USDA Natural Resources
Conservation Service

# Ecological site R015XI100CA
# Hills, south-facing 17-19" p.z.

Accessed: 05/13/2025

## General information

**Provisional**. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.


**Figure 1. Mapped extent**

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

## Classification relationships

Chamise series - Ecological Subregions of California, R5-EM-TP-005, Septemeber 1997.

Chamise series - California Native Plant Society, Manual of California Vegetation.

Chamise-Redshank Chaparral - California Wildlife Habitat Relationships System. California Department of Fish and Game, California Interagency Wildlife Task Group.

## Associated sites

| | |
|---|---|
| R015XI101CA | **Upper, north-facing slopes 17-19" p.z.**<br>Upper, north-facing slopes 17-19" p.z. - R015XI100CA grades into this site as the slopes become more shaded and protected from sun exposure. Soil moisture and availability is greater and temperatures are cooler. |
| R015XI104CA | **Steep, clayey-skeletal, south-facing slopes 17-19" p.z.**<br>Steep, clayey-skeletal, south-facing slopes 17-19" p.z. - R015XI100CA grades into this site in areas that are droughty, more exposed, and high in rock content. |
| R015XI110CA | **Exposed, rocky slopes 17-19" p.z.**<br>Exposed, rocky slopes 17-19" p.z. - R015XI100CA grades into this site in areas where the bedrock is at or near the soil surface and soils are very shallow. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | (1) *Adenostoma fasciculatum*<br>(2) *Ceanothus cuneatus* |
| Herbaceous | Not specified |

## Physiographic features

This ecological site is located on hills with slopes ranging from 2 to 75% at elevations from 984 to 2998 feet, and is found primarily on south-facing slopes.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Hill<br>(2) Terrace |
| Elevation | 300–914 m |
| Slope | 2–75% |
| Aspect | SE, S, SW |

## Climatic features

The average annual precipitation in MLRA 15 is from 6 to 20 inches (150 to 510 millimeters) in the area south of San Francisco, and snowfall is rare. The north half of this area can be divided into two rainfall and snowfall zones. The southern half north of San Francisco has an average annual precipitation from 18 to 40 inches (460 to 1,015 millimeters) and snowfall is rare. In the north half, average annual precipitation is from 40 to 79 inches per year (1,015 to 2,010 millimeters) and snowfall is common. Precipitation is evenly distributed throughout fall, winter, and spring but is very low in summer. Coastal areas receive some moisture from fog in summer. Most of the rainfall occurs as low to moderate intensity, Pacific frontal storms during the winter from October to May. The average annual temperature is from 51 to 66 degrees F (10 to 19 degrees C), decreasing from south to north. The average frost-free period is 275 days (180 to 365 days), decreasing with elevation and from south to north.

At Pinnacles National Monument, the average annual precipitation is 17 inches with a range between 17 and 19 inches, mostly from rain in the winter months from November through April. The average annual air temperature is between 59 and 63 degrees Fahrenheit, and the frost-free period (>32F) is 190 to 210 days.

NOTE: Data collected for monthly precipitation and temperatures is only from one climate station.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (average) | 200 days |
| Freeze-free period (average) | 0 days |
| Precipitation total (average) | 457 mm |

## Influencing water features

Water features are not a part of the ecological site.

## Soil features

The soils for this ecological site range from shallow to very deep, and are often sandy or sandy loams. They are derived from residuum weathered from rhyolite (Argixerolls and Knuckle), residuum weathered from conglomerate (Longsfolly, Ordeal, Passion, and Pinnacles), residuum weathered from shale (Santa Lucia), residuum weathered from sandstone (Pinnacles), and consolidated gravelly coarse-loamy alluvium derived from igneous rock

(Pinnacles).

