

UNIVERSITY OF CALIFORNIA, SANTA CRUZ

**CALIFORNIA CONIFERS: CONIFER COMMUNITIES OF THE SANTA CRUZ MOUNTAINS AND  
INTERPRETIVE SIGNAGE FOR THE UCSC ARBORETUM AND BOTANIC GARDEN**

A senior internship project in partial satisfaction of the requirements for the degree of

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by

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ABSTRACT: There are 52 species of conifers native to the state of California, 14 of which are endemic to the state, far more than any other state or region of its size. There are eight species of coniferous trees native to the Santa Cruz Mountains, but most people can only name a few. For my senior internship I made a set of ten interpretive signs to be installed in front of California native conifers at the UCSC Arboretum and wrote an associated paper describing the coniferous forests of the Santa Cruz Mountains. Signs were made using the Arboretum's laser engraver and contain identification and collection information, habitat, associated species, where to see local stands, and a fun fact or two. While the physical signs remain a more accessible, kid-friendly format, the paper, which will be available on the Arboretum website, will be more scientific with more detailed information. The paper will summarize information on each of the eight conifers native to the Santa Cruz Mountains including localized range, ecology, associated species, and topics pertaining to the species in current literature.

KEYWORDS: Santa Cruz, California native plants, plant communities, vegetation types, conifers, gymnosperms, environmental interpretation, UCSC Arboretum and Botanic Garden

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## Table of Contents

Conifer Communities of the Santa Cruz Mountains .....	2
Interpretive Signage for UCSC Arboretum and Botanic Garden .....	17
Acknowledgements .....	27

## Conifer Communities of the Santa Cruz Mountains

There are 52 species of conifers native to California, far more than any other state or region of its size (Lanner, 2007). Fourteen species exhibit varying degrees of endemism (Lanner, 2007), some widespread throughout California's diverse habitats, while some can only be found scattered across a single mountain range. Eight conifers are native to the Santa Cruz Mountains on the Central Coast of California from foggy hillsides close to sea level, moist interior canyons, and dry chaparral ridgetops (Neubauer, 2013). The diverse vegetation of the local Santa Cruz area is driven by its unique climatic, geologic, and topographic variability (Barbour, Evens, Keeler-Wolf, & Sawyer 2016). The upwelling of cold subsurface water off the coast produces the region's characteristic coastal fog, which buffers the extremes of its Mediterranean climate (Barbour et al., 2016). Though detailed accounts of species' general range and habits exist, the purpose of this paper is to localize existing literature to the conifers and coniferous forests of the Santa Cruz Mountains.

### Coast Redwood – *Sequoia sempervirens*

Family: Cupressaceae, subfamily Sequoioideae - Cypress family, Redwood subfamily

Possibly the best known of Santa Cruz's coniferous forests is the redwood forest. *Sequoia sempervirens* is nearly a California endemic with its northernmost extent just 14 miles into Oregon and its southern boundary at Hearst Ranch in the Santa Lucia Mountains (Lanner, 2007; B. Hall, personal communication, November 17, 2019). There are few old growth redwoods in the Santa Cruz area due to extensive logging in the late-1800s, but second growth trees are common. The first documentation of *S. sempervirens* was in the Santa Cruz area near

Pinto Lake in 1794 by a member of the Portola Expedition (Griffin & Critchfield, 1972), before such logging began. Unusual stands can be found in the Twisted Grove of Nisene Marks State Park, the largest trees at Big Basin and Portola Redwoods State Parks, and a handful of albino trees scattered throughout.

*S. sempervirens* is the tallest tree on our planet with the tallest individual measured at 380 feet in Humboldt County (Save the Redwoods League, n.d.). The tall form of these trees shape the plant communities in the understory below by shedding a thick bed of needles, creating dense shade, and collecting water from the coastal fog to feed plants below (Sawyer, Keeler-Wolf, & Evens, 2009). Herbaceous species of the understory include western bracken fern (*Pteridium aquilinum*), wild ginger (*Asarum caudatum*), hairy honeysuckle (*Lonicera hispidula*), redwood sorrel (*Oxalis oregana*), and redwood violet (*Viola sempervirens*) (Grumbine, et al. 2008). Woody species coinhabiting the canopy with *S. sempervirens* include Douglas fir (*Pseudotsuga menziesii* var. *menziesii*), California huckleberry (*Vaccinium ovatum*), big leaf maple (*Acer macrophyllum*), California hazelnut (*Corylus cornuta* var. *californica*) and California bay laurel (*Umbellularia californica*) to name a few (Sawyer et al., 2009).

