The 2016 update to the Napa Vegetation Map of 2004

2019

By

James H. Thorne

Ryan M. Boynton

Anne Merritt

Sloane K. Rice

Emad Kalalipour

Jillian Patrick

Department of Environmental Science and Policy

University of California

Davis, CA. 95616

Suggested citation

Thorne JH, RM Boynton, A Merritt, SK Rice, E Kalalipour, J Patrick. 2019. The 2016 update to the Napa Vegetation Map of 2004. University of California, Davis.

Introduction

Napa County has used a 2004 edition vegetation map produced using the Manual of California Vegetation classification system (Thorne et al. 2004[1]) as one of the input layers for land use decisions and policy. The county decided to update the map because of its utility. A University of California, Davis (UCD) group was engaged to produce the map. This report is meant to provide context for the new version, delivered to the county on 4, June 2019.

The earlier map used black and white digital orthophoto quadrangles from 1993, with a pixel resolution of 3 meters. This image was delineated using a heads up digitization technique produced by ASI (Aerial Services Incorporated). The resulting polygons provided vegetation and landcover attributes following the classification system used by California State Department of Fish and Wildlife mappers in the Manual of California Vegetation[2]. The 2004 effort included a brief field campaign in which surveyors drove accessible roads and verified or corrected the dominant vegetation of polygons adjacent to roadways or visible using binoculars. There were no field relevé or rapid assessment plots conducted.

This updated version uses a 2016 edition of 1 meter color aerial imagery taken by the National Agriculture Imagery Program (NAIP; https://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/index) as the base imagery. It therefore permits an assessment of the change in the patterns of vegetation over 23 years in the county.

In consultation with the county we decided to use similar methods to the previous mapping effort, in order to preserve the capacity to assess change in the county over time. This meant forgoing recent data and innovations in remote sensing such as were used in a concurrent project that mapped Sonoma County[3] including the use of LiDAR and Ecognition's segmentation of imagery to delineate stands. However, the use of such technologies would have made it more difficult to track land cover change in Napa county, because differences in publication dates would not be definitively attributable to actual land cover change or changes in methodology. The overall cost of updating the map in the way was approximately 20% of the cost of the Sonoma vegetation mapping program.

Therefore, we started with the original map, and on-screen inspections of the polygons to determine if change had occurred. If so, the boundaries and attributes were modified in the new edition of the map. We also used the time series of imagery available on Google Earth, and the high resolution imagery available through ArcMap to further inspect many edited polygons. We conducted 3 rounds of quality assessment/quality control exercises. Funding was not available to do field assessments, but we incorporated field expertise for the Angwin Experimental Forest, reviewed vegetation types identified in the Knoxville Wildlife Area from a 2014 map incorporating 29 of them, and used overlap with the Sonoma Vegetation Map to assess some polygons thought to contain redwood trees (*Sequoia sempervirens*) along the western side of Napa County.

---

[1]Thorne, J.H., J. A. Kennedy, T. Keeler-Wolf J. F. Quinn, M. McCoy, J. Menke. 2004. A new vegetation map of Napa County using the Manual of California Vegetation Classification and its comparison to other digital vegetation maps. *Madroño* 51(4) 343-363.

[2] Sawyer, J.O., T. Keeler-Wolf, and J.M. Evens. 2009. A Manual of California Vegetation, Second Edition. California Native Plant Society, Sacramento, CA.

[3] Sonoma Vegetation Mapping Program: http://sonomavegmap.org/.

This report describes the methods used, including an appendix containing our working "Editing Manual". This report also provides a short summary of the extents of vegetation and landcover types that are identified.

Methods

Distinct parts of the remapping effort

1. Updating polygon delineations
    a. Reviewing/Updating the county vegetation map
        i. The process began by reviewing all polygons. Both the polygon boundaries and the vegetation attributes of the 2004 vegetation map were reviewed and edited/updated as needed to reflect what was seen in the 2016 imagery. The boundaries were reviewed to verify that they correctly delineated the dividing line between different vegetation types. Three attributes were reviewed: vegetation type, vegetation size, and vegetation density. If a polygon contained one or more structures, it was given a WUI code and if it overlapped with a fire perimeter it was assigned a Burn Date and Burn Type.
            1. If an editor was unsure what to do with a polygon, they reviewed it with 1 or more people on the editing team. This usually solved the question(s) the original editor had, but if we were still unsure what vegetation attribute to assign the polygon, a comment and/or flag for a field check was assigned to the polygon.
            2. While doing this first pass at the polygons, fire perimeters were displayed on the map because vegetation size and density are likely to change after a recent fire.
        ii. After the first pass of polygons was completed, a second review was done for areas that are the most likely to have changed composition since 2004. These areas were:
            1. Where urban has either been added or removed between 2004 and 2016
                a. Source: Farmland Mapping and Monitoring Program's Important Farmland Map
        iii. Zones of high plant water stress. To estimate this we used outputs from the Basin Characteristic Model – Average yearly climatic water deficit between 1980-2010. We reviewed the areas that were within the top 10% of the range of deficit values for the county.
        iv. The reviewing/editing process is explained in detail in the Editing Manual (Appendix A).

    b. We reviewed the GIS layers from Napa County and used the following in the development of the updated version of the land cover polygons:

i. 2016 NAIP Imagery – color imagery that was displayed in the background of the vegetation polygons while they were reviewed and/or edited.
ii. Agriculture – a countywide shapefile of agriculture locations was used to identify agriculture areas. The county map tracks agriculture over time (1993-2016) so we used this shapefile to identify agriculture areas developed between 2011-2016 and added these to the county land cover map (because agriculture had been previously been updated through 2010).
iii. Water bodies – a countywide shapefile of water bodies. Most, if not all, of these were already incorporated in the map, so it was displayed while polygons were being reviewed in case they identified water bodies that needed to be added to the land cover map.
iv. Biological Studies – Scanned studies were provided by the county if they included a land cover mapping effort. These were used to review and update the countywide map for the areas covered by the reports.
v. Vegetation update exclusion areas – these are areas the county did not want us to focus on (mostly urban and agriculture areas). It was displayed while the polygons were being reviewed/updated so editors knew these polygons likely have the correct polygon boundary and attributes, so they could review them more quickly than surrounding polygons.

c. Independently produced data, imagery, and mapping efforts from five sources were assembled and reviewed for utility in the updating process:
    i. Sonoma county vegetation map
        1. The Sonoma county vegetation map overlapped with the Napa county vegetation map by about 1000 feet on the western side of the county. We used their map to identify potential redwood stands. We then examined our imagery. If the signature whorl of tree branches could be observed we added the redwood attribute and in some cases modified the polygon boundaries to the 2016 Napa vegetation map.
    ii. Knoxville wildlife area
        1. A vegetation map produced for the Knoxville Wildlife Area was created by the California Department of Fish and Wildlife in 2014, using imagery from 2009-2012[4]. This map was made available in February 2019, near the end of our production process. While we had previously reviewed the report, we were only able to work with the actual map starting in May when it was found online. In consultation with the county we determined to review 29 of the 53 vegetation and land cover types recorded in that map, and included 24 of them in the new Napa county map in one way or another (Appendix B). The other types were already documented in our map or were a minor change which as noted in the comments column of our map. We adjusted polygon boundaries,

[4] https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=164824; VEGETATION MAP AND CLASSIFICATION OF KNOXVILLE WILDLIFE AREA, NAPA COUNTY, CALIFORNIA. Department of Fish and Wildlife, Biogeographic Data Branch. January 2019.

particularly for grassland areas because the Knoxville map used more detailed imagery.

iii. Pacific Union College Experimental Forest map
    1. We used their map of existing vegetation to identify redwood stands and added these to the county map. The University's map was more spatially generalized than our map, but they had the advantage of field checking the polygons and could confirm the presence of potentially the eastern-most stand of coast redwood trees in California.

iv. Amber Manfree – Agriculture rock pile locations
    1. We used a shapefile created by Dr Manfree that identified ~15 rock piles in the county and added them to the map with a new landcover type (PI Code). These piles are created when a field is deep-ripped, typically for installation of a vineyard.

v. Google Earth Pro
    1. Google Earth Pro was used when the 2016 NAIP imagery was unclear or to look at imagery over time (years). We made extensive use of the time slider function in Google Earth. It was particularly helpful for identifying vegetation that was seasonally deciduous.

2. Attribution
    a. We used the previous vegetation map as a guide for the attribution of vegetation types
        i. If the imagery showed no change in the shape of the polygon or the composition of the vegetation within it, the polygon retained the attributes from the original 2004 map.
        ii. If the imagery showed a change in the vegetation community boundary, then the polygon boundary was changed to match the imagery.
        iii. If the imagery showed a change in the vegetation (type, size or density), these attributes were updated in the 2016 map.
        iv. If the imagery showed a change in the shape of the polygon and the vegetation within it, the boundary and attributes were updated in the 2016 map.
        v. All polygons were assigned a 'ChangeFlag' that tracks the changes (if any) to the polygon from 2004 to 2016. It could be (1) No Change, (2) change in polygon attributes, (3) change in polygon boundary, or (4) change in both polygon attributes and boundary. A unique ChangeFlag of 5 was used to identify polygons that changed from 4306 to 4304 or from 4305 to 4303.
        We also included ChangeFlags specific to the Knoxville Vegetation Map, as follows:
        ChangeFlags 6 and 7 track updates made to the county map from the Knoxville Vegetation Map. ChangeFlag 6 was used if a polygon was updated to an existing vegetation type, 7 was used if the polygon was updated to a new vegetation type that didn't previously exist in the 2016 Napa vegetation map.

    b. We used the county's agriculture map to identify areas that have been converted to vineyards or other agriculture types and embedded them in the map.

c. Vegetation Classification

Several vegetation Alliance names within the state's MCV classification system have been added since the 2004 edition of the Napa vegetation map. We conducted a crosswalk of the names in the Napa 2016 vegetation map to link them to the current MCV classification system.

We updated the landcover classification used for the 2016 Napa vegetation map to the newest (version 2) Manual of California Vegetation (MCV) mapping protocols, checked new alliance and association names on the MCV website, and discussed the classification with Dr. Todd Keeler Wolf, lead vegetation ecologist for the CA Department of Fish and Wildlife. Of the 67 types identified in the county, 35 are directly linked to a MCV description. Another 7 are landcover types that are similar to MCV categories. The Napa map names serpentine-affiliated vegetation, which is not distinguished in the MCV. We retained the serpentine and non-serpentine information in the names for the 2016 edition because these can be helpful in locating serpentine endemic plants. Some serpentine polygons may have species that correspond to species used in MCV classes that also suggest serpentine, but our map does not have the taxonomic resolution to capture those. Ten categories are linked to landcover types that are not predominantly vegetated. Finally, there are 15 vegetation types named in the Napa map that do not have MCV Alliance or Association names. Most of these would be now be classed as "Group" in the NVCS classification. These types were previously (2004 edition) called Super Alliances or NFD Super Alliance (NFD = Not Formally Defined). We found that some of the types that are now linked to explicit definitions in the MCV became Alliance and Association or Provisional Alliance and Association types. We include a column indicating at what level of detail in the classification tree each polygon resides, with most in Group, Alliance or Association.

Seven new alliances were added to the 2016 map, 2 of which have not been previously described:

> Agricultural Rock Pile – large rock piles near agriculture fields. These are the result of deep ripping for new vineyards. They were originally brought to our attention by Dr. Amber Manfree.
>
> Occasionally Flooded Grasslands & Forbes – 2 polygons were given this landcover type. These polygons appear to be occasionally manually flooded areas below the city of Napa's effluent settling ponds. The species in this area were not known to us and the polygons have been flagged for a field check.

and 5 that are described in MCV:

> Madrone Forest Alliance – The *Arbutus menziesii* Forest Alliance occurs where *Arbutus menziesii* is the dominant or co-dominant tree in the canopy with *Acer macrophyllum, Lithocarpus densiflorus, Pseudotsuga menziesii. Quercus*

agrifolia, Q. chrysolepis, Q. kelloggii, Q. wislizeni, and *Umbellularia californica*. Shrub layer is sparse to intermittent. Herbaceous layer is sparse. The Alliance is described on this webpage - http://vegetation.cnps.org/alliance/15

Purple Needlegrass Grassland Alliance: The *Nassella* spp. - *Melica* spp. Herbaceous Alliance is a perennial grass Alliance. The Alliance is described on this webpage - http://vegetation.cnps.org/alliance/536

Bunch Forming Grasses Group: The Group level classification is more generalized than the Alliance or Association. In this case unknown species of bunch grasses are mentioned. These are typically perennial and native where mapped in California.

California Bay - Interior Live Oak Association: This association adds the second name of *Quercus wislizeni.* The *Umbellularia californica* Forest Alliance contains *Umbellularia californica* as a dominant or co-dominant in the tree or tall shrub canopy with *Acer macrophyllum, Aesculus californica, Alnus rhombifolia, Alnus rubra, Arbutus menziesii, Corylus cornuta, Juglans californica, Notholithocarpus densiflorus, Pinus sabiniana, Platanus racemosa, Pseudotsuga menziesii, Quercus agrifolia, Quercus chrysolepis, Quercus wislizeni* and *Sequoia sempervirens*.
This association is within the alliance for California Bay, as described on this webpage - http://vegetation.cnps.org/alliance/97

California Buckeye Alliance: The *Aesculus californica* Woodland Alliance contains Aesculus californica as a dominant or co-dominant in the tree canopy with *Fraxinus dipetala, Heteromeles arbutifolia, Pinus sabiniana, Prunus ilicifolia, Quercus wislizeni* and *Umbellularia californica*. The Alliance is described on this webpage - http://vegetation.cnps.org/alliance/12

For a list of the Napa Vegetation Types, how the names have changed from the 2004 edition, and what level of the MCV-NVCS classification system each name was given in the 2016 Napa vegetation map, please see Appendix C.

d. We now include a column in the GIS that identifies the level of classification for each type.

3. Post-mapping accuracy assessment
    a. Informal QAQC: reviewing each other's edits
        i. Polygons were randomly selected by one reviewer on another person's edits. A half hour was dedicated to each ChangeFlag type. If the reviewer disagreed with the editors edit(s), they made a note and both of them reviewed the polygon together to get a consensus on the edit to the polygon.
    b. Accuracy of the updated polygon boundaries and attributes
        i. 303 polygons were randomly selected in the county and given an accuracy score ranging from 1-5, with a 1 being "Definitely agree" and 5 being "Definitely Don't

agree". Polygons were scored on the accuracy of (1) the boundary, (2) the vegetation type, (3) the vegetation size, (4) the vegetation density, and (5) the WUI code.

ii. Summary of the polygon QAQC scores

Score	Description	2016 Polygon Boundary Accuracy	2016 Polygon Vegetation Type Accuracy	2016 Vegetation Size Accuracy	2016 Vegetation Density Accuracy	2016 WUI Score Accuracy
1	Agreement	85%	93%	99%	79%	96%
2	Majority Agreement	9%	2%	1%	6%	3%
3	Partial Agreement	5%	3%	0%	7%	0%
4	Some errors	1%	2%	0%	5%	0%
5	Does Not Match	0%	1%	0%	3%	0%
	Total	100%	100%	100%	100%	100%

Table 1. Summary of polygon QAQC scores.

iii. For a table with all of the individual polygon scores, see Appendix D.

c. Accuracy of the historical vegetation mapping –
We examined 100 polygons that had no change and 100 polygons that we modified from the 2004 edition of the map against the updated map and the imagery used in the two maps. The intent was to determine the accuracy of the old vegetation map.

For polygons that did not change we recorded an imagery accuracy score of 96.1%, a boundaries detail score of 87.7%, and attribute score of 98%. For polygons that did change we recorded an imagery accuracy score of 99%, a boundary accuracy score of 90.1% and an attribute accuracy score of 91.7%. These provide mean estimates of overall accuracy of the 2004 map of 97.6% for imagery, 88.9% for boundaries, and 94.9% for attributes (Appendix E).

4. Interim and secondary products
   a. Tree crown density for Oak vegetation types
      i. For 21 vegetation types (unique PI codes), random polygons from each density class were selected to estimate tree crown density in each polygon. Tree crown density was estimated for PIs with oak as a dominant tree type, as well as some PIs not containing but not dominated by oaks.
      ii. For each PI, 5 polygons were selected per density class; or for PIs which did not have at least 5 polygons per density class, all polygons in the density class were used. In each polygon, we counted the number of tree crowns, or if the polygon was very large, we counted crowns in a small sample of the polygon and used the sample to estimate tree crowns in the entire polygon. If the sample counting

method was used, this was noted. Note that because it is sometimes difficult to distinguish between oaks and other trees, we estimated total tree crowns—not necessarily just oak crowns. Once the number of tree crowns in a polygon was estimated, we divided the number of trees by polygon area to obtain an estimate of tree density (in trees/acre).

iii. Tree density was estimated for the following PIs:
- 1000 series (1101, 1122, 1123, 1124, 1201, 1202, 1221, 1222, 1223)
- 2000 series (2104, 2121, 2123, 2126, 2222, 2230)
- 3000 series (3101, 3102, 3121, 3122, 3123, 3124)

Stem Density (Trees/Acre)

		Density Class					
PI	**Descriptive Name**	**1**	**2**	**3**	**4**	**5**	**notes**
1100	Winter-Rain Sclerophyll Forests & Woodlands	43	39	18			
1101	California Bay - Madrone - Coast Live Oak - (Black Oak Big Leaf Maple)	67	70	41	23		
1122	Canyon Live Oak	34	14				
1124	Tanbark Oak	46					
1126	California Bay - Interior Live Oak	54		32	26		
1201	Coast Live Oak – Blue Oak – (Foothill Pine)	44	31	18	15	13	
1202	Interior Live Oak – Blue Oak – (Foothill Pine)	43	40	27	19	12	
1221	Coast Live Oak	27	23	21	15	15	
1222	Interior Live Oak	49	41	21	26	17	
1223	Mixed Oak	31	27	23	18	8	

2104	Foothill Pine / Mesic Non-serpentine Chaparral	59	49	24	36	34	
2121	Foothill Pine	47	41	41	23	13	
2123	Ponderosa Pine - Douglas fir forest	40	33	20			
2126	Sugar Pine – Canyon Oak		44				only 1 poly for this PI
2128	Sparse California Juniper - Canyon Live Oak - California Bay - California Buckeye / Steep Rock Outcrop	40	39	30	8	7	
2222	Douglas-fir	39	20	27	25	12	
2230	Coast Redwood	44					
3101	Valley Oak – (California Bay – Coast Live Oak - Walnut - Ash) Riparian Forest	11	18	8	13	5	
3102	Valley Oak – Fremont Cottonwood – (Coast Live Oak) Riparian Forest	17	21	12	5		
3121	Black Oak	37	46	28	16		
3122	Blue Oak	15	27	20	12	7	
3123	Valley Oak	17	14	10	7	5	
3124	Oregon White Oak	36	31	26	25	15	
3125	California Buckeye			27	17		
	Average across all Oak PI Types:	**38**	**33**	**24**	**18**	**13**	
	Standard Deviation across all Oak PI Types	**14**	**13**	**8**	**8**	**7**	

Table 2. The relative cover of the 5 Density classes are: 1 = > 60%, 2 = 40-60%, 3 = 25-40%, 4 = 10-25%, 5 = 2-10%

These counts were based off reviews of the following number of polygons per type and density class (see further detail in Appendix F):

		Density Class					
PI	**Descriptive Name**	**1**	**2**	**3**	**4**	**5**	**Total polygons sampled**
1100	Winter-Rain Sclerophyll Forests & Woodlands	5	5	5			15
1101	California Bay - Madrone - Coast Live Oak - (Black Oak Big Leaf Maple)	5	6	4	4		19
1122	Canyon Live Oak	5	5				10
1124	Tanbark Oak	5					5
1126	California Bay - Interior Live Oak	1		5	2		8
1201	Coast Live Oak – Blue Oak – (Foothill Pine)	5	4	5	5	5	24
1202	Interior Live Oak – Blue Oak – (Foothill Pine)	5	5	5	5	5	25
1221	Coast Live Oak	5	5	5	5	5	25
1222	Interior Live Oak	5	5	5	5	5	25
1223	Mixed Oak	5	5	5	5	5	25
2104	Foothill Pine / Mesic Non-serpentine Chaparral	3	5	5	5	5	23
2121	Foothill Pine	5	5	5	5	5	25
2123	Ponderosa Pine - Douglas fir forest	5	1	1			7
2126	Sugar Pine – Canyon Oak		1				1
2128	Sparse California Juniper - Canyon Live Oak - California Bay - California Buckeye / Steep Rock Outcrop	5	5	5	5	5	25
2222	Douglas-fir	5	5	5	5	5	25
2230	Coast Redwood	5					5
3101	Valley Oak – (California Bay – Coast Live Oak - Walnut - Ash) Riparian Forest	5	5	5	5	1	21
3102	Valley Oak – Fremont Cottonwood – (Coast Live Oak) Riparian Forest	5	5	5	1		16
3121	Black Oak	5	5	5	2		17

3122	Blue Oak	5	5	5	5	5	25
3123	Valley Oak	10	10	11	10	10	51
3124	Oregon White Oak	5	5	5	5	1	21
3125	California Buckeye			5	5		10

Table 3. Number of Samples (the number of polygons where trees were counted)

b. BCM data
    i. 6 Hydro-climatic variables from the Basin Characterization Model (BCM) were averaged for each polygon within the vegetation map. These variables are Minimum temperature, Maximum temperature, Precipitation, Climatic Water Deficit, Recharge and Runoff. We provide the annual 30-year means for each of these variables. We provide this data for an historic time period (1981-2010) and for the projected 2010-2039 time period. Two futures were selected for the future projection: CNRM-CM5 and MIROC-ESM, both under the RCP8.5 emission scenario. This data is provided in a table within the NapaVeg File Geodatabase. Table name = BCM_Extractions.

