

## **FGDC-endorsed CAP 5 project**

**Date:** 2014-June

**Agreement Number:** G12AC20142

**Project title:** Integrating the FGDC National Vegetation Classification (NVC) Standard with the CNPS/CDFG *Manual of California Vegetation, second edition*

### **Final Report**

**Organization:** California Native Plant Society Name, 2707 K Street Suite 1, Sacramento, CA 95816, [www.cnps.org](http://www.cnps.org)

**Principal Investigator:** Julie M. Evens, 916-327-0714, [jevens@cnps.org](mailto:jevens@cnps.org)

**Collaborating Organizations:** Todd Keeler-Wolf, California Department of Fish and Wildlife, Biogeographic Data Branch, 1807 13th Street, Sacramento, CA 95811, <http://www.dfg.ca.gov/biogeodata/>; Marion Reid, NatureServe, Western Regional Office, 2108 55<sup>th</sup> St. Suite 220, Boulder CO 80301 and Don Faber-Landendoen, NatureServe, 4577 Ashfield Terrace, NY 13215, <http://www.natureserve.org/>; Alexa McKerrow, USGS Core Science Systems advisor and North Carolina State University, Zoology Department, Southeast Gap Land Cover, 218 David Clark Labs, Raleigh, NC 27695, <http://usnvc.org/>; Ralph Crawford, USDA Forest Service (Chair of FGDC Vegetation Sub-Committee), 1601 N. Kent Street, Room No. RPC-4, Arlington, VA 22209, <http://www.fgdc.gov/participation/working-groups-subcommittees/vsc>.

### **Executive Summary**

Ecologists from the California Native Plant Society (CNPS), California Department of Fish and Wildlife (CDFW), NatureServe, and US Geological Survey (USGS) have collaborated on a project to integrate the California Alliances into the updated version of the FGDC National Vegetation Classification (NVC) standard. Upon reviewing the newly revised USNVC hierarchy, we nested approximately 500 alliances found in California into the higher levels of the hierarchy. During a series of discussions between CNPS, CDFW and NatureServe, the California ecologists recommended changes to the USNVC hierarchy, including merging of various higher level groups and/or macrogroups. At least 10 groups have now been merged with other groups, and another 20 groups need further review by other regional ecologists. We have also presented the background and results of this project during two workshops in California and during ESA Vegetation Panel meetings. A resulting product, the CA Alliances intersected with the new USNVC hierarchy, will be posted online at the CNPS, CDFW, and USNVC websites.

### **Project Narrative**

*Project Initiation with Kick-off Meetings and Data-sharing Between Partners:*

During the project, the ecologists of the partner organizations and USGS had a kick-off meeting and quarterly check-in calls to discuss progress on the project. Some of these calls

included PowerPoint displays of the status and work being done in the project. Also, we had a series of conference calls between NatureServe, CDFW, and CNPS ecologists to discuss the classification relationships of the California Alliances/Associations with the higher levels of the USNVC hierarchy. Between early 2013 and 2014, we had approximately a dozen conference calls lasting 1 to 3 hours where we discussed alliances nested within one to four macrogroups at a time. Additionally, the California ecologists had another dozen meetings to discuss the placement California alliances into groups and upper levels of the USNVC hierarchy. Below in Table 1 are examples of the groups and macrogroups that were discussed across a 1+ year timeframe. For example, we discussed relationships of montane and subalpine forest groups and then discussed an assortment of desert types, in which CA ecologists had considerable knowledge. Figure 2 provides a display of the Principal Investigator reviewing desert vegetation types in the field during this project.

*Evaluation of USNVC Hierarchy with the California Alliances and Associations, and Management of Data:*

At the beginning of the project, NatureServe generated spreadsheet displays of the newly revised USNVC hierarchy matched up with a set of pre-existing Associations. CNPS and CDFW staff then created and maintained a database to denote classification relationships made between the Alliances/Associations of California (CA) to upper levels of USNVC hierarchy. The database contains approximately 500 Alliances and columns for the higher level Group(s) that were determined upon evaluating the USNVC hierarchy.

Upon relating the CA alliances in the USNVC hierarchy, we came up with a variety of recommendations for improving the hierarchy, and we tracked the recommended changes/updates for the hierarchy in the CNPS/CDFW database and the NatureServe spreadsheets. They included both merging of groups that were highly related ecologically and floristically, and splitting of groups that had significant ecological and floristic differences. Upon making these recommendations, the hierarchy has been simplified in some respects with over 10 types merged into other groups, including G234 Sierran-Intermontane Desert Western White Pine - White Fir Woodland, G244 Sierra-Cascade Mountain Hemlock Forest, G251 Colorado Plateau Pinyon - Juniper Scrub, G261 California Mesic Pre-montane Sclerophyll Scrub, G270 Sierran Subalpine Mesic Herbaceous Meadow, G274 Columbia Basin Foothill & Canyon Dry Grassland, G283 California Montane Chaparral, G363 Sierran Alpine Tundra & Fell-Field, G514 California Acidic Fen, G518 Western North American Temperate Interior Freshwater Marsh, G663 California Coastal Beach & Dune Scrub. Another 20+ groups have been recommended for merging (e.g., a suite of alkaline fen groups being merged together, as well as acidic fen groups being merged); however, great discussions with other regional ecologists are needed before additional updates to the hierarchy are made. An example of splitting of two groups previously included the G264 Central & Southern California Coastal Sage Scrub. CA ecologists recommended a new California Coastal & Foothill Seral Scrub Group be split from G264, and CNPS staff wrote a new group description and set of alliance descriptions for this new group. Other recommendations have been made (e.g., merge G240 North Pacific Maritime Douglas-fir - Western Hemlock Forest with G235 California Coastal Redwood Forest, and also merge these types with G750); however, more discussions with western regional ecologists will be needed to confirm this.

Now that the USNVC hierarchy accounts for ruderal/semi-natural vegetation separate from natural vegetation, some CA alliances will need to be separated into different alliances and groups to account for this variation. For example, the *Phragmites australis* Alliance will need to be split into two different alliances for placement of the ruderal associations in G524 Western North American Semi-natural Wet Shrubland, Meadow & Marsh and natural associations in G531 Arid West Emergent Marsh for natural types. Additionally, since the USNVC hierarchy accounts for riparian/wetland vegetation separately from upland vegetation, other CA alliances will need to be separated. For instance, the *Picea sitchensis* alliance includes wetland associations with *Lysichiton americanus* in G256 North Pacific Maritime Hardwood-Conifer Rich Swamp that will need to be separated from upland associations with other species in G750 North Pacific Western Hemlock - Sitka Spruce - Western Red-cedar Seasonal Rainforest. It appears that approximately 70 California alliances will either need to be separated into two or more groups and/or their association-level relationships will need to be further evaluated for denoting alternative classification concepts.

#### *Workshops and Other Outreach:*

CNPS staff hosted a couple workshops, including a vegetation sampling workshop at the UC Sagehen Field Station in September of 2013 and a vegetation mapping workshop at University of Redlands in the January of 2014, where we briefly discussed the new USNVC hierarchy and the integration of CA Alliances within it. We displayed PowerPoint slides and provided a handout during both workshops to illustrate the nesting of California Alliances within the new USNVC hierarchy. At both workshops, approximately 20 people attended from CA state agencies, federal agencies, consulting firms, and academic institutions. Also, CNPS and NatureServe staff presented information about the updates and the further discussions needed on mergers of USNVC groups and/or macrogroups at the ESA Vegetation Panel meetings during monthly conference calls and at an in-person meeting in April 2014.

