RANCHO SANTA ANA BOTANIC GARDEN OCCASIONAL PUBLICATIONS

NUMBER 11

QUAIL-FRIENDLY PLANTS OF BAJA CALIFORNIA:

AN EXPLORATION OF THE FLORA OF THE SANTO TOMÁS, SAN VICENTE, SAN JACINTO, AND SAN QUINTÍN VALLEYS, CORE HABITAT FOR THE CALIFORNIA QUAIL *(CALLIPEPLA CALIFORNICA* SUBSP. *PLUMBEA)*

Sula Vanderplank

Cover photos:
Quail: (Nueva York, Baja California) Alan Harper © 2011 (alanharper.com)
Landscape: (Eréndira, Baja California) Sula Vanderplank

This work was made possible by the generous financial assistance of Club La Misión of San Vicente, Baja California, Mexico; the Miller Family Charitable Trust; and the Walter Lantz Foundation. Cost-sharing was graciously provided by Rancho Santa Ana Botanic Garden and Huntington Botanical Gardens.

RANCHO SANTA ANA BOTANIC GARDEN OCCASIONAL PUBLICATIONS (ISSN 1094-1398) are published at irregular intervals in volumes of various sizes. This series of publications is designed to include results of original botanical research by members of the Rancho Santa Ana Botanic Garden staff, or by botanists who have collaborated in a Garden program. Proceedings of symposia sponsored by the Garden may also be published in this series.

Published by Rancho Santa Ana Botanic Garden, 1500 North College Avenue, Claremont, California 91711-3157. For information about orders for RANCHO SANTA ANA BOTANIC GARDEN OCCASIONAL PUBLICATIONS, contact Irene Holiman at the address above or via e-mail: aliso.subscriptions@rsabg.org, or fax at (909) 626-7670. For all other inquiries, contact Vanessa Ashworth at aliso.editor@rsabg.org. General information about the Garden and its programs can be obtained at *http://www.rsabg.org*.

PUBLICATION DATA

Quail-Friendly Plants of Baja California: an Exploration of the Flora of the Santo Tomás, San Vicente, San Jacinto, and San Quintín Valleys, Core Habitat for the California Quail (*Callipepla californica* var. *plumbea*). 2011. Sula Vanderplank.
Vanessa Ashworth, Editor–in–Chief; Lucinda McDade, Managing Editor; John Trendler, Graphic Design. RANCHO SANTA ANA BOTANIC GARDEN OCCASIONAL PUBLICATIONS, Number 11, x + 121 pages. ISSN 1094-1398. First printing: 300 copies.

Suggested citation: Vanderplank, S. 2011. Quail-friendly plants of Baja California. Rancho Santa Ana Botanic Garden Occasional Publications, Number 11, 131 p.

Contributors

John Trendler is Curator of Visual Resources at Scripps College and Graphic and Information Design Consultant. His layout and design work was assisted by Winona Bechtle and Nicole Frazer.

Jim Folsom is Director of Huntington Botanical Gardens. Jim is the primary collaborator on this project. His assistance with the project development, and the contributions of his employees, made this guide possible.

John Macdonald is Photographer at the Seed Bank of Rancho Santa Ana Botanic Gardens. Co-author of "Processing Seeds of California Native Plants", John has contributed seed images for most plants in this guide.

Barbara Eisenstein is a Native Plant Garden Consultant from Pasadena. In addition to her participation in field work and via image contributions, Barbara was heavily involved in image selection, color correction and formatting.

The following people contributed images to this publication after their participation in field work:

John Trager is Curator of Desert Collections at the Huntington Botanical Gardens.

Sean Lahmeyer is Plant Conservation Specialist at the Huntington Botanical Gardens.

Cody Coyotee Howard is Conservation Technician at the Huntington Botanical Gardens.

Karen Zimmerman is Succulent Plant Propagator at the Huntington Botanical Gardens.

Sarah Ratay is Plant Ecologist for the Catalina Island Conservancy.

Asuncion Andreu Soler is a Postdoctoral Researcher from Programa Seneca at the Universidad Autónoma de Baja California, Ensenada, BC.

Chris Barnhill is Curator of Collections at the Fullerton Arboretum of California State University, Fullerton.

Ben Wilder is a Ph.D. student at the University of California, Riverside.

Jorge Ochoa is Director of the Horticulture Program at Long Beach City College.

Acknowledgments

O'Malley Miller, Wade Killefer, and Jaime Navarro of Club La Mision (San Vicente) enabled all aspects of the work behind this guide, and I am deeply grateful for their enormous generosity and ongoing support. Sincere thanks also to Ed Landry of The Lantz Foundation, the Miller Family, Rancho Santa Ana Botanic Garden, and Huntington Botanical Gardens for additional financial support and in-kind contributions. I thank Bob Klitgaard of Claremont Graduate University for the original inspiration for this project. For additional assistance in the field I thank Bart O'Brien (Rancho Santa Ana Botanic Garden - RSABG), Carlos Figueroa Beltrán (Universidad Autónoma de Baja California - UABC), and Paul Cipolla (University of Southern California).

For editorial assistance I thank Lucinda McDade (RSABG), Jennifer Calkins (The Evergreen State College), Vanessa Ashworth, and Bart O'Brien (RSABG), in addition to all contributors. For information on the California quail I am most grateful to Jennifer Gee (University of California, Riverside, and Pomona College, Claremont), Gorgonio Ruiz Campos (UABC), Eric Mellink (Centro de Investigación Científica y de Educación Superior de Ensenada - CICESE), and Eugenio Peterson.

For their local knowledge and excellence in the field I extend my humble thanks to our guides: Jesus Sanchez Torres and Ubaldo Moreno Martinez, and to Heriberto Arauz Hernandez, in particular, for his knowledge, patience, and tireless assistance on all our fieldtrips. Thanks also to Alma-Rosa Arce Pechi, Diana Arauz Hernandez, and all the staff at Club La Mision for making our fieldwork so pleasant. For land access I am very grateful to Guadalupe Soto de Rudamekin, Izaias Rudamekin Soto, Martín and José Gabino Covarrubias Castillo, La Familia Panyagua, and Viñero Santo Tomás.

Table of Contents

How to Use this Guide ..... Page vi

Key to Symbols ..... Page vii

Introduction ..... Page viii

Habitats ..... Page ix

Chapter 1 – Trees & Tall Shrubs ..... Page 1

Chapter 2 – Low Shrubs ..... Page 33

Chapter 3 – Succulent and Rosette Plants ..... Page 67

Chapter 4 – Forbs, Bulbs, and Grasses ..... Page 85

Further Reading ..... Page 114

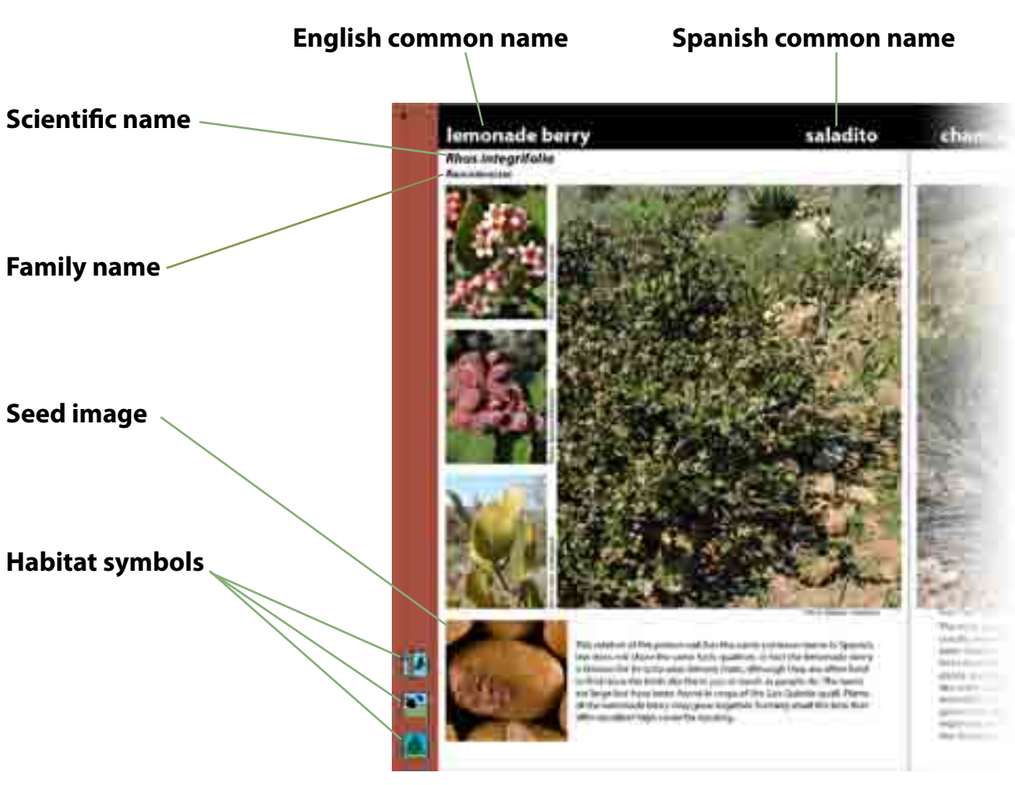
Appendix 1: List of Alternative Plant Names ..... Page 117

Index ..... Page 118

How to Use this Guide

This guide has been designed for ease of use by people who are not already familiar with the flora, but interested in identifying plants of the region. There are four chapters corresponding to the dominant life-forms in the region: Trees & Tall Shrubs; Low Shrubs; Succulent and Rosette Plants; and Forbs, Bulbs, and Grasses. Each of these life-forms has a different functional role in the life of the San Quintín quail (*Callipepla californica* subsp. *plumbea*). Each chapter is indicated by a distinct color of the side bar on each page. Within each chapter the dominant plants are presented first and rarest last. Icons in the side bar are used to indicate characteristics of the plants that are relevant to the San Quintín quail, e.g., the presence of year-round leaves for cover, and water indicator species, etc. (see page vii). Nest and food icons are only included for plants documented in the literature or by our fieldwork. English common names are found on the outside edge of each page, and Spanish common names, when available, are near the center-binding.

This guide introduces many of the plants of northwestern Baja California, particularly those that play important roles in the habitat for a subspecies of the California quail known as the San Quintín quail (*Callipepla californica* subsp. *plumbea*). As such, this guide does not include plants of coastal habitats such as saltmarsh and dunes, but rather focuses on species of the succulent sage scrub and chaparral, where the San Quintín quail makes its home. The area covered by this guide is focused on the core range of the San Quintín quail, based on fieldwork and photography from Ensenada to San Quintín, and primarily covers the private hunting lands of Club La Mision, San Vicente, Baja California.



Key to Symbols

Food
Indicates that this plant is eaten. (These data are based on our own field observations, on analyses of crop contents, personal communications cited in text, and data cited in the literature listed at the back of this booklet).

Nest
Indicates that parts of this plant are used in the nest itself or that it is a plant under which nests are built. (Data are based on our field observations and the literature listed at the back of this booklet).

Core habitat species
Indicates that this plant is restricted to the same region as the San Quintín quail (NW Baja California). These species may extend just over the US/MX border to the north, but are largely restricted to the Mediterranean-climate region of Baja California, which extends east to the Sierra San Pedro Mártir, and south to around the 30th parallel.

Water
Indicates that this plant is primarily found in wet areas, along streams and washes. Water is crucial to quail survival, and the species that grow near water provide important cover to the birds as they drink.

Lookout
Indicates that this species is used for perching, particularly by males in the spring who keep a look-out while females and young feed beneath them. These plants are often the tallest in the immediate landscape and frequently provide good roosting sites.

Drought-deciduous
Indicates that this plant only has leaves when conditions are favorable, particularly rainfall and water availability. These plants may provide excellent cover as they leaf-out in winter and spring, but often provide very little cover in the dry season.

Evergreen
Indicates that this plant is evergreen (i.e., keeps its leaves all year round). These plants are particularly important to birds in the dry season, often providing reliable roosting and escape cover when plants of other species have bare branches. (This feature is often seen in plants of the chaparral and in species that have access to year-round water).

Introduction

The California Floristic Province extends south into Baja California and across the northwestern portion of the state, extending east to the mountains and south to the El Rosario region just south of San Quintín. Many acres of pristine coastal sage scrub are found in the Santo Tomás, San Vicente, San Jacinto, and San Quintín valleys, south of the major developed areas from Tijuana to Ensenada. This vegetation is home to many plants that do not grow anywhere else, and to others that are rare in California; it is also home to large numbers of California quail.

In the vegetation of the California Floristic Province we see distinct changes in species composition that yield a unique vegetation type beginning in San Diego County and extending to the El Rosario region, at ca. 30 degrees latitude. Interestingly, we see a very similar distribution in the subspecies of California quail known as the 'San Quintín quail', *Callipepla californica* subsp. *plumbea*. There is very little information documented about this particular subspecies of quail. This guide focuses on the central habitat for this bird, an area that is perhaps the largest expanse of undeveloped land, north of the extensive agriculture at San Quintín, and south of the heavily developed border region.

