10920

Southern California Coastal Scrub

BpS Model/Description Version: Aug. 2020

Vegetation Type

Shrubland

Map Zone

4

Geographic Range

California Southern Coast Ranges, which includes Section 261A-Central California Coast and Section 261B-Southern California coast (McNab and Avers 1994). This system is found in more or less continuous bands near the coast from approximately San Benito County, California, south into northern Baja California, Mexico. It occurs below 1,000m (3,000ft) elevation. Coastal scrub communities extend farther inland in areas where the marine climatic influence extends farther inland due to gaps in coastal mountain ranges, as in western Riverside County and in the Salinas Valley, the Santa Clara River, Santa Margarita River, and many other coastal river valleys. In the Santa Monica Mountains (Ventura and Los Angeles counties), the Santa Ana Mountains (Orange County), and other parts of the coast range, coastal scrub occupies a low- to mid-elevation band on both the coastal and the interior sides of many coastal mountains, transitioning to chaparral communities at higher elevations.

A reviewer noted that maps of the distribution of southern coastal scrub is given in Minnich and Franco (1998).

Biophysical Site Description

The most important environmental factors are cool season precipitation and minimum winter temperature. Mean minimum winter temperature is substantially more predictive of southern sage scrub distribution patterns than mean maximum summer temperature. Southern scrub prefers warm winters and relatively low total precipitation. This means it is restricted to low-elevation areas that receive some marine climatic influence. Southern coastal scrub often responds sensitively to aspect on a local scale (e.g., in San Diego County, it sometimes occurs on south-facing slopes whereas north-facing slopes are occupied by chaparral types), but occurs on all aspects when viewed on a regional scale. Species composition of stands varies both with distance from the coast and with latitude. It occurs below 1,000m (3,000ft) elevation and in areas that receive about 10-60cm of annual precipitation. Soils vary from coarse gravels to clays, but typically only support plant-available moisture with winter and spring rain. Stands often form complex mosaics interdigitated with stands of chaparral and grassland types on scales of 10s-100s of meters.

Vegetation Description

Southern coastal scrub is a diverse plant community of summer deciduous and evergreen shrubs frequently dominated by *Artemisia californica*, *Eriogonum fasciculatum*, and species of *Salvia*. Its distribution extends from near San Francisco in central California to just south of El Rosario, northern Baja California, Mexico, where it is perhaps better called “succulent sage scrub” (Mooney 1972; Mooney 1977). Characteristic plant species include *Artemisia californica*, *Salvia mellifera*, *Salvia apiana*, *Salvia leucophylla*, *Encelia californica*, *Eriogonum fasciculatum*, *Eriogonum cinereum*, *Opuntia littoralis*, *Mimulus aurantiacus*, *Malosma laurina*, *Rhus integrifolia*, *Lotus scoparius*, *Rhamnus crocea*,and *Baccharis pilularis*.

Coastal sage scrub is distinguished from chaparral physiognomically and floristically. Most dominant species of coastal sage scrub are aromatic, soft-leaf (malacophyllous), facultatively dimorphic or drought deciduous, woody or half-woody shallow-rooted shrubs and sub-shrubs. They contrast with the leathery-leaf (sclerophyllous) evergreen woody shrubs of the adjacent chaparral. A few sclerophyllous species (*Malosma laurina*, *Rhus integrifolia*, *Heteromeles* *arbutifolia*) are typical of southern coastal scrub. Where these species occur, they are generally emergents from 2-4m high, in a matrix of 1- to 1.5-m-high malacophyllous shrubs and sub-shrubs. Southern coastal scrub is typically comprised of a shrub layer dominated by one to several species in any given stand, with a considerably more diverse understory of herbs and grasses (Mooney 1977; Westman 1981). This type has moderate alpha diversity, and rather greater beta and gamma diversity, because there are a number of sub-types of this plant community.

