Coachella Valley Conservation Commission

June 2017

Coachella Valley Multiple Species Habitat Conservation Plan &

Natural Community Conservation Plan

CVMSHCP Conservation Areas within Sand to Snow National Monument

Vegetation Map Report

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Final Report

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EXECUTIVE SUMMARY

The University of California Riverside's Center for Conservation Biology (CCB) has created fine-scale vegetation maps for a number of Conservation Areas under the jurisdiction of the Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP) under contract with the Coachella Valley Conservation Commission (CVCC). The primary purpose for creating these maps is provide a landscape-scale approach to monitoring changes due to land use, invasive species, recreation, hydrology, and climate. These digital maps, documenting changes and their causes, are then tools for prioritizing future conservation actions. The vegetation classification follows Federal Geographic Data Committee (FGDC) and National Vegetation Classification Standards (NVCS; Federal Geographic Data Committee 2008). The classification is meant to align with previous and concurrent efforts previous survey and classification work done by California Department of Fish and Wildlife's Vegetation Classification and Mapping Program (VegCaMP) and Aerial Information Systems (AIS) for the Desert Renewable Energy Conservation Plan Area as well as the southeastern Salton Sea Mid-Desert Area, and by the National Park Service for Joshua Tree National Park. This unit was mapped using the California Department of Fish and Wildlife (CDFW) and California Natural Plant Society Combined (CNPS) Vegetation Classification and Mapping Program protocol (CNPS 2014).

This map and report addresses the area of overlap between the newly-designated Sand to Snow National Monument and the CVMSHCP Plan Area (47,256 acres), hereafter, the "Sand to Snow/CVMSHCP mapping area." The Conservation Areas within the mapping area are: Cabazon, Whitewater Canyon, Stubbe and Cottonwood Canyons, and the Upper Mission/Big Morongo Conservation areas. Fieldwork, photo-interpretation and mapping were performed from 2016-2017. Within the study areas, rapid assessment protocol vegetation plots and supplemental reconnaissance observations were obtained within the study at pre-determined points in order to document the plant community, disturbances, and invasive species across space and types. Photo-interpretation of 2013 imagery and field information were combined to produce delineations of vegetation alliances and associations according to the California Department of Fish and Wildlife classification system, outlined in the Manual of California Vegetation Second Edition (Sawyer *et al.* 2009). Thus, the current version of the map best represents the status of vegetation in 2013.

We digitized the vegetation of the Sand to Snow/CVMHSCP mapping area from 2013 imagery provided by the Coachella Valley Association of Governments (CVAG); it includes approximately 938 delineated polygons to separate areas of varied vegetation cover and type, each assigned one of 61 vegetation alliances or land-cover types. We assigned the still finer-scale vegetation association where field plot data (Rapid Assessment Plot or reconnaissance observation) was available within the polygon boundaries, or where the association could be clearly identified from aerial imagery. This unit has several map classes that have less than 2% absolute vegetation cover, including Disturbed/Built-Up, Water, and a generic Non-Vegetated Habitat type. The largest amount of land cover is of the *Encelia farinosa* Shrubland Alliance, (encompassing 15,991 acres), followed by the *Larrea tridentata--Encelia farinosa* Shrubland Alliance (3,051 acres), and the *Quercus chrysolepis* Forest Alliance (2,731 acres). This report and accompanying data are to be released at the end of 2017.

INTRODUCTION

This vegetation map is a tool to help aid in species monitoring and management in the Sand to Snow/CVMSHCP area of the Coachella Valley MSHCP and Natural Community Conservation Plan. At the end of the twentieth century, 27 species and 27 vegetation communities in the Coachella Valley were identified as being affected by pressures of land development and conversion of habitats. The most direct

threat to the biodiversity of the area is habitat loss. From 1996 to 2008, citizens, scientists, land managers, and federal and state agencies of the Valley developed a conservation plan that offered protection to these species and preserved over 250,000 acres of open space (Figure 1). The plan was approved by federal and state agencies and was implemented in 2008, all cities involved in the collaborative effort.

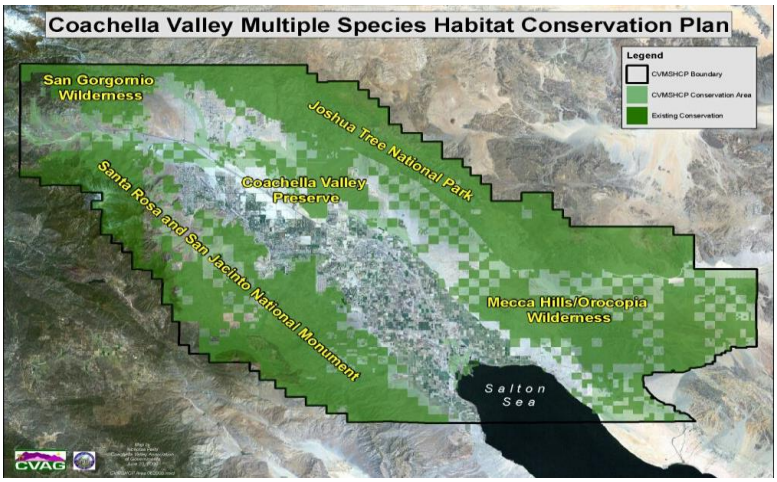

Figure 1: Coachella Valley Multiple Species Habitat Conservation Plan Boundary in relation to Joshua Tree National Park, the Santa Rosa and San Jacinto National Monument, the Coachella Valley USFWS Preserve, Wilderness areas, and the Salton Sea.

This comprehensive land planning essentially protects the ecological drivers and processes to enhance sustainability of community biodiversity. The plan is science-based and investigates hypotheses related to the persistence of species on conservation lands through adapting monitoring and management. The Coachella Valley is situated in the Colorado Desert which is situated on the northwest portion of the much larger Sonoran Desert, and consists of a variety of habitats. One hundred miles east of Los Angeles, it is bordered on the west by the San Jacinto, San Gorgonio, and Santa Rosa Mountain Ranges. The Valley lies at the northwest boundaries of the Colorado Desert, and to the east of the Valley lies the Salton Sea. The Coachella Valley is an extremely arid desert region that is characterized by aeolian sand communities, fan palm oases, creosote shrub, alluvial fan, and salt scrub communities.

