USDA Natural Resources Conservation Service

Ecological site F004BX118CA
Sitka spruce-redwood/salal/western brackenfern, marine terraces, marine deposits, fine sandy loam

Accessed: 04/19/2024

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.

Associated sites

F004BX108CA	**Redwood, western swordfern, mountain slopes, sandstone and schist, clay loam** F004BX108CA can be found in conjunction with this ecological site overlying sandstone and mudstone bedrock. F004BX108CA has a greater component of redwood in the overstory.
F004BX121CA	**Redwood-Sitka spruce/salal-California huckleberry/western swordfern, marine terraces, marine deposits, sandy loam and loam** F004BX121CA can be found adjacent to or slightly above this ecological site on an older marine terrace. F004BX121CA has a component of Sitka spruce in the overstory but can also have redwood and Douglas-fir.

Similar sites

F004BX110CA	**Sitka spruce-red alder/salmonberry/western swordfern, hills, sandstone and mudstone, clay loam** F004BX110CA is also adjacent to the coast and has a similar overstory component of Sitka spruce, but it is located on steeper sloped mountains of sandstone and mudstone parent material.

Table 1. Dominant plant species

Tree	(1) *Picea sitchensis* (2) *Sequoia sempervirens*

Shrub	(1) *Gaultheria shallon*
Herbaceous	(1) *Pteridium aquilinum*

Physiographic features

This ecological site is found on marine terraces around Crescent City, CA and Trinidad, CA, which were uplifted ~80,000 years ago. The site occurs on a uniform, nearly level to gently sloping surface. The flat terrace geomorphology and proximity to coastal harbors have made these soils prime for pasture and urban development.

Table 2. Representative physiographic features

Landforms	(1) Marine terrace
Flooding frequency	None
Ponding frequency	None
Elevation	0–200 ft
Slope	0–9%
Water table depth	30–40 in
Aspect	N, W, NW

Climatic features

The climate of this ecological site is humid with cool, foggy summers and cool, rainy winters. Close proximity to the coast limits the diurnal and seasonal range in temperatures. Mean annual precipitation ranges from 70 to 90 inches and usually falls from October to May. Mean annual temperature is 52 to 57 degrees F.

Table 3. Representative climatic features

Frost-free period (average)	330 days
Freeze-free period (average)	330 days
Precipitation total (average)	90 in

Influencing water features

There are no influencing water features on this site.

Soil features

These very deep soils formed in weakly consolidated marine sediments and are found on marine terraces close to the coast. These soils are isomesic and have mean summer and mean winter soil temperatures that differ by less than 6 degrees C. These soils have an udic moisture regime and a seasonal water table for 20 to 30 days at 75 - 100 cm depth. Arcata soils are classified as coarse-loamy, mixed, superactive, isomesic, Oxyaquic Dystrudepts.

Soils from CA605 Northern Humboldt and Del Norte Soil Survey Area that have been tentatively correlated to this ecosite include:

Map unit Soil component
145 Arcata
146 Arcata

Table 4. Representative soil features

Surface texture	(1) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderate
Soil depth	60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	7.9–8.2 in
Calcium carbonate equivalent (0-40in)	0%
Subsurface fragment volume <=3" (Depth not specified)	0–3%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This ecological site occupies marine terraces around Trinidad, CA and Crescent City, CA and is largely contained with the coastal fog belt. Because of its proximity to coast and flat terrain, this site has been heavily managed for agriculture, timber production, and residential construction.

Sitka spruce (*Picea sitchensis*) is the dominant tree species occupying a thin band along the north coast of California and extending north to the coast of British Columbia (Franklin and Dyrness 1973). This site is found adjacent to the coast and receives high inputs of sea salt spray, a condition that limits the establishment and growth of certain conifer species. Sitka spruce has a high tolerance for salt spray, while salt-laden winds can dehydrate and damage redwood (*Sequoia sempervirens*) (Zinke 1988). Inland from the effect of the marine air, redwood is commonly found and can dominate the overstory. The range of redwood 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 summer months for redwood, which has high transpiration rates. This ecological site straddles the boundary of this salt-laden marine influence, so both Sitka spruce and redwood occupy the site. Red alder (*Alnus rubra*) is a common associate species on this site and can dominate the site in an early seral stage.

