

Ecological site R019XI112CA Moderately deep volcanic slopes 13-31" p.z.

Accessed: 05/08/2024

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.

Similar sites

R019XI105CA	Deep slopes 13-24" p.z. This is a chaparral ecological site generally found on south slopes with coastal sage.
R019XI110CA	Concave slopes 13-24" p.z. This is a chaparral site found on the shist geology and it has a high diversity of chaparral shrubs.
R019XI108CA	Convex slopes 13-24" p.z. This is a manzanita-scrub oak chaparral site, found on ridges.
R019XI109CA	Shaly slopes 13-24" p.z. This is a chaparral community dominated primarily by <i>Quercus pacifica</i> and found on the shale geology.
R019XI106CA	Shallow slopes 13-31" p.z. This is a prostrate chamise chaparral type, found on wind blown ridges.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Quercus pacifica</i> (2) <i>Quercus agrifolia</i>
Herbaceous	Not specified

Physiographic features

This ecological site is found primarily on the backslopes of mountains and hills, on slopes ranging from 20 to 85 percent, and elevations from sea level to 2470 feet.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Mountain
Flooding frequency	None
Ponding frequency	None
Elevation	0–753 m
Slope	20–85%
Aspect	N, NE, NW

Climatic features

This ecological site is found on two of the five northern Channel Islands—Santa Cruz and Santa Rosa. Each island has a different temperature and precipitation range, however for the purposes of this description, they have all been averaged together to capture the entire range of variance.

The average annual precipitation is 19 inches with a range between 13 to 24 inches, mostly in the form of rain in the winter months (November through April). The average annual air temperature is approximately 56 to 73 degrees Fahrenheit, and the frost-free (>32F) season is 320 to 365 days.

NOTE: Data collected for monthly precipitation and temperatures is only from one climate station/island, and may not capture the variance in climates on each of the five islands.

Table 3. Representative climatic features

Frost-free period (average)	365 days
Freeze-free period (average)	365 days
Precipitation total (average)	787 mm

Influencing water features

This site is not influenced by wetland or riparian water features.

Soil features

These soils are comprised of volcanic breccia, andesite, and basalt. They are moderately deep to bedrock, well-drained with very high runoff, and moderately slow permeability above the bedrock. Soil textures are clayey, with an available water capacity between 3.4 and 6.9 inches.

Mean annual soil temperatures (MAST) on Santa Cruz Island range from 54 to 59 degrees F on north-facing slopes, which are classified as isomesic, and 59 to 71 degrees F on south-facing slopes, which are classified as thermic. MAST on Santa Rosa Island ranges from 59 to 64 degrees F, which are also classified as thermic.

This ecological site is found on the following map units and soil components:

SSA MU SYM Component

CA688 262 Halyard

CA688 152 Starboard

CA688 250 Starboard

CA688 260 Starboard

CA688 263 Starboard

CA688 272 Starboard

CA688 290 Starboard

Table 4. Representative soil features

Surface texture	(1) Gravelly (2) Very gravelly
Family particle size	(1) Clayey
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderate
Soil depth	51–99 cm
Available water capacity (0-101.6cm)	8.64–17.53 cm

Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.1–7.8
Subsurface fragment volume <=3" (Depth not specified)	5–35%

Ecological dynamics

The reference state for this ecological site is the shrubland and woodland communities of Santa Cruz and Santa Rosa Islands. Dominate species include Channel Island scrub oak (*Quercus pacifica*) and California live oak (*Quercus agrifolia*). Toyon (*Heteromeles arbutifolia*) and summer holly (*Comarostaphylis diversifolia*) are occasionally present with low cover. The understory is mostly deep leaf litter, with grasses in the canopy openings. This plant community is similar to the historic plant community in primary species composition, but the understory and the distribution have changed. Many native species may have been eliminated from this area, with non-native species taking their place. Severe grazing and pig disturbances may have killed many of the young oak seedlings and sprouts, affecting the long term regeneration of this community. Grazing on the lower branches of the shrubs has also altered the stature of this community to appear more like woodland than a shrubland.

