

M. KAT ANDERSON

# Tending the Wild

Native American Knowledge  
and the Management of  
California's Natural Resources



# Introduction

The New World is in fact a very old world. The mountain forests, broad inland valleys, oak-studded hills, and deserts of the region now called California were thoroughly known, celebrated in story and song, named in great detail, and inhabited long before European explorers sailed along the west coast of North America for the first time. Every day of every year for millennia, the indigenous people of California interacted with the native plants and animals that surrounded them. They transformed roots, berries, shoots, bones, shells, and feathers into medicines, meals, bows, and baskets and achieved an intimacy with nature unmatched by the modern-day wilderness guide, trained field botanist, or applied ecologist.

The first European explorers, American trappers, and Spanish missionaries entering California painted an image of the state as a wild Eden providing plentiful nourishment to its native inhabitants without sweat or toil. But in actuality, the productive and diverse landscapes of California were in part the outcome of sophisticated and complex harvesting and management practices.

California Indians protected and tended favored plant species and habitats, harvested plant and animal products at carefully worked out frequencies and intensities, and practiced an array of horticultural techniques. Through coppicing, pruning, harrowing, sowing, weeding, burning, digging, thinning, and selective harvesting, they encouraged desired characteristics of individual plants, increased populations of useful plants, and altered the structures and compositions of plant communities. Regular burning of many types of vegetation across the state created better habitat for game, eliminated brush, minimized the potential for catastrophic fires, and encouraged a diversity of food crops. These harvest and management practices, on the whole, allowed for sustainable harvest of plants over centuries and possibly

thousands of years. In other words, California Indians were able to harvest the foods and basketry and construction materials they needed each year while conserving—and sometimes increasing—the plant populations from which they came.

During the course of their long history in California, Indians so exhaustively explored the plant kingdom for its uses and so thoroughly tested nature's responses to human harvesting and tending that they discovered how to use nature in a way that provided them with a relatively secure existence while allowing for the maximum diversity of other species. In the context of the entire continuum of possible human interactions with nature, ranging from exploitation and human-designed environments to hands-off preservation, this relationship between the indigenous people of California and the natural world represented a middle way, a calculated, *tempered use* of nature. *Tending the Wild* explores how California Indians managed economies that occupied this middle portion of the continuum. It recasts them as active agents of environmental change and stewardship, shattering the hunter-gatherer stereotype long perpetuated in the anthropological and historical literature of California.

The terms "hunter-gatherer" and "forager," inaccurate anthropological labels assigned to most California Indian groups, connote a hand-to-mouth existence. They imply that California Indians dug tubers, plucked berries, and foraged for greens in a random fashion, never staying in any one place long enough to leave lasting human imprints. But as *Tending the Wild* demonstrates, the indigenous people of California had a profound influence on many diverse landscapes—in particular, the coastal prairies, valley grasslands, and oak savannas, three of the most biologically rich plant communities in California. Without an Indian presence, the early European explorers would have encountered a land with less spectacular wildflower displays, fewer large trees, and fewer parklike forests, and the grassland habitats that today are disappearing in such places as Mount Tamalpais and Salt Point State Park might not have existed in the first place.

### A Tended Wilderness

Through twelve thousand or more years of existence in what is now California, humans knit themselves to nature through their vast knowledge base and practical experience. In the process, they maintained, enhanced, and in part created a fertility that was eventually to be exploited by European and Asian farmers, ranchers, and entrepreneurs, who imagined themselves to have built civilization out of an unpeopled wilderness. The concept of Cali-

fornia as unspoiled, raw, uninhabited nature—as wilderness—erased the indigenous cultures and their histories from the land and dispossessed them of their enduring legacy of tremendous biological wealth. As the environmental historian William Cronon notes, "The removal of Indians to create an 'uninhabited wilderness'—uninhabited as never before in the human history of the place—reminds us just how invented, just how constructed, the American wilderness really is."<sup>1</sup>

John Muir, celebrated environmentalist and founder of the Sierra Club, was an early proponent of the view that the California landscape was a pristine wilderness before the arrival of Europeans. Staring in awe at the lengthy vistas of his beloved Yosemite Valley, or the extensive beds of golden and purple flowers in the Central Valley, Muir was eyeing what were really the fertile seed, bulb, and greens gathering grounds of the Miwok and Yokuts Indians, kept open and productive by centuries of carefully planned indigenous burning, harvesting, and seed scattering.

Of course, there were some places that had little or no intervention from native peoples, and these would qualify as true wilderness under the modern definition. The subalpine forests, the drier desert regions of southern California, the lower salt marsh areas, the beach and dune communities, and the alkali flats and serpentine balds with widely spaced plants do not burn readily; nor do they support large numbers of economically useful plants. In addition, there were areas that were off limits to burning because their favored plants were not fire-tolerant or the terrain was too rugged, or for other reasons.<sup>2</sup> In general, however, most of the plant communities in California were influenced in varying degree by Indian management.<sup>3</sup>

California Indians did not distinguish between managed land and wild land as we do today. The word for wilderness is absent from many tribal vocabularies, as is the word for civilization.<sup>4</sup> "Viewed retrospectively," writes Max Oelschlaeger in *The Idea of Wilderness*, "the idea of wilderness represents a heightened awareness by the agrarian or Neolithic mind, as farming and herding supplanted hunting and gathering, of distinctions between humankind and nature."<sup>5</sup>

Interestingly, contemporary Indians often use the word *wilderness* as a negative label for land that has not been taken care of by humans for a long time, for example, where dense understory shrubbery or thickets of young trees block visibility and movement. A common sentiment among California Indians is that a hands-off approach to nature has promoted feral landscapes that are inhospitable to life. "The white man sure ruined this country," said James Rust, a Southern Sierra Miwok elder. "It's turned back to wilderness" (pers. comm. 1989). California Indians believe that when hu-

mans are gone from an area long enough, they lose the practical knowledge about correct interaction, and the plants and animals retreat spiritually from the earth or hide from humans.<sup>6</sup> When intimate interaction ceases, the continuity of knowledge, passed down through generations, is broken, and the land becomes "wilderness."

### Indigenous Resource Management

Resource management is not a modern invention. Indigenous people in California and elsewhere have practiced the roots of this applied discipline for millennia. Our California landscapes, a reflection of historical processes, both natural and cultural, bear the indelible imprint of a medley of management techniques. The major aim of this book is to shed new light on the diverse ways in which native peoples of California very purposefully harvested, tended, and managed the wild—pruning tobacco patches, burning willow to discourage insect pests, allowing for rest periods between sedge rhizome harvests, and maintaining plants with edible seed in the understories of open lower montane forests.

The foundation of native peoples' management of plants and animals was a collective storehouse of knowledge about the natural world, acquired over hundreds of years through direct experience and contact with the environment. The rich knowledge of how nature works and how to judiciously harvest and steward its plants and animals without destroying them was hard-earned; it was the product of keen observation, patience, experimentation, and long-term relationships with plants and animals. It was a knowledge built on a history, gained through many generations of learning passed down by elders about practical as well as spiritual practices. This knowledge today is commonly called "traditional ecological knowledge."<sup>7</sup>

The traditional ecological knowledge of California Indians and the techniques they used to manage nature are still retrievable. The historical literature contains many descriptions of Indian practices and former landscapes, before they were completely transformed by Euro-American settlement. Archaeological findings provide information on diet, tools, and demographics. Phytolith studies and fire scar data can tell us about patterns of indigenous burning and the former composition of plant communities. The growth pattern, form, and age of plant material used for the weapons and baskets in museum collections can tell us how the plants were cultivated in nature. Ecological field studies of the responses of plants to burning, pruning, or digging can also tell us much about indigenous management techniques and their effects. Finally, native people themselves still retain a

great deal of the knowledge of their ancestors. Even today, Bodega Miwok/Dry Creek Pomo women gather edible peppernuts (*Umbellularia californica*) along stream banks; Yokuts men dig yerba mansa (*Anemopsis californica*) tubers for medicine in wind-riffled valley grasslands; Cahuilla women pluck long golden flowering stalks from deergrass (*Muhlenbergia rigens*) tufts along desert washes for their baskets.<sup>8</sup> Interviews of these people—especially the elders, whose grandparents lived before the Gold Rush—yield valuable and rich information about how and when areas were burned, which plants were eaten and used for basketry, and how those plants were managed.

*Tending the Wild* uses all these diverse sources of information to make the case that indigenous land management practices were largely successful in promoting habitat heterogeneity, increasing biodiversity, and maintaining certain vegetation types that would otherwise have undergone successional change. In many cases, native harvesting and management strategies were likely attuned to the reproductive biology of specific native plants and grounded in sound ecological principles.

This is not to say that all actions of California's indigenous people proved positive. The earliest humans in California may have been responsible, at least in part, for the Pleistocene extinction of the region's megafauna. The biologist Daniel Guthrie speculates that the earliest human settlers on San Miguel Island in California's Channel Islands may have been involved in the extinction of at least two of its wildlife inhabitants: the flightless goose (*Chendytes lawi*) and the giant island mouse (*Peromyscus nesodytes*). Other research indicates that in later prehistory, California Indians may have overharvested certain animals. The research of the archaeologists Mark Raab and Katherine Bradford suggests that indigenous people overharvested coastal shellfish, especially black abalone (*Haliotis cracherodii*), on San Clemente and Santa Catalina Islands in prehistoric and historic times. And the archaeologists William Hildebrandt and Terry Jones have presented unmistakable evidence that prehistoric hunting along the California coast led to the over-exploitation of marine mammals.<sup>9</sup>

Certainly California Indians were effective predators and influenced the distribution, abundance, and diversity of large mammals. "At times the intense intervention in non-human process by Indians resulted in depletions of important resources, especially the larger animals," claims the geographer William Preston. "By late Pre-Columbian times, many of the larger species of animals were constrained demographically and spatially by the subsistence requirements of the native dwellers." He postulates that the large numbers of deer, elk, antelope, beaver, and otter reported around the time of

Spanish missionization were a result of the relatively sudden diminishment of native hunting: "Their populations simply irrupted as their chief predator, the California Indians, were reduced by protohistoric plague."<sup>10</sup>

Very little is known about the impact of native harvesting on the flora. It is reasonable to assume, however, that the peoples migrating into what is now California more than ten thousand years ago undoubtedly experienced a learning curve, apprising the limits to resource use and then adjusting their harvesting and management from the lessons learned. At times, the result was landscape degradation and species reductions or extinctions, but over the long term, valuable lessons were learned about how to steward nature for future generations.

In general, accounts of the impact of native people on the land have been skewed in two almost contradictory ways. In some cases, these impacts are simply *assumed* to be negative. The possibility of beneficial influences, such as enhancing the numbers and diversity of other species, is seldom considered.<sup>11</sup> Then there is the old view that the population levels of Indians in California were so low, and their technologies so unadvanced that they had little or no impact on wild nature. Another version of this stance is the idea of the "conservation-minded Indian" put forth by some environmentalists. This view fosters a one-sided image of the California Indian as an ecological eunuch whose minimalist interventions on the environment served to guard nature's virgin treasures without despoiling or changing them. J. Donald Hughes expresses such a view in *American Indian Ecology*: "An Indian took pride not in making a mark on the land, but in leaving as few marks as possible: in walking through the forest without breaking branches, in building a fire that made as little smoke as possible, in killing one deer without disturbing the others."<sup>12</sup> The shallow image of the conservation-minded Indian who hardly uses, let alone influences nature and feels guilty about breaking a branch is perhaps based on a romantic notion stemming from Euro-American longings to have those same tendencies rather than on serious research into indigenous lifeways. California Indians have never advocated leaving nature alone.