Precipitation is the primary driver for vegetation growth in the Coachella Valley, which experiences both summer and winter precipitation events. Rains are highly variable from year to year, but tend to be more frequent at the far west of the Coachella Valley, due to the rain shadow of the San Jacinto, Santa Rosa, and San Bernardino mountain ranges. This causes a gradient of increasing temperature and aridness from west to east, as elevation decreases. During rare monsoonal events in July to September, weather systems that originate in the Gulf of Mexico, bring heavy but isolated thunderstorms to the Valley. During average years, the vast amount of reliable moisture comes from winter rains, which originate in the northwest and move into the area in October through May, contributing the greatest proportion of the annual rainfall.

Sand to Snow/CVMSHCP Mapping Area: Cabazon, Whitewater Canyon, Stubbe and Cottonwood Canyon and the Upper Mission Creek/Big Morongo Canyon (Reserve Management Unit 1)

The Sand to Snow/CVHMSCHP mapping area comprises over 47,546 acres at the northwestern end the Coachella Valley; the area between the I-10 and the San Bernardino County Line (Figure 2). It is

contiguous with the Joshua Tree National Park Conservation Area, as well as San Bernardino National Forest lands to the north and ends at the (western) Riverside County Multiple Species Habitat Conservation Plan Area to the west. The elevational range encompassed within this mapping unit is significant, from approximately 1,100 feet in the Whitewater Canyon Conservation Area to Kitching Peak at 6,598 feet within the Cabazon Conservation Area. This mapping unit is made up primarily of federal lands (USFS, BLM), private conservation lands (the Coachella Valley Conservation Commission, the Friends of the Desert Mountains and the Wildlands Conservancy), as well as small parcels of private land and non-permittee utilities (e.g. Metropolitan Water District and Southern California Edison).

The Conservation Areas within this mapping area contain a variety of vegetation types that thrive in the Colorado/Mojave Desert transition, riparian as well as lower montane climates. This area is a sand source area for the aeolian fluvial system. The conservation areas herein support Core Habitat and Other Conserved Habitat for many Plan-listed species, including: the arroyo toad, desert tortoise, Jerusalem cricket, Little San Bernardino linanthus, Le Conte's thrasher, Palm Springs pocket mouse, triple-ribbed milkvetch and many of the riparian birds (least Bell's vireo, southwestern willow flycatcher, summer tanager, yellow-breasted chat and yellow warbler). A general habitat map was produced prior with the inception of the Plan to document the distribution of conserved natural communities using the Holland Type system (Holland, 1986). This effort updates this outdated map, and provides more specific information about the acreage-extent of habitat in this Conservation Area, which will provide essential information for monitoring habitat for Plan-listed species.

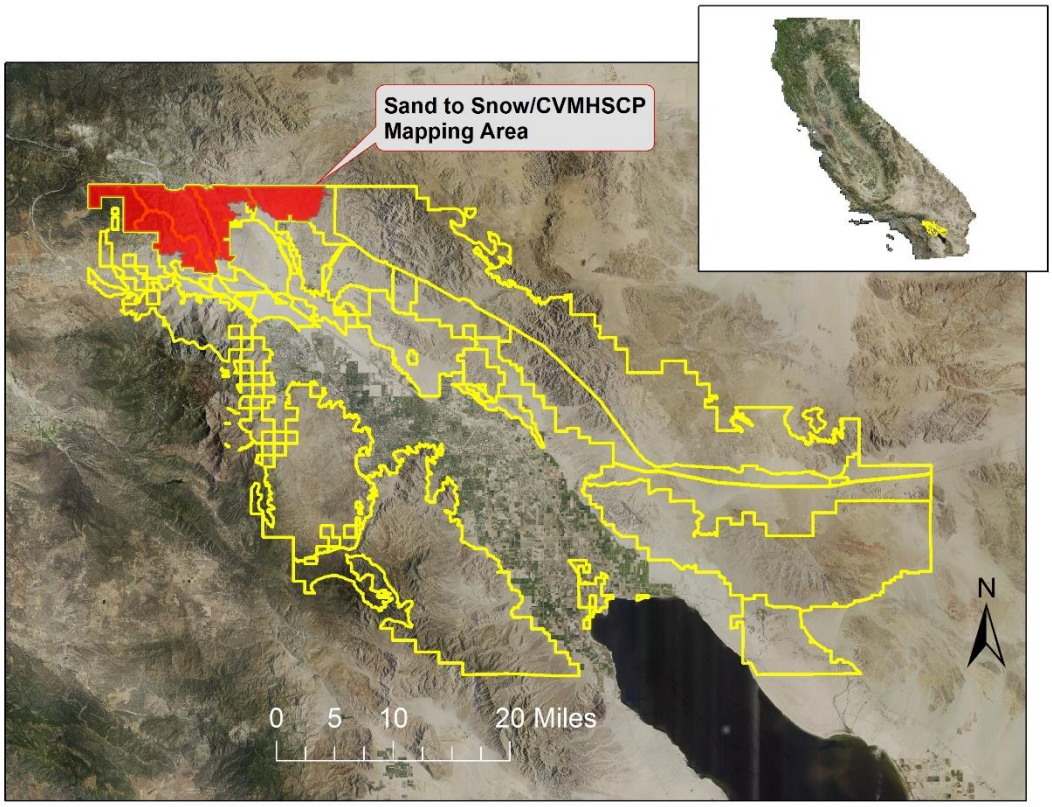

Figure 2: The Sand to Snow/CVMSHCP Mapping Area is located in Riverside County, California, USA, at the northwest end of the Coachella Valley. CVMSHCP Conservation Areas boundary shown in yellow, with the mapping area in red fill. Imagery from the National Agricultural Imagery Program (2014, USDA).

PURPOSE

The primary purpose for creating these maps is provide a landscape-scale approach to monitoring changes due to land use, invasive species, recreation, hydrology, and climate. These digital maps, documenting changes and their causes, are then tools for prioritizing future conservation actions. The outdated map of the Coachella Valley MSHCP areas, created before 1999, was based on the Holland classification system and was inconsistent with current standards prescribed by CDFW's Vegetation Classification and Mapping Program (VegCaMP). As part of the CVMSHCP/NCCP monitoring program, a phased work plan to remap all 746,000 acres of Conservation Areas began in 2012. These mapping areas together nearly complete the remap of the Plan Area, together with other Conservation Lands mapped by other entities, and previous work by UCR CCB. The completion of these maps updates the 2007 CVMSHCP/NCCP natural community map. This section of the map provides critical information to assist in monitoring habitat suitability in conservation areas, and quantifies attributes to help researchers understand the effects of environmental variability, including drought and climate change. An updated vegetation map was required to enhance understanding of species and their habitats, and identify management needs to ensure persistence of target species within the Plan area. The updated vegetation map is an essential element of monitoring for other covered species and natural communities and provides a baseline to monitor natural communities and landscape-scale vegetation change. Quantification of biotic habitat variables help document factors that may influence species population fluctuation. These data are key to conservation of biological diversity in the Plan area, in light of the listed threats to habitats in this management unit: invasive species; threats to hydrological regime/processes; climate change and habitat fragmentation, wildfire management, off-highway vehicle use, and other anthropogenic surface disturbance (CVMSHCP, Section 8). Understanding habitat requirements for species will help to guide the development of land management actions that support recovery and sustainability of healthy populations. Data produced under this effort is publicly available and supports concurrent CVMSHCP/NCCP monitoring.

