

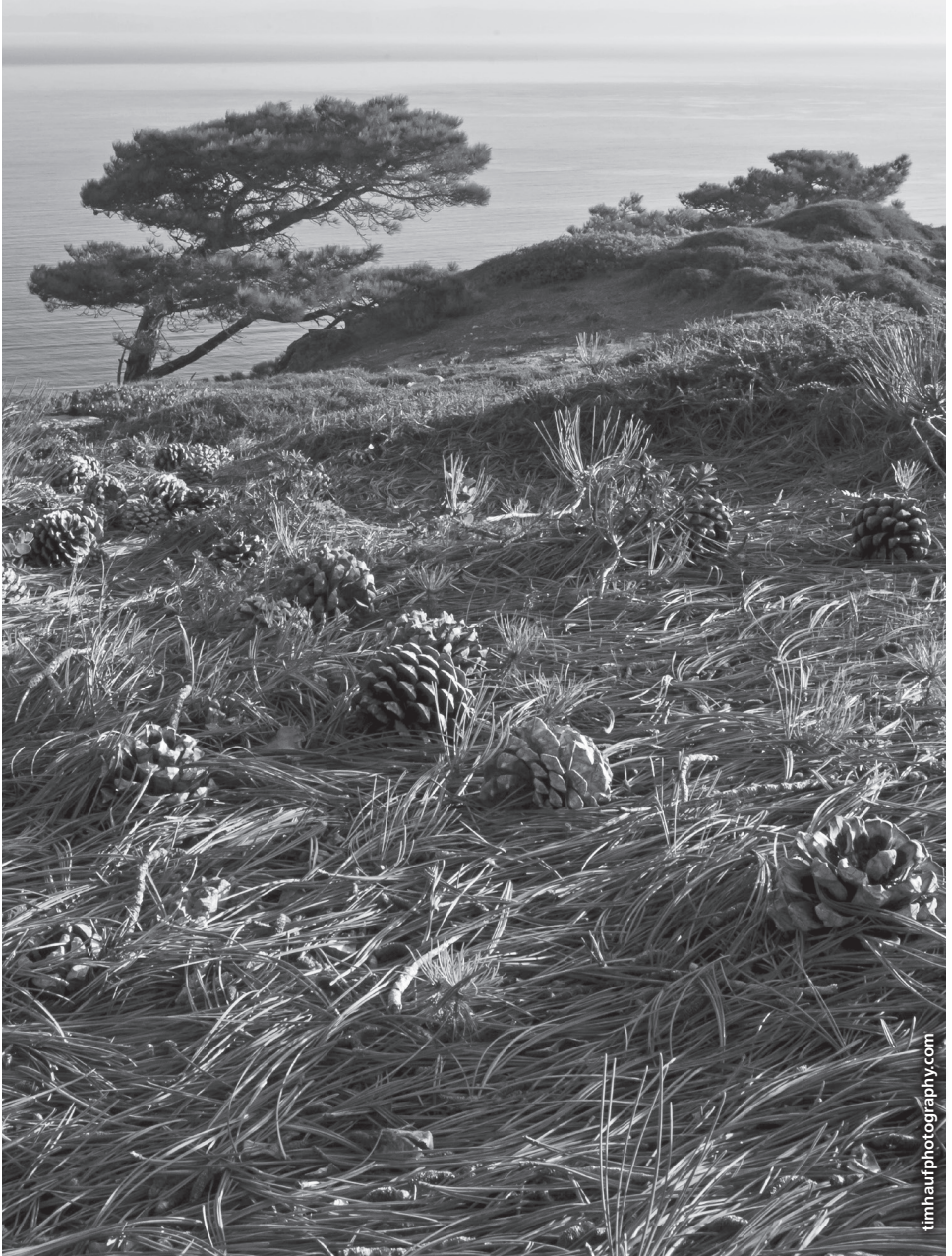
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