### Restoration

Learning about the ways in which the indigenous people of California appropriated plants and animals for cultural uses while allowing them to flourish can help us to change the ways in which we interact with nature today. Following the indigenous example, we can move beyond knowing and celebrating nature only through the view of a camera lensfinder, the end of a

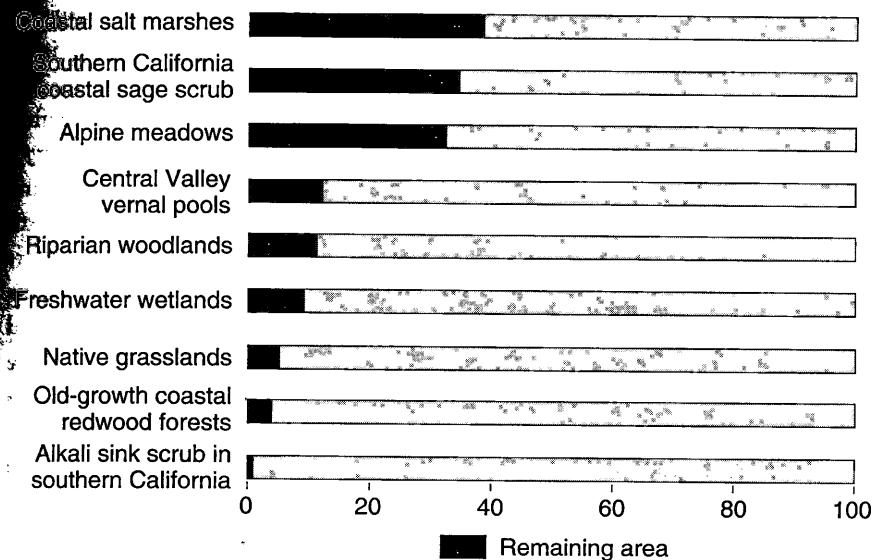


Figure 1. Remaining area of selected California ecosystems, as a percentage of total original acreage. Sources: Robert Holland pers. comm. 2005; Mark Stromberg pers. comm. 2005; Noss et al. 1995; R. F. Noss, ed., *The Redwood Forest* (Island Press, 2000).

tape measure, or the stroke of a paintbrush on canvas. We can begin to see the possibility of becoming part of localized food webs once again, being full participants in nature, and restoring and reinhabiting damaged lands.

Many of the state's native ecosystems—which contain plants of cultural significance to native people, give California its uniqueness, and act as reservoirs of precious biodiversity—are vanishing. (See Figure 1.)<sup>13</sup> Some temperate habitats in California are being eliminated more rapidly than most tropical rain forests and stand to lose as great a proportion of their species. With exceedingly diverse soil, topography, and climate, California harbors 25 percent of the biological diversity in the continental United States. Since the 1850s, at least twenty animal species and thirty-four plant species native to the state have gone extinct. For example, the San Joaquin Valley tiger beetle (*Cicindela tranquebarica*), the Santa Barbara song sparrow (*Melospiza melodia graminea*), and the Los Angeles sunflower (*Helianthus nuttallii* subsp. *parishii*) have vanished forever. Although extinction is a natural process, modern humans have driven the rate of extinctions today to about one hundred times the natural rate.<sup>14</sup> Dwindling biodiversity is linked to contemporary land uses, which cause degradation, fragmentation, and outright loss of habitat.<sup>15</sup>

Spanish missionization were a result of the relatively sudden diminishment of native hunting: "Their populations simply irrupted as their chief predator, the California Indians, were reduced by protohistoric plague."<sup>10</sup>

Very little is known about the impact of native harvesting on the flora. It is reasonable to assume, however, that the peoples migrating into what is now California more than ten thousand years ago undoubtedly experienced a learning curve, apprising the limits to resource use and then adjusting their harvesting and management from the lessons learned. At times, the result was landscape degradation and species reductions or extinctions, but over the long term, valuable lessons were learned about how to steward nature for future generations.

In general, accounts of the impact of native people on the land have been skewed in two almost contradictory ways. In some cases, these impacts are simply *assumed* to be negative. The possibility of beneficial influences, such as enhancing the numbers and diversity of other species, is seldom considered.<sup>11</sup> Then there is the old view that the population levels of Indians in California were so low, and their technologies so unadvanced that they had little or no impact on wild nature. Another version of this stance is the idea of the "conservation-minded Indian" put forth by some environmentalists. This view fosters a one-sided image of the California Indian as an ecological eunuch whose minimalist interventions on the environment served to guard nature's virgin treasures without despoiling or changing them. J. Donald Hughes expresses such a view in *American Indian Ecology*: "An Indian took pride not in making a mark on the land, but in leaving as few marks as possible: in walking through the forest without breaking branches, in building a fire that made as little smoke as possible, in killing one deer without disturbing the others."<sup>12</sup> The shallow image of the conservation-minded Indian who hardly uses, let alone influences nature and feels guilty about breaking a branch is perhaps based on a romantic notion stemming from Euro-American longings to have those same tendencies rather than on serious research into indigenous lifeways. California Indians have never advocated leaving nature alone.

### Restoration

Learning about the ways in which the indigenous people of California appropriated plants and animals for cultural uses while allowing them to flourish can help us to change the ways in which we interact with nature today. Following the indigenous example, we can move beyond knowing and celebrating nature only through the view of a camera lensfinder, the end of a

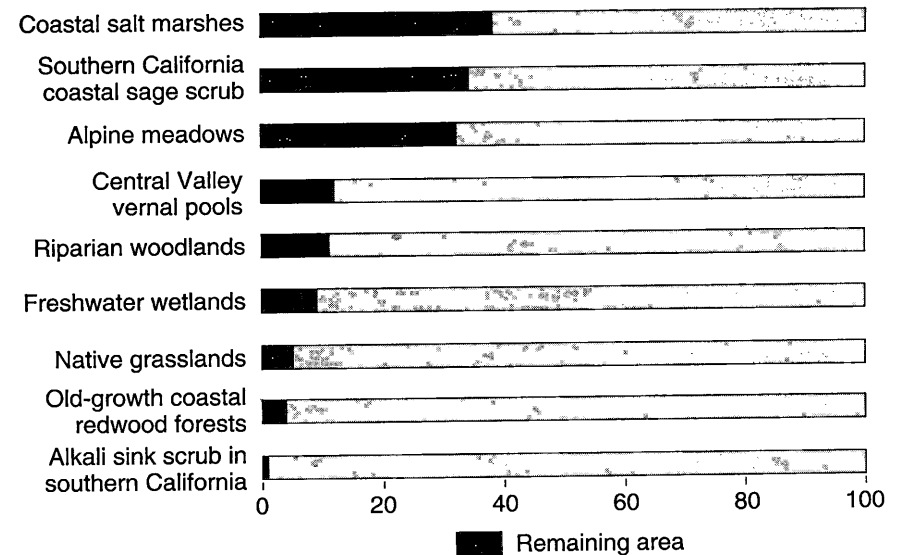


Figure 1. Remaining area of selected California ecosystems, as a percentage of total original acreage. Sources: Robert Holland pers. comm. 2005; Mark Stromberg pers. comm. 2005; Noss et al. 1995; R. F. Noss, ed., *The Redwood Forest* (Island Press, 2000).

tape measure, or the stroke of a paintbrush on canvas. We can begin to see the possibility of becoming part of localized food webs once again, being full participants in nature, and restoring and reinhabiting damaged lands.

Many of the state's native ecosystems—which contain plants of cultural significance to native people, give California its uniqueness, and act as reservoirs of precious biodiversity—are vanishing. (See Figure 1.)<sup>13</sup> Some temperate habitats in California are being eliminated more rapidly than most tropical rain forests and stand to lose as great a proportion of their species. With exceedingly diverse soil, topography, and climate, California harbors 25 percent of the biological diversity in the continental United States. Since the 1850s, at least twenty animal species and thirty-four plant species native to the state have gone extinct. For example, the San Joaquin Valley tiger beetle (*Cicindela tranquebarica*), the Santa Barbara song sparrow (*Melospiza melodia graminea*), and the Los Angeles sunflower (*Helianthus nuttallii* subsp. *parishii*) have vanished forever. Although extinction is a natural process, modern humans have driven the rate of extinctions today to about one hundred times the natural rate.<sup>14</sup> Dwindling biodiversity is linked to contemporary land uses, which cause degradation, fragmentation, and outright loss of habitat.<sup>15</sup>

A primary way that we have responded to the loss of biodiversity, the degradation of ecosystems, and the endangerment of particular species is by setting aside land and protecting it from virtually all human influences. The assumptions behind this strategy are apparent in the way that we define wilderness. According to the Wilderness Act of 1964 (Public Law 88-577), wilderness is "an area where the earth and [its] community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which . . . generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable."

Much of what we consider wilderness today was in fact shaped by Indian burning, harvesting, tilling, pruning, sowing, and tending. This fact suggests an alternative way of conserving the lands that have so far largely evaded (or have somewhat recovered from) the impact of modern society: manage them by applying the traditional ecological knowledge and traditional resource management practices of California's indigenous peoples.

Although setting aside areas as wilderness is still absolutely necessary given our population numbers, there are compelling reasons to protect, restore, and manage some "wild" lands by following a model other than the hands-off wilderness model. Under what could be called the "indigenous management model," we can re-create specific human-ecosystem associations within designated areas and use them to restore and maintain these areas as they were when first visited by non-Indians. David Egan, editor of *Ecological Restoration*, defines this kind of ecological restoration as "[t]he practice of re-establishing the historic plant and animal communities of a given area or region and renewing the ecosystem and cultural functions necessary to maintain these communities now and into the future" (pers. comm. 1996). The indigenous management model can also be extended to the more settled and human-influenced rangelands, forests, and residential open space mosaics surrounding the state's wild lands, with indigenous management principles helping landowners, gardeners, farmers, and resource managers to better manage, restore, and use their lands.<sup>16</sup>

Wildland areas can also be co-managed with California Indian tribes, with the goal of restoring, maintaining, and enhancing the natural resources important to their cultures. Such arrangements could be beneficial to all stakeholders, particularly the Indian tribes, whose cultures are endangered in part

because of the obstacles they face in continuing their cultural traditions: lack of access to gathering sites and the degradation of plant quality, soil fertility, and biological diversity.<sup>17</sup>

## Renewal

The cultures of the indigenous people of California are rooted in a belief that nature has an inherent ability to renew itself, to cause the return of the geese, the regrowth of the plants with edible bulbs, the germination of next year's crop of wildflowers. This belief is reflected in the names of the lunar cycles and the annual ceremonies welcoming the return of particular animals and dances honoring the ripening of acorns and other crops. But native peoples also believe that renewal cannot happen in the absence of appropriate human behavior toward nature.

