USDA Natural Resources Conservation Service

# Ecological site F004BX124CA Redwood-Douglas-fir/California huckleberry-salal, marine terrace, silty eolian deposits over marine deposits, loam

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## General information

**Provisional**. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.


**Figure 1. Mapped extent**

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

## Associated sites

| | |
|---|---|
| F004BX117CA | **Redwood-shore pine/California huckleberry-western Labrador tea/rush, marine terraces, silty eolian deposits over marine deposits, silt loam**<br>F004BX117CA is found in conjunction with this site but it has poorly drained soils and different plant species composition. |

## Similar sites

| | |
|---|---|
| F004BX119CA | **Redwood-Douglas-fir/California huckleberry/western swordfern, marine terraces, silty eolian deposits over marine deposits, loam**<br>F004BX119CA is similar to this ecological site but it is found on a younger slightly lower elevation marine terrace and is more productive. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Sequoia sempervirens*<br>(2) *Pseudotsuga menziesii* |
| Shrub | (1) *Vaccinium ovatum*<br>(2) *Gaultheria shallon* |
| Herbaceous | Not specified |

## Physiographic features

This ecological site is of limited extent and is only found on an upper, dissected marine terrace southeast of Trinidad, CA, which was uplifted over 300,000 years ago. The site occurs on a uniform nearly level to gently sloping surface.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Marine terrace |
| Elevation | 157–244 m |
| Slope | 2–15% |
| Aspect | SE, S |

## Climatic features

The climate is humid with cool, foggy summers and cool, moist winters. Proximity to the coastal limits the diurnal range in temperatures. Mean annual temperature is 50 to 55 degrees. Total annual precipitation ranges from 60 to 71 inches and usually falls from October to May.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (average) | 325 days |

| | |
|---|---|
| Freeze-free period (average) | 325 days |
| Precipitation total (average) | 1,803 mm |

## Influencing water features

There are no influencing water features on this site.

## Soil features

These very deep, well drained soils with an udic moisture regime and isomesic temperature regime were formed in silty eolian deposits over marine deposits. These soils contain a depleted, gray E horizon and have minimal rock fragment content. The taxonomic class of these soils is as follows: fine, isotic, isomesic Andic Haplohumults.

Soils that have been tentatively correlated to this ecosite include:

Soil Survey Area map unit component

CA605 254 Burriscreek

**Table 4. Representative soil features**

| | |
|---|---|
| Surface texture | (1) Loam |
| Family particle size | (1) Loamy |
| Drainage class | Well drained |
| Permeability class | Slow |
| Soil depth | 152 cm |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-101.6cm) | 24.89 cm |
| Subsurface fragment volume <=3" (Depth not specified) | 0–5% |
| Subsurface fragment volume >3" (Depth not specified) | 0% |

## Ecological dynamics

This ecological site occupies a marine terrace outside Trinidad, CA and is largely contained with the coastal fog belt. This site is of limited extent, and the reference plant community is inferred as no late successional communities of this site remains. The range of redwood (*Sequoia sempervirens*) is largely influenced by coastal fog, which ameliorates the effects of solar radiation on conifer transpiration rates (Daniel 1942). Fog is a critical source of water in the drier summer months for redwood, which has high transpiration rates. Fog drip and direct fog uptake by foliage may contribute significant moisture to understory species and the forest floor (Dawson 1998).

The northern range of redwoods evolved within a low to moderate natural disturbance regime, with severe fire intervals ranging from 500 to 600 years on the coast (Veirs 1979). Fires could have historically occurred by lightning ignition or deliberate setting by Native Americans to create desirable hunting habitat (Veirs 1996).

Surface fires may modify tree species composition by favoring thicker-barked redwood and killing grand fir (*Abies grandis*) and mature western hemlock ( *Tsuga heterophylla*) (Veirs 1979). Redwood has the ability to resprout following fire from the root crown or from dormant buds under the bark of the bole and branches (Noss 2000), but shallow roots and thin bark make western hemlock susceptible to fire damage (Arno 2002). However, frequent surface fire may promote establishment of western hemlock in the understory by exposing mineral-rich soil and reducing competition (Veirs 1979).