The historical fire regime for this community is unclear. The natural fire return interval for the chaparral in this area was probably greater than 70 years (Keeley and Fotheringham, 2001). Fire intervals may have been up to 200 years, but have generally increased to 40 to 50 year intervals with the increase in human caused fires. Data suggest the oak woodlands burned much more frequently, possibly at 10 to 30 year intervals (Steinburg, 2002). It was not stated, but this lower interval may include both surface and crown fires, whereas the chaparral fires were based on canopy fires. Lightning, the primary natural ignition source, is very uncommon on these islands (Keeley, 2000). Only three lightning-ignited fires have been documented on the Channel Islands in the last 140 years (Junak et al., 1995). When fires are ignited early in the season they tend to remain small in size. However, the Santa Ana winds in the fall can spread fires rapidly and cover large areas. Native Americas used to burn the grasses under the oaks every one to two years. However, if a canopy replacing fire becomes too frequent (less than 10 year intervals) it could detrimentally affect the regeneration of seedlings. Plant species which rely on reproducing from seed do not reach maturity during short fire intervals, and cannot replenish their seedbanks in time. Frequent fires also tend to favor non-native annual grasses and forbs. (Haidinger and Keeley, 1993; Keeley 2003).

After a canopy replacing fire, native grasses and annual forbs dominate for a couple of years, but the California live oak and Channel Island scrub oak quickly regain dominance by re-sprouting and establishing seedlings. The oak community can be replaced by the non-native annual grassland community if fires become too frequent or if heavy grazing causes soil loss or inhibits the shrubs from regenerating properly. The grasses can in turn increase the frequency of fire due to the production of an easily ignited and continuous fuel cover.

Very little research can be found concerning the fire effects on Channel Island scrub oak (*Quercus pacifica*), and more research is needed to determine how it responds to fire. Research has shown that California live oak (*Quercus agrifolia*) is well adapted to fire. It has very thick bark, evergreen leaves, and a strong ability to resprout after fire. It will often resprout from the charred upper branches and the root crown within two months of the burn. After 8 to 10 years the full pre-fire canopy is often restored. California live oak also regenerates from seed. Scrub jays help in the dispersal by caching the seeds and not recovering them all. The young seedlings show better survival rates the first season under nurse plants, such as coastal sagebrush and the bush monkeyflower. They also survive moderately well under the canopy of existing oaks (Steinburg, 2002).

In addition to fire, pig disturbance is detrimental to the regeneration of oaks on the Channel Islands. The pigs favor acorns and will dig up and consume both the acorns and young seedlings, leaving disturbed soil that is easily invaded by non-natives. The National Park Service is currently working to remove feral pigs completely from the island (NPS, 2006).

