10990

California Xeric Serpentine Chaparral

BpS Model/Description Version: Aug. 2020

|  |  |  |  |
| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| John Foster | jfoster@tnc.org | Jan Beyers | jbeyers@fs.fed.us |
| None | None | Richard Halsey | richardhalsey@sbcglobal.net |
| None | None | Hugh Safford/Dave Schmidt | hughsafford@fs.fed.us |

Vegetation Type

Shrubland

Map Zone

4

Geographic Range

This system occurs throughout Mediterranean California. Serpentine is lacking in far southern California, but gabbro outcrops support vegetation with similar characteristics.

Biophysical Site Description

This system occurs on thin, rocky ultramafic (gabbro, peridotite, serpentinite) soils and in areas below winter snow accumulations that typically experience hot and dry summers.

Not all ultramafic outcrops support distinct vegetation. Only those with very low calcium-to-magnesium ratio impact biotic composition. This system is highly variable and spotty in distribution. Gabbroic vegetation in southern California is less obviously distinct from surrounding chaparral than the serpentinic vegetation in northern and central California.

Vegetation Description

This system is highly variable and spotty in distribution. Characteristic plant species include *Cupressus macnabiana*, *Quercus durata*, *Arctostaphylos viscida*, *A. pungens*,and *A.* *glauca*. Common associates include *Adenostoma fasciculatum*, *Ceanothus cuneatus*, *Fremontodendron* *californicum*, and California endemics (e.g., *Ceanothus jepsonii*). *Pinus sabiniana* can occur at varying cover from trace to more abundant. A lot of locally endemic and often rare forbs, such as *Strepanthus* spp., *Hesperolinon* spp, *Eriogonum* spp., *Madia* (= *Harmonia*) spp., *Mimulus* spp., *Allium* spp., and *Aesclepias solanoana*.

Southern California gabbro soils support chamise chaparral, with unique forb species often occurring in openings. Cuyamaca cypress (*Cupressus arizonica* ssp. *Stephensonii*) and Tecate cypress (*C. forbesii*) occur in these soils. Chaparral is often of lower stature than in surrounding granitic or sedimentary soils.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| CUMA | *Cupressus macnabiana* | MacNab’s cypress |
| QUDU4 | *Quercus durata* | Leather oak |
| ARVI4 | *Arctostaphylos viscida* | Sticky whiteleaf manzanita |
| ARPU5 | *Arctostaphylos pungens* | Pointleaf manzanita |
| ARGL4 | *Arctostaphylos glauca* | Bigberry manzanita |

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

Disturbance Description

Due to the poor soil nutrient levels, biomass accumulation tends to be significantly lower in these serpentine systems than in neighboring patches of sandstone chaparral. As a result, fire frequency and fire severity are reduced. A study at the McLaughlin Reserve (Safford and Harrison 2000) found that time since last fire was nearly four times longer than on non-serpentine sites, and severity was also significantly reduced. The effects of fire on diversity in these systems are less pronounced than in non-serpentine systems, though they may be longer lasting (Safford and Harrison 2004).

The model’s fire regime parameters were informed from the Rapid Assessment R1CHAP model, but duration of Class A was lengthened and probability of fire was reduced to reflect the generally lower productivity of these sites. Fire severity is also reduced possibly due to lower biomass on the sites.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 81 | 100 | 40 | 150 |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 81 | 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 typically burn 10s-1000s of acres. A small percentage of fires may burn >10,000ac (this system and surrounding vegetation).

Adjacency or Identification Concerns

This chaparral type tends to have fewer trees than mesic chaparral. In Yolo, Napa, and Lake counties, it occurs as patches among scattered serpentine and non-serpentine grasslands and non-serpentine chaparral.

Southern California gabbroic chaparral is embedded in a matrix of mesic and xeric chaparral that may be difficult to distinguish from remote sensing images. The fire regime of gabbroic chaparral is more likely to be the same as surrounding chaparral than is true for serpentine, however, and the following model need not be applied.

Issues or Problems

Safford suggested that the two serpentine shrub systems (1099 and 1034) be combined because the dynamics are data-poor and hard to map separately. Halsey agreed that mapping the two separately would be difficult, but felt it should be attempted because there are so many endemic species related to this chaparral type. He added that many of the gabbro soil systems in southern California, like those that support restricted groves of Tecate cypress, have been seriously compromised by increased fire frequency and warrant special attention. Because this type was retained (i.e., not lumped) in map zone (MZ) 3, the regional lead in MZ04 and MZ05 decided to retain it in those zones as well.

Native Uncharacteristic Conditions

Comments

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 | B | B | B | B |
| Shrub | 0.5-1.0 | A | A | A | A | A | A | B | B | B | B |
| Shrub | 1.0-3.0 | A | A | A | A | A | A | B | B | B | B |
| Shrub | >3.0 | A | A | A | A | A | A | B | B | B | B |
| Tree | 0-5 | B | B | B | B | B | B | B | B | B | B |
| Tree | 5-10 | B | B | B | B | B | B | B | B | B | B |
| Tree | 10-25 | B | B | B | B | B | B | B | B | B | B |
| Tree | 25-50 | B | B | B | B | B | B | B | B | B | B |
| Tree | >50 | B | B | B | B | B | B | B | B | B | B |

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 18 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ADFA | Adenostoma fasciculatum | Chamise | Upper |
| CECU | Ceanothus cuneatus | Buckbrush | Upper |
| ARGL4 | Arctostaphylos glauca | Bigberry manzanita | Upper |
| QUDU4 | Quercus durata | Leather oak | Upper |

Description

Shrub seedlings, fire annuals, and short-lived perennials, geophytes. Many of the shrubs present before the fire are still present. The primary difference is the removal of thatch. This allows for a flush of forbs that thin out after a few years.

Species richness is relatively stable through the early years of recovery after fire.

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

Class B 82 Late Development 1 - Closed

Upper Layer Lifeform Is Not the Dominant Lifeform

Upper layer can be the emerging trees through the canopy of shrubs. The dominant shrub canopy closure is 70-100%. The sporadic tree canopy can be 0-50% closure, less than about 10m in height. Split these two classes on canopy closure of the shrub layer, rather than the tree layer.

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ADFA | Adenostoma fasciculatum | Chamise | Middle |
| CUMA | Cupressus macnabiana | MacNab’s cypress | Upper |
| QUDU4 | Quercus durata | Leather oak | Upper |

Description

Shrubs are well established, herbs mostly in openings >15yrs of age. *Adenostoma* is present under and around oak. MacNab's cypress increases in more mesic locations (riparian areas or above about 1,800ft). Some short-stature shrubs (e.g., *Ceanothus jepsonii*) may have dropped out.

*Maximum Tree Size Class*  
Medium 9-21" DBH

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Late1:CLS | 15 |
| Late1:CLS | 16 | 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 | 0.0075 | 133 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.0135 | 74 | Yes | 0 |

References

Harrison, S., B.D. Inouye and H.D. Safford. 2003. Ecological heterogeneity in the effects of grazing and fire on grassland diversity. Conservation Biology 7(3): 837-845.

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

Safford, H.D. and Susan Harrison. 2008. 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. USDA Forest Service General Technical Report PSW-GTR 189: 321-28.

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

Safford, H.D. and S.P. Harrison. 2004. The effects of fire and grazing on serpentine versus nonserpentine grassland and chaparral. 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. 315-322.

Safford, H.D. and S.P. Harrison. 2006. The effects of fire on serpentine vegetation and implications for management. In: 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.