USDA Natural Resources
Conservation Service

Ecological site R019XI109CA
Shaly slopes 13-24" p.z.

Accessed: 05/21/2025

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

R019XI112CA	**Moderately deep volcanic slopes 13-31" p.z.** This chaparral ecological site has more shrub and understory diversity, and is on soils derived from volcanic parent materials.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Quercus pacifica*
Herbaceous	(1) *Bromus rigidus*

Physiographic features

This ecological site is found on all aspects, on the backslopes of hills. Slopes range from 15 to 80 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	0–2,470 ft
Slope	15–80%
Aspect	Aspect is not a significant factor

Climatic features

This ecological site is found only on Santa Cruz Island. However, due to its size, temperature and precipitation ranges have been grouped together to capture the entire island's 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.

Table 3. Representative climatic features

Frost-free period (average)	365 days
Freeze-free period (average)	365 days
Precipitation total (average)	24 in

Influencing water features

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

Soil features

These soils are primarily from uplifted marine deposits derived from clayey shale or residuum weathered from shale, andesite, and either basalt or volcanic breccia, or both. They are deep to very deep. The surface textures are loamy, with clayey subsurface textures. Permeability is slow, runoff is rapid, and they are moderately well-drained. Available water capacity ranges from 0.7 to 4.1 inches. Mean annual soil temperatures (MAST) range from 54 to 59 degrees F, which is classified as isomesic.

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

SSA MU SYM Component
CA688 200 Forestay
CA688 210 Forestay
CA688 210 Forestay (Strongly sloping)
CA688 263 Pachic Palexerolls

Table 4. Representative soil features

Surface texture	(1) Very gravelly (2) Gravelly (3) Extremely gravelly
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Moderately slow to very slow
Soil depth	4–59 in
Available water capacity (0-40in)	0.7–4.1 in
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	3.5–7.8
Subsurface fragment volume <=3" (Depth not specified)	5–60%
Subsurface fragment volume >3" (Depth not specified)	5–30%

Ecological dynamics

The reference state for this site is a Channel Island chaparral community, and is dominated by Channel Island scrub oak (*Quercus pacifica*). Other common plants include Santa Cruz Island manzanita (*Arctostaphylos insularis*) and California live oak (*Quercus agrifolia*). It is found in patches, primarily associated with the shale geology on the isthmus of Santa Cruz Island.

This community has been altered from the historic plant community—severe grazing in the past has caused a shift in species composition. Grazing has also produced a tree-like stature to the shrub oak, changing the appearance of the community. Much of the understory has been altered by this over-grazing which has increased the introduction of non-native species, such as wild oat (*Avena fatua*), black mustard (*Brassica nigra*), ripgut brome (Bromus rigidus), and horehound (*Marrubium vulgare*).

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 near

40 to 50 year intervals with the increase in human caused 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). Historical evidence from the nearby Santa Monica Mountains indicates that when chaparral burns, it is very intense and difficult to control (Keeley, 2002). 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. Fire in this community almost always burns the entire canopy, and so it is very unlikely it would remain a surface fire.

After a fire, native grasses and annual forbs dominate for a couple of years, but the chaparral shrubs quickly regain dominance by re-sprouting and establishing seedlings. The chaparral community can be replaced by the non-native annual grassland community if fires become too frequent. This community can also be caused by heavy grazing which can inhibit the shrubs from regenerating properly and can also lead to soil loss. The grasses can in-turn increase the frequency of fire since they provide an easily ignitable, continuous fuel cover.

Many of the shrubs are dependent on fire for regeneration. However, if fire becomes too frequent (less than 10 year intervals) it can detrimentally affect the chaparral species that rely on establishing seedlings rather than re-sprouting after a burn. These reseeding species do not reach maturity during short fire intervals, and cannot replenish their seed banks in time. Frequent fires also tend to favor non-native annual grasses and forbs. (Haidinger and Keeley, 1993; Keeley 2003). Very little research can be found concerning the fire effects on the island's endemic chaparral species, namely Santa Cruz Island manzanita (*Arctostaphylos insularis*) and Channel Island scrub oak (*Quercus pacifica*). More research is needed to determine which shrubs tend to re-sprout and which are obligate seeders. Species similar to the Santa Cruz Island manzanita and Channel Island scrub oak indicate that they will probably resprout well and reseed moderately well after fire.

