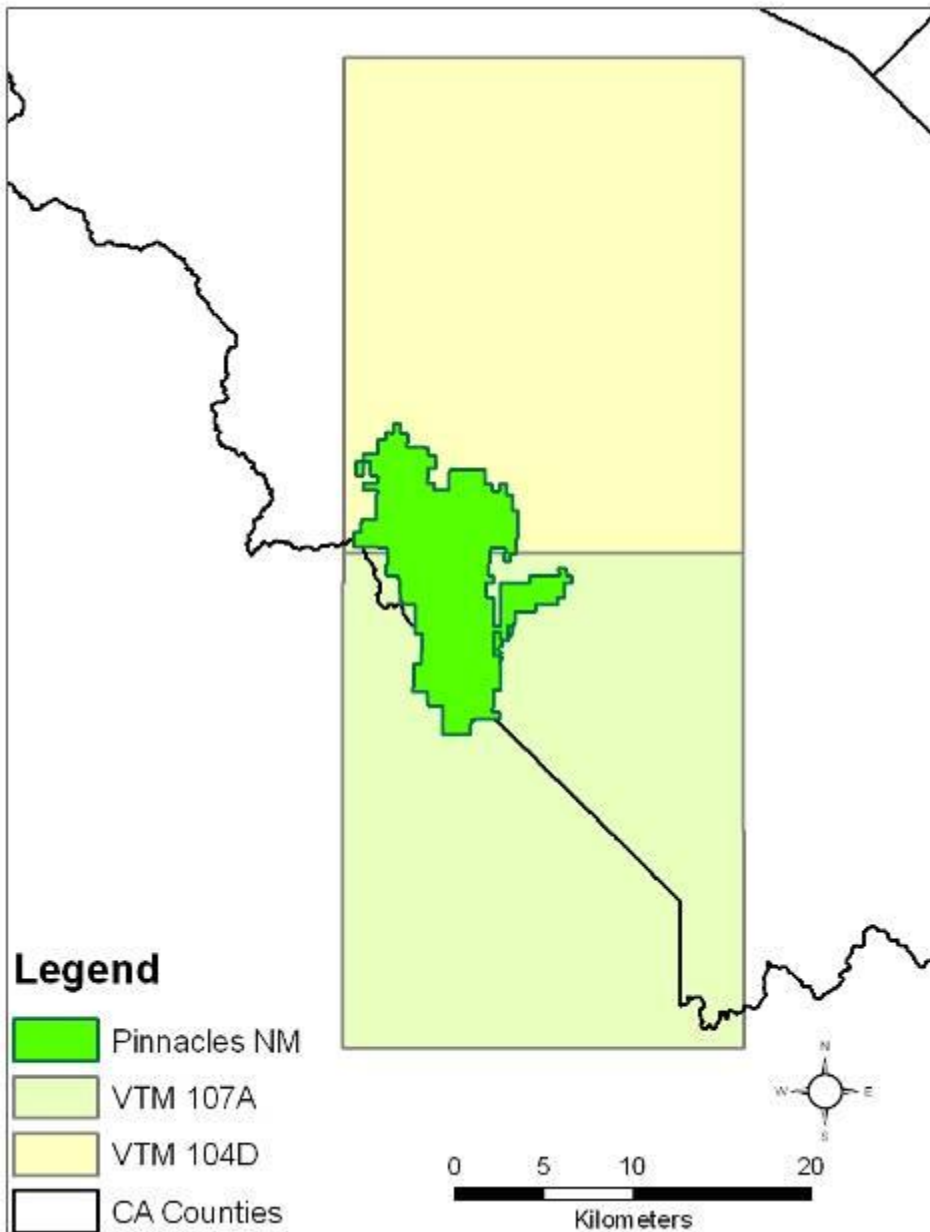


Figure 1. The extent of Wieslander VTM vegetation map proposed for Pinnacles National Monument. The two quadrangles that the maps occur on were fully digitized for this report.

PINN is located on two 15 minute quadrangles. The topographic maps used in the mapping by Wieslander Vegetation crews are: San Benito, 1931, VTM 104D and Metz, 1921, VTM 107A (Figure 2a). We obtained scans of these quadrangles from UCSB Alexandria Digital Library. We registered the quads using 16 tic marks per quad. The VTM maps were cut by the original surveyors into 'tiles' which were glued to canvas backing. Each quad has 4 tiles (Figure 2b). Both original scans and georeferenced versions of the tiles are provided. The Pinnacles National Monument covers 92.94 km² and is found on both of these quadrangles (Figure 1 and Figure 3a-d).