This map shows the known range of the San Quintín quail (*Callipepla californica* subsp. *plumbea*), a subspecies of the California quail, in Baja California. Coloration indicates population density as understood from data published by Grinnell (1926) and Leopold (1977).

The purpose of this guide is to aid in the identification of plants in the northwestern region of Baja California. Food and shelter plants have been documented for several quail species in various areas of the United States, but not for the California quail in Baja California. This guide contains many of the dominant plants in the area that are likely to be important habitat indicators; it is not intended to be a comprehensive list of all plant species used by the San Quintín quail. We hope that this first text on the subject will spark interest in ongoing studies on the rich habitats of northwestern Baja California, and the animals that depend on them.

Habitats

Quail are found in four main habitats in this region: chaparral; succulent coastal scrub; riparian habitat; and cultivated areas. They rarely venture into the most coastal habitats (e.g., dunes, saltmarsh). In the more inland habitats, succulent coastal scrub and chaparral, they may be found from the coastal terraces up into the higher elevation chaparral on the slopes of the Sierra San Pedro Mártir to the east. An introduction to each habitat follows.

Chaparral:
Chaparral habitat consists of mostly tall evergreen plants, which tend to have small thick leaves and grow densely together. This habitat is highly predisposed to fire and burns regularly. Following fire, many colorful forbs and bulbs colonize and are later succeeded by the dense shrubs. Chaparral-like habitats are known from all regions of the world that have a Mediterranean climate (California, Chile, Australia, South Africa and the Mediterranean Basin). Chaparral ceases to occur below 500 ft elevation around Eréndira in Baja California. To the south it is found only inland and at higher elevations, and it currently reaches the southerly limit of its core range near the southern end of the Sierra San Pedro Mártir. Historical data and a few outcrops of chaparral on 'sky islands' further down the peninsula suggest that the chaparral was once more widespread throughout the peninsula, probably before the drying period experienced during the Holocene.

Succulent/maritime coastal scrub:
The familiar California coastal sage scrub habitat of mostly drought-deciduous species transitions to the south into succulent or maritime coastal scrub. This unique and heterogeneous plant assemblage has more succulent and rosette-forming plants compared to coastal sage scrub to the north. Notably, rosette-forming plants are known to harvest moisture from fog (likely an important source of moisture in this region). This endangered habitat is found only along the coast of northwest Baja California and is home to many rare and narrowly endemic plants. Some of these plants were historically more widespread but others appear to have evolved locally more recently. The succulent coastal scrub also shares many species with the coastal sage scrub of California, and may be an important species refuge for many of California's rare plants.

Riparian habitat:
The fresh water in this region is often seasonal in its availability, flowing down from the mountains after winter rain. Seasonal water is also found in vernal pools on clay mesas, which are abundant on Colonet Mesa and near Cerro Solo. Permanent water is scarce, but can be found in some of the deepest canyons and rivers (e.g., San Vicente River). Many plants can access the water table year-round; their presence thus indicates seasonal water courses.

Cultivated areas:
The rich valleys of the region have given way to extensive cultivated fields. Often the crops being cultivated augment the quail diet, making agricultural fields a significant habitat. Cultivated fields may often feed several coveys (to the annoyance of the farmer), but the birds need a much more diverse habitat matrix for their survival. Monocultures generally do not provide adequate habitat for roosting or nesting and will result in a diet that is nutritionally deficient.

"...the local status and welfare of a quail population will be a direct function of the quality of habitat available for quail occupancy..... Conversely, in the absence of proper habitat the bird cannot exist irrespective of protective laws or benevolent intentions."
~ A. Starker Leopold, 1977

Trees & Tall Shrubs

Photo: Karen Zimmerman

This chapter covers woody plants that are shoulder-height or taller at maturity. Plants that have a low open habit and are rarely above waist-height are included in the following chapter (low shrubs), although there is not a sharp demarcation between these two groups. Trees are often distinguished from shrubs by the presence of a single trunk, yet some small trees in our region also take on a densely branching 'shrubby' habit (e.g., scrub oaks). Large native trees in the region are surprisingly few and grow mostly in moist areas. Trees along waterways can offer significant shelter for quail, especially during the height of summer when many plants have lost their leaves and temperatures are high; however, it is the large shrubs that provide the majority of roosting cover. Densely branching tall shrubs can also provide escape sites, cover for feeding birds, cover for drinking birds when they are near water, and sites for look-out by the males during the breeding season.

laurel sumac

Malosma laurina
Anacardiaceae

Photo: Karen Zimmerman

lentisco

lentisco

laurel sumac

Malosma laurina
Anacardiaceae

Photo: John Trager

Photo: John Trager

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

A landscape dominant, this tall shrub is perhaps the most consistent provider of roosting cover and elevated refuge from predators. Coveys with young are often seen to flock to the boughs of this evergreen shrub. This frost-sensitive species also makes a good look-out post, and its seeds have been occasionally reported from the crops of quail in this region. Very much a species of the California Floristic Province, this plant occupies chaparral and is occasional in the coastal scrub but does not extend into more xeric, desert areas.

Photo: John Macdonald

lemonadeberry

Rhus integrifolia

Anacardiaceae

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

Photo: Sula Vanderplank

Photo: Barbara Eisenstein

Photo: John Macdonald

This relative of the poison-oak is often also known as yiedra in Spanish, although it does not share the same toxic qualities. In fact, the lemonadeberry is famous for its tasty sour-lemony fruits, although they are often hard to find since the birds like them just as much as people do. The seeds are large but have been found in crops of the San Quintín quail. Plants of the lemonadeberry may grow together, forming small thickets that offer excellent high cover for roosting.

saladito chamiso chamise

Adenostoma fasciculatum

Rosaceae

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Barbara Eisenstein

Photo: John Macdonald

The most abundant plant in the chaparral, this fire-adapted shrub is usually around shoulder-height, but a dwarf form (never exceeding knee-height) occurs near the coast at Eréndira. A similar dwarf form from the California Channel Islands has been shown to be genetically stable and thus available to horticulture as a low cover plant. Chamise, like many chaparral species, is very plastic in its reproductive stages and will flower whenever there is enough rain. Being an evergreen species, this plant provides year-round cover and becomes particularly important to quail in summer, when they seek cool microclimates in the chaparral.

Baja bush snapdragon

Gambelia juncea

Plantaginaceae

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

Photo: Chris Barnhill

Photo: Jorge Ochoa

singlewhorl burrobrush

Ambrosia monogyra

Asteraceae

Photo: Barbara Eisenstein

Photo: Sula Vanderplank

Photo: Sula Vanderplank

Photo: Sula Vanderplank

This unusual shrub is endemic to Baja California and Sonora, occurring sporadically amongst the coastal and succulent scrubs of NW Baja California. The bright red flowers can be seen year-round, on the tips of long flexible green branches. This plant has small leaves and is not sturdy enough to provide roosting cover, often appearing as a mass of straggly green stems; it can, however, reach a considerable height and offer quail protective cover when it grows in dense thickets.

This plant is usually dominant in sandy riparian areas and is strongly indicative of perennial soil water. Unlike goldenbush *(Ericameria palmeri),* the leaves are not scented, and the plants often grow in dense thickets along disturbed water-courses. These plants may reach 7-8 ft in height and offer good year-round cover, having woody branches and evergreen leaves. Flowers appear in the fall and are not conspicuous.

Parry's buckeye

Aesculus parryi

Sapindaceae

Photo: Sula Vanderplank

Photo: Barbara Eisenstein

Photo: Sarah Ratay

Photo: Karen Zimmerman

Photo: John Macdonald

This species shares the same restricted distribution as the San Quintín quail, and is symbolic of NW Baja California. Although this tree rarely exceeds 6 ft in height, its distinctive form usually towers above the surrounding low vegetation of the succulent sage scrub. This species evolved to be drought-deciduous from a close ancestor that was winter-deciduous. Like so many species in the succulent sage scrub, the lack of leaves in summer means that these plants offer very little protection to quail in summer; however, during spring they offer the perfect roosting sites.

trompo

madroño

mission manzanita

Xylococcus bicolor

Ericaceae

Photo: Sula Vanderplank

Photo: John Trager

Photo: Barbara Eisenstein

This tall shrub of the chaparral has its core range in San Diego County and NW Baja California. Small disjunct populations are known from Catalina Island to the north, and further south on the sky islands of the Baja California peninsula, where small patches of chaparral are remnant at higher elevations in the Central Desert. There is only one species in this genus, which is thought to be an ancient lineage, whose closest ancestors went extinct long ago. Closest living relatives are the manzanitas (*Arctostaphylos* spp.) and the Baja bird bush.

Photo: John Macdonald

arroyo willow

Salix lasiolepis

Salicaceae

Photo: John Trager

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

Photo: Sula Vanderplank

This familiar riparian species is common along the water-ways of NW Baja California. The red galls of the sawfly (*Pontania californica*) are specific to this species and can even be useful in identifying it. These perennial plants provide important cover near water through the summer. Leaves are lost not to drought, as seen in many other species in the region, but are dropped in the winter months. Although the flowers are rarely noticed, they appear in early spring before the leaves. This allows the flowers easy wind-assisted pollen-transfer between individuals in late winter and early spring.

mule fat

Baccharis salicifolia

Asteraceae

Photo: Sula Vanderplank

Photo: John Trager

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

Only found in streams, along creeks and in canyon bottoms, this plant is an excellent water indicator. Provides important cover when quail come to drink or simply escape the heat in summer. This plant gets its common name from being an excellent food-plant for large animals. It is fast growing and locally abundant, and flowers late in the season.

Photo: John Macdonald

Baja California ash

fresnillo

salvia

Brandegee's sage

Fraxinus parryi

Oleaceae

Photo: Barbara Eisenstein

Photo: Jorge Ochoa

Photo: Ben Wilder

Photo: Barbara Eisenstein

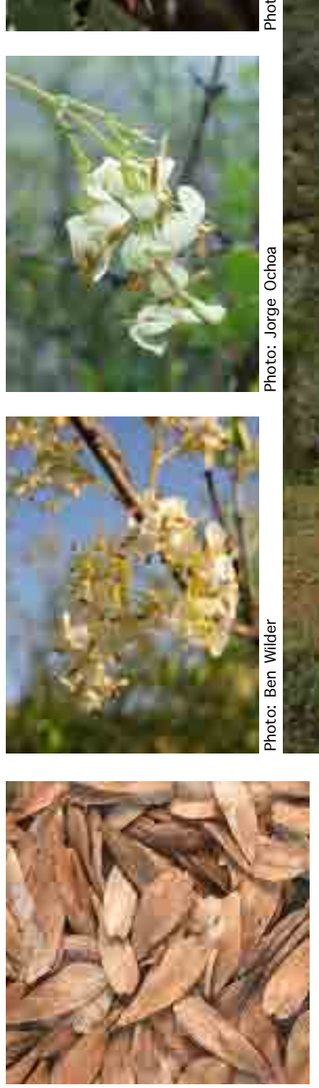


Photo: John Macdonald

A recently derived species from a temperate genus, the Baja California ash is mostly restricted to the Pacific coast of Baja California, extending north into San Diego County. This plant frequents the chaparral but occupies moist micro-habitats, north-facing slopes and cool drainages, often growing near water. Flowers early and abundantly with distinctive clusters of fruit through the summer. An important cover-plant in mating season, this plant puts out leaves very quickly, providing high cover and look-out posts in spring.

Salvia brandegeei

Lamiaceae

Photo: Ben Wilder

Photo: Karen Zimmerman

Photo: Barbara Eisenstein

Photo: Ben Wilder

This is one of a handful of species that Baja California shares with the California Channel Islands but that do not occur on mainland California at all. This may be related to the effects of the Catalina eddy which makes weather conditions on the Channel Islands similar to NW Baja California. This tall sage is easily distinguished by its warty leaves and very pleasant scent. Plants may be long-lived and form tree-like trunks over time. This species is limited to coastal habitats and is globally rare; it is an indicator species for a very restricted habitat type known as the maritime chaparral, which occurs right by the coast in foggy areas.

Photo: John Macdonald

desert apricot

Prunus fremontii

Rosaceae

Photo: Barbara Eisenstein

Photo: Chris Barnhill

Photo: Jorge Ochoa

Photo: Karen Zimmerman

Photo: John Macdonald

The desert apricot is aptly named, with fleshy orange fruits that don't last long with birds around. Its core range is in Baja California, but it also occurs in southern California. Mostly occurring on dry chaparral slopes inland, this species is also sometimes found in the coastal scrub near Santo Tomás. This species is one of the first plants to bloom in the spring, responding rapidly to rainfall. Drought tolerant, this plant quickly drops its leaves when the weather warms.

damasquillo

yerba santa

Eriodictyon sessilifolium

Boraginaceae

Photo: Barbara Eisenstein

Photo: John Trager

Photo: Jorge Ochoa

Photo: Karen Zimmerman

This local endemic has leaves that will leave a refreshing minty residue on your teeth if you chew them. Infrequent in the landscape, this woody shrub tends to occur in groups of several individuals where it is found. Particularly common near water and in arroyos near Rancho Covarrubias, this plant indicates reliable underground water.

yerba santa

desert broom escoba armarga tollón toyon

Baccharis sarothroides

Asteraceae

Photo: Barbara Eisenstein

Photo: Asuncion Andreu Soler

Photo: Barbara Eisenstein

Photo: Sula Vanderplank

Photo: Sula Vanderplank

This riparian species is well-adapted to hot dry summers, having very reduced leaves and green photosynthetic stems to reduce water-loss. This species is a sure indicator of arroyos and perennially wet areas, and its dense green branches offer protective cover to quail, especially in warm weather. This plant tends to have a large number of flowers that open simultaneously, resulting in quite a showy fall display.