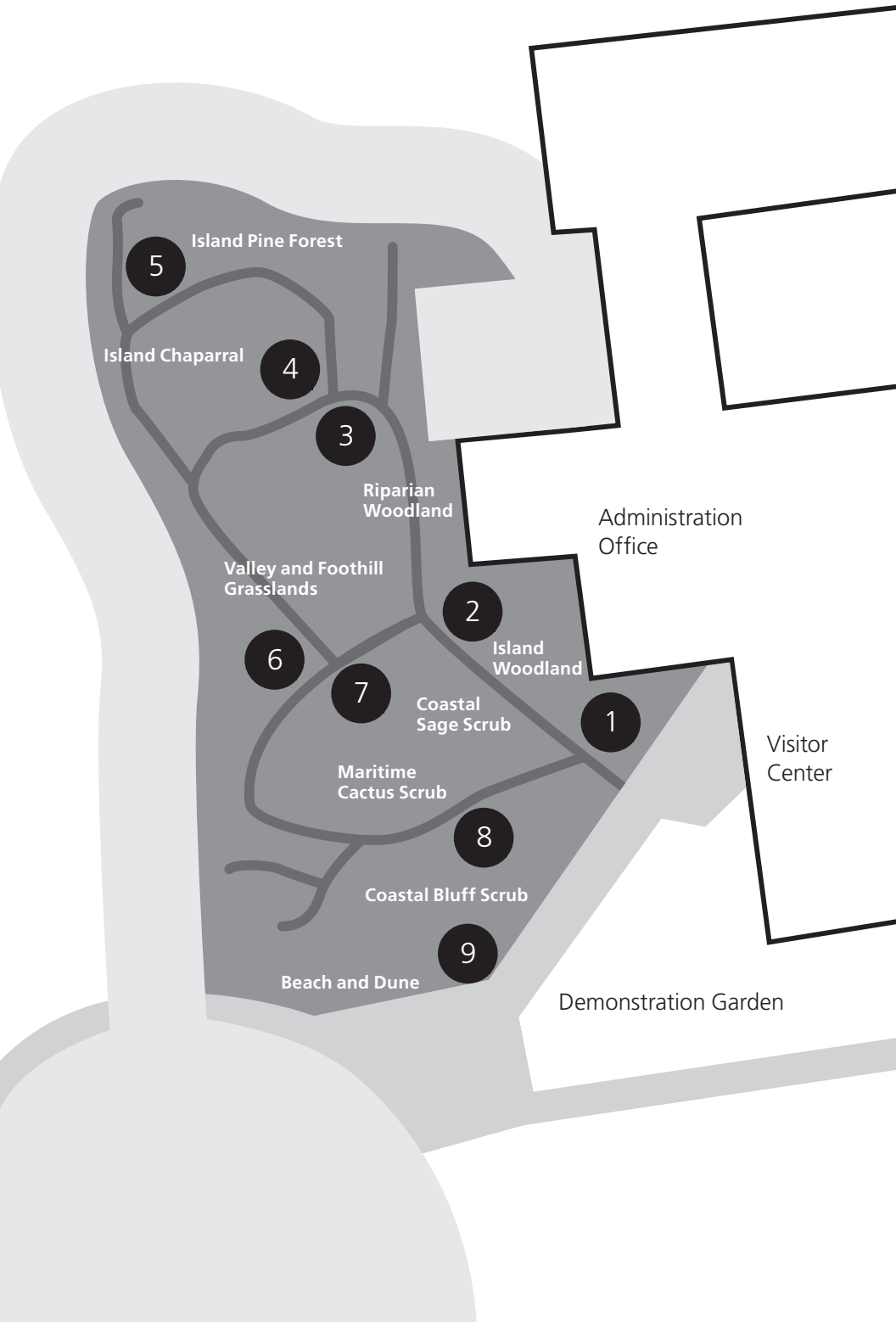
Channel Islands National Park

