USDA Natural Resources Conservation Service

Ecological site F004BX109CA
Douglas-fir/redwood/tanoak/California huckleberry, mountain slopes, sandstone and schist, clay loam

Accessed: 05/03/2024

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

F004BX103CA	**Redwood-Douglas-fir/Pacific rhododendron, mountain slopes, sandstone, clay loam** F004BX103CA is found in conjunction with this site.

Similar sites

F004BX102CA	**Douglas-fir-redwood/tanoak, mountain slopes, sandstone, clay loam** F004BX102CA is similar in vegetation composition to this site but site productivity is higher for F004BX102CA than for F004BX109CA.

Table 1. Dominant plant species

Tree	(1) *Pseudotsuga menziesii* (2) *Sequoia sempervirens*
Shrub	(1) *Lithocarpus densiflorus* (2) *Vaccinium ovatum*
Herbaceous	Not specified

Physiographic features

This ecological site is found within the Mill and Rock Creek watersheds. It occurs on dry, uniform to slightly convex summits and shoulders of broad ridges and upper mountain slopes. These mountain slopes are gently sloping to steep.

Table 2. Representative physiographic features

Landforms	(1) Ridge (2) Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	48–675 m
Slope	9–50%
Water table depth	152 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate is warm in the summer, with cool, moist in the winter. Coastal influence and fog is diminished by this sites distance inland from the coast. Lower slopes may receive some fog influence. The mean annual precipitation ranges from 80 to 100 inches and usually falls from October to May.

* Climate station data not representative for site, no local information available. The information below is based on the nearest climate station available.

Table 3. Representative climatic features

Frost-free period (average)	280 days
Freeze-free period (average)	280 days
Precipitation total (average)	2,540 mm

Influencing water features

There are no unique hydrological features on this site.

Soil features

These well-drained soils developed from colluvium and residuum derived from primarily sandstone and mudstone with small areas weathered from schist. They are strongly to very strongly acidic at 40 inches with a dominantly loamy subsurface rock content ranging from non-gravelly to very gravelly. These soils are dominantly very deep with small areas that are moderately deep to a lithic contact. Some soils on moderately to strongly steep summit positions may have a clayey subsurface texture group with minimal rock content.

Soils that have been tentatively correlated to this ecological site include the following.
Soil Survey Area: CA605 - Redwood National and State Parks

Map Unit Component

583 Wiregrass
584 Wiregrass
584 Scaath
585 Wiregrass
585 Rockysaddle

Table 4. Representative soil features

Surface texture	(1) Loam (2) Gravelly loam (3) Clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to slow
Soil depth	102–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	5.08–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	4.5–5.5
Subsurface fragment volume <=3" (Depth not specified)	0–45%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The historical origins of fires within this region remain unknown. Lightning-ignited fires are considered rare. However, Native American burning is thought to have played a major role by burning fires from the interior into the redwood zone (Veirs, 1996). Natural fire intervals ranged from 500 to 600 years on the coast, 150 to 200 years on intermediate sites, and 50 years on inland sites. This site has developed on mountain ridges and slopes in drier and warmer inland locations, and likely has a moderate natural disturbance regime.

A moderate fire could lead towards more of a mosaic in regeneration patterns. Patches of trees would be killed leaving others slightly damaged or unharmed. Douglas-fir (*Pseudotsuga menziesii*) regeneration would be favored in the large gaps that are created following a moderate fire, potentially leading to a larger proportion of Douglas-fir to redwood for several centuries (Agee, 1993). Without these gaps caused by fire, Douglas-fir regeneration is unsuccessful, and with continued lack of disturbance it may slowly be replaced by redwood as the dominant canopy species (Veirs, 1979, 1996).

Both redwood and tanoak have the ability to re-sprout following fire (Veirs, 1996). After fire, redwood may sprout from the root crown or from dormant buds located under the bark of the bole and branches (Noss, 2000). The sprouting ability of redwood is most vigorous in younger stands and decreases with age. Frequent fire reduces tanoak’s sprouting ability and tends to keep understories open (Arno, 2002). Fire exclusion would allow for the gradual increase of tanoak in the understory (McMurray, 1989).

California huckleberry (*Vaccinium ovatum*) is normally a fire-dependent shrub species; little is known concerning it's adaptation to fire under low to moderate fire return intervals (Tirmenstein, 1990). It is a common species in both moist and dry redwood environments. Sprouting is widespread following fire and recovery may be rapid.

Other potential disturbances in the redwood zone include winter storms that can cause top breakage. This breakage

may kill individual or groups of trees and create small openings from windfall (Noss, 2000). This would likely favor the establishment of redwood and other shade tolerant conifers.