### **Knobcone Pine – *Pinus attenuata***

Family: Pinaceae - Pine family

The first botanical collection of *Pinus attenuata* came from the Santa Cruz Mountains in 1845 by German botanist Karl T. Hartweg (Griffin & Critchfield, 1972), where the species still thrives today. Knobcone pine can be found throughout the Coast Ranges from the Santa Lucia Mountains in the south to the Klamath Ranges in the north, spreading to the Cascades, the

Modoc Plateau, and into the Sierra Nevada (Lanner, 2007). *P. attenuata* is often found on or near ridgetops with an open canopy, ample sunlight and well-draining soils (Griffin & Critchfield, 1972). Knobcone pines are common upon sandy, nutrient poor soils and require fog to obtain water in dry months (Lanner, 2007). Serotinous cones of *P. attenuata* require fire to open and to clear the understory for seedlings to establish (Sawyer et al., 2009). Snags remain a part of the system long after fire has passed through, staying rooted in the ground up to six years after fire (Lanner, 2007).

In 2009, research showed that approximately 75% of *P. attenuata* stands are mature to decadent (Sawyer et al.). This allows for the possibility of widespread extirpation with current fire suppression, as death of mature trees can lead to loss of 'in-situ' seed bank (Sawyer et al., 2009). However, the same year Sawyer et al. reported this (2009), the Lockheed fire burned areas of Swanton and Bonny Doon in the Santa Cruz Mountains. The fire resulted in rapid regeneration of *P. attenuata* on burned sites, where it is now crowding out other chaparral vegetation (B. Hall, personal communication, November 18, 2019). Likewise, fire suppression of UCSC's Upper Campus has resulted in the encroachment of California huckleberry (*Vaccinium ovatum*) and Douglas fir (*Pseudotsuga menziesii*) into *P. attenuata* dominated habitat (Haff et al., 2008).

Local stands can be found generously scattered on dry ridgetops at Loma Prieta, Ben Lomond Mountain, Butano and Big Basin Redwoods State Parks, and in north coast watersheds such as Laguna Creek and Swanton (CalFlora, n.d.; B. Hall, personal communication, November 18, 2019). Associated species of coastal stands, such as those in the Santa Cruz Mountains, include pacific madrone (*Arbutus menziesii*), tan oak (*Notholithocarpus densiflorus*), Douglas fir

(*Pseudotsuga menziesii* var. *menziesii*), canyon live oak (*Quercus chrysolepis*), and various species of manzanita (*Arctostaphylos*) and California lilac (*Ceanothus*) (Sawyer et al., 2009). Individuals in the Swanton population are known to hybridize with Monterey pine (*Pinus radiata*), which result in morphological changes in its bark, needles, and cones (West, 2016). Knobcone stands often co-occur with rare maritime chaparral species such as endemic Schreiber's manzanita (*Arctostaphylos glutinosa*) in Lockheed in the upper ridges of the Scott Creek watershed.

### **Ponderosa Pine – *Pinus ponderosa* var. *pacifica***

Family: Pinaceae - Pine family

*Pinus ponderosa* ranges beyond the western United States into southern Canada and northern Mexico at elevations from sea level to 10,000 feet (Graham & Jain, 2005). This species inhabits over five million acres in California throughout the Sierra Nevada, across the Cascades, Modoc Plateau and south through the Coast Ranges of Napa County where it begins to dwindle into more isolated populations south of the San Francisco Bay (Graham & Jain, 2005; Lanner, 2007). It is generally shade intolerant and occupies varying habitats throughout its range, but is confined to low-elevation habitats in the Santa Cruz Mountains (Sawyer et al., 2009; Griffin & Critchfield, 1972). Its insulating bark allows it to withstand low intensity fires, yet it remains susceptible to defoliation by the Pandora moth (*Coloradia pandora*) and infestation by western pine beetle (*Dendroctonus brevicomis*) in other parts of California (Graham & Jain, 2005).

Recent genetic work has suggested the differentiation of four subspecies with varying environmental tolerances (Willyard et al., 2017). *P. ponderosa* var. *pacifica*, found in the Santa

Cruz Mountains, is closely related to stands in the Pacific Northwest coined *Pinus ponderosa* var. *benthamiana* (Willyard et al., 2017). Local trees are present in Felton, Bonny Doon, UCSC Upper Campus, the Arboretum and Pogonip (B. Hall, personal communication, November 17, 2019). The lowest elevation trees recorded may be in the Pogonip, occurring at less than 200 ft elevation (B. Hall, personal communication, November 17, 2019). Bonny Doon and Ben Lomond stands are characterized as ‘parkland’ ecosystems due to the wide spacing between trees and limited understory (Sasaki, 2002). These stands also exhibit broad age heterogeneity, from 40 to over 100 years, due to logging of old growth trees in the late-1800s (Sasaki, 2002; Jensen, 1939).