Moving from mesic to xeric sites (as along a latitudinal gradient, or as distance from the coast increases), dominance generally shifts from evergreen species in the north to drought-deciduous species. The number of succulent species increases as one moves south, and in southern San Diego County the type has accumulated enough of these to warrant classification as Baja Semi-Desert Coastal Succulent Scrub. Variation in coastal influence at a given latitude also produces composition changes. Coastal *Rhus integrifolia* gives way to interior *Rhus ovata*. Dominant species typical of interior sites include *Salvia apiana* and *Eriogonum fasciculatum*. At the eastern edge of this community’s southern distribution, the type transitions to desert scrub types. *Encelia californica* occurs only very near the coast, but *Encelia farinosa* appears on the eastern edge of the southern distribution. *Eriogonum fasciculatum* and *Yucca schidigera* continue east into desert types, but southern coastal scrub is generally considered to end where *Artemisia californica* is replaced by *Artemisia tridentata*.

Across this broad geographic range, associated species vary widely. Types recognized in publications include *Salvia leucophylla*-dominated northern types (Westman and Axelrod’s Venturan associations), a southern *Salvia mellifera*-dominated type, and types dominated by *Artemisia californica*, *Eriogonum fasciculatum*, *Rhus* *integrifolia*, and *Encelia* *californica*. A coastal (Diegan) type and an interior (Riversidian) type have been described by several authors. *Eriogonum cinereum*, which is dominant in northern coastal types as far south as the Santa Monica Mountains, gives way to the more xeric-adapted *Eriogonum fasciculatum* south and inland of there.

BpS Dominant and Indicator Species

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

Disturbance Description

Fire and other disturbances in this group can be characterized as follows: variable frequency (times between fires), season, and intensity, depending on the size of and proximity to Native American village sites. The largest and most intense fires in modern times occur overwhelmingly during fall Santa Ana wind events between late September and early December. This was almost certainly also the case in prehistoric times.

There was disagreement between the modeler and one reviewer about the role that Santa Ana winds play in the fire dynamics of this type. The reviewer indicated that the dominance of Santa Ana wind-driven fires is an artifact of fire suppression. Most free-running fires in this assemblage in Baja, California, occur in summer (Minnich 1983). The Mensing (1998) study cannot constrain Santa Ana winds from summer “sundowner” winds (i.e., north winds in Santa Barbara in Jun-Aug occur simultaneously with onshore westerly winds elsewhere in California and northern Baja, California). Most burning in coastal sage scrub in Baja, California, occurs in summer, when there are no Santa Ana winds. The modeler disagreed, stating that modern Santa Ana wind-driven wildfires burn through all vegetation types and ages, exhibiting extreme fire behavior and spotting across all manner of fire defenses. The fuel-driven hypothesis may be adequate in moderate weather where fire behavior is actually fuel driven, but 90+% of the acres burn in weather-driven fire events where all manner of fuels burn with extreme fire behavior. Even if a lot more acres burned under moderate weather conditions north of the Mexican border, the fall Santa Anas would still whip big fires across shrubland of all ages, as they do today. There might be more type conversion from shrubland to ruderal grassland, with the shorter inter-fire intervals this scenario would produce. Furthermore, the modeler indicated he was not yet convinced that the Santa Ana wind patterns are equal north and south of the Mexican border. A paucity of good weather data for Baja, California, may make this comparison a difficult one, but it remains to be demonstrated.

Another reviewer offered comments on the debate outlined in the previous paragraph. This reviewer felt that, from a vegetation management point of view (i.e., leaving the public safety aspects to others), this debate about when the most fires occurred in 1700 is somewhat beside the point. There are two primary activities that are relevant here -- fire suppression and management burning -- both of which require an understanding of how coastal sage scrub as it exists today responds to lower or shorter intervals between fires. The evidence that any amount of burning is good is, to say the least, weak. The evidence that withholding fire has terrible biological consequences is even weaker (Zedler 1995).