RECONNAISSANCE VEGETATION ASSESSMENT

Initial research on the vegetation communities present in these Conservation Areas included a review of existing vegetation maps (CVCC 2007, CALVEG 2014, Joshua Tree National Park 2012, Western Riverside 2004) and development of a preliminary database of possible plant species, alliances and associations. To determine the plant communities that might be encountered during field surveys, CCB staff consulted with Wildlands Conservancy staff at Whitewater Canyon, who provided a plant species list from past survey data. Additional information concerning vegetation and stand history was provided by environmental scientists with the Morongo Band of Mission Indians. Between July 2016 and March 2017, CCB staff conducted surveys throughout the mapping area for sampling of vegetation types. The purpose of these field visits was to calibrate the photo-interpretation of aerial imagery to existing vegetation types within the area. The CNPS California Native Plant Society/Department of Fish and Game Protocol for Combined Vegetation and Rapid Assessment and Relevé Sampling Field Form was used for Rapid Assessment surveys (hereafter "RA plots"), in the study areas (CNPS 2014, 2016). The study areas were traversed on foot and by vehicle, and vegetation was assessed at optimal and accessible points, sited according to RA plot protocol (CNPS 2014, 2016). Accessibility to many areas was limited by a lack of vehicular access, rugged terrain, dense chaparral vegetation and the distance required to be traversed on foot, necessitating several overnight excursions by staff in order to access areas beyond the periphery of the 74-square-mile, largely roadless mapping area. Within the Stubbe Canyon area, access

was limited by private landholdings that occupied access points from the south. Access to the Millard Canyon area within the Cabazon Conservation Area as well as to the northwestern portions of Stubbe and Cottonwood Canyon Conservation Area was kindly granted with permission from the Morongo Band of Mission Indians.

The field staff completed 150 RA plots in 2016-2017 both opportunistically-located as well as targeted at priority areas according to the photo interpreter's preference and priorities. Some of these RA plots were sited for concurrent monitoring of *Astragalus tricarinatus* within mapping area boundaries. In addition, reconnaissance ("Recon") information including dominant species identities and other landscape cover notes were gathered at 161 points throughout the area. A significant effort was made to access areas where little was known about the vegetation types from previous visits, or where few RA or Recon points existed. At each point, an RA form was completed, resulting in a database containing perennial vegetation percent cover (and annual cover of key species, where it was likely to define the alliance); UTM easting and northing coordinates (NAD 1983 datum, Zone 11N); slope, aspect and elevation; percent surface cover of vegetation, litter and abiotic substrates; and other data (see protocol, CNPS 2016; Appendix A: RA Plot Database 2017). As well, file numbers for photos at each point in four cardinal directions were recorded (photo database available upon request from CCB). For each RA plot, the field team assessed and assigned a Vegetation Alliance and Association, which was subsequently reviewed and formally assigned at the office.

Because this vegetation map is tied to aerial imagery acquired by CVCC in 2013 (with the goal of a temporally-uniform snapshot of vegetation across the Plan Area), there is a 3 to 4-year gap between the temporal reference period for this map and the state of vegetation as it was recorded on RA plot field surveys. In the far western end of the Sand to Snow/CVMSHCP mapping area cases, RA plots were recorded in 2017, which reflect post-fire conditions within the Hathaway Fire burn area (ignition date June 6, 2013); however, Spring 2013 mapping date pre-fire vegetation conditions are documented on this vegetation map (see section on Aerial Photo Interpretation and Delineation). In any other case where field conditions in 2016-2017 differed from those on the aerial imagery in 2013 (dead or dying vegetation, different species composition or extent), the information about likely conditions in 2013 from photo interpretation took precedence.

AERIAL PHOTO INTERPRETATION AND DELINEATION

Mapping Imagery and Photointerpretation: The map was produced by applying heads-up digitizing techniques using the primary source imagery, six-inch resolution true-color (RGB) spring 2013 aerial imagery provided by the Coachella Valley Conservation Commission (CVCC) from local flights for the majority of the mapping area. This was supplemented with 2015 true-color (RGB) imagery from the CVCC, 2014 one meter imagery from the National Agricultural Imagery Program (NAIP), both 4-Band and color infrared (CIR) as well as a variety of other sources such as ESRI WorldImagery (various sources, see: https://www.arcgis.com/home/item.html?id=10df2279f9684e4a9f6a7f08febac2a9). These supplemental sources were not used for delineation unless the primary source imagery was lacking, in which case the imagery with the nearest reliable time stamp was used. These ancillary sources were mostly useful as supporting information to help identify types and photosignatures, as well as boundaries between types, especially where the 2013 photo-imagery had heavy shadows within topographically-diverse areas. As well, fire history data from CalFire (http://frap.fire.ca.gov/data/frapgisdata-sw-fireperimeters_download; Fire15_1, released June 9th, 2016) was used as additional information for identifying stand and cover boundaries.

Although much of the Sand to Snow/CVMSHCP mapping area was covered by the primary 2013 source imagery (Figure 6). For the areas within the DTLA mapping area not covered by the base imagery, NAIP 2014 4-band and color infrared imagery was used as the primary source for identification and delineation. For the remainder of the Sand to Snow mapping area where the primary source imagery was not available (the far western portion, UTM NAD 83 522567E to the western study area boundary, as well as a smaller eastern portion, 547096E to the eastern study boundary) 0.3m resolution USGS 2011 High Resolution Orthoimagery (https://lta.cr.usgs.gov/high_res_ortho) was used as the base imagery for delineation. 2011 imagery was used as the base in lieu of 2014 National Agricultural Imagery Program (NAIP) imagery in order to represent the pre-fire vegetation conditions in the Hathaway Fire burn area (ignition date June 6, 2013) matching the remainder of the Spring 2013-date imagery area. However, for a small portion in the southwest corner, the only available imagery was the 1m resolution NAIP 2014 4-band and color infrared imagery, and so this was used as the primary source for identification and delineation.