The soils under the chamise range from deep, weakly developed soils to shallow, rocky soils. They are all generally sandy loams with a gravelly texture modifier. Many of the soils, due to their coarse grain size and their high content of weatherable minerals are susceptible to erosion, and on steeper slopes, to landslides. Fertility in these soils is generally low, in some cases due simply to the low nutrient content of the parent materials, as well as the low contribution of organic matter from the chamise itself. Soils under chamise can also exhibit hydrophobicity, repelling water on the soil surface, however when water does penetrate the soil surface, it drains rapidly through the coarse soil textures, offering little water-holding capacity.

This ecological site occurs on the following soil components in the Pinnacles National Monument soil survey.

SSA MU Symbol Component name

CA069 101 Ordeal
CA069 101 Passion
CA069 104 Knuckle
CA069 104 Argixerolls
CA069 106 Argixerolls
CA069 110 Knuckle
CA069 111 Backdoor (south-facing)
CA069 114 Ordeal
CA069 114 Passion
CA069 127 Argixerolls
CA069 142 Ordeal
CA069 142 Longsfolly
CA069 155 Knuckle
CA069 156 Knuckle

**Table 4. Representative soil features**

| | |
|---|---|
| Family particle size | (1) Sandy |
| Drainage class | Somewhat excessively drained to well drained |
| Permeability class | Moderately slow to rapid |
| Soil depth | 18–203 cm |
| Surface fragment cover <=3" | 5–40% |
| Surface fragment cover >3" | 0–10% |
| Available water capacity (0-101.6cm) | 1.02–6.1 cm |
| Electrical conductivity (0-101.6cm) | 0–2 mmhos/cm |
| Soil reaction (1:1 water) (0-101.6cm) | 4.5–7.8 |
| Subsurface fragment volume <=3" (Depth not specified) | 0–80% |
| Subsurface fragment volume >3" (Depth not specified) | 0–40% |

## Ecological dynamics

Before European settlement, the natural plant communities for this ecological site ranged from chamise-dominated chaparral with little to no understory to chamise-grasslands dominated by native perennial grasses and forbs. The reference state for this ecological site is similar to its pre-European state; however density of chamise may be different due to fire suppression and annual grasses and forbs now commonly dominate the understory. Primary species include oats (Avena spp.), bromes (Bromus spp.), and annual fescues (Vulpia spp.). These two plant

communities can be found throughout this ecological site, however the chamise-dominated plant community is more prevalent, primarily due to a lack of fire in much of Pinnacles National Monument.

The reference state for this ecological site is almost exclusively composed of chamise (*Adenostoma fasciculatum*), with lesser dominants including buckbrush (*Ceanothus cuneatus*), black sage (*Salvia mellifera*), common deerweed (*Lotus scoparius*), California buckwheat (*Eriogonum fasciculatum*), and an understory composed of native and annual grasses and forbs. Other species that can be found throughout this ecological site include; birchleaf mountain mahogany (Cercocarpus betuloides var. betuloides), wooly yerba santa (*Eriodictyon tomentosum*), chaparral clarkia (*Clarkia affinis*), bluegrass (Poa spp.), oniongrasses (Melica spp.), silver hairgrass (*Aira caryophyllea*), ripgut grass (*Bromus diandrus*), soft brome (*Bromus hordeaceus*), oats (Avena spp.), smooth catsear (*Hypochaeris glabra*), rabbitfootgrass (*Polypogon monspeliensis*), rat-tail fescue (*Vulpia myuros*), goldback fern (*Pentagramma triangularis*), and bushy spikemoss (*Selaginella bigelovii*).