State and transition model

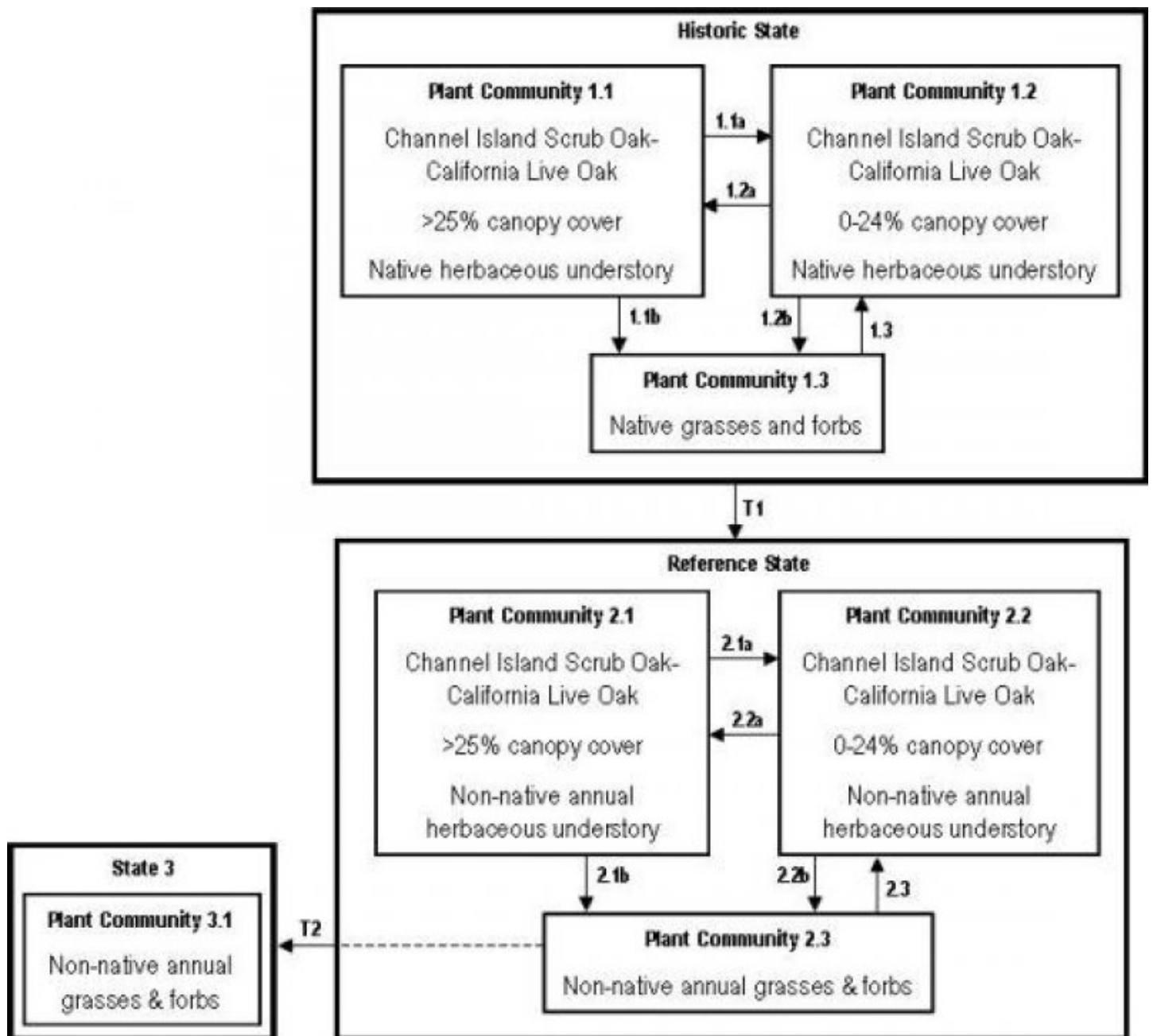


Figure 3. State Transition Model

State 1

Reference State - Plant Community 2.1

Community 1.1

Reference State - Plant Community 2.1

This state is similar to the reference state, PC 1.1 and is still dominated by Channel Island scrub oak and California live oak, but now has an understory of non-native annual grasses and forbs. The non-native annual grassland community is common throughout California. The primary species are slender oat (*Avena barbata*), wild oat (*Avena fatua*), ripgut grass (*Bromus diandrus*), soft brome (*Bromus hordeaceus*), and Spanish brome (*Bromus madritensis*). Community Pathway 2.1a: The shift from PC 2.1 to PC 2.2 historically occurred under a fire regime of approximately 70 to 200 years, with lightning being the primary ignition source. However, fires have generally increased due to an increase in human-caused fires since the arrival of European settlers. Fires result in a decrease in shrub cover and an increase in the non-native understories dominated by non-native annual grasses. Community Pathway 2.1b: The shift from PC 2.1 to PC 2.3 occurs if fires become more frequent (less than 10 year intervals). Non-natural grazing by livestock and non-native wildlife can also push PC 2.1 towards PC 2.3.

State 2

Historic State - Plant Community 1.1

Community 2.1

Historic State - Plant Community 1.1

This historic community is represented by Channel Island scrub oak (*Quercus pacifica*) and California live oak (*Quercus agrifolia*), with the Channel Island scrub oak having a higher cover across the area. Other oaks may be present occasionally as well, such as toyon (*Heteromeles arbutifolia*) and summer holly (*Comarostaphylis diversifolia*). The understory is sparse, and covered with a deep layer of leaf litter. Historically, native needlegrasses (*Nassella* spp.) were dominant in the canopy openings. Community Pathway 1.1a: The shift from PC 1.1 to PC 1.2 occurs under the natural fire regime of 70 to 200 years. Fire results in a decrease in shrub cover and an increase in the native perennial and annual herbaceous understory community. Community Pathway 1.1b: The shift from PC 1.1 to PC 1.3 occurs if fires become more frequent (less than 10 year intervals). Non-natural grazing by livestock and non-native wildlife can also push PC 1.1 towards PC 1.3.