Heteromeles arbutifolia

Rosaceae

Photo: Barbara Eisenstein

Photo: Sula Vanderplank

Photo: Sula Vanderplank

Photo: John Trager

Photo: John Macdonald

This member of the rose family looks more like a holly most of the year. Toyon is very characteristic of California, and is found throughout the floristic province. An evergreen species, it provides tall cover year-round, often near water. It is found scattered throughout the coastal and succulent sage scrub. Its red berries are sometimes eaten by quail in winter (Heriberto Arauz, pers. comm.).

bladderpod

Peritoma arborea

Cleomaceae

Photo: Karen Zimmerman

Photo: John Macdonald

This showy shrub often has prolific flowers and fruit in the spring and summer. A member of the caper family, this plant has large pods that are reported to have been eaten by indigenous people and have high nutritional value, but a strong peppery taste. The leaves are strongly scented. Though usually solitary, bladderpod provides excellent cover as the plants are often the tallest plants in the landscape. This plant is found throughout the state of Baja California and through central California to the north.

ejotillo

bladderpod

Peritoma arborea

Cleomaceae

Photo: Sula Vanderplank

Photo: Sula Vanderplank

Photo: Sula Vanderplank

matilija poppy

amapola del campo

Romneya trichocalyx

Papaveraceae

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: John Macdonald

Towering over the surrounding slopes with its long upright branches and spectacular flowers, the matilija poppy reigns over the chaparral slopes of the transverse range to the south of Ensenada, and the lower ranges of the sierras. Following fire, this poppy can send out runners from the roots and quickly form dense populations on steep slopes. Plants of this species are slightly smaller than the California relative, *Romneya coulteri*.

hoptree

Ptelea aptera

Rutaceae

Photo: Barbara Eisenstein

Photo: Sula Vanderplank

Photo: Chris Barnhill

Photo: Barbara Eisenstein

One of just two members of the citrus family that are native to the Baja California peninsula, this one is endemic to NW Baja California as it is known only from the region between Ensenada and El Rosario. The glands in the leaves are sweet-scented and the fruits resemble those of their cultivated cousins, sharing a warty skin with lemons and limes. These subtle plants are often overlooked; they occur in canyons, open chaparral on slopes, and near water. Another drought-deciduous species, this plant quickly puts out leaves and provides good cover through the breeding season, but offers little to quail in the summer months.

Photo: John Macdonald

scrub oak

roble

Quercus dumosa

Fagaceae

Photo: Sula Vanderplank

Photo: Barbara Eisenstein

Photo: John Trager

Photo: John Trager

Photo: Sean Lahmeyer

These small shrubby oaks form small thickets on slopes. One such thicket appears to be an 'Elfin Forest' just north of Eréndira. Generally considered a chaparral species, these oaks are not a common element, but may occur in dense populations in moist microclimates on the southern side of the low transverse range south of Ensenada. The dense growth form provides excellent protective cover. Acorns have been documented as quail food (Leopold 1977).

goldenbush

Ericameria palmeri

Asteraceae

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Cody Coyotee Howard

Photo: Barbara Eisenstein

This tall round shrub occurs among the coastal and succulent sage scrubs where individual shrubs are usually solitary in the landscape. Its range is restricted to southern California and NW Baja California. The leaves are sweet-smelling when crushed, but the flowers are unscented. This plant offers high cover for roosting year-round.

Photo: Sula Vanderplank

warty-stemmed ceanothus

Ceanothus verrucosus

Rhamnaceae

Photo: Barbara Eisenstein

Photo: John Trager

Photo: Sula Vanderplank

Photo: Barbara Eisenstein

Photo: John Macdonald

This ceanothus is known only from Oceanside to the southern end of the California Floristic Province near El Rosario. A denizen of the coastal chaparral, this plant occurs in moist microclimates and often along arroyos where it offers dense woody cover year-round. The Latin and common names refer to the black bumps on the stems. Large numbers of white flowers cover this large shrub in spring.

lila lila

blueblossom

Ceanothus

Rhamnaceae

Photo: Ben Wilder

Photo: Ben Wilder

Photo: John Trager

Photo: John Trager

There are several blue-flowered *Ceanothus* species in this region but none are abundant. All put on a showy display in spring when they bloom. *Ceanothus thyrsiflorus* is particularly rare in Baja California, but other species are more abundant at higher elevations (e.g., in the Sierra Juarez). Mostly seen in small numbers, blueblossoms are scattered throughout the Cerro Solo region. These plants occupy cool wet microclimates in chaparral and on arroyo banks or in canyons. As evergreen shrubs, they provide valuable cover near water.

Photo: John Macdonald

Baja bird bush

Ornithostaphylos oppositifolia

Ericaceae

Photo: John Trager

Photo: Sula Vanderplank

Photo: John Trager

Photo: John Macdonald

The Baja bird bush has flowers edible by people and provides high evergreen cover for quail in dense chaparral stands. This plant barely extends into California, occurring only at the northern end of the Tijuana hills in San Ysidro; it is otherwise entirely restricted to NW Baja California. Slower-growing than its relatives the manzanitas, this species is the only one in its genus.

palo blanco

islay

holly-leafed cherry

Prunus ilicifolia

Rosaceae

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Sula Vanderplank

Photo: Sula Vanderplank

With a distribution extending from Loreto to San Francisco, this versatile shrub favors cool microclimates in chaparral. In cool foggy canyons it almost reaches the coast near Ensenada. A member of the rose family, its leaves strongly resemble holly leaves but smell like almonds when crushed. This slow-growing shrub has sizeable fruits each containing a large central stone or pit covered with a thin flesh; although not pleasant-tasting, they were an important food source for native peoples. Birds are reported to enjoy the fruit too.

Photo: John Macdonald

Cedros Island oak

roble

cedro

Tecate cypress

Quercus cedrosensis

Fagaceae

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Once thought to be endemic to Cedros Island, this oak is actually fairly abundant in NW Baja California. This species shares its range with the San Quintín quail and is not found far north of the US/MX border. Another scrub oak, plants of this species maintain a shrubby habit. Individuals occupy cool microclimates in the canyons of the coastal scrub and, more inland, in the Eréndira and Santo Tomás region. Acorns are reported to be a food source for quail (Leopold 1977).

Cupressus forbesii

Cupressaceae

Photo: John Trager

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

The Tecate cypress is an ancient lineage that was once much more widespread but now has remnant populations throughout the chaparral of NW Baja California. Surviving in cool and moist microclimates, this species occurs almost at the coast in Eréndira where the thick coastal fog augments available water in the deep canyons that cut down from the Sierra San Pedro Mártir. The lower boughs may provide cool refuge for quail in arroyos on hot days.

Photo: John Macdonald

bishop pine

Pinus muricata

Pinaceae

Photo: Barbara Eisenstein

Photo: John Trager

Photo: John Trager

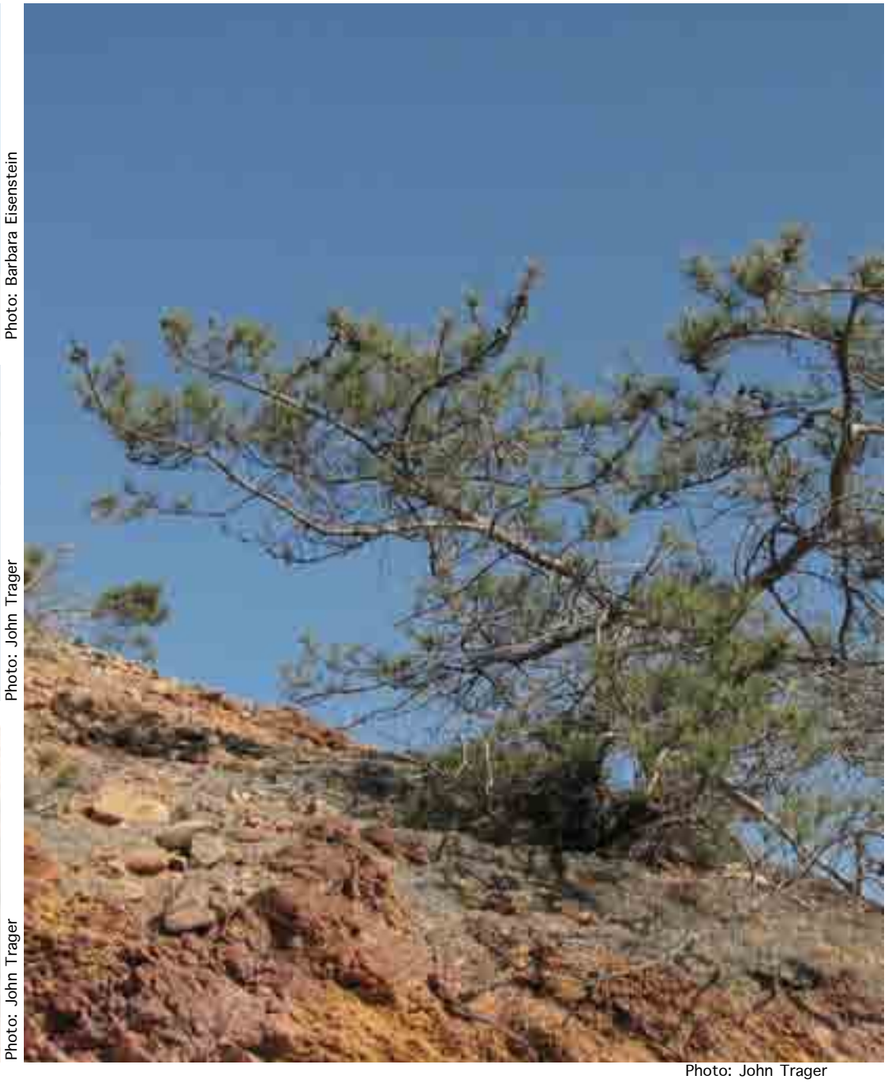


Photo: John Trager

Photo: John Macdonald

This ancient lineage occurs in Baja California only on specialized bedrock outcrops near the coast at Ejido Eréndira. The pine needles capture moisture from fog and drip water down onto the root zone in areas where wind blows fog onto the trees. The trees here are known as the 'green form' of this species which is disjunct to the California Channel Islands and further north, with a transition to the 'grey form' in Sonoma County. Quail can use the lower boughs for cover. These pines were more widespread during the Pleistocene epoch.

Parry's tetracoccus

Tetracoccus dioicus

Euphorbiaceae

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Ben Wilder

Photo: John Macdonald

This unusual shrub is listed as Rare, Threatened or Endangered in California and elsewhere by the California Native Plant Society, as are the other two species in this genus that occur in California. This species is listed as a species of concern by USFWS. Its northernmost populations are just south of San Clemente in San Diego County and the southern edge of its range is San Vicente. Known from chaparral slopes near the coast, it appears to be disjunct from San Vicente to the Tijuana area with few documented populations.

Mexican flannelbush

Fremontodendron mexicanum

Malvaceae

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Chris Barnhill

Photo: John Macdonald

This must be one of the rarest plants in Mexico. Historically documented from a couple of canyons in NW Baja California and Otay Mesa, the canyon populations are seriously diminished as a result of dam-building for cattle-ponds. As of fall 2010, just two individuals remain in the large canyon near the road to Cerro Solo. The Otay Mesa population appears to be the last refuge of this globally endangered taxon.

Low Shrubs

Photo: Ben Wilder

This chapter includes woody perennial plants that dominate the succulent coastal scrub. Shrubs are here defined by their perennial habitat (a life-cycle of more than two years), and thus usually have a woody base and/or branches. They are mostly low growing, and often drought deciduous (dropping their leaves in summer). These plants are important to quail both as low protective cover for feeding and, in the case of dense shrubs that grow close to the ground, for nesting. Since quail are ground-nesting birds they usually seek the low dense cover provided by perennial shrubs under which to build their nests. Evergreen shrubs in the landscape become particularly important in the summer when many plants of the succulent coastal scrub have lost their leaves and cover is sparse. Shrubs are not thought to constitute the staple grains on which quail depend for survival; however, many low shrubs have been documented as food plants for quail.

coast sunflower

Encelia californica

Asteraceae

Photo: Barbara Eisenstein

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Sula Vanderplank

Photo: John Macdonald

One of the most widespread and colorful flowers of the coastal and succulent sage scrubs, the coast sunflower will flower as long as water is available, losing its leaves and going dormant during the hottest months of the year. This species is widespread throughout the California Floristic Province and often turns the landscape yellow in spring. It is an important low-cover species in the spring and early summer.

incienso estafiate California sagebrush

Artemisia californica

Asteraceae

Photo: Barbara Eisenstein

Photo: Cody Coyotee Howard

Photo: Barbara Eisenstein

Photo: John Macdonald

This strongly scented shrub has insignificant flowers and is often first noticed by odor when one walks through the coastal and succulent sage scrub habitats. Popular in herbal medicines, plants have leaves with a number of secondary compounds that give this species its strong sage-like scent and putative medicinal efficacy. This evergreen shrub provides dense low cover year-round.