CNPS and CDFW staff members are preparing a document for online display of the CA Alliances from the Manual of California Vegetation, second edition (MCV2), nested within the new USNVC hierarchy. This includes the nesting of approximately 500 alliances in CA into approximately 90 groups. A draft of this document is provided in Table 2.

#### **Next Steps**

By the summer of 2014, the document showing the relationships of the CA Alliances to the USNVC hierarchy will be posted online on the CNPS and CDFW websites, as well as on the USNVC website, to display the project's product. The California ecologists will also continue reviewing and interpreting the USNVC hierarchy and participate in discussions with other regional ecologists about additional changes we have recommended.

CNPS and CDFW will continue to utilize the USNVC hierarchy and apply it to other vegetation classification and mapping projects, and we will assist other local and state agencies and institutions in applying the hierarchy to their projects. Over the course of the next year, we will update the set of alliances defined in California to accommodate the separation/expansion and mergers of alliances based on ecoregional, wetland/riparian, floristic, and other factors. We also will continue to analyze data to help support and

improve the different types within the hierarchy; for example, we will further analyze differences in ruderal versus natural grassland vegetation types.

In the future, we hope to seek funding for compiling separate vegetation project datasets by CNPS, CDFW and other entities in California, so that we can better compare and contrast the classification in future ecoregional and meta-analyses. We also will plan to present outcomes of this project at a meeting of the FGDC subcommittee and the ESA Vegetation Panel by this summer. NatureServe ecologists will be sending out information to other regional ecologists in peer review forms on the additional recommendations of merging different groups and/or macgroups, since macrogroup descriptions will be peer reviewed throughout 2014.

NatureServe staff will work with CNPS over the summer and fall of 2014 to integrate into Biotics (where the NVC is currently maintained and updated) the resultant relationships of the CA alliances to NVC Groups. This will be done in a tabular format wherein the CA alliances will be stored as "related concepts" to the NVC Groups. In addition, a selected subset of the CA alliances that are not currently represented in the NVC will be added to the Biotics database, and their descriptions and other information about them will be included. In the future, it is hoped additional funding can be found to allow this team to continue further refining the relationships of the CA alliances to the NVC and accomplish a more complete integration of the two.

### **Feedback on Cooperative Agreements Program**

Funding through the CAP Program enabled the California ecologists to evaluate and integrate the new classification hierarchy of the FGDC-NVC standard; without this funding, we would not have been able to integrate and review the hierarchy with the California classification of alliances and associations. We also received in-kind time from NatureServe and CDFW collaborators during the project, and we received support from the USGS staff who periodically checked in with us and provided us the reporting requirements. We also were able to request and receive a time-only extension, since it took longer than expected to initially receive the USNVC hierarchy from NatureServe and to fully review the hierarchy. We do not have any program management concerns, as we received ample support during the project.

**Table 1.** USNVC Groups discussed during the project.

**1.B.2 Cool Temperate Forest**

|             |  |
|-------------|--|
| <b>D010</b> | <b>1.B.2.Nc Western North American Cool Temperate Woodland &amp; Scrub</b> |
|             | <b>M026 Intermountain Singleleaf Pinyon - Western Juniper Woodland</b>     |
| X           | G248 Columbia Plateau Western Juniper Woodland & Savanna                   |
| X           | G247 Great Basin Pinyon - Juniper Woodland                                 |
| X           | G249 Intermountain Basins Curl-leaf Mountain-mahogany Scrub & Woodland     |
| X           | G246 Intermountain Juniper Savanna   |
|             | <b>M027 Rocky Mountain Two-needle Pinyon - Juniper Woodland</b>            |
| X           | G254 Colorado Plateau Pinyon - Juniper Scrub                               |
| X           | G250 Colorado Plateau Pinyon - Juniper Woodland                            |
| X           | G252 Southern Rocky Mountain Juniper Woodland & Savanna                    |
| X           | G253 Southern Rocky Mountain Pinyon - Juniper Woodland                     |

**D192 1.B.2.Nd Vancouverian Cool Temperate Forest**

|   |
|---|
| <b>M023 Southern Vancouverian Montane &amp; Foothill Forest</b>                           |
| G344 California Montane Conifer Forest & Woodland   |
| <del>G234 Sierran-Intermontane Desert Western White Pine - White Fir Woodland</del>       |
| <b>M024 Vancouverian Lowland &amp; Montane Rainforest</b>                                 |
| G235 California Coastal Redwood Forest  |
| G212 East Cascades Mesic Grand Fir - Douglas-fir Forest                                   |
| G240 North Pacific Maritime Douglas-fir - Western Hemlock Forest                          |
| G241 North Pacific Maritime Silver Fir - Western Hemlock Forest                           |
| G750 North Pacific Maritime Western Hemlock - Sitka Spruce Rainforest                     |
| G237 North Pacific Red Alder - Bigleaf Maple - Douglas-fir Forest                         |
| G751 North Pacific Western Hemlock - Sitka Spruce - Western Red-cedar Seasonal Rainforest |
| G205 Vancouverian Dry Coastal & Lowland Douglas-fir - Beach Pine Forest & Woodland        |
| <b>M405 Vancouverian Semi-natural Forest</b>  |
| <b>M025 Vancouverian Subalpine Forest</b>   |
| G245 North Pacific Mountain Hemlock - Silver Fir Forest & Tree Island                     |
| <del>G244 Sierra-Cascade Mountain Hemlock Forest</del>                                    |
| <del>G242 Sierra-Cascade Red Fir Forest</del>   |
| G243 Sierra-Cascade Cold-Dry Subalpine Woodland   |
| G749 Sierra-Cascade Red Fir - Mountain Hemlock Forest                                     |

**1.B.3 Temperate Flooded & Swamp Forest**

|             |  |
|-------------|--|
| <b>D013</b> | <b>1.B.3.Nd Southwestern North American Flooded &amp; Swamp Forest</b> |
|             | <b>M036 Warm Southwest Riparian Forest</b>                             |
|             | G509 Mediterranean California Lowland Flooded & Swamp Forest           |
|             | G508 Sonoran-Chihuahuan Warm Desert Riparian Scrub                     |
|             | G549 Tamaulipan Wet-Mesic Scrub Forest                                 |
|             | <b>M298 Warm Southwest Semi-natural Flooded &amp; Swamp Forest</b>     |
|             | G510 Southwestern North American Semi-natural Riparian Forest & Scrub  |
| <b>D193</b> | <b>1.B.3.Ng Vancouverian Flooded &amp; Swamp Forest</b>                |
|             | <b>M035 Vancouverian Flooded &amp; Swamp Forest</b>                    |
|             | G254 North Pacific Lowland Riparian Forest & Woodland                  |
|             | G256 North Pacific Maritime Hardwood-Conifer Rich Swamp                |
|             | G610 North Pacific Maritime Poor Swamp & Bog Forest                    |
|             | G507 North Pacific Montane Riparian Woodland                           |

**2.B.1 Mediterranean Scrub & Grassland**

|             |  |
|-------------|--|
| <b>D020</b> | <b>2.B.1.Na California Scrub</b>                               |
|             | <b>M043 California Chaparral</b>                               |
|             | G258 California Maritime Chaparral                             |
|             | <del>G263 California-Mesic-Pre-montane Sclerophyll Scrub</del> |
|             | G261 California Mesic & Pre-montane Sclerophyll Scrub          |