5. Final Map Production
    a. The final map has clean vector topology (no overlaps, splinters, gaps, or multipart polygons).
    b. The final map has the following fields: Shape, PI, SIZE_, DENSITY, COMMENT_, ChangeFlag, Burn_Date, WUI, Burn_Type, Area_Acres, Fieldcheck, Comments, Area_HA, NapaVegPolyID, Shape_Length, Shape_Area. Napa2016_PI_Name, MCV_NVCS_SCIENTIFIC_Name, MCV_NVCS_COMMON_Name, NVCS_Class_Level
        i. These are described at the beginning of the editing manual (Appendix A)

Results

The updated vegetation map has a distribution of 70 landcover and vegetation types, 60 dominated by natural vegetation, in 35,244 polygons across 793 square miles (507,440.9 acres).

Here is the distribution of the land cover types:

PI	Descriptive Name	Acres	Number of Polygons
1100	Winter-Rain Sclerophyll Forests & Woodlands	599.5	60
1101	California Bay - Madrone - Coast Live Oak - (Black Oak Big Leaf Maple)	18165.4	924
1122	Canyon Live Oak	667.7	36

1123	Eucalyptus	259.9	44
1124	Tanbark Oak	183.0	12
1126	California Bay - Interior Live Oak	42.9	17
1201	Coast Live Oak - Blue Oak - (Foothill Pine)	26122.5	1892
1202	Interior Live Oak - Blue Oak - (Foothill Pine)	18197.2	1323
1221	Coast Live Oak	13020.4	1687
1222	Interior Live Oak	5212.3	369
1223	Mixed Oak	29094.8	2001
1225	Madrone Forest	30.4	3
2104	Foothill Pine / Mesic Non-serpentine Chaparral	913.0	84
2121	Foothill Pine	1961.4	158
2122	Knobcone Pine	5842.1	404
2123	Ponderosa Pine - Douglas fir forest	161.4	8
2124	McNab Cypress	2398.0	142
2125	Sargent Cypress	2074.6	39
2126	Sugar Pine - Canyon Oak	3.5	1
2128	Sparse California Juniper - Canyon Live Oak - California Bay - California Buckeye / Steep Rock Outcrop	521.4	96
2201	Coast Redwood - Douglas-fir / California Bay	2883.6	101
2222	Douglas-fir	17244.3	829
2224	Douglas-fir - Ponderosa Pine	9431.2	383
2230	Coast Redwood	415.5	28
3101	Valley Oak - (California Bay - Coast Live Oak - Walnut - Ash) Riparian Forest	5734.6	258
3102	Valley Oak - Fremont Cottonwood - (Coast Live Oak) Riparian Forest	594.6	36
3121	Black Oak	2506.9	122
3122	Blue Oak	43330.4	3130
3123	Valley Oak	2861.5	355
3124	Oregon White Oak	1094.4	96
3125	California Buckeye	87.3	30
3201	White Alder (Mixed Willow - California Bay - Big Leaf Maple) Riparian Forest	977.8	49
3221	Mixed Willow	536.6	91
3223	Red Willow	7.0	4
3225	Arroyo Willow	4.3	3
4300	Sclerophyllous Shrubland	3231.0	298
4301	Scrub Interior Live Oak - Scrub Oak - (California Bay - California Ash - Birch Leaf Mountain Mahogany - Toyon - California Buckeye) Mesic East County	10965.0	1014
4302	Mixed Manzanita - (Interior Live Oak -California Bay - Chamise) West County	8120.2	895
4303	Leather Oak - White Leaf Manzanita - Chamise Xeric Serpentine	27843.3	1521
4304	Leather Oak - California Bay - Rhamnus spp. Mesic Serpentine Chaparral	4577.1	432
4305	White Leaf Manzanita - Leather Oak - (Chamise - Ceanothus spp. (Foothill Pine)) Xeric Serpentine	7285.4	572
4306	California Bay - Leather Oak - (Rhamnus spp. (Foothill Pine)) Mesic Serpentine	6993.2	469
4321	Chamise Alliance	30713.1	2893
4322	Chamise - Wedgeleaf Ceanothus	7126.1	498

4328	Yerba Santa Alliance	11.9	6
4501	Coyote Brush - California Sagebrush - (Lupine spp.)	81.2	14
4502	Sparse Bush Lupine / Annual Grasses / Rock Outcrop	17.0	14
4503	Lotus scoparius (post-burn)	31.0	3
5222	Brewer Willow (riparian and serpentine soils)	285.4	40
6100	Bunch Forming Grasses	9.3	1
6122	Purple Needlegrass	24.0	6
6402	(Bulrush - Cattail) Fresh Water Marsh	787.3	45
6403	(Carex spp. - Juncus spp - Wet Meadow Grasses)	268.1	76
6404	Californian warm temperate marsh/seep	3.1	2
6501	Saltgrass - Pickleweed	4895.9	46
7100	Upland Annual Grasslands & Forbs Formation	12360.1	719
7101	Perennial Bunchgrass Restoration Sites	257.0	3
7120	California Annual Grasslands	37707.2	2737
7130	Serpentine Grasslands	2008.8	609
7201	Pale Spikerush	0.5	1
7300	Occasionally Flooded Grassland & Forbes	194.4	2
9001	Rock Outcrop	1662.2	343
9002	Riverine, Lacustrine, and Tidal Mudflats	510.5	18
9003	Serpentine Barren	62.7	27
9100	Urban or Built-up	28315	1727
9200	Agriculture	65445.5	3244
9201	Agricultural Rock Pile	32.1	22
9300	Vacant	85.9	10
9400	Water	31601.6	2001
9999	Unknown	747.4	121

Table 1. The spatial extent for each vegetation or land cover types in Napa County, measured from the 2016 Napa vegetation map.

The 3 most extensive vegetation types are: Agriculture, Blue Oak, and California Grasslands

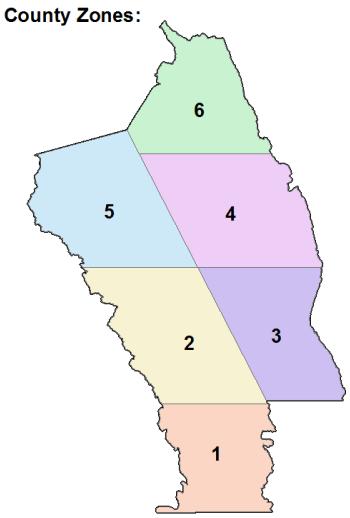
12.9% of the county is in Agriculture, 5.6% is Urban, and 6.3% is mapped as water.

Appendices

Appendix A. Editing Manual

Napa Veg Map Update 2018
Editing Manual

Setup



For this project, Napa County has been split into 6 county zones so that multiple people can be working on different parts of the county simultaneously. While working on the project you will likely only be working in one county zone at any given time.

The shapefiles containing only the county zone boundaries can be found in \\MapUpdate2018\Students\County_Zones.

The shapefiles containing the county zones with polygon and veg data can be found in: \\MapUpdate2018\Students\County_Zones_clip.

Fields

The feature class contains the following fields in the attribute table: Shape, PI, SIZE_, DENSITY, COMMENT_, ChangeFlag, Burn_Date, WUI, Burn_Type, Area_Acres, Fieldcheck, Comments, Area_HA, NapaVegPolyID, Shape_Length, Shape_Area. Napa2019PIName, MCV_NVCS_SCIENTIFIC_Name, MCV_NVCS_COMMON_Name, NVCS_Class_Level

Field Descriptions:

- Shape
    a. ESRI required field
- PI
    a. Vegetation Cover Type Code
    b. 4-digit photo interpretation ("PI") code. Represents the vegetation cover type (i.e. "9001 - Rock Outcrop"). This field is important because it is used in numerous table joins, including a join with the MAP_CODE field in the VEG_SIMPLIFIED_BDR table. This join collapses the numerous veg classes into a simplified classification system.

- SIZE_
    a. Size Class – for tree-dominated cover types only
        i. 1 = Seedlings (less than 1')
        ii. 2 = Saplings (1-6')
        iii. 3 = Pole (6-11')
        iv. 4 = Small (11-25')
        v. 5 = Medium – Large (Greater than 25')
        vi. 6 = Multi Layered Medium to Large Tress over smaller trees in Densities > 60%
        vii. 9 = no size class
    b. The SIZE class is used if a vegetation cover is dominated by trees. Combined with DENSITY, it is used to crosswalk data between the MCV veg classifications and the Dept. of Fish & Game's Wildlife Habitat Relationship (WHR) classification system that is used to predict the habitat suitability of each type, with respect to its separate value for breeding, forage, or cover.
    c. Vegetation types/non-vegetated classifications without a size code are given a size of 9. The following vegetation types do not have a size code.

Vegetation types that don't have a size code

PI_Num	PI_Desc
2128	Sparse California Juniper-Canyon Live Oak-California Bay-California Buckeye / Steep Rock Outcrop NFD Alliance
4300	Sclerophyllous Shrubland Formation
4301	Scrub Interior Live Oak – Scrub Oak – (California Bay – California Ash – Birch Leaf Mountain Mahogany – Toyon - California Buckeye) Mesic East County NFD Super Alliance
4302	Mixed Manzanita – (Interior Live Oak -California Bay - Chamise) West County NFD Alliance
4303	Leather Oak – White Leaf Manzanita – Chamise Xeric Serpentine NFD Super Alliance
4304	Leather Oak – California Bay – Rhamnus spp. Mesic Serpentine Chaparral NFD Alliance
4321	Chamise Alliance
4322	Chamise – Wedgeleaf Ceanothus Alliance
4501	Coyote Brush – California Sagebrush – (Lupine spp.) NFD Super Alliance
4502	Sparse Bush Lupine / Annual Grasses / Rock Outcrop NFD Alliance
4503	Lotus scoparius Alliance (post-burn)
5222	Brewer Willow Alliance
6402	(Bulrush – Cattail) Fresh Water Marsh NFD Super Alliance
6403	(Carex spp. – Juncus spp – Wet Meadow Grasses) NFD Super Alliance
6501	Saltgrass – Pickleweed NFD Super Alliance
7100	Upland Annual Grasslands & Forbs Formation
7101	Perennial Bunchgrass Restoration Sites
7120	California Annual Grasslands Alliance
7130	Serpentine Grasslands NFD Super Alliance
9001	Rock Outcrop
9002	Riverine, Lacustrine, and Tidal Mudflats
9003	Serpentine Barren
9100	Urban or Built-up
9200	Agriculture
9300	Vacant
9400	Water
9999	Unknown

- DENSITY
    a. Density Class – refers to the relative cover of the dominant life form being mapped: Tree, Shrub, or Herbaceous
        i. 1 = > 60%
        ii. 2 = 40-60%
        iii. 3 = 25-40%
        iv. 4 = 10-25%
        v. 5 = 2-10%
        vi. 9 = no density class
    b. The DENSITY class, along with the SIZE field (if a vegetation cover is dominated by trees), is used to crosswalk data between the MCV veg classifications and the Dept. of Fish & Game's Wildlife Habitat Relationship (WHR) classification system. WHR classes are used

to predict the habitat suitability of each type, with respect to its separate value for breeding, forage, or cover.

c. Vegetation types without a density code are given a density of 9. The following vegetation types do not have density codes:
    i. 9001 – Rock Outcrop
    ii. 9002 – Riverine, Lacustrine and Tidal Mudflats
    iii. 9003 – Serpentine Barren
    iv. 9100 – Urban or Built-up
    v. 9200 – Agriculture
    vi. 9300 – Vacant
    vii. 9400 – Water
    viii. 9999 – Unknown

- COMMENT _
    a. Comments that were associated with the polygon in the 2004 mapping effort.
- ChangeFlag
    a. Whether the Vegetation Cover Type (PI code) changed between 2004 to 2016
        i. 1 = No Change
        ii. 2 = Landcover changed
        iii. 3 = Polygon boundary changed
        iv. 4 = Landcover and polygon boundary changed
        v. 5 = PI change from 4305 to 4303, or 4306 to 4304
        vi. 6 = Changed to an existing PI from the Knoxville Vegetation Map
        vii. 7 = Changed to a new PI from the Knoxville Vegetation Map
- Burn_Date
    a. Year of Burn (we are checking burns from 2005-2016). If the polygon overlapped with FRAP fire perimeters (version fire17_1), the year of the burn is stored in this field.
- Burn_Type
    a. Whether the fire perimeter covered the entire polygon (Burn_Type = full) or part of it (Burn_Type = partial). If the polygon overlapped with FRAP fire perimeters (version fire17_1), the extent of the burn (full or partial) is stored in this field.
- WUI
    a. Wildlife/Urban Interface code
    b. If urban (housing/buildings) is within a polygon with a vegetation PI code, it was given a WUI Code:
        i. 1 = High Density Urban
        ii. 2 = Medium Density Urban
        iii. 3 = Low Density Urban
        iv. 4 = Campground
- Area_Acres
    a. Area of the polygon in acres
- Fieldcheck
    b. A flag to identify what polygons we recommend checking the vegetation type in person (in the field)
        i. 0 = No field check needed

ii. 1 = Priority field check (for polygons with unknown vegetation type)
iii. 2 = Field check needed

- Comments
  a. New comments, questions, notes
- Area_HA
  a. Area of the polygon in hectares
- NapaVegPolyID
  a. A unique ID for each polygon. Use this field to join the BCM extraction table.
- Shape_Length
  a. Perimeter length of the polygon. In units of feet.
- Shape_Area
  a. Area of the polygon. In units of square feet.
- OBJECTID
  a. Required field. A unique ID for each polygon.
- Napa2019PIName
  a. This is the actual name we applied to each polygon. It can consist of a string of species names, or other combinations.
- MCV_NVCS_SCIENTIFIC_Name
  a. This column names all the species from our names in Napa2019PIName by their Latin binomials.
- MCV_NVCS_COMMON_Name
  a. When available, this column calls the common name used by the California Vegetation Mapping conventions (MCV).
- NVCS_ClassLevel
  a. This column designates the level in the classification hierarchy that we assigned to each name. Some types are listed as provisional, which is consistent with the ongoing classification process in California. Types listed as 'Group' also indicate further taxonomic details may later be added. It is recommended to use the Napa2019PIName for site level assessments.

Getting Set Up

Most county zones should already have a useful symbology established but if not these are some basic steps to get started.

Display Polygons by ChangeFlag

1. Right click on the polygon shapefile (e.g. "CZ3_clip")
2. Select "Properties…"
3. Select the Tab labelled "Symbology"
4. Show the layer based on "Categories" -> "Unique values"
5. For "Value Field" select "ChangeFlag" from the dropdown.
6. Next click "Add All Values." The center box should populate with all the ChangeFlag values currently in use.

7. Now you can select the colors to indicate the type of change performed on a polygon by double-clicking on the colored box next to each ChangeFlag number. The color choice is not standardized and is only for your benefit.
8. For ChangeFlag = 0, we recommend no fill color and an easily visible outline color like Yellow.
9. Add transparency to this layer my selecting the Display tab and setting transparency around 50%. This will allow you to still see the underlying vegetation of previously checked polygons.
10. Once you are satisfied with the symbology, click "OK" and save your ArcMap document.

Label Polygons with Veg Type, Density, & Size

1. Right click on the polygon shapefile (e.g "CZ3_clip")
2. Select "Properties…"
3. Select the Tab named "Labels"
4. Check the box "Label features in this layer"
5. Next click "Expression…" under the "Text String" box
6. In the "Expression" box make sure "Parser:" is set to "Python"
7. Then in the box above enter the following without quotes "[PI] + '\n' + [DENSITY] + '\n' + [SIZE_]"
8. Click "OK"
9. Next set the "Text Symbol" to something easily visible like bold/red/12pt
10. To set the map scale at which the labels will appear click "Scale Range"
11. Recommended settings are: "Don't show labels when zoomed out beyond 1:10,000"
12. Click "OK" and save your ArcMap document.