Moderate fire, wind disturbance, and management decisions could create a mosaic in regeneration patterns. Previous harvest and the use of fire as a slash treatment can alter species composition on many sites (Noss 2000) as repeated burning can favor resprouting of redwood and hardwoods and limit the regeneration of Douglas-fir and other conifers. Wind damage from winter storms can cause canopy top breakage which may kill individual trees or create windthrow gaps in the forest (Noss 2000). Canopy gap creation or selective redwood cutting could favor Douglas-fir regeneration and growth and lead to a larger proportion of Douglas-fir in the stand for several centuries (Agee 1993). Aerial seeding in past decades have lead to dense Douglas-fir dominated stands in some areas of the redwood region, skewing the natural overstory species composition (Noss 2000).

Red alder (*Alnus rubra*) is effective at rapidly colonizing disturbed landscapes following ground disturbance, harvest, or fire. Red alder is able to fix nitrogen with a symbiotic relationship with an actinomycete located on its root nodules (Bormann and Gordon 1984). These significant inputs of nitrogen to the ecosystem by red alder may even increase stand productivity (Hart et al 1997). Shade intolerant red alder will eventually decrease in the stand as conifer regrowth reaches greater canopy heights.

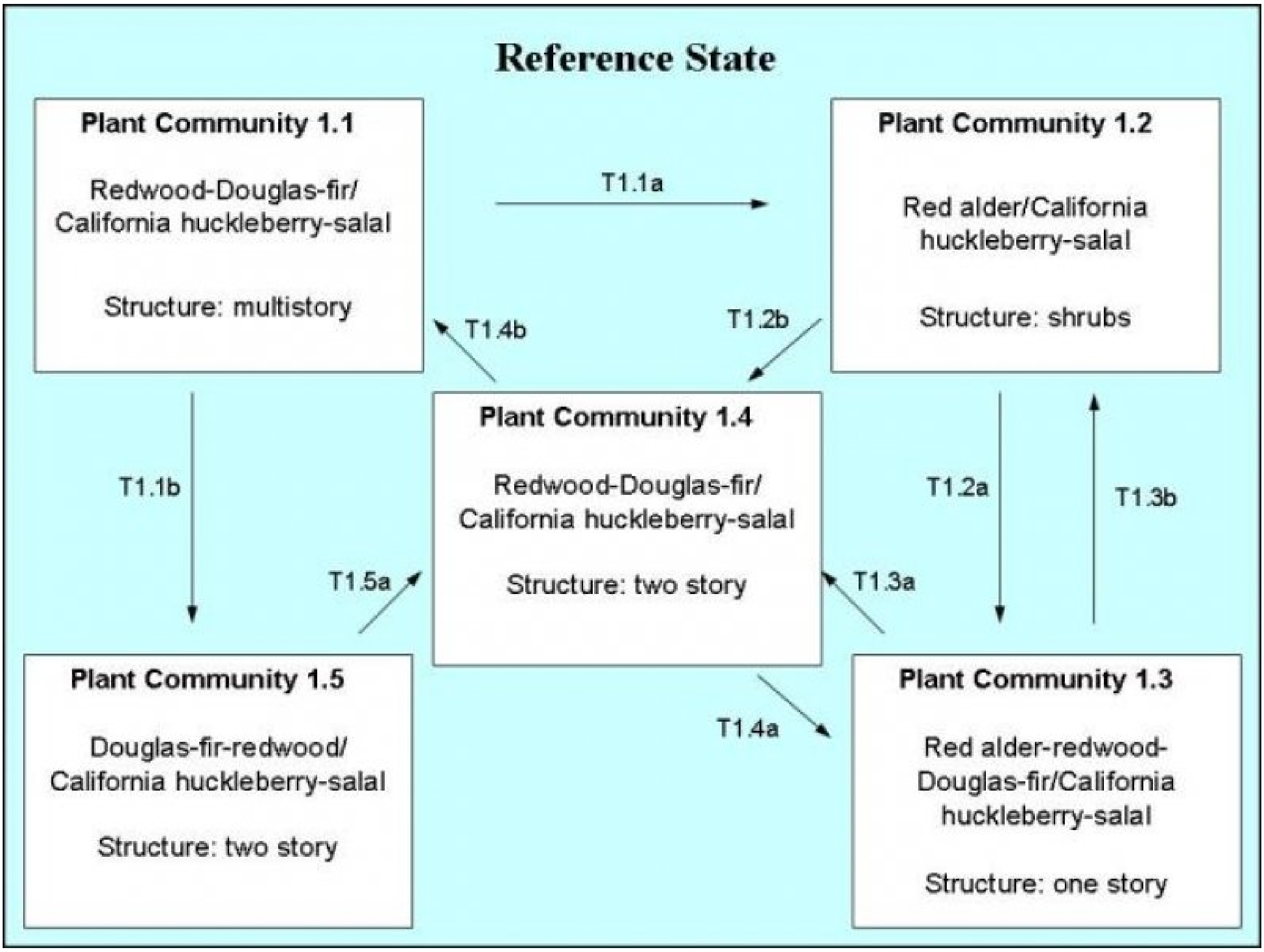
California huckleberry (*Vaccinium ovatum*) and salal (*Gaultheria shallon*) occupy a large percentage of the understory on this site. California huckleberry is a dominant shrub species across redwood ecological sites as it can thrive in both moist and dry environments. As California huckleberry is typically a fire-dependent species, sprouting can be widespread following natural fire or site preparation treatments (Tirmenstein 1990b). Salal, another important understory shrub on this ecological site, increases significantly after harvest and can even reduce regeneration and stocking of Douglas-fir