*P. ponderosa* var. *pacifica* co-occur with species such as Santa Cruz cypress (*Hesperocyparis abramsiana*), coast live oak (*Quercus agrifolia*), Shreve Oak (*Quercus parvula* var. *shrevei*) and silverleaf manzanita (*Arctostaphylos silvicola*) in dry chaparral habitats (Jensen, 1939; Griffin & Critchfield, 1972). The Zayante geologic formation and Santa Margarita sand hills in particular, near Felton and elsewhere along Ben Lomond Mountain facilitate other rare plant communities with endemic and locally rare species such as Ben Lomond spineflower (*Chorizanthe pungens* var. *hartwegiana*), Scotts Valley spineflower (*C. robusta* var. *hartwegii*), and Ben Lomond wallflower (*Erysimum teretifolium*) (Sasaki, 2002).

### **Santa Cruz Cypress - *Hesperocyparis abramsiana***

Family: Cupressaceae - Cypress family

*Hesperocyparis abramsiana* is endemic to the foggy western slopes of the Santa Cruz Mountains. It is listed under the federal and state Endangered Species Acts and is ranked

*Critically Imperiled* by the California Native Plant Society Inventory of Rare and Endangered Plants (Lanner, 2007; CNPS Rare Plant Program, 2019). It exists in five main stands within the Santa Cruz Mountains on sandstone outcrops and sandy soils: Majors Creek, Butano Ridge, Eagle Rock, Boulder Creek Canyon (Brackenbrae), and Bonny Doon (Lanner, 2007). Two varieties of the Santa Cruz Cypress exist locally, the more common *H. abramsiana* var. *abramsiana*, and *H. abramsiana* var. *butanoensis* only found on Butano Ridge (Sawyer et al., 2009). Associated species include coast live oak (*Quercus agrifolia*), brittle leaf manzanita (*Arctostaphylos crustacea*), Santa Cruz manzanita (*A. andersonii*), California flannelbush (*Fremontodendron californicum*), pacific madrone (*Arbutus menziesii*), tan oak (*Notholithocarpus densiflorus*), knobcone pine (*Pinus attenuata*) on sandstone outcroppings and ponderosa pine (*Pinus ponderosa*) on deeper soils (Griffin & Critchfield, 1972; Sawyer et al., 2009). Individuals reach up to 50 feet in height, but some remain a mere 3 feet on extremely nutrient poor soils (Lanner, 2007).

Threats to the species include fire suppression, competition with non-native species, land cover change and logging (Fish and Wildlife Service, 2016). Now protected from residential and agricultural development, the USFWS (2016) listed the highly altered fire regime as a high level threat to *H. abramsiana*, which requires fire to maintain an open canopy, clear mineral soil, and release viable seed. Without fire, germination occurs opportunistically in outcroppings or disturbed sites, reducing recruitment and reproduction (USFWS Service, 2016). Management considerations to promote regeneration include removal of understory litter, invasive competitors, and clearing of the canopy to allow sunlight to reach the forest floor (Fish and Wildlife Service, 2016). Invasive species that negatively impact *H. abramsiana* populations

include silver wattle (*Acacia dealbata*) shading out the canopy and French broom (*Genista monspessulana*) reducing seedling recruitment through competition for bare soil (Fish and Wildlife Service, 2016). Though still protected under the federal Endangered Species Act, *H. abramsiana* is considered threatened, as opposed to endangered, due to habitat preservation and observed regeneration (Fish and Wildlife Service, 2016).

### **Gray Pine – *Pinus sabiniana***

Family: Pinaceae - Pine family

*Pinus sabiniana* is a California endemic whose range almost perfectly encircles the Central Valley from the Coast Ranges on the west up and around the Klamath and southern Cascade Mountains to the western Sierra Nevada (Lanner, 2007). A curious 55 mile gap exists in its ring around the Central Valley between the Kings and Tule Rivers, which has been debated as being caused by indigenous people burning the land and simple biogeographical discrepancies (Whitaker, Rosenthal, & Wohlgemuth, 2014). It is known that native Californians harvested the seeds of *P. sabiniana* for its high content in protein and fats (Lanner, 2007), but the lack of archaeobotanical evidence suggests ancient pluvial lakes historically limited its range (Whitaker et al., 2014). This tree is generally drought tolerant and sensitive to fire despite its thick insulating bark, with stands becoming denser with fire suppression (Sawyer et al., 2009).