Past harvesting and the use of fire as a slash treatment has altered species composition on many sites (Noss, 2000). Within many areas of the park, aerial seeding of Douglas-fir has led to a 10:1 ratio of Douglas-fir to redwood (Noss, 2000).

Redwood's interior range is largely contained within the coastal fog belt. Coastal fog ameliorates the effects of solar radiation on conifer transpiration rates (Daniel, 1942). Research in the redwood region (Dawson 1998) has indicated that fog drip and direct fog uptake by foliage may contribute significant amounts of moisture to the forest floor during summer months and over the course of the year.

State and transition model

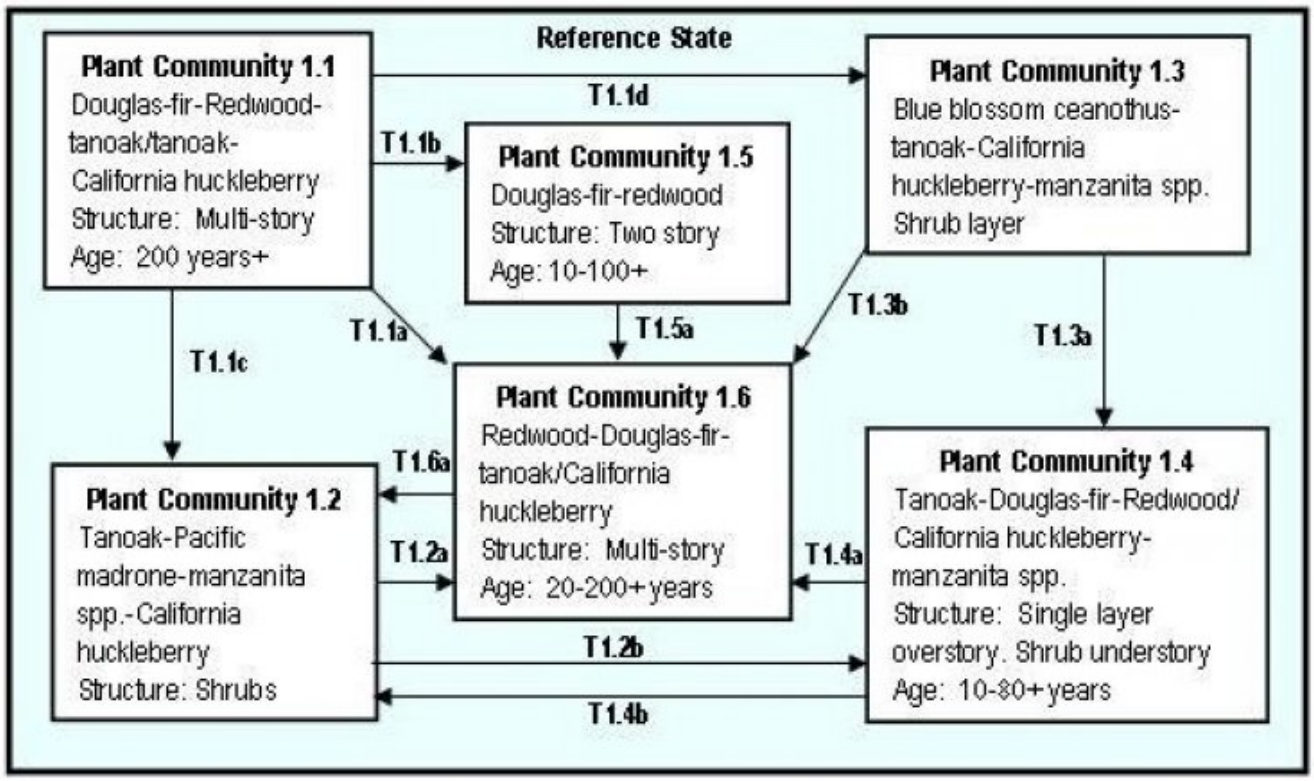

Figure 4. Douglas-fir-redwood-tanoak/tanoak model

State 1
Reference State - Plant Community 1.1

Community 1.1
Reference State - Plant Community 1.1

The historic plant community is presumed to be the reference plant community, dominated by Douglas-fir (*Pseudotsuga menziesii*) and redwood (*Sequoia sempervirens*). Douglas-fir and redwood are nearly equally represented in these interior, drier sites. On more moist north-facing or lower slopes, redwood may become more dominant. Tanoak (Lithocarpus densiflorus) dominates the sub-canopy. Pacific madrone (*Arbutus menziesii*) may also be a minor component on some sites. Tanoak is also found in the shrub layer, in addition to California huckleberry (*Vaccinium ovatum*), salal (*Gaultheria shallon*), and manzanita (Manzanita spp.). Moderate fire or partial cutting would tend to maintain the plant community by allowing Douglas-fir to either infill or regenerate. T1.1a – Fire exclusion could lead to an eventual shift from redwood to Douglas-fir in the overstory, especially on north-facing lower slopes. See PC#1.6. T1.1b – Following a moderate fire with partial stand replacement, a dense thicket of Douglas-fir could become established if it is a good seed year. After block harvesting, aerial seeding, or tree planting, Douglas-fir stocking could considerably exceed that of redwood. See PC#1.5. T1.1c – Block harvesting,

followed by post-harvest burning, could cause sprouting hardwoods and evergreen shrubs to dominate until sprouting redwood and infill of Douglas-fir occurs. Some manzanita species may sprout or germinate from seed banked in the soil. See PC#1.2. T1.1d – After block harvesting and post-harvest burning, and if a seed source is present, blueblossom (*Ceanothus thyrsiflorus*) and sprouting tanoak may dominate the site until conifers are able to overtop them. See PC#1.3.

Forest overstory. The interpretive plant community for this site is dominated by Douglas-fir with a lesser amount of redwood. Tanoak dominates the sub-canopy. Pacific madrone is also represented as a minor component on some sites.

Overstory canopy cover

Main canopy

Douglas-fir 10-85%
Redwood 0-25%

Subcanopy

Tanoak 5-70%
Pacific madrone 0-20%

Forest understory. California huckleberry and tanoak dominate the understory while pacific rhododendron, salal, and bracken fern may also be found on these sites.

Understory canopy cover

