10340

Mediterranean California Mesic Serpentine Woodland and Chaparral

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Steppe/Savanna

Map Zones

4, 6, 7

Geographic Range

This ecological system occurs in Mediterranean California in the north and south Coast Ranges and the northern Sierra Nevada.

Biophysical Site Description

This type occurs on cool, northerly, and concave slopes and toe-slopes with thin, rocky, ultramafic (gabbro, peridotite, serpentinite) soils.

Vegetation Description

These are mosaics of woodlands with chaparral understories, shrub-dominated chaparral, or short-lived chaparrals, with conifer species invading if good seed source is available. Shrubs often have higher densities than the trees, which are more limited due to the rocky/thin soils. These can also be short-duration chaparrals in previously forested areas that have experienced crown fires. Trees tend to have a scattered, open canopy or can be clustered over the shrub layer.

*Cupressus sargentii*, *Cuppressus macnabiana*, *Pinus sabiniana*, *Garrya congdonii*, *Quercus durata*, *Umbellularia californica*, and *Frangula californica* ssp*. tomentella* (=*Rhamnus tomentella* ssp. *tomentella*) are characteristic. Common associates include *Heteromeles arbutifolia*, *Adenostoma fasciculatum*, and the California endemics *Arctostaphylos viscida* ssp*. pulchella* and *Ceanothus jepsonii*. In some settings, *Arctostaphylos glauca*, *Styrax rediviva* (=*Styrax officinalis*), or *Cercocarpus montanus* var*. glaber* (=*Cercocarpus betuloides*) can be common. Common grasses and forbs can include *Melica torreyana*, *Festuca idahoensis*, *Iris* spp., and locally endemic serpentine forbs (*Senecio* spp. and others). Structurally, this system is sometimes woodland in character, but it can also be an arborescent chaparral, depending on fire history.

Most chaparral species are fire adapted, resprouting vigorously after burning or producing fire-resistant seeds. Occurrences of this system likely shift across montane forested landscapes with catastrophic fire events.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| CUSA3 | *Cupressus sargentii* | Sargent’s cypress |
| PISA2 | *Pinus sabiniana* | California foothill pine |
| GACO9 | *Garrya congdonii* | Chaparral silktassel |
| QUDU4 | *Quercus durata* | Leather oak |
| UMCA | *Umbellularia californica* | California laurel |
| FRCA12 | *Frangula californica* | California buckthorn |

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

Disturbance Description

Stand-replacing fires occur mostly in the shrub-dominated stages. In the conifer-dominated, late-seral closed stage, surface fire is also important. Mean fire return interval (MFRI) is generally greater than that of the surrounding forested landscape (including the lower elevation California Mesic Chaparral, 1097)—perhaps double (Nagel and Taylor, in press)—due to the lack of flammability of many young shrub fields without a long history of fuel accumulation.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 181 | 37 |  |  |
| Moderate (Mixed) | 107 | 63 |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 67 | 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

Montane chaparral typically originates following large stand-replacing fires in conifer forests. A variety of montane shrubs occupy the site and limit establishment and growth of conifers. If these shrublands burn again before succession to late-seral closed forest, they can stay shrub dominated for long periods of time (centuries). Patch size can be quite large, especially in the northern part of the state.

Adjacency or Identification Concerns

This includes several types of montane shrublands on sites that are typically seral to conifers. Montane chaparral is usually embedded within mixed-conifer, red fir, white fir, Jeffrey pine, and other conifer forests on sites that are prone to stand-replacing fire, or on otherwise disturbed or more open sites.

Issues or Problems

The map zone (MZ) 6 model was imported directly from the Rapid Assessment model R1CHAPmn and the text was not widely corrected to fit the serpentine type. The modifier of the model does not know the system, but was instructed to lengthen the duration of the boxes and to provide for a 50- to 70-yr MFRI.

Not sure about historical composition of seral stages. System described over broad area on east and west side of Sierras. It also occurs elsewhere; however, most literature summarized is characteristic of the Sierra Nevada range.

A recurring issue with this biophysical setting (BpS) and with 1098 (montane chaparral) is the recognition that these shrub fields occur as a BpS on some pockets of the landscape, but also occur as a seral stage before conifer regeneration (red fir, white fir, mixed conifer, Jeffrey pine). The conifer models are generally modeled with a persistent shrub stage, whereas this and other models represent the parts of the landscape that are unlikely to ever develop a conifer overstory. Sugihara and Sherlock created a four-box model. Shlisky edited the model to three boxes, removing the tree-dominated state. Safford then suggested combining these relatively data-poor shrub systems as one BpS.

Native Uncharacteristic Conditions

Shrub canopy closure in Class A won’t exceed 70%; but, in later stages, it could. Trees overtop the shrubs in Classes B and C. The mid-open stands will have at least 10%, but not more than 50%, canopy closure of trees. The range of canopy closure for trees in Class C exceeds 20%, but is <80%. Class C could also include canopy closure up to 80% of trees <25m. Shrub canopy closure for Classes B and C is in the range of 40 - 90%. Tree canopy closure in excess of 80% would be uncharacteristic.

Comments

MZs 4, 6, and 7 were combined during 2015 BpS Review.

Hugh Safford (hughsafford@fs.fed.us) reviewed the model for MZs 3, 4, and 6.