California buckwheat alforfón maderista California buckwheat

Eriogonum fasciculatum
Polygonaceae

Photo: Karen Zimmerman

Photo: Sula Vanderplank

Photo: John Macdonald

One of the most abundant plants in the California Floristic Province, the California buckwheat occurs along the Pacific coast in the coastal and succulent sage scrubs. The buckwheat family (Polygonaceae) is especially species-rich in western North America and this species is well-known for its nutritious seeds. Quail are reported to nest under this species.

Eriogonum fasciculatum
Polygonaceae

Photo: Karen Zimmerman

San Diego bur-sage

Ambrosia chenopodiifolia

Asteraceae

Photo: John Trager

Photo: John Trager

Photo: John Trager

Photo: John Trager

Photo: John Macdonald

Characteristic of the succulent coastal scrub of Baja California, this species is near- endemic to NW Baja California, extending north just across the border into southern San Diego County. Although drought-deciduous, this species provides excellent cover in the spring and through the mating season. The spiny fruits are often found in one's socks after a day of hiking.

huizapol

rosa de castilla

Baja little leaf rose

Rosa minutifolia

Rosaceae

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

Photo: Karen Zimmerman

The loss of a small population of this plant in San Diego County due to the construction of a car dealership has made it endemic to NW Baja California. The Baja rose caused the botanist Marcus E. Jones to pull a gun on others in his party in an argument over its name. It grows mostly on clay soil of flat mesas and is often a habitat dominant, providing important low cover to quail. Particularly valuable for nesting cover, despite losing its leaves in times of drought, the dense stems provide year-round spiny protection. Local people make a medicinal tea from the flowers.

Photo: John Macdonald

San Diego sunflower

Bahiopsis laciniata

Asteraceae

Photo: Karen Zimmerman

margaritas

San Diego sunflower

Bahiopsis laciniata

Asteraceae

Photo: Karen Zimmerman

Photo: Sula Vanderplank

Photo: Karen Zimmerman

Photo: Sula Vanderplank

These bright flowers light-up the Baja California landscape in spring. The San Diego sunflower is actually near-endemic to NW Baja California, extending just over the boundaries to both the north and south, into San Diego County and down to the northern ranges of the Vizcaíno Desert, respectively. The low dense growth provides excellent cover for nesting and feeding.

Photo: John Macdonald

desert globemallow

Sphaeralcea ambigua

Malvaceae

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: John Trager

Photo: Karen Zimmerman

Photo: John Macdonald

This plant is abundant throughout the Southwest, often in desert habitat, and sometimes occurring in dense patches. Flower color is usually orange but may vary; other species in NW Baja California are more reliably distinguished by fruit characteristics. In dry periods these plants may be reduced to a clump of dry stems that re-sprout the following spring.

mal de ojo

goldenbush

Isocoma menziesii

Asteraceae

Photo: Asuncion Andreu Soler

Photo: Barbara Eisenstein

Photo: Sula Vanderplank

Photo: Barbara Eisenstein

Photo: John Macdonald

This abundant shrub quickly colonizes disturbed areas and slightly saline places (e.g. abandoned farmland). Peak flowering is in the fall, but blooms sporadically throughout the year. This species is widespread but has several subspecies with different leaf-shapes and leaf-hairs, several of which are known from NW Baja California. Often occurring in dense clumps, these plants can provide good cover, particularly near managed lands.

wishbone bush

Mirabilis laevis

Nyctaginaceae

Photo: John Trager

Photo: Barbara Eisenstein

Photo: John Trager

Photo: Barbara Eisenstein

Photo: John Macdonald

Showy in spring with shocks of bright pink flowers, this plant is almost invisible in the fall after summer drought knocks it right back to the ground. After its leaves are dropped, the distinctive wish-bone-forked stems often blow away. There are several subspecies of wishbone bush in Baja California, but even within a subspecies flower color can vary from white to dark purple. Flower size is also variable in this member of the four o' clock family.

yerba del empacho

frutilla

Baja desert-thorn

Lycium brevipes

Solanaceae

Photo: Barbara Eisenstein

Photo: Sula Vanderplank

Photo: Sula Vanderplank

Photo: Barbara Eisenstein

The branches of *Lycium* bushes form strong woody spines that are often hidden under their fleshy leaves and can cause nasty scratches to the legs. This species has succulent flattened leaves and purple flowers that peak in spring but can be found throughout most of the year if weather is mild. A tomato relative, this plant produces red berries (frutillas) that can be eaten by people and birds alike.

Photo: John Macdonald

Simmondsia chinensis

Simmondsiaceae

Photo: Karen Zimmerman

Simmondsia chinensis

Simmondsiaceae

Photo: Cody Coyotee Howard

Photo: Barbara Eisenstein

Photo: Sula Vanderplank

Photo: Sula Vanderplank

Famous for its use in beauty products, the jojoba is remarkably abundant in the landscape. The fruits are believed to have been an important part of the diet of indigenous peoples of the area. They taste a little soapy but somewhat like almonds. This species has no close relatives but is surprisingly widespread, occurring throughout the arid Southwest in several floristic provinces.

Photo: Sula Vanderplank

California broom

Acmispon glaber

Fabaceae

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Sula Vanderplank

Photo: Karen Zimmerman

Legumes are central to the diet of the California quail. In spring the high levels of phytoestrogens in these plants are thought to impact female reproduction. The California broom is often found growing densely throughout the coastal and succulent sage scrubs. The flowers may appear different colors at different life stages, varying from yellow to orange to red. In the late summer all that is visible of this plant are bare broom-like sticks, which may take on an orange hue.

Photo: John Macdonald

pata de pajaro

canutillo

desert tea

Ephedra californica

Ephedraceae

Photo: Barbara Eisenstein

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Barbara Eisenstein

A source of ephedrine, this plant is a natural stimulant often taken as a tea. Scattered throughout the coastal and succulent scrubs, this species has a wide range and also occurs in desert habitats. *Ephedra* is actually a gymnosperm (like pine trees) with cones instead of flowers, and separate male and female plants. Female plants are more likely to be found in wetter areas and male plants predominate on dry slopes.

Photo: John Macdonald

bushrue

Cneoridium dumosum

Rutaceae

Photo: Barbara Eisenstein

Photo: John Trager

Photo: John Trager

Photo: Barbara Eisenstein

Photo: John Macdonald

Known from the coast of southern California and northern Baja California, the bushrue occurs in the coastal and maritime scrub habitats, and produces flowers in low numbers year-round. It is a member of the citrus family with secondary compounds in the leaves that cause a phototoxic reaction similar to poison-oak rash in many people. The effects are compounded in strong sunlight, and the sap of this plant may stain clothes.

jumetón

Euphorbia misera

Euphorbiaceae

Photo: Barbara Eisenstein

Photo: Karen Zimmerman

Photo: Barbara Eisenstein

Photo: Karen Zimmerman

Known from southern California and NW Baja California, this unusual shrub has semi-succulent stems and drops it leaves in drought. In mild conditions it will produce small numbers of red and green flowers almost continually, but peak flowering follows rainfall. If the stems are broken a very sticky milky sap is produced that can stain clothes. This shrub grows throughout the coastal and succulent sage scrubs.

Photo: John Macdonald

Munz's sage — salvia

Salvia munzii

Lamiaceae

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

Photo: Sean Lahmeyer

Photo: Karen Zimmerman

Photo: John Macdonald

There are several sage species in the region, but Munz's is the most abundant in the region. It rarely grows taller than waist-height and is often seen in large numbers, particularly away from the coast. Philip Munz, for whom this species was named, wrote the flora of southern California in 1974 and had been herbarium curator at Rancho Santa Ana Botanic Garden. This species is central to the same range as the San Quintín quail, occurring from southern San Diego County down to the southern tip of the California Floristic Province near El Rosario. It has a more gentle scent than many of its relatives and is pleasant to walk through.

bolsa de conejo — rabbit's purse

Harfordia macroptera var. *galioides*

Polygonaceae

Photo: Karen Zimmerman

Photo: John Trager

Photo: John Trager

Photo: John Trager

This unusual species is endemic to the Baja California Peninsula. It is related to the buckwheats but bears little initial resemblance. The flowers are small and insignificant but the showy inflated fruits have a small seed in the center, and a strong wind will blow each one a significant distance. Although frequent throughout the coastal and succulent scrubs, particularly along the coast, it is surprisingly difficult to see when not in fruit.

Photo: John Macdonald

white sage

Salvia apiana

Lamiaceae

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

Photo: John Macdonald

The white sage is well-known for its many medicinal properties and spiritual significance to native peoples. Native to the Coast Ranges of California and Baja California, the white sage becomes more restricted southward as water availability decreases. Although not rare, it is not a frequent component of the scrub of NW Baja California. This plant provides the best cover in spring, but retention of some leaves through the summer offers continued protection.

Santo Tomás redberry

Rhamnus insula

Rhamnaceae

Photo: Barbara Eisenstein

Photo: Sula Vanderplank

Photo: Karen Zimmerman

Photo: Barbara Eisenstein

This low shrub is endemic to peninsular Baja California where it occurs in the inland scrub. The small flowers are easily overlooked, and the succulent fruits serve as forage to birds and small mammals. The dense growth habit offers excellent feeding cover for the San Quintín quail.

Photo: John Macdonald

rush milkweed

Asclepias subulata

Apocynaceae

Photo: Sula Vanderplank

Photo: Barbara Eisenstein

Photo: John Trager

Photo: Barbara Eisenstein

Photo: Sula Vanderplank

Bunches of yellow-cream flowers appear at the end of the bare stems of this unusual plant that is scattered in the scrub, usually along arroyos. The rush milkweed is a close relative of the California milkweed commonly grown in gardens to attract monarch butterflies. This species shares the complex flowers that enhance pollination by trapping insects' legs, forcing the floral visitors to stay a little longer and hopefully exchange additional pollen in the struggle.

mata candelilla

chuparosa

Justicia californica

Acanthaceae

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

Photo: John Trager

Photo: John Trager

Normally a desert species, the chuparosa can be found in NW Baja California in dry inland areas, dotted along rocky water-courses. The bright red flowers are born in dense clusters making this plant very readily visible when flowering and attracting its hummingbird pollinators. Its fleshy leaves are dropped as flowering begins in the spring. This species should not be confused with *Gambelia juncea* which is larger and more frequent in this region and also has tubular red flowers.

Baja buckwheat

Eriogonum fastigiatum

Polygonaceae

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Sula Vanderplank

Photo: Chris Barnhill

Photo: John Macdonald

This small dense buckwheat is locally abundant but has a very restricted distribution, occuring on flat plains of Cerro Solo and Punta Colonet, then disjunct south to El Rosario. It is not found outside these flat clay mesas. These round mounding plants turn completely white when in flower but the leaves are somewhat inconspicuous in winter despite it being evergreen. The brownish orange fruits blow across the landscape in summer, providing nutritious buckwheat seeds.

alforfón

grosella

Catalina perfume

Ribes viburnifolium

Grossulariaceae

Photo: John Trager

Photo: Barbara Eisenstein

Photo: John Trager

Photo: Karen Zimmerman

This is another NW Baja California species that shares its distribution with Catalina Island. It is considered rare by the California Native Plant Society and occurs in the deep canyons between Eréndira and Cerro Solo in Baja California. This species is often cultivated as an evergreen ground-cover plant and like all currants and gooseberries the berries are edible (if not palatable).

Photo: Barbara Eisenstein

fuchsia-flowering gooseberry

Ribes speciosum

Grossulariaceae

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

Photo: John Trager

Photo: Barbara Eisenstein

The gooseberry is a much larger shrub than the Catalina perfume. It is only found along water-courses and may drape its bright red flowers across arroyos. One of the first plants to flower in the spring, the dark foliage and showy flowers also make this a popular garden plant that will attract hummingbirds. Found in the canyons between Eréndira and Cerro Solo, this plant needs the cooler, moister microclimates in this region.

Claire's barberry

Berberis claireae

Berberidaceae

Photo: John Trager

Photo: John Trager

Photo: Karen Zimmerman

Photo: Chris Barnhill

This globally rare and narrowly endemic low shrub is only known from the canyons between Santo Tomás and Cerro Solo. The creation of cattle ponds by damming these canyons threatens the entire population. This species was first discovered by Reid Moran of the San Diego Natural History Museum who named it for the explorer Claire Brey.