- G257 California Xeric Chaparral
- M044 California Coastal Scrub
- G264 Central & Southern California Coastal Sage Scrub
- D021 2.B.1.Nb California Grassland & Meadow
- M045 California Annual & Perennial Grassland
- G766 California Annual Grassland
- G496 California Native Bunchgrass Grassland

## 2.B.2 Temperate Grassland, Meadow & Shrubland

- D022 2.B.2.Na Western North American Grassland & Shrubland
- M048 Central Rocky Mountain Montane & Foothill Grassland & Shrubland
- X G305 Central Rocky Mountain High Montane Mesic Shrubland
- X G273 Central Rocky Mountain Lower Montane, Foothill & Valley Grassland
- X G267 Central Rocky Mountain Montane Grassland
- X G272 Central Rocky Mountain Montane-Foothill Dry Deciduous Shrubland
- X G275 Central Rocky Mountain Montane-Foothill Mesic Deciduous Shrubland
- X ~~G274 Columbia Basin Foothill & Canyon Dry Grassland~~
- M172 Northern Vancouverian Lowland & Montane Grassland & Shrubland
- G354 Vancouverian Alder - Salmonberry - Willow Shrubland
- G355 Vancouverian Grassland & Meadow
- G618 Vancouverian Shrub & Herb Dune
- Rocky Mountain-Vancouverian Subalpine & High Montane Mesic Grass & Forb Meadow
- M168
- X G271 Rocky Mountain Subalpine-Montane Mesic Herbaceous Meadow
- X ~~G270 Sierran Subalpine Mesic Herbaceous Meadow~~
- X G268 Southern Rocky Mountain Montane-Subalpine Grassland
- M049 Southern Rocky Mountain Montane Shrubland
- X G276 Southern Rocky Mountain Cercocarpus - Mixed Foothill Shrubland
- X G277 Southern Rocky Mountain Gambel Oak - Mixed Montane Shrubland
- D061 2.B.2.Nd Western North American Interior Sclerophyllous Chaparral Shrubland
- X M094 Cool Interior Chaparral
- X ~~G283 California Montane Chaparral~~
- X G282 Western North American Montane Sclerophyll Scrub

## 2.B.4 Temperate & Boreal Scrub & Herb Coastal Vegetation

- D027 2.B.4.Nb Pacific North American Coast Scrub & Herb Vegetation
- M059 Pacific Coastal Beach & Dune Vegetation
- ~~G663 California Coastal Beach & Dune Scrub~~
- G498 North Pacific Maritime Coastal Scrub & Herb Beach & Dune
- G664 Warm Pacific Coastal Beach & Dune Vegetation
- M058 Pacific Coastal Cliff & Bluff Vegetation
- G662 California Coastal Evergreen Scrub Bluff
- G554 North Pacific Coastal Scrub & Herb Cliff & Bluff
- G665 Warm Pacific Coastal Bluff Vegetation

## 2.B.5 Temperate & Boreal Bog & Fen

- D029 2.B.5.Na North American Bog & Fen
- M062 North American Boreal & Sub-Boreal Bog & Fen
- G748 Eastern North American Boreal Acidic Bog & Fen
- G185 Eastern North American Boreal Alkaline Fen
- G745 Eastern North American Sub-Boreal Acidic Bog & Poor Fen
- G360 Western North American Boreal Acidic Bog & Fen
- G361 Western North American Boreal Alkaline Fen
- M063 North Pacific Bog & Fen
- ~~G544 California Acidic Fen~~
- G285 North Pacific Alkaline Fen
- G284 North Pacific Bog & Acidic Fen
- M064 Rocky Mountain Fen

- G515 Rocky Mountain Acidic Fen
- G516 Rocky Mountain Alkaline Fen

## 2.B.6 Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland

- D031 **2.B.6.Nb** Western North American Freshwater Shrubland, Wet Meadow & Marsh
- M075** Western North American Montane & Subalpine Wet Shrubland & Wet Meadow
    - G504 Rocky Mountain & Great Basin Montane Alder & Birch Riparian Shrubland
    - G527 Rocky Mountain & Great Basin Montane Riparian & Seep Shrubland
    - G521 Vancouverian & Rocky Mountain Montane Wet Meadow
    - G520 Vancouverian & Rocky Mtn. Subalpine Snowbed, Wet Meadow & Dwarf-Shrubland
  - M301** Western North American Semi-natural Wet Shrubland, Meadow & Marsh
    - G524 Western North American Semi-natural Wet Shrubland, Meadow & Marsh
  - M073** Western N. American Temperate Lowland Wet Shrubland, Wet Meadow & Marsh
    - G526 Rocky Mountain & Great Basin Lowland & Foothill Riparian & Seep Shrubland
    - G525 Temperate Pacific Freshwater Wet Mudflat
    - G517 Vancouverian Freshwater Wet Meadow & Marsh
    - G322 Vancouverian Wet Shrubland
    - G523 Western North American Maritime Lowland Wet Meadow & Herbaceous Seep
    - G548 Western North American Temperate Interior Freshwater Marsh
- D032 **2.B.6.Nc** Southwestern North American Warm Desert Freshwater Marsh
- M076** Warm Desert Freshwater Shrubland, Meadow & Marsh
    - G531 Arid West Emergent Marsh
  - M076** Warm Desert Freshwater Shrubland, Meadow & Marsh
    - G533 North American Warm Desert Riparian Low Bosque & Shrubland

## 2.B.7 Salt Marsh

- D036 **2.B.7.Nd** North American Western Interior Brackish Marsh
- M082** Cool-Semi-Desert Alkali-Saline Wetland
    - G538 Intermountain Basins Alkaline-Saline Herb Wet Flat
    - G537 Intermountain Basins Alkaline-Saline Shrub Wetland
  - M083** Warm Semi-Desert & Mediterranean Alkaline-Saline Wetland
    - G672 North American Warm Desert Alkaline Scrub & Herb Playa & Wet Flat

## 4.B.1 Temperate & Boreal Alpine Vegetation

- D043 **4.B.1.Nb** Western North American Alpine Vegetation
- M099** Rocky Mountain Alpine Scrub, Forb Meadow & Grassland
    - G316 Rocky Mountain Alpine Dwarf-Shrubland
    - G314 Rocky Mountain Alpine Turf & Fell-Field
  - M101** Vancouverian Alpine Scrub, Forb Meadow & Grassland
    - G362 Aleutian Ericaceous Dwarf-Shrubland & Heath
    - G317 North Pacific Alpine-Subalpine Dwarf-Shrubland & Heath
    - G320 North Pacific Alpine-Subalpine Turf & Herbaceous Meadow
    - G363 Sierran Alpine Tundra & Fell-Field
  - M404** Western Boreal Alpine
    - G613 Western Boreal Alpine Dwarf-Shrubland
    - G747 Western Boreal Alpine Grassland & Meadow

## 6.D.2 Polar & Alpine Cliff, Scree & Other Rock Vegetation

- D058 **6.D.2.Nb** North American Alpine Cliff, Scree & Rock Vegetation
- M133** Eastern Alpine Cliff, Scree & Rock Vegetation
    - G108 Eastern Alpine Cliff, Scree & Rock Vegetation
  - M119** Rocky Mountain Alpine Cliff, Scree & Rock Vegetation
    - G571 Rocky Mountain Alpine Bedrock & Scree
  - M120** Vancouverian Alpine Cliff, Scree & Rock Vegetation
    - G319 North Pacific Alpine & Subalpine Bedrock & Scree
    - G572 Sierran Alpine Cliff, Scree & Rock Vegetation