Guide to Island Plant Adaptations

Native Plant Garden



timhauphotography.com



Island Pine Forest

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Island Chaparral

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Riparian Woodland

Valley and Foothill Grasslands

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Coastal Sage Scrub

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Beach and Dune

Demonstration Garden

Guide to Island Plant Adaptations

Native Plant Garden

The warm morning sun climbs from a low bank of fog to illuminate a brilliant field of yellow-flowered coreopsis of Anacapa Island. A cool breeze rustles the leaves of island oaks crowning a rocky hilltop on Santa Rosa. The soil surrounding their gnarled, moss-covered trunks is still damp with moisture from the nighttime fog. Gulls swoop and dive above a windswept cliff carpeted with green and yellow goldfields on Santa Barbara Island.

A fascinating variety of plants can be found in California's Channel Islands National Park. This is due in large measure to the many plant habitats that exist on the islands, each representing a distinct combination of environmental conditions affecting plant germination and growth. Some of these conditions include wind, sun, fog, seasonal rainfall, soil conditions, and the amount of sea salt in the air and soil. The distance and isolation of the islands from the mainland has allowed plants and animals to develop into unique island forms.

Map Key



Stops



Trail



Sidewalks



Roads



Buildings

map not to scale

Trail stops for this island plant adaptations guide are marked by numbered posts and decorated with a leaf shape.



A separate trail guide describing the Chumash use of many of these plants is also available.

As you walk along the trail remember many native plants are easily damaged. Please do not pick the flowers or touch the plants.

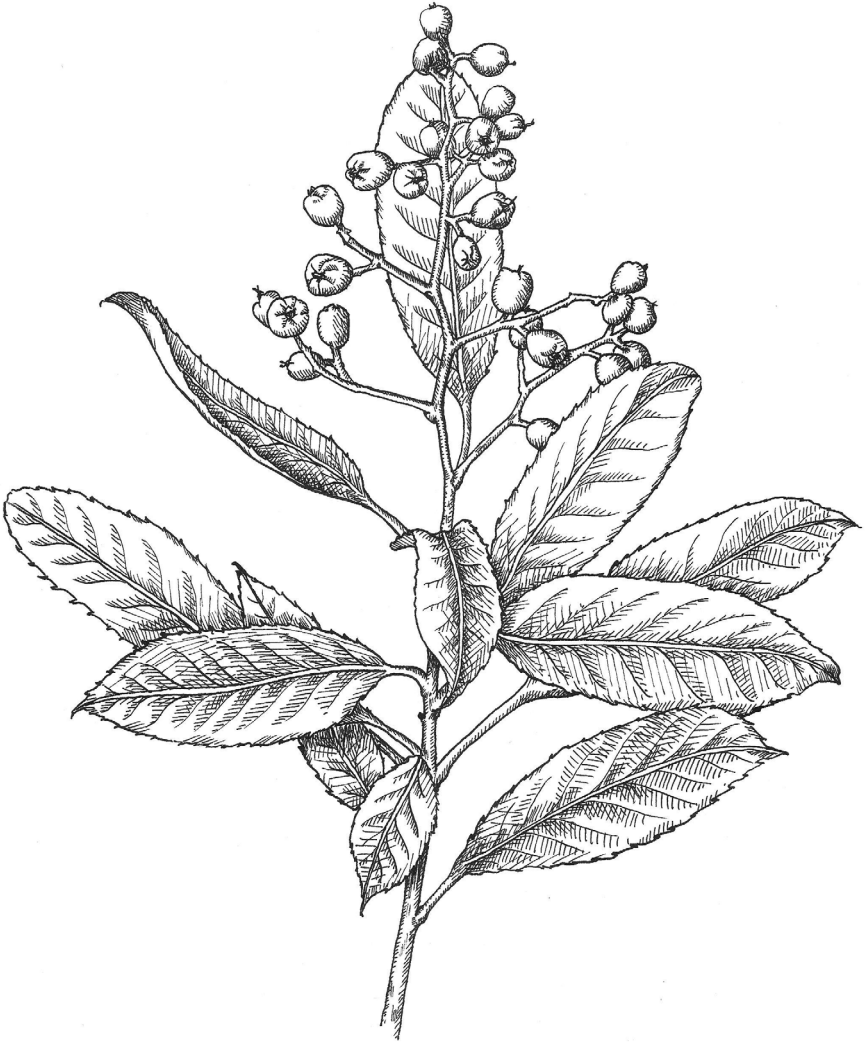


How Did Plants Reach the Channel Islands?

Plants originally arrived on the Channel Islands by a slow, steady process known as dispersal. The islands were never connected to the mainland; however, over millions of years, plants, seeds, and spores were carried from the mainland by ocean currents, wind, and birds.

Some seeds and spores may also have been caught in the fur of animals that reached the islands. More recently, humans have been important agents of plant dispersal. During the prehistoric period, the Chumash may have introduced some plants to the islands. Beginning in the early 1800s, European grasses and other foreign plants became established on the islands, largely as a by-product of farming and ranching.

Toyon, which grows on all of the larger islands, is an excellent example of natural dispersal. During summer and fall the small flowers decorating the tips of the branches gave way to clusters of bright-red berries. These berries are an important source of winter food for California's birds. In turn, birds help propagate toyon by dispersing undigested seeds to new locations. The island scrub-jay also stores toyon seeds in winter food caches; seeds that are not consumed may germinate and become established as new plants.



Toyon



Remnants of a Moister Climate

Thousands of years ago the Channel Islands knew a moister climate, as did much of southern California. Different plant communities and different animals, such as the pygmy mammoth, existed on the islands.