Generally found scattered on dry foothill slopes or valley floors, *P. sabiniana* exists in higher, less maritime settings in chaparral of the Santa Cruz Mountains (Sawyer et al., 2009). Locally rare in Santa Cruz, individuals occur naturally only in Loma Prieta with species such as California buckeye (*Aesculus californica*), canyon live oak (*Quercus chrysolepis*), and western

rush (*Juncus occidentalis*) (Sawyer, et al., 2009; Calfora, n.d.). Trees are generally widely spaced and occupy chaparral habitats (Thomas, 1961). *P. sabiniana* makes its most coastal appearance south of Big Sur near the tiny town of Lucia, growing on Serpentine “where digger pines come almost to the surf” (Griffin & Critchfield 1972). Gray pine generally has a deep taproot where soil depth permits, but a shallow taproot with spreading roots on shallow soils such as those in Santa Cruz (Sawyer, et al., 2009).

### **California Nutmeg - *Torreya californica***

Family: Taxaceae - Yew family

*Torreya californica* is a California endemic as the name suggests, present in the Coast Ranges from Trinity to Monterey counties and the western Sierra Nevada from Shasta to Tulare counties (Griffin & Critchfield, 1972). There is no apparent connection between the two sets of ranges (Lanner, 2007). It is not considered rare due to its fairly extensive range, but often has few localities and few individuals in a given location (Griffin & Critchfield, 1972). This species is often solitary or in small groups, rarely in pure stands, in redwood forests, montane coniferous forests, oak woodlands, riparian corridors, and even chaparral from sea level to 6500 feet elevation (Lanner, 2007; Burke, 1975). Individuals on nutrient poor soils have a stunted and shrubby form compared to its average form of around 50 feet (Griffin & Critchfield, 1972). Some trees in the Santa Cruz Mountains have this stunted form (Griffin & Critchfield, 1972).

*T. californica* is found in the Santa Cruz Mountains throughout redwood forests and chaparral habitats as solitary individuals and in small groups. It can be found from Loma Prieta in the south to Butano State Park in the north, in bigger numbers in Big Basin Redwoods State

Park and the Scott Creek watershed (CalFlora, n.d.). The most southerly, immediate coastal stands are in the Laguna Creek and Scott Creek watersheds where they are locally abundant (B. Hall, personal communication, November 17, 2019). Associated species include coast redwood (*Sequoia sempervirens*), Douglas fir (*Pseudotsuga menziesii*), big leaf maple (*Acer macrophyllum*), tan oak (*Notholithocarpus densiflorus*), California hazelnut (*Corylus cornuta* var. *californica*), and California bay laurel (*Umbellularia californica*). Until it fell a few years ago, the largest *T. californica* vouchered was in Swanton north of Santa Cruz along lower Scott Creek (B. Hall, personal communication, November 17, 2019).

### **Monterey Pine - *Pinus radiata***

Family: Pinaceae - Pine family

*Pinus radiata* grows naturally in only three regions of California's Central Coast: the furthest south in Cambria of San Luis Obispo County, the Monterey peninsula and Carmel area, and the Año Nuevo-Swanton area north of Santa Cruz (Lanner, 2007). In its native range, it inhabits cool foggy climates, where condensation of fog on its needles can account for half an inch of water per week in dry summer months (Lanner, 2007). Soils are generally sandy loams with a thick layer of understory litter (Lanner, 2007). *P. radiata* is adapted to periodic fire, however a 2007 study reported the Año Nuevo-Swanton population does not require fire to be maintained (Sawyer et al., 2009). Pine pitch canker (*Fusarium circinatum*) has established in all three mainland populations and poses a serious threat to mature aged stands (Lanner, 2007; Sawyer et al., 2009). This species is planted worldwide as a horticulture variety, and extensively used for timber in New Zealand and Australia, where trees grow upright to 190 feet tall without

its characteristic wind gnarled posture (Lanner, 2007). It has also become a problematic invasive species in these countries, as well as in Spain and Chile (K. Holl, personal communication, November 19, 2019).