**Table 1.** Draft relationships of the revised USNVC hierarchy with the MCV2 California Alliances.

---

| <b>Level 1 - CLASS</b>   |   |
|--|---|
| <b>Level 2 - SUBCLASS</b>  |   |
| <b>Level 3 - FORMATION</b>   |   |
| <b>Level 4 - DIVISION</b>  |   |
| <b>Level 5 - Macrogroup</b>  |   |
| <b>Level 6 - Group</b>   |   |
|  | <b>Level 7 – Alliance (Alternate Group)</b>                                     |
| 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                                 |   |
|  | Aesculus californica Alliance   |
|  | Juglans californica Alliance  |
|  | Lyonothamnus floribundus Special Stands   |
|  | Quercus (agrifolia, douglasii, garryana, kelloggii, lobata, wislizeni) Alliance |
|  | Quercus agrifolia Alliance  |
|  | Quercus chrysolepis tree Alliance   |
|  | Quercus douglasii Alliance  |
|  | Quercus engelmannii Alliance  |
|  | Quercus kelloggii Alliance  |
|  | Quercus lobata Alliance (G508/G509/G503)  |
|  | Quercus palmeri Alliance  |
|  | Quercus parvula var. shrevei Provisional Alliance                               |
|  | Quercus tomentella Special Stands   |
|  | Quercus wislizeni tree Alliance   |
|  | Umbellularia californica Alliance (G254)  |
| Group G198. California Conifer Forest & Woodland                                   |   |
|  | Hesperocyparis abramsiana Special Stands  |
|  | Hesperocyparis bakeri Alliance  |
|  | Hesperocyparis forbesii Alliance  |
|  | Hesperocyparis goveniana Special Stands   |
|  | Hesperocyparis macnabiana Alliance  |
|  | Hesperocyparis macrocarpa Special Stands  |
|  | Hesperocyparis nevadensis Alliance  |
|  | Hesperocyparis pigmaea Alliance   |
|  | Hesperocyparis sargentii Alliance   |
|  | Hesperocyparis stephensonii Special Stands                                      |
|  | Juniperus californica Alliance (G296)   |
|  | Pinus attenuata Alliance  |
|  | Pinus coulteri Alliance   |
|  | Pinus muricata Alliance   |
|  | Pinus quadrifolia Alliance  |
|  | Pinus radiata Alliance  |
|  | Pinus sabiniana Alliance  |
|  | Pinus torreyana Special Stands  |
| Group G208. Californian Moist Coastal Mixed Evergreen Forest                       |   |
|  | Arbutus menziesii Alliance  |
|  | Chrysolepis chrysophylla Alliance   |
|  | Notholithocarpus densiflorus Alliance   |
|  | Pseudotsuga menziesii–Notholithocarpus densiflorus Alliance                     |
| Macrogroup M513. Californian Semi-natural Forest                                   |   |
| Group G678. Californian Semi-natural Forest  |   |
|  | Eucalyptus (globulus, camaldulensis) Semi-Natural Stands (G510)                 |
|  | Schinus (molle, terebinthifolius)–Myoporum laetum Semi-Natural Stands (G510)    |
| Formation 1.B.2. Cool Temperate Forest   |   |
| Division 1.B.2.Nb. Rocky Mountain Cool Temperate Forest                            |   |
| Macrogroup M020. Rocky Mountain Subalpine-High Montane Conifer Forest              |   |
| Group G218. Rocky Mountain Subalpine Moist Spruce - Fir Forest & Woodland          |   |
|  | Abies lasiocarpa Alliance (G506)  |
|  | Picea engelmannii Alliance (G506)   |
| Group G224. Intermountain Basins Subalpine Limber Pine - Bristlecone Pine Woodland |   |
|  | Pinus flexilis Alliance   |
|  | Pinus longaeva Alliance   |

---



---

**Level 1 - CLASS**

**Level 2 - SUBCLASS**

**Level 3 - FORMATION**

**Level 4 - DIVISION**

**Level 5 - Macrogroup**

**Level 6 - Group**

**Level 7 – Alliance (Alternate Group)**

---

- Division 1.B.2.Nc. Western North American Cool Temperate Woodland & Scrub
- Macrogroup M026. Intermountain Singleleaf Pinyon - Utah Juniper - Western Juniper Woodland
    - Group G247. Great Basin Pinyon - Juniper Woodland
      - Juniperus osteosperma Alliance
      - Pinus monophylla Alliance
    - Group G248. Columbia Plateau Western Juniper Woodland & Savanna
      - Juniperus occidentalis Alliance
    - Group G250. Colorado Plateau Pinyon - Juniper Woodland
      - Pinus edulis Special Stands
  - Division 1.B.2.Nd. Vancouverian Cool Temperate Forest
    - Macrogroup M023. Southern Vancouverian Montane-Foothill Forest
      - Group G344. California Montane Conifer Forest & Woodland
        - Abies bracteata Alliance
        - Abies concolor Alliance (G226/G225)
        - Abies concolor–Pinus lambertiana Alliance
        - Abies concolor–Pseudotsuga menziesii Alliance
        - Calocedrus decurrens Alliance
        - Juniperus grandis Alliance
        - Picea breweriana Alliance
        - Pinus jeffreyi Alliance
        - Pinus lambertiana Alliance
        - Pinus ponderosa Alliance (G210/G213)
        - Pinus ponderosa var. washoensis Alliance (G210/G213)
        - Pinus ponderosa–Calocedrus decurrens Alliance
        - Pinus ponderosa–Pseudotsuga menziesii Alliance (G210/G213)
        - Pseudotsuga macrocarpa Alliance
        - Pseudotsuga menziesii–Calocedrus decurrens Alliance
        - Sequoiadendron giganteum Alliance
      - Macrogroup M024. Vancouverian Lowland & Montane Rainforest
        - Group G205. Vancouverian Dry Coastal & Lowland Douglas-fir - Beach Pine Forest & Woodland
          - Pinus contorta ssp. contorta Alliance
        - Group G206. Cascadian Oregon White Oak - Conifer Forest & Woodland
          - Quercus garryana tree Alliance
        - Group G240. North Pacific Maritime Douglas-fir - Western Hemlock Forest
          - Abies grandis Alliance
          - Chamaecyparis lawsoniana Alliance
          - Picea sitchensis Alliance (G256)
          - Pseudotsuga menziesii Alliance (G226/G225)
          - Sequoia sempervirens Alliance
          - Tsuga heterophylla Alliance (G256)
        - Group G241. North Pacific Maritime Silver Fir - Western Hemlock Forest
          - Abies amabilis Alliance (G749/G245)
      - Macrogroup M025. Vancouverian Subalpine Forest
        - Group G243. Sierra-Cascade Cold-Dry Subalpine Woodland
          - Pinus albicaulis Alliance (G223)
          - Pinus balfouriana Alliance
          - Pinus contorta ssp. murrayana Alliance (G284(G514)/G515)
        - Group G749. Sierra-Cascade Red Fir - Mountain Hemlock Forest
          - Abies magnifica Alliance
          - Abies magnifica–Abies concolor Alliance
          - Hesperocyparis nootkatensis Alliance
          - Pinus monticola Alliance (G243)
          - Tsuga mertensiana Alliance

---

**Level 1 - CLASS**

**Level 2 - SUBCLASS**

**Level 3 - FORMATION**

**Level 4 - DIVISION**

**Level 5 - Macrogroup**

**Level 6 - Group**

**Level 7 – Alliance (Alternate Group)**

---

Formation 1.B.3. Temperate Flooded & Swamp Forest

Division 1.B.3.Nc. Rocky Mountain & Great Basin Flooded & Swamp Forest

Macrogroup M034. Rocky Mountain & Great Basin Riparian Forest

Group G506. Rocky Mountain & Great Basin Montane Riparian Forest

Populus tremuloides Alliance (G222)