The idea that nature has a capacity for renewal as long as humans allow it to occur is not foreign to either Western culture or modern science. The English language is laden with words whose forgotten meanings point to nature's capacity for renewal and instruct us on how to live with nature. For example, the word *resource*, which now connotes ownership and production for profit, comes from the old French feminine past participle *ressourdre*, which meant "to rise again."<sup>18</sup> The word *horticulture*, which comes from the roots *hortus* ("to garden") and *culture* ("to take care of, worship, cultivate, respect"), essentially means "to garden with respect."<sup>19</sup> The visionary forester Aldo Leopold wrote of "the renewal capacity of the earth" and the need for human relationships with nature that *preserve* this capacity. Ecologists point out that large human disturbances that do not mimic perturbations in nature have the effect of simplifying ecosystems and drastically reducing the land's capacity for self-renewal. California has many examples: agricultural fields with excessive salinity from irrigation in the Central Valley; overgrazed areas in pinyon-juniper woodlands; vast clear-cut areas in the Sierra Nevada and along the North Coast. In these and other places, ecosystem processes and structures have been so damaged that the land can no longer be used for farming, grazing, or timber harvesting without expensive technological inputs.<sup>20</sup>

Finding ways to use and live in the natural world without destroying its renewal capacity is one of the major challenges facing modern-day Californians, just as it was for the people who migrated here more than ten thousand years ago. The detailed descriptions of the land use and management practices of California Indians contained in *Tending the Wild*—the results

of thousands of years of experimentation, adaptation, and ingenuity—can help us to meet this challenge. With a better understanding of the California that untold generations of Indians created, and the ways in which they brought it about and maintained it, we can reinhabit California as more circumspect stewards.



## Wildlife, Plants, and People

No country in the world was as well supplied by Nature, with food for man, as California, when first discovered by the Spaniards. Every one of its early visitors have left records to this effect—they all found its hills, valleys and plains filled with elk, deer, hares, rabbits, quail, and other animals fit for food; its rivers and lakes swarming with salmon, trout, and other fish, their beds and banks covered with mussels, clams, and other edible mollusca; the rocks on its sea shores crowded with seal and otter; and its forests full of trees and plants, bearing acorns, nuts, seeds and berries.

TITUS FEY CRONISE, *The Natural Wealth of California* (1868)

California is a land of superlatives. It has the highest mountain peaks, the largest, oldest, and tallest trees, the rivers of the greatest variety, and the most diverse Indian tribes found in the coterminous United States. California harbors the smallest bird on the continent north of Mexico, the calliope hummingbird (*Stellula calliope*), and the largest flying bird, the California condor (*Gymnogyps californianus*). From the summit of Telescope Peak in the Panamint Range, one can face east to see the lowest point on the American continent, in Death Valley, and then turn around to gaze at the highest point of land in the United States outside of Alaska, the summit of Mount Whitney, 14,501 feet above sea level.<sup>1</sup>

Not unlike that of an isolated island, the plants, animals, landscapes, and native peoples of California have a distinctness and unusual diversity that casts them apart from the rest of the mainland. This was apparent to every European visitor during the period of early exploration. One-third of the state's 6,300 native plant species are endemics and grow nowhere else on earth. It has nineteen of the ninety oak (*Quercus*) species that grow in the United States. And it contains nearly all of the world's approximately sixty species of manzanitas (*Arctostaphylos* spp.) and forty-three of the forty-five species of California-lilacs (*Ceanothus* spp.).<sup>2</sup>

In 1542 one hundred languages resonated across California's myriad landscapes—one quarter of the 418 native languages that existed within the bor-

ders of the present-day United States. Alfred Kroeber, the father of California anthropology, split the state into six major Native American culture areas, which reflect the state's tremendous variety of lifestyles. The archaeologist Michael Moratto states, "Such cultural, linguistic, and biological variations bespeak a long and rich prehistory in this part of the Far West."<sup>3</sup>

Early European explorers and settlers were universally impressed not just by California's diversity but also by the sheer abundance of its wildlife. Jean-François de Galaup, Comte de La Pérouse, a French seafarer, described California in 1786 as a land of "inexpressible fertility." He and others were taken with the prodigious congregations of wildlife: rookeries of seals, shoals of fish, pods of whales, flocks of birds, and herds of pronghorn antelope. The immense numbers of tule elk in the Central Valley, for example, rivaled ungulate numbers in Africa's Serengeti.<sup>4</sup>

Thomas Jefferson Mayfield, a white man who came to live with the Choynumni Yokuts in the San Joaquin Valley in the 1850s when just a boy, vividly described this overflowing abundance of wildlife: "Thousands of bandtail pigeons" came "in flights that would sometimes shut out the sun like a cloud. They piled into the nearest trees until there was not a single place for another pigeon to sit."<sup>5</sup>

Padre Pedro Muñoz, a member of Gabriel Moraga's Spanish military expedition through the San Joaquin Valley in 1806, observed thousands of California tortoise-shell butterflies (*Nymphalis californica*) on September 27, possibly at what is now Mariposa Creek, and jotted in his diary: "This place is called [the place] of the mariposas [butterflies] because of their great multitude, especially at night and morning. . . . One of the corporals of the expedition got one in his ear, causing him considerable annoyance and no little discomfort in its extraction."<sup>6</sup>

James Carson, a sergeant in the U.S. Army, wrote of the biological wealth of the Tulare Plains in the Great Central Valley between 1846 and 1852: "[S]wan, geese, brant, and over twenty different descriptions of ducks . . . cover the plains and waters in countless myriads from the first of October until the first of April, besides millions of grous [sandhill cranes], plover, snipe and quail. The rivers are filled with fish of the largest and most delicious varieties, and the sportsman and epicurean can find on the Tulares everything their hearts can desire."<sup>7</sup> By the mid- to late 1800s, dozens of travel guides were written to attract new settlers to California, including Felix Paul Wierzbicki's 1849 book, *California: A Guide to the Gold Region*, and Charles Nordhoff's *California: A Book for Travellers and Settlers*, published in 1873. The alluring descriptions were designed to captivate the newcomer eager for a fresh start in life. But in many cases the advertisements

were not exaggerated, because the truth worked just as well. The American-born traveler and writer Bayard Taylor wrote his fiancée from California in 1849:

I cannot express to thee how I have been charmed with this country. Its pure, cloudless sky; its spring-like airs, always filled with the odor of balmy shrubs and grasses; its vast plains that stretch away like seas with forest islands and shores; its mountain ranges, which the wild oat cover with cloth of gold and which loom through the violet haze; its deep-cloven ravines, its shores and sparkling seas impress me like some new-created world.<sup>8</sup>

Early California was a massive flower garden. John Muir dubbed the state "the Pacific land of flowers," and he compared the frothy white flowers in the Sierra foothills to "patches of unmelted snow" and the wavy hills of yellow composites to "abundant, divine, gushing, living plant gold, forming the most glowing landscape the eye of man can behold."<sup>9</sup> These densely growing native wildflowers and grasses of hundreds of varieties such as brodiaeas, yampah, mule ears, farewell-to-springs, lilies, balsam root, tarweeds, evening primroses, wild ryes, deergrass, and California bromes at one time covered large areas of ground not just in open grasslands but also in the open understory of California's coniferous forests, oak woodlands, chaparral, and pinyon-juniper forests, forming the bulk of the plant diversity in these communities. (See Figure 2.)

The goldfields (*Lasthenia californica*) were among the first wildflowers to appear in large, dense carpets in grasslands and open woodlands. Red maids (*Calandrinia ciliata*) were common throughout the state in the lower elevations, forming battalions of magenta pink. Charles Greene spotted red maids along with other wildflowers in the San Joaquin Valley and published this species account in 1892: "Eschscholtzias [*sic*] flamed in places, and nemophilae repeated the blue of the skies. Mallows and calendrinias [*sic*] made more beautiful red on the sod than we had been looking upon; and besides these there were a multitude more of flowers, red and white, and yellow and blue." Central Valley farmers still find red maids in their agricultural fields—but their status has changed; they are listed in *Weeds of the West*.<sup>10</sup>

Masses of fragrant blue lupines (*Lupinus nanus*, *L. bicolor*, and *L. micranthus*) and California poppies (*Eschscholzia californica*) were particularly notable, as they blanketed hills and valleys through large portions of the state. Blue and gold, the colors of the University of California, are said to have been chosen originally because of the great abundance of blue lupines and golden poppies in the vicinity of the first campus in Berkeley, founded in 1868.<sup>11</sup>

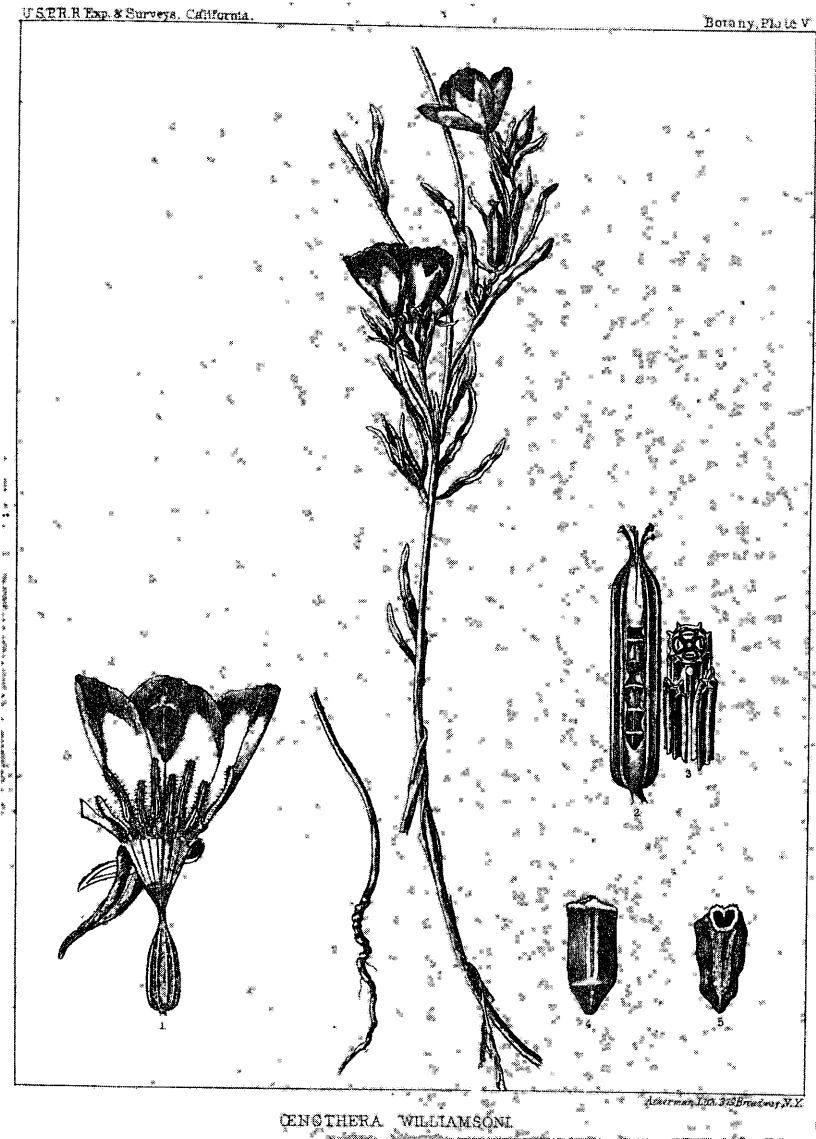


Figure 2. William's clarkia (*Clarkia williamsonii*, formerly *Oenothera williamsonii*) was one of many abundant wildflowers noted during the Pacific Railroad Survey of 1853 under the charge of Lieutenant R. S. Williamson, for whom the wildflower was named. It was new to science and first collected as a botanical specimen at Fort Miller (now Millerton Lake) in July during the survey by Dr. A. L. Heermann. Drawing by Charles Koppel, assistant civil engineer.