Chamise is the most characteristic and widely distributed chaparral species in California, and is also the most common ecological site found throughout Pinnacles National Monument. Chamise typically dominates the shrub cover of California's chaparral communities on the more xeric sites, where evapotranspiration is higher and exposures are harsher, however it can be found as a lesser or co-dominant in mixed chaparral sites that include manzanitas (Arctostaphylos spp.), scrub oaks (Quercus spp.), and ceanothus (Ceanothus spp.). It is drought resistant, using its well-developed root system as a primary mechanism of survival on these dry, exposed soils. Chamise roots are many times more extensive then the aboveground portions and can penetrate deep into the soil profile, creating a widespread network of horizontal and lateral roots that can even penetrate fractured bedrock in search of water. Besides its elaborate root system, its reproductive traits and fire adaptations allow chamise to establish dominance and many times create uniform, dense stands. Chamise can reproduce both sexually by seed and vegetatively by resprouting at the crown from a primary lignotuber. Since chamise seeds germinate at high rates after fire, seedling recruitment and establishment are fire dependent, whereas vegetative sprouting can occur with or without the influence of fire (McMurray 1990).

Chamise chaparral is unable to perpetuate itself without fire (McMurray 1990). Old stands more than 60 years old have low species diversity, produce very little annual growth, becoming decadent, and in many cases almost impenetrable. Fire clears out these old plants, removing dead branches, increasing the concentration of available nutrients, and stimulating seed germination and new basal sprouting. Chamise is present from soon after a fire and remains present throughout all stages of succession. It is adapted to a fire cycle that can range anywhere from 10 to 100 years, however 30 to 80 years have been suggested as a more "typical" fire frequency (McMurray 1990).