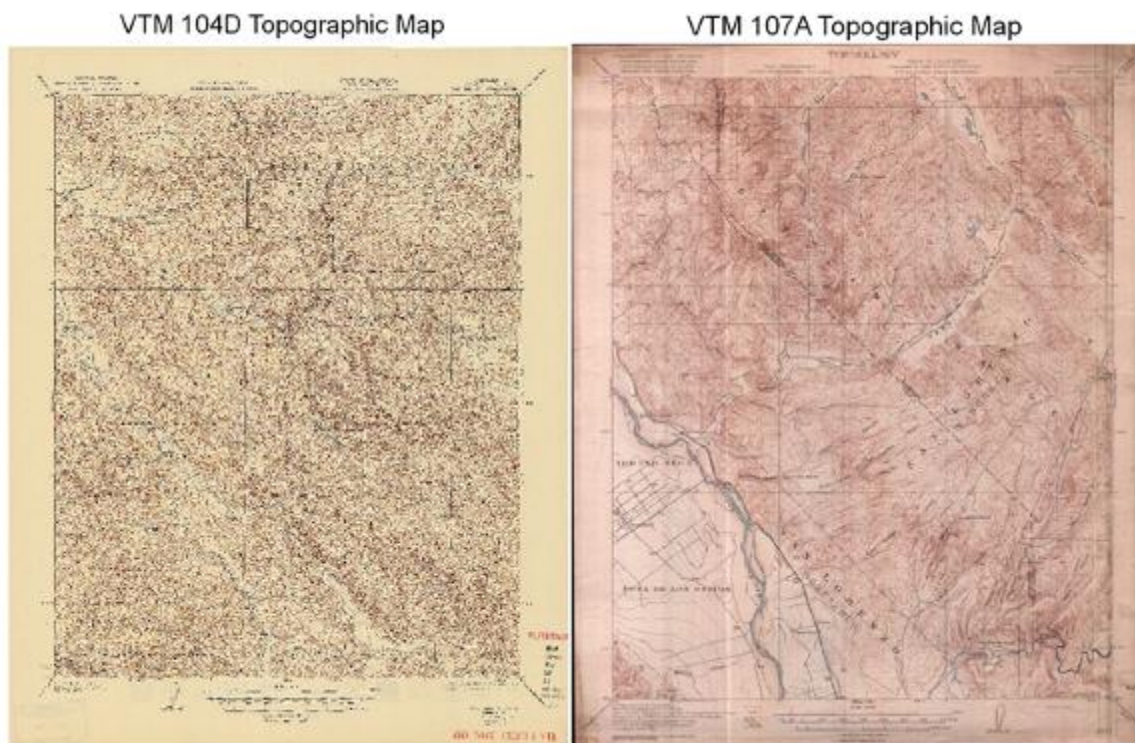


Figure 2a. The USGS Topographic maps used by the Wieslander Vegetation crew: San Benito, 1931, VTM 104D (left) and Metz, 1921, VTM 107A (right). Digital scans of these maps are included in the deliverables.

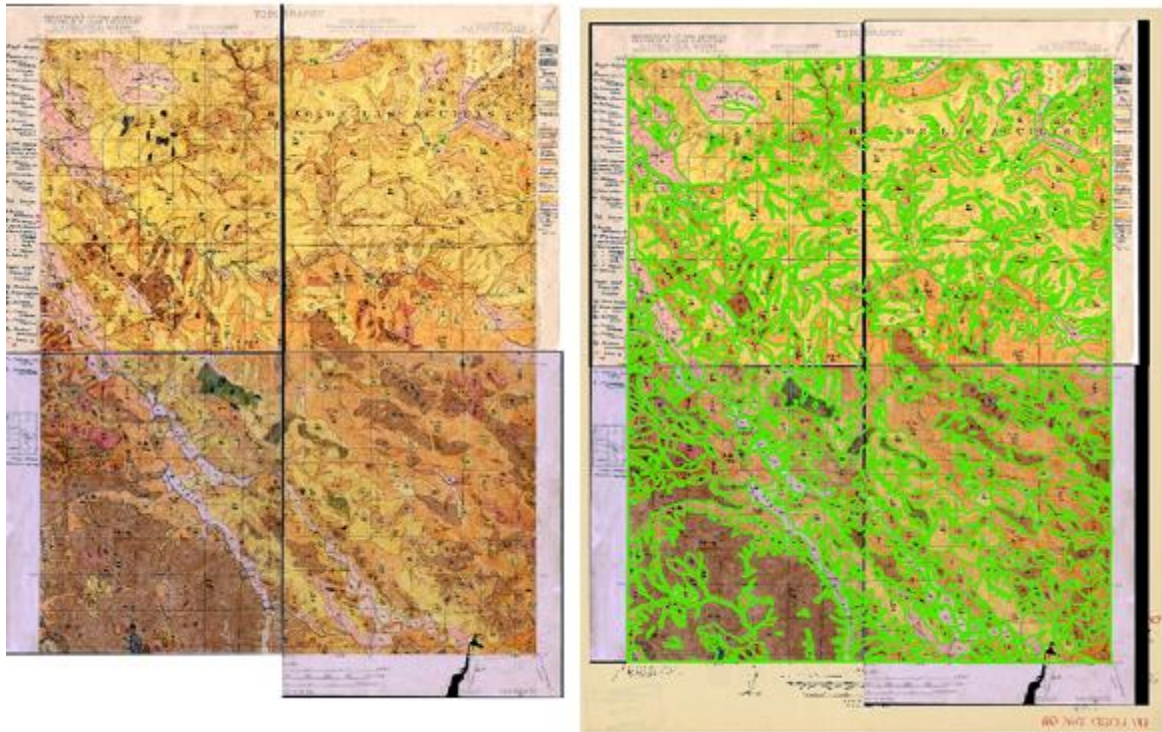


Figure 2b. The unclipped borders of VTM vegetation map tiles are shown for quad 104D with notes often written by the surveying crew (left). Once they are registered onto the USGS topographic maps, the polygons can be traced (right).