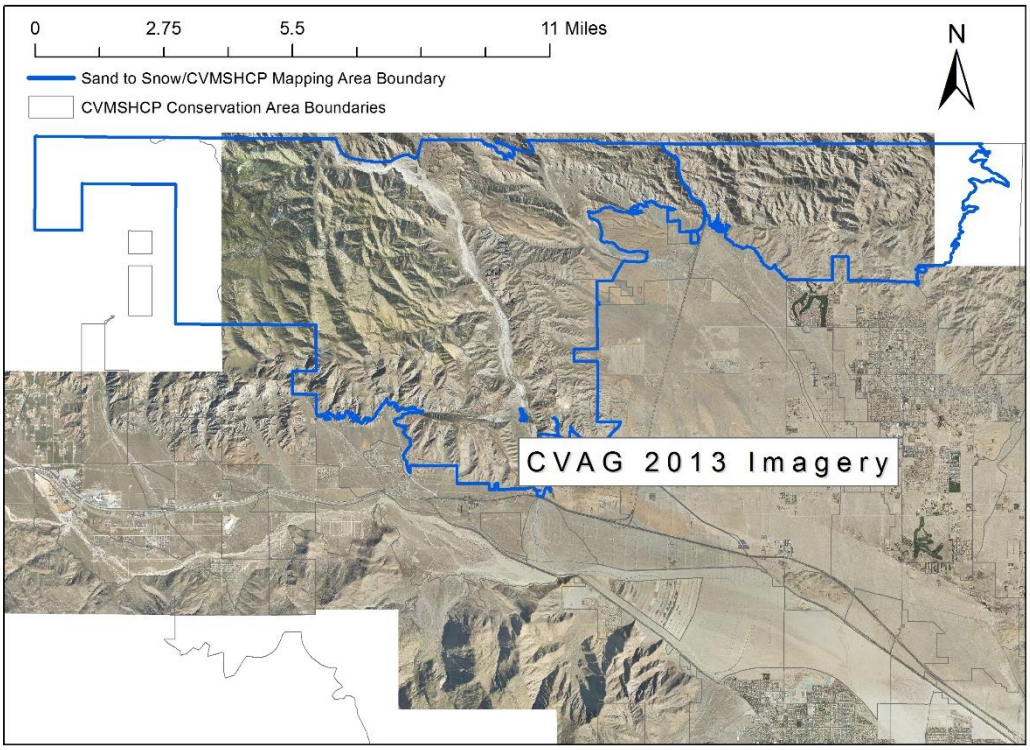

Figure 3: 2013 CVAG true-color 6-inch resolution imagery coverage with the Sand to Snow/CVMSCHP mapping area boundaries.

The photo interpreter used the verified vegetation type locations (vegetation type photo signatures) to identify vegetation across the landscape, additionally using ecological characteristics of vegetation types in relation to landscape characteristics such as topographic features. Map polygons were assessed for vegetation type, percent cover, presence of exotic plants, anthropogenic alteration, development, and roadedness. Lines were drawn to delineate non-vegetated areas and vegetated areas, and within vegetated areas, to establish boundaries of Alliance and Association types. The photo interpreter drafted boundaries separating vegetation types generally at 1:1500 scale and attributed the type using RA plot information and relevant datasets. A finer visualization scale was used in some cases to delineate wetland types occurring in narrows bands and patchy areas. Absolute cover values from the RA plots was used to assist photo interpreters with delineating boundaries. Cover was quantified as non-vegetated habitat where it was less than 2%. Some coordinates for plots fall outside of the plot boundaries due to the extremely

delicate habitat or accessibility challenges. For these surveys, the cover estimates, as they currently stand, apply to the projected coordinate locations indicated in the RA database where applicable.

Geodatabase: The photo interpreter worked with a GIS specialist to establish a geodatabase containing domain tables that relate alliance, group and macrogroup for assigned types in ArcGIS 10.3.1. Vegetation delineation was done using a line feature class, assigned to type using point feature class, and finally, a polygon feature class was created, attributed with alliance and other attributes. A comprehensive quality control effort was conducted by senior GIS staff to finalize polygons, and geodatabase domains (Alliance, Common Name, Association, Group and Macrogroup). Continuous quality control checks were performed using query tools in ArcGIS as well as the utilization of a secondary reviewer from the team (other than the photo-interpreter) to review polygon assignments, identify problematic vegetation assignments errors and discrepancies as monitoring continued, and all were incorporated into the final geodatabase.

Minimum Mapping Unit: For upland alliances occurring in expansive areas, a minimum mapping unit of 10 acres was observed for breaking up classes, or major changes in the vegetation cover class. For the purposes of the CVMSHCP, habitat of sensitive species is of particular concern and therefore to improve the ability of researchers and land managers to target wildlife habitat that is patchily-distributed, there are several alliances where the minimum mapping unit (MMU) is less than an acre. These include *Prosopis glandulosa* Woodland Alliance (habitat for the covered species, *Toxostoma crissalis*, crissal thrasher), *Washingtonia filifera* Woodland Alliance (potentially supporting Federally endangered *Cyprinodon macularius,* desert pupfish), as well as wetland or montane meadow types and as well as certain wash types which displayed complexity that necessitated delineation (generally, Groups G531, G533 and G538; see "Classification…" section below). Following common vegetation standards, stands that did not meet minimum mapping unit criteria were lumped with, or drawn within the bounds of, the most similar adjacent vegetation type polygon, for example, tree alliances with other tree alliances, shrubs with other shrub types, upland types with upland types, and so forth.

Vegetation Mortality, Land Use and Other Changes: Due to land clearing for wind power generation or transmission, some areas were heavily anthropogenically-altered. These are noted on the vegetation map as indicated above, as an anthropogenic disturbance or invasive plant % cover class. For polygons in which the RA plot data indicated significant mortality of the vegetation or dormant vegetation, the photo interpreter visually assessed the greenness of the vegetation in the aerial imagery from 2013 (or the photo imagery nearest to that date) to decide how much of the dominant alliance vegetation was in fact living in 2013. Often, remaining basal sprouts or small percentage of the vegetation remained alive, with sufficient cover remaining alive to pass the assignment rules for the dominant vegetation type. In a very *few areas* was enough of the dominant vegetation dead, with certainty on the ground and from the aerial imagery, to justify assigning a different alliance. These cases included mortality of *Pseudotsuga macrocarpa* within the Sand to Snow/CVMSCHP mapping area. Where the vegetation could be clearly identified but where it was ambiguous as to whether the dominant vegetation type was sufficiently alive in 2013 after using the decision process described above, the photo interpreter defaulted to the assumption that the vegetation in question was still alive during the time stamp represented by the map in lieu of assigning a different alliance.