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

Acer negundo Alliance

Juglans hindsii and Hybrids Special and Semi-Natural Stands

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

Acer macrophyllum Alliance

Alnus rhombifolia Alliance (G508/G509/G503)

Alnus rubra Alliance

Fraxinus latifolia Alliance

Populus trichocarpa Alliance

Salix lucida Alliance (G527)

**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

Adenostoma fasciculatum–Salvia apiana Alliance

Adenostoma fasciculatum–Salvia mellifera Alliance

Arctostaphylos glauca Alliance

Arctostaphylos myrtifolia Alliance

Arctostaphylos viscida Alliance

Ceanothus crassifolius Alliance

Ceanothus cuneatus Alliance

Ceanothus megacarpus Alliance

Group G258. California Maritime Chaparral

Arctostaphylos (crustacea, tomentosa) Alliance

Arctostaphylos (nummularia, sensitiva) Alliance

Arctostaphylos (purissima, rudis) Special Stands

Arctostaphylos bakeri Special Stands

Arctostaphylos hookeri Provisional Alliance

Arctostaphylos hooveri Alliance

Arctostaphylos montana Alliance

Arctostaphylos montereyensis Provisional Alliance

Arctostaphylos morroensis Alliance

Arctostaphylos pajaroensis Alliance

Arctostaphylos pumila Provisional Alliance

Arctostaphylos silvicola Provisional Alliance

Ceanothus verrucosus Provisional Alliance

Malosma laurina Alliance

Quercus pacifica Alliance

Rhus integrifolia Alliance

---

**Level 1 - CLASS**

**Level 2 - SUBCLASS**

**Level 3 - FORMATION**

**Level 4 - DIVISION**

**Level 5 - Macrogroup**

**Level 6 - Group**

**Level 7 – Alliance (Alternate Group)**

---

Group G261. California Mesic & Pre-montane Chaparral

Adenostoma fasciculatum–Xylococcus bicolor Alliance  
Arctostaphylos canescens Provisional Alliance  
Arctostaphylos glandulosa Alliance  
Arctostaphylos manzanita Provisional Alliance  
Arctostaphylos pringlei ssp. drupacea Alliance  
Arctostaphylos stanfordiana Provisional Alliance  
Ceanothus leucodermis Alliance  
Ceanothus oliganthus Alliance  
Ceanothus papillosus Alliance  
Ceanothus spinosus Alliance  
Cercocarpus montanus Alliance  
Frangula californica Alliance  
Heteromeles arbutifolia Alliance  
Prunus ilicifolia Alliance  
Quercus berberidifolia Alliance  
Quercus berberidifolia–Adenostoma fasciculatum Alliance  
Quercus chrysolepis shrub Alliance  
Quercus durata Alliance  
Quercus john-tuckeri Alliance  
Quercus wislizeni shrub Alliance

Macrogroup M044. California Coastal Scrub

Group G264. Central & Southern California Coastal Sage Scrub

Artemisia californica Alliance  
Artemisia californica–Eriogonum fasciculatum Alliance  
Artemisia californica–Salvia mellifera Alliance  
Coreopsis gigantea Alliance  
Deinandra clementina–Eriogonum giganteum Provisional Alliance  
Dendromecon rigida Alliance  
Diplacus aurantiacus Alliance  
Encelia californica Alliance  
Ericameria linearifolia Provisional Alliance  
Ericameria palmeri Provisional Alliance  
Eriodictyon californicum Alliance  
Eriodictyon crassifolium Provisional Alliance  
Eriogonum cinereum Alliance  
Eriogonum fasciculatum Alliance  
Eriogonum fasciculatum–Salvia apiana Alliance  
Gutierrezia californica Provisional Alliance  
Hazardia squarrosa Alliance  
Isocoma menziesii Alliance  
Keckiella antirrhinoides Alliance  
Lotus scoparius Alliance  
Lupinus albifrons Alliance  
Lycium californicum Provisional Alliance  
Malacothamnus fasciculatus Alliance  
Opuntia littoralis Alliance  
Salvia apiana Alliance  
Salvia leucophylla Alliance  
Salvia mellifera Alliance  
Venegasia carpesioides Alliance

Group G662. California North Coastal & Mesic Scrub

Baccharis pilularis Alliance  
Ceanothus thrysiflorus Alliance  
Corylus cornuta var. californica Alliance  
Garrya elliptica Provisional Alliance  
Ribes quercetorum Provisional Alliance  
Rubus (parviflorus, spectabilis, ursinus) Alliance  
Toxicodendron diversilobum Alliance

---

**Level 1 - CLASS**

**Level 2 - SUBCLASS**

**Level 3 - FORMATION**

**Level 4 - DIVISION**

**Level 5 - Macrogroup**

**Level 6 - Group**

**Level 7 – Alliance (Alternate Group)**

---

- Division 2.B.1.Nb. California Grassland & Meadow
  - Macrogroup M045. California Annual & Perennial Grassland
    - Group G496. California Native Perennial Grassland
      - Leymus condensatus Alliance
      - Melica torreyana Provisional Alliance
      - Nassella cernua Provisional Alliance
      - Nassella lepida Provisional Alliance
      - Nassella pulchra Alliance
    - Group G766. California Annual Grassland
      - Amsinckia (menziesii, tessellata) Alliance
      - Deinandra fasciculata Alliance
      - Eschscholzia (californica) Alliance
      - Lasthenia californica–Plantago erecta–Vulpia microstachys Alliance
      - Plagiobothrys nothofulvus Alliance
  - Macrogroup M046. California Semi-natural Grassland & Meadow
    - Group G497. California Semi-natural Grassland & Forb Meadow
      - Aegilops triuncialis Provisional Semi-Natural Stands
      - Avena (barbata, fatua) Semi-Natural Stands
      - Brassica nigra and other mustards Semi-Natural Stands
      - Bromus (diandrus, hordeaceus)–Brachypodium distachyon Semi-Natural Stands
      - Centaurea (solstitialis, melitensis) Semi-Natural Stands
      - Conium maculatum–Foeniculum vulgare Semi-Natural Stands
      - Lolium perenne Semi-Natural Stands
      - Pennisetum setaceum Semi-Natural Stands
- Formation 2.B.2. Temperate Grassland, Meadow & Shrubland
  - Division 2.B.2.Na. Western North American Grassland & Shrubland
    - Macrogroup M048. Central Rocky Mountain Montane-Foothill Grassland & Shrubland
      - Group G272. Central Rocky Mountain Montane-Foothill Dry Deciduous Shrubland
        - Ceanothus cordulatus Alliance
        - Ceanothus integerrimus Alliance
        - Quercus garryana shrub Alliance
        - Rhus trilobata Provisional Alliance
      - Group G273. Central Rocky Mountain Lower Montane, Foothill & Valley Grassland
        - Elymus glaucus Alliance
        - Elymus multisetus Provisional Alliance
        - Festuca idahoensis Alliance
        - Poa secunda Alliance
        - Pseudoroegneria spicata Alliance (G311)
      - Group G305. Central Rocky Mountain High Montane Mesic Shrubland
        - Acer glabrum Provisional Alliance (G527)
        - Holodiscus discolor Alliance
        - Prunus emarginata Provisional Alliance
        - Prunus virginiana Provisional Alliance
    - Macrogroup M049. Southern Rocky Mountain Montane Shrubland
      - Group G276. Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland
        - Cercocarpus intricatus Alliance
        - Cercocarpus ledifolius Alliance
    - Macrogroup M050. Southern Vancouverian Lowland Grassland & Shrubland
      - Group G488. Southern Vancouverian Shrub & Herbaceous Bald, Bluff & Prairie
        - Calamagrostis nutkaensis Alliance
        - Danthonia californica Alliance (G273/G267)
        - Festuca rubra Alliance