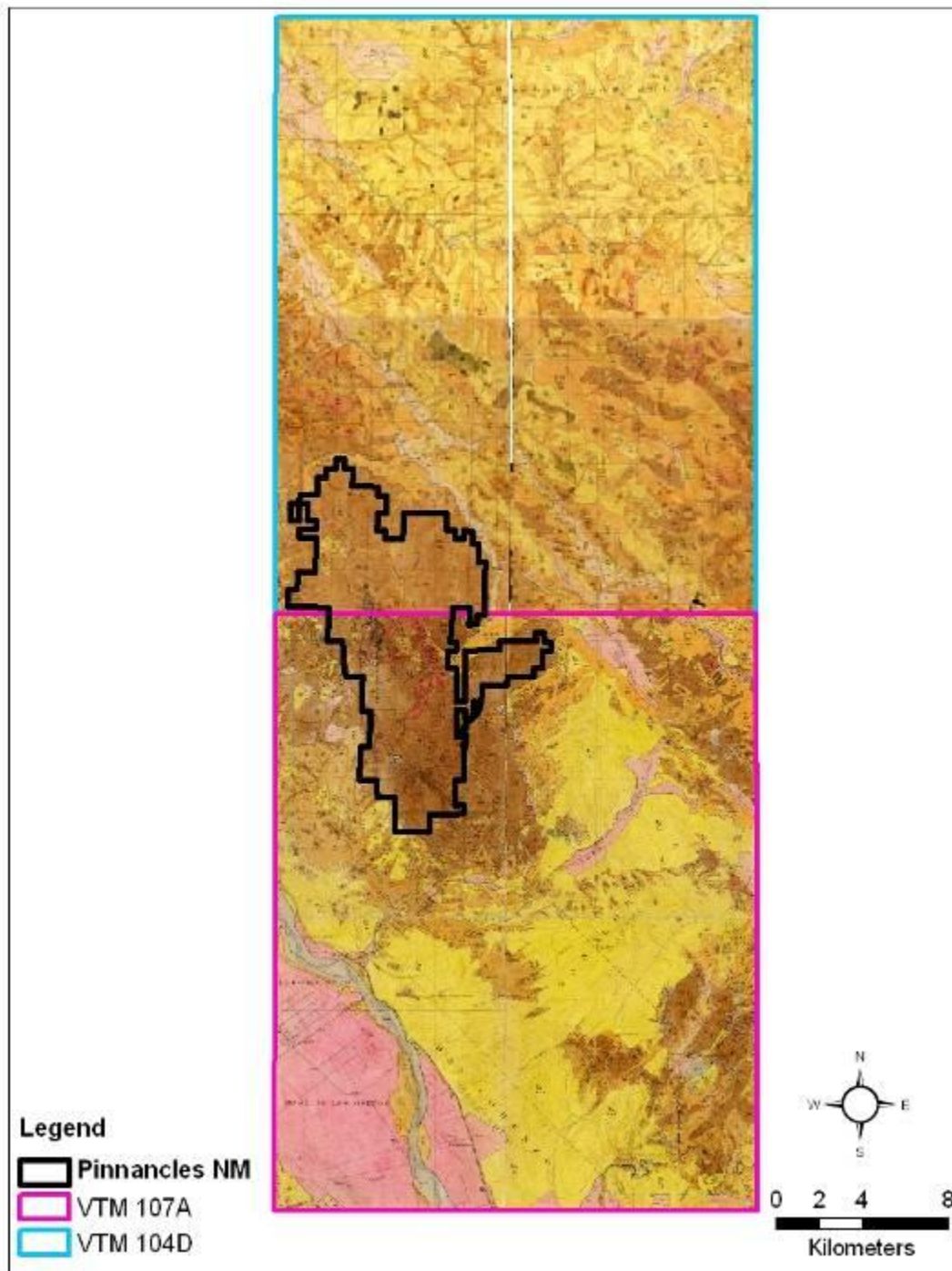


Figure 3a. This image shows the clipped borders of georeferenced Wieslander VTM vegetation map tiles for both quadrangles and the Pinnacles National Monument.

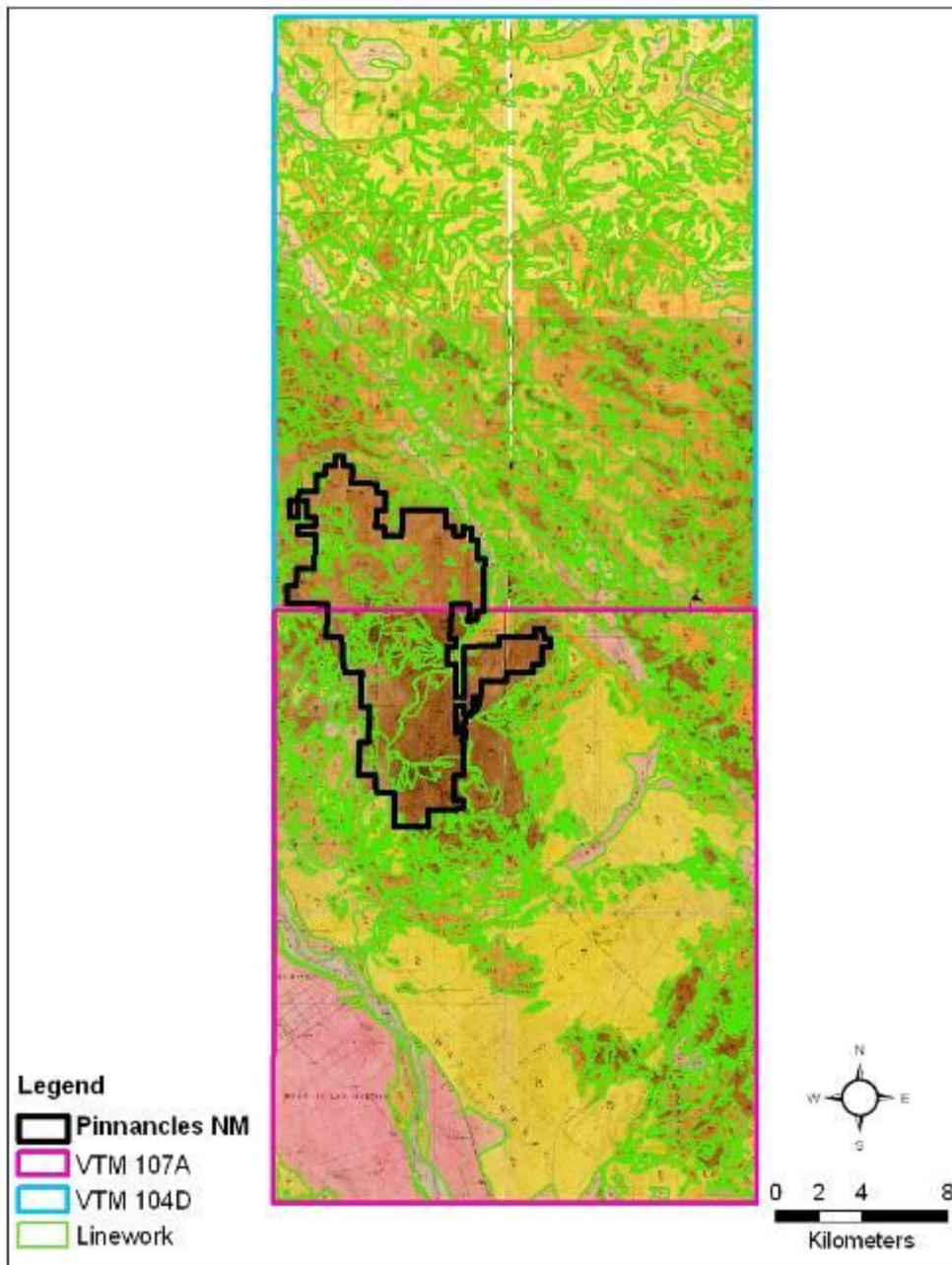


Figure 3b. This image shows the clipped borders of georeferenced Wieslander VTM vegetation map tiles for both quadrangles and the Pinnacles National Monument with the digitized line work.