Island ironwood is a reminder of this earlier environment. Fossil evidence demonstrates that ironwoods once grew on the mainland as far north as Washington and as far east as Nevada.

Today, Santa Cruz Island ironwood grows only in locations where conditions approximate California's earlier, wetter climate. Small groves of these trees are found on Santa Rosa, Santa Cruz, Santa Catalina, and San Clemente Islands, where they grow mostly in north-facing canyons cooled by fog.

In fact, fog is an important element in island ironwood's successful adaptation and survival. Moisture from fog collects on the leaves and drips down to the soil surrounding the trunk, thereby increasing the amount of water available to the tree.



Island ironwood

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Defenseless Island Plants

There were no large herbivores (plant-eating animals) on the Channel Islands until the advent of ranching during the late 1800s. Prior to this time the largest land mammal found on the islands was the island fox. The introduction of many new animals and plants during the past 150 years made it difficult for native plants to survive and reproduce. Herbivores grazed on leafy plants and grasses, or browsed on the shoots of young shrubs and trees. Vigorous, nonnative grasses spread rapidly, outcompeting and replacing native plants.

Island oak, which exists only on the Channel Islands, is a prime example of a plant that was heavily impacted by nonnative species. Introduced species such as deer and elk browsed on the shoots of young trees, and feral pigs consumed the acorns. Annual grasses, introduced to the islands to provide pasture for sheep and cattle, formed a dense ground cover that robbed the soil of water and nutrients needed by oak seedlings. As a result of these factors, natural propagation of these trees remained rare. Today, however, with the removal of all nonnative animals from the islands, island oaks as well as other native plants are thriving again.



Island oak

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Fire Followers

Fire is an important agent in the evolution of California chaparral. Fire thins and prunes chaparral, removing old growth and releasing nutrients locked up in the woody plants. Some plants, such as island manzanita and chamise, have adapted to fire by developing deep root systems and large, swollen trunk bases called burls. After a burn, these plants regenerate by sprouting from the many buds that were protected in the burls. The deep roots also make these plants ideally suited to hot, dry rocky ridges and slopes.

Certain annuals, such as wild heliotrope, and perennials, such as mariposa lily, are “fire followers” and sprout well only after fire has cleared the chaparral. The seeds of these plants lie dormant until fire removes the shrub canopy, leaving behind a mineral-rich soil and ample sunlight. When the winter rains come, the seeds germinate and begin to grow; their roots anchor the soil and reduce erosion, while their plants carpet the landscape with a profusion of wildflowers. Each spring these annuals return, but are decreased in number as the chaparral regenerates, consuming soil nutrients and forming a closed canopy of brush that covers the land until fire begins the cycle anew.



Island Manzanita

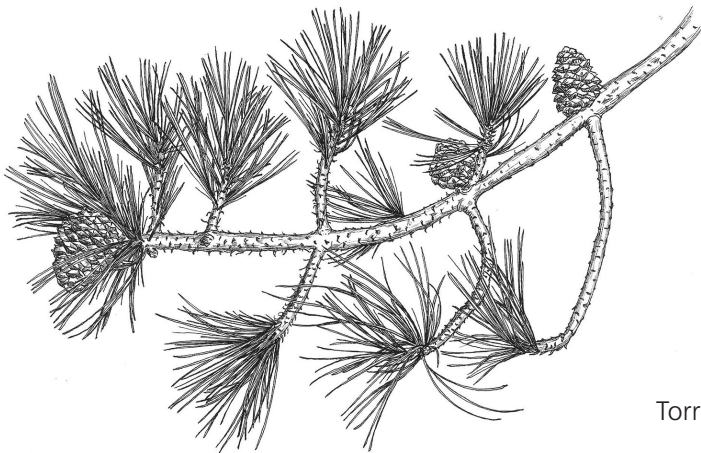
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Island Isolation

Approximately 137 (22 percent) of the 621 native plants found on the Channel Islands are endemic; that is, these plants are found only on the Channel Islands. When a localized plant population is isolated for a very long time, environmental and genetic factors can result in the development of a new species. If the new species remains isolated, it is said to be endemic.

Some endemic plants are relict species. Relict species are plants that evolved under a different climate and were once widespread, but which are now restricted to locations where conditions resemble the earlier environment.

A prime example of a relict species is the Torrey pine, which graces the eastern shore of Santa Rosa Island. Ten thousand years ago, when the climate was cooler and moister, Torrey pines were probably widespread throughout coastal California. As the climate grew warmer (and drier) these trees became restricted to cool, foggy sites near the ocean. Today Torrey pines are found in only two locations; approximately 4,000 trees grow on Santa Rosa Island, and a closely related subspecies is found in Torrey Pine State Reserve near Del Mar in San Diego County.