Supporting Layers

- NAIP\California_2016_60cm:
    - USGS NAIP Imagery
    - Primary imagery used for classification of polygons
- ICE_2004:
    - Shapefile of previous map project
    - Can be used to see new edits or check discrepancies.
- DOQQs:
    - Black and white 1993 County imagery used for the original project.
    - Useful for checking if vegetation has grown or receded in areas.
- Napa_10m_hillshade:
    - County hill shade layer
    - Useful for understanding topographic features that may affect vegetation
    - Increase NAIP imagery transparency when using.
- Exclusion Layer:
    - Layer from Napa County of areas not to reclassify polygons.
- Oaks:
    - Layer of oak woodlands in Napa County.
- Agriculture:
    - Layer from Napa of agriculture areas in County.
- Streams:

    - Streams of Napa County.
    - Useful for mapping veg types that follow streams.
- Parcels:
    - Napa County Assessor Parcels and Numbers.
    - Useful when asking the County about certain areas.
- Fires: Historic fire imagery
    - Useful for completing Burn_Date and Burn_Type fields.
- ESRI Basemap:
    - Useful when shadows obstruct NAIP imagery
- PI_9300
    - Layer containing information on map units identified as vacant
    - Useful for locating vacant map units across all county zones
- PI_9999
    - Layer containing information on map units identified as unknown
    - Useful for locating unknown map units across all county zones
- County boundary
    - Boundary of the County of Napa developed using the California Government Code 23128 descriptions.
- Napa_2015
    - Original line work updated by Napa County though 2015
    - This is the original shapefile used to be updated
- Ortho_1-1_hn_s_ca055_2016_1.sid
    - 1 meter ground sample distance ortho imagery rectified to a horizontal accuracy within +/-5 meters of reference digital ortho quarter quads from the National Digital Ortho Program
    - Lower quality imagery than NAIP\California_2016_60cm layer
    - Used to classify polygons if NAIP\California_2016_60cm layer server is not responding

<u>Symbology Tips</u>

- For County Zone (CZ) layers
    - Base symbology on ChangeFlag
    - Use hollow fill or simple hatch pattern for ChangeFlag values of 1, 2, 3, or 4. This makes it easier to compare a polygon in question to other surrounding polygons that have already been assigned ChangeFlag values.
- For Exclusion layer
    - Represent with dark red, transparent symbol to make it clear which map units Napa County does not need to be reclassified.
- For Agriculture layer
    - Base symbology on type of agriculture present
        - Ex) fallow, orchard, vineyard, etc.
    - Use solid fill in order to differentiate from overlayed map units
- For Fires layer
    - Use a cross-hatch pattern to distinguish from map units with marked ChangeFlag symbology

Editing Procedure

Setup: When editing polygons it is useful to have the Editor, Advanced Editing, and Snapping toolbars docked to the top ribbon. To add new toolbars, right click on the top ribbon and check the toolbars. You can then drag these toolbars to the top ribbon to dock them.

Basics

1. To begin editing, select the "Editor" dropdown on the Editor toolbar and click "Start Editing"
    a. Next you will need to select which layer to edit. This should be the county zone clipped shapefile (e.g. CZ3_clip). Click OK.
    b. Ignore the layer warning that pops up next and click "Continue".
2. Now your cursor will default to the "Edit Tool". With this tool you can select any polygon and then view its information in the attribute table.
    a. You can select multiple features by dragging the Edit tool over multiple polygons
    b. NOTE: If you do not drag the Edit tool further than your current selection, you will end up just shifting the polygon boundary. You do not want to do this. If this happens make sure to select Undo to replace the polygon BEFORE you Save Edits.
3. When finished with an editing session select "Stop Editing"
    a. Be sure to select "Save Edits" *frequently* throughout any editing session.

Updating Attributes

To update the attributes of a polygon you must be in an Editing session.

1. After you have selected a polygon, open up the Attribute Table for the shapefile(e.g. CZ3_clip) by right-clicking on it in the TOC and selecting "Open Attribute Table"
    a. It is helpful to have the attribute table docked to the bottom of the screen or opened on a second monitor.
2. In the Attribute Table, click on the blue icon for "Show Selected Records" near the bottom. This will let you focus only on the attributes for the polygons you select with the Edit Tool.
3. Scrolling to the right in the attribute table you should find the new fields (ChangeFlag, PI_2016, etc.) Click into the field you wish to update and leave others blank or 0.
    a. **ChangeFlag**: This field is used to indicate the changes made to a polygon.
        i. 1 = Polygon checked but no changes made
        ii. 2 = Landcover change (either PI#, density or size)
        iii. 3 = Polygon boundary changed
        iv. 4 = Landcover and polygon boundary changed
    b. **PI**: This field indicates the dominant veg type of the polygon. The field is usually only changed when there is a significant change in the underlying vegetation type. PI change can usually be seen using historic imagery or fire data.
    c. **Size**: The size field is used to indicate the average height of trees in a polygon. The size field is only used for tree veg types and should be a 9 for all other veg types (e.g. shrubs, grassland). Size can be difficult to determine from aerial imagery but it can be estimated

by looking at canopy size and shadows cast by individual trees. When in doubt, refer to the old size values as they were informed by field checks of actual tree size.

d. **Density**: The density field indicates to average density of the dominant veg type in the polygon. This value is only for the dominant PI and should ignore density from other veg types. The density of a polygon takes time to determine and relies on training one's eye to see relative density patterns. Use the map unit and density reference sheets found here: \MapUpdate2018\RefData\PercentCoverAndMMU.
e. **Burn Date & Type**: These fields are informed by CalFire data of fire perimeters from 2005-2016. While checking polygons, those that overlap the fire perimeter shapefiles should have the Burn Date and Burn Type recorded in the attribute table. Burn Date can be determined by using the "Identify" tool to find the date within the CalFire layer. Burn Type indicates either a "Complete" or "Partial" burn of the polygon depending on if the fire perimeter covers the whole polygon. If a polygon is completely burned, generally keep the old PI number.
f. **WUI**: The WUI field indicates polygons within the Wildland-Urban Interface. These polygons will be veg types with identifiable houses or infrastructure. The WUI code is not used for polygons already identified as Urban/Built-up (PI=9100). The WUI field is not exact but a relative measure from Low to High density urban interface.

<u>Drawing</u>

When changing the shape of a polygon remember that the ChangeFlag must be set to 3 (boundary change) or 4 (boundary and landcover change).

1. To change the boundary of an existing polygon or to create a new polygon we will use the Cut tool from the Editor Toolbar.
2. First select the polygon you wish to edit.
3. Next select the Cut tool.
4. With this tool create new polygons by cutting shapes from existing polygons. You must begin and end your cut on the boundary of the selected polygon.
5. Drawing can be done with either mouse-clicks or by using the WACOM tablets.
    a. When drawing with the mouse, make sure to zoom in as far as possible to achieve smooth lines.
    b. When drawing with the pen and tablet, you must enable streaming by right-clicking and selecting "Streaming" after the Cut tool has been selected.
        i. Before streaming, select options in the editor toolbar. Under General find Stream Mode and change "Stream tolerance" to 50.
6. When drawing is complete, double-click to finish the sketch.

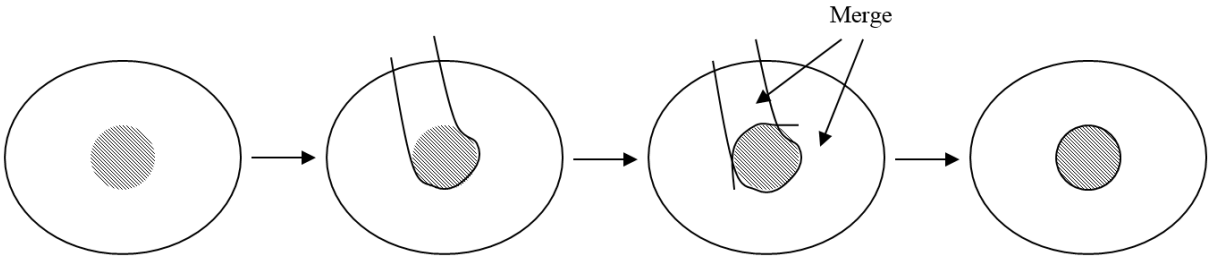
<u>Merging</u>

The Merge tool is useful when combining polygons with the same attributes.

1. First select all polygons you wish to merge. This can be done by dragging over the polygons or by holding SHIFT while selecting with the Edit Tool.
2. Next select "Merge…" from the Editor dropdown.

3. The next popup will ask which polygon to merge the others to. The polygon you select will keep its attributes and other polygons will be merged into it.
4. Clicking OK to confirm the merge.

The Merge tool can also be used to cut a hole out of an existing polygon. This requires making 2 cuts with the Cut tool and then a merge. The image below serves as an example.



Tracking Progress

Create summary tables using the frequency tool:

- Create a new field: Area_Acres, field type = float
- Calculate that field using Calculate Geometry (Right-click on the field name).
- Use frequency tool
    - Input table = shapefile you are editing (ex: CZ6)
    - Output table: save to \\MapUpdate2018\students\area_acres_summary folder
    - Frequency field = ChangeFlag
    - Summary field = Area_Acres
- Copy the table from ArcMap to Excel
    - \\MapUpdate2018\students\area_acres_summary\AcresByChangeFlag.xlsx

General Tips

- For **Unknown** (PI=9999) polygons in which you cannot determine the appropriate PI from the imagery, assign a Fieldcheck of 1 to indicate a priority field check is needed.
- **Vacant** (PI=9300) polygons are reviewed by the county and assigned a PI, when possible. When PI cannot be determined from imagery assign a Fieldcheck of 1 to indicate a priority field check is needed.
- For polygons that **burned between 2005 and 2016**, do not change PI. Change only size and density, if applicable. If it appears that the area has been wiped out from the fire, make a comment that the area needs a field check to determine whether the vegetation type has changed.
- For **rock out crop** polygons (PI=9001) with some vegetation mixed in—make a comment about the type of vegetation (e.g. trees, shrubs) and give a density code in the comments section but do not change PI code.
- For **vegetation polygons with some rocks** within the polygon, add a comment about the rocks.
- For **serpentine vegetation types 4305 and 4306**, use density of trees only (do not include shrubs in density assessment). This was the method used for these PIs in the 2004 map. Note that:

    - Xeric means dry so usually South facing slopes
    - Mesic means wet so usually North facing slopes
    - Veg types 2105 and 2106 are the same as 4305 and 4306, respectively. The 2004 ICE map used the 21XX codes but it looks like they were converted to 43XX for the current map. 3202 and 5222 are also the same.
- For **PI 2104 (Foothill Pine / Mesic Non-serpentine Chaparral NFD Association)**, use density of trees only when assessing density (do not include shrubs in density assessment). This was the method used for this PI in the 2004 map.
- For former **Agriculture (PI=9200) polygons that look like vegetation polygons now**, look at Google Earth Pro historical imagery to see if grazing or agriculture used to occur. If it looks abandoned or overgrown, change PI code to Upland Annual Grassland & Forbs Formation (7100) and make a comment that agriculture or grazing used to occur.
- For areas that look like **campgrounds**, change the PI to the appropriate vegetation type and update size and density. Assign a WUI of 4.

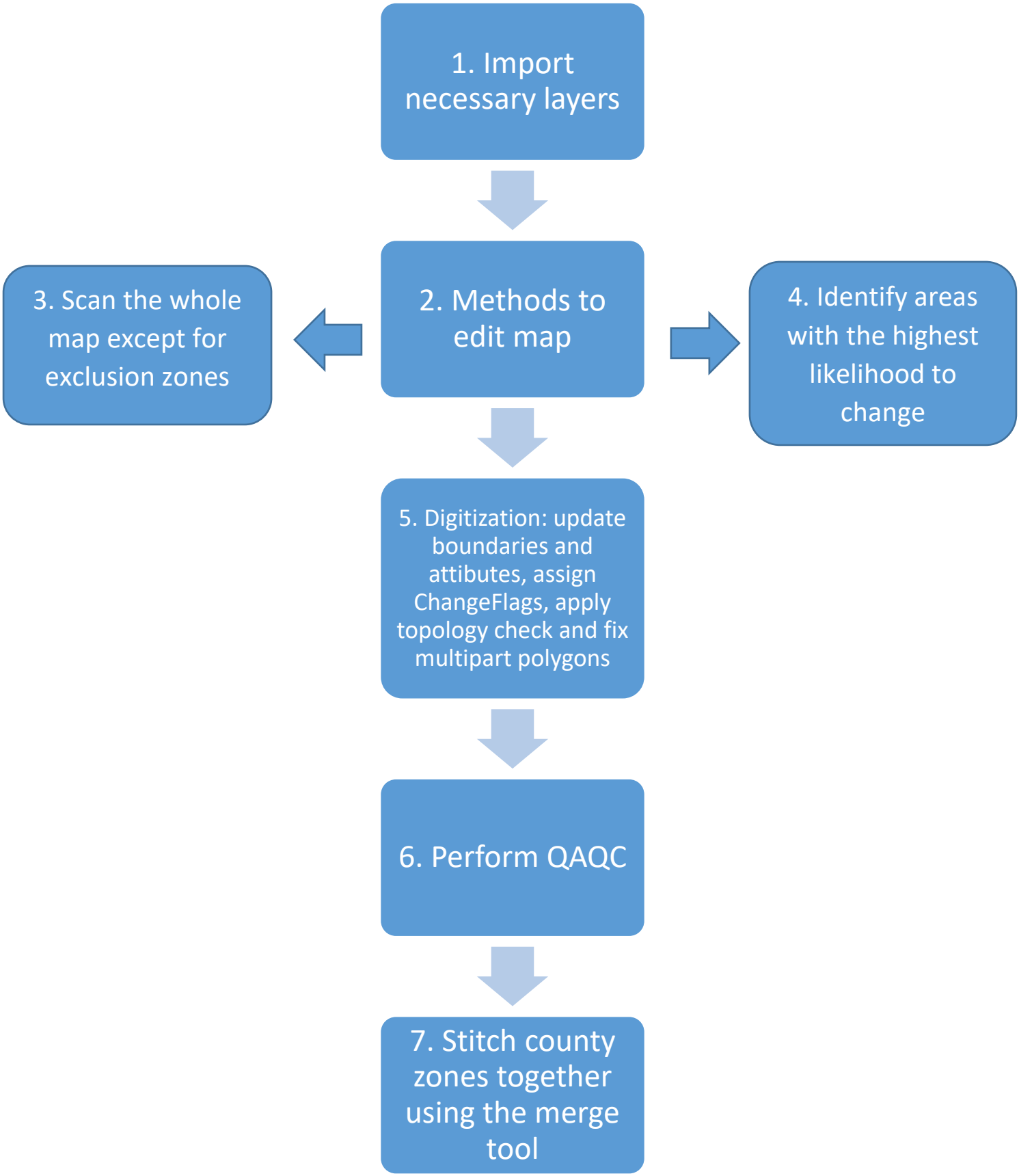

1. Import necessary layers
2. Methods to edit map
3. Scan the whole map except for exclusion zones
4. Identify areas with the highest likelihood to change
5. Digitization: update boundaries and attibutes, assign ChangeFlags, apply topology check and fix multipart polygons
6. Perform QAQC
7. Stitch county zones together using the merge tool

Figure 1. This is a flow chart showing the sequence of steps taken to revise digitized maps showing dominant vegetation in Napa County.

1. Necessary layers include NAIP\California_2016_60cm, ICE_2004, DOQQs, Napa_10m_hillshade, Exclusion Layer, oaks, Agriculture, Streams, Parcels, Fires, ESRI Basemap, PI_9300, PI_9999, County boundary, Napa_2015, and Ortho_1-1_hn_s_ca055_2016_1.sid.
2. Two methods were applied to review and update polygons. We first reviewed the entire extent of the county (editing method 1), then we did a focused review of polygons that were likely to have changed (editing method 2). These two editing methods are explained in bullet points 3 and 4 below.
3. Editing Method 1: Scan entire map
    a. Review all polygons. For those in the exclusion zone, quickly review these as they likely have the correct boundary and attributes. For all other polygons, review and edit/update polygon boundaries and/or polygon attributes as needed to reflect the 2016 imagery. Boundaries should be reviewed to verify that they correctly delineate the dividing line between different vegetation types. The three main attributes should be reviewed: vegetation type, vegetation size, and vegetation density.
    b. If the polygon contains one or more structures, assign the appropriate WUI code.
    c. If the polygon overlaps with a fire perimeter (from the Fire layer showing fires between 2005 and 2016) assign a Burn Date and Burn Type.
    d. If unsure what to do with a polygon, review it with 1 or more people on the editing team. If you are still unsure what vegetation attribute to assign the polygon, comment your question and/or flag the polygon for a field check.

    While doing this first pass at editing the polygons, fire perimeters will be displayed on the map because the size and density are likely to change after a recent fire.

4. Editing Method 2: Focus editing on areas identified as having high likelihood of change.
    a. These areas are:
        1. Where urban areas have either been added or removed between 2004 and 2016.
            - Source: Farmland Mapping and Monitoring Program's Important Farmland Map.
            - Use the FMMP shapefile to identify places to check our vegetation map. The FMMP layer highlights areas where their urban classification changed between 2004 and 2016.
        2. Zones of high plant water stress
            - Source: Basin Characteristic Model – 30 year average yearly climatic water deficit between 1980 and 2010.
            - Review the areas that are within the top 10% of the range of deficit values for the county.

5. Procedures when editing polygons:
    a. Digitization: Update Boundaries and Attributes: Identify polygons that require attribute updates and update as appropriate. Update boundaries and identify specific landcover changes. These revisions can include a change in dominant vegetation (PI), size, density, and presence of structures or infrastructure (WUI).
    b. Assign ChangeFlags: All polygons must be assigned a ChangeFlag value. Polygons requiring no revisions get assigned a value of 1. Polygons that require a landcover change and no boundary change are assigned a value of 2. Polygons that require a boundary change but not a landcover change are assigned a value of 3. Polygons requiring both a landcover and boundary change are assigned a value of 4. Polygons with a PI change from 4306 to 4304 or 4305 to 4303 are assigned a ChangeFlag of 5. If the boundary is changed for these polygons with a ChangeFlag of 5, make a comment about the boundary change.
        1. Note: Many polygons with PI 4306 (California Bay – Leather Oak – (Rhamnus spp.) Mesic Serpentine NFD Super Alliance) and 4305 (White Leaf Manzanita – Leather Oak – (Chamise – Ceanothus spp.) Xeric Serpentine NFD Super Alliance) no longer have trees in 2016. For polygons with PI 4306 which no longer have trees, change the PI code to 4304 (Leather Oak – California Bay – Rhamnus spp. Mesic Serpentine NFD Alliance). For polygons with PI 4305 which no longer have trees in 2016, change PI to 4303 (Leather Oak – White Leaf Manzanita – Chamise Xeric Serpentine NFD Super Alliance). However, as usual, do not change PI for polygons that burned between 2005 and 2016.
    c. Apply Topology Checks: Throughout the editing process, check for gaps or overlaps between polygons. This should be done by creating topologies for the features in the geodatabase (where our map is stored), and creating two topology rules: 1) Must Not Overlap; and 2) Must Not Have Gaps. Fix topology errors as necessary.
    d. Fix multipart polygons: Use the Data Reviewer toolbar in ArcMap to identify multipart polygons, if any. Separate multipart polygons using the Explode Multipart Feature tool in the Advanced Editing toolbar on ArcMap. Once multipart features are exploded, review polygon attributes to ensure they are correct. Merge small polygons into adjacent ones with the same vegetation.

6. Quality assurance and quality control (QAQC) is meant to confirm the reliability of polygon adjustments. Here, editors randomly select polygons and review each other's proposed polygon edits, going over attribute updates including ChangeFlag value, PI change, density change, size change, and WUI code. QAQC is then reviewed by the original editor and the peer reviewer.
    a. Three rounds of QAQC checks were done during the project. During the first (informal) QAQC check we used the following procedure:
        1. Add field* called QAQC_Check (type = short integer).
        2. Put a 1 in this field after you have reviewed it and agree, 2 if you disagree.