California huckleberry 25-40%
Tanoak 25-40%
Pacific rhododendron 10-25%
Salal 10-25%
Bracken fern 5-15%
Other shrubs <5%

Table 5. Ground cover

Tree foliar cover	75-100%
Shrub/vine/liana foliar cover	25-60%
Grass/grasslike foliar cover	0%
Forb foliar cover	5-10%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

State 2
Plant Community 1.2

Community 2.1

Plant Community 1.2

This plant community is shrub-dominated with sprouting hardwoods and shrubs including tanoak, Pacific madrone, Manzanita spp. and California huckleberry. Mature Pacific madrone is a prolific seeder which, when coupled with an adjacent seed source or animal dispersion, may contribute to infill into disturbed areas (Burns, 1990). Some manzanita species are seed banking and stored seed in the soil will germinate after the canopy is opened (Adams, et al, 1994). T1.2a – With tree planting and brush management, a conifer-dominated plant community may establish in the area. See PC#1.6. T1.2b – If left to develop without management, vigorously sprouting tanoak may dominate a site for a short period of time. Douglas-fir infill and sprouting redwood will occur, but growth may be suppressed by competition from hardwoods. See PC#1.4.

State 3
Plant Community 1.3

Community 3.1
Plant Community 1.3

After block harvesting and post-harvest burning, and if a seed source is present, blueblossom may dominate the site (Adams, 1992). Fire favors the germination of stored seed by eliminating duff cover and reducing other plant competition. It is thought that germination of blueblossom is increased by the pulse of heat from burning (Adams et al, 1992). Growth of this shrub to tree form is rapid. Following cutting or burning disturbances evergreen shrubs, such as California huckleberry, will tend to sprout. Tanoak seedlings present prior to the disturbance will rapidly respond to increased light conditions (Adams, 1992). Some species of manzanita may also sprout or reproduce through seed banking (Adams, et al, 1992). Periodic fire could maintain the blueblossom-dominated plant community. T1.3a – Left to develop without disturbance, abundant infill of Douglas-fir from adjacent stands could occur (Burns, 1990). Redwood will sprout from existing stumps, and will gradually infill from adjacent seed source in the shade of established Douglas-fir. See PC#1.4. T1.3b – A conifer-dominated plant community could be established with the chemical control of hardwood trees and shrubs, in conjunction with either tree planting or infill. See PC#1.6.

State 4
Plant Community 1.4

Community 4.1
Plant Community 1.4

Infill of conifers will occur over time, resulting in both tanoak and Douglas-fir dominating the canopy. Redwood infill may start to occur below established Douglas-fir, and eventually may become part of the canopy layer. T1.4a – A combination of either chemically controlling tanoak or partial cutting hardwoods, coupled with tree planting, could lead to a more conifers-dominated site. See PC#1.6. T1.4b – The plant community would be set back to a shrub state if a block harvest or a moderate fire occurred. See PC#1.2.

