11050

Northern and Central California Dry-Mesic Chaparral

BpS Model/Description Version: Aug. 2020

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|  |  |  |  |

Reviewer: Olivia Duren

Vegetation Type

Shrubland

Map Zones

3, 6, 7

Geographic Range

This system occurs throughout California, away from the coastal fog belt, and through the northern end of the central valley and into southern Oregon.

Biophysical Site Description

In the north coastal region, chaparral is diminished in extent compared to the southern part of the state. In the Sierra Nevada, chaparral occurs in the foothills on the western slopes. In the coast ranges, chaparral is found largely on interior slopes and in large patches in the Siskiyou, Cascade, and Klamath mountains. The northern limits are the dry parts of the Rogue River watershed in Oregon. Annual precipitation should be greater than in the southern part of California: up to 100cm. Dry-mesic chaparral is located in the interior valleys and on xeric, south-facing slopes in the coastal ranges.

Vegetation Description

This vegetation type is composed primarily of shallow-root obligate seeders or facultative seeders that generate a persistent seed bank cued by fire to germinate. The facultative seeders are also able to resprout after fire (facultative seeders comprise a minor part of this community in the Klamath Mountains). Where canopy cover is high, these species generally do not recruit in the absence of fire. However, a low but sustained level of recruitment in canopy gaps, such as in stands that are very old or disturbed, may be sufficient to ensure persistence of this community type in long-unburned stands (Duren and Muir 2010). Dry-mesic chaparral requires at least 5-25yrs to replenish its seed bank (sufficient enough to produce seedlings after fire).

This system is made up of a mixture of mostly obligate seeders. Characteristic species include *Adenostoma fasciculatum*, *Ceanothus cuneatus*, *Arctostaphylos viscida*, *A. manzanita*, *A. glauca*, *A. glandulosa*, *A. stanfordiana*, *Fremontodendron californicum*, *Malacothamnus fasciculatus*, *Dendromecon rigida*,and *Pickeringia montana*. In Oregon’s Jackson and Josephine counties, additional species are *Cercocarpus betuloides*, *Garrya fremontii*, *Prunus subcordata*,and *Toxicodendron diversilobum*.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| ADFA | *Adenostoma fasciculatum* | Chamise |
| CECU | *Ceanothus cuneatus* | Buckbrush |
| ARCTO3 | *Arctostaphylos* | Manzanita |
| FRCA6 | *Fremontodendron californicum* | California flannelbush |
| MAFA | *Malacothamnus fasciculatus* | Mendocino bushmallow |
| DERI | *Dendromecon rigida* | Tree poppy |
| PIMO5 | *Pickeringia montana* | Montana chaparral pea |

Species names are from the NRCS PLANTS database. Check species codes at http://plants.usda.gov.

Disturbance Description

Chaparral burns in high-intensity, stand-replacing crown fires, resulting in even-age stands in which the post-fire composition (after 5-10yrs) is largely the same as the pre-fire composition (referred to as “autosuccession” by Hanes [1971]). The fuel is drier and more flammable than mesic chaparral. *Adenostoma fasciculatum* is particularly flammable, with a large surface area-to-volume ratio. Mean fire return intervals (FRIs) vary according to species composition and environmental conditions. Sediment cores taken from the Santa Barbara Channel in central California dating from the 16th and 17th centuries indicate that large fires burned the Santa Ynez and Santa Lucia mountains every 40-60yrs. Season of burning may play a role in species composition. The largest fires are often the product of strong offshore winds (such as the Santa Anas in southern California).

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 74 | 100 | 30 | 125 |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 74 | 100 |  |  |

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

Wildfires can burn thousands and tens of thousands of acres, especially when driven by Santa Ana winds; a small percentage burns >100,000ac. In some areas, typical fire size may be much smaller. For example, in Jackson and Josephine county chaparral stands, mean area burned was 111ac prior to 1940 (taken as the year of effective fire suppression) and 57ac thereafter (based on fire record maintained by BLM, 1910-2007; see Appendix D in Duren [2009]).

Adjacency or Identification Concerns

In northern California, chaparral can merge with annual grass and blue oak-gray pine (Pinus

Sabiniana) at lower elevations, and with coastal oak, ponderosa pine, or mixed-conifer forest types at higher elevations. In the central coastal regions of California, chaparral forms a patchwork with grassland, coastal sage scrub, and broadleaf and coniferous forests.