(Tirmenstein 1990a).

This ecological site occupies a young marine terrace near Trinidad. The marine terrace sequence around Trinidad demonstrates the fluctuations of sea level and tectonic uplift over the past 400,000 years. Six distinct marine terraces are identified in this area, the sediments of which we deposited during times of higher sea level (Woodward-Clyde Consultants). The youngest emergent terrace is found closest to the coast, and subsequently older terraces are found further east and at higher elevation. The oldest and highest terrace (Maple Stump) is found furthest east and exhibits the most soil development (Stephens 1982). Local eolian and colluvial deposits overlie the marine sediments on older terraces (Stephens 1982). The A Line terrace, upon which this ecological site is found, is the second oldest of these six terraces and likely formed about 300,000 years.

The effects of climate change on species distribution and viability need to be considered in this age of rapidly changed climate regimes. The western United States is already experiencing an increase in tree mortality across all tree cohort age classes, likely due to regional warming and water deficits (van Mantgem et al 2009). These forest structure changes may cause species to migrate to higher elevations, as much as 500-1000m, as temperatures increase in lower elevations (Urban et al 1993). Climate models project many different climate regimes for the north coast of California. One model predicts a warmer, wetter climate regime in which redwood may be able to expand into canyon live-oak-madrone and chaparral systems (Lenihan et al 2003). Climate change and its effects on vegetation patterns should be considered along with historical perspectives in ecological site development.

## State and transition model




## State 1
## Reference State - Plant Community 1.1

## Community 1.1
## Reference State - Plant Community 1.1

The reference plant community for this site is the presumed historic plant community prior to European settlement. This reference community is characterized by an overstory dominated by redwood (*Sequoia sempervirens*) and Douglas-fir (*Pseudotsuga menziesii*), with a moderate cover of California huckleberry (*Vaccinium ovatum*) and salal (*Gaultheria shallon*) in the understory. Plant community transitions: T1.1a) Block harvest or intensive fire would open up light and nutrients for pioneer species and shrubs to dominate the site. T1.b) A selective redwood cut or moderate fire could change the overstory species composition by improving seed bed conditions for Douglas-fir infill. Shrub cover may also increase in this community phase.