---

**Level 1 - CLASS**

**Level 2 - SUBCLASS**

**Level 3 - FORMATION**

**Level 4 - DIVISION**

**Level 5 - Macrogroup**

**Level 6 - Group**

**Level 7 – Alliance (Alternate Group)**

---

- Macrogroup M168. Rocky Mountain & Vancouverian Subalpine-High Montane Mesic Grass & Forb Meadow
  - Group G268. Southern Rocky Mountain Montane-Subalpine Grassland
    - Carex filifolia Alliance (G273/G267)
  - Group G271. Rocky Mountain Subalpine-Montane Mesic Herbaceous Meadow
    - Calamagrostis muiriana Alliance
    - Carex douglasii Provisional Alliance
    - Carex heteroneura Provisional Alliance
    - Carex integra Provisional Alliance
    - Carex straminiformis Provisional Alliance
    - Carex subnigricans Alliance
    - Cistanthe (umbellata)–Gayophytum (diffusum) Alliance
    - Danthonia intermedia Provisional Alliance
    - Muhlenbergia richardsonis Provisional Alliance
    - Penstemon heterodoxus Provisional Alliance
    - Ptilagrostis kingii Alliance
    - Solidago canadensis Provisional Alliance
- Macrogroup M493. Western North American Temperate Semi-natural Grassland & Shrubland
  - Group G648. Southern Vancouverian Lowland Semi-natural Grassland & Shrubland
    - Broom (Cytisus scoparius and Others) Semi-Natural Stands
    - Cortaderia (jubata, seloana) Semi-Natural Stands
    - Cynosurus echinatus Semi-Natural Stands
    - Holcus lanatus–Anthoxanthum odoratum Semi-Natural Stands
    - Phalaris aquatica Semi-Natural Stands
- Division 2.B.2.Nd. Western North American Interior Sclerophyllous Chaparral
  - Macrogroup M091. Warm Interior Chaparral
    - Group G281. Western Interior Chaparral
      - Adenostoma sparsifolium Alliance (G257)
      - Ceanothus greggii Alliance
      - Quercus cornelius-mulleri Alliance
      - Quercus turbinella Alliance
    - Macrogroup M094. Cool Interior Chaparral
      - Group G282. Western North American Montane Sclerophyll Scrub
        - Arctostaphylos patula Alliance
        - Ceanothus velutinus Alliance
        - Chrysolepis sempervirens Alliance
        - Notholithocarpus densiflorus var. echinoides Alliance
        - Quercus sadleriana Alliance
        - Quercus vacciniifolia Alliance
- Formation 2.B.4. Temperate & Boreal Scrub & Herb Coastal Vegetation
  - Division 2.B.4.Nb. Pacific North American Coast Scrub & Herb Vegetation
    - Macrogroup M059. Pacific Coastal Beach & Dune Vegetation
      - Group G498. North Pacific Maritime Coastal Scrub & Herb Beach & Dune
        - Leymus mollis Alliance
      - Group G663. California Coastal Beach & Dune Scrub
        - Abronia latifolia–Ambrosia chamissonis Alliance
        - Lupinus arboreus Alliance and Semi-Natural Stands
        - Lupinus chamissonis–Ericameria ericoides Alliance
    - Macrogroup M511. North Pacific Coastal Semi-natural Grassland & Shrubland
      - Group G647. North Pacific Maritime Coastal Sand Dune Semi-natural Scrub & Herb Vegetation
        - Ammophila arenaria Semi-Natural Stands
        - Cakile (edentula, maritima) Provisional Semi-Natural Stands
        - Carpobrotus edulis or Other Ice Plants Semi-Natural Stands

---

**Level 1 - CLASS**

**Level 2 - SUBCLASS**

**Level 3 - FORMATION**

**Level 4 - DIVISION**

**Level 5 - Macrogroup**

**Level 6 - Group**

**Level 7 – Alliance (Alternate Group)**

---

Formation 2.B.5. Temperate & Boreal Bog & Fen

Division 2.B.5.Na. North American Bog & Fen

Macrogroup M063. North Pacific Bog & Fen

Group G284. North Pacific Bog & Acidic Fen

Bistorta bistortoides–Mimulus primuloides Alliance (G521)

Carex (aquatilis, lenticularis) Alliance (G521)

Carex echinata Alliance

Carex lasiocarpa Provisional Alliance

Carex luzulina Provisional Alliance

Darlingtonia californica Alliance

Dulichium arundinaceum Provisional Alliance

Kalmia microphylla Provisional Alliance (G316/G317/G520)

Rhododendron neoglandulosum Alliance

Triantha occidentalis–Nartheccium californicum Alliance

Vaccinium uliginosum Alliance

Group G285. North Pacific Neutral - Alkaline Fen

Carex limosa Alliance

Carex simulata Alliance

Kobresia myosuroides Alliance

Oxypolis occidentalis 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 G322. Vancouverian Wet Shrubland

Morella californica Alliance

Salix hookeriana Alliance

Salix sitchensis Provisional Alliance

Group G517. Vancouverian Freshwater Wet Meadow & Marsh

Camassia quamash Alliance (G521)

Carex barbarae Alliance

Carex densa Provisional Alliance (G521)

Carex nudata Alliance (G521)

Carex obnupta Alliance

Carex pansa Provisional Alliance

Carex serratodens Provisional Alliance (G521)

Cirsium fontinale Alliance

Deschampsia caespitosa Alliance (G521)

Eleocharis acicularis Alliance (G521)

Eleocharis macrostachya Alliance (G521)

Hordeum brachyantherum Alliance (G521)

Juncus (oxymersis, xiphioides) Provisional Alliance

Juncus arcticus (var. balticus, mexicanus) Alliance (G521)

Juncus effusus Alliance (G521)

Juncus lescurii Alliance

Juncus patens Provisional Alliance

Mimulus (guttatus) Alliance (G521)

Muhlenbergia rigens Alliance

Oenanthe sarmentosa Alliance

Scirpus microcarpus Alliance (G521)

Group G525. Temperate Pacific Freshwater Wet Mudflat

Ambrosia psilostachya Provisional Alliance

Artemisia dracunculus Alliance

Lotus purshianus Provisional Alliance

Persicaria lapathifolia–Xanthium strumarium Provisional Alliance

Group G526. Rocky Mountain & Great Basin Lowland & Foothill Riparian Shrubland

Artemisia cana Alliance (G304)