Issues or Problems

Due to the length of time required to replenish seed banks, obligate seeders are sensitive to repeat fires (FRI of 5-12yrs). With increasing fire frequency from human ignitions and the presence of exotic annual grasses, there is a potential for widespread type conversion of shrublands to grasslands. According to Halsey (pers. comm.), there has already been much type conversion of this biophysical setting (BpS). In southern California, exotic grasses (*Avena* spp. and *Bromus* spp.) can sustain very high fire frequency and can promote fire, thereby causing a positive feedback cycle of increasing fire frequency. However, in the Klamath Mountains, fire frequency in chaparral (as well as in landscape as a whole) appears to have been reduced since 1940 (based on fire records maintained by BLM, 1910-2007; see Appendix D in Duren [2009]).

In some areas, a more pressing issue may be fuels management. Prescriptions that greatly reduce chaparral canopy cover degrade stands ecologically. Obligate-seeding species recruitment after treatment is 10-100+ times lower than after fire, and non-native annuals invade (Duren and Muir 2010).

Native Uncharacteristic Conditions

The biggest issues in this BpS are exotic annual grasses and type conversion of shrublands under repeated fires and fuel treatments.

Comments

During the 2016 model review period, this model was reviewed and descriptive changes made by Olivia Duren (olivia@thefreshwatertrust.org). Keith Perchemlides (The Nature Conservancy) provided information used to define succession class mapping rules. During the review, there was discussion about the applicability of this model further south in CA especially to the southern extent of the Sierra Nevada (map zone 6). Future review should consider this issue.

Succession Classes

**Mapping Rules**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Upper Layer Lifeform** | **Height (m)** | **Canopy Cover (%)** | | | | | | | | | |
| **0-10** | **11-20** | **21-30** | **31-40** | **41 - 50** | **51-60** | **61-70** | **71-80** | **81-90** | **91-100** |
| Herb | 0-0.5 | A | A | A | A | A | A | A | A | A | A |
| Herb | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| Herb | >1.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 0-0.5 | A | A | A | A | A | B | B | B | B | B |
| Shrub | 0.5-1.0 | A | A | A | A | A | B | B | B | B | B |
| Shrub | 1.0-3.0 | A | A | A | A | A | B | B | B | B | B |
| Shrub | >3.0 | A | A | A | A | A | B | B | B | B | B |
| Tree | 0-5 | B | B | B | B | B | UN | UN | UN | UN | UN |
| Tree | 5-10 | B | B | B | B | B | UN | UN | UN | UN | UN |
| Tree | 10-25 | B | B | B | B | B | UN | UN | UN | UN | UN |
| Tree | 25-50 | B | B | B | B | B | UN | UN | UN | UN | UN |
| Tree | >50 | B | B | B | B | B | UN | UN | UN | UN | UN |

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

**Description**

Class A 13 Early Development 1 - All

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ADFA | Adenostoma fasciculatum | Chamise | Upper |
| LOSC2 | Lotus scoparius | Common deerweed | Upper |
| CEANO | Ceanothus | Ceanothus | Upper |
| ARCTO3 | Arctostaphylos | Manzanita | Upper |

Description

The shrub species listed in the previous table will be present as seedlings from a fire-cued seed bank, resprouts from facultative seeders, in addition to fire annuals, perennial geophytes, and short-lived perennials. Herb species may include common deerweed (*Lotus scoparius*), *Phacelia* spp., *Cryptantha* spp., and *Emmenanthe* spp. The temporary post-fire vegetation starts to drop out within approximately 5yrs, after which the seedlings begin to predominate in similar composition as pre-fire conditions.

The relationship of age to height or cover of chaparral varies greatly with species and setting. Estimates of cover and height provided here are intended for use in mapping, not field identification of s-classes.

*Maximum Tree Size Class*  
None

Class B 87 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ADFA | Adenostoma fasciculatum | Chamise | Upper |
| CEANO | Ceanothus | Ceanothus | Upper |
| ARCTO3 | Arctostaphylos | Manzanita | Upper |
|  |  |  |  |

Description

Shrubs growing from seedlings from Class A; herbs, only in openings. Species may include chamise (*Adenostoma fasciculatum*), *Ceanothus megacarpus*, *C. leucodermis*, *C. cuneatus*, *Arctostaphylos glauca*,and *A. viscida*. Trees may be present at low cover levels and may have a shrubby growth form.