**Forest overstory.** The overstory primarily consists of redwood and Douglas-fir.

Average Percent Canopy Cover:

Main canopy

Redwood 50-70%
Douglas-fir 15-25%
Sitka spruce <5%
western hemlock <5%
hardwoods <5%

**Forest understory.** The understory is dominated by shrubs with California huckleberry and salal predominating.

Average Percent Canopy Cover:

California huckleberry 20-30%
salal 10-30%
Pacific rhododendron 0-10%
swordfern 5-10%
deerfern <5%
trailing blackberry <5%
western azalea <5%
evergreen violet <5%
bracken fern <5%
cascara <5%
red huckleberry <5%

## State 2
## Plant Community 1.2

## Community 2.1
## Plant Community 1.2

Red alder dominates this plant community phase following block harvest or another large scale disturbance. Shrubs and other pioneer species will also cover a large percentage of this site. T1.2a) Over time redwood will resprout and Douglas-fir will infill into the site although pioneer species and shrubs will continue to dominate the site. T1.2b) Direct seeding or planting of Douglas-fir could create a Douglas-fir dominated canopy until redwood sprouts grow into the overstory.

## State 3
## Plant Community 1.3

## Community 3.1
## Plant Community 1.3

Red alder continues to occupy the upper canopy, but redwood sprouts and infilling Douglas-fir occupy a large percentage of the site. T1.3a) Mechanical or chemical hardwood management techniques could accelerate the establishment and growth of conifers by decreasing competition for light from red alder and shrub species. T1.3b) Block harvesting would increase light availability into the site and provide for red alder and shrub colonization and establishment.

### State 4
### Plant Community 1.4

### Community 4.1
### Plant Community 1.4

Over time or after hardwood management, redwood and Douglas-fir dominate the canopy of this plant community phase. Several decades of growth will also allow recruits to create a more ecologically diverse two story canopy structure. T1.4a) Windthrow or other small scale disturbances could create a gap in the overstory for red alder and shrubs to colonize, providing for hardwood species along with conifers in the overstory. T1.4b) A selective redwood cut would leave Douglas-fir dominating the site as redwood sprouts grow in the subcanopy. 1.4c) Time and an intermediate disturbance regime could create the opportunity for the site to transition towards the reference plant community with a multi-layered canopy and more open understory.

### State 5
### Plant Community 1.5

### Community 5.1
### Plant Community 1.5

A Douglas-fir dominated canopy would result from a selective redwood harvest. Shrub cover may be higher in gaps created by disturbance or selective harvest. 1.5a) Several decades of redwood sprout regrowth would provide for a mixed overstory of redwood and Douglas-fir.

## Additional community tables

## Animal community

California huckleberry leaves may be eaten by deer, and its berries are utilized by many bird and mammal species including bear, fox, squirrels and skunks.

## Hydrological functions

The soils of this stie are very deep and well-drained with medium runoff. These soils have a moderately low rate of water transmission.

As this ecological site is predominately shallow sloped, erosion may not be a major concern; however road building, timber harvest, and site preparation for planting may increase surface erosion and potential for mass wasting.

Refer to the Soil Survey Manuscript for further information.

## Recreational uses

As this ecological site has a limited extent (less than 2.5 square miles in one area east of Trinidad, California), it will likely not be targeted for widescale recreational use. However, the forested landscape would provide excellent hiking and pack trails. Development on other marine terraces west of this ecological site exhibit the desirability of the shallow slopes of the ecological site for building and industrial use.

## Wood products

Redwood is a highly valued lumber because of its resistance to decay. Uses of redwood include house siding, paneling, trim and cabinetry, decks, hot tubs, fences, garden structures, and retaining walls. Other uses include fascia, molding and industrial storage and processing tanks.

Douglas-fir is employed in residential structures and light commercial timber-frame construction. It is also used for solid timber heavy duty construction such as pilings, wharfs, bridge components and warehouse construction.

## Other products

California huckleberries are made into wine, and used by home and commercial processors for pie fillings. Berries from Rubus species can also be eaten raw or processed. Foliage of the California huckleberry and salal are used by florists in floral arrangements. Edible mushrooms can be found on this ecological site by experienced fungi identifiers.