## State and transition model

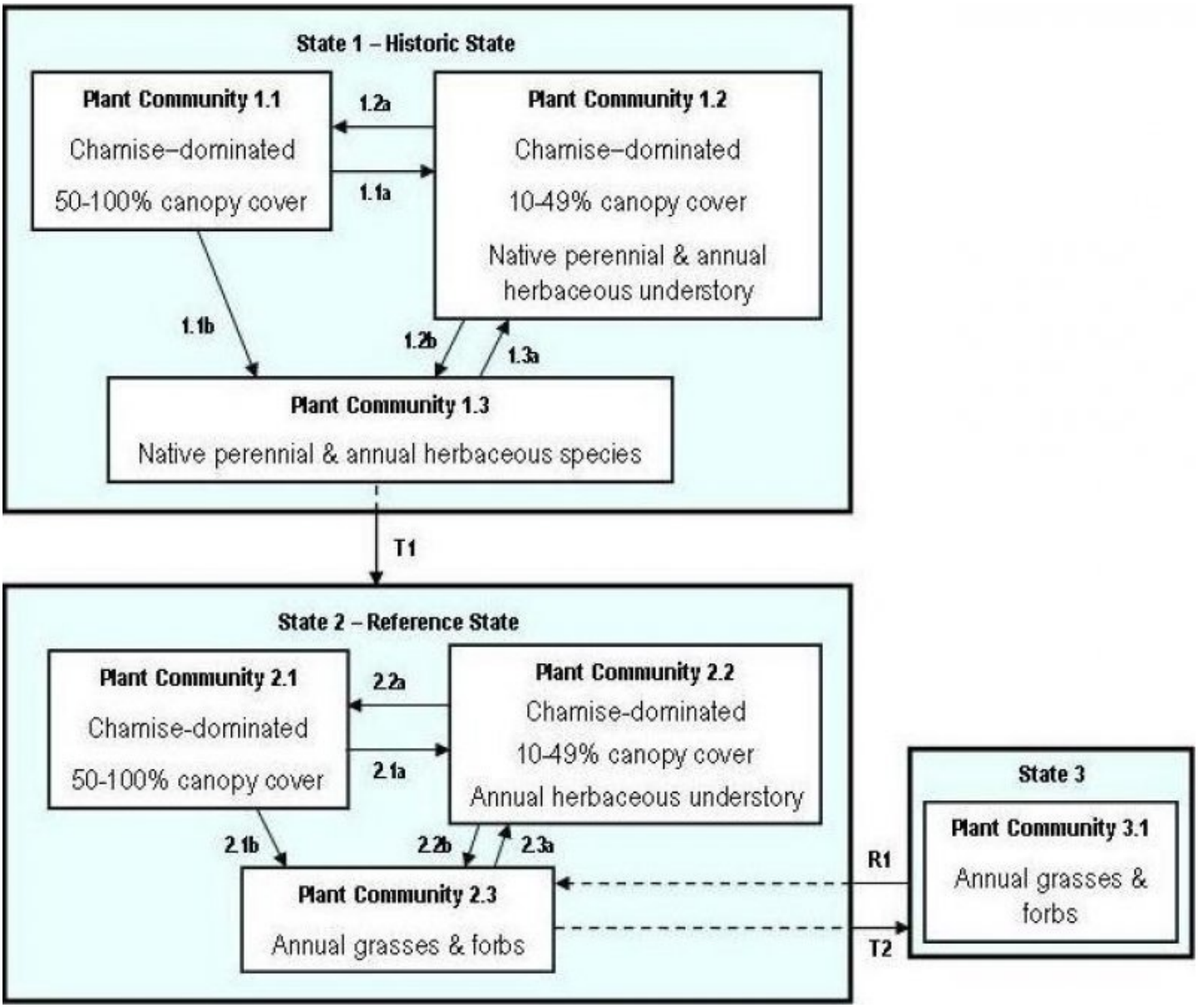


**Figure 5. Hills, south-facing 17-19" p.z. model**

## State 1
## State 2 - Reference State

## Community 1.1
## State 2 - Reference State

Plant Community 2.1: This state is similar to the historic state, State 1, and is still dominated by chamise with a relative cover between 50-75%; however it is now intermixed with open, dense patches of non-native annual grasses and forbs, such as fennel or Maltese star-thistle (*Centaurea melitensis*). 2.1a – Under the natural fire regime of approximately 30 – 80 years (see Plant Community 1.2). 2.1b – Although still within the natural fire regime, this transition occurs when the plant community has reached the extreme end of the fire cycle (80-100 years). Once the chamise habitat has become a decadent, low-producing, impenetrable stand, it becomes much more vulnerable to more severe fires, which would burn so hot that many of the chamise would die through the roots. This would prevent the typical resprouting to occur and would instead require the chamise to re-establish by seed from a surrounding seed source. This kind of regeneration would take several more years to accomplish and would thus take the plant community directly to open, annual grassland (see Plant Community 1.3).

**Table 5. Annual production by plant type**

| Plant Type | Low (Kg/Hectare) | Representative Value (Kg/Hectare) | High (Kg/Hectare) |
|---|---|---|---|
| Shrub/Vine | 897 | 1009 | 1121 |
| Grass/Grasslike | – | 112 | 224 |
| **Total** | **897** | **1121** | **1345** |

**Table 6. Ground cover**

| | |
|---|---|
| Tree foliar cover | 0-1% |
| Shrub/vine/liana foliar cover | 50-75% |
| Grass/grasslike foliar cover | 1-20% |
| Forb foliar cover | 0-2% |
| Non-vascular plants | 2-35% |
| Biological crusts | 0-1% |
| Litter | 30-75% |
| Surface fragments >0.25" and <=3" | 30-70% |
| Surface fragments >3" | 1-5% |
| Bedrock | 1-5% |
| Water | 0% |
| Bare ground | 2-8% |

