USDA Natural Resources
Conservation Service

Ecological site F004BX105CA
Douglas-fir/tanoak/California huckleberry, ridge-tops, schist, red clay

Accessed: 05/19/2024

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.

Classification relationships

There is no relationship to other established classifications.

Associated sites

F004BX104CA	**Redwood-Douglas-fir/Pacific rhododendron, ridge-tops, schist, red clay** F004BX104CA also occurs on summits and steep mountain slopes west of Redwood creek. The majority of F004BX105CA occurs in the Mill and Rock Creek watesheds. F004BX104CA tends to be a more productive site than F004BX105CA due to a stronger coastal influence. Other than a decrease in soil moisture, the soils in these two ecological sites are fairly similar in characteristics.

Similar sites

F004BX104CA	**Redwood-Douglas-fir/Pacific rhododendron, ridge-tops, schist, red clay** F004BX104CA may be confused with this ecological site due to a similarity in vegetative composition. F004BX105CA tends to be a much drier site, as it is located further inland than F004BX104CA, resulting in a higher percentage of Douglas-fir to redwood, and a corresponding lower site productivity.

Table 1. Dominant plant species

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

Physiographic features

This ecological site is found on dry, upper-mountain slopes and narrow ridge-tops west of Redwood Creek, within the Mill and Rock Creek watersheds. It occurs on uniform to slightly convex shoulders with moderately steep to strongly sloping mountain summits.

Table 2. Representative physiographic features

Landforms	(1) Ridge (2) Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	28–805 m
Slope	9–50%
Water table depth	152 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate has warm, dry summers and cool, moist winters. This ecological site is found inland, and therefore has a greater daily temperature range than coastal areas where temperatures are moderated by fog. Average summertime temperatures range from 65 to 80 degrees F. The total annual precipitation ranges from 80 to 100 inches and usually falls from October to May.

*Note: No climate stations in close proximity to site. Data from climate station may not represent the conditions on the site.

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 influencing water features on this ecological site.

Soil features

These well-drained soils developed from colluvium and residuum derived from schist. They are very strongly to strongly acidic at 40 inches with a dominantly clayey subsurface rock content ranging from non-gravelly to gravelly. These soils are dominantly very deep, with small areas that are moderately deep to a paralithic contact.

Soils that have been tentatively correlated to: Soil Survey Area - Redwood National and State Parks

Mapunit Soil

563 Trailhead
563 Fortyfour
583 Trailhead

Table 4. Representative soil features

Surface texture	(1) Loam (2) Loam (3) Silty clay loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow to moderately slow
Soil depth	102–203 cm
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	10.16–20.32 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)	0–30%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The historical origins of fires within the northern Redwood 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. The northern range of redwoods evolved within a low to moderate natural disturbance regime. (Veirs, 1979).

Surface fires likely modified the tree species composition by favoring the thicker-barked redwood (*Sequoia sempervirens*) and killing western hemlock (*Tsuga heterophylla*), tanoak (Lithocarpus densiflorus) and grand fir (*Abies grandis*) (Veirs, 1979). Western hemlock's shallow roots and thin bark make it susceptible to fire damage (Arno, 2002). The establishment of a western hemlock understory is increased by surface fires. This is due to the exposure of mineral-rich soil and the reduction of other plant competition (Veirs, 1979, Williamson, 1976). Tanoak seedlings and sapling-sized stems are often top-killed by surface fire, though larger stems may survive with only basal wounding (Tappeiner, 1984).

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).

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).

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.

Pacific rhododendron (*Rhododendron macrophyllum*) is considered sensitive to fire and may sprout from the rootcrown or stembase following surface fire (Crane, 1990). After disturbance a decrease in plant cover is common, followed by a gradual increase over time.

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. On alluvial sites with periodic flooding, redwood may dominate, along with other colonizing hardwoods (Veirs, 1996). Where existing redwoods are inundated, new roots develop in newly deposited silt (Veirs, 1996).