---

**Level 1 - CLASS**

**Level 2 - SUBCLASS**

**Level 3 - FORMATION**

**Level 4 - DIVISION**

**Level 5 - Macrogroup**

**Level 6 - Group**

**Level 7 – Alliance (Alternate Group)**

---

- Group G531. Arid West Interior Freshwater Emergent Marsh
  - Phragmites australis Alliance (G524)
  - Schoenoplectus acutus Alliance
  - Schoenoplectus americanus Alliance (G499)
  - Schoenoplectus californicus Alliance
  - Typha (angustifolia, domingensis, latifolia) Alliance
- Macrogroup M074. Western North American Vernal Pool
  - Group G530. California Vernal Pool
    - Eryngium aristulatum Alliance
    - Lasthenia fremontii–Distichlis spicata Alliance
    - Lasthenia fremontii–Downingia (bicornuta) Alliance
    - Lasthenia glaberrima Alliance
    - Layia fremontii–Achyraea mollis Alliance
    - Montia fontana–Sidalcea calycosa Alliance
    - Trifolium variegatum Alliance
  - Macrogroup M075. Western North American Montane-Subalpine Wet Shrubland & Wet Meadow
    - Group G520. Vancouverian & Rocky Mountain Subalpine Snowbed, Wet Meadow & Dwarf-Shrubland
      - Carex nigricans Provisional Alliance
    - Group G521. Vancouverian & Rocky Mountain Montane Wet Meadow
      - Alopecurus geniculatus Provisional Alliance (G517)
      - Calamagrostis canadensis Alliance
      - Carex (utriculata, vesicaria) Alliance
      - Carex jonesii Alliance
      - Carex microptera Provisional Alliance
      - Carex nebrascensis Alliance
      - Carex scopulorum Alliance
      - Eleocharis quinqueflora Alliance
      - Glyceria (elata, striata) Alliance
      - Glyceria ×occidentalis Provisional Alliance
      - Iris missouriensis Provisional Alliance
      - Juncus nevadensis Alliance
      - Muhlenbergia filiformis Provisional Alliance
      - Senecio triangularis Alliance
      - Trifolium longipes Provisional Alliance
      - Veratrum californicum Alliance
    - Group G527. Rocky Mountain & Great Basin Montane Riparian & Seep Shrubland
      - Alnus incana Alliance
      - Alnus viridis Provisional Alliance (G322)
      - Betula glandulosa Provisional Alliance (G285/G516)
      - Betula occidentalis Alliance
      - Cornus sericea Alliance (G322)
      - Rosa woodsii Provisional Alliance
      - Salix bebbiana Alliance
      - Salix eastwoodiae Alliance
      - Salix geeyeriana Alliance
      - Salix jepsonii Alliance
      - Salix lemmonii Alliance
      - Salix lutea Alliance
      - Salix orestera Alliance
      - Salix planifolia Provisional Alliance
  - Macrogroup M301. Western North American Semi-natural Wet Shrubland, Meadow & Marsh
    - Group G524. Western North American Semi-natural Wet Shrubland, Meadow & Marsh
      - Agrostis (gigantea, stolonifera)–Festuca arundinacea Semi-Natural Stands
      - Arundo donax Semi-Natural Stands
      - Lepidium latifolium Semi-Natural Stands
      - Poa pratensis Semi-Natural Stands
      - Rubus armeniacus Semi-Natural Stands

---

**Level 1 - CLASS**

**Level 2 - SUBCLASS**

**Level 3 - FORMATION**

**Level 4 - DIVISION**

**Level 5 - Macrogroup**

**Level 6 - Group**

**Level 7 – Alliance (Alternate Group)**

---

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 emoryi Provisional Alliance

Baccharis salicifolia Alliance

Baccharis sergiloides Alliance

Cephalanthus occidentalis Alliance

Forestiera pubescens Alliance

Pluchea sericea Alliance

Prosopis glandulosa Alliance (G287)

Prosopis pubescens Alliance

Rhododendron occidentale Provisional Alliance

Rosa californica Alliance

Salix breweri Alliance

Salix exigua Alliance (G526)

Salix lasiolepis Alliance (G527)

Sambucus nigra Alliance

Formation 2.B.7. Salt Marsh

Division 2.B.7.Nc. Temperate & Boreal Pacific Coastal Salt Marsh

Macrogroup M081. North American Pacific Coastal Salt Marsh

Group G499. Temperate Pacific Tidal Salt & Brackish Marsh

Argentina egedii Alliance

Arthrocnemum subterminale Alliance (G538)

Atriplex prostrata–Cotula coronopifolia Semi-Natural Stands

Bolboschoenus maritimus Alliance (G538)

Distichlis spicata Alliance (G538)

Sarcocornia pacifica (Salicornia depressa) Alliance (G538)

Spartina (alterniflora, densiflora) Semi-Natural Stands

Spartina foliosa Alliance

Spergularia marina Provisional Alliance (G538)

Division 2.B.7.Nd. North American Western Interior Brackish Marsh

Macrogroup M082. Cool Semi-Desert Alkaline-Saline Wetland

Group G537. North American Desert & Semi-Desert Alkaline-Saline Shrub Wetland

Allenrolfea occidentalis Alliance

Atriplex lentiformis Alliance

Atriplex spinifera Alliance

Frankenia salina Alliance

Sarcobatus vermiculatus Alliance

Suaeda moquinii Alliance

Group G538. Western North American Desert & Semi-Desert Alkaline-Saline Herbaceous Wetland & Playa

Anemopsis californica Alliance

Centromadia (pungens) Alliance

Cressa truxillensis–Distichlis spicata Alliance

Grindelia (stricta) Provisional Alliance

Juncus cooperi Alliance

Leymus cinereus Alliance (G271)

Leymus triticoides Alliance

Sesuvium verrucosum Alliance

Spartina gracilis Alliance

Sporobolus airoides Alliance

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 G292. Sonoran Sarcocaulis Desert Scrub

Bursera microphylla Special Stands



---

**Level 1 - CLASS****Level 2 - SUBCLASS****Level 3 - FORMATION****Level 4 - DIVISION****Level 5 - Macrogroup****Level 6 - Group****Level 7 – Alliance (Alternate Group)**

---

- Group G293. Sonoran Paloverde - Mixed Cacti Desert Scrub
  - Koeberlinia spinosa Special Stands
  - Parkinsonia microphylla Provisional Alliance
  - Prunus fremontii Alliance
  - Rhus ovata Alliance
  - Simmondsia chinensis Provisional Alliance
  - Tetracoccus hallii Provisional 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
  - Agave deserti Alliance
  - Coleogyne ramosissima Alliance (G312)
  - Ephedra funerea Provisional Alliance
  - Ephedra nevadensis Alliance
  - Ephedra viridis Alliance (G312)
  - Ericameria teretifolia Alliance
  - Eriogonum heermannii Provisional Alliance
  - Eriogonum wrightii Alliance
  - Lycium andersonii Alliance
  - Menodora spinescens Alliance
  - Nolina (bigelovii, parryi) Alliance
  - Purshia stansburiana Alliance (G310)
  - Viguiera parishii Alliance
  - Yucca brevifolia Alliance
  - Yucca schidigera Alliance
- Group G675. North American Warm Semi-Desert Dunes & Sand Flats
  - Dicoria canescens–Abronia villosa Alliance
  - Panicum urvilleanum Alliance
  - Swallenia alexandrae Special Stands
- Macrogroup M092. North American Warm-Desert Xero-Riparian Scrub
  - Group G541. Warm Semi-Desert Shrub & Herb Dry Wash
    - Acacia greggii Alliance
    - Ambrosia salsola Alliance
    - Castela emoryi Special Stands
    - Chilopsis linearis Alliance
    - Encelia virginensis Alliance
    - Ephedra californica Alliance
    - Ericameria paniculata Alliance
    - Hyptis emoryi Alliance
    - Justicia californica Provisional Alliance
    - Lepidospartum squamatum Alliance
    - Parkinsonia florida–Olneya tesota Alliance
    - Prunus fasciculata Alliance
    - Psorothamnus spinosus Alliance
    - Salazaria mexicana Alliance
    - Salvia dorrii Alliance
    - Viguiera reticulata Alliance
    - Ziziphus obtusifolia Special Stands
  - 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)