This model may be redundant with the mixed-conifer models (i.e., dominant species in Classes B and C are all trees, not shrubs) and could be captured within vegetation Class A of the mixed-conifer, red fir/white fir, and the red fir/white pine models by including shrub species in the descriptions. This issue needs to be rectified when the first-draft Rapid Assessment map is constructed, and relationships between forest and montane chaparral PNVGs can be assessed. As modeled, it’s possible that montane chaparral could be mapped as a PNVG only in areas where it does not turn into forest with lack of fire and succession. What Shlisky tried with the model: (1) Class D (forest) from original model deleted and reference percent of old Class D combined with new Class C and (2) surface fire removed and replaced by mixed fire (no surface fire expected in this type). Lots of fire may not necessarily lead to a persistent shrub field except on steep, especially south-facing slopes. On thinner soils at higher elevation, fire is not necessary to perpetuate shrubs; trees don’t grow there for other reasons.

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 | A | A | UN | UN | UN |
| Shrub | 0.5-1.0 | A | A | A | A | A | A | A | UN | UN | UN |
| Shrub | 1.0-3.0 | A | A | A | A | A | A | A | UN | UN | UN |
| Shrub | >3.0 | A | A | A | A | A | A | A | UN | UN | UN |
| 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 | C | C | C | C | C | C | C | C | UN | UN |
| Tree | >50 | C | C | C | C | C | C | C | C | 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 23 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| GACO9 | Garrya congdonii | Chaparral silktassel | Low-Mid |
| QUDU4 | Quercus durata | Leather oak | Low-Mid |
| UMCA | Umbellularia californica | California laurel | Low-Mid |

Description

Early succession, after large patches of stand-replacement fire. Comprised of grass, shrubs, and few tree seedlings to saplings. *Prunus emarginata* also common.

*Maximum Tree Size Class*  
Pole 5-9" DBH

Class B 23 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| CUSA3 | Cupressus sargentii | Sargent’s cypress | Upper |
| PISA2 | Pinus sabiniana | California foothill pine | Upper |
| QUDU4 | Quercus durata | Leather oak | None |

Description

Open or closed shrublands with scattered pole to medium-size conifers.

*Maximum Tree Size Class*  
Large 21-33" DBH

Class C 54 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| CUSA3 | Cupressus sargentii | Sargent’s cypress | Upper |
| PISA2 | Pinus sabiniana | California foothill pine | Upper |

Description

Open or closed shrublands with scattered large and very large conifers, and sometimes medium and small shade-tolerant conifers. Tree cover >35% can occur in small to moderate-size patches on northern aspects and lower slope positions.

*Maximum Tree Size Class*  
Very Large >33" DBH

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:OPN | 49 |
| Mid1:OPN | 50 | Late1:OPN | 119 |
| Late1:OPN | 120 | Late1:OPN | 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 | 0.007 | 143 | Yes | 0 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.012 | 83 | No | 0 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Mixed Fire | Late1:OPN | Late1:OPN | 0.012 | 83 | No | 0 |

References

Conard, S.G. and S.R. Radosevich. 1982. Post-fire succession in white fir (Abies concolor) vegetation of the northern Sierra Nevada. Madrono 29: 42-56.

Nagel, T.N. and A.H. Taylor. Fire and persistence of montane chaparral in mixed conifer forest landscapes in the northern Sierra Nevada, Lake Tahoe Basin, California, USA. J. Torrey Bot. Soc. In Press.

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

Potter, D.A. 1998. Forested Communities of the upper montane in the central and southern Sierra Nevada. General Technical Report PSW-GTR-169. USDA Forest Service. 319 pp.

Safford, H.D. and Susan Harrison.2004. Fire effects on plant diversity in serpentine vs. sandstone chaparral. Ecology 85(2)2004: 539-548.

Safford, H.D. and S.P. Harrison. 2004. The effects of fire and grazing on serpentine versus nonserpentine grassland and chaparral. 315-322. In: Boyd, R.S., A.J. Baker and J. Proctor, eds. Ultramafic rocks: their soils, vegetation and fauna. Proceedings of the 4th International Conference on Serpentine Ecology. St. Albans, UK: Science Reviews.

Safford, H.D. and S.P. Harrison. 2006. The effects of fire on serpentine vegetation and implications for management. Proceedings of the 2002 Fire Conference on Managing Fire and Fuels in the Remaining Wildlands and Open Spaces of the Southwestern United States. 2-5 December 2002, San Diego, CA. General Technical Report PSW-189. Albany, CA: USDA-Forest Service, Pacific Southwest Research Station. In press.

Skinner, C.N. and C. Chang. 1996. Fire regimes, past and present. In: Sierra Nevada Ecosystem Project: final report to Congress, Vol. II, Assessments and scientific basis for management options. Davis, CA: University of California Davis, Centers for Water and Wildland Resources. 1041-1070.

Vankat, J.L. and J. Major. 1978. Vegetation changes in Sequoia National Park. J. Biogeography 5: 377-402.

van Wagtendonk, J.W. and J. Fites-Kaufmann. 2005. Fire in the Sierra Nevada Bioregion in: Sugihara, N.G., J.W. van Wagtendonk, J. Fites-Kaufman, K.E. Shaffer and A.E. Thode, eds. Fire in California ecosystems. Berkeley, CA: University of California Press. In press.

Also of interest:

Whittaker, R. H., 1960. Vegetation of the Siskiyou Mountains, Oregon and California. Ecological Monographs, Vol. 30, no.3, p 279-338.

Wilken, G.C. 1967. History and fire record of a timberland brushfield in the Sierra Nevada of California. Ecology 48: 302-304.