This ecological site has developed with a low natural disturbance regime. Mean fire intervals for the area may be around 10 years but with low intensity (Brown and Swetnam 1993). The close proximity to the coastal zone has caused this site to evolve with small to moderate disturbances from wind events. Winter windstorms can cause broken tops and windthrow. Repeated disturbance by wind is evidenced by a hummocky ground appearance caused by fallen trees and root wads (Agee, 1993). Pioneer species such as native shrubs and nitrogen-fixing red alder may quickly colonize windthrow gaps. . In the Sitka spruce coastal zone following logging, dense shrub communities can arise, and nurse logs are important for spruce regeneration (Franklin and Dyrness 1979). Salmonberry (*Rubus spectabilis*), salal (*Gaultheria shallon*), and bracken fern (*Pteridium aquilinum*) may become very dense following a disturbance and can potentially form large brushfields (Tirmenstien 1989, Crane 1990). These species can reproduce vegetatively following timber harvesting or fire. Though these brush species are most prevalent in early to mid-seral successional stages, they persist in the openings of mature stands.

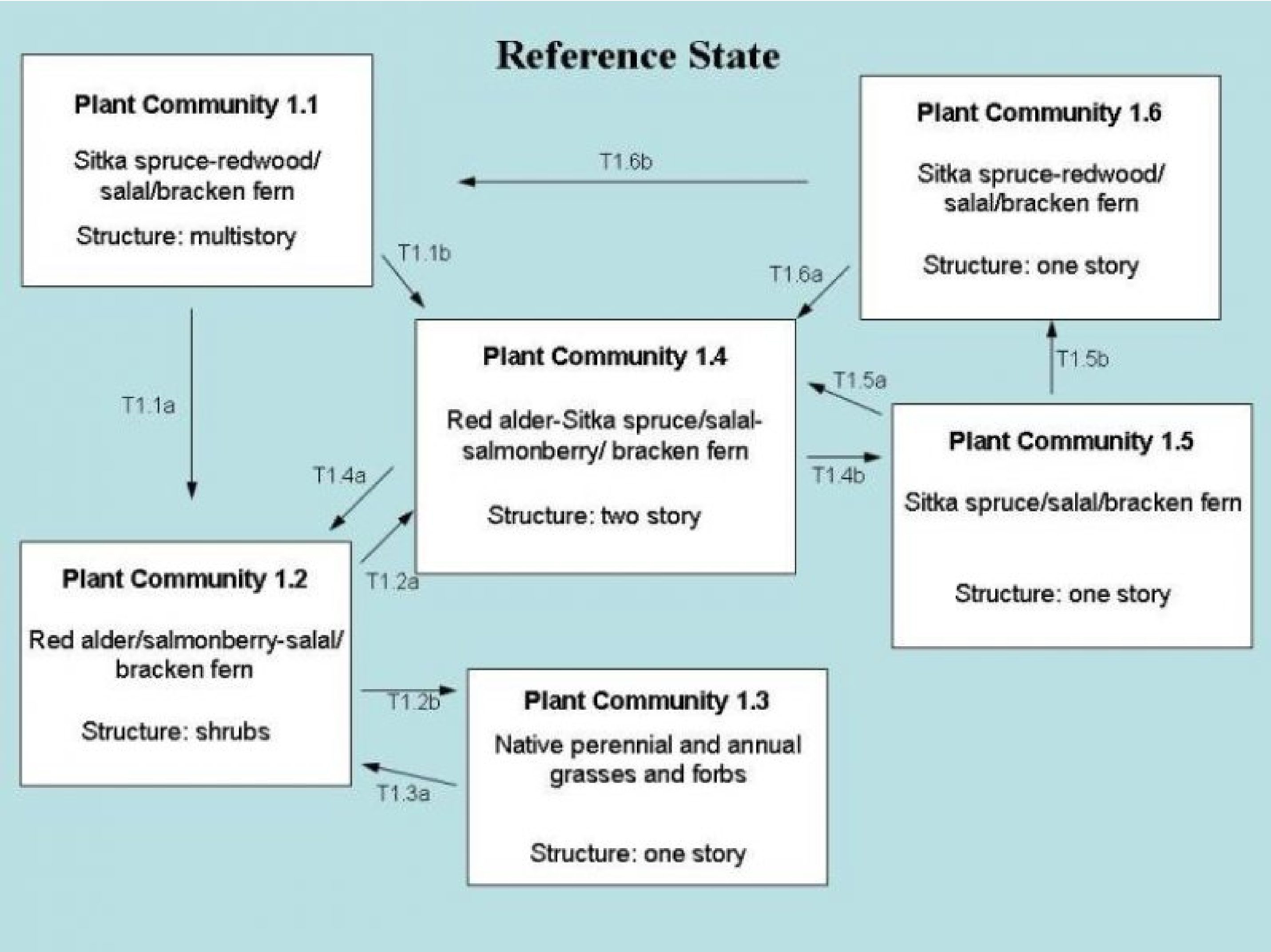
Human interactions with the coast landscape have left a significant mark on this ecological site. Much of this ecological site is currently in pastureland and residential use between Crescent City and Smith River in Del Norte County. Historical photos indicate European settlers cleared terrace land around Trinidad for agriculture in order to provision the growing port (Trinidad Museum). Established before the towns around Humboldt Bay, Trinidad was a bustling port servicing miners coming down from the Klamath Mountains and ships loaded with goods headed up the Oregon Coast or down to San Francisco Bay.