California poppies set a tilted mesa north of Pasadena aglow with their blooms in spring, serving as a beacon to ships more than twenty-five miles away. Seeing hillsides covered with these flowers, early Spanish explorers named the coast "the Land of Fire," appropriate in a literal as well as a figurative sense because of the hot, arid summers and the frequency of fires ignited by lightning strikes.<sup>12</sup>

### The Role of Natural Disturbance

According to the plant ecologist Michael Barbour, "Late summer and early fall fires were an expected natural event in many California vegetation types below six thousand feet elevation. The same acre of ground could be expected to burn every ten to fifty years. Fire was uncommon only in deserts and at high elevations. California plants evolved with fire as a natural environmental factor over millions of years. As a result, not only do many California species survive fires, but some require fire in order to complete their life cycle or to remain vigorous" (pers. comm. 2004). The ecologist Richard Vogl has postulated that fire helped to shape three-fourths of California's vegetation.<sup>13</sup>

Carl Purdy, an astute horticulturist, made the connection between wildflower abundance and fire in his description of a stagecoach ride from Petaluma to Ukiah in 1870: "The trip was through lovely country, at its loveliest in mid-May. Brush fires had kept the hillsides open, cultivation did not cover much of the land, and we passed through a long succession of wild flower gardens. There were masses of a single flower covering acres, or even at times, hundreds of acres. This wonderful flower show was surpassed only by that vast one that John Muir described as adorning all of the uplands of the great interior valleys of the San Joaquin and Sacramento. That was a circuit of a thousand miles of bloom. Now, one has to go clear to the southern end of the San Joaquin Valley to see any spring flower show that is at all comparable."<sup>14</sup>

Fire was not the only natural occurrence shaping the landscape. Spring floods scoured watercourses and deposited silt, small and large mammals dug in the soil, storms felled trees, and torrential rains caused landslides. Each of these common events is known by plant ecologists as a natural disturbance, defined as "any relatively discrete event in time that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment." Having evolved with these erratic or episodic perturbations, many plant species not only tolerate them, but require them to complete their life cycles or to maintain dominance.<sup>15</sup>

Ecological studies from all over the world, in both aquatic and terrestrial

ecosystems, bear out the important ecological role of disturbance in the development and maintenance of forest, shrubland, grassland, and wetland habitats. In many instances, moderate to medium disturbance promotes habitat heterogeneity and allows for greater diversity of plants and animals. For example, small mammal activity increases the abundance and diversity of geophytes (perennials with bulbs, corms, or tubers); wave action contributes to biodiversity in the rocky intertidal zone; fires maintain biologically rich grasslands; and the alternate filling and draining of lakes, marshes, and estuaries supports vast populations of aquatic life and waterfowl. Some scientists suggest that pyrodiversity (the diversity in frequency, scale, season, and type of fire) leads to great biodiversity of plant species and vegetation types.<sup>16</sup>

Disturbance is a recurrent feature of virtually every vegetation type in California. In fact, it is now accepted that perturbations are *required* for the rejuvenation of many plant populations and ecosystems. According to a hypothesis put forth by the ecologist Joseph Connell, disturbances that occur at intermediate intensities and frequencies promote the greatest biological diversity.<sup>17</sup>

Many perennial species have underground or otherwise protected organs that enable them to regenerate and spread after the aboveground parts are burned, grazed by herbivores, disrupted by landslides, or moved by digging rodents. Through the process of vegetative reproduction, they can multiply their parts or create replicas of themselves. Many shrubs and trees, for example, can resprout from suppressed epicormic or adventitious buds along their trunks or roots. Sometimes these new shoots arise on shrubs from large, gnarly underground burls, particularly after a fire. This adaptation is referred to as crown-sprouting, and it is characteristic of many chaparral shrubs. Some plants—ferns, sedges, cattails, tules, rushes, certain grasses, milkweeds, and dogbanes—die back to woody roots each year and arise anew the next year. They send out horizontal stems under the ground, or rhizomes, that enable the plants to survive and reestablish themselves and even expand the portion of the site they occupy. Still other perennials have bulbs or corms that produce offsets—tiny bulblets or cormlets containing the beginnings of a new plant genetically identical to the parent—that are spread more readily when disturbed.<sup>18</sup>

### Wildlife

The California encountered by the Portuguese explorer Juan Rodríguez Cabrillo in 1542, the English explorer Sir Francis Drake in 1579, and the Franciscan missionary Junípero Serra in 1769 was an altogether different

place from their tamed European homelands. Much of Europe had already been ecologically degraded centuries before, its wildlands deforested, mined, and overgrazed by goats, sheep, and cattle.<sup>19</sup> California, in contrast, was not a human-dominated landscape; its sights, sounds, and smells dwarfed Europeans and put them in awe of nature's grand show. The animals often took center stage: the large mayfly swarms hovering over streams in springtime, the orange-black clouds of hundreds of thousands of monarch butterflies in autumn, or the harsh "wah" calls of a hundred thousand white-fronted geese in winter could hardly go unnoticed.

### LARGE MAMMALS

Grizzly bears (*Ursus arctos*), the largest of California's terrestrial mammals, historically ranged from Siskiyou and Humboldt Counties in northern California to San Diego County in the south, at least two-thirds of the state. John Bidwell spotted a group of sixteen grizzlies in the Sacramento Valley in 1841 and said "grizzly bears were almost an hourly sight, in the vicinity of the streams, and it was not uncommon to see thirty to forty a day." The grizzly bear population has been estimated at ten thousand, or one every fifteen square miles. Many California place-names reflect the former abundance of bears: Bear Valley on Highway 4 above Arnold, and Bear Creek Gulch in San Mateo County, for example. Many bear trails crisscrossed chaparral thickets, and numerous tracks could be seen at springs. Large paths worn half a foot below the surface of the earth appeared in the alluvium of flat valleys. Grizzly bears would come down to the coast at night and feast on beached whales.<sup>20</sup>

As many as half a million tule elk (*Cervus elaphus nannodes*) fed on the lush grasses and forbs of the valley grassland. Herds as large as one thousand to three thousand were reported. Historically, tule elk in central California ranged over the entire San Joaquin and Sacramento Valleys and adjacent foothills and through the Livermore and Sunol Valleys across to the Santa Clara Valley. Don Sebastián Vizcaíno spotted abundant tule elk when he landed at Monterey on December 10, 1602. In 1848 the traveler James Lynch witnessed the San Joaquin plains covered with tule elk "as far as the eye could reach." The animals' heads rose in surprise at the approach of his regiment, and the multitude of horns reminded him of a "young forest." Edward Bosqui spotted tule elk between Merced and Stockton and said, "At times we saw bands of elk, deer and antelope in such numbers that they actually darkened the plains for miles, and looked in the distance like great herds of cattle." During the Gold Rush, well after the first European settle-

ment, elk might be seen in bands of forty or fifty, grazing on the edge of the marshes, near Stockton. Their whistles could be heard nearly a mile away.<sup>21</sup>

Pronghorn antelope (*Antilocapra americana*) were common in the Central Valley from at least the Sutter Buttes southward to the desert, and there were many thousands of antelope in what are today Los Angeles and Orange Counties. The Spanish soldier Pedro Fages, during his inland exploration of the country between Monterey and the head of the Bay of San Francisco in November 1770, jotted in his diary: "We crossed it [probably Santa Clara Valley] at a cost of three leagues' [march], seeing on the way many herds of antelopes, some of them exceeding fifty." In 1874 John Muir wrote, "The antelope is quite abundant in the plains and open timber to the north of Shasta. One of the fleetest and most graceful of all wild animals, he ranges not only the open valleys but the pine woods, and feeds upon grasses. In flocks of a hundred or more they are still seen almost any day by the vaqueros of the region."<sup>22</sup>

The now extinct black jaguar (*Panthera onca*) roamed the South Coast Ranges between San Francisco and Monterey. Mountain lions (*Panthera concolor*) roamed from sea level to 11,000 feet elevation and screamed at night near Indian village campfires. Their lairs might be in a rocky cavern on a mountainside, under an uprooted tree, or in heavy underbrush. Gray wolves (*Canis lupus*) occurred along the eastern edge of the state and in the Central Valley. The graceful bighorn sheep (*Ovis canadensis californiana* and *O. c. cremobates*), their huge horns "rising like the upturned roots of dead pine-trees," occupied large areas of mountainous California. They could be seen in bands of fifty or more. They reared their young in oval-shaped hollows of inaccessible crags, above the nesting rocks of eagles.<sup>23</sup>

## BIRDS

As recently as two centuries ago, perhaps tens of millions of birds lived in California or passed through on an annual basis as migrants, nesters, or overwinterers. Fish-eating bald eagles (*Haliaeetus leucocephalus*) were at one time common as nesters along California's rivers and lakes. Alcatraz Island in San Francisco Bay was named after a Spanish word for "pelican," and with good reason. A French visitor, Auguste Duhaut-Cilly, described their numbers vividly in 1827: "A rifle shot we fired across these feathered legions made them rise in a dense cloud with a noise like that of a hurricane." Hundreds of pairs of cormorants occupied rookeries in Tule Lake, Eagle Lake, and Clear Lake and along the flooded banks of the San Joaquin and Sacramento Rivers. Condors, whose wingspans approach ten feet, were not an uncommon sight

in south-central California in the earliest years of Euro-American settlement. Hunters would spot these birds in the vicinity of recently killed game. At least one European settler spotted four of them jointly dragging a dead young grizzly bear weighing perhaps one hundred pounds.<sup>24</sup>

As an area along the Pacific Flyway, California was a major destination and stopover point for dozens of species of migratory birds. Fox sparrows (*Passerella iliaca*) and golden-crowned sparrows (*Zonotrichia atricapilla*), for example, traveled thousands of miles to winter in California's coastal woodlands. Arctic terns (*Sterna paradisaea*) stopped in California on their way between the Arctic, where they nested, and Antarctica, where they spent the winter (their round-trip annual journey is 33,000 miles, requiring them to be "on the wing" most of the time). Hundreds of thousands of sooty shearwaters (*Puffinus griseus*) stopped in California before turning back to cross the Pacific Ocean, linking California to New Zealand.<sup>25</sup>

Some migratory species made use of California's elevational extremes, moving from lowlands to highlands and back down again. The ornithologist Scott Weidensaul says, "This kind of altitudinal migration is common in North America among many Western mountain species—gray-crowned rosy finches (*Leucosticte tephrocotis*) and dark-eyed juncos (*Junco hyemalis*) among them—moving to lower elevations in the winter, then back up to alpine meadows and forests in summer."<sup>26</sup> Common mergansers nested by the crystal clear waters of the high Sierra and then spent their winters at the ocean or the larger lakes of the Central Valley. Sierra Nevada rosy finches (*Leucosticte tephrocotis dawsoni*) bred at 14,000 feet on Mount Whitney. Mountain quail (*Oreortyx pictus*) scurried on foot to lower ground to avoid the heavy Sierran snows, while blue grouse (*Dendragapus obscurus*) moved in the opposite direction, climbing higher in the winter to feed on an exclusive diet of fir needles.