State 3

Plant Community 1.2

Community 3.1

Plant Community 1.2

This state is dominated by native grasses and annual forbs, which will grow well while the canopy is open during the first couple of years following a fire. Most of the dominant shrub species are able to rapidly recover and grow after a fire, which will eventually lead back to PC 1.1. Community Pathway 1.2a: The shift from PC 1.2 back to PC 1.1 generally occurs after an extended period of time without disturbance from fires or grazing. After a fire, California live oak (*Quercus agrifolia*), and toyon (*Heteromeles arbutifolia*) will resprout from the root crown. Channel Island scrub oak (*Quercus pacifica*) will probably resprout as well. The oaks will also resprout from seeds. As the shrubs continue to increase in size and cover, they will eventually shade out the grasses and forbs in the understory and lead back to the pre-fire canopy cover of PC 1.1. Community Pathway 1.2b: The shift from PC 1.2 to PC 1.3 will take place under continued grazing or frequent fires (less than 10 year intervals). These disturbances will hinder the new growth of shrubs, leading to a state dominated by native perennial and annual herbaceous species.

State 4

Plant Community 1.3

Community 4.1

Plant Community 1.3

If frequent fire or heavy grazing continually impacts this site, the regeneration and growth of the shrubs will be greatly hindered. This will lead to a site dominated by native perennial and annual herbaceous species. Community Pathway 1.3: The shift from PC 1.3 back to PC 1.2 can occur after an extended period of time without disturbance from fires or grazing. Restoration efforts can also help to expedite the return of PC 1.2. Transition 1: Continued frequent fires and non-natural grazing by livestock and non-native wildlife can place a stress on PC 1.3. This pressure can give an advantage to encroaching non-native plant species and may lead to the invasion of non-native annual grasslands.

State 5

Plant Community 2.2

Community 5.1

Plant Community 2.2

This community is dominated by non-native annual grasslands, which will grow well while the canopy is open during the first couple of years following a fire. Most of the Channel Island scrub oak and California live oak will recover and grow after a fire, which will eventually lead back to PC 2.1. Community Pathway 2.2a: The shift from PC 2.2 back to PC 2.1 generally occurs after an extended period of time without disturbance by fire or grazing. New shrubs will resprout and begin to increase in size and cover. Eventually, the non-native annual grasslands will start to diminish as they are shaded out by the shrubs. Community Pathway 2.2b: The shift from PC 2.2 to PC 2.3 will take place

under continued grazing or frequent fires (less than 10 year intervals). These disturbances will hinder the new growth of shrubs, leading to a state dominated by non-native annual grasses and forbs.

State 6 Plant Community 2.3

Community 6.1 Plant Community 2.3

If frequent fire or heavy grazing continually impacts this site, the regeneration and growth of the shrubs will be greatly hindered. This will lead to a site dominated by non-native annual grasses and forbs. Community Pathway 2.3: The shift from PC 2.3 back to PC 2.2 could occur after an extended time without disturbance, and in conjunction with restoration efforts. Transition 2: Continual grazing as well as frequent fires occurring more often than the natural range could transition PC 2.3 into a long term state.

State 7 State 3 - Plant Community 3.1

Community 7.1 State 3 - Plant Community 3.1

This state is dominated by non-native annual grasses and forbs with no Channel Island scrub oak or California live oak present. Extensive restoration efforts would be needed to transition this state back to PC 2.2.

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
1	Shrubs and trees			168–560	
	Channel Island scrub oak	QUPA6	<i>Quercus pacifica</i>	56–224	–
	California live oak	QUAG	<i>Quercus agrifolia</i>	56–112	–
	oak	QUERC	<i>Quercus</i>	6–84	–
	toyon	HEAR5	<i>Heteromeles arbutifolia</i>	56–84	–
	summer holly	CODI3	<i>Comarostaphylis diversifolia</i>	6–56	–
Forb					
2	forbs			1–56	
	Cucamonga manroot	MAMA8	<i>Marah macrocarpus</i>	1–34	–
	stickywilly	GAAP2	<i>Galium aparine</i>	1–22	–
	springbeauty	CLAYT	<i>Claytonia</i>	1–2	–
Grass/Grasslike					
3	grasses			22–448	
	California brome	BRCA5	<i>Bromus carinatus</i>	1–22	–

Inventory data references

The following NRCS plots were used to describe this ecological site.

SC-313 lbs
 SRV-3 %
 SC-375% - site location
 SCV-1 % and lbs

Type locality

Location 1: Santa Barbara County, CA	
UTM zone	N
UTM northing	3769438
UTM easting	241124
General legal description	The site location is on Santa Cruz Island, just on the north side of the North Ridge, off of the Lagunitas Secas Road.

Other references

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McMurray, Nancy E. 1990. *Heteromeles arbutifolia*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/> [2005, June 29].

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Steinberg, Peter D. 2002. *Quercus agrifolia*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/> [2005, July 7].

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:**