3. Add field* named QAQC_Comment (type = text, length = 254). *Note: You cannot add a field to a table while in an editing session.
4. Randomly check polygons with change flag = 1, then 2, then 3, then 4 (at least 30 minutes each).
5. Randomly check polygons that have a PI change, then density change, then size change.
6. Randomly check all polygons.
7. If you don't agree, make a QAQC_Comment instead of updating the attributes. Make note of what you think the attributes should be and make QAQC_Check = 2.
8. Review your comments with the original editor and edit attributes together.

b. During the second QAQC round, we followed a more formal procedure:
   1. Select a section of the map you have not edited previously.
   2. Randomly select polygons using random number generation.
   3. Review only polygons in which ChangeFlag is greater than 1.
   4. Review the first 75 such polygons (skipping any polygons below the minimum mapping unit) and fill out the QAQC tracking sheet to indicate whether you agree or disagree with the changes that have been made to each polygon.

The figure below shows the choices (1-5) editors had in indicating their agreement or disagreement with each polygon attribute and boundary. If editors chose a number in red, a comment was made explaining why they disagreed with the attribute in question.

Scores:				
		boundary	**PI**	**Size**
1	Definitely Agree	good job separating veg types	I agree with PI	I agree with size
2	Mostly Agree	mostly follws the boundary		
3	It's ok	I would have edited a few minor sections of this boundary	It's hard to tell the PI without field check	It's hard to tell the size without a field check
4	Some errors	I would have madea major edit to this boundary		
5	Definitely Don't Agree	Not a good boundary between veg types	I don't a gree with PI	I don't agree with the size
WUI only has 2 scores				
1	Agree			
2	Don't agree (put what you would have assigned it in the comments)			
red scores require comments				

An Excel spreadsheet was created to track QAQC reviews. The figure below shows an example part of this spreadsheet.

Reviewer	Section	QAQC_ID	2016_boundary	2016_PI	2016_Size	2016_Density	2016_WUI	2016_Comments*
Annie	CZ5	3404	1	1	1	1	1	
Annie	CZ5	6111	1	1	1	1	1	
Annie	CZ5	4530	1	1	1	1	1	
Annie	CZ5	1249	1	1	1	4	1	Density: I would make it 2 or 3 b/c it's just of trees
Annie	CZ5	6512	1	1	1	1	1	
Annie	CZ5	3053	2	1	1	1	1	
Annie	CZ5	4426	1	1	1	4	1	Density: I'd make it 2 or 3 because eit's supposed to be density of foothill pines only
Emad	CZ2	1	4	1	1	1	1	I do not see a boundary change
Emad	CZ2	6	1	1	1	1	1	
Emad	CZ2	7	1	1	1	1	1	
Emad	CZ2	9	1	1	1	1	1	
Emad	CZ2	10	3	1	1	3	1	density coould have changed to 3 and boundary could have been differently
Emad	CZ2	11	1	1	1	1	1	
Emad	CZ2	12	1	1	1	1	1	
Emad	CZ2	17	1	1	1	3	1	density seemd to be more of 1 than 2

7. After all edits are complete, stitch county zones together and merge the polygons along the borders that had been split up. This should be done using the Merge tool in ArcToolbox to merge the sections together. After merging sections, use ArcMap to manually edit borders between the sections (merge polygons back together that have been split). Review attributes of polygons along the borders to ensure polygons have correct attributes.

Appendix B. Protocols used for inclusion of the Knoxville Wildlife Area vegetation map.

Integration of the 2014 Knoxville Vegetation map to the 2016 imagery Napa Vegetation Map.

5/31/2019

James Thorne, Ryan Boynton, Sloane Rice, Anne Merritt

The 2014 Knoxville vegetation map was produced after the Rumsey fire of 2004, with consideration that the vegetation types may have changed. It was produced by the California Department of Fish and Wildlife's Vegetation Classification and Mapping Program (VegCAMP) program, following the National Vegetation Classification System (NVCS). Imagery was the 2011 30-cm color infrared imagery, and polygons were drawn using head up digitizing. The MMU is 1-acre, excepting wetlands, which were mapped to ½ acre.

Because this map was publically released only a month before the end of our Napa Vegetation mapping effort, in February 2019, we did not fully incorporate the Knoxville map into the updated Napa Vegetation Map. However, we reviewed the vegetation types they describe and in coordination with Napa county experts identified 29 of the 58 types that we considered for addition to the county-wide map. These were broken into three categories:

There were 18 named alliances or associations that we included. Most of these directly translated into vegetation types we already had in the Napa map, for example, their call of

"Western Dry Upland Perennial Grasslands" was crosswalked to our "Perennial Grasslands". For this series we reviewed the polygons the Knoxville map was associated with in the Napa map and did one of the following:

a. accepted that this was a new type widely-enough recorded in Knoxville that we gave it a new PI code in Napa (e.g. for 17 of the *Umbellularia californica- Quercus wislizeni* polygons, we accepted that this did not map into either our California Bay Alliance or our CA bay- Madrone-Coast Live Oak etc. Super Alliance, and we gave it a new code (1126) for a new CA bay-Interior live oak type); or

b. found that the Knoxville map's type corresponded with a type we had, in which case we would either just make a note that Knoxville said it was something similar to what we already had recorded or we would change the dominant veg type in Napa to the type Knoxville had identified but retaining an existing PI code. This was done when we thought the Knoxville map had advantage of field work conducted

For both criteria we also reviewed the line work, in some cases modifying it. All these edits can be tracked through our flag code system in the Napa map. We also noted all edits in the Knoxville map.

There were 6 types that we considered on a polygon-by-polygon basis.

For these types, we reviewed to see if the imagery suggested a difference from surrounding vegetation. If so, we accepted the call and in some cases modified line work. In no cases was a PI code introduced that never existed previously in the set of PIs that comprise the 2016 Napa vegetation map classification system. However, two of the PIs which were not applied in the Napa Map are now in polygons: 3125 (California Buckeye Alliance) and 3223 (Red Willow Alliance).

There were 5 types that we reviewed and only noted that they were documented in the Knoxville map. In this case we did not change the vegetation type attributed from our Napa map for the polygon that most intersected the Knoxville map's polygon, we only mention in our note column that another name was provided.

For example, Knoxville identified star thistle (*Centaurea* (*solstitialis, melitensis*)) in 50 polygons. While we could see a green blue tint in the grasslands it was described in, we did not change our call of 7120 (California annual grasslands) because most grasslands in Napa already contain star thistle, and it was not possible to return to review all grasslands to systematically include this species.

For each of these types of edits we also examined the line work from the Knoxville map. In many cases we modified the lines in the Napa map, but when the differences in area were small, we retained our original line work. For the other 29 types that are in the Knoxville map we did not attempt to change our polygon lines or attributes. In many cases the Knoxville map's vegetation polygons for these types

identify a similar vegetation type to what is recorded in the 2016 Napa vegetation map. The major exception to this is that we did survey polygons named as grassland polygons from the Knoxville map. Where warranted we modified the line work in the Napa map to better reflect the pattern of these grasslands.

There were 18 Knoxville vegetation types that were identified as ones that we would insert into the county map. These are:

PI Number	PI Description	Knoxville Description	How added	Number of polygons accepted	Notes
2125	Sargent Cypress Alliance	*Hesperocyparis sargentii*	Existing PI	3 of 3	
3101	Valley Oak - (California Bay - Coast Live Oak - Walnut - Ash) Riparian Forest NFD Association	*Quercus lobata*	Existing PI	16 of 35	
3101	Valley Oak - (California Bay - Coast Live Oak - Walnut - Ash) Riparian Forest NFD Association	*Quercus lobata - Salix lasiolepis*	Existing PI, added note	8 of 8	
3123	Valley Oak Alliance	*Quercus lobata - Quercus wislizeni*	Existing PI, added note	4 of 4	
3202	Brewer Willow Alliance	*Salix breweri*	Existing PI, added note	8 of 9, 1 already 3202	
3225	Arroyo Willow Alliance	*Salix lasiolepis*	Existing Unused PI	3 of 3	
4328	Yerba Santa Alliance	*Eriodictyon californicum*	New PI	4 of 4	

4328	Yerba Santa Alliance	*Eriodictyon californicum / herbaceous*	New PI	2 of 2	Knoxville called this an Association, but we remained at the Alliance level for both types listed.
4502	Silver Lupine Alliance	*Lupinus albifrons*	New PI	13 of 13	
5222	Brewer Willow Alliance (riparian and serpentine soils)	*Salix breweri*	Existing PI, added note	8 of 9, 1 already 3202	We could not discern serpentine polygons from the Knoxville map attributes. We retained Serpentine for those polygons in the Napa Map which were named as such. Some of the brewer willow polygons might be serpentine, in which case they should be 3202
6001	California aster - Buckwheats (Longstem, Naked) Association	*Corethrogyne filaginifolia* - *Eriogonum (elongatum, nudum)*	New PI	1 of 1	
6100	Bunch Forming Grasses	Western dry upland perennial grassland	Existing Unused PI	1 of 1	
6122	Needle Grass - Melic Grass Association	*Nassella* spp. - *Melica* spp.	Existing PI, added note	6 of 6	
6403	(Carex spp. - Juncus spp - Wet Meadow	*Carex serratodens*	Existing PI,	2 of 2	

	Grasses) NFD Super Alliance		added note	
6403	(Carex spp. - Juncus spp - Wet Meadow Grasses) NFD Super Alliance	*Juncus (oxymeris, xiphioides)*	Existing PI, added note	1 of 1
6404	Californian warm temperate marsh/seep	Californian warm temperate marsh/seep	New PI	2 of 2
7130	Serpentine Grasslands NFD Super Alliance	*Allium* spp. - *Streptanthus* spp. - *Hesperolinon* spp. Serpentinite	Existing PI, added note	1 of 1
7201	Spikerush Alliance	*Eleocharis macrostachya*	New PI	1 of 1

There were 6 Knoxville vegetation types that were identified as ones that we would insert into the county map on a case by case basis. These are:

PI Number	**PI Description**	**Knoxville Description**	**How added**	**Number of polygons accepted**
3125	California Buckeye Alliance	*Aesculus californica*	Existing Unused PI	32 of 38 accepted
3223	Red Willow Alliance	*Salix laevigata*	Existing Unused PI	4 of 4 accepted
7120	California Annual Grasslands Alliance	*Eryngium aristulatum*	Existing PI, added note	1 of 1 accepted
7120	California Annual Grasslands Alliance	*Lasthenia californica - Plantago erecta - Vulpia microstachys*	Existing PI, added note	0 of 1 accepted

9001	Rock Outcrop	California Cliff, Scree, and Other Rock Vegetation	Existing PI, added note	3 of 12 accepted, many outside of county boundary
9002	Riverine, Lacustrine, and Tidal Mudflats	Lacustrine, Riverine	Existing PI, added note	0 of 20 accepted, some already 9400

The last group includes 5 Knoxville vegetation types that were reviewed on a case by case basis, but only a few were added to the map. Most were not assigned to a new vegetation class, but were given a note because the PI they were found in already represented the identified vegetation. Even though they might not have been added to the county map, the line work was used to modify the county polygons. We did accept and make a new PI (1125) for 17 polygons of *Umbellularia californica - Quercus wislizeni*, now called California Bay – Interior Live Oak.

PI Number	**PI Description**	**Knoxville Description**	**How added**	**Number of polygons**	**Notes**
4322	Chamise -Wedgeleaf Ceanothus Alliance	*Ceanothus integerrimus*	leave as 4322	1	Noted within Polygon we retained that this veg type was called out in Knoxville
		Ceanothus oliganthus - Adenostoma fasciculatum	Existing PI, added note	0 of 12 accepted	We only used existing Napa PI attributes and noted the presence of this from Knoxville map

1125	California Bay - Interior Live Oak	*Umbellularia californica - Quercus wislizeni*	New PI	17 of 36 accepted	Were accepted according to tree size. In some cases the PI we already had accounted for these species, in other cases we updated to a new PI. In some cases we called it 1121, which is California Bay.
7120	California Annual Grasslands Alliance	*Centaurea (solstitialis, melitensis)*	Existing PI, added note	50	only noted within Napa polygons, all grasslands, some line work modification
1101	California Bay - Madrone - Coast Live Oak - (Black Oak - Big Leaf Maple) NFD Super Alliance	*Umbellularia californica*	Existing PI, added note	4 of 8 accepted	

The other 24 vegetation types in the Knoxville map were not added to the county map because they were already similarly attributed in the county map.

Knoxville Description
Adenostoma fasciculatum
Adenostoma fasciculatum - Heteromeles arbutifolia / Melica torreyana
California annual herb/grass
Ceanothus (oliganthus, tomentosus)
Ceanothus cuneatus
Ceanothus cuneatus - Adenostoma fasciculatum
Mediterranean California naturalized annual and perennial grassland
Quercus agrifolia
Quercus agrifolia / Frangula californica - Heteromeles arbutifolia
Quercus berberidifolia
Quercus berberidifolia - Adenostoma fasciculatum
Quercus berberidifolia - Ceanothus oliganthus
Quercus berberidifolia - Cercocarpus montanus
Quercus berberidifolia / Aesculus californica
Quercus douglasii
Quercus douglasii - Pinus sabiniana
Quercus douglasii / grass
Quercus durata
Quercus durata - Adenostoma fasciculatum
Quercus wislizeni - Ceanothus oliganthus
Quercus wislizeni - Pinus sabiniana / annual grass - herb
Quercus wislizeni - Quercus douglasii - Aesculus californica
Quercus wislizeni - Quercus douglasii - Pinus sabiniana / (grass)
Quercus wislizeni (tree)

Field descriptions for the above tables:

- PI Number
    - The county code for the vegetation type
- PI Description
    - A common name descriptor for the county vegetation cover type
- Knoxville Description
    - The NCVS Name field within the Knoxville vegetation map
- How Added
    - If the Knoxville polygon was accepted, this filed indicates how it was added to the county vegetation map
        - New PI
            - Vegetation types that are identified in the Knoxville map, but did not have a corresponding type in the county map. These areas were added to the county map and assigned to a new vegetation type (PI Number).
        - Existing Unused PI
            - Vegetation types identified in the Knoxville map, but did not have a corresponding type in the county map. They did have PI number and description in the 2004 report that accompanies the county map, but weren't mapped because they either occur in stands smaller than the MMU or they are impossible to differentiate from similar types using the original black and white base map imagery. They were added to the

county map and assigned vegetation codes (PI Numbers) identified in the 2004 report.

- Existing PI
    - Vegetation types identified in the Knoxville map that had a corresponding type in the county map. These areas were added to the county map and assigned an existing vegetation type (PI Number). The Knoxville Description was added to the comments field of the polygon.

Appendix C: Napa Vegetation Types and their relationship to the MCV mapping classification

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes
1100	Winter-Rain Sclerophyll Forests & Woodlands		Madrean Forest and Woodland	Division	MCH	Mixed Chaparral	Winter-Rain Sclerophyll Forests & Woodlands Formation		
1101	California Bay - Madrone - Coast Live Oak - (Black Oak Big Leaf Maple)	Umbellularia californica - Arbutus menziesii- Quercus agrifolia - Quercus kelloggii - Acer macrophyllum	California bay forest	Macrogroup	MHW	Montane Hardwood	California Bay - Madrone - Coast Live Oak - (Black Oak Big - Leaf Maple) NFD Super Alliance	Californian broadleaf forest and woodland	
1122	Canyon Live Oak	Quercus chrysolepis	Canyon live oak forest	Alliance	MHW	Montane Hardwood	Canyon Live Oak Alliance	Quercus chrysolepis tree	
1123	Eucalyptus	Eucalyptus spp. - Ailanthus altissima - Robinia pseudoacacia	Eucalyptus - tree of heaven - black locust groves	Semi-natural Stands	EUC	Eucalyptus	Eucalyptus Alliance	Eucalyptus (globulus, camaldulensis)	

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes
1124	Tanbark Oak	Notholithocarpus densiflorus	Tanoak forest	Alliance	MHW, MHC	Montane Hardwood, Montane Hardwood-Conifer	Tanbark Oak Alliance	Neolithocarpus densiflorus	
1126	California Bay - Interior Live Oak	Umbellularia californica - Quercus wislizeni	California Bay - Interior Live Oak	Association	MHW	Montane Hardwood			from Knoxville map, valid association
1201	Coast Live Oak - Blue Oak - (Foothill Pine)	Quercus agrifolia -Quercus douglasii	Coast live oak woodland	Provisional Association	COW, BOP	Coastal Oak Woodland, Blue Oak-Foothill Pine	Coast Live Oak - Blue Oak - (Foothill Pine) NFD Association		Because foothill pine is also in the name this may later be reclassed in the MCV system. Note there is also a blue oak-coast live oak Class

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes
1202	Interior Live Oak - Blue Oak - (Foothill Pine)	Quercus wislizeni - Quercus douglasii - Pinus sabiniana / (grass)	Interior Live Oak - Blue Oak	Provisional Association	BOP	Blue Oak-Foothill Pine	Interior Live Oak - Blue Oak - (Foothill Pine) NFD Association	Quercus wislizeni tree	
1221	Coast Live Oak	Quercus agrifolia	Coast live oak woodland	Alliance	COW	Coastal Oak Woodland	Coast Live Oak Alliance		
1222	Interior Live Oak	Quercus wislizeni	Interior Live Oak	Alliance	MHW	Montane Hardwood	Interior Live Oak Alliance	Quercus wislizeni tree	
1223	Mixed Oak	Quercus (agrifolia, douglasii, garryana, kelloggii, lobata, wislizeni)	Mixed oak	Group	MHW	Montane Hardwood	Mixed Oak Alliance	Californian broadleaf forest and woodland	
1225	Madrone Forest	Arbutus menziesii	Madrone forest	Alliance	MHW	Montane Hardwood			Not a PI in 2004

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes

2104	Foothill Pine / Mesic Non-serpentine Chaparral	Pinus sabiniana -	Foothill Pine Alliance	Group	MCH	Mixed Chaparral	Foothill Pine / Mesic Non-serpentine Chaparral NFD Association	Californian mesic chaparral	Comment from CDFG 'This translation of the map unit to a group seems right, identifying the shrubs underneath would be good, because if dense shrub with emergent pine, it should go to shrub type.' Note that the MCV name loses the serpentine specification

PI Number 2016	**Napa2016 PI Name**	**MCV-NVCS SCIENTIFIC Name**	**MCV-NVCS COMMON Name**	**NVCS_Class_Level**	**WHR Code**	**WHR Name**	**Napa 2004 Name**	**Other Names**	**Notes**

2121	Foothill Pine	Pinus sabiniana	Foothill Pine Alliance	Alliance	BOP, MCH	Blue Oak-Foothill Pine, Mixed Chaparral	Foothill Pine Alliance	
2122	Knobcone Pine	Pinus attenuata	Knobcone Pine Alliance	Alliance	CPC	Closed-Cone Pine-Cypress	Knobcone Pine Alliance	
2123	Ponderosa Pine - Douglas fir forest	Pinus ponderosa-Pseudotsuga menziesii	Ponderosa Pine - Douglas fir forest	Alliance	PPN	Ponderosa Pine	Ponderosa Pine Alliance	The Association is now formally described in the MCV manual. In 2004 it was only called 'Ponderosa pine alliance'.
2124	McNab Cypress	Callitropsis macnabiana	McNab Cypress Woodland	Alliance	CPC	Closed-Cone Pine-Cypress	McNab Cypress Alliance	
2125	Sargent Cypress	Callitropsis sargentii	Sargent Cypress Woodland	Alliance	CPC	Closed-Cone Pine-Cypress	Sargent Cypress Alliance	

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes
2126	Sugar Pine - Canyon Oak	Pinus lambertiana - Quercus chrysolepis		Association	KMC, PPM	Klamath Mixed Conifer, Ponderosa Pine	Sugar Pine - Canyon Oak NFD Association		There is a MCV series now that has these names but also includes high-elevation Quercus vaccinifolia. Our type does not match that one. Also, since not formally defined does not have common name. CDFG comment 'This will remain a map unit until there is survey and classification, but fine to use'

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes
2128	Sparse California Juniper - Canyon Live Oak - California Bay - California Buckeye / Steep Rock Outcrop	Juniperus californica - Quercus chrysolepis - Umbellularia californica - Aesculus californica		Provisional Alliance	JUN	Juniper	Sparse California Juniper-Canyon Live Oak-California Bay-California Buckeye / Steep Rock Outcrop NFD Alliance		Since not formally defined does not have a MCV-NVCS common name. Because the two most common species are likely the correct ones, as determined from imagery, I'm putting this classification to 'Provisional Alliance'.