Many kinds of birds, such as quail, occurred in extremely large concentrations. According to the ornithologist William Dawson, in the mid-1870s, flocks of from one thousand to five thousand California quail (*Callipepla californica*) were considered commonplace.<sup>27</sup> Walter R. Welch published this account of quail: "In 1867 we moved to a ranch located between 'Spanish-town,' now called Half Moon Bay, and San Gregorio, on the coast side of San Mateo County. There I saw quail by the thousands everywhere; every canyon, gulch and ravine contained quail . . . and the whole country seemed to be alive with them."<sup>28</sup> The naturalist José Longinos Martínez mentions the "plague" of quail at the missions. La Pérouse, who reached Monterey in 1786, says this of the California quail: "The coppices and plains are covered with small grey crested partridges, which live in society like those of



PERDRIX, MÂLE ET FEMELLE, DE LA CALIFORNIE.

Figure 3. Jean-Louis-Robert Prévost, drawing of a male and a female California quail, from Jean-François de Galaup, Comte de La Pérouse, *Voyage de la Pérouse autour du monde*, 1793. Flocks of valley quail could number from one thousand to five thousand. Gift of E. E. and D. A. Eyre in memory of Florence Atherton Eyre, North Baker Research Library. Courtesy of the California Historical Society, FN-30508.

Europe but in coveys of three or four hundred. They are fat and of excellent taste." (See Figure 3.) Nordhoff said: "[I]n favorable seasons the whole plain [the Central Valley] is alive with the pretty top-knotted quail." In the lowlands of California, large bands of several thousand California quail fed on the tender leaves of clovers in spring and built their nests in a deep tangle of grass and briars and often beneath a pile of brush or dead cuttings.<sup>29</sup>

The Great Central Valley served as an important overwintering site for ducks, geese, and other waterfowl. Every winter, waterfowl flocked by the millions into the vast maze of waterways formed by the Sacramento-San Joaquin Delta; this elaborate labyrinth of splitting and merging distributaries made up "the richest ecosystem in the state."<sup>30</sup> Of all the displays of wildlife, the tremendous flocks of geese—snow geese, Ross' geese, white-fronted geese, and Canada geese—were perhaps the most striking in appearance. They could appear in thick cloudlike congregations, so large that the roar of their wingbeats as they took flight was deafening. Wild geese were so common that an American officer who shot and presented them to his hostess in the early 1850s was considered stingy.<sup>31</sup>

Dawson described the abundance of the snow and Ross's geese (*Chen hyperboreus*, now *caerulescens*, and *C. rossii*): "It is scarcely possible to exaggerate the number which frequented this region before the advent of the white man. It must have run into the millions, and may easily have reached the tens of millions. Practically the entire population of the North, breeding and bred on the Arctic shores of British America, in Banks Land and, presumably, upon the still undiscovered Hyperborean land mass, poured across the defiles of the Sierras in late September and early October, and covered the central California landscape as with a quivering white blanket." Adolphus Heermann wrote of them in the 1850s, "These birds often cover so densely with their masses the plains in the vicinity of the marshes as to give the ground the appearance of being clothed with snow."<sup>32</sup>

In his 1873 travel guide to California, Nordhoff entices the would-be traveler: "I have seen two square miles of geese feeding on a sheep pasture near a lagoon, and so tame I almost rode them down before they rose." Jeff Mayfield said that when he first came to the San Joaquin Valley in 1850, he saw so many white geese in flight that he was positive one band of them would cover four square miles when they landed.<sup>33</sup>

#### LIFE IN THE RIVERS

Salmon (*Oncorhynchus kisutch*, *O. tshawytscha*, *O. keta*) ran up every major river and creek from what is now the Smith River on the north to the Carmel River on the south, swimming against the current to return near where they were born. Thirty-one coastal and Central Valley rivers and hundreds of lesser creeks carried the lifeblood of millions upon millions of salmon and provided six thousand miles of spawning habitat. Joaquin Miller described the head of the Sacramento River as a "silver sheet" because salmon were so abundant. He had seen the stream "so filled with salmon that [it] was impossible to force a horse across the current."<sup>34</sup> A white man stated in the early 1900s, "[Y]ou could load wagons with salmon that got stalled on Mad River. . . . At the little sloughs near Arcata you could get salmon with pitch-forks and fork them on to the bank."<sup>35</sup> Bayard Taylor described salmon caught from the Sacramento River in 1850: "Salmon trout exceeded in fatness any fresh water fish I ever saw; they were between two and three feet in length, with a layer of pure fat, quarter of an inch in thickness, over the ribs. When made into chowder or stewed in claret, they would have thrown into ecstasies the most inveterate Parisian gourmand."<sup>36</sup>

Various species of trout (*O. clarki*, *O. mykiss*, *O. chrysogaster*) were plentiful in mountain brooks, rivers, and lakes. Theodore Van Dyke commented

in 1886: "But a few years ago these fish were so plenty [sic] in these mountains and so tame that a failure in fishing was an impossibility for any one. They dashed in full confidence at the clumsiest bait upon the coarsest line. A fresh fish was often ready to take in a moment the same bait that had already caught two or three. And often six or eight trout were taken in succession from the same little pool or rapids."<sup>37</sup>

The rivers were full of mammals as well: river otters (*Lutra canadensis*), mink (*Mustela vison*), and beavers (*Castor canadensis*). River otters' dens were located under steep riverbanks, and their loud, shrill voices or low coughs or grunts could be heard from every major central and northern California river. Rolling places, grassy areas where otters roll to dry off, and otter slides, paths worn smooth by otters sliding down streamside banks, were numerous along streams and sloughs. River otters and beavers also abounded in Kern and Buena Vista Lakes in the southern San Joaquin Valley and could be shot easily from a boat. River mussels, crayfish, frogs, newts, salamanders, turtles, and snakes were prolific, all indicators of healthy rivers and creeks.<sup>38</sup>

#### LIFE IN THE PACIFIC OCEAN

To someone standing on the shore at the dawn of Euro-American contact, the ocean was a virtual menagerie of life. Basking harbor seals (*Phoca vitulina*) covered offshore rock outcrops. Rafts of sea otters (*Enhydra lutris*) played and ate in the kelp beds. The flukes of whales, the dorsal fins of bottlenosed dolphins, and the heads of seals constantly broke what the Alaskan Yupik called the "skin of the world"—that line between water and air.

By the thousands and thousands, northern fur seals (*Callorhinus ursinus*) and Guadalupe fur seals (*Arctocephalus townsendi*) returned to the same rookeries on the Channel Islands year after year—usually the very islands where they were born. Alpha male northern elephant seals (*Mirounga angustirostris*) molted and defended their harems with shrieking cries. Gray whales (*Eschrichtius robustus*) born in the shallow lagoons and bays of Baja California migrated by the thousands to the Chukchi Sea in the Arctic and back again, a ten-thousand-mile annual journey. Many kinds of fish migrated along the coast or from deeper waters into shallower waters and back again.

Among the major coastal fish were bass, herring, halibut, smelt, sardine, flounder, rock cod, dogfish and other sharks, stingray, and sturgeon. In 1857 the *Crescent City Herald* reported that a massive school of smelt and sardines piled up a foot deep on the shore at Crescent City and extended three-fourths of a mile seaward. The fish were so numerous three men found it impossible to row a skiff through them.<sup>39</sup>

William Brewer described the abundant life in the tidepools at Pescadero near Monterey in 1861: "Shellfish of innumerable forms, from the great and brilliant abalone to the smallest limpet—every rock matted with them, stuck into crevices, clinging to stones—millions of them. Crustaceans (crabs, etc.) of strange forms and brilliant colors, scampered into every nook at our approach. Zoophytes of brilliant hue, whole rocks, covered closely with sea anemones so closely that the rock could not be seen—each with its hundred arms extended to catch the passing prey. . . . Every pool of water left in the rugged rocks by the receding tide was the most populous aquarium to be imagined."<sup>40</sup>

The plankton of San Francisco Bay was rich and abounded in shrimp. Tidepools along the Central Coast harbored abalone that could be easily taken at low tide. Dense beds of intertidal abalone were found in southern California. In his notes during a military reconnaissance in 1846, Lieutenant William Emory said that kelp (*Fucus giganteus*) was so thick in San Diego Bay that he mistook it for a low island.<sup>41</sup>

Enormous flocks of southern-bred pink-footed shearwaters (*Puffinus creatopus*) would annually flood California's coast and Channel Islands. As late as the 1920s, it was possible to see a million sooty shearwaters (*Puffinus griseus*) off the California coast feeding on millions of herring.

#### Plant Life

California's plant life was, and still is, exceptionally diverse in two senses. First, a very large number of plant species, many of them endemic, grow within the state's borders. The *Jepson Manual*, the authority on the state's flora, lists more than 5,800 species, and a California Native Plant Society inventory lists 6,300.<sup>42</sup> Second, these species grow together in particular patterns to form very many types of vegetation. This diversity can be seen in the way the vegetation changes as one moves from valley to mountain, from north to south, and from moist coast to arid, rain-shadowed desert.

Vegetation can be divided into types, each having a characteristic physical structure, or physiognomy. Some of the major broad types are marsh, grassland, shrubland, woodland, and forest. Vegetation types are in turn divided into plant communities. A plant community is a distinctive grouping of plant species, defined as "an aggregation of living organisms having mutual relationships among themselves." Each plant community is distinguished by the presence of certain dominant or characteristic plant species.<sup>43</sup> For its size, California has one of the largest numbers of plant communities in the world, in part because of its varied climates, soils, and topographies.

Elna Bakker calls California "the great mosaic." In traveling the length of the state, one can be in the cool temperate rain forests of the northwest coast, cross open grassland in the Central Valley, trudge through chaparral in the foothills, walk across wet meadows in the high mountains, and finally weave among scattered shrubs under scorching 120 degree heat in the Mojave Desert.<sup>44</sup>

To cover all the vegetation types and plant communities in California would require an entire volume. Many books already do this very well. Instead, I sample the state's great vegetation diversity as it likely existed in pre-Columbian times—looking at some of the most significant plant communities in terms of acreage covered and the biodiversity they supported.