Local populations in the Swanton area can be found along Swanton Road in the Scott Creek watershed and in Año Nuevo and Big Basin Redwoods State Parks (CalFlora, n.d.). This tree has been planted in large numbers along the central coast, making its natural limit hard to discern (Griffin and Critchfield, 1972). Associated species of the Santa Cruz population include knobcone pine (*P. attenuata*), Douglas fir (*P. menziesii*), coast redwood (*S. sempervirens*), tan oak (*Notholithocarpus densiflorus*), Arroyo willow (*Salix lasiolepis*), coast live oak (*Quercus agrifolia*), Shreve oak (*Quercus parvula* var. *shrevei*), and California bay laurel (*Umbellularia californica*) (Sawyer et al., 2009). This is the only population whose range overlaps with knobcone pine (*Pinus attenuata*), and hybridization is known to occur via wind dispersed pollen (Griffin and Critchfield, 1972; West, 2016). Hybridization results in variable bark topography, leaf morphology, cone structure and apophysis (a natural swelling or enlargement at the base of scales) (West, 2016). Gene flow is hypothesized to flow one-way from *P. attenuata* to *P. radiata*, as anecdotally it has more morphological influence on the other (West, 2016). However, this phenomenon is in need of further study and genetic analysis.

### **Douglas fir - *Pseudotsuga menziesii* var. *menziesii***

Family: Pinaceae - Pine family

*Pseudotsuga menziesii* can be found throughout the Pacific Northwest from British Columbia and Washington where it diverges into two populations with distinct varieties: *P.*

*menziesii* var. *menziesii* inhabiting the Pacific coast and Sierra Nevada, and *P. menziesii* var. *glauca* found southeast through the Rockies (Lanner, 2007). Within California, it ranges from the northern state border through the Klamath Ranges and the Coast Ranges to Little Sur and Salmon Creek of the Santa Lucia Mountains (Lanner, 2007; B. Hall, personal communication, November 18, 2019). Commonly mistaken for coast redwood (*S. sempervirens*), *P. menziesii* has thick, gray brown bark, its needles are arranged around the full circumference of its branch, and its cone is elliptic and much larger than that of the redwood (Haff et al., 2008). This tree is vulnerable to fire and its seedlings are shade intolerant, so it rarely regenerates in established forests (Haff et al., 2008). However, under fire suppression it often encroaches into coastal prairie ecosystems and redwood mixed coniferous and evergreen forest ecotones.

*P. menziesii* var. *menziesii* is one of the most common trees of the Santa Cruz Mountains often occupying redwood and mixed evergreen forests (Thomas, 1961; Haff et al., 2008). It can be found in the Forest of Nisene Marks to the south, throughout town in Pogonip and Wilder Ranch State Park, east to Castle Rock and Portola Redwoods State Parks, and north to Big Basin Redwoods and Butano State Parks (CalFlora, n.d.). Associated species of local *P. menziesii* var. *menziesii* populations include redwood (*S. sempervirens*), tan oak (*Notholithocarpus densiflorus*), coast live oak (*Quercus agrifolia*), pacific madrone (*Arbutus menziesii*), California coffee berry (*Frangula californica*), ocean spray (*Holodiscus discolor*), and coyote brush (*Baccharis pilularis*).

### **Naturalized or introduced conifers**

Though the Santa Cruz Mountains boast an impressive array of coniferous forests, some species are not native to the area and have been introduced. Two species native to California, but not to the Santa Cruz Mountains, which are now found in Santa Cruz are Coulter pine (*Pinus coulteri*) and Torrey Pine (*Pinus torreyana*) (Nuebauer, 2013). *P. coulteri* ranges from the Coast Ranges south of the San Francisco Bay, the Santa Lucia Mountains, the Transverse and Peninsular Ranges, and into Baja California (Lanner, 2007). This tree was planted in Santa Cruz and has naturalized to a small degree in localized areas (B. Hall, personal communication, November 17, 2019). It can be found along Empire Grade near Ben Lomond Mountain, Graham Hill Road, and Summit Road (CalFlora, n.d.).

*Pinus torreyana* occurs naturally in only a five mile stretch of coastal bluffs along northern San Diego and the northeast side of Santa Rosa Island of Channel Islands National Park (Lanner, 2007). It was introduced in the California Conservation Garden of the UCSC Arboretum in 1978 and has since spread within the garden and to the west side of Empire Grade. (B. Hall, personal communication, November 30, 2019). *P. torreyana* can also be found locally in the the Forest of Nisene Marks State Park and Seacliff State Beach (CalFlora, n.d.). It was also planted along the Big Sur Coast just south of Esalen in the mid-1900s, where there are now close to fifty individuals (B. Hall, personal communication, November 18, 2019). This unintended assisted migration could help preserve the genetic diversity of a species with an extremely limited range, but little is known on the extent of its introduced range or its impacts on native plant communities.

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## SITKA SPRUCE

*Picea sitchensis*

From Jepson eFlora



### Identification

Thin, flaky purplish bark on a tall straight trunk supporting upswept branches.