Further evidence for land clearing and an open coastal prairie landscape is indicated by the dense even-aged stands of Sitka spruce now occupying much of the Trinidad headlands. Older open grown wolf trees can also be seen in the area indicating a more open pasture landscape. Sitka spruce can rapidly invade adjacent coastal prairies after cessation of burning, grazing, or tilling (Franklin and Dyrness 1973). If land clearing and stump removal did occur, redwood regeneration may be slow to infill onto the site. Historically, land clearings would have been occupied by native perennial and annual grasses and forbs with deliberate plantings of other species for forage and cultivation. Current cleared areas of this site are now dominated by both native and non-native species.

This ecological site occupies young marine terraces near Trinidad and Crescent City. 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, Patrick’s Point 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), which in the case of the A Line terrace (Savagecreek soils) influences water drainage and vegetation patterns distinct from the other terraces. The Patrick’s Point terrace, upon which this ecological site is found, likely formed about 82,000 years ago during the last interglacial period (Rust). Marine terraces in the vicinity of Crescent City suggest similar deposition during sea level high stands, with the formation of the terrace upon which this ecological site is found occurring approximately 80,000 years ago (Lorenz and Kelsey 1999). The recent formation of these terraces suggests a limitation to the amount of pedogenesis that has yet occurred in these young sediments.

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 these ecological sites.

State and transition model



State 1
Reference State - Plant Community 1.1

Community 1.1
Reference State - Plant Community 1.1

This plant community is the presumed reference plant community because no remnant stands of this site are currently present on the landscape. Sitka spruce (*Picea sitchensis*) and Redwood (*Sequoia sempervirens*) dominate the overstory, with occasional red alder (*Alnus rubra*) occurring in canopy gaps. Western hemlock (*Tsuga heterophylla*) can be a rare associate on some sites. The understory is dominated by salal (*Gaultheria shallon*)and bracken fern (Pteridium aquilium). On some sites salmonberry (*Rubus spectabilis*) and California huckleberry (*Vaccinium ovatum*) may also be significant understory species. This reference plant community is presumed because old-growth communities are no longer present on the landscape. T1.1a) Following block harvest, red alder, salmonberry and salal may rapidly colonize the site and slow the regeneration of conifers. T1.b) Selective harvesting of redwood could allow Sitka spruce and red alder to infill into the site in canopy gaps.

Forest overstory. Sitka spruce and redwood dominate the overstory, with red alder occurring in patches throughout the plant community. A larger percentage of Sitka spruce may be found in the overstory on sites closer to the coast as proximity to sea spray may limit the growth and productivity of other conifers.

Forest understory. The understory is dominated by salal and bracken fern. Pockets of more dense understory may develop in canopy gaps.