Photo: John Macdonald

longstem buckwheat

Eriogonum elongatum

Polygonaceae

Photo: Sula Vanderplank

Photo: Sula Vanderplank

Photo: Sula Vanderplank

Photo: Sula Vanderplank

Photo: John Macdonald

This very attractive buckwheat is one of the few species in the region to flower in the fall, giving a pink blush to roadsides and canyon slopes. Known from California and Baja California, locally it is seen in amongst the succulent coastal scrub and chaparral near Ejido Nativos del Valle. This plant has nutritious seeds and can grow in dense thickets. Flowers can be used in dried flower arrangements.

manzanita

Baja manzanita

Arctostaphylos australis

Ericaceae

Photo: Sarah Ratay

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Chris Barnhill

Photo: John Macdonald

There are several different species of manzanita in Baja California, but this globally rare species is endemic to the coastal region near Eréndira and San Vicente. The Baja manzanita has pink edges to the leaves and does not form a burl. It co-occurs with other manzanita species and can be found growing underneath pines and on woody chaparral slopes.

yerba buena

Clinopodium ganderi

Lamiaceae

Photo: Chris Barnhill

Photo: Sula Vanderplank

This rare mint is another species that is endemic to NW Baja California, only known from the canyons between Santo Tomás and Cerro Solo. It is globally rare and heavily threatened by the damming of the canyons for cattle ponds, which is increasingly common in the region. Delightful scent and attractive flowers but never seen in large numbers.

barba de viejo

old man's beard

Clematis pauciflora

Ranunculaceae

Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

Photo: Ben Wilder

This vine may appear shrubby at first glance since it is usually found climbing over other woody shrubs. Known from southern California and northern Baja California, this species is usually found well away from the coast along the edges of the chaparral or near openings and arroyos. It flowers profusely, and its large clusters of wind-blown seeds give it several common names such as old-man's-beard. It can cause mild dermatitis.

Photo: John Macdonald

Photo: Sean Lahmeyer

Succulent and Rosette plants

Photo: Karen Zimmerman

Succulent plants increase steadily in the landscape south of the US-MX border. Many of the succulent plants of NW Baja California do not occur elsewhere, but are restricted to the same area as the San Quintín quail. Most succulent plants in this region are heavily protected with spines. Although succulent plants are not generally considered to be of much importance to quail, larger plants can certainly provide protective cover from hawks and other raptors. Quail and other birds are reported to peck the young pads of some cacti, and several succulent species have edible fruits that are probable food sources.

Shaw's agave

Agave shawii

Agavaceae

Photo: John Trager

Photo: John Trager

Photo: John Trager

Photo: Karen Zimmerman

Photo: John Macdonald

This iconic plant of NW Baja California extends into southern San Diego County at the northern edge of its range but transitions into a different subspecies as it reaches the Central Desert to the south. Where it occurs (near the coast) it is usually the tallest plant in the landscape and thus makes an ideal lookout post for quail. In particular, the male birds can be seen watching over their mates from the new and old flower spikes in spring. The dense clumping rosettes provide some low protective cover. This species is locally abundant but considered sensitive due to its narrow range, threatened habitat, and slow regeneration times (each plant only flowers once and may take 30 years to do so).

maguey

cholla pelona

Cylindropuntia prolifera

Cactaceae

Photo: Sula Vanderplank

Photo: Cody Coyotee Howard

Photo: Karen Zimmerman

Photo: Karen Zimmerman

The scourge of all hikers and their dogs, this abundant cactus has long, barbed spines that are very painful to extract from one's flesh. These same spines keep predators away and provide a safe-haven of excellent escape-cover for quail. Some birds such as the cactus-wren choose to nest in the cholla for just this reason. This particular species is a hybrid of two less common species (*C. cholla* and *C. alcahes*) that also occur in the area. It flowers on-and-off for most of the year, with peak flowering in summer.

Photo: Sula Vanderplank

coast opuntia

golden-spined cereus

cacto aterciopelado

tapertip live-forever

Bergerocactus emoryi

Cactaceae

Photo: Karen Zimmerman

Photo: Sula Vanderplank

Photo: Karen Zimmerman

Photo: Chris Barnhill

Photo: John Macdonald

Another succulent plant that characterizes the succulent sage scrub of NW Baja California, the genus *Bergerocactus* has only one species, which is found from southern San Diego County to El Rosario. This near-endemic genus adds a golden tinge to the landscape on a sunny day, often co-occurring with agave and deerweed. The golden flowers are often almost hidden against the background of golden spines. Interestingly, this cactus flowers in the spring, not summer.

Dudleya attenuata

Crassulaceae

Photo: Sula Vanderplank

Photo: Sula Vanderplank

Photo: Sula Vanderplank

Photo: John Trager

This dudleya looks more like a cluster of fingers in spring when the fleshy cylindrical leaves can be green or brown and actively growing, but it can appear grey or white in summer, confusing observers with its color changes. This is one of the most abundant and widespread live-forevers in NW Baja California. It is also known from San Diego County in California where it is considered rare. White and pink flowers appear in the spring.

Photo: John Macdonald

Mammillaria
Cactaceae

Mammillaria brandegeei Photo: Karen Zimmerman

Photo: John Trager

Mammillaria brandegeei

The fish-hook cacti are some of the most interesting plants in Baja California, often narrowly endemic, with specific adaptations to local conditions. All species have tasty edible fruits known locally as 'chilitos' that have a flavor not that different to raspberries.

Mammillaria brandegeei grows level with the soil surface in clay mesas (near Colonet and El Rosario) in the winter and spring, but combats summer drought by shrinking down into the soil and creating a low, moist microclimate to survive the high temperatures. It is one of few species to have yellow flowers and yellow-ish pink fruits instead of the more common red fruits, making it easy to distinguish from its relatives.

Photo: John Macdonald

Little is known about *Mammillaria louisae*, a very narrow endemic from the Colonet and San Quintín regions. It is documented in large numbers on San Martín Island but its abundance on the mainland appears to be quite limited. It is distinctive in having enormous flowers (as compared to the body-size of the plant itself) and brown stigmas.

Mammillaria dioica is the most common and widespread of the fish-hook cacti in this area. Its range extends from southern California south to Baja California and East to Sonora and it forms a larger plant-body than the other species featured here. It can be very variable in flower-size and habit, but usually has green stigmas in the flowers and hairs around the spine-clusters.

Mammillaria
Cactaceae

Mammillaria dioica Photo: Barbara Eisenstein

Photo: Barbara Eisenstein

Mammillaria dioica

Mammillaria louisae Photo: John Trager

Photo: Sula Vanderplank

Mammillaria louisae

coast barrel-cactus

Ferocactus viridescens

Cactaceae

Photo: Sean Lahmeyer

Photo: John Trager

Photo: Jorge Ochoa

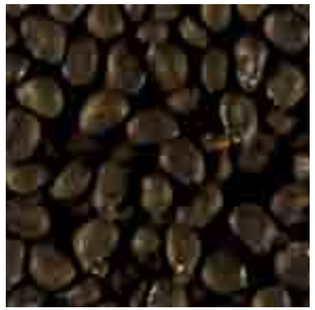


Photo: John Macdonald

This cactus is aptly named for its viridescent yellow-green flowers. Near-endemic to NW Baja California, there are two subspecies, one that is only found in the Santo Tomás region (subsp. *littoralis*), and another that extends into San Diego County and reaches the southern end of its range just north of San Quintín (subsp. *viridescens*). The fruits of this species have little flesh and a lemony flavor. Seeds are reported as a food source for indigenous peoples.

bisnaga de la costa

bisnaga

barrel-cactus

Ferocactus fordii

Cactaceae

Photo: Chris Barnhill

Photo: Sula Vanderplank

Photo: Sula Vanderplank

Photo: Sula Vanderplank

Photo: John Macdonald

This barrel-cactus has bright pink flowers and is endemic to the Baja Peninsula, occurring from the San Quintín region south into the Central Desert. This species is somewhat salt-tolerant and can be found in a variety of habitats, but most frequently amongst the coastal-scrub in NW Baja California. This species does not tend to be quite as large as some of the other barrel cacti, but it can grow across the ground in a prostrate manner in windy areas.

chaparral yucca

Hesperoyucca whipplei

Agavaceae

Photo: Sean Lahmeyer

Photo: Karen Zimmerman

Photo: John Trager

Photo: Sean Lahmeyer

Photo: John Macdonald

This iconic plant is a favorite of many people with its showy white flower spikes dominating chaparral hillsides in the spring. This species is native to southern California and northern Baja California, usually only found above 300 m (1000 ft) elevation. It has evolved a very special symbiosis with its pollinator, the California yucca moth. This moth lays its eggs in the ovaries of the plants which ensures pollination and fruit development for the survival of its own young. The young flowering stems are a tasty food source for people and have an apple-like flavor that is very pleasant.

lechuguilla

pitaya agria

Stenocereus gummosus

Cactaceae

Photo: Chris Barnhill

The delicious fruits of this cactus make it famous throughout Baja California. It was an important food source for indigenous peoples in this region. The flowers are night blooming and bat pollinated, thus rarely seen despite their large size and radiant beauty. The tangling growth habit of the creeping stems allows this species to provide excellent protection to quail and they probably enjoy the tasty summer fruits too!

sour pitaya

Photo: Sula Vanderplank

Photo: Karen Zimmerman

Photo: Sula Vanderplank

Photo: John Macdonald

candelabra cactus

cochal

nopal

nopal

Myrtillocactus cochal

Cactaceae

Photo: Karen Zimmerman

Photo: Sean Lahmeyer

Photo: Sean Lahmeyer

Photo: Karen Zimmerman

Photo: John Macdonald

Cochal is a striking landscape plant with its candelabra-like branching pattern. Endemic to the peninsula of Baja California, it is more abundant in the deserts to the south, but often seen on dry canyon walls and hillslopes in NW Baja California. The flowers are almost green and fairly hidden against the broad stems of this plant in the spring. The small edible fruits are not very tasty but offer some refreshment to the thirsty hiker. The spiny boughs offer good protective cover for quail.

Opuntia

Cactaceae

Photo: John Trager

Photo: Barbara Eisenstein

Photo: Asuncion Andreu Soler

Photo: Barbara Eisenstein

There are several native species of 'nopal' in NW Baja California. Just a few are pictured here but each varies in its spine number and arrangement, and in aspects of flowers and fruits. *Opuntia phaeacantha* has a distinctive long spine in each cluster which lies across the pad. *Opuntia littoralis* is the most common species in the region, but *Opuntia oricola* is also abundant and can often be distinguished from a distance by its very circular pads. Quail have been reported to peck the young leaves of these cacti in the spring, but this has yet to be confirmed.

Photo: John Macdonald

California cholla

Cylindropuntia californica subsp. *rosarica*

Cactaceae

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Sula Vanderplank

This rare cactus is distinctive in its snaking habit, staying low to the ground and forming a mat of spiny stems that provide good protective cover. This subspecies has large yellow flowers and is endemic to NW Baja California. Frequently seen in well-drained soils, this cactus is found fairly far from the coast, suggesting that it is less dependent on the coastal fogs. This plant is protected by the Mexican Government as a threatened species (NORMA 059).

cholla

hedgehog cactus

Echinocereus maritimus

Cactaceae

Photo: Karen Zimmerman

Photo: Cody Coyotee Howard

Photo: Karen Zimmerman

This low mounding cactus can get surprisingly large (around 5 ft across). Growing along the Pacific coast, often within the salt-spray zone, this peninsular endemic species has bright yellow flowers and red fruits that look like small pitayas from the sour pitaya, but always seem well-protected by those long spines.

Photo: John Macdonald

Dudleya
Crassulaceae

D. cultrata

Photo: Sean Lahmeyer

D. anthonyi

Photo: John Trager

D. pulverulenta

Photo: John Trager

D. ingens

Photo: Karen Zimmerman

Photo: John Macdonald

Northwest Baja California appears to have been a hot-bed of speciation for the genus *Dudleya* with several narrowly endemic species. Despite their ability to hybridize fairly widely between species, hybrids remain relatively rare and the ranges of the different species are not broadly overlapping (with the exception of *Dudleya pulverulenta* which occurs across a wide range). *Dudleya ingens* is endemic to the Colonet area, *Dudleya cultrata* is endemic to the Colonet-San Quintín region, and *Dudleya anthonyi* (although very similar in appearance to *D. pulverulenta*) is completely endemic to the volcanic cones of San Quintín bay.

[seed image: *Dudleya ingens*]

Dudleya
Crassulaceae

Photo: Karen Zimmerman

D. britonii

Photo: Karen Zimmerman

D. ingens

Photo: Karen Zimmerman

Photo: Karen Zimmerman

D. ingens

Several other rosette-forming live-forevers are found in NW Baja California, particularly near the coast, since their rosettophilous (rosette-forming) leaves are perfectly adapted to harvest moisture from fog. These species are an important indicator of the succulent coastal scrub habitat that is unique to the range of the San Quintín quail. Each of the species featured here has its own flowering period and pollinator, distinct from that of the other species.