## Other information

Site productivity interpretations are based on the following site index curves:

Species Curve Base age

Redwood 930 100 years
Douglas-fir 790 100 years

**Table 5. Representative site productivity**

| Common Name | Symbol | Site Index Low | Site Index High | CMAI Low | CMAI High | Age Of CMAI | Site Index Curve Code | Site Index Curve Basis | Citation |
|---|---|---|---|---|---|---|---|---|---|
| redwood | *SESE3* | 133 | 166 | 173 | 257 | – | – | – | |
| Douglas-fir | *PSME* | 156 | 172 | 165 | 183 | – | – | – | |

## Inventory data references

Forestry data was collected in association with the following soils pits in the CA605 soil survey area:

Forestry plot#
08F027
08FT003
08F019
08F008
08F017
08F007

## Type locality

| Location 1: Humboldt County, CA | |
|---|---|
| Township/Range/Section | T8N R1E S20 |
| UTM zone | N |
| UTM northing | 4547217 |
| UTM easting | 407627 |
| General legal description | Crannell Quadrangle |

## Other references


Agee J.K. 1993. Fire ecology of Pacific Northwest forests. Island Press. Covelo, CA.

Arno, S.F., Allison-Bunnell, S., 2002. Flames in our forest: disaster or renewal? Island Press, Washington, DC, 227 pp.

Bormann B.T. and Gordon J,C. 1984 Stand density effects in yound red alder planations: productivity, photosynthate partitioning, and nitrogen fixation. Ecology 65: 394-402

Daniel, T. W. 1942.The comparative transpiration rates of several western conifers under controlled conditions. Ph. D. Thesis. U. of Calif., Berkeley. 190 p.

Dawson, T.E. 1998. Fog in the California redwood forest: ecosystem inputs and use by plants. Oecologia 117: 476-485.

Hart, S.C., Binkley, D., and Perry, D.A. 1997. Influence of red alder on soil nitrogen transformations in two conifer forests of contrasting productivity. Soil Biol. Biochem. Vol. 29, No. 7, pp. 111 l-1123.

Lenihan, J.M., R. Drapek, D. Bachelet, R.P. Neilson. 2003. Climate change effects on vegetation distribution, carbon, and fire in California. Ecological Applications 13(6), 2003, pp. 1667–1681

Noss, R.F., editor. 2000. The redwood forest: history, ecology, and conservation of the coast redwoods. Save-the-Redwoods League. Island Press. Covelo, CA. 377 pages.

Stephens, T.A., 1982, Marine terrace sequence near Trinidad, Humboldt County, California, Friends of the Pleistocene 1982 Pacific Cell Field Trip Guidebook, Aug. 5-8, 1982, p. 100- 105.

Tirmenstien, D. 1990a. *Vaccinium ovatum*. In: Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Fire Sciences Laboratory. Available: http://www.fs.fed.us/database/feis

Tirmenstein, D. 1990b. *Gaultheria shallon*. In: Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available: http://www.fs.fed.us/database/feis/

Urban, D. L. M.E. Harmon C.B. Halpern. 1993. Potential response of Pacific Northwestern forests to climatic change, effects of stand age and initial composition Climate Change 23: 247-266.

van Mantgem, P.J., Stephenson, N.L., Byrne, J.C., Daniels, L.D., Franklin, J.F., Fulé, P.Z., Harmon, M.E., Larson, A.J., Smith, J.M., Taylor, A.H., and Veblen T.T., 2009. Widespread Increase of Tree Mortality Rates in the Western United States. Science 323:521-524.

Woodward-Clyde Consultants. 1982. Central and Northern California Coastal Marine Habitats: Oil Residence and Biological Sensitivity Indices: Final Report (POCS Technical Paper #83-5) Prepared for the US Minerals Management Service Pacific Outer Continental Shelf Region.

Veirs, S.D. 1996. Ecology of the coast redwood. Conference on coast redwood ecology and management. Pg 9-12.

Veirs, S.D. 1979. The role of fire in northern coast redwood forest dynamics. Conference on Scientific Research in the National Parks.

## Contributors

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## Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

| | |
|---|---|
| Author(s)/participant(s) | |
| Contact for lead author | |
| Date | |
| Approved by | |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth ( in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**

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