Flat, dark, stiffly pointed needles up to one inch.

Pale yellow to reddish brown cone up to four inches, with thin papery scales.

### Ecology

Found in wet, mild coastal habitats along its 1,800 mile range along the Pacific coast from Alaska, British Columbia, Washington, Oregon, and barely reaching into northern California. It inhabits bottomlands, coastal bluffs and steep slopes in its California range. Associated species include Grand Fir (*Abies grandis*), Red Alder (*Alnus rubra*), Coast Redwood (*Sequoia sempervirens*), and Western Hemlock (*Tsuga heterophylla*).



### Collection Information

This individual was collected from its southernmost extent in Russian Gulch of Mendocino County.

### Local Stands

This species does not occur in Santa Cruz, but can be found in higher rainfall coastal mountains in Del Norte, Humboldt, and Mendocino counties.

### Fun Fact

Individuals close to shore exhibit a hedge-like form with long, outreaching branches shaped by wind, which make good nesting sites for bald eagles.

# PACIFIC YEW

## *Taxus brevifolia*

### Identification

Reddish, peeling bark topped by a broad crown of slender horizontal branches, rarely to 50 feet tall.

Short, flat, pointed needles spread on either side of twig, attached by a short, yellow stalk.

Seed encapsulated in bright coral-red ovoid seed pod.



### Ecology

Almost never found in large stands, scattered individuals can be found on deep, moist soils in the understory of old growth Redwood (*Sequoia sempervirens*), White Fir (*Abies concolor*), and Douglas Fir (*Pseudotsuga menziesii*) forests and riparian corridors. Associated species include Big Leaf Maple (*Acer macrophyllum*) and Tan Oak (*Notholithocarpus densiflorus*).



### Collection Information

This individual was collected from the Siskiyou Mountains in Del Norte County, California.

### Local Stands

This species is not native to the Santa Cruz area, but can be found in Marin County and throughout the North Coast Ranges.

### Fun Fact

The Yew family, Taxaceae, are gymnosperms that bear fleshy seed pods as opposed to cones. This species and the other California native taxad, *Torreya californica*, are both dioecious (having separate male and female plants). Male cones form on the underside of limbs and produce pollen that is then wind dispersed to female trees' cuplike fruit.

# INCENSE CEDAR

*Calocedrus decurrens*

## Identification

Thick, fibrous, cinnamon colored bark upon a thick trunk. Yellow-green flattened scale-like foliage surrounding the branchlet, aromatic when crushed.

Slender, almond-shaped inch long cones are present in the upper canopy of mature trees.



## Ecology

This species can be found in an array of habitats throughout its California range from 2,000-8,000 feet in elevation. Associated forest tree species include White Fir (*Abies concolor*), White Alder (*Alnus rhombifolia*), Ponderosa Pine (*Pinus ponderosa*), Jeffery Pine (*Pinus jeffreyi*), Western Juniper (*Juniperus occidentalis*) and Douglas Fir (*Pseudotsuga menziesii*). It also intergrades with riparian vegetation and chaparral.



## Collection Information

This individual was collected from Fiddler Mountain, Rogue River-Siskiyou National Forest.

## Local Stands

This species is not present in the Santa Cruz Mountains, but is locally common in the Santa Lucia Mountains. Scattered groves can be found on high elevation serpentine substrates of the North Coast and Klamath Ranges.

## Fun Fact

This species is found in abundance throughout the western Sierra Nevada, because mature trees are defoliated by several species of worm, such as Western Spruce budworm (*Choristoneura occidentalis*), making the wood unusable as timber.

# SANTA CRUZ CYPRESS

*Hesperocyparis abramsiana* var. *abramsiana*

From Jepson et al.



## Identification

Gray-brown bark furrowed in vertical strips, mature trees up to 50 feet.

Bright green scale-like leaves.

Round to ovate cone to 1.5" composed of 8 or 10 scales.

## Ecology

Endemic to dry, higher elevation slopes of the Santa Cruz Mountains on nutrient poor soils and sandstone outcrops.

Associated species include Coast Live Oak (*Quercus agrifolia*), Brittle Leaf Manzanita (*Arctostaphylos crustacea*), Santa Cruz Manzanita (*Arctostaphylos andersonii*), Knobcone Pine (*Pinus attenuata*), Ponderosa Pine (*Pinus ponderosa*), Pacific Madrone (*Arbutus menziesii*), and Tan Oak (*Notholithocarpus densiflorus*).



## Collection Information

This individual was collected from the Bonny Doon stand.