State and transition model

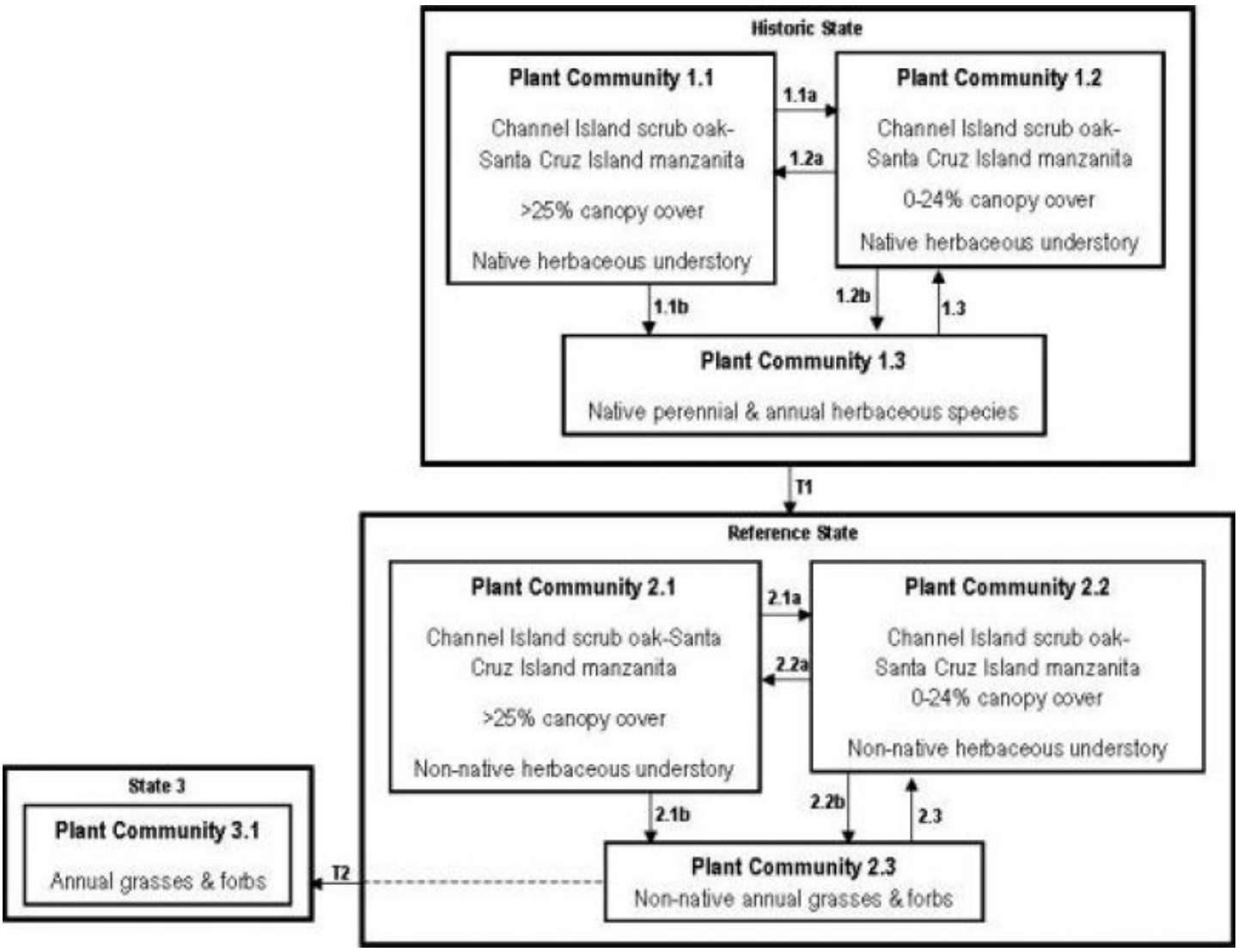

Figure 3. State Transition Model

State 1
Reference State - Plant Community 2.1

Community 1.1
Reference State - Plant Community 2.1

Figure 4. Shrub oak Woodland

This state is similar to the reference state, PC 1.1 and is still dominated by Channel Island scrub oak (*Quercus pacifica*) and Santa Cruz Island manzanita (*Arctostaphylos insularis*). However, it is now intermixed with a non-native annual grassland understory, which is common throughout California. The primary invading 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 occurs under a fire regime of approximately 70 to 200 years, with lightning being the primary ignition source. Fires have generally increased to 40 to 50 years 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). 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 community is represented by Channel Island chaparral and is dominated mostly by Channel Island scrub oak (*Quercus pacifica*) and Santa Cruz Island manzanita (*Arctostaphylos insularis*). California live oak (*Quercus agrifolia*) is occasionally present. It may also be intermixed with native grasses and coastal sagebrush, and generally has an understory with a dense layer of leaf litter. Community Pathway 1.1a: The shift from PC 1.1 to PC 1.2 occurs under the natural fire regime of approximately 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). 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, Santa Cruz Island manzanita (*Arctostaphylos insularis*) and Channel Island scrub oak (*Quercus pacifica*) will most likely resprout from the root crown. 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 Santa Cruz Island manzanita 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 Channel Island scrub oak and Santa Cruz Island manzanita 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 Santa Cruz Island manzanita present. Extensive restoration efforts could

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 (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
1	**Shrubs**			400–1400	
	Channel Island scrub oak	QUPA6	*Quercus pacifica*	400–600	–
	California live oak	QUAG	*Quercus agrifolia*	10–400	–
	island manzanita	ARIN2	*Arctostaphylos insularis*	10–100	–
	island broom	LODE2	*Lotus dendroideus*	10–100	–
Grass/Grasslike					
2	**grasses**			300–800	
	wild oat	AVFA	*Avena fatua*	30–200	–
Forb					