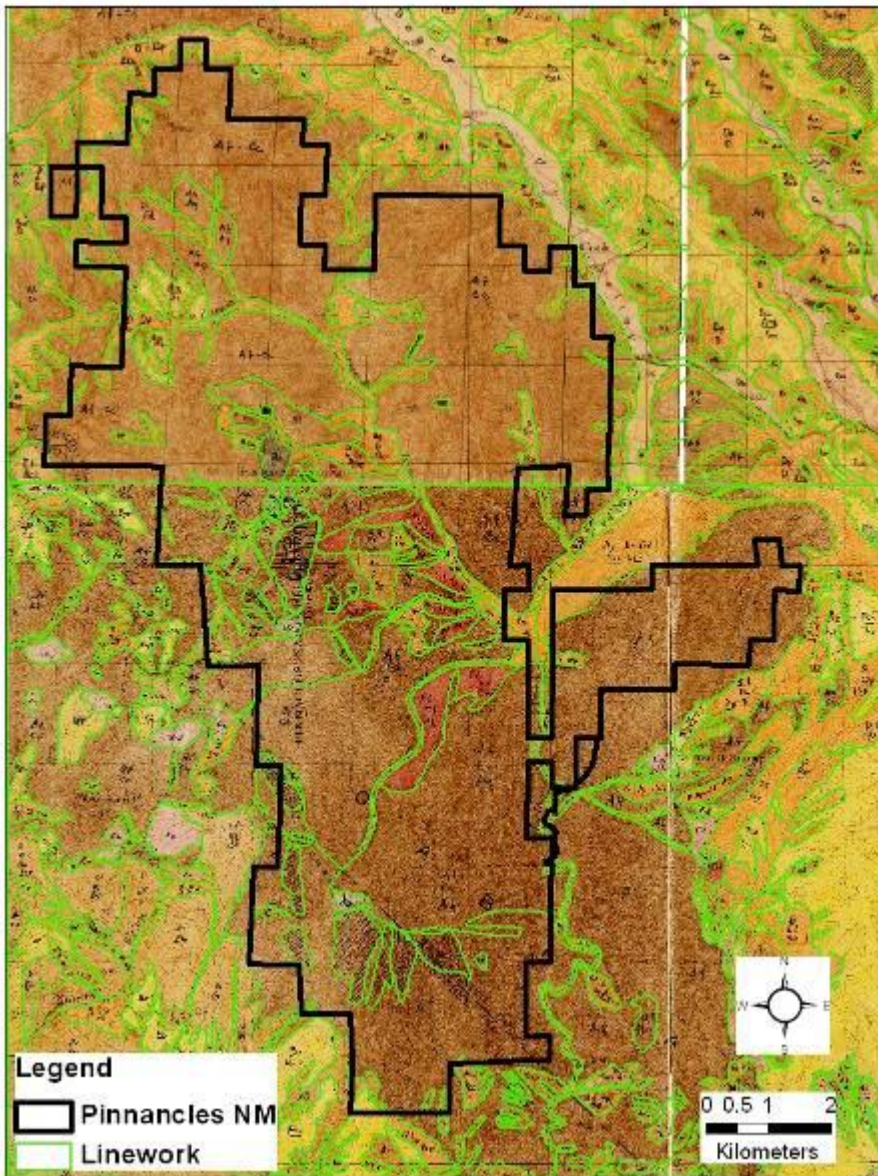


Figure 3c. This image shows the extent of the Pinnacles National Monument and Wieslander VTM tiles.

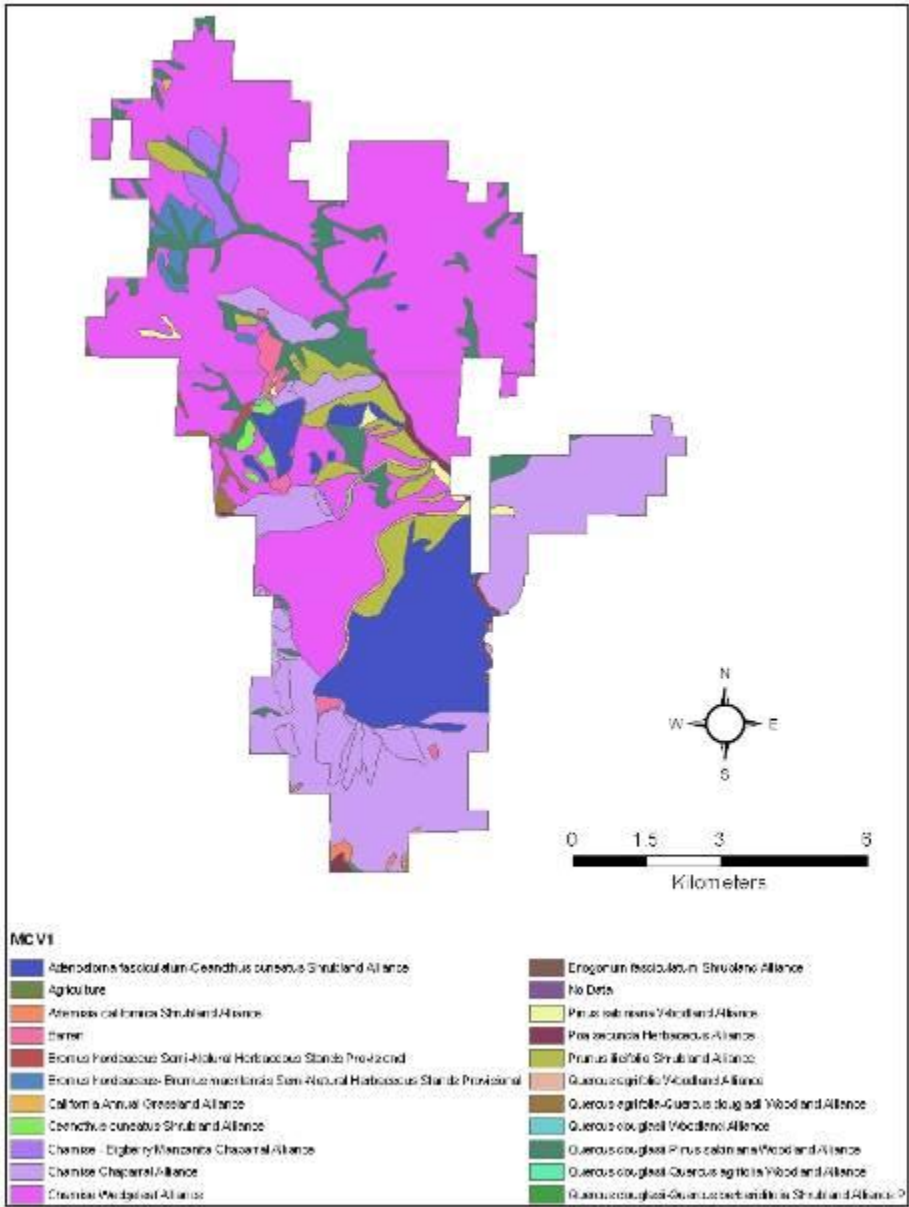


Figure 5a. . Map of assigned species aggregations to California Manual of Vegetation classes (Sawyer and Keeler-wolf 2009).