## State 2
## Plant Community 2.2

## Community 2.1
## Plant Community 2.2

Plant Community 2.2: This plant community occurs after fire in the chamise chaparral. During this time, a variety of sub-shrubs and herbaceous species will dominate or co-dominate the site. The primary species might include oats (Avena spp.) and bromes (Bromus spp.), with lesser dominant species including woolly yerba santa (Eriodycton tomentosa), California buckwheat (*Eriogonum fasciculatum*), and common deerweed (*Lotus scoparius*). Depending on the severity and extent of the fire, chamise:herbaceous cover will vary. In lighter, less severe fires, chamise will likely recover its past dominance quickly by sprouting from the left over crowns, opening up the canopy to herbaceous species for only a short-time before out-competing them. After more severe, hot fires, little sprouting will occur and the community will be more dependent on seed germination to regenerate, and can take up to 10 years to recover. Seed germination may also contribute to a more patchy distribution of chamise as it recovers, leaving more open spaces for continual dominance by the annual grasses and buckwheats. Chamise seeds may or may not germinate, depending on seed viability, and sometimes even after establishment mortality can still occur. Predation by wildlife to the seedlings is also possible, especially by deer. 2.2a – Chamise is a fire-adapted species, so it is capable of sprouting after fire and rapidly returns to a chamise-dominated system (see Plant Community 2.1). 2.2b – When a fire occurs before the sprouting chamise is able to return to its full dominance, it often kills many of the sprouting chamise, thus removing them from the system and allowing the competitive annual grasses and forbs to maintain a significant dominance (see Plant Community 2.3).

**Table 7. Annual production by plant type**

| Plant Type | Low (Kg/Hectare) | Representative Value (Kg/Hectare) | High (Kg/Hectare) |
|---|---|---|---|
| Grass/Grasslike | 897 | 1121 | 1233 |
| Shrub/Vine | – | 224 | 448 |
| **Total** | **897** | **1345** | **1681** |

**Table 8. Ground cover**

| | |
|---|---|
| Tree foliar cover | 0-1% |
| Shrub/vine/liana foliar cover | 5-50% |
| Grass/grasslike foliar cover | 20-50% |
| Forb foliar cover | 5-30% |
| Non-vascular plants | 0% |
| Biological crusts | 0% |
| Litter | 45-70% |
| Surface fragments >0.25" and <=3" | 1-5% |
| Surface fragments >3" | 1-2% |
| Bedrock | 1-5% |
| Water | 0% |
| Bare ground | 0-33% |

## State 3
## Plant Community 2.3

## Community 3.1
## Plant Community 2.3

Plant Community 2.3: This plant community is dominated by annual grasses and forbs, including yerba santa and California buckwheat. 2.3a – Over time chamise either resprouts or reseeds into the open grassland. If chamise is resprouting, the transition may only take 8-10 years, but if chamise needs to reestablish by seed, this transition may take significantly longer, especially when competing with the non-native annual grasses in the system. This plant community is considered the at-risk community in this state (see Transition 2). Transition Pathway 2 – This transition occurs when fires are more frequent than the natural range of variation in fire frequency (often times this is fires every 5-10 years), which perpetuates the dominance and competitiveness of the non-native annuals. If fires occur too frequently, plant community 2.3 becomes at-risk of transitioning to a new, annual-dominated grassland state that is no longer capable of returning to a chamise-dominated stand (see State 3, Plant Community 3.1). Note: No data was collected in this plant community.

## State 4
## State 1 - Historic State

## Community 4.1
## State 1 - Historic State

This is the reference plant community for the ecological site, and is dominated by chamise (Adenastoma fasciculatum). At Pinnacles National Monument, average chamise cover ranges from 50 to 75% (maximum 100%), intermixed with small patches of California buckwheat (*Eriogonum fasciculatum*), buckbrush (*Ceanothus cuneatus*), and/or black sage (*Salvia mellifera*), bushy spikemoss (Selaginella bigelovi), and an herbaceous cover and bareground. Primary herbaceous species include bromes (Bromus hordeaceous, B. madretensis, and *B. rubens*), oats (Avena spp.), annual fescues (Vulpia spp.), and bluegrass (*Poa secunda*). In some areas of the Monument, chamise cover can reach 100%, creating an impenetrable wall up to 8-10 feet high with very little to no understory. Since most of the soils in chamise chaparral are easily erodable, vegetation cover is essential to the site's stability. Although chamise doesn't create a very deep or extensive litter layer to protect the soil surface, it can reduce surface runoff by creating a fairly continuous cover, growing very closely together with branches sometimes growing almost on the soil surface (McMurray 1990). Chamise roots also significantly reduce mass soil movement by reaching deep into the soil profile binding the soil into its root network (Hellmers et al 1955). In chamise stands with open patches, the California buckwheat, buckbrush, and/or black sage, bushy spikemoss, and annual or perennial grasses and forbs can be found. These open patches are sometimes caused by the patchy recovery of chamise after fire, sometimes due to constantly disturbed soils, sometimes areas of extremely shallow soils to