[seed image: *Dudleya anthonyi*]

Photo: John Macdonald

Photo: Chris Barnhill

Forbs, Bulbs, and Grasses

Photo: Sean Lahmeyer

Forbs (including grasses) are leafy herbs that complete their whole life cycle in one year or less. This category includes most of those plants that quickly color the hillsides after rain. Most species of forbs are scarce in dry years but very abundant in wet years. Forbs are thought to be the most important food plants to quail (as grains and leafy greens, the latter being particularly important to females in spring). Forbs also provide important nesting materials, all the nests seen during the preparation of this guide were made entirely from the leaves and stems of annual species. Several forb species in the region are not native to Baja California but cope well with the dry summers and somewhat augment available food in the landscape.

goldfields

Lasthenia gracilis

Asteraceae

Photo: Karen Zimmerman

Photo: Karen Zimmerman

This common spring annual wildflower will form a golden carpet on the land in years of heavy rainfall. It is often among the first flowers to appear in the spring and may co-occur with any number of other spring wildflowers. This plant has also been known as *Lasthenia californica* but was recently shown to be a distinct species.

fascicled tarweed

Deinandra fasciculata

Asteraceae

Photo: Barbara Eisenstein

Photo: Karen Zimmerman

Photo: Sula Vanderplank

This abundant annual tends to bloom at the end of spring and into the summer months, giving the ground a golden glow when other flowers have dried up in the summer heat. A plant of mostly clay soils, this species can provide an excellent summer food resource for quail since it usually occurs in large numbers, particularly inland.

mustards mostaza filaree alfilerillo

Brassica species
Brassicaceae

B. nigra

Photo: Barbara Eisenstein

B. tournefortii

Photo: Barbara Eisenstein

B. geniculata

Photo: Barbara Eisenstein

B. nigra

Photo: Karen Zimmerman

Photo: John Macdonald

These abundant annuals were first introduced to North America by Europeans in the 18th century. There are many species of *Brassica* in the region, but the most dominant locally are *Brassica nigra* and *B. tournefortii*. As members of the mustard family, these species have nutritious seeds that are often favored by quail, particularly given their abundance in disturbed areas (often along roadsides and crops and in marginal habitat).

Erodium
Geraniaceae

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: John Trager

One of the most widespread plant groups from Eurasia to the Americas, these members of the geranium family have spread throughout disturbed areas all across the United States. The long pointy fruits give rise to seeds with appendages that enable them to cork-screw into the ground during wetting and drying periods (coiling and uncoiling with the varying moisture levels). The seeds are nutritious, and several species are frequent in NW Baja California.

Photo: John Macdonald

Poaceae

Melica frutescens Photo: Barbara Eisenstein

Photo: John Macdonald

Most annual grasses in Baja California are not native to the region but come from Europe. Several were introduced intentionally as fodder for grazing animals and many more were introduced accidentally, in ballast and through human and livestock transport. The native grasses of the region are mostly large perennial bunch-grasses. Annual grasses may provide food in the spring when quail are eating leaves but are most often used as a nesting resource.
[seed image: *Bromus carinatus*]

Poaceae

Photo: Barbara Eisenstein

Stipa pulchra

Photo: Barbara Eisenstein

Elymus condensa-

Photo: Karen Zimmerman

Avena barbata

Photo: Karen Zimmerman

Bromus madritensis* subsp. *rubens

wild radish

Raphanus sativus
Brassicaceae

Photo: John Trager

Photo: Karen Zimmerman

Photo: Sula Vanderplank

The wild radish shows a lot of variation in flower color and can put on quite a display in a wet spring. As a member of the cabbage family, and as one of the oldest cultivated plants, it has nutritious seeds and its fruits are edible to humans. Wild radish is often seen along roadsides and invading cultivated fields.

rabano

golondrinia

Chamaesyce
Euphorbiaceae

Photo: Barbara Eisenstein

Photo: John Trager

Photo: Karen Zimmerman

Photo: Karen Zimmerman

These very small, flat plants grow across the ground, forming small compact mats. The tiny flowers have showy, colorful bracts that look like petals. These plants are often considered members of genus *Euphorbia*, which includes a large and diverse group, including many large succulents. Several species occur in NW Baja California, including a few local endemics.

Photo: John Macdonald

rattlesnake weed

blue dicks

Dichelostemma capitatum

Asparagaceae

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: John Macdonald

This common member of the lily family is unusual in forming bulbs in the winter but using all the bulbs' resources in spring. If harvested when bulbs are present, the bulbs are indeed very tasty and were reported to be an important food source in the past. Flowering in the spring, blue dicks are often the first plants to bloom after a fire. This plant has also been known as *Dichelostemma pulchellum*.

coveria

amapola amarilla

California poppy

Eschscholzia californica

Papaveraceae

Photo: Sula Vanderplank

Photo: John Trager

The state wildflower of California is as abundant here as it is in the north in wet years, and it can flower for a long period when there is adequate water. There is a torus ring at the base of the flower that is an important character for distinguishing this species from others in this genus. Locally, it is affectionately known as 'hush poppy'.

Photo: John Macdonald

rancher's fiddleneck

Amsinckia menziesii

Boraginaceae

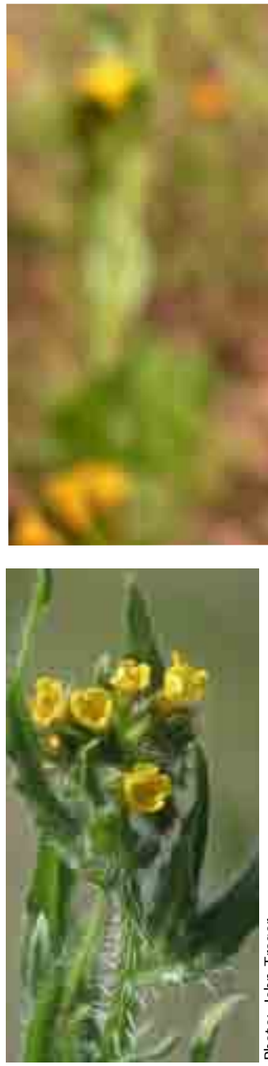


Photo: John Trager

Photo: Karen Zimmerman

Photo: John Macdonald

This widespread plant may give the hillsides an orange hue in spring. The coiled heads of flowers are distinctive and give this plant its common name. The prickly leaves make this wildflower one of those that is lesser collected. In the volcanic bay of San Quintín there is a locally endemic species, *A. inepta,* that has larger, more open flowers.

ground pink

Linanthus dianthiflorus

Polemoniaceae

Photo: Barbara Eisenstein

Photo: Karen Zimmerman

Photo: John Trager

Photo: John Trager

These tiny plants have flowers many times their body size, and if one looks closely they actually provide a very showy display. Often found on dry, convex hillsides and open soils, they may form a patchy carpet of flowers that intergrade from white to pink. There are a few less-common species of this genus in the local area.

Photo: John Macdonald

arroyo lupine

Lupinus succulentus

Fabaceae

Photo: Karen Zimmerman

Photo: Sean Lahmeyer

Photo: John Trager

Photo: Karen Zimmerman

Photo: John Macdonald

Lupines are a particularly abundant group of the pea or legume family in Baja California. Legumes are well-known for their ability to form root nodules in symbiosis with a bacterium called *Rhizobium*, which allows them to fix nitrogen. As such, they enrich the soil wherever they grow and are often planted in fields during fallow years. This is a plant group of particular importance to the San Quintín quail. They are also the group best documented to produce high levels of phytoestrogens that affect the reproduction of the quail.

collared lupine

Lupinus truncatus

Fabaceae

Photo: Karen Zimmerman

Photo: Barbara Eisenstein

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Female quail are well-documented for eating the young leaves of these legumes in the spring time when mating begins. The effect of the phytoestrogens on quail reproduction is to delay clutch production and reduce clutch size. This effect may allow quail to conserve energy during dry years and increase reproduction in favorable years. The arroyo lupine is perhaps the most abundant in the region, often seen along roadsides and in fields; the collared lupine is usually found in smaller numbers and is rarely seen in dry years.

Photo: John Macdonald

fringed spineflower

Chorizanthe fimbriata

Polygonaceae

Photo: Sarah Ratay

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: John Macdonald

Flowering towards the end of spring, this stunning little plant can turn entire hillsides pink as the weather warms. The individual plants are small with a forked branching pattern, growing across the ground. There are several species of spineflower in this region, many of which are narrowly endemic taxa of conservation concern, but this species is abundant and has been suggested as a food source for quail.

owl's clover

Castilleja exserta

Orobanchaceae

Photo: Karen Zimmerman

Photo: Ben Wilder

This attractive wildflower is hemi-parasitic, taking at least some of its nutrients from its neighbors. As such, it needs very little leaf area for photosynthesis, and the majority of the plant is flowers. Though a close relative of the paintbrushes, it has at times been placed in its own genus (*Orthocarpus exsertus*). Fairly common in wet years.

Photo: John Macdonald

mariposa lily

Calochortus splendens

Liliaceae

Photo: Sarah Ratay

Photo: Sean Lahmeyer

Photo: Karen Zimmerman

Photo: John Macdonald

These iconic wildflowers are a symbol of California. The cup-shaped flowers sit at the top of such narrow stems that they can be very difficult to spot when not flowering. Most often found in fire-prone habitats like chaparral; there are several mariposa species in NW Baja California.
[Seed image: *Calochortus weedii*]

shooting stars

Dodecatheon clevelandii

Primulaceae

Photo: John Trager

Photo: John Trager

Photo: John Trager

Photo: Karen Zimmerman

Photo: John Macdonald

This showy low herb is not truly an annual plant, but a perennial that re-sprouts from underground roots. In unfavorable years it will often not appear but stay underground until conditions improve; however, in wet years it may come up in abundance. There are two subspecies in NW Baja California (*D. c.* subsp. *clevelandii* and *D. c.* subsp. *insularae*).

Indian paintbrush

***Castilleja foliosa* (inset: *C. affinis*)**

Orobanchaceae

Photo: Barbara Eisenstein

Photo: John Trager

Photo: John Macdonald

These plants add a distinctive splash of color to the landscape and may be found growing as annual plants, herbaceous perennials or small shrubs. These species are parastic on the roots of neighboring grasses and forbs for some of their nutrients. The genus is named after the Spanish botanist Domingo Castillejo, and the flowers are reported to have been a food source for indigenous peoples.

cream cups

Platystemon californicus

Papaveraceae

Photo: Karen Zimmerman

Photo: Karen Zimmerman

One of our most beautiful California wildflowers, cream-cups is a member of the poppy family, with hairy stems and nodding heads. The name *Platystemon* is derived from a greek term that means wide-stamens. The delicate flowers range from cream to yellow and are often seen in large numbers during wet years.

Photo: John Macdonald

locoweed cascabelito

Astragalus trichopodus

Fabaceae

Photo: John Trager

Photo: John Trager

Photo: Karen Zimmerman

Photo: John Macdonald

Well-known to farmers, the loco-weed has a strange effect on livestock, causing temporary insanity. As another member of the legume family, it is important to the San Quintín quail (see lupines for more details). There are many narrowly endemic species of *Astragalus* in NW Baja California. This species is one of the most widespread.

chía chia

Salvia columbariae

Lamiaceae

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: Karen Zimmerman

Photo: John Macdonald

An important food source for indigenous peoples, this plant is still popular today as a food supplement. Chia is on the edge of its range in this region, and to the north the plants are larger and more common. In NW Baja California it is a spring wildflower rarely seen in dry years. In particular, the seeds have many medicinal uses and are often put in the water-bottles of long-distance runners.