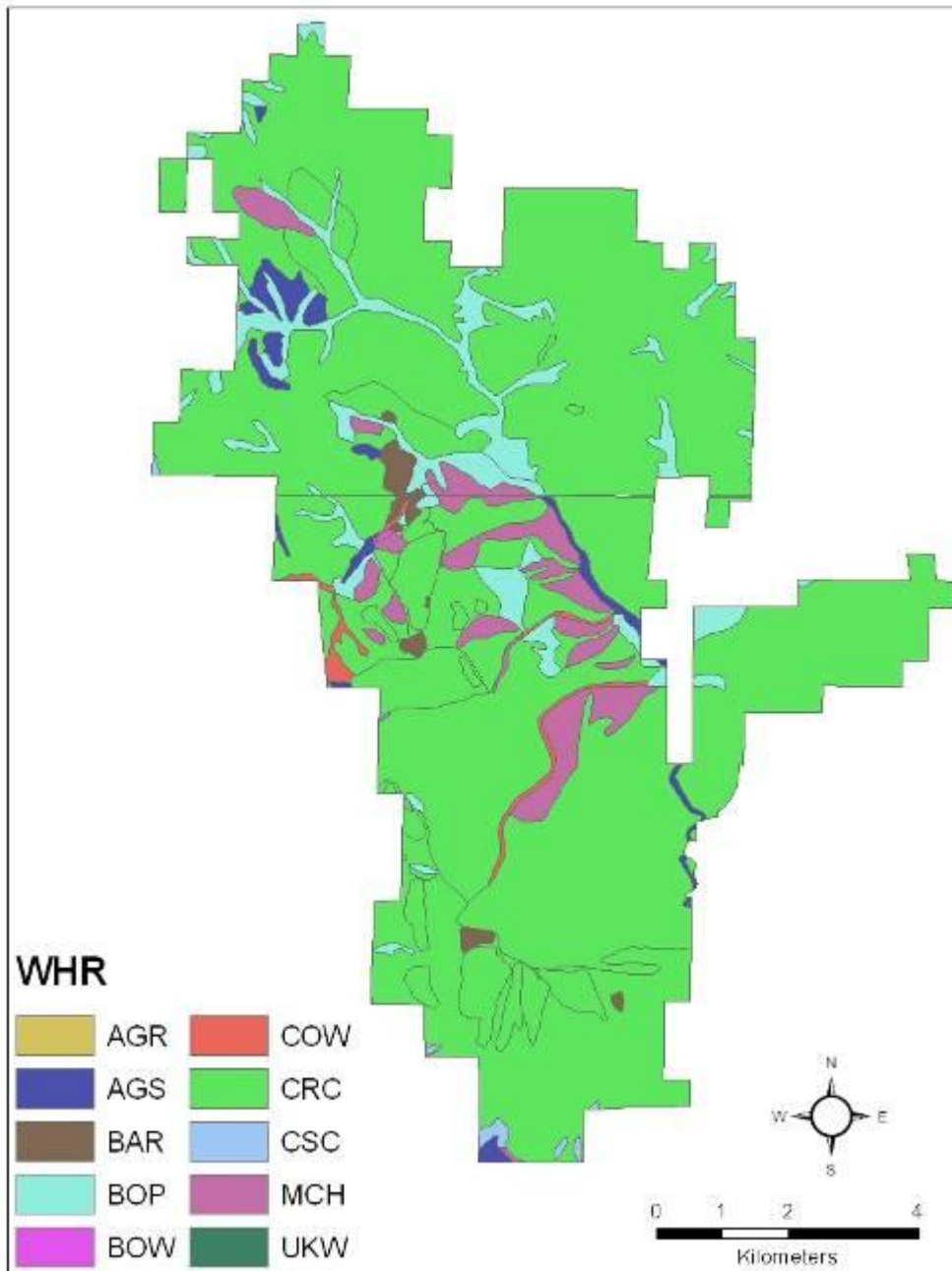


Figure 5b. Map of assigned species aggregations to California Wildlife Habitat Relationship (WHR) Models (California Department of Fish and Game 2004).

Table 1. The size class distribution of vegetation mapping units surveyed in the 1930s by the Wieslander VTM mapping crews. The values shown are for the entire extent of both quads. Of the six largest polygons, three are grasslands, one is agriculture, one a blue oak woodland (*Quercus douglasii*) and one a chamise chaparral (*Adenostoma fasciculatum*). The two polygons over 100 km² are grasslands. Note that the size distribution between polygons found in the Monument and those on the entire quads is similar. Also note that use of these maps for resource management analysis will likely be most effective when considering polygons from 2-128 ha in size.

Size Class	# Polygons in Quads 104D & 107A	# Polygons in PINN
0-1 ha	14	1
1-2 ha	62	7
2-4 ha	220	15
4-8 ha	317	17
8-16 ha	312	19
16-32 ha	284	20
32-64 ha	190	17
64-128 ha	120	12
128-256 ha	63	4
256-512 ha	40	1
512-1024 ha	16	6
1024-2048 ha	5	5
2048-4096 ha	2	6
4096-8192 ha	2	0
> 8192 ha	2	1

The extent of different Manual of California Vegetation Types (MCV; Sawyer and Keeler Wolf 1995) and California Wildlife Habitat Relationship (WHR; California Department of Fish and Game 2004) vegetation types is presented for Pinnacles National Monument (Table 2) and for the extent of the two quadrangles digitized for this contract (Appendix 1). Note that a second Manual of California Vegetation (Sawyer and Keeler Wolf 2009) was published while our work was ongoing. We also provide the vegetation extents according to that manual.

The accompanying digital data include a GIS of the vegetation polygons pulled from the original maps. This GIS contains all the species recorded by the VTM crews, and the final vegetation types according to the three classifications listed above. The GIS can be used to examine what the vegetation type of any given polygon is, or what species comprised the dominant species in that polygon (**Figure 4**). Details of the dominance ranking within polygons are given in Thorne et al. (2008) and in the methods manual.