Other cases in which RA plot data differed from photo imagery included: development, fire, expansion or management of invasive species, and other changes in land use or land management activities, and these were assigned to 2013 vegetation status similar to the above. Disturbance codes were entered for stands that were surveyed, per Rapid Assessment protocol, which aided in interpretation of imagery. As well,

disturbance types and intensity were assigned for all polygons in the geodatabase: roadedness, development, anthropogenic alteration, as well as invasive species % cover (only if obvious from stand interpretation or as noted in RA plots). Definitions and protocol for assigning disturbance types in the geodatabase were assigned using the criteria set forth in the DRECP vegetation map (CDFW 2013); differing only in that we did not separate hydrologic alteration from other types of anthropogenic alteration.

Time Period Represented: The time period aimed at in this map to classify the vegetation state during the year 2013. This aligns with the overall mapping goal for the CVMSHCP area to have a uniform temporal snapshot of vegetation across the Plan area for this year. However, as a living map, polygons and assignments will be regularly reviewed, updated, or flagged for further field visits as part of ongoing monitoring within the mapping area. It is recommended, due to ongoing changes within the Plan area, that that periodic updates should be published as additional information and newer imagery becomes available.

CLASSIFICATION OF VEGETATION FOR THE MAPPING AREA

The map classification is based largely on work done in areas for previous and ongoing projects: Vegetation Mapping of Anza-Borrego Desert State Park and Environs (Keeler-Wolf *et al.* 1998), the Western Riverside County MSHCP Vegetation Map (2004), Vegetation of Joshua Tree National Park (La Doux *et al.* 2013), and the Vegetation Map in Support of the Desert Renewable Energy Conservation Plan (CDFW, 2013). There are also several new provisional alliances developed from previous work in the CVMSHCP area, including the Mecca Hills and Orocopia Mountains Map (2016) and the Dos Palmas Conservation Area Map (2016); these new provisional alliances are described in the respective reports. Any provisional alliance that has not been yet adopted by CDFW into the MCV schema as reflected in the MCV online (http://vegetation.cnps.org/, accessed June 2017) are still listed as "Provisional" in this map and geodatabase. There were two provisional alliances identified during this study, based on relevé plot observation and subsequent classification, the *Eriodictyon tricocalyx* Provisional Scrub Alliance, and the *Ziziphus parryi* Provisional Scrub alliance (both * in the classification below), though both of these types need additional sampling before being proposed to the NVCS.

The nested hierarchy, including the Macrogroup and Group, was based on the National Vegetation Classification System (Federal Geographic Data Committee 2008); specifically, the recommendations of Evens (2014) to align the NVCS with the Manual of California Vegetation (Sawyer *et al.* 2009).

Class 1. Forest to Open Woodland
- Subclass 1.B. Temperate & Boreal Forest
  - Formation 1.B.1. Warm Temperate Forest
    - Division 1.B.1.Nc. Californian Warm Temperate Forest
      - Macrogroup M009. California Forest & Woodland
        - Group G195. California Broadleaf Forest & Woodland
          - Quercus chrysolepis Forest Alliance
        - Group G198. California Conifer Forest & Woodland
          - Juniperus californica Alliance (G296)
          - Pinus coulteri Alliance
  - Formation 1.B.2. Cool Temperate Forest

Division 1.B.2.Nd. Vancouverian Cool Temperate Forest
Macrogroup M023. Southern Vancouverian Montane-Foothill Forest
Group G344. California Montane Conifer Forest & Woodland
Abies concolor–Pinus lambertiana Alliance
Calocedrus decurrens Alliance
Pseudotsuga macrocarpa Alliance
Formation 1.B.3. Temperate Flooded & Swamp Forest
Division 1.B.3.Nd. Southwestern North American Flooded & Swamp Forest
Macrogroup M036. Warm Southwest Riparian Forest
Group G508. Sonoran-Chihuahuan Warm Desert Riparian Woodland
Platanus racemosa Alliance
Populus fremontii Alliance
Salix gooddingii Alliance
Salix laevigata Alliance
Washingtonia filifera Alliance
Macrogroup M298. Warm Southwest Semi-natural Flooded & Swamp Forest
Group G510. Southwestern North American Semi-natural Riparian Forest & Scrub
Tamarix spp. Semi-Natural Stands
Division 1.B.3.Ng. Vancouverian Flooded & Swamp Forest
Macrogroup M035. Vancouverian Flooded & Swamp Forest
Group G254. North Pacific Lowland Riparian Forest & Woodland
Alnus rhombifolia Alliance (G508/G509/G503)
Class 2. Shrubland & Grassland
Subclass 2.B. Temperate & Boreal Grassland & Shrubland
Formation 2.B.1. Mediterranean Scrub & Grassland
Division 2.B.1.Na. California Scrub
Macrogroup M043. California Chaparral
Group G257. California Xeric Chaparral
Adenostoma fasciculatum Alliance
Arctostaphylos glauca Alliance
Group G261. California Mesic & Pre-montane Chaparral
Arctostaphylos glandulosa Alliance
Ceanothus leucodermis Alliance
Cercocarpus montanus Alliance
Prunus ilicifolia Alliance
Quercus berberidifolia Alliance
Quercus chrysolepis Shrubland Alliance
Quercus wislizeni shrub Alliance
Macrogroup M044. California Coastal Scrub
Group G264. Central & Southern California Coastal Sage Scrub
Dendromecon rigida Alliance
Eriodictyon tricocalyx Provisional Alliance *
Eriogonum fasciculatum Alliance
Eriogonum fasciculatum–Salvia apiana Alliance
Keckiella antirrhinoides Alliance
Salvia apiana Alliance
Division 2.B.1.Nb. California Grassland & Meadow
Macrogroup M046. California Semi-natural Grassland & Meadow
Group G497. California Semi-natural Grassland & Forb Meadow
Bromus (diandrus, hordeaceus)–Brachypodium distachyon Semi-Natural Stands
Formation 2.B.2. Temperate Grassland, Meadow & Shrubland
Division 2.B.2.Nd. Western North American Interior Sclerophyllous Chaparral
Macrogroup M091. Warm Interior Chaparral
Group G281. Western Interior Chaparral
Ceanothus greggii Alliance
Quercus cornelius-mulleri Alliance
Formation 2.B.6. Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland
Division 2.B.6.Nb. Western North American Freshwater Shrubland, Wet Meadow & Marsh
Macrogroup M073. Western North American Temperate Lowland Wet Shrubland, Wet Meadow & Marsh