## Local Stands

This species can be found in five or more stands in the Santa Cruz Mountains: Majors Creek, Butano Ridge, Eagle Rock, Boulder Creek Canyon, and Bonny Doon.

## Fun Facts

*Hesperocyparis abramsiana* is listed under the federal and state Endangered Species Acts.

Genetic work has shown the differentiation of *H. abramsiana* var. *butanoensis* in the Butano Ridge population, compared to *H. abramsiana* var. *abramsiana* in the other populations.

# COAST REDWOOD

*Sequoia sempervirens*

## Identification

Fibrous, ridged, fiery-brown bark.

Short, stiff needles arranged in flat sprays.

Round to elliptical cone up to 1" composed of many wrinkled, shield-shaped scales.

From Jepson eFlora



## Ecology

Almost entirely restricted to California's coastal fog belt in varying habitats from sea level to 3200 feet. Associated species of the redwood forest include Douglas Fir (*Pseudotsuga menziesii*), Western Bracken Fern (*Pteridium aquilinum*), Wild Ginger (*Asarum caudatum*), Big Leaf Maple (*Acer macrophyllum*), California Nutmeg (*Torreya californica*), California Hazelnut (*Corylus cornuta* var. *californica*) and California Bay Laurel (*Umbellularia californica*).



## Collection Information

The four redwoods before you have been collected throughout its range: the blue-tinted tree furthest left was collected from the hills west of Los Altos, the small-leaved tree was collected by Arboretum founder Ray Collett outside Hahn Student Services, and the right two were collected close to its northern limit at 2700 feet in the Siskiyou Mountains.

## Local Stands

This species can be found throughout the Santa Cruz Mountains, the largest trees in Big Basin Redwoods and Portola Redwoods State Parks.

## Fun Facts

The first Redwood was documented in Santa Cruz near Pinto Lake by a member of the Portola Expedition in 1794.

Albino redwoods can be found throughout the Santa Cruz Mountains on UCSC's Upper Campus, Henry Cowell Redwoods State Park, and in the Swanton area.

# PACIFIC PONDEROSA PINE

*Pinus ponderosa* var. *pacifica*

From Jepson eFlora



## Identification

Darkly furrowed red-brown bark.

Tufts of three needles clustered at branch tips up to 10."

Dull brown 3-5" egg-shaped cone with symmetrical base, scale curving outward.

## Ecology

This tree occupies varying habitats throughout its range, confined to low elevation pockets on sandy, well-drained soils within the Santa Cruz Mountains in maritime chaparral and sandhill parkland ecosystems.

Associated species of local stands include Coast Live Oak (*Quercus agrifolia*), Silverleaf Manzanita (*Arctostaphylos silvicola*), and Santa Cruz Cypress (*Hesperocyparis abramsiana* var. *abramsiana*).



## Collection Information

This individual was collected from UCSC's Upper Campus near Marshall Fields, while many trees in the Arboretum occur naturally.

## Local Stands

Small disjunct populations can be found in Felton, Ben Lomond sand hills, Bonny Doon, UCSC Upper Campus, Pogonip, and scattered along Empire Grade.

## Fun Fact

Granivores, animals which feed on its seed, include California Quail (*Callipepla californica*) and Western Gray Squirrel (*Sciurus griseus*), both found at the Arboretum.

# CALIFORNIA NUTMEG

*Torreya californica*



From Jepson eFlora

## Identification

Small to medium sized understory tree, often no more than 70 feet tall, with pale red or gray brown shallowly fissured bark. Needles are almost 2 inches long, glossy green on top, sharply pointed, and spread flat off the shoot.

In fall, female trees produce elliptical green fruits 1-2" long, purple streaks forming with age.

## Ecology

Found solitary or in small stands, on moist rocky sites within the shade of tall coniferous forests. Individuals on nutrient poor soils often exhibit a stunted, shrubby form. Associated species include Coast Redwood (*Sequoia sempervirens*), Douglas Fir (*Pseudotsuga menziesii*), Big Leaf Maple (*Acer macrophyllum*), and California Bay Laurel (*Umbellularia californica*).



## Collection Information

This individual was collected near Swanton north of Santa Cruz.

## Local Stands

This species is found scattered across the Santa Cruz Mountains from Loma Prieta to Butano State Park, in larger numbers at Big Basin Redwoods State Park and the Scott's Creek watershed.

## Fun Facts

This tree gets its name from its large fleshy arils, or fleshy exterior seed covering, which resembles that of the unrelated commercial nutmeg.

Also known colloquially as the 'stinking cedar,' all nutmeg trees stink thanks to an unidentified substance in its leaves and shoots.