3	**forbs**			100–400	
	horehound	MAVU	*Marrubium vulgare*	1–500	–
	Cucamonga manroot	MAMA8	*Marah macrocarpus*	1–150	–
	black mustard	BRNI	*Brassica nigra*	10–100	–

Inventory data references

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

SC301 Lbs
SC302 Lbs
SC103 Lbs- site location

Type locality

Location 1: Santa Barbara County, CA	
UTM zone	N
UTM northing	3765064
UTM easting	253751

General legal description	The site loaction is on Santa Cruz Island, off of the Navy Road.

Other references

Haidinger, Tori L. and Keeley Jon E. (1993). Role of High Fire Frequency in Destruction of Mixed Chaparral. Madrono, Vol. 40, No.3, pp. 141-147, 1993.

Junak, Steve; Ayers, Tina; Scott, Randy; Wilken, Dieter; and Young, David (1995). A Flora of Santa Cruz Island. Santa Barbara Botanic Garden, Santa Barbara, CA.

Keeley, Jon E. (2004). Impact of Antecedent Climate on Fire Regimes in Coastal California. International Journal of Wildland Fire, 2004, 13, 173-182.

Keeley Jon E. (2002). Fire Management of California Shrubland Landscapes. Environmental Management Vol. 29, No. 3, pp. 395-408.

Keeley, J.E. (2001). Fire and invasive species in Mediterranean-climate ecosystems of California. Pages 81–94 in K.E.M. Galley and T.P. Wilson (eds.). Proceedings of the Invasive Species Workshop: the Role of Fire in the Control and Spread of Invasive Species. Fire Conference 2000: the First National Congress on Fire Ecology, Prevention, and Management. Miscellaneous Publication No. 11, Tall Timbers Research Station, Tallahassee, FL.

Keeley, Jon E. and Fotheringham C.J. (2001). Historic Fire Regime in Southern California shrublands. Conservation Biology, Volume 15, No. 6, December 2001. pp. 1536-1548.

Keeley, Jon E. and Fotheringham C.J. (1998). Mechanism of smoke-induced seed germination in a post-fire chaparral annual. Journal of Ecology, 1998, 86, 27-36. British Ecological Society.

Keeley, Jon E. (1992). Recruitment of Seedlings and Vegetative Sprouts in Unburned Chaparral. Ecology, Volume 73, Issue 4 (August, 1992), 1194-1208. The Ecological Society of America.

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].

McMurray, Nancy E. 1990. Adenostoma fasciculatum. 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].

Uchytil, Ronald J. 1991. Cercocarpus betuloides. 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].

Contributors

M. Munnecke

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:**