Coastal scrub often occupies sites denuded by landslides, slumps, debris flows, and other mass wasting events. It sometimes occupies chaparral sites temporarily for a few years after a burn, before the larger, woodier chaparral shrubs re-establish their dominance. A reviewer noted that although *Lotus scoparius* can occupy chaparral sites temporarily, *Artemisia californica* could not have the seed bank necessary to be abundant in post-fire chaparral, except in a case where there were repeated burns over several to many years that open up the chaparral. Southern coastal scrub can clearly persist on favorable sites for at least a hundred years -- and probably much longer -- in the absence of any fire. Re-sampling 70-yr-old Vegetation Type Map (VTM) plots in San Diego County and analyzing serial air photos showed that species composition can change over time in long-undisturbed stands (cumulatively losing *Artemisia californica* and gaining dominance by other native species, including *Eriogonum fasciculatum*, *Salvia mellifera*, *Malosma laurina*, and *Rus integrifolia*, depending on local site conditions). A reviewer felt that the decline in *Artemisia* *californica* shown in the aforementioned VTM study was a phenomenon that had not been studied adequately to the extent that it could be used to manage ecosystems. The modeler agreed that further long-term study of change in California coastal scrub composition was warranted, but that two fairly extensive VTM change detection studies from two different southern California counties showed similar results with regard to *Artemisia* *californica*. Taylor (2004) found that *Artemisia californica* cover declined by about 50% over 70yrs in sites across San Diego County. Minnich and Dezzani (1998) found that *Artemisia californica* essentially vanished from many Riverside County sites during the same interval. The modeler also clarified that he mentions *Artemisia californica* as an example, because it is the most abundant and widespread coastal sage scrub species, although it may be less abundant in some areas (e.g., Riverside). Both Minnich and Dezzani (1998) and Taylor (2004) found that *Artemisia californica* was experiencing a steeper decline than other species between 1930 and 2000.

Because this type is known to be a good opportunistic colonizer of disturbed land (especially prior to the arrival of highly competitive Eurasian weed species), some of the 20th-century distribution of this type may be a consequence of widespread burning to type-convert chaparral to cattle rangeland during the latter half of the 1800s. Some pollen stratigraphy data suggest that this type may have expanded its range during the past few years, presumably as a result of changes from Native American to Euro-American land use practices.

The following is based on the information from fire regime workshops held for revision of the Manual of California Vegetation (Table 2; *Artemisia californica*, *Baccharis pilularis*, and *Nassella pulchra* combined). Frequency: 1-100+yrs. Seasonality: Jun-Nov. Size/extent: variable, up to or beyond stand size (spotty to stand replacing - -400ha). Complexity: low to high. Intensity: low to high. Severity: moderate to very high. Type: dependent-independent crown.

There was some disagreement between modeler and reviewers regarding the appropriate fire return interval (FRI) for this system. One reviewer indicated he felt that the 150-yr FRI seemed long, but did not have any data to suggest an alternative. Another reviewer stated that, as shown in maps by Minnich (1983), burning rates are highest in northern Baja, California (two to three times per century), and decrease with mean annual precipitation southward to one to two times per century south of Ensenada. The modeler indicated that the FRIs he proposed for the model were based on the observation that almost all of our modern fires are started by people and that there were several tens of millions *fewer* people in the area during the historical period modeled. However, a reviewer countered that the comment that fires are started by people is, in itself, irrelevant. The reviewer went on to note the following: “The association of a fire area measurement with a fire cause (man, lightning, etc.) is simplistic. The approach is invalid in the assessment of pre-suppression fire or anthropogenic ignitions because analyses of ignition starts do not account for vegetation status, and most ignitions are suppressed, skewing the outcomes of large fires to severe weather states. Ignitions as a ‘cause’ (establishment source) of fires is a valid perspective at timescales of a split second and is an error in ‘first-cause’ logic that skews human perception of fires toward short timescale processes. Moreover, ignition frequency and distribution provide little explanation of fire regimes because most fire ‘starts’ fail to establish landscape fires. Vegetation status strongly influences the succession of ignitions and this is not considered.”

Another reviewer commented on the debate over the FRI, stating that we lack the data to say even what the fire regime was like in the two-plus centuries since European land use was introduced, much less what was going on before that. Current observations of the response of coastal sage scrub suggest that very short FRIs (<ca.10-25yrs) can be harmful, whereas we do not yet have any idea of what might be a maximum interval, or whether there even is a maximum interval. This suggests that, for the present, we should err on the side of insuring longer, rather than shorter, intervals. Many believe that intervals in the range of 100yrs would not be excessive.

The regional lead chose not to make a quantitative change to the model for the following reasons: (1) there was disagreement between the modeler and reviewers about weather evidence from Baja California, Mexico, applied to southern California; (2) changing the return interval to 100yrs or 75yrs did not significantly (+ or - 10%) change the percentage of the landscape in each class; and (3) reviewers did not indicate that the fire severity should change, and a decrease in return interval alone within the suggested range would not be sufficient to change the fire regime group for this type.

Fire Frequency

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

Patch size variable from 0.1-400ha.