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

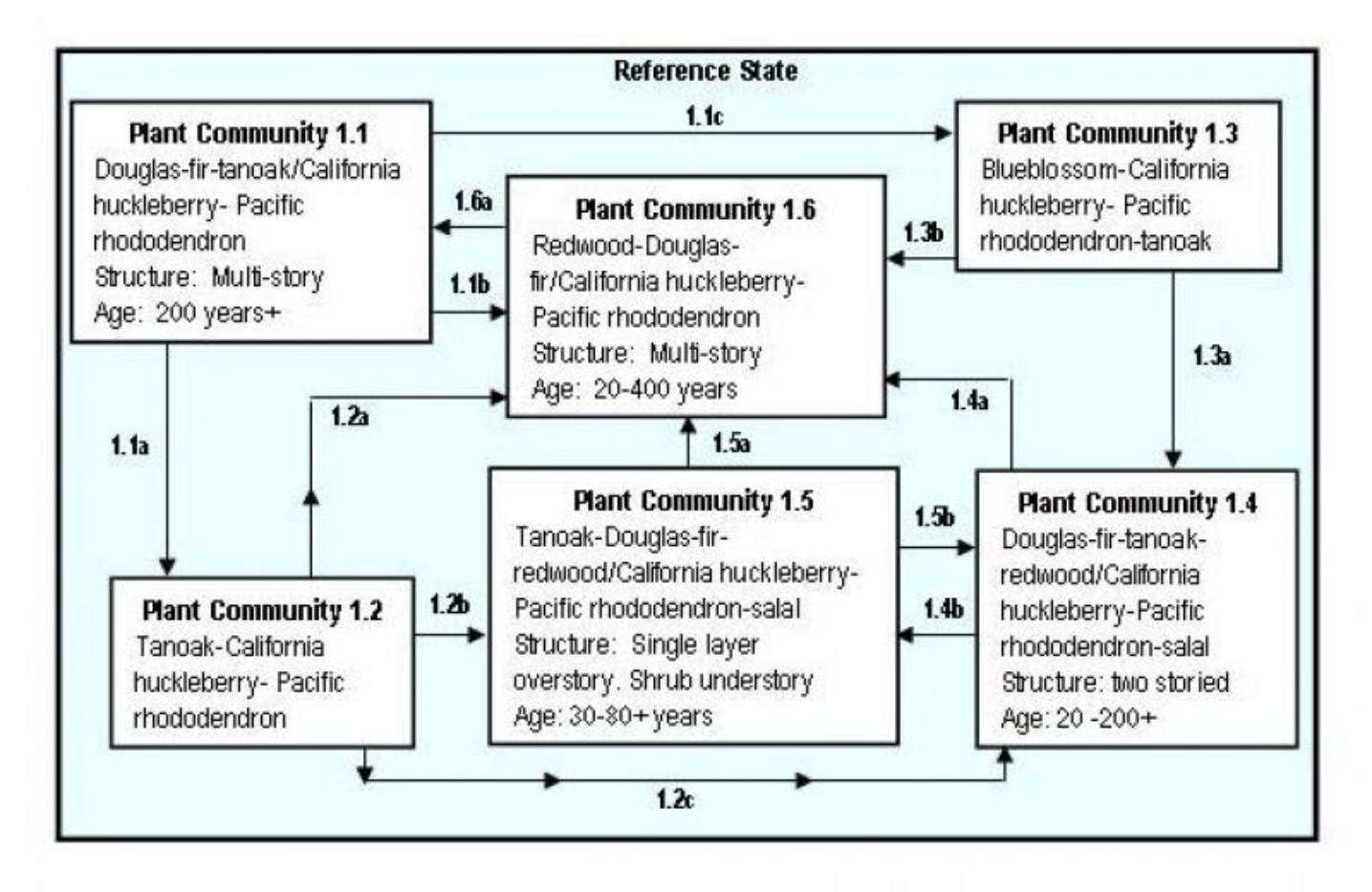

Figure 4. Douglas-fir/tanoak/California huckleberry model

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. It is characterized by an overstory community dominated by Douglas-fir (*Pseudotsuga menziesii*), with a moderate cover of tanoak (Lithocarpus densiflorus) in the sub-canopy. Redwood (*Sequoia sempervirens*) is generally present in significantly lesser amounts. The understory is shrub-dominated with California huckleberry (*Vaccinium ovatum*) Pacific rhododendron (*Rhododendron macrophyllum*), and a minor amount of salal (*Gaultheria shallon*). Cover of grass and forbs are very low. Moderate fire or partial cutting could perpetuate the Douglas-fir/tanoak mix. Tanoak grows rapidly in created openings. Douglas-fir needs disturbance and enough sunlight to reproduce successfully. 1.1a – In the event of block harvesting followed by post-harvest burning, a shrub-dominated plant community of tanoak, California huckleberry and Pacific rhododendron may develop. These species are all capable of sprouting and recovering rapidly following mechanical disturbance and fire. See PC#1.2. 1.1b – In the event of fire exclusion and subsequent infill, redwood could become a more significant component of the plant community. See PC#1.6. 1.1c – If a seed source is present; a shrub community dominated by blueblossom ceanothus (*Ceanothus thyrsiflorus*) may develop. See PC#1.3.

Forest overstory. The main overstory is primarily Douglas-fir, with a minor component of Redwood.

Tanoak forms a sub-canopy layer beneath the primary overstory.