bedrock, or a combination of these possibilities. They all have fibrous, laterally growing, shallow roots that are better adapted to surface runoff and soil movement during the dry season, taking advantage of light and water available near the soil surface and reducing soil movement down slope (Hellmers et al 1955). California buckwheat can sometimes have its entire root system in a 6-inch layer of soil and broken rock fragments underlain by solid bedrock, making it an extremely important part of this ecosystem that is constantly at risk of surface erosion. It can also inhabit areas that are heavily altered or considered harsh and exposed, where water is available for very short periods of time near the soil surface. Black sage is similar in its rooting structure, however it is more successful in chamise stands that are more open and patchy, since it is a shade-intolerant species (McMurray 1990). In Pinnacles National Monument, it is found associated with chamise on steep, exposed slopes that are shallow to bedrock, which keeps chamise densities low enough to create open niches for the black sage. These sites also often have high densities of bushy spikemoss, especially in areas that are extremely shallow to bedrock. In areas of the Monument where chamise is found with substantial co-dominance of buckbrush, the slopes are generally north- or east-facing, steep; less exposed, and has slightly cooler soil temperatures and higher available water. Buckbrush is well-adapted to chamise habitats, however it does require a bit more moisture for substantial germination and establishment, which is often why it is found with chamise on the less exposed or north-facing slopes. The chamise chaparral plant community is the most dominant throughout Pinnacles National Monument and one of the more visible communities as well. Plant Community 1.1: This plant community is the most representative plant community for this ecological site and is characterized by an average chamise cover of 50-75%, with small open patches that are dominated by California buckwheat, common deerweed, black sage, and native grasses and forbs. 1.1a – Under the natural fire regime of approximately 30 – 80 years (see Plant Community 1.2). 1.1b – Although still within the natural fire regime, this transition occurs when the plant community has reached the extreme end of the fire cycle (80-100 years). Once the chamise habitat has become a decadent, low-producing, impenetrable stand, it becomes much more vulnerable to more severe fires, which would burn so hot that many of the chamise would die through the roots. This would prevent the typical resprouting to occur and would instead require the chamise to re-establish by seed from a surrounding seed source. This kind of regeneration would take several more years to accomplish and would thus take the plant community directly to open, native grassland (see Plant Community 1.3). Note: No data was collected in this plant community.

### State 5
### Plant Community 1.2

### Community 5.1
### Plant Community 1.2

Plant Community 1.2: The natural fire regime would have kept the chamise cover from reaching 100% and becoming decadent, allowing chamise to actively resprout after a fire. In the first year after a fire, grasses, forbs and resprouting chamise can be found. Although heavily dominated by grasses and forbs, chamise still comprises at least 5% of the stand and within 10 years, chamise will regain the dominance reducing the grass and forb cover back down to 5-10%. 1.2a – Chamise is a fire-adapted species, so it is capable of sprouting after fire and rapidly returns to a chamise-dominated system (see Plant Community 1.1). 1.2b – When a fire occurs before the sprouting chamise is able to return to its full dominance, it often kills many of the sprouting chamise, thus removing them from the system and allowing the native grasses and forbs to maintain a significant dominance (see Plant Community 1.3). Note: No data was collected in this plant community.