## MARSHES

### *Coastal Salt Marshes*

Coastal salt marshes were at one time much more extensive than today, forming important habitat rich in plant and animal life. Salt marshes occur in the upper intertidal zone of sheltered shallow bays, river mouths, and coastal lagoons. They are bordered, below the upper intertidal, by beds of sea grasses, both eel-grass (*Zostera marina*) and surf-grass (*Phyllospadix* spp.). In the marshes themselves grow stands of California cord grass (*Spartina foliosa*), which at the lower edges of the marsh are submerged for nine hours at a time. At the midmarsh zone, pickleweed (*Salicornia bigelovii*) abounds, sometimes in association with cord grass. Other common plants are jaumea (*Jaumea carnosa*) and arrow-grass (*Triglochin concinna*). The upper zone, where the vegetation is submerged for less than five hours at a time, is home to alkali heath (*Frankenia salina*), sea lavender (*Limonium californicum*), saltgrass (*Distichlis spicata*), and California sea-blite (*Suaeda californica*).<sup>45</sup>

These plants provided food and nesting and ground cover for myriad birds and mammals. Black-crowned night herons, in colonies of a thousand individuals, would bed down together in the rushes in San Francisco Bay area marshes. Waterfowl were so numerous in the Salinas marshes that boys throwing cords weighted at both ends could easily bring them down as they ascended.<sup>46</sup>

### *Brackish and Freshwater Marshes*

Michael Barbour and colleagues describe brackish and freshwater marshes as "among the most productive ecosystems on earth."<sup>47</sup> According to the botanist Herbert Mason, the marshes that exist today represent only a frac-

tion of what once originally prevailed in California, especially in the Central Valley.<sup>48</sup> At one time they occurred in many of the interior valleys, along river courses, creeks, and sloughs and bordering lakes, as well as in brackish areas landward of salty marsh areas along the coast. Common plant species included various tules (*Schoenoplectus americanus*, *S. validus*, *S. acutus*, *S. californicus*, formerly in the genus *Scirpus*), three species of cattails (*Typha latifolia*, *T. angustifolia*, and *T. domingensis*), sedges (many species of *Carex*), common reed (*Phragmites australis*), water plantain (*Alisma plantago-aquatica*), arrowhead (*Sagittaria* spp.), and yerba mansa (*Anemopsis californica*).

The Kern, Kaweah, and Kings Rivers, which drain the southern Sierra Nevada range, had no outlets and spilled into large natural lakes—Tulare, Kern, and Buena Vista—that extended for miles in all directions in the southern San Joaquin Valley. Tulare Lake, seven hundred square miles in extent, was the second largest lake west of the Mississippi River. On an 1830 map of upper California, José Maria Narváez labeled a large oval with irregular borders covering much of the Central Valley "Ciénegas o Tulares" (Marshes of Tules). Freshwater marsh areas along the lake borders and sloughs were immense. During wet years, a Kitanemuk man could paddle a tule balsa from Kern Lake up through connecting sloughs to Buena Vista Lake and on to Tulare Lake, eventually reaching the San Joaquin River. James Carson described the slough that conveyed the water from Tulare Lake into the San Joaquin River: "Its length, from its entrance into the San Joaquin to the edge of the tule beds of the lake, is about thirty-five miles. The tules at the lower end of the lake are some fifteen miles in width. Large flocks of white-fronted geese used Tulare Lake as a loafing ground."<sup>49</sup>

The lakes and surrounding marshes supported large populations of mammals, birds, and other animals. River otters and beavers abounded in Kern and Buena Vista Lakes, and tule elk dug into the tules and exposed themselves to moist mud to cool off. C. B. Linton reported two colonies of American white pelicans (*Pelecanus erythrorhynchos*) nesting on Buena Vista Lake in 1908: one of about 250 nests, on a small sandy island in the river mouth; the other of perhaps 500 nests, on the lake shore. Apparently, a large colony of thousands of white pelicans also nested on an island in Tulare Lake for many years.<sup>50</sup> Large numbers of Western pond turtles, freshwater mussels and clams, and myriad fish species could be found in the lakes. Of all the wildlife in the marshes, waterfowl were the most abundant. The canvasback, reputed to be the best-tasting duck by contemporary hunters, was found by the tens of thousands in the lakes and lagoons of southern California.<sup>51</sup>



## GRASSLANDS

Pure grasslands, including coastal prairies, valley grasslands, vernal pools, and montane meadows, covered one-fifth of the state before 1850. After Euro-American settlement, they became the most productive rangelands and farmlands in North America.<sup>52</sup>

### Coastal Prairie

Coastal prairie in aboriginal California was characterized by a mixture of broad-leaved herbs and native annual and perennial grasses. This grassland was discontinuous, occurring in large and small patches from the coast to 62 miles inland and up to elevations of 3,280 feet. In the south, it extended to what is now Point Lobos State Park, and in the north it reached beyond what is now the Oregon border. Among the important grass species in California's coastal prairies were Idaho and red fescues (*Festuca idahoensis* and *F. rubra*), California oatgrass (*Danthonia californica*), and bent grass (*Agrostis exarata*). Characteristic broad-leaved species were Douglas iris (*Iris douglasiana*), California buttercup (*Ranunculus californicus*), and blue-eyed-grass (*Sisyrinchium bellum*). Other species were yampah (*Perideridia kelloggii*), goldfields (*Lasthenia* spp.), and tidy-tips (*Layia platyglossa*). Recently, the ecologist Mark Stromberg and colleagues discovered that the species richness of the coastal prairies—averaging 22.6 species per square meter—is greater than that of any other grassland type in North America.<sup>53</sup>

### Valley Grassland

Valley grassland is thought to have originally covered much of the Central Valley, as well as the lower elevations of the central and southern Coast Ranges. Like the pristine coastal prairie, it contained a mixture of annual and perennial plants. Most important were various bunchgrasses such as purple needlegrass (*Nassella pulchra*), nodding needlegrass (*N. cernuus*), one-sided bluegrass (*Poa secunda* subsp. *secunda*), and poverty three-awn (*Aristida divaricata*). Deergrass (*Muhlenbergia rigens*) was another major associate. Prominent wildflowers possibly included miniature lupine (*Lupinus bicolor*), blue dicks (*Dichelostemma capitatum*), stinkbells (*Fritillaria agrestis*), owl's-clover (*Castilleja* spp.), adobe-lily (*Fritillaria pluriflora*), white brodiaea (*Triteleia hyacinthina*), clovers (*Trifolium* spp.), goldfields (*Lasthenia fremontii*, *L. californica*, and *L. glaberrima*), fiddleneck (*Amsinckia menziesii* var. *intermedia*), red maids, and yellow carpet (*Blennosperma nanum*). Today, this grassland exists only in small pockets and has largely been altered by the introduction of alien species, especially annual grasses.<sup>54</sup>

Within valley grassland are shallow basins with poorly drained soils that collect winter rainfall. These ephemeral wetlands are referred to as vernal pools. They support a rich variety of plants, which grow in concentric rings according to their tolerance for inundation. An average of thirty-five species is found per pool, with an estimated fifty community types among different pools throughout the state. Several species of meadowfoam (*Limnanthes* spp.) and downingia (*Downingia* spp.), as well as button-celery (*Eryngium vaseyi*), willow herb (*Epilobium pygmaeum*), and water-starwort (*Callitriche marginata*) are found here. At wet times of the year vernal pools are laden with animal life: fairy shrimp, delta green ground beetles, California tiger salamanders, and Pacific chorus frogs. John Muir was serenaded by "an immense crop" of frogs after late rains filled the vernal pools near Snelling. There were more than a million acres of these vernal pools in early aboriginal California in the Central Valley, on the western slopes of the Cascade Range and the Sierra Nevada, in the valleys of the Coast Ranges, and on the coastal terraces of southern California.<sup>55</sup>

The grasses and wildflowers of the valley grassland provided a vast food reservoir for insects, serving as both nectar and larval food plants to scores of butterflies, native bees, beetles, and flies. The white, lacy flowers of various species of yampah were important nectar sources to the anise swallowtail (*Papilio zelicaon*). Owl's-clover, which occurred in great swaths, was an important nectar plant to the northern checkerspot (*Charidryas palla*) and the Leanira checkerspot (*Thessalia leanira*) butterfly.

One North Fork Mono/Chukchansi elder, Pauline Conner, reminisced about the time long ago when wildflowers covered vast areas of grassland and "butterflies were so thick they would come in clouds, and you could reach out and touch them. Sometimes they would land on you." These were the buckeyes (*Junonia coenia*), anise swallowtails, and orange sulfurs (*Colias eurytheme*). Acres and acres were clothed in owl's-clover (*Orthocarpus* and *Castilleja* spp.) and clovers (*Trifolium willdenovii* and *T. wormskioldii*), important food plants to these butterflies.

## SHRUBLANDS

Many types of shrublands cover the hills, plains, and coastal terraces of California, including coastal scrub along the coast and creosote scrub in the desert, but chaparral is the most extensive, covering about 8.6 million acres. Chaparral, composed of woody shrubs and small evergreen trees, is common on most hills and lower mountain slopes of the Coast Ranges, the western slopes of the Sierra Nevada, and the more southern mountains. Of all

the state's plant communities, it is probably the most adapted to fire and passes "endlessly through cycles of burning and regrowth."<sup>56</sup>

*Chaparral* means "short woody vegetation" in Spanish. This plant community is rich in vascular plant species. There are at least nine major types of chaparral, each dominated by specific species. The most extensive type is chamise chaparral, dominated by chamise (*Adenostoma fasciculatum*). Another widespread chaparral type is ceanothus chaparral, dominated by buck brush (*Ceanothus cuneatus*). Associated species include nude buckwheat (*Eriogonum fasciculatum*), scrub oak (*Quercus dumosa*), and mountain mahogany (*Cercocarpus betuloides*), all extremely important browse species for deer. A third type is mixed chaparral with toyon (*Heteromeles arbutifolia*), scrub oak, chamise, buck brush, California coffeeberry (*Rhamnus californica*), and silk tassel bush (*Garrya* spp.). In addition to the 240 woody plant species found in chaparral, more than 600 annual and perennial herbs are present, many appearing in great abundance after a fire. These include red maids, farewell-to-spring (*Clarkia* spp.), melic grass (*Melica* spp.), gilia (*Gilia* spp.), clover (*Trifolium tridentatum*), and chia (*Salvia columbariae*). Ecologists hypothesize that for many of these postfire species, biotic and abiotic conditions in mature chaparral have selected for seed dormancy mechanisms that delay germination until the first spring after fire.<sup>57</sup>

## WOODLANDS

### *Riparian Woodland*

Before dams and man-made levees, river boundaries surged and retreated with the seasons. Almost every spring the rivers and creeks in the lower elevations spilled over their borders into overflow channels, dropping nitrogen-rich silt and sand—the nutrient influx that helped to make California's riparian corridors so productive. Flooding scoured the vegetation, removing dead and dying growth of trees, shrubs, and herbs and spurring new vegetative growth. The riverbanks and overflow channels harbored a unique riparian flora that included a large variety of sedges (*Carex* spp.), reeds (*Juncus* spp.), grasses, deergrass, and deciduous trees and shrubs such as large cottonwoods (*Populus fremontii*), redbuds (*Cercis orbiculata*, formerly *C. occidentalis*), willows (*Salix* spp.), alders (*Alnus rhombifolia*), maples (*Acer macrophyllum*), and sycamores (*Platanus racemosa*). Riparian woodlands, which before 1850 covered 900,000 acres in the Central Valley, teemed with animal life. Today only about 100,000 acres remain.<sup>58</sup>

Native walnut trees (*Juglans hindsii*), measuring up to six feet in diameter and clear of branches for forty feet, lined the Sacramento River. These trees were the favored nesting sites of the now threatened Swainson's hawk (*Buteo swainsoni*). Grand old California sycamores, with trunks five feet across, dotted the alluvial benches and river bottoms in the South Coast Ranges, the San Joaquin and Sacramento Valleys, the Sierra foothills, and parts of southern California. These splendid trees were overwintering sites for monarch butterflies in autumn and roosts for several kinds of bats. Birds such as the American kestrel (*Falco sparverius*) built their nests in deep cavities in hollow sycamores.<sup>59</sup> In the 1920s, Dawson found forty-one blue heron nests and twenty-eight night heron nests in one massive, seven-foot-diameter sycamore—what he called a virtual "heron village."<sup>60</sup> Sycamores often grew in the overflow channels of rivers and creeks and could withstand and even benefit from periodic inundations. After a flood, seedlings would sprout from the scoured earth in great numbers.