white pincushion

Chaenactis artemisiifolia

Asteraceae

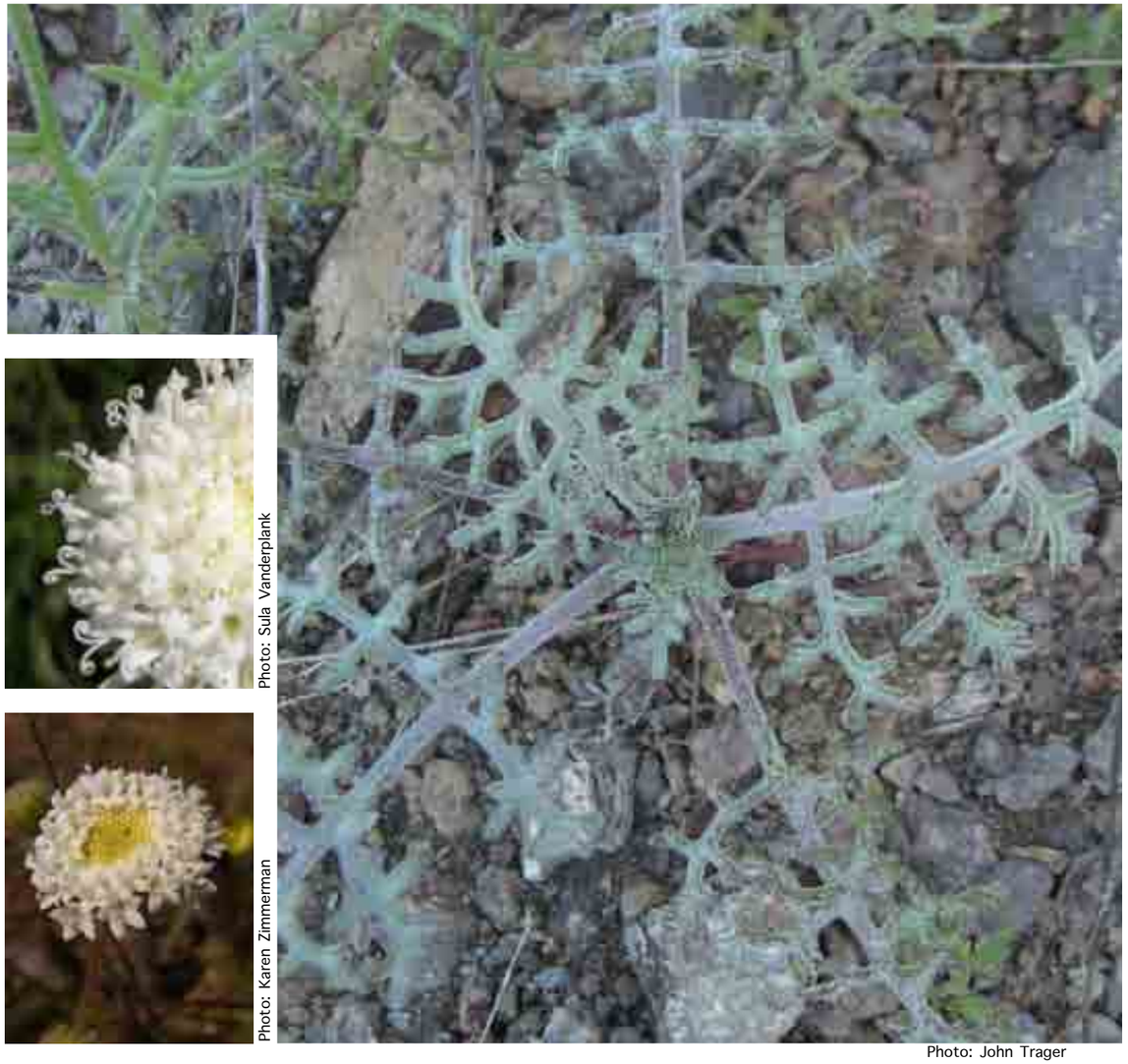


Photo: Sula Vanderplank

Photo: Karen Zimmerman

Photo: John Trager

Photo: John Macdonald

The species name—*artemisiifolia*—refers to the resemblance of the leaves to the genus *Artemisia* (see page 35), which is named after the Greek goddess Artemis. The rosettes of finely divided, silvery leaves appear early in the spring and send up a stem that bears a dense head of white flowers at the top.

spikemoss

Selaginella cinerascens

Selaginellaceae

Photo: Karen Zimmerman

Photo: Jorge Ochoa

Photo: Jorge Ochoa

Photo: Karen Zimmerman

This ancient fern relative has spores rather than seeds and is only found following very wet seasons. It has very limited vasculature for holding water, and so it grows across the soil surface in moist times and dries up completely as the environment dries. It is often known as the resurrection plant because it will green-up and come back to life very quickly if sufficient moisture returns. This species is not truly annual but survives underground as rhizomes. We were surprised to see heavy predation of the spore-cones by quail near Rancho La Jolla.

Photo: John Macdonald

wild onion

Allium praecox

Alliaceae

Photo: Ben Wilder

Photo: John Macdonald

One of a few wild onion species in NW Baja California, these plants can quickly be identified by their scent when the leaves are crushed. Often found on the driest and poorest soils, these bulbs occur throughout the California Floristic Province, from Oregon to NW Baja California.

doveweed

Croton setigerus

Euphorbiaceae

Photo: Barbara Eisenstein

This well-known plant has long been recognized as a favorite food source for mourning doves. The nutritious seeds are also favored by quail, but this species is dubiously native and usually only occurs in disturbed areas and edges or roadsides. In this region it is rarely found in large numbers.

Photo: Sula Vanderplank

Photo: Karen Zimmerman

Marsilea vestita

Photo: Sula Vanderplank

Eryngium aristulatum* var. *parishii

Photo: Chris Barnhill

Psilocarphus brevissimus

Photo: Karen Zimmerman

Vernal pools are a very special habitat type that arises from the presence of seasonal water and an impermeable soil. These conditions repeatedly favor the evolution of very specialized plants that are adapted to the rapidly changing water levels and strong seasonality of the pools. Often plants are endemic to just one cluster of pools. Colonet Mesa has extensive vernal pools, with some over 1 km in length. Several species occur only in these pools. This seasonal water source may well be important for the California quail.

Photo: Chris Barnhill

Orcuttia californica

Photo: Chris Barnhill

Elatine brachysperma

Photo: Sula Vanderplank

Ambrosia pumila

Photo: Chris Barnhill

Photo: Karen Zimmerman

Malvella lepidota

Further reading

Axelrod, D. I. 1978. The origin of coastal sage vegetation, Alta and Baja California. *Amer. J. Bot.* **65**: 1117–1131.

Barbour, M. G., T. Keeler-Wolf, and A. A. Schoenherr. 2007. Terrestrial vegetation of California. University of California Press, Berkeley, USA. 712 p.

Botsford, L. W., T. C. Wainwright, J. T. Smith, S. F. D. Mastrup, and A. Press. 2011. Population dynamics of California quail related to meteorological conditions. *J. Wildlife Managem.* **52**: 469–477.

Boue, S. M., T. E. Cleveland, C. Carter-Wientjes, B. Y. Shih, D. Bhatnagar, J. M. McLachlan, and M. E. Burow. 2009. Phytoalexin-enriched functional foods. *J. Agric. Food Chem.* **57**: 2614–2622.

Brown, D. E. 1979. Factors influencing reproductive success and population densities in Montezuma quail. *J. Wildlife Managem.* **43**: 522–526.

Calkins, J. D., J. C. Hagelin, and D. F. Lott. 1999. California quail (*Callipepla californica*). *In* A. Poole and F. Gill [eds.], The birds of North America, no. 473. The Birds of North America, Inc., Philadelphia, PA, USA.

Campbell, H. 1968. Seasonal precipitation and scaled quail in Eastern New Mexico. *J. Wildlife Managem.* **32**: 641.

Cartron, J. E., G. Ceballos, and R. S. Felger (editors). 2005. Biodiversity, ecosystems and conservation in Northern Mexico. Oxford University Press, New York, USA. 496 p.

Caso, M., C. González-Abraham, and E. Ezcurra. 2007. Divergent ecological effects of oceanographic anomalies on terrestrial ecosystems of the Mexican Pacific coast. *Proc. Natl. Acad. Sci. U.S.A.* **104**: 10530–10535.

Dailey, T. and T. Hutton. 2007. On the edge: a guide to managing land for bobwhite quail. The Conservation Commission of the State of Missouri, Jefferson City, MO, USA. 68 p.

Del Barco, M. 1980. The natural history of Baja California. [Translated by F. Tiscareno]. *In* E. Carpenter and G. Dawson [eds.], Baja California: travels series. Los Angeles, USA. 298 p.

Delgadillo, J. 1998. Florística y ecología del Norte de Baja California. Universidad Autónoma de Baja California, Mexicali, B.C., Mexico. 141 p.

Duncan, D. A. 1968. Food of California quail on burned and unburned central California foothill rangeland. *California Fish and Game* **54 (2)**: 123–127.

——— and P. W. Shields. 1966. Fall and winter food of California quail in dry years. *California Fish and Game* **52 (4)**: 275–282.

Emlen, J. T. 1979. Land bird densities on Baja California islands. *Auk* **96**: 152–167.

Flora of North America Editorial Committee. 1993+. Flora of North America North of Mexico [FNA], 12+ vols. New York, USA. 455 p.

Francis, W. J. 1970. The influence of weather on population fluctuations in California quail. *J. Wildlife Managem.* **34**: 249–266.

Garcillan, P. P., Gonzalez-Abraham, C. E., and E. Ezcurra. 2010. The cartographers of life: two centuries of mapping the natural history of Baja California. *Journal of the Southwest* **52 (1)**: 1–40.

Genelly, R. E. 1955. Annual cycle in a population of California quail. *Condor* **57**: 263–285.

Gentry, H. S. 1982. Agaves of continental North America. University of Arizona Press, Tucson, USA. 668 p.

Glading, B., H. H. Biswell, and C. F. Smith. 1940. Studies on the food of the California quail in 1937. *J. Wildlife Managem.* **4**: 128.

Grinnell, J. 1926. Another new race of quail from Baja California. *The Condor* **XXVIII**: 128–129.

Harper, A. B., S. Vanderplank, M. Dodero, S. Mata, and J. Ochoa. 2011. Plants of the Colonet region, Baja California, Mexico, and a vegetation map of Colonet Mesa. *Aliso* **29**: 25–42.

Heffelfinger, J. R., F. S. Guthery, R. J. Olding, C. L. Cochran, and C. M. McMullen. 1999. Influences of precipitation timing and summer temperatures on reproduction of Gambel's quail. *J. Wildlife Managem.* **63**: 154–161.

Hickman, J. C. (editor). 1993. The Jepson Manual. University of California Press, Berkeley, USA.

Hill, H. M. and I. L. Wiggins. 1948. Ornithological notes from Lower California. *Condor* **50**: 155–161.

Howell, J. T. 1957. The California flora and its province. *Leafl. W. Bot.* **8**: 133–138.

Johnson, N. K. 1972. Origin and differentiation of the avifauna of the Channel Islands, California. *Condor* **74**: 295–315.

Kearney, T. H. and R. H. Peebles. 1951. Arizona flora. University of California Press, Berkeley, USA. 1032 p.

Kirkpatrick, J. B. and C. F. Hutchinson. 1977. The community composition of California coastal sage scrub. *Vegetatio* **35**: 21–33.

Las Pilitas Nursery. 2011. California quail. *http://www.laspilitas.com/California_birds/Quail/California_Quail_in_your_garden.htm* (Jul 2011).

Lenz, L. W. 1986. Marcus E. Jones: Western geologist, mining engineer and botanist. Rancho Santa Ana Botanic Garden, Claremont, CA, USA. 486 p.

Leopold, A. S. 1977. The California quail. University of California Press, Berkeley, USA.

———, M. Erwin, J. Oh, and B. Browning. 1976. Phytoestrogens: adverse effects on reproduction in California quail. *Science* **191**: 98–100.

Lindsay, G. 1955. Notes concerning the botanical explorers and exploration of lower California, Mexico. Published by author, Stanford, CA, USA.

Lott, D. F. and S. N. A. Mastrup. 1999. Facultative communal brood rearing in California quail. *Condor* **101**: 678–681.

Martin, T. E. 1987. Food as a limit on breeding birds: a life-history perspective. *Annual Rev. Ecol. Syst.* **18**: 453–487.

McIlvaine, J. 2000. The biogeography of California quail (*Callipepla californica*). San Francisco State University, Department of Geography. *http://bss.sfsu.edu/holzman/courses/fall00projects/quail.html* (July 2011).

McMillan, I. I. 1964. Annual population changes in California quail. *J. Wildlife Managem.* **28**: 702.

Minnich, R. A. and E. Franco-Vizcaíno. 1998. Land of chamise and pines: historical descriptions of vegetation in northern Baja California. *Univ. Calif. Publ. Bot.* **80**: 1–166.

Moutsatsou, P. 2007. The spectrum of phytoestrogens in nature: our knowledge is expanding. *Hormones* **6**: 173–193.

Mulroy, T. W., P. W. Rundel, and P. A. Bowler. 1979. The vascular flora of Punta Banda, Baja California Norte, Mexico. *Madroño* **26**: 69–90.

Munz, P. A. 1974. A flora of Southern California. University of California Press, Los Angeles, CA, USA. 1086 p.

O'Brien, B., J. Delgadillo, S. Junak, T. Oberbauer, J. Rebman, H. Riemann, and S. Vanderplank. Rare, endangered, and endemic vascular plants of the California Floristic Province (CFP) portion of northwestern

Baja California, Mexico. In prep.

Peinado, M., F. Alcaraz, J. L. Aguirre, J. Delgadillo, and I. Aguado. 1995. Shrubland formations and associations in Mediterranean-desert transitional zones of northwestern Baja California. *Vegetatio* **117**: 165–179.

Raven, P. H. and D. I. Axelrod. 1978. Origin and relationships of the California flora. *Univ. Calif. Publ. Bot.* **72**: 1–134.

Riemann, H. and E. Ezcurra. 2005. Plant endemism and natural protected areas in the peninsula of Baja California, Mexico. *Biol. Conservation* **122**: 141–150.

——— and ———. 2007. Endemic regions of the vascular flora of the peninsula of Baja California, Mexico. *Journal of Vegetation Science* **18**: 327–336.

Roberts, N. C. 1989. Baja California plant field guide. Natural History Publishing Company, La Jolla, CA, USA. 310 p.

Rochester, J. R. and Millam, J. R. 2009. Phytoestrogens and avian reproduction: exploring the evolution and function of phytoestrogens and possible role of plant compounds in the breeding ecology of wild birds. *Comp. Biochem. Physiol.* **154**: 279–288.