Average Percent Canopy Cover:

Main canopy

Redwood 5-25%
Douglas-fir 50-70%

Sub-canopy

Tanoak 20-30%
Other hardwoods <5%

Forest understory. The understory is dominated by California huckleberry and Pacific rhododendron. Salal is present in the understory in varying amounts.

Average Percent Canopy Cover

California huckleberry 25-40%
Pacific rhododendron 5-15%
Salal 0-5%

State 2
Plant Community 1.2

Community 2.1
Plant Community 1.2

Following harvest and post-harvest burning, a shrub community dominated by tanoak, with lesser amounts of California huckleberry, Pacific rhododendron, and possibly salal, will likely develop. These species all respond to disturbance by sprouting and are capable of rapid growth. 1.2a – If this plant community were treated with either brush control or chemical control in conjunction with tree planting, a redwood/Douglas-fir plant community could develop. See PC#1.6. 1.2b – Without disturbance or management, growth of tanoak will continue over time. It will

become the dominant tree cover over conifers. There will also be a shrub layer composed of California huckleberry, Pacific rhododendron and salal. See PC#1.5. 1.2c – The use of brush management or chemical control, in conjunction with tree planting, will develop a conifer-hardwood plant community dominated by Douglas-fir. See PC#1.4.

State 3
Plant Community 1.4

Community 3.1
Plant Community 1.4

This plant community is characterized by Douglas-fir, tanoak, and some redwood dominating the tree layer. California huckleberry, Pacific rhododendron and salal are in the shrub layer. 1.4a – A redwood/Douglas-fir plant community could develop with the use of chemical control or partial cutting of tanoak; tree planting and timber stand management may also be used. See PC#1.6. 1.4b – Moderate fire could kill young Douglas-fir, causing the plant community to become tanoak-dominated for a period of time. See PC#1.5.

State 4
Plant Community 1.3

Community 4.1
Plant Community 1.3

If a seed source is present, a blueblossom plant community may form following post-harvest burning. Blueblossom reproduces from seed banks and stem-sprouting. Fire generally improves germination rates of this species. Other shrubs present, such as California huckleberry, Pacific rhododendron and tanoak will be killed or damaged by burning and later respond by vigorous sprouting. Periodic fire could maintain this plant community. 1.3a – If left undisturbed, conifers should establish over time. Blueblossom declines in vigor with age and dies as it is shaded out by the growing conifers. See PC#1.4. 1.3b – With chemical control, tree planting, and timber stand management, the plant community could eventually return to redwood/Douglas-fir plant community. See PC#1.6.

State 5
Plant Community 1.5

Community 5.1
Plant Community 1.5

Tanoak grows rapidly and initially dominates the overstory above Douglas-fir and redwood. 1.5a – The establishment of conifers may be accelerated by partially cutting tanoak, followed by tree planting, or chemical treatments. See PC#1.6. 1.5b – With time, conifers grow in height and eventually over-top the tanoak, to become the dominant overstory. Tanoak continues to occupy the sub-canopy. See PC#1.4.

State 6
Plant Community 1.6

Community 6.1
Plant Community 1.6

Redwood height eventually surpasses that of Douglas-fir. Douglas-fir is still a major part of the overstory and is nearly equally represented as redwood. 1.6a – Fire or partial cutting could shift dominance to Douglas-fir. See PC#1.1.

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.

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 harvesting, and site preparation for planting may have limitations on slopes greater than 25%.

Hydrological Group:

Trailhead-563--C
Trailhead-583--D
Fortyfour-563--D

Recreational uses

Limitations for trail development and use may exist on slopes greater than 25%.

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

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.

California huckleberries are made into wine, as well as processed into pie fillings for home and commercial use. Foliage of the California huckleberry is used by florists in floral arrangements and to make Christmas decorations.

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*	110	150	125	214	–	–	–	
Douglas-fir	*PSME*	120	155	115	164	–	–	–	

Inventory data references

Vegetation plots were established in conjunction with soil pits or along transects.

The references pertain to the soil pit or transect number within the following components and map units:

Fortyfour 563
04-51

Trailhead 563
05-150
6030

Trailhead 583
04-091

Other references

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Noss, Reed, F., editor. 2000. The Redwood Forest. 377 pages.

Silvics of North America. 1990. USDA Handbook 654

Tappeiner, John C., II; Harrington, Timothy B.; Walstad, John D. 1984. Predicting recovery of tanoak (Lithocarpus densiflorus) and Pacific madrone (Arbutus menziesii) after cutting or burning. Weed Science. 32: 413-417.

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Viers, Stephen D. 1996. Ecology of the Coast Redwood. Conference on Coast Redwood Forest Ecology and Management. P 9-12.

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Williamson, Richard L.; Ruth, Robert H. 1976. Results of shelterwood cutting in western hemlock. Res. Pap. PNW-201. Portland, OR: U.S.
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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:**