- Group G517. Vancouverian Freshwater Wet Meadow & Marsh
  - Muhlenbergia rigens Herbaceous Alliance
- Group G531. Arid West Interior Freshwater Emergent Marsh
  - Typha (angustifolia, domingensis, latifolia) Alliance

Division 2.B.6.Nc. Southwestern North American Warm Desert Freshwater Marsh

Macrogroup M076. Warm Desert Freshwater Shrubland, Meadow & Marsh

- Group G533. North American Warm Desert Riparian Low Bosque & Shrubland
  - Baccharis sergiloides Alliance
  - Pluchea sericea Alliance
  - Prosopis glandulosa Alliance (G287)
  - Salix exigua Alliance (G526)
  - Salix lasiolepis Alliance (G527)

Class 3. Desert & Semi-Desert

Subclass 3.A. Warm Desert & Semi-Desert Woodland, Scrub & Grassland

Formation 3.A.2. Warm Desert & Semi-Desert Scrub & Grassland

Division 3.A.2.Na. North American Warm Desert Scrub & Grassland

Macrogroup M088. Mojave-Sonoran Semi-Desert Scrub

- Group G293. Sonoran Paloverde - Mixed Cacti Desert Scrub
  - Rhus ovata Alliance
  - Simmondsia chinensis Provisional Shrubland Alliance
- Group G295. Mojave-Sonoran Bajada & Valley Desert Scrub
  - Ambrosia dumosa Alliance
  - Cylindropuntia bigelovii Alliance
  - Encelia farinosa Alliance
  - Larrea tridentata Alliance
  - Larrea tridentata–Ambrosia dumosa Alliance
  - Larrea tridentata–Encelia farinosa Alliance
- Group G296. Mojave Mid-Elevation Mixed Desert Scrub
  - Eriogonum wrightii Alliance
  - Viguiera parishii Alliance
  - Yucca schidigera Alliance
  - Ziziphus parryi Provisional Shrubland Alliance *

Macrogroup M092. North American Warm-Desert Xero-Riparian Scrub

- Group G541. Warm Semi-Desert Shrub & Herb Dry Wash
  - Acacia greggii Alliance
  - Ambrosia salsola Alliance
  - Chilopsis linearis Alliance
  - Encelia (actoni, virginensis) Shrubland Alliance
  - Ephedra californica Alliance
  - Ericameria paniculata Alliance
  - Hyptis emoryi Alliance
  - Lepidospartum squamatum Alliance

Macrogroup M512. North American Warm Desert Semi-natural Scrub & Grassland

- Group G677. North American Warm Desert Semi-natural & Planted Scrub & Grassland
  - Bromus rubens–Schismus (arabicus, barbatus) Semi-Natural Stands (G497)

Subclass 3.B. Cool Semi-Desert Scrub & Grassland

Formation 3.B.1. Cool Semi-Desert Scrub & Grassland

Division 3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland

Macrogroup M169. Great Basin & Intermountain Tall Sagebrush Shrubland & Steppe

- Group G302. Intermountain Mesic Tall Sagebrush Shrubland & Steppe
  - Artemisia tridentata Alliance (G303)

PROVISIONAL ALLIANCE DESCRIPTIONS

***Eriodictyon tricocalyx* Provisional Alliance**
Hairy yerba santa scrub Provisional Alliance

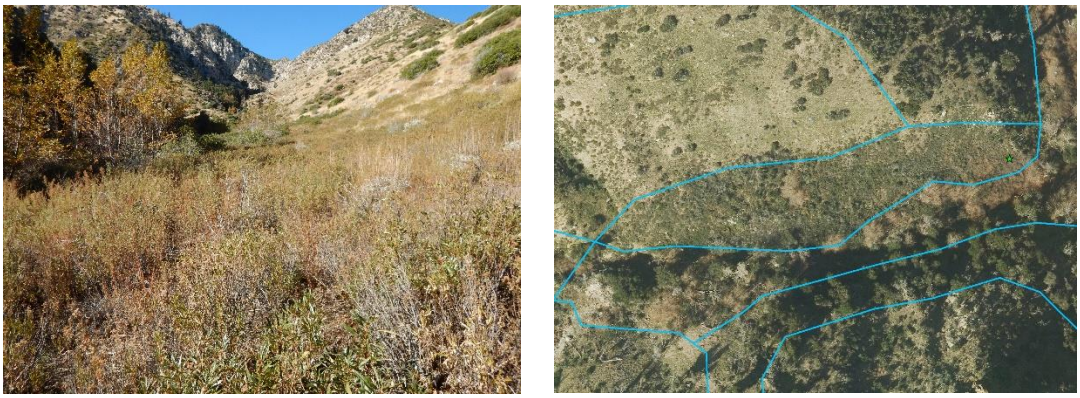

Figure 4: The image on the left shows an *Eriodictyon tricocalyx* stand, with *Artemisia dracunculus*. On the right, the image shows the photo signature within a gently sloping, flat area at the base of a hill, at approximately 3700' elevation on the 6-inch 2013 true-color imagery, with the location of the left-hand photo identified with a green star, taken facing westward.

DESCRIPTION: Polygons mapped as this Provisional Alliance are dominated by *Eriodictyon tricocalyx*, have at least 50% relative cover the shrub canopy with moderate cover. These stands were found in post-burn areas at mid-elevation, with absolute cover of *Eriodictyon* often exceeding 30%. Additional samples should be taken of this stand type.

***Ziziphus parryi* Provisional Alliance**
Parry's jujube scrub Provisional Alliance

Figure 5: The image on the left shows a *Ziziphus parryi* stand. On the right, the image shows the photo signature on the 6-inch 2013 true-color imagery, on a north-facing moderate-slope area, at approximately 2500' elevation, with the location of the left-hand photo identified with a green star, taken facing westward.

DESCRIPTION: Polygons mapped as this Provisional Alliance are dominated by *Ziziphus parryi*, have at least 50% relative cover the shrub canopy, and greater than 2% absolute cover in the tall shrub canopy. These stands were found on cool, moderate to steep slopes at low-mid-elevation, often co-occuring with *Quercus cornelius-mulleri* and *Juniperus californica.* Additional samples should be taken of this stand type.