---

**Level 1 - CLASS**

**Level 2 - SUBCLASS**

**Level 3 - FORMATION**

**Level 4 - DIVISION**

**Level 5 - Macrogroup**

**Level 6 - Group**

**Level 7 – Alliance (Alternate Group)**

---

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 M093. Great Basin Saltbush Scrub

Group G300. Intermountain Shadscale - Saltbush Scrub

*Atriplex canescens* Alliance (G559)

*Atriplex confertifolia* Alliance

*Atriplex polycarpa* Alliance

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

Group G302. Intermountain Mesic Tall Sagebrush Shrubland & Steppe

*Artemisia tridentata* Alliance (G303)

*Purshia tridentata* Alliance (G303)

Group G304. Intermountain Mountain Big Sagebrush Shrubland & Steppe

*Artemisia rothrockii* Alliance

*Artemisia tridentata* ssp. *vaseyana* Alliance

Macrogroup M170. Great Basin & Intermountain Dwarf Sage Shrubland & Steppe

Group G308. Intermountain Low & Black Sagebrush Shrubland & Steppe

*Artemisia arbuscula* ssp. *arbuscula* Alliance

*Artemisia arbuscula* ssp. *longicaulis* Provisional Alliance

*Artemisia nova* Alliance

Macrogroup M171. Great Basin & Intermountain Dry Shrubland & Grassland

Group G310. Intermountain Semi-Desert Shrubland & Steppe

*Ericameria nauseosa* Alliance (G559)

*Ericameria parryi* Alliance

*Grayia spinosa* Alliance (G296)

*Gutierrezia sarothrae* Provisional Alliance (G296)

*Krascheninnikovia lanata* Alliance (G296)

Group G311. Intermountain Semi-Desert Grassland

*Achnatherum hymenoides* Alliance

*Achnatherum speciosum* Alliance (G296)

*Aristida purpurea* Provisional Alliance

*Pleuraphis jamesii* Alliance

*Pleuraphis rigida* Alliance

Macrogroup M499. Western North American Cool Semi-Desert Semi-natural Scrub & Grassland

Group G600. Great Basin & Intermountain Semi-natural Dry Shrubland & Grassland

*Agropyron cristatum* Semi-Natural Stands

*Bromus tectorum* Semi-Natural Stands

*Centaurea (virgata)* Provisional Semi-Natural Stands

Class 4. Polar & High Montane Scrub & Grassland

Subclass 4.B. Temperate, Boreal & Polar Alpine - Tundra Vegetation

Formation 4.B.1. Temperate & Boreal Alpine Vegetation

Division 4.B.1.Nb. Western North American Alpine Vegetation

Macrogroup M099. Rocky Mountain Alpine Scrub, Forb Meadow & Grassland

Group G314. Rocky Mountain Alpine Turf & Fell-Field

*Calamagrostis purpurascens* Alliance

*Carex breweri* Alliance

*Carex congdonii* Provisional Alliance

*Carex spectabilis* Alliance

*Ericameria discoidea*-*Hulsea algida* Alliance (G573/G565)

*Festuca brachyphylla* Alliance

*Phlox covillei* Alliance

*Phlox pulvinata* Alliance

Group G316. Rocky Mountain Alpine Dwarf-Shrubland

*Cassiope mertensiana* Provisional Alliance

*Dasiphora fruticosa* Alliance

*Phyllodoce breweri* Alliance

*Phyllodoce empetriformis* Provisional Alliance

*Salix nivalis* Provisional Alliance

---

**Level 1 - CLASS**

**Level 2 - SUBCLASS**

**Level 3 - FORMATION**

**Level 4 - DIVISION**

**Level 5 - Macrogroup**

**Level 6 - Group**

---

**Level 7 – Alliance (Alternate Group)**

Salix petrophila Alliance

Vaccinium cespitosum Alliance (G284(G514)/G515)

Class 5. Aquatic Vegetation

Subclass 5.A. Saltwater Aquatic Vegetation

Formation 5.A.3. Benthic Aquatic Vascular Saltwater Vegetation

Division 5.A.3.Wf. Temperate Coastal Intertidal & Inland Saline Aquatic Vegetation

Macrogroup M186. Ditchgrass Saline Aquatic Vegetation

Group G383. Widgeongrass

Ruppia (cirrhosa, maritima) Alliance

Subclass 5.B. Freshwater Aquatic Vegetation

Formation 5.B.2. Temperate & Boreal Freshwater Aquatic Vegetation

Division 5.B.2.Na. North American Freshwater Aquatic Vegetation

Macrogroup M109. Western North American Freshwater Aquatic Vegetation

Group G544. Western North American Temperate Freshwater Aquatic Bed

Azolla (filiculoides, mexicana) Provisional Alliance

Hydrocotyle (ranunculoides, umbellata) Alliance

Isoetes (bolanderi, echinospora, howellii, nuttallii, occidentalis) Provisional Alliance

Lemna (minor) and Relatives Provisional Alliance

Ludwigia (hexapetala, peploides) Provisional Semi-Natural Stands (G544a)

Nuphar lutea Provisional Alliance

Sparganium (angustifolium) Alliance

Stuckenia (pectinata)–Potamogeton spp. Alliance (G383)

Torreyochloa pallida Alliance

Class 6. Rock Vegetation

Subclass 6.B. Mediterranean, Temperate & Boreal Rock Vegetation

Formation 6.B.1. Mediterranean Cliff, Scree & Other Rock Vegetation

Division 6.B.1.Na. Mediterranean California Cliff, Scree & Rock Vegetation

Macrogroup M110. California Cliff, Scree & Rock Vegetation

Group G563. California Cliff, Scree & Rock Vegetation

Sedum spathulifolium Provisional Alliance

Selaginella bigelovii Alliance

Formation 6.B.2. Temperate & Boreal Cliff, Scree & Other Rock Vegetation

Division 6.B.2.Nb. Western North American Temperate Cliff, Scree & Rock Vegetation

Macrogroup M114. Vancouverian Cliff, Scree & Rock Vegetation

Group G573. South Vancouverian Cliff, Scree & Rock Vegetation

Carex helleri Alliance

Juncus parryi Alliance

Penstemon newberryi Alliance

Saxifraga nidifica Provisional Alliance

Saxifraga tolmiei Provisional Alliance

Subclass 6.C. Desert & Semi-Desert Rock Vegetation

Formation 6.C.1. Warm Desert & Semi-Desert Cliff, Scree & Other Rock Vegetation

Division 6.C.1.Na. North American Warm Semi-Desert Cliff, Scree & Rock Vegetation

Macrogroup M117. North American Warm Semi-Desert Cliff, Scree & Rock Vegetation

Group G569. North American Warm Semi-Desert Cliff, Scree & Pavement Sparse Vegetation

Atriplex hymenelytra Alliance

Tidestromia oblongifolia Provisional Alliance

Subclass 6.D. Polar & High Montane Rock Vegetation

Formation 6.D.2. Polar & Alpine Cliff, Scree & Other Rock Vegetation

Division 6.D.2.Nb. North American Alpine Cliff, Scree & Rock Vegetation

Macrogroup M119. Rocky Mountain Alpine Cliff, Scree & Rock Vegetation

Group G571. Rocky Mountain Alpine Bedrock & Scree

Oxyria digyna Provisional Alliance



**Figure 1.** Project Principal Investigator, Julie Evens, in the Mojave National Preserve with her daughter, Daphne, opining about classification relationships of sand dune and grassland vegetation types.