Torrey pine

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Lie Low

Wind is an ever-present factor in the climate of San Miguel Island, and coastal goldenbush has adapted to this windy environment in several ways. The plant's low-growing form offers minimal wind resistance, while its deep roots and tough woody stems help it remain firmly anchored in the soil. Thick, leathery leaves help to prevent desiccation. Wind also plays a role in the natural spread of coastal goldenbush. The seeds of this plant have many hair-like bristles that act like tiny wings to aid in wide dispersal.

Another wind-adapted plant is the San Miguel Island sagebrush. This plant's low-trailing branches and needle-like foliage reduce the physical damage and moisture loss that accompanies windy conditions.



San Miguel Island sagebrush



Dealing with Dryness

The plants habitats found in many regions of the Channel Islands present a number of environmental challenges. South-facing slopes are hot and dry, and receive seasonal rainfall only during the winter and early spring months. In many locations soils are thin and rocky, and have little covering of leaf mulch to hold moisture or provide nutrients.

Plants found on the Channel Islands have responded to these environmental challenges through adaptations. For example, the light-colored leaves of coastal sagebrush reflect more sunlight than darker leaves, thereby helping to control plant temperature. Sagebrush also sheds many of its leaves in the dry season, which conserves even more water. A waxy coating on the leaves of the sage plant controls evaporation, and their curled edges protect the delicate undersurface.

Other island plants have evolved different strategies for dealing with dry conditions. The vine-like wild cucumber has immense underground tubers that store water and nutrients. Cacti such as coastal cholla and coastal prickly pear have spines in the place of leaves. The spines reflect sun and wind, thereby protecting the plants from dehydration. These cacti have also evolved shallow root systems that spread over a wide area to take maximum advantage of the limited rainfall on the islands. Coastal boxthorn has also adapted to the hot, dry environment by developing small, specialized leaves to conserve moisture and reduce heat.

Perhaps no plant is more versatile in adapting to different habitats than dudleya, also known as live-forever. Dudleya commonly grows on dry, rocky outcroppings; however, it can also be found on stabilized sand dunes, grasslands, and scrub habitats in conditions varying from full sun to shade. This adaptability is reflected in the variety of dudleyas found on the Channel Islands, which include Santa Rosa Island live-forever and Santa Barbara Island live-forever.

Approximately 22 percent of the native plants growing on California's Channel Islands are endemic to one or more of the islands. This endemism results from tens of thousands of years of isolation; during this period of isolation genetic factors and environmental change have produced new plant species unique to the islands.

Because of their highly specialized nature, populations of endemic plants are generally small. Endemic plants are also vulnerable to competition from hardier introduced species such as nonnative grasses. These introduced plants can grow and reproduce rapidly, thereby competing with native plants for limited soil and moisture. Native plants are also vulnerable to competition from humans. Today there is great pressure to develop wild land; such development inevitably destroys the integrity of the habitat and severely impacts native species.



Santa Barbara Island live-forever



Coastal boxthorn

Examine closely the thick, brown stalks of giant coreopsis. Giant coreopsis has adapted to the dry conditions of the coastal bluffs by remaining dormant throughout the dry season; during these months the branches appear brittle and lifeless. However, in the spring, after rain has moistened the soil, giant coreopsis explodes with green foliage and bright yellow flowers. The flowers may last several weeks, depending on the amount of rain that has fallen. After it blooms and disperses seeds, giant coreopsis returns to dormancy in anticipation of the summer drought.



Giant coreopsis

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Living on the Edge

Coastal sand dunes represent one of the harshest plant habitats found on the islands. The dry, wind-blown sand found on unstabilized dunes offers little moisture or nutrients for plant germination and growth. Beach sand verbena, morning glory, and beach bur are three plants that have deep root systems to penetrate the sand, and thick, fleshy leaves covered with wax or hairs to conserve moisture and to reflect light and heat. These plants are also able to obtain moisture and nutrients from salt spray, a crucial factor in their successful adaptation to the dune environment.

Once these plants become established, their deep root systems help retain moisture and stabilize sand dunes, making it possible for other plants to germinate and grow there. Prominent among the plants found on stabilized sand dunes are dune lupine, silver lupine, dunedelion, and red buckwheat.



Beach sand verbena



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