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes
2201	Coast Redwood - Douglas-fir / California Bay	Sequoia sempervirens - Pseudotsuga menziesii - Notholithocarpus densiflorus	Redwood forest	Association	RDW	Redwood	Coast Redwood - Douglas-fir / California Bay NFD Association		Since 2004 this was given an association within the 'Redwood forest' alliance in MCV.
2222	Douglas-fir	Pseudotsuga menziesii	Douglas-fir forest	Alliance	DFR	Douglas Fir	Douglas-fir Alliance		

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes
2224	Douglas-fir - Ponderosa Pine	Pseudotsuga menziesii - Pinus ponderosa	Douglas-fir - Ponderosa Pine forest	Provisional Association	DFR	Douglas Fir	Douglas-fir - Ponderosa Pine Alliance		from CDFG 'This is fine PSME-PIPO alliance in theory, but what else is in these stands?' This is not currently listed in MCV. However, there is a ponderosa-Douglas fir association, so this might eventually become that.
2230	Coast Redwood	Sequoia sempervirens	Redwood forest	Alliance	RDW	Redwood	Coast Redwood Alliance		

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes
3101	Valley Oak - (California Bay - Coast Live Oak - Walnut - Ash) Riparian Forest	Quercus lobata - Umbellularia californica - Quercus agrifolia - Juglans californica - Fraxinus spp.		Macrogroup	VRI	Valley Foothill Riparian	Valley Oak - (California Bay - Coast Live Oak - Walnut - Ash) Riparian Forest NFD Association		This type has not yet been described in MCV, there is a Valley Oak, Coast live Oak Association
3102	Valley Oak - Fremont Cottonwood - (Coast Live Oak) Riparian Forest	Quercus lobata - Populus fremontii - (Quercus agrifolia)		Provisional Association	VRI	Valley Foothill Riparian	Valley Oak - Fremont Cottonwood - (Coast Live Oak) Riparian Forest NFD Association		from CDFW 'This will remain a map unit until there is survey and classification, but fine to use.'
3121	Black Oak	Quercus kelloggii	California black oak forest	Alliance	MHW	Montane Hardwood	Black Oak Alliance		
3122	Blue Oak	Quercus douglasii	Blue oak woodland	Alliance	BOW	Blue Oak Woodland	Blue Oak Alliance		

3123	Valley Oak	Quercus lobata	Valley oak woodland	Alliance	VOW	Valley Oak Woodland	Valley Oak Alliance		
3124	Oregon White Oak	Quercus garryana	Oregon white oak woodland	Alliance	MHW	Montane Hardwood	Oregon White Oak Alliance	Quercus garryana tree	
PI Number 2016	**Napa2016 PI Name**	**MCV-NVCS SCIENTIFIC Name**	**MCV-NVCS COMMON Name**	**NVCS_Class_Level**	**WHR Code**	**WHR Name**	**Napa 2004 Name**	**Other Names**	**Notes**
3125	California Buckeye	Aesculus californica	California buckeye groves	Alliance	MHW	Montane Hardwood			Not in the 2004 map

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes

3201	White Alder (Mixed Willow - California Bay - Big Leaf Maple) Riparian Forest	Alnus rhombifolia - Salix spp. - Umbellularia californica - Acer macrophyllum	White alder groves	Alliance	MRI	Montane Riparian	White Alder (Mixed Willow - California Bay - Big Leaf Maple) Riparian Forest NFD Association		Although this type has many species named, and otherwise in our scheme would be called a 'group', I've accepted the CDFW-NCVS Alliance for this type. Given that there are many species, it may eventually be given an Association name, although there is none yet.

PI Number 2016	**Napa2016 PI Name**	**MCV-NVCS SCIENTIFIC Name**	**MCV-NVCS COMMON Name**	**NVCS_Class_Level**	**WHR Code**	**WHR Name**	**Napa 2004 Name**	**Other Names**	**Notes**

3221	Mixed Willow	Salix spp.		Group	MRI, VRI	Montane Riparian, Valley Foothill Riparian	Mixed Willow Super Alliance		
3223	Red Willow	Salix laevigata	Red willow thickets	Alliance	VRI	Valley Foothill Riparian			Not in 2004 map
3225	Arroyo Willow	Salix lasiolepis	Arroyo willow thickets	Alliance	VRI, FEW	Valley Foothill Riparian, Fresh Emergent Wetland			Existing PI but not used in 2004. From Knoxville map
4300	Sclerophyllous Shrubland			Macrogroup	MCH	Mixed Chaparral	Sclerophyllous Shrubland Formation		

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes
4301	Scrub Interior Live Oak - Scrub Oak - (California Bay - California Ash - Birch Leaf Mountain Mahogany - Toyon - California Buckeye) Mesic East County	Quercus wislizeni (shrub) - Quercus spp. - Umbellularia californica - Cercocarpus betuloides - Heteromeles arbutifolia - Aesculus californica		Group	MCH	Mixed Chaparral	Scrub Interior Live Oak - Scrub Oak - (California Bay - Flowering Ash - Birch Leaf Mountain Mahogany - Toyon - California Buckeye) Mesic East County NFD Super Alliance	Californian mesic chaparral	Sonoma has a Q wislizeni alliance with Umbellularia that occurs in mesic chaparral. Because there is a mix of species and geography or site information, I classed it to group.
4302	Mixed Manzanita - (Interior Live Oak -California Bay - Chamise) West County	Arctostaphylos spp. - Quercus wislizeni - Umbellularia californica - Adenostoma fasciculatum		Group	MCH	Mixed Chaparral	Mixed Manzanita - (Interior Live Oak - California Bay - Chamise) West County NFD Alliance	Californian xeric chaparral	Because there is a mix of species and geography or site information, I classed it to group.

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes
4303	Leather Oak - White Leaf Manzanita - Chamise Xeric Serpentine	Quercus durata - Arctostaphylos viscida - Adenostoma fasciculatum		Group	MCH	Mixed Chaparral	Leather Oak - White Leaf Manzanita - Chamise Xeric Serpentine NFD Super Alliance	Californian serpentine chaparral	Sonoma has a Q durata Alliance, but different co-dominants or associates. Because there is a mix of species and geography or site information, I classed it to group.

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes
4304	Leather Oak - California Bay - Rhamnus spp. Mesic Serpentine Chaparral	Quercus durata - Umbellularia californica - Rhamnus spp.		Group	MCH	Mixed Chaparral	Leather Oak - California Bay - Rhamnus spp. Mesic Serpentine NFD Alliance	Californian serpentine chaparral	Might go to Quercus durata – Heteromeles arbutifolia – Umbellularia californica, but no serpentine is identified in MCV. Because there is a mix of species and geography or site information, I classed it to group.

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes
4305	White Leaf Manzanita - Leather Oak - (Chamise - Ceanothus spp. (Foothill Pine)) Xeric Serpentine	Arctostaphylos viscida - Quercus durata - (Adenostoma fasciculatum - Ceanothus spp. (Pinus sabiniana))		Group	MCH	Mixed Chaparral	White Leaf Manzanita - Leather Oak - (Chamise - Ceanothus spp.) Xeric Serpentine NFD Super Alliance	Californian serpentine chaparral	Might go to Arctostaphylos viscida – Adenostoma fasciculatum, but no serpentine is called in MCV. Sonoma has an A viscida alliance with Ceanothus jepsonii. Because there is a mix of species and geography or site information, I classed it to group.

4306	California Bay - Leather Oak - (Rhamnus spp. (Foothill Pine)) Mesic Serpentine	Umbellularia californica - Quercus durata - Rhamnus spp. Pinus sabiniana	California bay forest	Provisional Alliance	MRI, MCH	Montane Riparian, Mixed Chaparral	California Bay - Leather Oak - (Rhamnus spp.) Mesic Serpentine NFD Super Alliance		CDFW comment, 'We call anything dominated by Bay a tree type, so if these are dominated by Bay, then it goes into UMCA alliance.' However, I (JT) think you lose the distinction of serpentine if you just take that MCV common name alliance. However, I left this as a provisional alliance, while other similar types were assigned to a group in the vegetation classification.

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes
4321	Chamise Alliance	Adenostoma fasciculatum	Chamise chaparral	Alliance	CRC	Chamise-Redshank Chaparral	Chamise Alliance		
4322	Chamise - Wedgeleaf Ceanothus	Adenostoma fasciculatum - (Ceanothus cuneatus)	Chamise - Wedgeleaf Ceanothus Association	Association	MCH	Mixed Chaparral	Chamise - Wedgeleaf Ceanothus Alliance		
4328	Yerba Santa Alliance	Eriodictyon californicum	thick leaf yerba santa scrub	Alliance	MCH	Mixed Chaparral			Existing PI but not used in 2004. From Knoxville map
4501	Coyote Brush - California Sagebrush - (Lupine spp.)	Baccharis pilularis - Artemisia californica	Coyote Brush - California Sagebrush Scrub	Association	CSC	Coastal Scrub	Coyote Brush - California Sagebrush - (Lupine spp.) NFD Super Alliance		

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes
4502	Sparse Bush Lupine / Annual Grasses / Rock Outcrop	Lupinus albifrons	Silver bush lupine scrub	Alliance	MCH, CSC	Mixed Chaparral, Coastal Scrub	Sparse Bush Lupine / Annual Grasses / Rock Outcrop NFD Alliance		This type has been named since the 2004 map. We added from Knoxville map, where it was just called Lupinus albifrons. Since we had a version with the other features, all polygons were assigned to the name we had
4503	Lotus scoparius (post-burn)	Lotus scoparius	Deer weed scrub	Alliance	MCH	Mixed Chaparral	Lotus scoparius Alliance (post-burn)		

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes
5222	Brewer Willow (riparian and serpentine soils)	Salix breweri	Brewer willow thickets	Alliance	MRI	Montane Riparian	Brewer Willow Alliance		Brewer willow polygons from the Knoxville map were incorporated and assigned to this name because the MCV book defines all brewer willow as being on riparian or serpentine.
6100	Bunch Forming Grasses			Group	PGS	Perennial Grassland			Existing PI but not used in 2004. From Knoxville map

6122	Purple Needlegrass	Nassella pulchra	Purple needlegrass grassland	Alliance	PGS	Perennial Grassland		Nassella pulchra Herbaceous Alliance	Existing PI but not used in 2004. From Knoxville map
PI Number 2016	**Napa2016 PI Name**	**MCV-NVCS SCIENTIFIC Name**	**MCV-NVCS COMMON Name**	**NVCS_Class_Level**	**WHR Code**	**WHR Name**	**Napa 2004 Name**	**Other Names**	**Notes**
6402	(Bulrush - Cattail) Fresh Water Marsh	Typha spp.	Cattail marshes	Group	FEW	Fresh Emergent Wetland	(Bulrush - Cattail) Fresh Water Marsh NFD Super Alliance		If truly dominated by bullrush only then it could be the 'Typha herbaceous alliance', according to the MCV 2009.

6403	(Carex spp. - Juncus spp - Wet Meadow Grasses)	Carex spp. - Juncus spp.	Californian warm temperate marsh/seep	Group	WTM	Wet Meadow	(Carex spp. - Juncus spp - Wet Meadow Grasses) NFD Super Alliance	Sedge meadows?	Might be Dense sedge marshes, Carex densa – Juncus xiphioides. But not clear which Carex or Juncus here. But, there are many Carex alliances, would need field sampling to determine which one.

PI Number 2016	**Napa2016 PI Name**	**MCV-NVCS SCIENTIFIC Name**	**MCV-NVCS COMMON Name**	**NVCS_Class_Level**	**WHR Code**	**WHR Name**	**Napa 2004 Name**	**Other Names**	**Notes**
6404	Californian warm temperate marsh/seep		Californian warm temperate marsh/seep	Group	FEW	Fresh Emergent Wetland			From Knoxville map, mapping unit. Could potentially merge with 6403, if species can be determined

6501	Saltgrass - Pickleweed	Distichlis spp. - Salicornia spp.	Temperate Pacific tidal salt and brackish meadow	Group	SEW	Saline Emergent Wetland	Saltgrass - Pickleweed NFD Super Alliance		Might be California cordgrass marsh, Spartina foliosa. There are also several Distichlis associations, not clear what 'Saltgrass' is here
7100	Upland Annual Grasslands & Forbs Formation		California annual forb/grass vegetation	Group	AGS	Annual Grassland	Upland Annual Grasslands & Forbs Formation		
PI Number 2016	**Napa2016 PI Name**	**MCV-NVCS SCIENTIFIC Name**	**MCV-NVCS COMMON Name**	**NVCS_Class_Level**	**WHR Code**	**WHR Name**	**Napa 2004 Name**	**Other Names**	**Notes**
7101	Perennial Bunchgrass Restoration Sites		Western North American Temperate Grassland and Meadow	Group	PGS	Perennial Grassland	7101	Perennial Bunchgrass Restoration Sites	

7120	California Annual Grasslands		California annual forb/grass vegetation	Group	AGS	Annual Grassland	7120	California Annual Grasslands Alliance	
7130	Serpentine Grasslands		California Annual and Perennial Grassland	Group	PGS	Perennial Grassland	7130	Serpentine Grasslands NFD Super Alliance	
7201	Pale Spikerush	Eleocharis macrostachya		Alliance	FEW, WTM	Fresh Emergent Wetland, Wet Meadow			From Knoxville map, mapping unit.
7300	Occasionally Flooded Grassland & Forbes			Group	FEW, SEW	Fresh Emergent Wetland, Saline Emergent Wetland		Occasionally Flooded Grassland & Forbes	New group, located downslope of Napa settling ponds

PI Number 2016	**Napa2016 PI Name**	**MCV-NVCS SCIENTIFIC Name**	**MCV-NVCS COMMON Name**	**NVCS_Class_Level**	**WHR Code**	**WHR Name**	**Napa 2004 Name**	**Other Names**	**Notes**
9001	Rock Outcrop		Central California Coast	Macrogroup	BAR	Barren	Rock Outcrop		Mapping unit from Knoxville map

		Ranges cliff and canyon				
9002	Riverine, Lacustrine, and Tidal Mudflats	Lacustrine, Riverine, Estuarine	RIV, LAC, EST	Lacustrine, Riverine, Estuarine	Riverine, Lacustrine and Tidal Mudflats	
9003	Serpentine Barren	Barren	BAR	Barren	Serpentine Barren	
9100	Urban or Built-up	Urban	URB	Urban	Urban or Built-up	
9200	Agriculture	Agriculture	CRP, DGR, IGR, IRH, IRF, OVN, DOR, EOR, VIN	Cropland, Dryland Grain, Irrigated Grain, Irrigated Hayfield, Irrigated Row and Field crops, Orchard - Vineyard, Deciduous Orchard, Evergreen Orchard, Vineyard	Agriculture	Orchard-Vineyard

PI Number 2016	Napa2016 PI Name	MCV-NVCS SCIENTIFIC Name	MCV-NVCS COMMON Name	NVCS_Class_Level	WHR Code	WHR Name	Napa 2004 Name	Other Names	Notes
9201	Agricultural Rock Pile		Agricultural Rock Pile		BAR	Barren			New group, created to recognize large piles of rocks removed from vineyard plantings
9300	Vacant		Vacant		BAR	Barren	Vacant		Suggested common name
9400	Water		Water		WAT, RIV, LAC	Water, Riverine, Lacustrine	Water		Suggested common name
9999	Unknown		Unknown		UKW	Unknown	Unknown		Suggested common name

Appendix D. Accuracy of line work and PI of 2016 map. The appendix detailed 303 polygons evaluated for accuracy of line work and PI. They are the expanded version of the summary table included in the main report.