ALLIANCES AND LANDSCAPE ATTRIBUTES IDENTIFIED

Vegetation Alliance or Land Cover Type	Area (ha)	Area (acres)
Encelia farinosa Shrubland Alliance	6,471.7	15,991.9
Larrea tridentata--Encelia farinosa Shrubland Alliance	1,234.9	3,051.6
Quercus chrysolepis Forest Alliance	1,105.6	2,731.9
Adenostoma fasciculatum Shrubland Alliance	1,104.3	2,728.7
Quercus cornelius-mulleri Shrubland Alliance	1,065.4	2,632.4
Quercus wislizeni Shrubland Alliance	1,012.1	2,500.9
Cercocarpus montanus Shrubland Alliance	680.1	1,680.7
Rhus ovata Shrubland Alliance	574.5	1,419.6
Ceanothus greggii Shrubland Alliance	472.5	1,167.5
Pseudotsuga macrocarpa Forest Alliance	470.0	1,161.3
Acacia greggii Shrubland Alliance	459.7	1,136.0
Larrea tridentata--Ambrosia dumosa Shrubland Alliance	431.6	1,066.5
Ericameria paniculata Shrubland Alliance	388.9	960.9
Juniperus californica Woodland Alliance	379.3	937.3
Encelia (actoni, virginensis) Shrubland Alliance	357.8	884.1
Quercus berberidifolia Shrubland Alliance	355.5	878.6
Chilopsis linearis Woodland Alliance	285.5	705.4
Larrea tridentata Shrubland Alliance	275.0	679.4
Ambrosia dumosa Shrubland Alliance	176.9	437.1
Dendromecon rigida Shrubland Alliance	155.6	384.5
Eriogonum fasciculatum Shrubland Alliance	144.9	358.1
Ceanothus leucodermis Shrubland Alliance	144.7	357.6
Lepidospartum squamatum Shrubland Alliance	135.1	333.9
Prunus ilicifolia Shrubland Alliance	128.9	318.6
Ambrosia salsola Shrubland Alliance	123.3	304.6
Arctostaphylos glandulosa Shrubland Alliance	103.9	256.8
Populus fremontii Forest Alliance	87.0	215.0
Quercus chrysolepis Shrubland Alliance	82.7	204.4
Keckiella antirrhinoides Shrubland Alliance	81.8	202.0
Pinus coulteri Woodland Alliance	78.8	194.6
Disturbed/built-up	61.5	151.9
Bromus rubens--Schismus (arabicus, barbatus) Herbaceous Semi-Natural Alliance	104.8	259.2
Non-vegetated Habitat (less than 2% absolute cover)	48.5	119.9
Ephedra californica Shrubland Alliance	46.1	113.8
Salix exigua Shrubland Alliance	45.5	112.5

Abies concolor--Pinus lambertiana Forest Alliance	37.2	92.0
Viguiera parishii Shrubland Alliance	31.2	77.2
Prosopis glandulosa Woodland Alliance	28.0	69.2
Platanus racemosa Woodland Alliance	26.1	64.4
Ziziphus parryi Provisional Shrubland Alliance	21.0	51.8
Calocedrus decurrens Forest Alliance	16.4	40.4
Alnus rhombifolia Forest Alliance	16.0	39.4
Arctostaphylos glauca Shrubland Alliance	13.2	32.6
Salvia apiana Shrubland Alliance	9.6	23.7
Salix laevigata Woodland Alliance	4.9	12.2
Tamarix spp. Shrubland Semi-Natural Alliance	4.1	10.1
Eriogonum wrightii Dwarf Shrubland Alliance	3.9	9.8
Simmondsia chinensis Provisional Shrubland Alliance	3.8	9.4
Cylindropuntia bigelovii Shrubland Alliance	3.8	9.3
Hyptis emoryi Shrubland Alliance	3.5	8.8
Eriogonum fasciculatum--Salvia apiana Shrubland Alliance	3.2	7.8
Salix lasiolepis Shrubland Alliance	3.0	7.4
Typha (angustifolia, domingensis, latifolia) Alliance	2.6	6.5
Baccharis sergiloides Shrubland Alliance	2.2	5.5
Artemisia tridentata Shrubland Alliance	2.2	5.4
Salix gooddingii Woodland Alliance	1.8	4.5
Pluchea sericea Shrubland Alliance	1.3	3.1
Yucca schidigera Shrubland Alliance	1.0	2.6
Muhlenbergia rigens Herbaceous Alliance	0.7	1.7
Eriodictyon trichocalyx Provisional Shrubland Alliance	0.6	1.5
Washingtonia filifera Woodland Alliance	0.1	0.3
TOTAL	**19,115.6**	**47,235.72**

ASSOCIATIONS IDENTIFIED

Vegetation Association or Land Cover Type

Acacia greggii / Chilopsis linearis Association

Acacia greggii--Ambrosia salsola Association

Acacia greggii--Larrea tridentata--Ambrosia dumosa Association

Ambrosia salsola--Acacia greggii--(Bebbia juncea--Hyptis emoryi) Association

Ambrosia salsola--Ericameria paniculata Association

Encelia farinosa--Ambrosia dumosa Association

Ericameria paniculata--Ambrosia salsola Association

Larrea tridentata Association

Larrea tridentata--Ambrosia dumosa--Ambrosia salsola--Psorothamnus schottii Association

Larrea tridentata--Ambrosia dumosa--Encelia farinosa Association

Larrea tridentata--Ambrosia dumosa--Krameria grayi Association

Larrea tridentata--Ambrosia dumosa--Psorothamnus arborescens Association

Larrea tridentata--Encelia farinosa--Ambrosia dumosa--Krameria grayi Association

Larrea tridentata--Encelia farinosa--Ambrosia salsola Association

Larrea tridentata--Encelia farinosa--Ephedra californica Association

Quercus cornelius-mulleri--Eriogonum fasciculatum--Ericameria linearifolia Association