# BIGCONE SPRUCE

*Psuedotsuga macrocarpa*

## Identification

Reddish brown bark, often with resinous blisters and fire scars, supporting horizontal to gently drooping limbs. Deep green, pointed needles ~1" long arranged around the branch like a bottlebrush.

Woody cones to 7" with short three-pointed bract between scales.

Sargent, C. S. (1922)



## Ecology

This species can be found on dry to moist slopes and canyon bottoms in transitional chaparral and woodlands in its lower elevational range, and mixed coniferous forests at higher elevations. Associated species include Gray Pine (*Pinus sabiniana*), Knobcone Pine (*Pinus attenuata*), Ponderosa Pine (*Pinus ponderosa*), Big Leaf Maple (*Acer macrophyllum*), and Incense Cedar (*Calocedrus decurrens*).



## Collection Information

This tree was collected from its largest population in the San Gabriel Mountains.

## Local Stands

This species cannot be found locally, but occurs in coastal southern California from the San Rafael Mountains through the Transverse Ranges, to the San Bernardino and San Gabriel Mountains.

## Fun Facts

Young trees resemble its relative, the Douglas Fir, but with grayer and bluer foliage, a sharper crown, and smaller buds. Mature trees have much larger cones, larger winged seeds, and redder bark than mature Douglas Firs.

When scorched by a surface fire, this tree drops its dead needles and rapidly sprouts new foliage in the unburned upper canopy and beneath its bark.

# SANTA LUCIA FIR

*Abies bracteata*

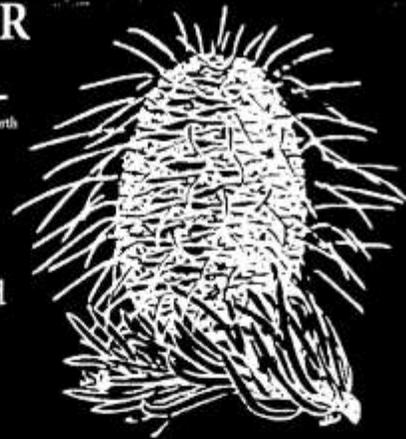
George B. Sudworth

## Identification

Thick, scaly, red-brown bark with a deep green steeple-like crown.

Stiff, spiny tipped needles up to 2" in length arranged around branch.

Cone 2.5-4" with 2" bracts extending beyond cone, only growing high up in the tree's crown.



## Ecology

Found in small groups or as solitary individuals in moist canyon bottoms and steep rocky slopes, occasionally forming small stands. Associated species include Canyon Live Oak (*Quercus chrysolepis*), Interior Live Oak (*Quercus wislizeni*), Pacific Madrone (*Arbutus menziesii*), California Bay Laurel (*Umbellularia californica*), as well as Coulter Pine (*Pinus coulteri*), and Sugar Pine (*Pinus lambertiana*) at high elevations.



## Collection Information

This individual was collected below Botcher's Gap near Mt. Carmel in the Santa Lucia Mountains in 1968 by Arboretum founder Ray Collett.

## Local Stands

Populations can be found scattered through the Santa Lucia Mountains on UCSC Landels-Hill Big Creek Reserve, Cone Peak, Chew's Ridge and beyond.

## Fun Fact

*Abies bracteata* is considered the rarest North American Fir. Wildfire remains its biggest threat given its limited range.

# WESTERN RED CEDAR

*Thuja plicata*

## Identification

A straight trunk with a buttressed base and reddish brown to gray fibrous bark, to 200 feet tall.

Flattened sprays of grassy green scale-like foliage arranged in opposite pairs hang loosely from branches. Oblong brown cones to ½” composed of four to six scales hang from trees each autumn.



## Ecology

In its California range, this species inhabits temperate rainforest conditions with cool summers, and heavy winter rainfall, aided by heavy fog of coastal areas. Associated species of the northern Coast Ranges include Coast Redwood (*Sequoia sempervirens*), Sitka Spruce (*Picea sitchensis*), Western Hemlock (*Tsuga heterophylla*), and Douglas Fir (*Pseudotsuga menziesii*).



## Collection Information

This individual was collected from Wild Cat Creek, south of Ferndale, in Humboldt County.

## Local Stands

This species' range barely extends into the North Coast Ranges. Its primary distribution is in Alaska, British Columbia, Washington, and Oregon.

## Fun Fact

*Thuja plicata* is commonly used for shingles and siding of homes, which is often prohibited in many California municipalities for their flammability and susceptibility to wildfire.

## **Acknowledgements**

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