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California Coastal Redwood Forest

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Forest and Woodland

Map Zones

2, 3, 4

Geographic Range

This type occurs in a narrow band along the coast from the Chetco River, Oregon, south to Monterey County, California, along the west side of the northern California Coast Range.

Biophysical Site Description

This type is restricted to elevations below 3,500ft. Redwood forests occur in an irregular, narrow strip, ranging in width from 8-56km (5-35mi) (Olson et al. 1990; Griffin and Critchfield 1972). Precipitation in this zone is typically more than 100cm/yr but can be more than 200cm in the northern end of the range (Sawyer et al. 2000). The tallest and largest trees are confined to moist, wind-protected canyons and lower slopes.

In the southern portion of the range, annual precipitation may be as little as 50cm, and the system is limited to coves and ravines. It is commonly found on moderately well-drained marine sediments (non-metamorphosed, siltstones, sandstones, etc.).

Vegetation Description

These are dense forests dominated by coast redwood. There are two types: an inland type that includes Douglas-fir and tanoak in dryer locations, and a wetter type in the fog zone that includes Sitka spruce and western hemlock.

Shade-tolerant understory species include *Rubus parviflorus*, *Oxalis oregana*, *Aralia californica*, *Mahonia nervosa* (= *Berberis nervosa*), *Gaultheria shallon*, and many ferns, such as *Blechnum spicant*, *Polypodium* spp., and *Polystichum munitum*. The inland type approaches the coast in the Santa Cruz and Santa Lucia mountains where the rainfall is the lowest.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
SESE3	<i>Sequoia sempervirens</i>	Redwood
PSME	<i>Pseudotsuga menziesii</i>	Douglas-fir
TSHE	<i>Tsuga heterophylla</i>	Western hemlock

LIDE3	<i>Lithocarpus densiflorus</i>	Tanoak
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Species names are from the NRCS PLANTS database. Check species codes at <http://plants.usda.gov>.

Disturbance Description

Redwood forests typically burned in the summer and early fall in low- to moderate-intensity surface fires that consumed irregular patches of surface fuel and understory vegetation. The great height of the canopy and separation of surface and crown fuels resulted in a pattern in which fire rarely resulted in canopy tree mortality. Fire intervals ranged from <10yrs in interior and upland locations to 100yrs or more along the coast in the fog belt. Van de Water and Safford reported a mean fire return interval (FRI) of 23yrs (range, 10-170yrs). Native Americans were thought to have contributed to the ignitions (perhaps as much as every 5-8yrs) because lightning is relatively infrequent in the area -- especially in the fog belt.

Flooding events that undermine trees may have been a significant disturbance, but it was not modeled. Windstorms and landslides also affect this type (Lorimer et al. 2009).

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	405	7		
Moderate (Mixed)				
Low (Surface)	32	93		
All Fires	30	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

Fires in the interior sub-type probably encompassed tens to thousands of acres, occurring mainly during droughts and with warm, dry east winds. Fires in the coastal fog sub-type were significantly smaller. However, in the Santa Lucia Mountains of Monterey County, the fires were large and infrequent, and essentially burned at the same frequency as adjacent upslope vegetation (mixed evergreen, mesic or dry-mesic chaparral, or southern coastal scrub).

Adjacency or Identification Concerns

Includes a variety of forest types that are dominated by coast redwood. Fire exclusion has changed the duff, fuel accumulation patterns, understory shrub cover, flammability of bark, and flammability of the fire scar cavities, which increases the level of canopy tree mortality that occurs in surface fires.

Issues or Problems

Coast redwood includes a wide variety of forest types dominated or co-dominated by coast redwood. It was suggested to split this type into separate models: (1) a coastal fog belt model with extremely long fire intervals and a rich variety of coastal species (Sitka spruce, western hemlock, and rhododendron) and (2) a more interior model with more frequent fire and more interior associated species (tanoak, Douglas-fir, madrone). For the current model, these two systems are combined but annotated distinctly. Stand structure is defined similarly for both types into a three-box model. The fire dynamics of the types, although distinct, both result in a landscape that is almost exclusively Class C.

As a result of current management, there may be stands >10m that are open canopy (closure <30%). Likewise, taller stands (>25m) are uncharacteristic if the closure is less than about 60%.

During the 2017 model review, Kori Blankenship made minor descriptive edits, added several references, and consulted with Eamon Engber (interagency fire ecologist), and Clint Isbell (USFS fire ecologist) about the fire frequency of this type. Engber indicated that the coast redwoods likely burned more frequently than adjacent Douglas-fir/tanoak sites, with the exception of very wet coast redwood sites, which would have had much longer FRIs. The adjacent Douglas-fir/tanoak sites are covered by the Mediterranean California Mixed-Evergreen Forest -- Coastal BpS, which has a modeled FRI of 39yrs. Both ecologists agreed the FRI modeled here was reasonable, but it could be even more frequent in some parts of the redwood range. Previous review (described later) indicated that the modeled fire frequency for this type may have been too short. But, based on the relative frequency of fire in redwoods versus the adjacent mixed-evergreen BpS and the Van de Water and Safford estimate of fire frequency, Blankenship decided that the modeled fire frequency was within the bounds suggested by literature and expert opinion. Blankenship did increase the frequency of replacement fire in the Late Closed class to ensure that class A would occupy at least one percent of the landscape (the original model parameters resulted in class A occupying less than 1% of the landscape). There seems to be general agreement that certain redwood sites probably had a much less frequent FRI than indicated by this model. Future review should consider splitting these sites as suggested in the Issues and Problems section of this description.

Additional LANDFIRE National model reviewers not listed earlier include Todd Keeler-Wolf, Hugh Safford, and Dave Schmidt.

Mapping Rules

[illegible]

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
SESE3	Sequoia sempervirens	Redwood	Upper
PSME	Pseudotsuga menziesii	Douglas-fir	Mid-Upper
VAOV2	Vaccinium ovatum	California huckleberry	Lower
GASH	Gaultheria shallon	Salal	Lower

Description

Dense forest dominated by coast redwood. Douglas-fir co-dominates in interior locations. Hardwoods including tanoak, bigleaf maple, and hazelnut inland; and spruce and hemlock on the coast. Shrubs include huckleberry, salal, and swordfern throughout. In the fog zone, salmonberry occasionally stays as the dominant understory, especially on river terraces. In the inland sub-type, the canopy can be relatively open.

A significant distinction between the dry and wet types is the frequency of surface fires. In the fog zone, surface fires may only occur every 100yrs on average, but inland they can occur every 20yrs or more frequently.

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:CLS	4
Mid1:CLS	5	Late1:CLS	49
Late1:CLS	50	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	0.05	20	Yes	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.01	100	Yes	0
Surface Fire	Mid1:CLS	Mid1:CLS	0.05	20	No	0
Replacement Fire	Late1:CLS	Early1:ALL	0.0014	714	Yes	0
Surface Fire	Late1:CLS	Late1:CLS	0.03	33	No	0

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