Ambrosia salsola--Larrea tridentata Association

Encelia farinosa Association

Non-vegetated habitat / Encelia farinosa Association

Ambrosia dumosa--Larrea tridentata Association

Encelia farinosa - Pleuraphis rigida Association

Acacia greggii--Eriogonum fasciculatum Association

Adenostoma fasciciulatum Association

Adenostoma fasciculatum--(Arctostaphylos glandulosa) Association

Adenostoma fasciculatum--(Ceanothus greggii / mafic) Association

Adenostoma fasciculatum--Eriogonum fasciculatum Association

Alnus rhombifolia--Acer macrophyllum Association

Alnus rhombifolia--Platanus racemosa Association

Arctostaphylos glandulosa Association

Arctostaphylos glauca Association

Ceanothus greggii--Adenostoma fasciculatum Association

Cercocarpus montanus--Adenostoma fasciculatum Association

Cercocarpus montanus--Eriogonum fasciculatum Association

Chilopsis linearis / Ericameria paniculata Association

Cylindropuntia bigelovii--Ferocactus cylindraceus--Larrea tridentata Association

Dendromecon rigida Association

Ephedra californica Association

Eriogonum fasciculatum Association

Eriogonum fasciculatum--Salvia apiana Association

Juniperus californica / Yucca schidigera / Pleuraphis rigida Association

Juniperus californica--Yucca schidigera Association

Keckiella antirrhinoides--Mixed Chaparral Association

Pinus coulteri--Quercus chrysolepis Association

Pinus coulteri--Quercus wislizeni Association

Populus fremontii / Salix exigua Association

Populus fremontii Association

Populus fremontii--Salix (laevigata, lasiolepis, lucida ssp. lasiandra) Association

Prunus ilicifolia ssp. ilicifolia Association

Pseudotsuga macrocarpa--Quercus chrysolepis Association

Quercus berberidifolia Association

Quercus chrysolepis Forest Association

Quercus chrysolepis--Calocedrus decurrens Association

Quercus chrysolepis--Calocedrus decurrens Forest Association

Quercus cornelius-mulleri--Rhus ovata Association

Quercus wislizeni--Ceanothus leucodermis / Pinus coulteri Shrubland Association

Quercus wislizeni--Ceanothus leucodermis Shrubland Association

Quercus wislizeni--Cercocarpus montanus Shrubland Association

Quercus wislizeni--Quercus berberidifolia Shrubland Association

Rhus ovata Association

Rhus ovata--Ziziphus parryi Association

Salix exigua / Baccharis sergiloides Association

Acacia greggii--Encelia farinosa Association

Baccharis sergiloides--Eriodictyon trichocalyx Association

Calocedrus decurrens--Pseudostuga macrocarpa Association

Chilopsis linearis / Acacia greggii Association

Cylindropuntia bigelovii--Ambrosia dumosa--Encelia farinosa Association

Encelia actoni Association

Encelia farinosa / Ziziphus parryi Association

Ephedra californica / Acacia greggii Association

Ericameria paniculata Association

Eriodictyon trichocalyx Association

Juniperus californica / Ephedra californica Association

Juniperus californica / Xylorhiza tortifolia Association

Juniperus californica / Ziziphus parryi Association

Platanus racemosa--Salix laevigata Association

Platanus racemosa / Lepidospartum squamatum Association

Populus fremontii / Baccharis sergiloides Association

Populus fremontii--Plantanus racemosa Association

Prosopis glandulosa / Encelia farinosa Association

Quercus chrysolepis--Pseudotsuga macrocarpa Association

Quercus cornelius-mulleri / Juniperus californica Association

Viguiera parishii--Eriogonum fasciculatum Association

Washingtonia filifera / Rhus ovata Association

Yucca schidigera--Viguiera parishii Association

Ziziphus parryi Association

Ziziphus parryi--Acacia greggii Association

VEGETATION MAP

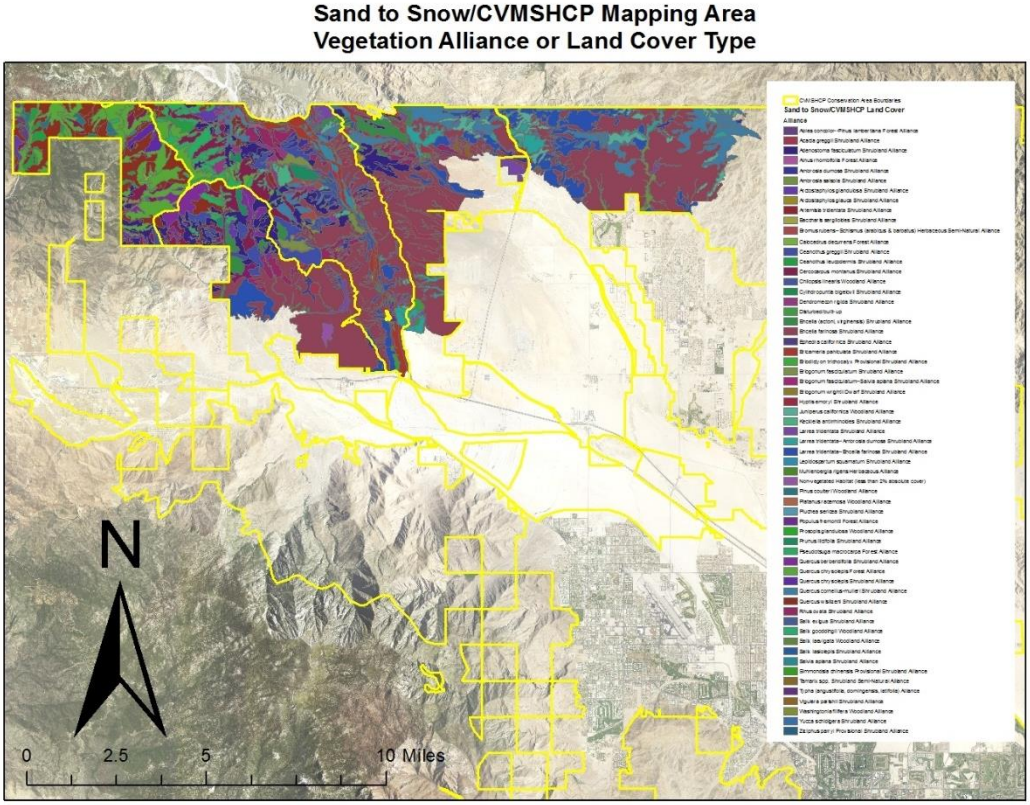

Figure 5: The vegetation alliance map for the mapping area within the CVMSHCP and the Sand to Snow National Monument.

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APPENDICES

Appendix A: Vegetation Geodatabase 2017

Geodatabase components:

"SAND_RA_plots" (Rapid Assessment Database)
"SAND_Recon_points" (Reconnaissance Information Database)
"SAND_Veg_Poly" (Vegetation and Land Cover)
"CVAG_SAND_MappingBoundary" (Mapping Area Boundary)

File name and type: CVAG_SAND_Vegmap_2017.gdb
ArcGIS 10.3.1 Geodatabase

Appendix B: Sand to Snow/CVMSHCP Mapping Area Alliance Map

File name and type: UCR_CCB_CVAG_SAND_Vegetation_2017.pdf
File name and type: PDF