The basic information for interpretation goes as follows: 1) a single species in a polygon must cover at least 80% of the area; 2) two or more species in a polygon, each species occupies at least 20% of the area; 3) species in different strata, such as shrubs and grasses, represent a mosaic polygon in which the species from each strata are listed in rank order for that polygon, within their respective strata. Polygons with cross hatching indicate areas of early seral condition due to fire or logging, depending on the angle of the cross hatching. We also are including a pdf of the field manual provided to the VTM crews who conducted the original maps and also a transcription of an interview with Albert Wieslander, who ran the mapping project. This interview was conducted towards the end of his life, and some sections provide insight into how he perceived the VTM data might be used over time.

Table 2. This table presents the extent of different vegetation types found within the borders of Pinnacles National Monument. The top table contains the extents according to the 1995 Manual of California Vegetation, the middle table contains the extents according to the 2009 Manual of California, and the bottom table contains the extents according to the California Wildlife Habitat Relationship landcover classes. Rows in yellow reflect vegetation types that were either added or lost between classifications. Rows in pink represent types that were identified as secondary vegetation types within mosaic polygons. For Pinnacles this was only identified for Salix dominated vegetation.

MCV1 1995 Edition PINN	Total area MCV1 1995 Edition PINN ha	Total area MCV1 1995 Edition PINN km2	Number of polygons	Mean polygon size ha	Mean polygon size km2
Adenostoma fasciculatum-Ceanothus cuneatus Shrubland Alliance	1,071.67	10.72	11	97.42	0.97
Agriculture	0.02	0.0002	1	0.02	0.0002
Artemisia californica Shrubland Alliance	22.52	0.23	5	4.50	0.05
Barren	80.48	0.80	8	10.06	0.10
Bromus hordeaceus-Bromus madritensis Semi-Natural Herbaceous Stands Provisional	91.56	0.92	6	15.26	0.15
Bromus hordeaceus Semi-Natural Herbaceous Stands Provisional	13.88	0.14	2	6.94	0.07
California Annual Grassland Alliance	2.93	0.03	1	2.93	0.03
Ceanothus cuneatus Shrubland Alliance	45.54	0.46	5	9.11	0.09
Chamise - Bigberry Manzanita Chaparral Alliance	125.29	1.25	3	41.76	0.42
Chamise Chaparral Alliance	2,159.21	21.59	19	113.64	1.14
Chamise Wedgeleaf Alliance	4,465.28	44.65	12	372.11	3.72
Eriogonum fasciculatum Shrubland Alliance	2.54	0.03	1	2.54	0.03
No Data	0.27	0.00	1	0.27	0.00
Pinus sabiniana Woodland Alliance	52.38	0.52	6	8.73	0.09
Poa secunda Herbaceous Alliance	59.82	0.60	3	19.94	0.20

Prunus ilicifolia Shrubland Alliance	403.58	4.04	13	31.04	0.31
Quercus agrifolia Woodland Alliance	40.49	0.40	3	13.50	0.13
Quercus agrifolia- Quercus douglasii Woodland Alliance	31.75	0.32	1	31.75	0.32
Quercus douglasii Woodland Alliance	4.27	0.04	4	1.07	0.01
Quercus douglasii- Pinus sabiniana Woodland Alliance	617.25	6.17	19	32.49	0.32
Quercus douglasii- Quercus agrifolia Woodland Alliance	0.24	0.0024	1	0.24	0.0024
Quercus douglasii- Quercus berberidifolia Shrubland Alliance P	2.86	0.03	1	2.86	0.03
MCV2 1995 Edition PINN	Total area MCV2 1995 Edition PINN ha	Total area MCV2 1995 Edition PINN km2	Number of polygons	Mean polygon size ha	Mean polygon size km2
Salix Alliance P	8.22	0.08	1	8.22	0.08
MCV1 2009 Edition PINN	Total area MCV1 2009 Edition PINN ha	Total area MCV1 2009 Edition PINN km2	Number of polygons	Mean polygon size ha	Mean polygon size km2
Adenostoma fasciculatum- Ceanothus cuneatus Shrubland Alliance	1,071.67	10.72	11	97.42	0.97
Agriculture	0.02	0.0002	1	0.02	0.0002
Artemisia californica Shrubland Alliance	22.52	0.23	5	4.50	0.05
Barren	80.48	0.80	8	10.06	0.10
Bromus hordeaceus- Bromus madritensis Semi-Natural Herbaceous Stands Provisional	91.56	0.92	6	15.26	0.15
Bromus hordeaceus Semi-Natural Herbaceous Stands Provisional	13.88	0.14	2	6.94	0.07

California Annual Grassland Alliance	2.93	0.03	1	2.93	0.03
Ceanothus cuneatus Shrubland Alliance	45.54	0.46	5	9.11	0.09
Arctostaphylos glauca Shrubland Alliance	4,590.57	45.91	15	306.04	3.06
Chamise Chaparral Alliance	2,159.21	21.59	19	113.64	1.14
Eriogonum fasciculatum Shrubland Alliance	2.54	0.03	1	2.54	0.03
No Data	0.27	0.0027	1	0.27	0.0027
Pinus sabiniana Woodland Alliance	52.38	0.52	6	8.73	0.09
Poa secunda Herbaceous Alliance	59.82	0.60	3	19.94	0.20
Prunus ilicifolia Shrubland Alliance	403.58	4.04	13	31.04	0.31
Quercus agrifolia Woodland Alliance	72.24	0.72	4	18.06	0.18
Quercus douglasii Woodland Alliance	624.63	6.25	25	24.99	0.25
MCV2 1995 Edition PINN	Total area MCV2 1995 Edition PINN ha	Total area MCV2 1995 Edition PINN km2	Number of polygons	Mean polygon size ha	Mean polygon size km2
Salix Alliance P	8.22	0.08	1	8.22	0.08
WHR1 1995 Edition PINN	Total area WHR 1995 Edition ha	Total area WHR 1995 Edition km2	Number of polygons	Mean polygon size ha	Mean polygon size km2
Agriculture	0.02	0.0002	1	0.02	0.0002
Annual Grasslands	168.20	1.68	12	14.02	0.14
Barren	80.48	0.80	8	10.06	0.10
Blue Oak Foothill Pine	669.87	6.70	26	25.76	0.26
Blue Oak Woodland	4.27	0.04	4	1.07	0.01
Coastal Oak Woodland	72.24	0.72	4	18.06	0.18
Chamise-Redshank Chaparral	7,821.46	78.21	45	173.81	1.74
Coastal Scrub	25.06	0.25	6	4.18	0.04
Mixed Chaparral	451.97	4.52	19	23.79	0.24