How polygons were scored:

Scores		**boundary**	**PI**	**Size**
1	Definitely Agree	good job separating veg types	I agree with PI	I agree with size
2	Mostly Agree	mostly follows the boundary		
3	It's ok	I would have edited a few minor sections of this boundary	It's hard to tell the PI without field check	It's hard to tell the size without a field check
4	Some errors	I would have made a major edit to this boundary		
5	Definitely Don't Agree	Not a good boundary between veg types	I don't agree with PI	I don't agree with the size
WUI only has 2 scores				
1	Agree			
2	Don't agree (put what you would have assigned it in the comments)			

Scores for the 303 polygons

Section	**QAQC_ID**	**2016_boundary**	**2016_PI**	**2016_Size**	**2016_Density**	**2016_WUI**	**2016_Comments* *If score >=3, please explain in comments**
CZ1	592	2	2	1	1	1	
CZ1	1085	2	1	1	2	1	
CZ1	1145	1	1	1	2	1	
CZ1	1352	1	1	1	3	1	density: I would have made it 2
CZ1	116	1	4	1	1	1	PI: I don't know what to classify this as, but not water

CZ1	1081	1	1	1	4	1	density: I would have made it 4
CZ1	547	1	1	1	1	1	
CZ1	2118	1	3	1	1	1	PI: I'm not sure if this is the right PI
CZ1	1366	1	1	1	3	1	density: I would make it 3
CZ1	1213	1	1	1	1	1	
CZ1	242	1	1	1	1	1	
CZ1	1303	1	1	1	1	1	
CZ1	1056	1	1	1	1	1	
CZ1	222	3	1	1	1	1	boundary: I would have combined polygon with neighboring urban polygon
CZ1	31	2	1	1	1	1	
CZ1	2471	2	1	1	1	1	
CZ1	1396	1	3	1	5	1	PI: I'm not sure if this is the right PI; density: I would make it a 1
CZ1	2137	3	1	1	1	1	boundary: I would have combined polygon with neighboring urban polygon
CZ1	375	2	1	1	1	1	
CZ1	1192	1	1	1	1	1	
CZ1	1151	1	1	1	2	1	
CZ1	60	1	3	1	1	1	PI: not sure of PI, I might've made it 7100
CZ1	636	1	1	1	1	1	
CZ1	157	1	1	1	1	1	
CZ1	276	1	1	1	2	1	
CZ1	725	1	1	1	4	1	density: I would make it a 2
CZ1	2521	1	2	1	1	1	
CZ1	1242	1	1	1	1	1	
CZ1	1101	1	1	1	1	1	

CZ1	1837	1	1	1	1	1	
CZ1	583	3	1	1	1	1	Boundary: I would have included more of the trees north of the polygon
CZ1	809	3	1	1	1	1	Boundary: Again, I would have included more of the trees north of the polygon
CZ1	592	2	1	1	1	1	
CZ1	1830	1	1	1	1	1	
CZ1	407	1	1	1	1	1	
CZ1	2246	1	1	1	1	1	
CZ1	179	2	1	1	1	1	
CZ1	1320	1	1	1	1	1	
CZ1	1046	1	1	1	1	1	
CZ1	822	1	3	1	1	1	PI: not sure if this is the right PI
CZ1	29	1	1	1	1	1	
CZ1	2429	1	1	1	1	1	
CZ1	32	3	1	1	1	2	boundary: I would have cut it off at the road on the west side; WUI: I would have made it a 3 because there are two streets in this polygon
CZ1	932	1	1	1	1	1	
CZ1	807	1	1	1	1	1	
CZ1	1070	1	1	1	1	1	
CZ1	2516	3	4	1	1	1	boundary: I would have excluded the trees and house in the northeast part; PI: I would make it 7100

CZ1	2458	1	1	1	1	1	
CZ1	1948	1	1	1	1	1	
CZ1	401	2	1	1	2	1	
CZ1	2480	1	1	1	1	1	
CZ1	818	1	1	1	1	1	
CZ1	2494	1	1	1	1	1	
CZ1	1315	2	2	1	4	2	density: I would make it 4; WUI: I would make it 2
CZ1	1349	1	1	1	1	1	
CZ1	2427	1	1	1	5	1	density: should be 9
CZ1	799	2	1	1	1	2	WUI: I would have made it 3 because there's part of a house at the bottom
CZ1	2482	1	1	1	1	1	
CZ1	37	2	1	1	1	1	
CZ1	1131	2	1	1	1	1	
CZ1	2469	2	1	1	1	1	
CZ1	577	1	1	1	4	1	density: I would make it a 1
CZ1	922	4	1	1	1	2	boundary: I would have split the polygon up. The northern part is more dense; WUI: I'd make it a 3 because there's a small house
CZ1	513	3	1	1	1	1	boundary: I would have merged it with the surrounding ag polygon
CZ1	672	1	1	1	1	1	
CZ1	558	1	1	1	4	1	Density: I would make it 2
CZ1	788	1	1	1	3	1	Density: I'd make it 1
CZ1	600	1	1	1	1	1	

CZ1	331	2	1	1	5	1	Density: I'd make it 1
CZ1	26	1	1	1	1	1	
CZ1	1208	1	1	1	3	1	Density: I'd make it 2
CZ1	2019	1	1	1	1	1	
CZ1	865	1	1	1	1	1	
CZ1	813	1	5	1	1	2	PI: I'd make it 7100; WUI: I'd make it a 3 because there's a street and a small structure in polygon
CZ1	1821	1	5	1	1	1	PI: I'd make it 9100 because it's a man-made holding pond
CZ1	239	1	1	1	1	1	
CZ5	1389	3	1	1	1	1	Boundary: I would have taken out the trees along the western and southern border of polygon
CZ5	3269	1	1	1	1	1	
CZ5	6630	1	4	1	1	2	PI: I would make it 9200, not 9100; WUI: If PI changed to Ag, WUI should be 3
CZ5	3389	1	1	1	1	1	
CZ5	1212	2	1	1	1	1	
CZ5	3906	1	1	1	1	1	
CZ5	4096	1	1	1	1	2	WUI: should be 3
CZ5	6147	1	1	1	1	1	
CZ5	6504	2	1	1	1	1	
CZ5	3049	1	1	1	1	1	
CZ5	3873	1	1	1	1	1	
CZ5	4854	1	1	1	1	1	
CZ5	3011	1	1	1	1	1	
CZ5	6024	1	1	1	1	1	
CZ5	6162	1	1	1	1	1	

CZ5	3941	2	1	1	1	1	
CZ5	1027	2	1	1	3	1	Density: I would make it 2
CZ5	4059	1	1	1	1	1	
CZ5	254	3	1	1	1	1	Boundary: I would have cut out the house in the southern part of polygon
CZ5	2382	1	1	1	5	1	Density: I'd make it a 2
CZ5	5676	1	1	1	1	1	
CZ5	6396	2	1	1	1	1	
CZ5	5028	2	1	1	1	1	
CZ5	3154	1	5	1	5		PI: should be 9001; for 7120 density would be 1, if PI changed to 9001, density should be 9
CZ5	1987	1	1	1	1	1	
CZ5	6628	3	3	1	5	1	Boundary: I would cut out the green grass on the eastern side because it looks irrigated; PI: not sure if this is agriculture or grassland now; Density: if PI=7100 density should be 1, if PI is changed to 9200 then density can be 9
CZ5	6584	1	4	5	1	1	PI: Should be 4305 or 4306 because there are trees; Size should not be 9
CZ5	6635	2	1	1	1	1	
CZ5	2070	1	1	1	1	1	

CZ5	3205	1	1	1	1	1	
CZ5	2461	1	1	1	1	1	
CZ5	2122	1	1	1	1	1	
CZ5	3919	1	1	1	1	1	
CZ5	1448	1	1	1	1	1	
CZ5	2304	1	1	1	1	1	
CZ5	3134	2	1	1	1	1	
CZ5	6364	1	1	1	1	1	
CZ5	3211	1	1	1	1	1	
CZ5	1352	1	1	1	1	1	
CZ5	4463	1	1	1	1	1	
CZ5	2373	1	1	1	1	1	
CZ5	6514	1	1	1	1	1	
CZ5	3869	2	1	1	1	1	
CZ5	2470	1	1	1	1	1	
CZ5	2151	1	1	1	1	1	
CZ5	6074	1	1	1	1	1	
CZ5	1560	1	1	1	1	1	
CZ5	390	2	1	1	1	1	
CZ5	3674	2	1	1	4	1	Density: I would make it a 2
CZ5	5391	1	1	1	1	1	
CZ5	4015	1	1	1	3	1	Density: not sure if density is right
CZ5	3079	1	1	1	4	1	Density: I would make it 2
CZ5	1559	1	1	1	1	1	
CZ5	3327	1	1	1	1	1	
CZ5	6501	1	1	1	1	1	
CZ5	4320	1	1	1	1	1	
CZ5	3340	1	1	1	1	1	
CZ5	3642	1	4	1	1	1	PI: I don't think this is blue oak
CZ5	6374	1	1	1	1	1	
CZ5	2113	1	1	1	1	1	
CZ5	1814	1	1	1	1	1	
CZ5	3993	1	1	1	1	1	
CZ5	4660	1	1	1	1	1	
CZ5	168	1	1	1	1	1	
CZ5	6099	1	1	1	1	1	
CZ5	6523	1	1	1	4	1	Density: I'd make it 1

CZ5	785	1	1	1	5	1	Density: should be a 3
CZ5	2731	1	1	1	1	1	
CZ5	5404	1	1	1	1	1	
CZ5	3404	1	1	1	1	1	
CZ5	6111	1	1	1	1	1	
CZ5	4530	1	1	1	1	1	
CZ5	1249	1	1	1	4	1	Density: I would make it 2 or 3 b/c it's just of trees
CZ5	6512	1	1	1	1	1	
CZ5	3053	2	1	1	1	1	
CZ5	4426	1	1	1	4	1	Density: I'd make it 2 or 3 because it’s supposed to be density of foothill pines only
CZ2	1	4	1	1	1	1	I do not see a boundary change
CZ2	6	1	1	1	1	1	
CZ2	7	1	1	1	1	1	
CZ2	9	1	1	1	1	1	
CZ2	10	3	1	1	3	1	density could have changed to 3 and boundary could have been differently
CZ2	11	1	1	1	1	1	
CZ2	12	1	1	1	1	1	
CZ2	17	1	1	1	3	1	density seemed to be more of 1 than 2
CZ2	18	1	1	1	1	1	
CZ2	4589	1	1	1	1	1	
CZ2	26	1	1	1	1	1	
CZ2	27	1	1	1	2	2	there is a building in the polygon. Also the the change flag is 2 but

							nothing has changed
CZ2	33	1	1	1	1	1	
CZ2	34	1	1	1	1	1	
CZ2	39	1	1	1	2	1	
CZ2	40	1	1	1	1	1	
CZ2	44	1	2	1	1	1	
CZ2	50	1	1	1	1	1	
CZ2	53	1	1	1	1	1	
CZ2	55	1	1	1	1	1	
CZ2	56	1	1	1	1	1	
CZ2	64	1	1	1	1	1	
CZ2	67	1	1	1	4	1	density seems to be 3
CZ2	71	1	1	1	1	1	
CZ2	74	1	1	1	2	1	
CZ2	79	1	1	1	4	1	density seems to0 be 1
CZ2	82	1	1	1	1	1	
CZ2	84	1	1	1	1	1	
CZ2	98	1	1	1	1	1	
CZ2	99	1	1	1	4	1	density of 3 looks more appropriate
CZ2	107	4	1	1	1	1	boundary seemed to be changed from original
CZ2	110	1	1	1	1	1	
CZ2	114	1	1	1	1	1	
CZ2	117	1	1	1	1	1	
CZ2	119	1	1	1	1	1	
CZ2	138	1	3	1	4	1	not sure whether the veg type is correct. Also, density is not right(depending on veg type)
CZ2	146	1	1	1	1	1	
CZ2	149	1	1	1	1	1	
CZ2	151	1	1	1	1	1	
CZ2	155	1	1	1	4	1	density seems to be 2

CZ2	156	1	1	1	2	1	
CZ2	165	1	1	1	3	1	seems more to like 3
CZ2	167	1	1	1	1	1	
CZ2	172	1	1	1	1	1	
CZ2	175	1	1	1	1	1	
CZ2	180	1	1	1	1	1	
CZ2	182	1	1	1	1	1	
CZ2	184	1	1	1	1	1	
CZ2	185	1	1	1	1	1	
CZ2	191	1	1	1	1	1	
CZ2	192	1	1	1	1	1	
CZ2	195	1	1	1	2	1	
CZ2	200	1	1	1	1	1	
CZ2	212	1	1	1	1	1	
CZ2	214	1	1	1	3	1	density seems like 1
CZ2	215	1	1	1	1	1	
CZ2	218	1	1	1	3	1	density is more like 2
CZ2	222	1	1	1	1	1	
CZ2	223	1	1	1	1	1	
CZ2	226	1	1	1	4	1	density looks like 2
CZ2	228	1	1	1	2	2	there is a building in the polygon.
CZ2	229	1	1	1	1	1	
CZ2	230	1	1	1	1	1	
CZ2	232	1	1	1	1	1	
CZ2	234	1	1	1	3	1	density looks like a 1
CZ2	236	1	1	1	1	1	
CZ2	238	1	1	1	1	1	
CZ2	239	1	1	1	1	1	
CZ2	241	1	1	1	2	1	
CZ2	249	1	1	1	1	1	
CZ2	250	1	1	1	1	1	
CZ2	255	1	1	1	1	1	
CZ2	256	1	3	1	3	1	not sure if the vegetation is correct. Also,

							not sure about density
CZ2	263	1	1	1	1	1	
CZ2	264	1	1	1	1	1	
CZ2	277	1	1	1	2	1	
CZ3_4	7700	4	1	1	1	1	Boundary: I would have extended the boundaries of this poly and the one above to include the oaks going up slope
CZ3_4	1962	1	1	1	1	1	
CZ3_4	4733	1	1	1	3	1	Would have made density a 3
CZ3_4	691	1	1	1	1	1	
CZ3_4	2939	3	1	1	3	1	Would have cut out the more densely vegetated areas on the east and west sides of this polygon
CZ3_4	7588	1	1	1	1	1	
CZ3_4	1556	1	1	1	1	1	
CZ3_4	9487	1	1	1	1	1	
CZ3_4	2067	1	1	1	1	1	
CZ3_4	2458	1	1	1	1	1	
CZ3_4	9056	1	1	1	1	1	
CZ3_4	3569	1	1	1	1	1	
CZ3_4	610	1	1	1	1	1	
CZ3_4	1761	1	1	1	1	1	
CZ3_4	4599	1	1	1	3	1	Density: I would have made this density of 1
CZ3_4	7725	1	1	1	1	1	
CZ3_4	1248	1	1	1	1	1	
CZ3_4	7608	1	1	1	1	1	
CZ3_4	973	1	1	1	1	1	
CZ3_4	9563	1	1	1	1	1	
CZ3_4	4779	1	1	1	1	1	

CZ3_4	2313	1	1	1	1	1	
CZ3_4	5882	1	1	1	1	1	
CZ3_4	1954	1	1	1	1	1	
CZ3_4	5459	1	1	1	2	1	
CZ3_4	3065	3	1	1	3	1	Would have trimmed out oaks in north/ northwest region. Density of oaks - 3, density of Chamise 2.
CZ3_4	9480	1	1	1	3	1	I would have made this density of 4
CZ3_4	8900	1	1	1	3	1	I would have made this density of 4
CZ3_4	3474	1	1	1	2	1	
CZ3_4	9942	1	1	1	1	1	
CZ3_4	3624	1	1	1	1	1	
CZ3_4	9722	3	1	1	3	1	I would have cut out the western portion and changed density of only the eastern portion to 1
CZ3_4	2064	1	1	1	1	1	
CZ3_4	6821	1	1	1	1	1	
CZ3_4	7396	1	1	1	1	1	
CZ3_4	4501	1	1	1	1	1	
CZ3_4	8628	1	1	1	1	1	
CZ3_4	1208	1	1	1	1	5	WUI should be 2, a couple houses in the southern potion
CZ3_4	2498	1	1	1	1	1	
CZ3_4	8807	2	3	1	2	1	This has to be 7120 with a density of 2 or the PI needs to change. Also, would have maybe merged

							this with a portion of the adjacent polygon to the west.
CZ3_4	3553	1	1	1	1	1	
CZ3_4	3178	1	1	1	1	1	
CZ3_4	3339	1	1	1	3	1	I wouldn't have changed density to 1
CZ3_4	4873	1	1	1	1	1	
CZ3_4	2015	1	1	1	1	1	
CZ3_4	64	1	1	1	1	1	
CZ3_4	8409	1	1	1	1	1	
CZ3_4	3952	1	1	1	1	1	
CZ3_4	83	1	1	1	1	1	
CZ3_4	9072	1	1	1	5	1	Density: would have made 4
CZ3_4	9268	1	1	1	1	1	
CZ3_4	9013	1	1	1	1	1	
CZ3_4	2351	1	1	1	1	1	
CZ3_4	2522	1	1	1	1	1	
CZ3_4	1421	1	1	1	1	1	
CZ3_4	9760	1	2	2	2	1	
CZ3_4	3897	1	1	1	1	1	
CZ3_4	939	1	5	1	1	1	This looks like a mistake, not sure what the PI change was intended to be
CZ3_4	7970	1	1	1	1	1	
CZ3_4	6417	1	1	1	1	1	
CZ3_4	7620	1	1	1	2	1	
CZ3_4	918	1	1	1	1	1	
CZ3_4	6294	1	1	1	1	1	
CZ3_4	8303	1	1	1	1	1	
CZ3_4	2984	1	1	1	1	1	
CZ3_4	9643	1	1	1	1	1	
CZ3_4	230	1	1	1	1	1	
CZ3_4	4284	1	1	2	1	1	
CZ3_4	5989	1	1	1	1	1	
CZ3_4	8137	1	1	1	3	1	Density: would have made 3 or 4

CZ3_4	7899	1	1	1	1	1	
CZ3_4	98	1	1	1	1	1	
CZ3_4	4188	1	1	1	1	1	
CZ3_4	5061	1	1	1	1	1	
CZ3_4	3064	1	1	1	1	1	

Appendix E. Accuracy of the 2004 vegetation map. This appendix details 200 polygons selected randomly to test the accuracy of the 2004 vegetation map. 100 polygons were selected that had no change relative to the 2016 map, and 100 were selected representing polygons that had changed.

Goal: Compare historical imagery with 2016 to see how well the older imagery captures details in modern imagery.

Accuracy Scores

1 Detail matches current

2

3 Detail ok

4

5 Detail does not match current

No Change Polygons

QAQC_ID	Imagery Score	Detail Score - boundary	Detail Score- Attributes	Notes
10120	1	1	1	
31215	2	2	2	
29419	1	3	1	
12173	1	1	1	
24934	1	1	1	
1323	1	1	1	
16267	1	1	1	
22184	1	1	1	
32376	1	1	1	
17448	1	1	1	
18223	1	1	1	
2882	1	1	1	
8532	1	1	1	
24576	1	1	1	
26714	1	1	1	
12014	1	1	1	

12342	1	1	1	
30112	1	1	1	
56	1	1	1	
15882	1	2	1	
30440	1	1	1	
8500	1	1	1	
29227	2	1	1	
3909	1	1	1	
33416	1	1	1	
9481	1	1	1	
16596	1	1	1	
31017	1	2	1	
8975	1	3	1	
21375	1	1	1	
31290	1	1	1	
3116	1	1	1	
12938	1	1	1	
18244	1	1	1	
22069	1	2	1	
26917	1	1	1	
17599	1	1	1	
23841	1	1	1	
7612	1	1	1	
26587	1	1	1	
1483	1	1	1	
3416	1	1	1	
15144	1	1	1	
12058	1	1	1	
8721	1	1	1	
26357	1	1	1	
544	1	2	1	
7671	1	1	1	
25927	1	1	1	
28515	1	1	1	
11537	1	2	1	
4968	1	1	1	
5169	1	1	1	
7497	1	1	1	
4345	3	2	2	hard to see low density trees over chaparral in old imagery
8152	1	1	1	
33578	1	1	1	

15650	1	1	1	
25128	1	1	1	
597	1	1	1	
25179	1	1	1	
2561	1	1	1	
920	1	1	1	
1206	1	1	1	
21335	1	1	1	
23324	1	1	1	
1183	1	1	1	
18167	1	1	1	
29421	1	1	1	
3880	1	1	1	
19334	1	1	1	
12241	1	1	1	
12677	1	1	1	
15698	1	1	1	
18650	1	1	1	
15484	1	2	1	
29353	1	2	1	
4468	1	1	1	
8827	1	1	1	
12317	1	1	1	
24686	1	1	1	
8284	1	1	1	
4462	1	1	1	
30711	1	1	1	
3599	1	1	1	
26213	1	1	1	
28500	1	1	1	
6884	1	1	1	
11624	1	1	1	
24551	1	1	1	
26138	1	2	1	
1494	1	1	1	
7373	1	1	1	
20744	1	1	1	
3870	1	1	1	
15404	1	1	1	
6037	1	1	1	
19833	1	1	1	

18652	1	1	1	
32447	1	1	1	

Change Polygons

	QA QC_ ID	Change Flag	PI Change?	Density Change?	Size Change?	Boundary Change?	Imagery Score	Detail Score - boundary	Detail Score- Attributes	Flag for edit	reason	notes
1	488	3	x	x	x	merge	1	1	1	y	< MMU area vegetation filled in (and not ag)	a small section (0.4ha) in SW corner not ag, but under MMU
2	895	3	x	x	x	merge	1	3	1	n	veg filling in	neighboring polygons with same PI, diff Den merged.
3	967	2	x	2 to 1	x	x	1	1	1	n	veg filling in	
4	1047	3	x	x	x	split	1	1	1	n	veg filling in	split section on east side and merged to neighb

												oring poly
5	2058	3	x	x	x	split/ merge	1	1	1	n		
6	2177	4	9200 to 9100	x	x	split/ merge	1	2	1	if ag	<MMU grassland, planted trees urban or ag?	small area (0.26ha) on south side not ag (grass), majority of poly a road with planted trees next to it, was merged with house on NE side and changed from Ag to Urban, not in county ag layer
7	2257	3	x	x	x	merge	1	1	3	y (D=1), original PIs	post burn, veg filled in	3 polys merged, merged mixed oak PI with 2

												neighboring polys with different oak PI, kept density 2, should be 1
8	2496	3	x	x	x	merge	1	1	1	n	veg filling in	merged coast live oak/blue oak into mixed oak poly
9	2530	4	9200 to 7120	9 to 1	x	split/ merge	1	1	1	y (bottom part = ag)	grass not ag, looks similar	looks like neighboring 7120 poly, not in county ag layer
10	2752	3	x	x	x	split	1	1	1	y, density increase	veg filling in, new ag was split out	
11	3149	3	x	x	x	split	1	1	1	n	small ag fields cut out	