State 5
Plant Community 1.6

Community 5.1
Plant Community 1.6

This plant community is dominated by both redwood and Douglas-fir in the overstory, with redwood being slightly more dominant than Douglas-fir. Tanoak exists in the sub-canopy and in the shrub layer, along with California huckleberry. T1.6a – In the event of a moderate fire or block harvesting, the plant community could be set back to shrubs. See PC#1.2 and 1.3. T1.6b – Partial cutting in PC #1.6 could allow tanoak to become dominant in created openings. See PC#1.4.

State 6
Plant Community 1.5

Community 6.1
Plant Community 1.5

Following fire or block cutting, and if a seed source is present, Douglas-fir will infill to form a dense stand of trees. The same result has occurred historically from past aerial seeding and planting of Douglas-fir. Redwood will sprout following disturbance but is far outnumbered by the dense thicket of Douglas-fir regeneration. Eventually, redwood infill from adjacent seed sources begins to occur under the shade of established Douglas-fir. After many years, the plant community becomes dominated by both Douglas-fir and redwood. The understory cover of shrubs is light to moderate with California huckleberry and salal. Periodic fire could kill young redwood and maintain a dominate stand of Douglas-fir. T1.5a – Over a long period of time and with fire exclusion, redwood may become the dominant conifer on some sites. With timber stand management and tree planting, species composition could shift to a redwood dominated site. See PC#1.6.

Additional community tables

Animal community

The Redwood forest provides habitat for many species of mammals and native birds. Predators include black bear, fisher and marten, mountain lion, fox and bobcat. Ungulates included deer and elk, which use the forested areas for foraging and cover.

Many bird species use the redwood forest on a seasonal basis. Bird species include warblers, tanagers, sparrows, blackbirds, the Marbeled Murrelet, the Northern spotted owl and the Bald Eagle.

Tanoak provides an important wildlife habitat for many animals, by providing forage and cover sites for mammals such as: squirrel, black bear and black-tailed deer; as well as many birds, including the band-tailed pigeon and various cavity nesters.

Common reptiles found in forested areas would include the alligator lizard and garter snake.

Amphibians are mostly associated with riparian and wetland areas. The northwest salamander and two newt species spend much of their lives in upland habitat.

Hydrological functions

The site is subject to erosion where adequate vegetative cover is not maintained. Road building, timber harvest, and site preparation for planting may increase surface erosion and potential for mass wasting.

Hydrologic Group

583 Wiregrass--C
584 Wiregrass--C
584 Scaath--C
585 Wiregrass--C
585 Rockysaddle--D
586 Rockysaddle--D

Recreational uses

Limitations to recreational uses and development may occur due to slope considerations, the amount of rock fragments, or soil permeability.

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.

Tanoak is most widely used as a source of firewood. Manufacture of tanoak products has been limited due to lack of demand and difficulty in processing. When processed properly, it may be used for flooring or paneling. The wood may also be chipped for particle board and pulp manufacture.

Other products

Redwood burls are used for tabletops, veneers, bowls and other turned products. Redwood bark is widely used as garden mulch.

Douglas-fir is a very desirable Christmas tree; branches and cones are also used as materials for Christmas wreaths.

Foliage of the California huckleberry is used by florists in floral arrangements and to make Christmas decorations.

Table 6. 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*	168	174	263	282	–	–	–	
Douglas-fir	*PSME*	115	150	106	158	–	–	–	

Inventory data references

Forestry data for this ecosite was collected at the following soil pits:

Rockysaddle 585 04-138
Rockysaddle 586 04-107
Scaath 584 04-141
Wiregrass 583 04-107
Wiregrass 584 04-054
Wiregrass 584 05-007
Wiregrass 585 04-142
Wiregrass 585 04-137
Wiregrass 585 04-055
Wiregrass 585 04-055

Other references

Adams, W. T. et al, 1992. Reforestation Practices in Southwestern Oregon and Northern California. Forest Research Laboratory, Oregon State University, Corvallis, Oregon.

Agree, James K., 2000. Fire Ecology of Pacific Northwest Forests. Island Press.

Burns, Russell M., and Honkala, Barbara H., Technical Coordinators. 1990. Silvics of North America. Agricultural Handbook 271, Volumes 1 and 2. United Sates Department of Agriculture, Forest Service.

Noss, Reed F., Editor. The Redwood Forest. History, Ecology and Conservation of the Coast Redwoods. Save-the Redwoods League. Island Press.

Contributors

Judy Welles

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:

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

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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:

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

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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:**