### State 6
### Plant Community 1.3

### Community 6.1
### Plant Community 1.3

Plant Community 1.3: This plant community is dominated by native perennial and annual grasses and forbs, including yerba santa and California buckwheat. 1.3a – Over time chamise either resprouts or reseeds into the open grassland. If chamise is resprouting, the transition may only take 8-10 years, but if chamise needs to reestablish by seed, this transition may take significantly longer. Transition Pathway 1 – This transition represents the invasion of non-native annual species into the system, permanently altering the site. Once non-native annuals become a part of this system, they do not leave. They are extremely competitive and highly adapted to the site conditions and fire regime, and after one fire, will out-compete the native perennials for resources and becomes the dominant

herbaceous component. Due to their high reproductive rates, greater physiologic adaptability, and shallow rooting systems, non-native annual grasses and forbs become a permanent part of this system. It would require great amounts of time and money to attempt to remove these species from the system, and thus it is assumed that restoration to the historic, pre-European state is not possible. Note: No data was collected in these plant communities.

**State 7**
**State 3**

### Community 7.1
**State 3**

Plant Community 3.1: This plant community is dominated by non-native annual grasses and forbs. Chamise sprouts and seeds are no longer a part of the system, due to multiple, frequent fires. Restoration Pathway 1 – There is potential for restoration in this state, although costs would be significant in order to get chamise re-established. Chamise is a reasonably competitive species with non-native annuals, and thus if chamise seed was returned to the site, it is possible to return to State 2. Note: No data was collected for this plant community.

## Additional community tables

### Animal community

Wildlife species found in this habitat type are also found in mixed chaparral, coastal scrub, and in the shrubs beneath many woodland and forestland types.

Over seventy species of mammals occur in these habitats, with five endemic and near-endemic species– the giant kangaroo rat (Dipodomys ingens), Heermann kangaroo rat (Dipodomys heermani), Santa Cruz kangaroo rat (Dipodomys venustus), Sonoma chipmunk (Eutamias sonomae), and the Suisun shrew (Sorex sinuosus).

Among the 100 species of birds that occur in this ecoregion, scrub jays (Aphelocoma coerulescens), acorn woodpeckers (Melanerpes formicivorus), and wrentits (Chamaea fasciata), are a few of the most characteristic species.

Army ants (Neivamyrmex spp.) and primitive bristletails, and land snails are among the ecoregion’s large number of relict and unusual invertebrate species.

Many species and communities within the ecoregion are adapted to periodic fires, indeed many species depend upon fires for regeneration. An entire guild of annual herbaceous plants that occur in chamise chaparral have seeds that lie dormant for long periods until fires trigger their germination approximately every 20-25 years.

## Inventory data references

ADFA-01 - %
ADFA-02 - %
ADFA-03 - %
ORDEAL-BRN - % & LBS
ORDEAL-BN1 - % & LBS

## Other references

Christensen, N.L. and C.H. Muller. 1975. Relative Importance of Factors Controlling Germination and Seedling Survival in Adenostoma Chaparral. The American Midland Naturalist. 93:71-78.

Hellmers, H., J.S. Horton, G. Juhren, J. O’Keefe. 1955. Root Systems of Some Chaparral Plants in Southern California. Ecology. 36 (4): 667-678.

Keeley, J.E. 1992. Demographic Structure of California Chaparral in the Long-term Absence of Fire. Journal of Vegetation Science. 3:79-90.

Keeley, J.E. 1992. Recruitment of Seedlings and Vegetative Sprouts in Unburned Chaparral. Ecology. 73: 1194-1208.

League, K.R. 2005. *Ceanothus cuneatus*. . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2006, October 13].

McMurray, N.E. 1990. *Adenostoma fasciculatum*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2005, December 1].

McMurray, N.E. 1990. *Salvia mellifera*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2006, October 13].

Odion, D.C. and F.W. Davis. 2000. Fire, Soil, Heating, and the Formation of Vegetation Patterns in Chaparral. Ecological Monographs. 70: 149-169.

## Contributors

K. Moseley

## Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

| | |
|---|---|
| Author(s)/participant(s) | |
| Contact for lead author | |
| Date | |
| Approved by | |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth ( in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**

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