Moderate-frequency fire is likely to best sustain robust canopy cover of dry-mesic chaparral. However, a low but sustained level of recruitment in canopy gaps, such as in stands that are very old or are disturbed, may be sufficient to ensure persistence of this community type in long-unburned stands (Duren and Muir 2010; Keeley et al. 2005; Nagel and Taylor 2005). Dominant species can generally live from 75-150yrs.

The relationship of age to height or cover of chaparral varies greatly with species and setting. Estimates of cover and height provided here are intended for use in mapping, not field identification of s-classes.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Late1:CLS | 10 |
| Late1:CLS | 11 | Late1:CLS | 999 |

Probabilistic Transitions

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Disturbance Type** | **Disturbance occurs In** | **Moves vegetation to** | **Disturbance Probability** | **Return Interval (yrs)** | **Reset Age to New Class Start Age After Disturbance?** | **Years Since Last Disturbance** |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.014 | 71 | Yes | 0 |

References

Byrne, R.I., J. Michaelsen and A. Soutar. 1977. Fossil charcoal as a measure of wildfire frequency in southern California: a preliminary analysis. In: Mooney, H.A. and C.E. Conrad, eds. Proceedings of the symposium on environmental consequences of fire and fuel management in Mediterranean ecosystems. Gen. Tech. Rep. WO-3. USDA Forest Service. 361-367.

Duren, O.C. and P.S. Muir. 2010. Does fuel management accomplish restoration in southwest Oregon, USA, chaparral? Fire Ecology 6:76-96.

Duren, O.C. 2009. Chaparral history, dynamics, and response to disturbance in southwest Oregon: insights from age structure. Thesis. Oregon State University.

Hanes, T.L. 1971. Succession after fire in the chaparral of southern California. Ecological Monographs. 41: 27-52.

Keeley, J.E. 2002. Native American impacts on fire regimes of the California coastal ranges. Journal of Biogeography 29: 303-320.

Keeley, J.E. Fire in the South Coast region. 2005. In Fites-Kaufman, J., N. Sugihara and J. van Wangtendonk, eds. Fire Ecology of California Ecosystems. University of California Press. In press.

Keeley, J.E., C.J. Fotheringham and M. Morais. 1999. Reexamining fire suppression impacts on brushland fire regimes. Science 284: 1829-1832.

Keeley, J.E. and C.J. Fotheringham. 2001. The historical role of fire in California shrublands. Conservation Biology 15: 1536-1548.

Keeley, J.E. and C.J. Fotheringham. 2001. History and management of crown-fire ecosystems: A summary and response. Conservation Biology 15: 1561-1567.

Keeley, J.E. and C.J. Fotheringham. 2003. Impact of past, present, and future fire regimes on North American Mediterranean shrublands. In: Veblen, T.T., W.L. Baker, G. Montenegro and T.W. Swetnam, eds. Fire and Climatic Change in Temperate Ecosystems of the Western Americas. NY: Springer. 218-262.

Keeley, J.E., A.H. Pfaff and H.D. Safford. 2005. Fire suppression impacts on postfire recovery of Sierra Nevada chaparral shrublands. International Journal of Wildland Fire 14:255-265.

Moritz, M.A., J.E. Keeley, E.A. Johnson and A.A. Schaffner. 2004. Testing a basic assumption of shrubland fire management: Does the hazard of burning increase with the age of fuels? Frontiers in Ecology and the Environment 2: 67-72.

Nagel, T.A. and A.H. Taylor. 2005. Fire and persistence of montane chaparral in mixed conifer forest landscapes in the northern Sierra Nevada, Lake Tahoe Basin, California, USA. Journal of the Torrey Botanical Society 132(3): 442-457.

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. Data current as of 10 February 2007.

Wells P.V. 1962. Vegetation in relation to geological substratum and fire in the San Luis Obispo quadrangle, California. Ecological Monographs 32, 79, 103.

Zedler, P.H. 1995. Plant life history and dynamic specialization in the chaparral/coastal sage scrub flora in southern California. In: Arroyo, M.T.K., P.A. Zedler and M.D. Fox, eds. Ecology and Biogeography of Mediterranean Ecosystems in Chile, California, and Australia. NY: Springer. 89-115.

Zedler, P.H., C.R. Gautier, C.R. and G.S. McMaster. 1983. Vegetation change in response to extreme events: the effect of a short interval between fires in California chaparral and coastal sage scrub. Ecology 64: 809-818.