These trees were massive enough to create a home for a menagerie, from tiny wood-boring beetles to reptiles to large raptors and wading birds and small mammals. William Brewer commented as he hiked through Hospital Canyon near Mount Oso, "A few cottonwoods grow along the creek, and in them hundreds of cranes [great blue herons] have built their nests—great awkward birds, with their maltese-colored plumage, long slim necks, and longer slimmer legs. . . . Great numbers of other species of birds also congregate in these canyons."<sup>61</sup>

Lining many of the rivers and creeks in the Central Valley, above the overflow channels in the sandy flats, were huge valley oaks (*Quercus lobata*) that reached diameters of 8 to 12 feet and heights of 150 feet. Because they grow in the deep moist loam of alluvial or delta valleys, these oaks were dubbed the "old-time monarchs of the soil" by Willis Linn Jepson.<sup>62</sup>

Present-day Visalia, for example, was in the midst of a magnificent forest of these oaks. George Vancouver, a British naval captain who visited the San Francisco Bay area in 1792, noted that one valley oak near Santa Clara Mission measured fifteen feet in girth. However, he pointed out that the missionary fathers did not consider this tree of extraordinary size; other oaks were of even greater magnitude. He also mentioned that the timber from these oaks was "equal in quality to any produced in Europe."<sup>63</sup>

Valley oaks also created a microclimate for many kinds of understory plants and fungi that only survived under the trees. Thus, these giants of the plant world were like arks supporting a great diversity of life. William L. Finley reported in 1915 that near Crows Landing in Stanislaus County he found fifty to seventy-five nests of American egrets in the tops of large oak trees

lining a small creek tributary to the San Joaquin River. He said that a much larger number had nested in the same vicinity two years before.<sup>64</sup>

#### *Foothill Woodland*

Foothill woodland covers more than three million acres in California (one-half of all oak-covered lands) and is so abundant that some ecologists have elected it the "state vegetation type." In the interior, drier foothills, deciduous blue oak (*Quercus douglasii*), unique to California, is the dominant tree. This plant community is found below 3,500 feet on slopes bordering interior valleys from Los Angeles County to the head of the Sacramento Valley. Blue oaks may occur in nearly pure stands as dense woodland or open savanna; as a dominant in mixed stands that include gray or foothill pine (*Pinus sabiniana*), interior live oak (*Q. wislizenii*), valley oak (*Q. lobata*), and/or coast live oak (*Q. agrifolia*); or as a minor component in mixed stands of oaks and other hardwoods. Associated shrub species scattered in the understory include California-lilacs (*Ceanothus* spp.), redbud (*Cercis orbiculata*), yerba santa (*Eriodictyon californicum*), manzanita (*Arctostaphylos* spp.), coffeeberry (*Rhamnus californica*), and poison oak (*Toxicodendron diversilobum*). Closer to the Pacific Ocean, dominant oaks are the California black oak (*Q. kelloggii*) and Oregon oak (*Q. garryana*) in the north and the coast live oak everywhere else. Coast live oaks often attained a height of seventy feet, and some early accounts report that the canopy of certain trees sprawled outward from the trunk for a distance of sixty feet in every direction. These trees often grew with an absence of underbrush, and their woodlands were likened to "highly cultivated parks."<sup>65</sup>

## FORESTS

#### *Lower Montane Forest*

The lower montane forests of all California mountain ranges form a distinct belt spanning the elevation between 3,200 feet and 6,900 feet. Ponderosa pine (*Pinus ponderosa*) and Jeffrey pine (*P. jeffreyi*) dominate the more xeric sites; white fir (*Abies concolor*) is found on more mesic sites. From historical archival records and early photographs, it is clear that at the beginning of Euro-American contact the central and southern Sierra Nevada in many areas was very open, featuring large-diameter trees, 40 to 60 feet apart, and minimal underbrush.<sup>66</sup>

Other tree species in the lower montane forest are giant sequoia (*Sequoiadendron giganteum*), sugar pine (*Pinus lambertiana*), incense cedar

(*Calocedrus decurrens*), Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*) or bigcone Douglas-fir (*P. macrocarpa*), and a major hardwood, California black oak. Sugar pine, ponderosa pine, and California black oak are well adapted to light and regular ground fires and are intolerant of deep shade. Black oak needs bare mineral soil to germinate. James Hutchings, one of the first non-Indian inhabitants of Yosemite Valley, described the openness of this forest community: "Large sugar-pine trees, *Pinus Lambertiana*; from five to ten feet in diameter, and over two hundred feet in height, devoid of branches for sixty or a hundred feet, and straight as an arrow, everywhere abound. . . . These forests are not covered up with a dense undergrowth, as [in] the East, but give long and ever-changing vistas for the eye to penetrate."<sup>67</sup>

#### *Coastal Redwood Forest*

Coastal redwoods (*Sequoia sempervirens*), the tallest trees on earth (up to 369 feet), occur in a narrow belt five to thirty-five miles wide along the coast from the Oregon border to the southern boundary of Monterey County. Taking advantage of the moisture from the fog, which condenses on branches and drips to the ground, these trees thrive in California's mild humid marine climate. Plant companions include Douglas-fir, madrone (*Arbutus menziesii*), colorful rhododendrons, several kinds of oaks, nutmeg (*Torreya californica*), tan oak (*Lithocarpus densiflorus*), several kinds of huckleberry (*Vaccinium ovatum*, *V. parvifolium*), salal (*Gaultheria shallon*), and California bay (*Umbellularia californica*).<sup>68</sup>

Natural lightning fires are sparse along this belt, yet fire ecologists have found numerous fire scars on the long-lived stumps—suggesting that fires occurred in short-return intervals in many of these stands. Redwoods have durable, decay-resistant wood, and they are resilient in the face of flood or fire. In the latter case, they are protected by an insulating layer of bark and are able to sprout back. If the entire crown of the tree is fatally injured by fire, clones sprout from the base, forming a "family circle."<sup>69</sup>

#### *Mixed Evergreen Forest*

Mixed evergreen forest occurs along the upper edge of the redwood forest or the foothill woodland, in the North Coast Ranges, at elevations of 1,000 to 3,000 feet. Major species are Douglas-fir, maple, maul oak (*Quercus chrysolepis*), California bay, tan oak, and California black oak. Understory species include hazelnut (*Corylus cornuta* var. *californica*), mountain dogwood (*Cornus nuttallii*), several wild lilacs (*Ceanothus* spp.), and yerba buena (*Satureja douglasii*). Among the herbaceous plants are bear-grass (*Xerophyllum tenax*) on the drier sites and redwood sorrel (*Oxalis oregana*)

and evergreen violet (*Viola sempervirens*) on the wetter sites. Clumps of ferns and epiphytic mosses grow commonly on tree trunks throughout these forests. In the southern and central Coast Ranges and the mountains of southern California, mixed evergreen hardwood species still form extensive forests on moist slopes, but Douglas-fir is much less prominent.<sup>70</sup>

## People

Excluding desert and high-elevation areas, it was almost impossible for early Euro-American explorers to go more than a few miles without encountering indigenous people. Grass-thatched domical houses could be seen from southern coastal waters; redwood plank houses stretched along Pacific Northwest rivers; conical houses of incense cedar bordered meadows in the mountains of the western Sierra Nevada; clusters of saltbush huts dotted sagebrush clearings on the east side of the Sierra Nevada; tule mat-covered, wedge-shaped houses lined San Joaquin River delta waterways; and palm frond houses were nestled around springs in the Mojave Desert.

California's cultural diversity matched its biodiversity: it contained the most diverse native cultural groups of any other state or country of comparable geographic size from the Arctic to the tip of South America. (See Figure 4.) The state was thickly populated, and most anthropologists agree that north of Mexico City, California held the highest densities of people of any area of equal size in North America. Population density varied, from fewer than 0.08 people per square mile in desert regions to more than 1.49 per square mile in places near the Santa Barbara Channel.<sup>71</sup>

Estimates of California's total population vary from 133,000 to 705,000; about 310,000 is the most widely accepted number. The lowest estimates are thought by some demographers and archaeologists to be highly conservative, because Old World diseases had swiftly reduced populations before the arrival of settlers in many areas (William Hildebrandt pers. comm. 2004). In fact, when Cabrillo made the first recorded European visit to the west coast, in 1542, he noted in his journal that the native people (Kumeyaay and Tongva) spoke about and pantomimed bearded men on horses who lived somewhere to the north, suggesting that European contact was not new.<sup>72</sup>