Unknown	0.27	0.0027	1	0.27	0.0027
WHR2 1995 Edition PINN	Total area WHR 1995 Edition ha	Total area WHR 1995 Edition km2	Number of polygons	Mean polygon size ha	Mean polygon size km2
Valley Foothill Riparian	8.22	0.08	1	8.22	0.08

6) References

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Appendix 1. These tables show the extent of vegetation on the two quadrangles containing Pinnacles National Monument. The top table contains the extents according to the 1995 Manual of California Vegetation, the middle table contains the extents according to the 2009 Manual of California, and the bottom table contains the extents according to the California Wildlife Habitat Relationship landcover classes. Rows in yellow reflect vegetation types that were either added or lost between classifications. Rows in pink represent types that were identified as secondary vegetation types within mosaic polygons.

MCV1 1995 Edition Quads 104D and 107A	Total Area by MCV1 1995 Edition Quads 104D and 107A ha	Total Area by MCV1 1995 Edition Quads 104D and 107A km2	Number of polygons	Mean Polygon size ha	Mean Polygon size km2
Adenostoma fasciculatum-Ceanothus cuneatus Shrubland Alliance	1,420.10	14.20	14	101.44	1.01
Adenostoma fasciculatum-Salvia mellifera Shrubland Alliance	4.21	0.04	2	2.10	0.02
Aesculus californica Woodland Alliance	28.20	0.28	3	9.40	0.09
Agriculture	14,475.20	144.75	98	147.71	1.48
Artemisia californica Shrubland Alliance	3,304.70	33.05	181	18.26	0.18
Artemisia californica-Eriogonum fasciculatum Shrubland Alliance	2,184.39	21.84	61	35.81	0.36
Artemisia californica-Salvia mellifera Shrubland Alliance	3,849.25	38.49	70	54.99	0.55
Baccharis salicifolia Shrubland Alliance	1,042.19	10.42	13	80.17	0.80
Barren	332.65	3.33	41	8.11	0.08
Bromus hordeaceus-Bromus madritensis Semi-Natural Herbaceous Stands Provisional	290.31	2.90	11	26.39	0.26
Bromus hordeaceus Semi-Natural Herbaceous Stands Provisional	163.61	1.64	12	13.63	0.14
California Annual Grassland Alliance	22,268.48	222.68	127	175.34	1.75
Ceanothus cuneatus Shrubland Alliance	45.53	0.46	5	9.11	0.09

Chamise - Bigberry Manzanita Chaparral Alliance	657.14	6.57	8	82.14	0.82
Chamise Chaparral Alliance	10,666.54	106.67	202	52.54	0.53
Chamise Wedgeleaf Alliance	8,502.84	85.03	29	293.20	2.93
Common Rush Riparian Grassland	78.53	0.79	5	15.71	0.16
Distichlis spicata Herbaceous Alliance	38.43	0.38	1	38.43	0.38
Dry Wash Habitat P	1,230.83	12.31	1	1,230.83	12.31
Eriodictyon californicum Shrubland Alliance	14.03	0.14	1	14.03	0.14
Eriogonum fasciculatum Shrubland Alliance	606.08	6.06	20	30.30	0.30
Juniperus californica Woodland Alliance	189.26	1.89	12	15.77	0.16
Lepidospartum squamatum Shrubland Alliance	7.12	0.07	1	7.12	0.07
Lotus scoparius Shrubland Alliance	34.51	0.35	3	11.50	0.12
No Data	6.11	0.06	4	1.53	0.02
Pinus coulteri Woodland Alliance	3.40	0.03	1	3.40	0.03
Pinus lambertiana Forest Alliance	0.71	0.01	1	0.71	0.01
Pinus sabiniana Woodland Alliance	365.63	3.66	22	16.62	0.17
Poa secunda Herbaceous Alliance	23,675.03	236.75	110	215.23	2.15
Populus fremontii Forest Alliance	196.02	1.96	6	32.67	0.33
Prunus ilicifolia Shrubland Alliance	544.11	5.44	18	30.23	0.30
Quercus agrifolia Woodland Alliance	83.30	0.83	6	13.88	0.14
Quercus agrifolia- Quercus douglasii Woodland Alliance	194.44	1.94	8	24.31	0.24
Quercus berberidifolia Shrubland Alliance	422.59	4.23	49	8.62	0.09
Quercus berberidifolia- Adenostoma fasciculatum	20.91	0.21	1	20.91	0.21

Shrubland Alliance					
Quercus berberidifolia-Ceanothus cuneatus Shrubland Alliance	156.66	1.57	4	39.17	0.39
Quercus douglasii Aesculus californica Woodland Alliance	705.02	7.05	11	64.09	0.64
Quercus douglasii Woodland Alliance	6,965.02	69.65	239	29.02	0.29
Quercus douglasii-Juniperus californica Woodland Alliance P	83.66	0.84	4	20.91	0.21
Quercus douglasii-Pinus sabiniana Woodland Alliance	15,087.86	150.88	115	131.20	1.31
Quercus douglasii-Pinus sabiniana/Ceanothus cuneatus Woodland Alliance	338.53	3.39	1	338.53	3.39
Quercus douglasii-Quercus agrifolia Woodland Alliance	1,033.27	10.33	11	93.93	0.94
Quercus douglasii-Quercus berberidifolia Shrubland Alliance P	926.93	9.27	26	35.65	0.36
Quercus douglasii-Quercus berberidifolia Woodland Alliance P	691.18	6.91	19	36.38	0.36
Quercus douglasii-Quercus lobata Woodland Alliance	52.20	0.52	1	52.20	0.52
Quercus douglasiiQuercus wislizeni Woodland Alliance	38.55	0.39	2	19.27	0.19
Quercus wislizeni Shrubland Alliance	695.21	6.95	26	26.74	0.27
Salix Alliance	5.26	0.05	1	5.26	0.05
Salvia mellifera Shrubland Alliance	471.76	4.72	39	12.10	0.12
Valley Oak Alliance	113.31	1.13	2	56.66	0.57