Rowley, J. S. 1935. Notes on some birds of Lower California, Mexico. *The Condor* **XXXVII**: 163–168.

Rundel, P. W. 2007. Sage scrub, pp. 208–228. *In* M. G. Barbour, T. Keeler-Wolf, and A. A. Schoenherr [eds.], Terrestrial vegetation of California, 3rd ed. University of California Press, Berkeley, USA. xvii + 712 p.

Shreve, F. 1936. The transition from desert to chaparral in Baja California. *Madroño* **3**: 257–264.

Sudkamp, S., Chapman, R. N., and R. A. Pierce. 2008. Quail-friendly plants of the Midwest: an aid to identifying plants and managing habitats. University of Missouri Extension Publication. 65 p.

Sumner, E. L., Jr. 1935. A life history study of the California quail, with recommendations for its conservation and management. *California Fish and Game* **21**: 167–253, 275–342.

Thorne, R. F. 1989. The vascular plants of Bahía San Quintín and adjacent areas, Baja California, Mexico. *Crossosoma* **15(2)**: 5–8.

Tsutsui, K., G. E. Bentley, G. Bedecarrats, T. Osugi, T. Ubuka, and L. J. Kriegsfeld. 2010. Gonadotropin-inhibitory hormone (GnIH) and its control of central and peripheral reproductive function. *Frontiers in Neuroendocrinology* **31**: 284–295.

Ubuka, T., G. E. Bentley, K. Ukena, J. C. Wingfield, and K. Tsutsui. 2005. Melatonin induces the expression of gonadotropin-inhibitory hormone in the avian brain. *Proc. Natl. Acad. Sci. U.S.A.* **102**: 3052–3057.

Van Rossem, A. J. 1946. The California quail of central Baja California. *The Condor* **48**: 265–267.

Vanderplank, S. E. 2011. Rare plants of California in Greater San Quintín, Baja California, Mexico, pp. 381–387. *In* J. W. Willoughby, B. K. Orr, K. Schierenbeck, and N. Jensen [eds.], Proceedings of the CNPS Conservation Conference: Strategies and Solutions, 17–19 Jan 2009, California Native Plant Society, Sacramento, CA, USA.

———, D. Hannon, J. Ochoa, and D. Bell. 2009. Noteworthy collection: Mexico: *Salvia brandegeei*. *Madroño* **56(2)**: 135.

Wiggins, I. 1980. The flora of Baja California. Stanford University Press, Stanford, CA, USA. 1025 p.

Zink, R. M., D. F. Lott, and D. W. Anderson. 1987. Genetic variation, population structure, and evolution of California quail. *The Condor* **89**: 395.

——— and R. C. Blackwell. 1998. Molecular systematics of the scaled quail complex (genus *Callipepla*). *Auk* **115(2)**: 394–403.

Appendix 1: List of Alternative Plant Names

Many plant names are changing as additional genetic evidence comes to light and species are reclassified. I have made an effort to use names that are the most recently published in almost all cases (notable exceptions are *Brassica geniculata* and *Chamaesyce* species). Names in this guide are generally concordant with the list of rare and endemic species of northwest Baja California (O'Brien et al. in prep), that was also used to assess which species are locally endemic.

Provided here is a list of selected synonyms (alternative names) that may be encountered for some of the plants in this guide.

Brassica geniculata = *Hirschfeldia incana*
Bromus rubens = *Bromus madritensis* var. *rubens*
Chamaesyce species = *Euphorbia* species
Galvezia juncea = *Gambelia juncea*
Hemizonia fasciculata = *Deinandra fasciculata*
Hymenoclea monogyra = *Ambrosia monogyra*
Isomeris arborea = *Peritoma arborea*
Leymus condensatus = *Elymus condensatus*
Lotus scoparius = *Acmispon glaber*
Mirabilis californica = *Mirabilis laevis*
Nassella pulchra = *Stipa pulchra*
Opuntia prolifera = *Cylindropuntia prolifera*
Opuntia rosarica = *Cylindropuntia californica* subsp. *rosarica*
Orthocarpus exserta = *Castilleja exserta*
Rhamnus crocea var. *insula* = *Rhamnus insula*
Satureja ganderi = *Clinopodium ganderi*
Viguieria laciniata = *Bahiopsis laciniata*
Yucca whipplei subsp. *eremica* = *Hesperoyucca whipplei* = *Hesperoyucca peninsularis*

Family names follow the Angiosperm Phylogeny Group (Stevens 2001). These changes include moving *Aesculus* from Hippocastanaceae into Sapindaceae, *Dichelostemma* from Liliaceae into Themidaceae, *Eriodictyon* from Hydrophyllaceae into Boraginaceae, *Gambelia* from Scrophulariaceae into Plantaginaceae, and *Peritoma* from Capparaceae into Cleomaceae.

Proper names are poetry in the raw. Like all poetry they are untranslatable.
~W.H. Auden

Index

A

Acanthaceae 57
Adenostoma fasciculatum 5
Aesculus parryi 8
Agavaceae 68, 76
Agave shawii 68
alfilerillo 89
alforfón 36, 58
Alliaceae 110
amapola amarilla 95
amapola del campo 20
Ambrosia chenopodiifolia 38
Ambrosia pumila 113
Amsinckia menziesii 96
Anacardiaceae 2, 3, 4
Apocynaceae 56
Arctostaphylos australis 63
arroyo lupine 98, 99
arroyo willow 10
Artemisia californica 35
Asclepias subulata 56
Asteraceae 7, 11, 16, 23, 34, 35, 38, 40, 41, 43, 86, 87, 108
Astragalus trichopodus 106

B

Baccharis salicifolia 11
Baccharis sarothroides 16
Baja buckwheat 58
Baja bush snapdragon 6
Baja California ash 12
Baja desert-thorn 45
Baja little leaf rose 39
Baja manzanita 63
barba de viejo 65
barrel-cactus 74, 75
Berberidaceae 61
Berberis claireae 61
Bergerocactus emoryi 70
bishop pine 30
bisnaga 74, 75
bisnaga de la costa 74
bisnagitas 72, 73
bladderpod 18, 19
blueblossom 25
blue dicks 94
bolsa de conejo 53
Boraginaceae 96
Brandegee's sage 13
Brassicaceae 88, 92
Brassica species 88
bushrue 50

C

Cactaceae 69, 70, 72, 73, 74, 75, 77, 78, 79, 80, 81
cacto aterciopelado 70
California broom 48
California buckwheat 36, 37
California cholla 80
California poppy 95
California sagebrush 35
Calochortus splendens 102
cañatillo 49
candelabra cactus 78
Capparaceae 18, 19
cascabelito 106
Castilleja exserta 101
Castilleja foliosa 104
Catalina perfume 59, 60
Ceanothus thyrsiflorus 25
Ceanothus verrucosus 24
cebolla 110
cedro 29
Cedros Island oak 28
Chaenactis artemisiifolia 108
Chamaesyce 93
chamise 5
chamiso 5
chaparral yucca 76
chia 107
chía 107
cholla 69, 80
cholla pelona 69
Chorizanthe fimbriata 100
chuparosa 57
Claire's berberis 61
Clematis pauciflora 65
cliff spurge 51
Clinopodium ganderi 64
Cneoridium dumosum 50
coast barrel-cactus 74
coast opuntia 69
Coast sunflower 34
cochal 78
collared lupine 99
coveria 94
Crassulaceae 71, 82, 83
cream cups 105
creeping devil 77, 81
Croton setigerus 111
Cupressaceae 29
Cupressus forbesii 29
Cylindropuntia californica subsp. rosarica 80
Cylindropuntia prolifera 69

D

damasquillo 14
desert apricot 14
desert broom 16
desert globemallow 42
desert tea 49
Dichelostemma capitatum 94
Dodecatheon clevelandii 103
doveweed 111
Dudleya 71, 82, 83
Dudleya attenuata 71

E

Echinocereus maritimus 81
ejotillo 18, 19
Elatine brachysperma 113
Encelia californica 34
Ephedra californica 49
Ephedraceae 49
Ericaceae 9, 26, 63
Ericameria palmeri 7, 23
Eriodictyon sessilifolium 15
Eriogonum elongatum 62
Eriogonum fasciculatum 36, 37
Eriogonum fastigiatum 58
Erodium 89
Eryngium aristulatum var. parishii 112
Eschscholzia californica 95
escoba armarga 16
estafiate 35
Euphorbiaceae 31, 51, 93, 111
Euphorbia misera 51

F

Fabaceae 48, 98, 99, 106
Fagaceae 22, 28
fascicled tarweed 87
Ferocactus fordii 75
Ferocactus viridescens 74
filaree 89
fish-hook cacti 72, 73
Fraxinus parryi 12
Fremontodendron mexicanum 32
fresnillo 12
fringed spineflower 100
frutilla 45
fuchsia-flowering gooseberry 60

G

garbancillo 98
Geraniaceae 89
goldenbush 23, 43
goldenfields 86
golden-spined cereus 70
golondrinia 93
grasses 90, 91
grosella 59, 60
Grossulariaceae 59, 60
ground pink 97

H

Harfordia macroptera var. galioides 53
hedgehog cactus 81
Hemizonia fasiculata 87
Hesperoyucca whipplei 76
Heteromeles arbutifolia 17
holly-leafed cherry 27
hoptree 21
huatamate 11
huizapol 38

I

incienso 34

Indian paintbrush 104
islay 27
Isocoma menziesii 43
Isomeris arborea 18, 19

J

jojoba 46, 47
jumetón 51
junco 6
Justicia californica 57

L

Lamiaceae 13, 52, 54, 64, 107
Lasthenia gracilis 86
laurel sumac 2, 3
lechuguilla 76
lemonadeberry 4
lentisco 2, 3
lila 24, 25
Liliaceae 94, 102
Linanthus dianthiflorus 97
live-forevers 82, 83
locoweed 106
longstem buckwheat 62
Lotus scoparius 48
Lupinus succulentus 98
Lupinus truncatus 99
Lycium brevipes 45

M

maderista 37
madroño 9
Maguey 68
mal de ojo 42
Malosma laurina 2, 3
Malvaceae 32, 42
Malvella lepidota 113
Mammillaria 72, 73
Mammillaria brandegeei 72
Mammillaria dioica 72, 73
Mammillaria louisae 72, 73
manzanita 9, 63
margaritas 40, 41
mariposa lily 102
Marsilea vestita 112
mata candelilla 56
matilija poppy 20
Mexican flannelbush 32
Mirabilis laevis 44
mission manzanita 9
mostaza 88
mule fat 11
Munz's sage 52
mustards 88
Myrtillocactus cochal 78

N

nopal 79
Nyctaginaceae 44

O

old man's beard 65
Oleaceae 12
Opuntia 79
Orcuttia californica 113
Ornithostaphylos oppositifolia 26
Orobanchaceae 101, 104
owl's clover 101

P

palo blanco 26
Papaveraceae 20, 95, 105
Parry's buckeye 8
Parry's tetracoccus 31
pata de pajaro 48
Pinaceae 30
pino 30
Pinus muricata 30
pitaya agria 77
Platystemon 105
Poaceae 90, 91
Polemoniaceae 97
Polygonaceae 36, 37, 53, 58, 62, 100
Primulaceae 103
Prunus fremontii 14
Prunus llicifolia 27
Psilocarphus brevissimus 112
Ptelea aptera 21

Q

Quercus cedrosensis 28
Quercus dumosa 22

R

rabano 92
rabbit's purse 53
rancher's fiddleneck 96
Ranunculaceae 65
Raphanus sativa 92
rattlesnake weed 93
Rhamnaceae 24, 25, 55
Rhamnus insula 55
Rhus integrifolia 4
Ribes speciosum 60
Ribes viburnifolium 59
roble 22, 28
romerillo 7
Romneya trichocalyx 20
rosa castilla 39
Rosaceae 5, 14, 17, 39
Rosa minutifolia 39
rush milkweed 56
Rutaceae 21, 50

S

Sacates 90
saladito 4
Salicaceae 10
Salix lasiolepis 10
salvia 13, 52, 54
Salvia apiana 54
Salvia blanca 54
Salvia brandegeei 13
Salvia columbariae 107
Salvia munzii 52
San Diego bur-sage 38
San Diego sunflower 40, 41
Santo Tomás redberry 55
sauce 10
scrub oak 22
Shaw's agave 68
shooting stars 103
siempre-vivas 82, 83
Simmondsiaceae 46, 47
Simmondsia chinensis 46, 47
singlewhorl burrobrush 7
Solanaceae 45
Sphaeralcea ambigua 42
spikemoss 109
Stenocereus gummosus 77

T

tapertip live-forever 71
Tecate cypress 29
Tetracoccus dioicus 31
tollón 17
toyon 17
trompo 8

V

Vernal pool species 112, 113
Viguiera laciniata 40, 41

W

warty-stemmed ceanothus 24
white pincushion 108
white sage 54
wild onion 110
wild raddish 92
wishbone bush 44

X

Xylococcus bicolor 9

Y

yerba buena 64
yerba del empacho 44
yerba santa 15