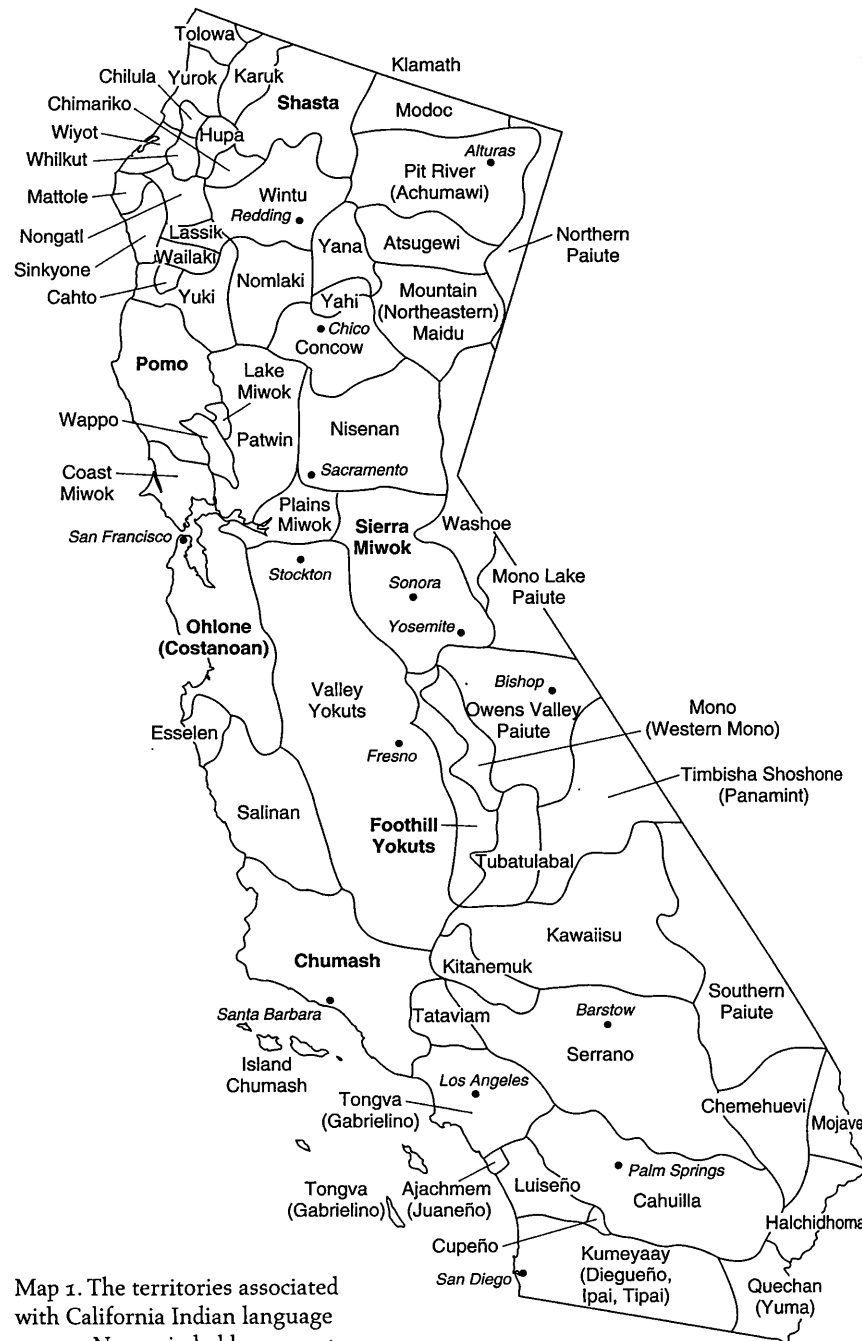
Anthropologists have lumped diverse sociopolitical groups into sixty broad linguistic designations, such as Pomo, Achumawi, Yokuts, and Hupa, but this belies the true heterogeneity of the state's indigenous peoples. (See Map 1.) What is assigned the term "Pomo" on the map, for example, is a language group that in reality is made up of seven mutually unintelligible languages. If these broad designations for each tribe were separated out, California



Figure 4. Alice Frank Spott, of Del Norte County in northwestern California, was a Yurok, one of the many diverse tribes of the state. Photograph taken in 1907. Courtesy of the Phoebe Apperson Hearst Museum of Anthropology and the Regents of the University of California, #15-3834.

would have perhaps as many as one hundred mutually unintelligible languages and many dialects. Alfred Kroeber listed between five and six hundred tribes as the number of sociopolitical groups that were autonomous and self-governing and encompassed a cluster of two or more separate villages led by a chief.<sup>73</sup>

It was not uncommon to encounter speakers of several different languages or dialects within a half-day's travel of one's village. "The Indians have never formed a national body," wrote Duhaut-Cilly, a Frenchman visiting California in 1827-28. "[E]ven their language undergoes great variations in very short distances; often those at one mission do not understand those of the nearest mission."<sup>74</sup> Father Geronimo Boscana wrote, "Almost every fifteen



Map 1. The territories associated with California Indian language groups. Names in bold represent a language family of two or more languages and multiple dialects.

or twenty leagues you find a distinct dialect; so different that in no way does one resemble the other." Thomas Henley, in an Indian Affairs report of 1854, commented that from "the San Joaquin northward to the Klamath there are some hundreds of small tribes."<sup>75</sup>

Ponder one hundred different ways to say blue elderberry (*Sambucus mexicana*)—such as *'angtáyu* (Central Sierra Miwok), *hunqwat* (Cahuilla), *ḥeqhále* (Kashaya Pomo), and *kunuguvi* (Kawaiisu). This great linguistic diversity reflects the tremendous length of time people have been here. Language, in part, shaped thinking and culture and brought a great variety of ways of using and tending the land. Tribal languages simulated the sounds of nature, reinforcing ties to places. The Luiseño word *putquivi*, the name for the olive-sided flycatcher (*Contopus borealis*), imitates the bird's spirited song. The Choynumni Yokuts spoke sharply when they said *skée-til*, their word for squirrel, in imitation of the animal's bark.

California had been peopled for at least 12,000 to 13,500 years when European settlement began. The Tubatulabal say that they have always lived in the region where they are found today (the drainage area of the Kern and South Fork Kern Rivers, from their sources near Mount Whitney to approximately forty-one miles below the junction of the two rivers); many other tribes make a similar claim about their territories. In their own words, native people today say, "We've always been here." Some creation stories place the origins of plants, animals, people, and the earth in the very heart of the respective tribal territory. And often the center of the whole world was somewhere within the homeland. The Modoc believed (and still believe) that the center of the world is a hill on the eastern shore of Tule Lake. Migration stories are absent from the lore of many tribes.<sup>76</sup>

At the dawn of Euro-American settlement, there were dozens of villages lining every major river and creek, and great shell-mound deposits as well as explorers' logs provide evidence of large bayshore villages clustered around the margins of coastal estuaries.<sup>77</sup> In 1830 the fur trapper Alexander McLeod said of Bonaventura Valley, present-day Sacramento Valley, "The Indian population . . . is very great. It is impossible for me to give even an idea of their number. Several Villages that our route led us to pass close by each contained at least 1500 Men and every Creek or Lake where water could be found Indians were stationed at in great numbers as well in the low country as in the high land."<sup>78</sup>

Juan José Warner, who traveled through the San Joaquin Valley during the winter of 1832–33, noted, "The banks of the Sacramento and San Joaquin, and the numerous tributaries of these rivers, and the Tule Lake [probably Tulare Lake], were at this time studded with Indian villages of

from one to twelve hundred inhabitants each. The population of this extensive valley was so great that it caused surprise, and required a close investigation into the nature of a country that without cultivation, could afford the means of subsistence to so great a community."<sup>79</sup>

The repertoire of subsistence activities included gathering, hunting, fishing, making fires, and quarrying stones for tools. Tribal territories often spanned several elevational zones encompassing a variety of plant communities. Gatherers and hunters visited every type of plant community—from beach and dune to coastal scrub, evergreen forest, sagebrush steppe, valley grassland, and pinyon-juniper woodland. The people obtained a diversity of plant and animal resources by following an annual cycle of population movements that coincided with seasonal availability of specific resources.

California's promontories, declivities, and unusual rock formations were infused with meaning. Every place was named. For example, Lake Tahoe, around which the Washoe lived, was called *Da ow a gā* ("giver of life") in their language.<sup>80</sup> Even modest knolls and insignificant peaks carried Indian names. Often places were named for their specific characteristics. Lindsay Creek and the adjacent prairie were called *Topōdērōs* ("Indian potato") in the Wiyot language, as many corms of *Brodiaea coronaria* were gathered there. False Klamath Rock was called *Wetc' atagasni* ("digging something") by the Tolowa, because edible roots once flourished at that spot. Abundant bulbs were dug by the Wintu at a spring at McCardle Place, and it was called *Ke-ten-ton* ("wild-potato-place"). In the Nomlaki language, some places carried the name of an abundant local animal, such as *Anunsawal* ("turtle spring"). A famous place in which to hunt deer at night was called *So-kut Men-yil* ("deer moon") by the Cahuilla.<sup>81</sup>

Areas now labeled simply "wilderness" or "national park" on topographic maps once encompassed ancient gathering and hunting sites, burial grounds, work stations, sacred areas, trails, and village sites, all making up what was home to hundreds of generations of California Indians. Being at home in a place meant that generation after generation of people were born, lived, and died in the same, familiar surroundings. C. Hart Merriam, one of the earliest biological scientists to describe California's Indian cultures, understood well the deep veneration that native people held for their birthplace: "In most parts of California, the greatest calamity that can befall an Indian is to be removed from the place where his father and mother lived and were buried." California Indians "are fond of home," wrote Robert Brown, "and if away for a short time from the locality where they have been born or brought up, soon weary to return."<sup>82</sup>

The anthropologist Julian Steward recorded and published in 1934 the

life stories of two Owens Valley Paiutes, Jack Stewart and Sam Newland. Stewart said in his autobiography, "Few Indians leave their own country who do not return. I know of only one who stayed away." And the anthropologist George Foster wrote of Eben Tillotson (Yuki) describing his delight at walking over the ground where he had once lived: "'I once killed a deer on that hillside. My, I remember how thick the berries used to grow on that slope.' He then explained how good it seemed to be on home ground again: it felt right and natural. The rocks and the trees knew him, and were glad to have him back; they were friendly toward him. One finds harmony in one's home that cannot exist in an alien place. It is best to die and be buried in the ground that knows a person, the ground that is waiting to receive home its children."<sup>83</sup>

Stephen Powers, a pioneering anthropologist, wrote about how intimately the Mattole of northwestern California and other tribes knew their homes—their places in the world:

The boundaries of all tribes . . . are marked with the greatest precision, being defined by certain creeks, canyons, boulders, conspicuous trees, springs, etc., each of which has its own individual name. Accordingly, the squaws teach these things to their children in a kind of sing song. . . . Over and over, time and again, they rehearse all these boulders, etc., describing each minutely and by name, with its surroundings. Then, when the children are old enough, they take them around . . . and so faithful has been their instruction, that [the children] generally recognize the objects from the descriptions given them previously by their mothers.<sup>84</sup>

Many stories, myths, and sacred events were tied to odd-shaped rocks, certain mountain peaks, bends in rivers, or specific springs. The anthropologist William Simmons writes, "Through such legends and myths, Native Californians recognized rock formations, mountains, springs, rivers, soil colors, and other natural features as the signs of their predecessors' activities, inscribed in and imparting ancestral meanings to their physical landscapes."<sup>85</sup> "In the old ways, the flora and fauna and landforms are *part of the culture*," says Gary Snyder in *Practices of the Wild*. There is no compartmentalization of nature *from* humans.

Elaborate trade networks were established between coastal, plains, desert, and foothill peoples. The Sierra Miwok, for example, obtained red abalone (*Haliotis rufescens*) and purple olive (*Olivella biplicata*) shells through trade with the Ohlone (also known as the Costanoan). Shells of *Dentalium pretiosum* from as far away as Vancouver Island lie buried in Chumash archaeological sites along the south-central coast. Southwestern pottery shards can be found in Pacific Coast shell mounds.<sup>86</sup>

Many human trails were worn several feet deep from ancient use. In the desert and heavily wooded landscapes, trails often followed the courses of large rivers.<sup>87</sup> Footpaths almost always climbed over the tops of mountains in a straight line so as to cover the shortest distance possible, demonstrating the physical stamina of the indigenous people. So many trails crisscrossed the lower valleys that they caused non-Indian travelers to lose their way. The anthropologist Roland Dixon reported of the Maidu in the northern Sierra: "The whole Maidu area seems originally to have been crossed by a great number of well-beaten trails, connecting the different villages and hunting and fishing grounds." Well-traveled Indian trails such as the route over Pacheco Pass—linking the Salinas and San Joaquin Valleys—became horse trails, wagon roads, and, finally, highways.<sup>88</sup>