MCV2 1995 Edition Quads 104D and 107A	Total Area by MCV2 1995 Edition Quads 104D and 107A ha	Total Area by MCV2 1995 Edition Quads 104D and 107A km2	Number of polygons	Mean Polygon size ha	Mean Polygon size km2
Artemisia californica- Eriogonum fasciculatum Shrubland Alliance	55.68	0.56	3	18.56	0.19
Quercus berberidifolia Shrubland Alliance	127.79	1.28	8	15.97	0.16
Salix Alliance P	8.22	0.08	1	8.22	0.08

MCV1 2009 Edition Quads 104D and 107A	Total Area by MCV1 2009 Edition Quads 104D and 107A ha	Total Area by MCV1 2009 Edition Quads 104D and 107A km2	Number of polygons	Mean Polygon size ha	Mean Polygon size km2
Adenostoma fasciculatum- Ceanothus cuneatus Shrubland Alliance	1,420.10	14.20	14	101.44	1.01
Adenostoma fasciculatum-Salvia mellifera Shrubland Alliance	4.21	0.04	2	2.10	0.02
Adenostoma fasciculatum Shrubland Alliance	19,169.38	191.69	231	82.63	0.83
Aesculus californica Woodland Alliance	28.20	0.28	3	9.40	0.09
Agriculture	14,475.20	144.75	98	147.71	1.48
Arctostaphylos glauca Shrubland Alliance	657.14	6.57	8	82.14	0.82
Artemisia californica Shrubland Alliance	3,304.70	33.05	181	18.26	0.18
Artemisia californica- Eriogonum fasciculatum Shrubland Alliance	2,184.39	21.84	61	35.81	0.36
Artemisia californica- Salvia mellifera Shrubland Alliance	3,849.25	38.49	70	54.99	0.55

Avena barbata Semi-Natural Herbaceous Stands	145.58	1.46	8	18.20	0.18
Baccharis salicifolia Shrubland Alliance	1,042.19	10.42	13	80.17	0.80
Barren	332.65	3.33	41	8.11	0.08
Bromus hordeaceus-Bromus madritensis Semi-Natural Herbaceous Stands Provisional	290.31	2.90	11	26.39	0.26
Bromus hordeaceus Semi-Natural Herbaceous Stands Provisional	163.61	1.64	12	13.63	0.14
California Annual Grassland Alliance	22,122.90	221.23	119	185.91	1.86
Ceanothus cuneatus Shrubland Alliance	45.53	0.46	5	9.11	0.09
Common Rush Riparian Grassland	78.53	0.79	5	15.71	0.16
Distichlis spicata Herbaceous Alliance	38.43	0.38	1	38.43	0.38
Dry Wash Habitat P	1,230.83	12.31	1	1,230.83	12.31
Eriodictyon californicum Shrubland Alliance	14.03	0.14	1	14.03	0.14
Eriogonum fasciculatum Shrubland Alliance	606.08	6.06	20	30.30	0.30
Juniperus californica Woodland Alliance	189.26	1.89	12	15.77	0.16
Lepidospartum squamatum Shrubland Alliance	7.12	0.07	1	7.12	0.07
Lotus scoparius Shrubland Alliance	34.51	0.35	3	11.50	0.12
No Data	6.11	0.06	4	1.53	0.02
Pinus coulteri Woodland Alliance	3.40	0.03	1	3.40	0.03
Pinus lambertiana Forest Alliance	0.71	0.01	1	0.71	0.01
Pinus sabiniana Woodland Alliance	365.63	3.66	22	16.62	0.17
Poa secunda Herbaceous Alliance	23,675.03	236.75	110	215.23	2.15
Populus fremontii Forest Alliance	196.02	1.96	6	32.67	0.33

Prunus ilicifolia Shrubland Alliance	544.11	5.44	18	30.23	0.30
Quercus agrifolia Woodland Alliance	277.74	2.78	14	19.84	0.20
Quercus berberidifolia Shrubland Alliance	579.25	5.79	53	10.93	0.11
Quercus berberidifolia- Adenostoma fasciculatum Shrubland Alliance	20.91	0.21	1	20.91	0.21
Quercus douglasii Woodland Alliance	25,922.21	259.22	429	60.28	0.60
Quercus lobata Woodland Alliance	113.31	1.13	2	56.66	0.57
Quercus wislizeni Shrubland Alliance	695.21	6.95	26	26.74	0.27
Salix Alliance	5.26	0.05	1	5.26	0.05
Salvia mellifera Shrubland Alliance	471.76	4.72	39	12.10	0.12

WHR1 2009 Edition Quads 104D and 107A	Total Area by WHR1 2009 Edition Quads 104D and 107A ha	Total Area by WHR1 2009 Edition Quads 104D and 107A km2	Number of polygons	Mean Polygon size ha	Mean Polygon size km2
Agriculture	14,475.20	144.75	98	147.71	1.48
Annual Grasslands	46,397.43	463.97	260	178.45	1.78
Barren	1,563.49	15.63	42	37.23	0.37
Blue Oak Foothill Pine	16,094.22	160.94	147	109.48	1.09
Blue Oak Woodland	9,203.00	92.03	276	33.22	0.33
Coastal Oak Woodland	277.74	2.78	14	19.84	0.20
Chamise-Redshank Chaparral	21,250.83	212.51	255	83.01	0.83
Coastal Scrub	10,457.81	104.58	375	27.89	0.28
Fresh Emergent Wetland	1,309.99	13.10	30	43.67	0.44
Mixed Chaparral	2,825.97	28.26	130	21.74	0.22
Montane Hardwood Conifer	3.40	0.03	1	3.40	0.03
Montane Hardwood	28.20	0.28	3	9.40	0.09
Saline Emergent Wetland	38.43	0.38	1	38.43	0.38
Sierran Mixed Conifer	0.71	0.01	1	0.71	0.01
Unknown	69.80	0.70	6	11.63	0.12

Valley Oak Woodland	113.31	1.13	2	56.66	0.57
Valley Foothill Riparian	201.28	2.01	7	28.75	0.29
WHR2 2009 Edition Quads 104D and 107A	Total Area by WHR2 2009 Edition Quads 104D and 107A ha	Total Area by WHR2 2009 Edition Quads 104D and 107A km2	Number of polygons	Mean Polygon size ha	Mean Polygon size km2
Coastal Scrub	55.68	0.56	3	18.56	0.19
Mixed Chaparral	127.79	1.28	8	15.97	0.16
Valley Foothill Riparian	8.22	0.08	1	8.22	0.08