Adjacency or Identification Concerns

Southern coastal scrub often occurs adjacent to various chaparral types. The stands are often interdigitated in a complex manner with adjacent vegetation types, responding to local changes in slope, aspect, and edaphic conditions on scales of tens to hundreds of meters. Although southern coastal scrub is largely composed of malacophyllous species, evergreen sclerophylls often make up significant portions of total cover. Stands on north-facing or immediately coastal-facing aspects can be strongly dominated by evergreen species that might be hard to distinguish from chaparral types. On the edge of the desert, coastal scrub is transitional to mixed desert scrub types that might look similar on a satellite photo. Coastal scrub is often adjacent to annual grasslands.

Southern coastal scrub communities are much less widespread now due to the extensive urban development across coastal southern California. Many portions of this association have been greatly reduced in extent and quality as a result of grazing and introduction of exotic plant species, especially in Riverside County.

Issues or Problems

Much of the former low-elevation distribution of this system has been lost to urban and agricultural land use in the 19th and 20th centuries. Loss is ongoing.

Native Uncharacteristic Conditions

Re-sampling of VTM plots shows that *Artemisia californica* has decreased sharply in both Riverside and San Diego counties since 1929. In Riverside, it has been mostly replaced by annual grasses. In San Diego County, it has mostly been replaced by other native species in the type. This may be a slow response to massive and widespread disturbances during the late 1800s.

In some coastal sites, emergent sclerophyllous species (*Rhus integrifolia*, *Malosma laurina*, *Heteromoles arbutifolia*) gain near-total dominance and the type adopts the structural appearance of chaparral (tall, deep-rooted, woody sclerophyllous vegetation). *Rhus integrifolia* is doing this on north-facing slopes from San Diego to Ventura counties on sites from which fire is apparently excluded by adjacent urban or agricultural development. In the Santa Monica Mountains, *Malosma laurina* is gaining strong dominance in some places with very frequent fire, apparently by exploiting its relatively strong ability to resprout post-fire. In western Riverside County, this Biophysical Setting is rapidly type-converting to herbaceous communities dominated by exotic annual grasses and non-native forbs, apparently from a combination of hard grazing by sheep, frequent fire, and possibly nitrogen deposition from air pollution.

A reviewer indicated that coastal sage in Baja, California, is not being converted to exotic annual grasslands, possibly because livestock grazing (mostly cattle) is removing thatch and actually improving coastal sage scrub recruitment and successions. The modeler stated that the hypothesis that cattle might enhance coastal sage scrub establishment that the reviewer espoused was not consistent with his observations from Alta, California. The modeler felt that at a very light stocking rate, cattle might not be detrimental to coastal sage scrub, but examples of grazing abetting loss in this type abound.

Comments

Paul Zedler (phzedler@wisc.edu), Zach Principe (zprincipe@tnc.org), Hugh Safford (hughsafford@fs.fed.us), and Dave Schmidt also reviewed this model for map zone (MZ) 4.

An MZ04 reviewer commented that recent literature, including the current in-press version of *The Terrestrial Vegetation of California*, is moving away from using the term “coastal scrub” in favor of “sage scrub.” This is justified because, as is the case in the current model, the term applies to both coastal and interior vegetation types.

Succession Classes

**Mapping Rules**

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 3 Early Development 1 - All Structures

Indicator Species

Description

Early successional southern coastal scrub, with post-fire annuals and short-lived re-colonizers. Additional species include *Eriophyllum confertiflorum*, *Sisirynchium bellum*, *Phacelia* spp.*, Mirabilis laevis*,and *Cryptantha* spp.Exoticweedsinclude *Brassica* spp., *Hirschfeldia incana*, *Bromus* spp., *Avena* spp., and *Hordeum* spp*.*

*Maximum Tree Size Class*  
None

Class B 12 Mid Development 1 - Closed

Indicator Species

Description

More than 50% cover of short-lived shrub species (e.g., *Artemisia caifornica*, *Baccharis pilularis*), with some longer lived species. Shrubs may actually be shorter than 1m in early years.

*Maximum Tree Size Class*  
None

Class C 85 Late Development 1 - Closed

Indicator Species

Description

More than 50% cover of short-lived shrub species (e.g., *Artemisia caifornica*, *Baccharis* *pilularis*), with some longer lived species.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

Probabilistic Transitions

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