12	3603	2	x	2 to 1	x	x	1	1	1	n	veg filling in	
13	3720	2	x	2 to 1	x	x	1	1	1	n	veg filling in	
14	3876	2	x	3 to 2	4 to 3	x	1	1	1	n	veg filling in	
15	3974	4	x	2 to 3	x	merge	1	1	1	n	veg filling in	neighboring grasslands now have trees in them, so merged into tree poly
16	4025	3	x	x	x	split/ merge	1	1	1	n	cleaning up at edge of county	
17	4323	3	x	x	x	split	1	3	1	n	small patch scrub oak included	split out scrub oak
18	4962	2	9400 to 4321	9 to 1	x	x	1	1	5	n	Chamise with 100% cover	100% cover of 4321 was interpreted as water, looks similar to nearby

												pond in old imagery
19	6448	3	x	x	x	split/ merge	1	2	1	n	1 ridgeline slightly off, few trees included	some trees included in small area (0.5ha) that should have been in neighboring poly
20	6837	2	x	2 to 1	x	x	1	1	1	n	veg filling in	
21	8291	3	x	x	x	split	1	1	1	n	slight edit to pond boundary	
22	8540	2	x	4 to 3	x	x	1	1	1	n	density right on threshold for 3 and 4	
23	8867	3	x	x	x	merge	1	1	1	n	small boundary change	small poly (0.8ha) merged in
24	9139	3	x	x	x	split	1	1	1	n	veg filling in	veg got denser in part of the original poly,

												so it was split off and assigned a higher density class
25	10945	3	x	x	x	split	1	1	1	y	shouldn't have changed	
26	11273	4	9200 to 7100	9 to 1	x	split	1	1	1	n	section not being used in ag, changed to grassland	
27	11551	3	x	x	x	split	1	1	1	n	minor boundary changes	
28	11803	3	x	x	x	merge	1	1	1	n	minor boundary changes	
29	11954	4	x	4 to 5	x	split	1	1	1	n	split out small poly that didn't have	

											pine trees	
30	12734	2	x	1 to 2	x	x	1	1	1	n	veg thinned out	
31	13429	3	x	x	x	split	1	1	1	n	fire	split due to fire 2015
32	13454	2	x	1 to 3	x	x	1	1	1	n	fire	fire thinned out veg in 2015
33	13893	4	x	2 to 5	x	split	1	1	1	n	fire	split due to fire 2014
34	13948	2	x	2 to 4	x	x	1	1	1	n		
35	14348	3	x	x	x	merge	1	1	1	n	small bnd change	
36	15762	2	x	1 to 2	x	x	1	1	2	n	could be density 1 or 2 (I would have kept 1)	a few trees in middle of grassland poly
37	16231	3		x	x	merge	1	1	1	n	merged slivers along county boundary	
38	16398	3	x	x	x	merge	1	1	1	n	merged neighboring	veg fill in after burn

												polys with same PI, diff density (now all density 1)	
39	17081	3		x	x	x	merge	1	1	1	n	veg filling in	
40	17194	3		x	x	x	split	1	1	1	n	new ag field cut out	
41	17403	3		x	x	x	split	1	1	1	n	new ag field cut out	
42	17951	3		x	x	x	merge	1	1	1	n	veg filling in	merge with neighboring polys that have more veg now,
43	17978	3		x	x	x	split	1	1	1	n	new urban	ag to urban conversion
44	17979	2		x	3 to 2	x	x	1	1	1	n	veg filling in	
45	18386	3		x	x	x	split	1	1	1	n	new urban	ag to urban conversion
46	18567	3		x	x	x	split	1	1	1	n	new urban	ag to urban

												conversion
47	20261	4	9200 to 1223	9 to 4	9 to 3	x	1	1	1	n	veg filling in, not in ag layer	
48	20498	3	x	x	x	new area	1	1	1	n	filled in gap along county boarder	
49	20627	3	x	x	x	split	1	1	1	n	veg filling in	
50	20784	2	x	1 to 4	x	x	1	1	1	y	don't agree with density change (could be a 2 maybe but not a 4)	update to change flag = 1
51	21879	3	9100-9400 (partial)	x	x	merge	1	1	1	n	old ponds now look like flood control area	
52	22258	4	9200 to 9100	x	x	x	1	1	1	n	new urban	ag to urban conversion
53	22383	3	x	x	x	split	1	1	1	n	ag cut out	

54	22635	4	6402 to 9200	1 to 9	x	split	1	1	1	n	urban cut out	was 9200 in 2004 map, not sure where 6402 came from
55	22667	3	x	x	x	split	1	1	1	n	urban cut out	
56	22737	3	x	x	x	split	1	1	1	n	urban cut out	
57	22743	3	x	x	x	split	1	1	1	y	orchard cut out, should remain ag	its on the north side of the poly
58	22746	3	x	x	x	merge	1	1	1	n	new ag at top of poly added	
59	22861	3	x	x	x	split	1	1	1	n	small edit to water boundary	
60	22891	3	x	x	x	split	1	1	1	n	field by highway split out because not urban	new highway moved urban boundary
61	23016	4	9200 to 7120	x	x	split	1	1	1	n	ag cut out, grazing land	

											changed to grassland	
62	23017	3	x	x	x	split	1	1	1	n	new ag cut out	
63	23221	3	x	x	x	split	1	1	1	n	new ag cut out	
64	23223	3	x	x	x	multi-part polys	1	1	1	n	Multi-part polygon was exploded/edited	
65	23330	3	x	x	x	split	1	2	1	n	corner cut out and merge to adjacent poly	
66	23939	2	x	5 to 3	x	x	1	1	2	n	veg grew in? hard to tell density in old imagery	density could be 3 or 4, not 5
67	24025	3	x	x	x	merge	1	1	1	n	slight bnd change at ag boarder	
68	25101	2	x	2 to 1	x	x	1	1	1	n	veg filled in	

69	26347	3	x	x	x	split	1	1	1	n	slight bnd change at ag boarder
70	28060	3	x	x	x	merge	1	1	1	n	neighboring ag polys combined
71	28085	3	x	x	x	extend	1	1	1	n	new veg so extended polygon
72	28415	3	x	x	x	split	1	1	1	n	NW corner split out, looks like neighboring veg type
73	28727	3	x	x	x	multipart	1	1	1	n	Multi-part poly merged in
74	28791	2	x	2 to 1	x	x	1	1	1	n	veg filled in
75	29210	3	x	x	x	extend	1	2	1	n	small extension into neighb

											oring poly	
76	29831	3	x	x	x	extend	1	1	1	n	small extension into neighboring poly	
77	29950	3	x	x	x	split	1	1	1	n	veg converted to mine	
78	30015	2	x	2 to 1	x	x	1	1	1	n	veg filled in	
79	30108	3	x	x	x	merge	1	1	1	n	veg filled in	
80	30356	4	x	3 to 1	x	merge	1	2	1	n	veg filled in	
81	30460	1	x	x	3 to 4	x	1	1	1	n	trees got bigger	
82	30525	3	x	x	x	merge	1	1	1	n	merged with neighboring poly with same PI, size and density	
83	31343	4	x	x	4 to 5	1merge, 3split	1	2	1	n	trees got bigger	NW/S/E - split for smaller trees, SW - merged (same

												PI/Size /Density)
84	31640	2	x	x	x	2merge, 2 split	1	1	1	n	veg filled in some parts, they were split out and given higher density value	
85	32357	3	x	x	x	2 merge	1	1	1	n	merged neighboring polys with same attributes	
86	32375	2	x	4 to 5	4 to 2	x	1	1	1	n	poly burned in 2015	
87	32406	2	x	3 to 1	x	x	1	1	1	n	veg filled in	
88	32951	3	x	x	x	merge	1	1	1	n	new vineyard	
89	33478	3	x	x	x	split	1	1	1	n	new urban split out	
90	33515	3	x	x	x	merge	1	1	1	n	merged neighboring polys with	

											same attributes
91	33677	3	x	x	x	merge	1	1	1	n	merged neighboring polys with same attributes
92	33791	3	x	x	x	split	1	1	1	n	not sure why split, all sections of split poly kept original attributes
93	33870	3	x	x	x	split	1	1	1	n	new ag split out
94	33971	3	x	x	x	split	1	1	1	n	split out sections that burned
95	34570	3	x	x	x	merge	1	1	1	n	merged neighboring polys with same attributes

96	35146	3	x	x	x	split	1	1	1	n	split out new veg	
97	35402	3	x	x	x	merge	2	2	2	n	merged in new veg from grassland	water and veg looks similar in old imagery
98	35459	3	x	x	x	merge	1	1	1	n	merged neighboring polys with same attributes	
99	35477	3	x	x	x	split	1	1	1	n	split out new veg	
100	35631	3	x	x	x	split	1	1	1	n	veg increase at stream, so veg cut out; new urban cut out too	

Appendix F. Trees per hectare assessment. The appendix details the stem/canopy counts made by examining a set of polygons for the number of tree canopies within them. The summary table is also contained in the NapaVeg file geodatabase.

PI Vegetation Cover Type Code

1100 Winter-Rain Sclerophyll Forests & Woodlands

1101 California Bay - Madrone - Coast Live Oak - (Black Oak Big Leaf Maple)

1122 Canyon Live Oak

1124 Tanbark Oak

1126 California Bay - Interior Live Oak

1201 Coast Live Oak – Blue Oak – (Foothill Pine)

1202 Interior Live Oak – Blue Oak – (Foothill Pine)

1221 Coast Live Oak

1222 Interior Live Oak

1223 Mixed Oak

2104 Foothill Pine / Mesic Non-serpentine Chaparral

2121 Foothill Pine

2123 Ponderosa Pine - Douglas fir forest

2126 Sugar Pine – Canyon Oak

2128 Sparse California Juniper - Canyon Live Oak - California Bay - California Buckeye / Steep Rock Outcrop

2222 Douglas-fir

2230 Coast Redwood

3101 Valley Oak – (California Bay – Coast Live Oak - Walnut - Ash) Riparian Forest

3102 Valley Oak – Fremont Cottonwood – (Coast Live Oak) Riparian Forest

3121 Black Oak

3122 Blue Oak

3123 Valley Oak

3124 Oregon White Oak

3125 California Buckeye

Density Class – refers to the relative cover of the dominant life form being mapped: Tree, Shrub, or Herbaceous

1 = > 60%

2 = 40-60%

3 = 25-40%

4 = 10-25%

5 = 2-10%

Size Class – for tree-dominated cover types only

1 = Seedlings (less than 1')

2 = Saplings (1-6')

3 = Pole (6-11')

4 = Small (11-25')

5 = Medium – Large (Greater than 25')

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

Burn Flag Whether the fire perimeter covered the entire polygon (Burn_Type = full) or part of it (Burn_Type = partial)

Change Flag Whether the Vegetation Cover Type (PI code) changed between 2004 to 2016

1 = No Change

2 = Landcover changed

3 = Polygon boundary changed

4 = Landcover and polygon boundary changed

5 = PI change from 4305 to 4303, or 4306 to 4304

6 = Changed to an existing PI from the Knoxville Vegetation Map

7 = Changed to a new PI from the Knoxville Vegetation Map

WUI Wildlife/Urban Interface code

1 = High Density Urban

2 = Medium Density Urban

3 = Low Density Urban

4 = Campground

Comments New comments, questions, notes

Area - Acre Area of the polygon in Acres

Number of Trees Number of trees in the polygon

Counting Method How the Number of trees were counted

1 = counted all tree crowns

2 = counted tree crowns in a portion of the polygon, then estimated the total across the entire polygon

Trees per Acre An estimate of tree density within the polygon

Calculated Field: Number of Trees divided by Area - Acre

Tree Count Table

PI	Density	Size	Burn Flag	Change Flag	WUI	Area - Acre	Number of Trees	Counting Method	Trees per Acre	Comments
1100	1	6	partial	4	0	2.5	123	1	50	
1100	1	2		4	0	1.7	57	1	32.9	
1100	1	2		3	3	2.5	105	1	42.8	
1100	1	2		1	0	1.3	50	1	40	
1100	1	2		1	0	4.8	227	1	47.1	
1100	2	4		4	0	5	185	1	37.1	
1100	2	2		4	0	24.3	835	1	34.3	
1100	2	2		1	0	1	41	1	42.5	
1100	2	2		2	0	2.1	64	1	30.8	
1100	2	2		1	0	1.8	90	1	51.4	
1100	3	2		1	0	5.5	138	1	25.3	
1100	3	2		2	0	9.7	148	1	15.2	
1100	3	2		2	0	15.6	173	1	11.1	
1100	3	2		4	0	3.1	45	1	14.7	
1100	3	4		4	0	4.7	108	1	23.1	
1101	1	4	full	1	0	65.8	6983	1	106.1	
1101	1	4	full	1	0	16.1	1095	1	67.9	
1101	1	4		1	0	7.7	521	1	67.6	
1101	1	3		1	0	11.6	628	1	54	
1101	1	4		1	0	42.8	1751	1	40.9	

1101	2	4		1	0	8.4	873	1	103.5
1101	2	4		1	0	6	514	1	86.3
1101	2	4		2	0	2.9	238	1	83.3
1101	2	4	partial	4	0	0.4	20	0	53
1101	2	4		1	0	4.5	218	0	48.3
1101	2	3	partial	2	0	52.6	2315	1	44
1101	3	3	full	1	0	15.1	1032	1	68.2
1101	3	4	full	1	0	1.1	55	0	49.1
1101	3	4	full	2	0	2.9	85	0	29.5
1101	3	4		1	0	9.9	150	0	15.2
1101	4	4		1	0	2.6	73	0	28.6
1101	4	4		1	0	4	99	0	24.9
1101	4	4		2	0	3	67	0	22.3
1101	4	4	full	2	0	5.7	91	0	15.9
1122	1	4	full	3	0	2	114	0	57.2
1122	1	4	full	3	0	35.2	1212	1	34.4
1122	1	4	full	1	0	34.5	1103	0	31.9
1122	1	3	partial	3	0	20	519	1	26
1122	1	4	full	1	0	3.5	70	1	20.2
1122	2	4	full	3	0	4.1	78	1	19
1122	2	4		1	0	48.7	809	1	16.6
1122	2	3		1	0	10.2	122	1	12
1122	2	3	full	2	0	33.8	402	1	11.9
1122	2	4	partial	3	0	32.7	338	1	10.4
1124	1	4		1	0	78.2	6219	1	79.5
1124	1	4		1	0	12.3	593	1	48.3

1124	1	4		1	0	9.6	444	1	46.2
1124	1	4		1	0	88.2	2956	1	33.5
1124	1	4		1	0	4	81	0	20.3
1126	1	3		7	0	5.1	275	1	54.2
1126	3	3		7	0	1.8	54	1	30.1
1126	3	3		7	0	0.6	23	0	37.2
1126	3	3		7	0	1.2	31	0	25.4
1126	3	3		7	0	2.5	95	1	38.2
1126	3	3		7	0	0.9	24	0	27.1
1126	4	3		7	0	2.8	64	1	22.6
1126	4	3		7	0	3.2	93	1	29.1
1201	1	4		2	0	1.9	125	1	67.5
1201	1	4		1	0	2.2	120	1	55.4
1201	1	4	full	1	0	13.5	610	1	45.3
1201	1	4	full	2	0	24.7	819	1	33.1
1201	1	4		1	0	22.3	368	1	16.5
1201	2	4	full	1	0	2.2	110	1	49.1
1201	2	4	full	2	0	8.3	330	1	39.9
1201	2	4		1	0	12.7	251	1	19.7
1201	2	4		4	0	3	50	0	16.5
1201	3	4	full	1	0	3.4	74	0	21.8
1201	3	4		3	0	21	380	1	18.1
1201	3	4		2	3	10.5	189	1	18
1201	3	4	full	1	0	2.8	49	0	17.7
1201	3	4		3	3	9.2	143	1	15.5
1201	4	4		1	2	9.5	221	1	23.2
1201	4	4	partial	1	3	21	341	1	16.2
1201	4	4	full	2	0	3.7	55	0	14.7

1201	4	4		1	0	12.3	140	0	11.4
1201	4	4		2	0	4.7	46	0	9.7
1201	5	4	full	2	0	0.7	12	0	16.4
1201	5	4	full	1	0	1.6	25	0	15.6
1201	5	4	full	1	3	3.1	42	0	13.4
1201	5	3	full	1	0	3.2	33	0	10.4
1201	5	4	full	1	0	1.8	16	0	9.1
1202	1	3		1	0	2.8	235	1	84.9
1202	1	3	full	1	0	21.4	820	1	38.4
1202	1	3		1	0	49.9	1866	1	37.4
1202	1	3	full	1	0	1.8	48	0	26.3
1202	1	4		2	0	2.3	59	0	25.7
1202	2	4	full	1	0	7.9	418	1	52.7
1202	2	4		1	0	6.4	322	1	50
1202	2	4		1	0	3	108	0	36.4
1202	2	4		1	0	7	252	1	36.2
1202	2	4	full	1	0	18.4	452	1	24.6
1202	3	4		1	0	2.7	86	0	31.5
1202	3	4	full	1	0	10.2	320	1	31.4
1202	3	3	full	1	0	26.9	733	1	27.2
1202	3	4	full	1	0	31.7	774	1	24.4
1202	3	4	full	1	0	3.1	57	0	18.4
1202	4	4	partial	1	0	61.9	1970	1	31.8
1202	4	4	partial	1	0	19.8	423	1	21.4
1202	4	4	partial	1	0	3	57	0	18.7
1202	4	4	full	1	0	23.4	283	1	12.1

1202	4	4	full	1	0	3.4	40	0	11.7
1202	5	4	partial	3	0	4	72	0	18.2
1202	5	4	full	2	0	5.4	91	0	16.9
1202	5	4	full	1	0	2.5	30	0	11.8
1202	5	4		1	0	7.2	76	0	10.6
1202	5	4	full	1	0	1.7	7	0	4.2
1221	1	4	full	2	0	12.3	417	0	33.9
1221	1	4	partial	1	0	3.9	124	0	31.8
1221	1	4	partial	3	0	3.3	105	0	31.5
1221	1	4		4	0	2	37	0	18.8
1221	1	4		1	0	8.2	150	0	18.2
1221	2	4	full	1	0	2.2	70	0	32
1221	2	4		1	3	5.8	150	0	25.8
1221	2	4	full	1	0	7	175	0	25
1221	2	4		4	0	4.9	85	0	17.4
1221	2	4	full	2	0	3.2	51	0	16.2
1221	3	4		2	0	3.3	89	0	27.1
1221	3	4	full	2	0	2.7	68	0	25.3
1221	3	2	full	1	0	5.5	109	0	19.9
1221	3	4		1	0	5.3	89	0	16.8
1221	3	4	full	1	0	2.7	39	0	14.4
1221	4	4	full	1	0	1.8	40	0	21.9
1221	4	2	full	2	3	2.1	36	0	17.4
1221	4	4		2	0	2	31	0	15.2
1221	4	4	full	1	0	5.5	75	0	13.7
1221	4	4		1	0	6.6	56	0	8.4