Understory percent canopy cover:

salal 5-75%

bracken fern 5-15%
salmonberry 0-10%
California huckleberry 0-15%
false lily-of-the-valley <5%

State 2
Plant Community 1.2

Community 2.1
Plant Community 1.2

Red alder will quickly become established on the site post harvest. Salal cover may initially be reduced by block harvesting and post-harvest burning it can often quickly colonize open areas left by canopy gaps. Salmonberry will likely colonize the open site as it is a prolific seeder and sprouts following disturbance. T1.2a) Without management, red alder can dominate the site for 30 years, limiting the growth of conifers. Over time, Sitka spruce recruits will grow to equal height as red alder. If land has been cleared and stumps removed, redwood will not easily regenerate on the site. T1.2b) Frequent burning, land clearning, and intensive grazing could create and maintain an open prairie of perennial and annual grasses. Early European settlers cleared marine terrace land along the coast to creat farmland and rpvide pasture for livestock. Intensive management of this site with land clearing, grazing, and seeding of non-native species for livestock forage can create this pastureland community phase. T1.2c) Intensive management of this site with land clearing, grazing, and seeding of introduced species for livestock forage can create a pastureland community phase.

State 3
Plant Community 1.4

Community 3.1
Plant Community 1.4

Red alder and Sitka spruce co-dominate the canopy in this plant community, while salmonberry and salal may be patchier and will exist primarily in openings caused by windfall. Selective harvest of Sitka spruce could result in red alder dominating the canopy for several decades. T1.4a) Block harvesting will reduce light and nutrient limitations and encourage colonization by shrubs and red alder. T1.4b) Mechanical or chemical hardwood management techniques could accelerate the establishment and growth of Sitka spruce by decreasing competition for light from red alder and shrub species.

State 4
Plant Community 1.5

Community 4.1
Plant Community 1.5

This plant community is characterized by a nearly closed canopy of Sitka spruce with a relatively high trees per acre. These dense stands result from Sitka spruce encroachment on pastureland or direct seeding. The understory is often sparse as reduced light penetrates the canopy. T1.5a) Selective harvesting of Sitka spruce could allow for red alder to regain dominance in the overstory. T1.5b) Time and an intermediate disturbance regime could create the opportunity for the site to transition towards the Sitka spruce reference plant community with a multi-layered canopy a diverse subcanopy and understory.

State 5
Plant Community 1.3

Community 5.1
Plant Community 1.3

A pastureland community phase could arise if frequent land clearing, burning or intensive grazing occured on this site. This plant community phase contains native annual and perennial grasses and forbs. T1.3a) Cessation of grazing, farming, or burning would provide the opportunity for red alder, shrubs, and Sitka spruce to encroach the pasture.

State 6
Plant Community 1.6

Community 6.1
Plant Community 1.6

This community phase is dominated by pastureland comprising grasses and forbs selected for forage or agriculture. The history of intensive grazing with domestic livestock and seeding of introduced forage species has provided for the sustained existence of pastureland over a large area of this ecological site. T1.6a) Selective harvest of redwood could create a Sikta spruce-red alder canopy. T1.6b) Time and an intermediate disturbance regime could create the opportunity for the site to transition towards the redwood-Sitka spruce reference plant community with a multi-layered canopy and a diverse understory.

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

Soils have a moderate infiltration rate when thoroughly wet. 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.

Hydrologic Group

Map Unit Component

145 Arcata - C
146 Arcata - C

Recreational uses

Recreational development is extensive on this ecological site because of its flat terrain and proximity to the coast. Many state parks along the Humboldt County coast lie within this ecological site and provide hiking, picnicking, and cultural resource history activities for the public.

Wood products

Sitka spruce is used as saw timber, wood pulp and plywood. It has a high stength to weight ratio which is valuable for use as masts for sail boats, oars, boats and racing sculls. It is also valued for use in making guitars and for piano sounding boards.

Other products

Salal berries and salmonberries can be eaten fresh or preserved. They are an important food source for birds and other animals. Salal foliage are used in floral arrangements. Edible mushrooms can be found on this ecological site by experienced fungi identifiers.

Other information

Site index curves for overstory tree species:

Sitka spruce: #490, base age 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
Sitka spruce	*PISI*	177	200	267	300	–	–	–	

Inventory data references

Data supporting this ecological site description was collected from the following forestry plots in the Northern Humboldt and Del Norte soil survey area (CA605):

09F023
09F027
09F028
09F033
09F038

Type locality

Location 1: Humboldt County, CA	
Township/Range/Section	T9N R1W S13
UTM zone	N
UTM northing	4557425.51
UTM easting	0405399.32
General legal description	USGS Trinidad Quadrangle. Located in Big Lagoon State Park, a component of Humboldt Lagoons State Park.

Other references

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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):**

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

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:**

17. **Perennial plant reproductive capability:**