1221	5	2	full	1	0	3.5	70	0	19.8
1221	5	3	full	1	0	2.7	52	0	19.5
1221	5	4		1	0	8.4	103	0	12.3
1221	5	4		1	0	6.5	78	0	12
1221	5	4		1	0	2.7	25	0	9.2
1222	1	4	partial	2	0	33.3	2559	1	76.9
1222	1	3	full	1	0	3.4	230	1	68
1222	1	4	partial	1	0	3.9	184	1	47.6
1222	1	4	full	1	0	2.4	71	1	30
1222	1	4		1	0	42.6	1012	1	23.8
1222	2	4	full	3	0	2.4	163	1	69.2
1222	2	4		1	0	8.7	380	1	43.6
1222	2	4	full	1	0	9.6	346	1	36.1
1222	2	4		1	0	6.8	200	1	29.3
1222	2	4		2	0	1.7	44	0	26.2
1222	3	4	full	1	0	3.2	124	0	38.5
1222	3	4	partial	1	0	6.4	168	0	26.2
1222	3	4		1	0	2.4	39	0	16.2
1222	3	4	full	2	3	3.9	56	0	14.5
1222	3	4	full	1	3	20.8	247	0	11.9
1222	4	4	full	1	0	2.1	90	0	43.7
1222	4	4	full	4	0	2	61	0	30.6
1222	4	3	full	1	0	2.1	49	0	23.6
1222	4	3	full	1	0	4.4	74	0	16.9
1222	4	3	full	2	0	4.1	65	0	15.9
1222	5	4	full	2	0	1.3	35	0	27.3

1222	5	4	full	1	0	2.1	41	0	19.1
1222	5	3	full	1	0	2.3	35	0	15.2
1222	5	4	full	3	0	4	60	0	14.9
1222	5	4	full	1	0	4	34	0	8.5
1223	1	4		1	0	6	300	0	49.8
1223	1	4		1	0	2.6	91	0	35
1223	1	4		1	0	11.9	300	0	25.3
1223	1	4		1	0	6.5	154	0	23.8
1223	1	4	full	1	0	19.5	400	0	20.5
1223	2	4	partial	1	0	9.2	365	0	39.6
1223	2	4	full	4	0	11	375	0	34
1223	2	4		1	0	8	224	0	27.9
1223	2	4	full	1	0	8	180	0	22.4
1223	2	4	full	1	0	8.6	90	0	10.5
1223	3	4	full	2	0	9.4	350	0	37.4
1223	3	4	partial	1	0	3.8	98	0	25.6
1223	3	4		2	0	3	65	0	21.9
1223	3	4		1	0	7.9	145	0	18.3
1223	3	3	full	1	0	6	58	0	9.7
1223	4	4	full	1	0	2.1	54	0	25.3
1223	4	4	full	1	0	2.2	46	0	20.8
1223	4	2	full	2	0	3	60	0	19.8
1223	4	4		1	0	3.4	44	0	12.8
1223	4	4		1	0	3.7	47	0	12.8
1223	5	4		1	0	2.4	39	0	16.2
1223	5	4	full	1	0	4.8	35	0	7.2
1223	5	4		1	0	11.5	70	0	6.1

1223	5	4		1	0	4.2	25	0	6
1223	5	4	full	1	0	15.6	55	0	3.5
2104	1	4		2	0	39.7	3109	1	78.2
2104	1	4	full	4	0	1.7	90	0	52.3
2104	1	4	full	1	0	6.5	301	1	46.4
2104	2	4		2	0	5.3	436	1	82.8
2104	2	4		2	0	9.5	477	1	50
2104	2	4	full	1	0	4.1	187	1	45.7
2104	2	3		1	0	20.6	695	1	33.8
2104	2	4	full	2	0	2.5	82	0	32.3
2104	3	4	partial	2	0	33.8	983	1	29.1
2104	3	4		2	0	23.9	617	1	25.9
2104	3	4	full	2	0	2.5	57	0	23.1
2104	3	4		3	0	7.4	150	0	20.4
2104	3	4		1	0	3.8	77	0	20
2104	4	4	full	1	0	3	198	1	65
2104	4	4		2	0	8	373	1	46.9
2104	4	4	full	1	0	1.6	73	0	44.8
2104	4	4		2	0	4.6	58	0	12.6
2104	4	4	partial	2	0	5.6	55	0	9.9
2104	5	4	full	1	0	4.7	330	1	70.6
2104	5	4		1	0	7.4	382	1	51.7
2104	5	4		1	0	4.5	101	0	22.3
2104	5	4	full	2	0	2.7	37	0	14
2104	5	4		1	0	5.3	57	0	10.8
2121	1	4		1	0	5.1	487	1	95
2121	1	4		1	0	6.9	328	1	47.7

2121	1	4		4	0	29.4	1077	1	36.6
2121	1	4		1	0	5.4	181	1	33.6
2121	1	4		1	0	2	46	0	23.4
2121	2	4		3	0	0.3	26	0	80.1
2121	2	4		1	0	9.5	359	1	37.8
2121	2	4		1	0	1.9	64	0	33.6
2121	2	4		1	0	1.9	51	0	26.7
2121	2	4		2	0	55.4	1430	1	25.8
2121	3	4		2	0	7.9	393	1	49.7
2121	3	4		1	0	0.5	25	0	49.5
2121	3	4		1	0	0.7	30	0	42.4
2121	3	4	partial	4	0	4	155	1	39.1
2121	3	4		1	0	3	80	1	26.6
2121	4	4	full	2	0	5	234	1	46.8
2121	4	4	partial	1	0	9.6	227	1	23.5
2121	4	4		2	3	3	58	0	19.5
2121	4	4	full	1	0	1.1	20	0	18.4
2121	4	4	partial	4	0	3.4	28	0	8.2
2121	5	4		1	0	12.1	271	1	22.4
2121	5	4	full	2	0	18.7	333	1	17.8
2121	5	4	full	4	0	4.8	45	0	9.3
2121	5	4	partial	2	0	5.5	50	0	9
2121	5	4	full	2	0	1.8	14	0	7.6
2123	1	4		1	0	11.8	550	1	46.7
2123	1	4		3	0	11	483	1	43.8
2123	1	4		3	0	0.6	22	0	39.5

2123	1	4	3	3	91.6	3581	1	39.1
2123	1	6	4	0	17.8	537	1	30.2
2123	2	4	4	3	2.3	76	0	33.2
2123	3	4	1	3	5	99	0	19.7
2126	2	4	1	0	3.5	153	0	44
2128	1	9	4	0	14.6	503	1	34.4
2128	1	9	2	0	0.6	24	0	42.9
2128	1	9	2	0	5.7	178	1	31.1
2128	1	9	1	0	3	136	1	44.9
2128	1	9	2	0	2.2	100	1	46.3
2128	2	9	2	0	2.5	80	1	32.3
2128	2	9	2	0	6	260	1	43.3
2128	2	9	2	0	4.1	164	1	39.5
2128	2	9	1	0	3.6	136	1	37.4
2128	2	9	1	0	4.2	188	1	44.3
2128	3	9	2	0	12.3	492	1	40
2128	3	9	1	0	4.2	135	1	31.8
2128	3	9	1	0	3.5	102	1	29.2
2128	3	9	4	0	2	63	1	31.5
2128	3	9	4	0	1.5	30	1	19.5
2128	4	9	2	0	30.7	152	1	5
2128	4	9	1	0	6.2	60	1	9.6
2128	4	9	1	0	5.2	59	1	11.4
2128	4	9	3	0	4.1	29	1	7.1
2128	4	9	1	0	6.4	48	1	7.5
2128	5	9	1	0	9.5	42	0	4.4
2128	5	9	1	0	3.9	24	0	6.2
2128	5	9	1	0	3.1	32	1	10.3

2128	5	9		1	0	1.7	14	0	8.4
2128	5	9		1	0	3.8	25	0	6.6
2222	1	4		1	0	25.3	1506	1	59.5
2222	1	4		1	0	18.2	888	1	48.9
2222	1	6		2	0	58.4	1991	1	34.1
2222	1	4	partial	1	0	24.8	717	1	28.9
2222	1	4		2	0	3.3	75	0	22.9
2222	2	4	partial	1	0	2.2	76	0	35
2222	2	4	partial	1	0	2.8	54	0	19.1
2222	2	6		1	0	12.6	215	1	17.1
2222	2	4		1	3	13.1	212	1	16.2
2222	2	4	full	1	0	5.6	62	0	11
2222	3	4	full	1	0	8.1	330	1	41
2222	3	6	full	1	0	8.7	280	1	32.3
2222	3	4		1	0	12.8	368	1	28.8
2222	3	4		2	0	4.7	80	0	17.1
2222	3	4		2	0	2.8	39	0	14.1
2222	4	4		1	0	10.7	452	1	42.3
2222	4	4	full	2	0	3.3	129	1	38.9
2222	4	4		1	0	3.7	67	0	17.9
2222	4	4		1	0	6.4	108	0	16.9
2222	4	4	full	2	0	3.2	22	0	6.9
2222	5	6	full	1	0	4.2	79	0	19
2222	5	3	full	1	0	4.6	62	0	13.5
2222	5	4	full	1	0	1.1	12	0	11.4
2222	5	3	full	1	0	8.9	87	0	9.8

2222	5	6	full	3	0	20	99	0	4.9	
2230	1	4		4	0	3.9	255	1	65.2	From Peter: Redwood
2230	1	4		4	0	3.7	179	1	48.7	From Peter: Redwood
2230	1	4		1	0	10.2	393	1	38.7	
2230	1	4		1	0	7.9	304	1	38.5	
2230	1	6		4	0	5.2	149	0	28.6	From Peter: Redwood
3101	1	4	partial	1	0	11.6	200	1	17.3	
3101	1	4		3	3	246	2633	1	10.7	
3101	1	4		1	0	20.1	200	1	10	
3101	1	4		3	0	5.3	51	0	9.6	
3101	1	4	partial	3	1	13	108	1	8.3	
3101	2	4	full	3	0	0.1	4	0	30	
3101	2	4		1	0	1.4	29	0	20.5	
3101	2	4		1	0	3.4	52	0	15.3	
3101	2	4		2	0	2.7	37	0	13.8	
3101	2	4		2	0	3.6	32	0	8.8	
3101	3	4		1	0	3.7	57	0	15.3	
3101	3	4		1	0	1.4	13	0	9.1	
3101	3	4	partial	2	0	11	80	0	7.2	
3101	3	4	full	1	0	3	16	0	5.3	
3101	3	4	partial	3	0	92.5	385	1	4.2	
3101	4	4	full	4	0	2.1	50	0	23.5	
3101	4	4	full	2	0	2.1	35	0	16.9	
3101	4	4	full	1	0	1.6	21	0	13.5	

3101	4	4		2	0	5.6	43	0	7.6
3101	4	4		4	0	25.5	56	0	2.2
3101	5	4		4	3	5.8	31	0	5.3
3102	1	4		3	0	8.3	164	1	19.8
3102	1	4		3	0	30.2	554	1	18.4
3102	1	4		1	0	11.6	188	1	16.2
3102	1	4		1	3	10.4	165	1	15.8
3102	1	4		3	0	0.6	7	0	12.7
3102	2	4		1	0	2.2	62	0	28.4
3102	2	4		3	0	7.3	174	1	23.8
3102	2	4		2	2	1.7	38	0	22.4
3102	2	4		2	0	13.7	242	1	17.7
3102	2	4		1	3	6.3	85	1	13.4
3102	3	4		1	0	7.2	141	1	19.7
3102	3	4	partial	3	0	31	400	0	12.9
3102	3	4	full	1	0	6.3	69	0	10.9
3102	3	4		4	0	7.8	76	0	9.7
3102	3	4	full	1	0	6.9	44	0	6.4
3102	4	4		4	0	3.6	19	0	5.3
3121	1	4		3	2	177.3	9274	1	52.3
3121	1	4	full	3	0	99.4	4365	1	43.9
3121	1	4	partial	3	0	17.5	700	1	40
3121	1	3	full	1	0	6.1	161	1	26.5
3121	1	4		3	3	53.7	1203	1	22.4
3121	2	4		1	0	0.5	33	0	61.3
3121	2	4	full	1	0	2.8	161	1	58.3

3121	2	4	partial	1	3	0.7	37	0	54.3
3121	2	4	partial	2	3	1.8	60	0	34
3121	2	4	full	2	0	1.5	32	0	21.3
3121	3	4	full	1	0	7.4	380	1	51.6
3121	3	4	full	3	0	1.3	60	0	45.4
3121	3	4	partial	3	0	3.2	82	0	25.7
3121	3	4		1	0	8.5	84	0	9.9
3121	3	4	partial	3	0	22.3	192	1	8.6
3121	4	4	partial	4	0	0.8	20	0	24.7
3121	4	4	partial	4	0	22.3	155	0	7
3122	1	3	partial	1	0	3	86	0	28.8
3122	1	4	full	1	3	13.2	180	0	13.6
3122	1	3	full	1	0	4.3	56	0	13
3122	1	3		1	0	8.4	93	0	11.1
3122	1	4		1	3	24.2	190	0	7.9
3122	2	4		1	0	4.9	180	0	36.4
3122	2	4		1	0	5.1	150	0	29.5
3122	2	4		1	0	3.8	100	0	26.2
3122	2	4		1	0	3.8	95	0	25.1
3122	2	4	partial	1	0	2.5	40	0	15.9
3122	3	4		1	0	3.7	135	0	36.4
3122	3	4		1	0	3.7	77	0	20.8
3122	3	4	partial	1	0	2.5	42	0	17

3122	3	4		1	0	5	75	0	15.1
3122	3	4		1	0	5	55	0	11.1
3122	4	4	full	1	0	3.8	85	0	22.6
3122	4	4	full	1	0	5.1	57	0	11.2
3122	4	4		1	0	3.8	42	0	11.2
3122	4	4	partial	1	0	2.5	23	0	9.3
3122	4	4		1	0	5.1	25	0	4.9
3122	5	4		1	0	3.9	50	0	12.7
3122	5	4		1	0	2.8	22	0	7.8
3122	5	4	full	1	0	2.5	17	0	6.8
3122	5	4		1	0	6.2	37	0	6
3122	5	4	partial	1	0	5.4	20	0	3.7
3123	1	4	partial	2	0	47.6	1045	0	21.9
3123	1	4		1	0	2.3	48	0	21
3123	1	4	partial	1	0	12.2	245	0	20.1
3123	1	4		1	0	0.5	10	0	18.6
3123	1	4	full	2	0	4.8	88	0	18.3
3123	1	4	full	1	0	1.4	23	0	17
3123	1	4		2	0	1.9	31	0	16.1
3123	1	4		3	0	5	67	0	13.5
3123	1	4		4	0	3.2	32	0	9.9
3123	1	4		1	0	8	77	0	9.6
3123	2	4	partial	2	0	2.3	63	0	26.8
3123	2	4	full	1	0	6.1	112	0	18.2
3123	2	4	full	1	2	4.4	68	0	15.5

3123	2	4		3	0	4.5	69	0	15.3
3123	2	4	partial	3	0	2.9	40	0	14
3123	2	4		4	0	6.9	85	0	12.2
3123	2	4	full	1	0	15.8	189	0	12
3123	2	4		1	0	2.3	23	0	10
3123	2	4		1	0	2.7	26	0	9.6
3123	2	4		4	0	3.4	24	0	7.2
3123	3	4		1	0	3	48	0	16.3
3123	3	4	partial	1	0	15.9	236	0	14.9
3123	3	4		1	0	2.7	35	0	13.2
3123	3	4	full	2	0	1.4	16	0	11.4
3123	3	4	full	2	2	11.6	125	0	10.8
3123	3	4		1	0	1.6	16	0	9.9
3123	3	4		2	0	6.2	54	0	8.6
3123	3	4	full	2	3	10.5	86	0	8.2
3123	3	4	partial	1	0	2.7	22	0	8.1
3123	3	4		4	0	2.8	20	0	7.3
3123	3	4	partial	3	0	13	70	0	5.4
3123	4	4		1	0	12.8	206	0	16.1
3123	4	4	partial	1	3	5.7	76	0	13.3
3123	4	4	full	3	0	2.9	30	0	10.5
3123	4	4		4	3	7.1	55	0	7.7
3123	4	4		1	0	13.3	84	0	6.3
3123	4	4	full	4	0	2.7	16	0	6
3123	4	4		1	0	14	51	0	3.6

3123	4	4	full	1	0	19.7	71	0	3.6
3123	4	4	full	1	0	2.3	7	0	3.1
3123	4	4		1	0	12.5	31	0	2.5
3123	5	4		1	0	3	29	0	9.6
3123	5	4	full	1	0	4	31	0	7.7
3123	5	4		1	0	2	14	0	7.2
3123	5	4		3	0	3.3	14	0	4.2
3123	5	4		3	0	23.5	87	0	3.7
3123	5	4	partial	3	3	26.7	97	0	3.6
3123	5	4		1	0	3.3	11	0	3.3
3123	5	4		1	0	18.2	57	0	3.1
3123	5	4		1	0	3.1	9	0	2.9
3123	5	4		3	3	115.3	104	0	0.9
3124	1	3		1	0	26.9	1290	1	48
3124	1	3		1	0	12.7	610	1	47.9
3124	1	2		3	0	18.2	621	1	34.2
3124	1	4		1	0	16.9	510	1	30.1
3124	1	4		1	3	26.6	528	1	19.8
3124	2	4	partial	3	3	45.1	1942	1	43.1
3124	2	4		4	3	10.5	444	1	42.3
3124	2	4	partial	3	0	2.5	67	0	26.3
3124	2	4		1	3	6.1	133	0	21.9
3124	2	4	partial	4	0	2.7	56	0	20.5
3124	3	4		1	0	11	440	1	40
3124	3	4		4	1	2.6	72	0	27.9
3124	3	4		2	0	2.7	60	0	21.9

3124	3	4		4	0	16.9	357	1	21.1
3124	3	4		1	0	8.7	180	1	20.6
3124	4	4		1	0	34.8	1793	1	51.5
3124	4	4	full	4	0	10.5	283	1	27
3124	4	4	full	3	0	3.5	72	0	20.6
3124	4	4		2	0	3.1	48	0	15.5
3124	4	4	partial	3	0	5.5	55	0	9.9
3124	5	4	full	1	0	7.8	113	0	14.5
3125	3	3		6	0	3.6	126	1	35
3125	3	3		6	0	0.5	12	0	26.3
3125	3	3		6	0	1.2	27	0	23.3
3125	3	3		6	0	1.3	33	0	26.4
3125	3	3		6	0	1.1	28	0	25.2
3125	4	3		6	0	1.6	43	0	26.9
3125	4	3		6	0	4.2	76	0	18.1
3125	4	3		6	0	1	18	0	17.5
3125	4	4		6	0	3.3	32	0	9.7
3125	4	3	full	6	0	4.2	47	0	11.2