

# INTRODUCTION



This contribution to the California Natural History Guide Series of the University of California Press follows a long tradition of books that explain, explore, and celebrate the natural riches of California and beyond. Our intent is to tell beginning birders, or curious naturalists, the how, what, when, where, and why of birding.

Because birds are so mobile, some individuals of most species can wander far from their natal homes and appear anywhere. Here we have tried to include only those species most likely to be seen along the coast, from Big Sur to the Oregon border. This is not a field guide to bird identification, but a field guide to the birds themselves.

*Birding* is a word that encompasses many concepts. For some, the activity of searching for and observing birds is a clear window into the natural world, an affirmation of its beauty and its peacefulness. To others, birding is a delightful diversion from the hectic or perhaps boring daily routine of the modern world—providing calm amid the chaos. Birds are nature's ambassadors, connecting us through their ancient lineage to evolution's astonishing creativity and offering us some guidance, through our study of their habitat needs, in our stewardship of the Earth. Some people have found the wonders of birds to be the perfect antidote to sadness or loneliness, or a path to comradeship with kindred spirits; others consider the complexities of identification or behavior an intellectual challenge. To many of us, birding provides all these comforts and challenges.

Finding and identifying new species can be like treasure hunting, and the quest can be casual or all-consuming. The treasure, once found, is a mixture of beauty, freedom, spirit, and a greater understanding of nature's sublime diversity. At the same time, even the most familiar birds offer opportunities for learning, discovery, and enchantment. Variations in the robin's song, the foraging techniques of egrets, and the flight patterns of swallows all display improvisation and provide the keen observer with a lifelong educational and aesthetic pursuit.

Getting started is easy. All that is needed is a pair of binoculars (preferably 8 or 10 power), a field guide, and the time and desire to go outside. A backyard, city park, or nearby wetland can provide days, months, or a lifetime of discovery and pleasure. Any place where nature abides hosts an ever-changing kaleidoscope of birdlife. Then again, you may also want to

wander widely to visit national parks, preserves, or refuges, or travel to faraway lands to see exotic species.

Watching birds may take some practice, but the rudimentary skills are fairly easily acquired and available to almost everybody. It may be best to start with larger, slower-moving birds. It's easier to observe a Great Blue Heron stalking the edge of a marsh than a Chestnut-backed Chickadee flitting through the foliage. Once you are used to using binoculars and standing still for a few moments, birding techniques will come naturally. We humans like to categorize things, to pigeonhole them. Do not worry about trying to identify every bird you see, especially in the notoriously difficult groups like gulls or small sandpipers. Just admire their energy and watch them carefully with open eyes, and eventually, the distinctive movements and field marks of each species will reveal themselves to you.

This book covers birds that occur along the coastal strip of Northern California, with an emphasis on the most commonly occurring species. Although some coastal field guides consider only species found within a mile or two of shore, we extend coverage somewhat farther to include species observed on pelagic birding trips, especially to Monterey Bay, the Farallon Islands, and the Cordell Bank. Those unique destinations support such a diversity of species—marine birds that represent a large proportion of our regional avifauna—that to omit them would be an oversight. However, we emphasize the more common species and those more likely to be seen from shore.

Although you may think first of waterbirds when considering coastal birds, land birds are also important members of the coastal community. Vultures and ravens patrol the beaches for shore-cast carrion and human refuse. Some songbirds are restricted in distribution to the coastal fog belt or to coastal scrub, prairie, strand, and dune habitats. Peregrines and Merlins shadow the shores of estuaries in search of waterbird prey. Migrant land birds, especially young birds on their first migratory journey, follow coastal topography and “pile up” at islands of vegetation at headlands, lighthouses, and coastal promontories—a phenomenon known as the “coastal effect.” Some coastal land uses, especially cattle ranching and other agricultural cultivation, have created habitats that attract large flocks of ground foragers—blackbirds, cowbirds, starlings, and even longspurs—that might not otherwise favor the coast.

The diversity of land birds is high in coastal Northern California, but many also occur inland, in drier environments. Within the discussion of each avian family, we have tried to include those land birds most characteristic of the coastal counties, or those species most likely to be encountered along the shore. Each discussion of avian families is followed by more in-depth species accounts. For these we selected especially representative coastal species (or subspecies) over those that are more wide-ranging geographically.

Birding basics are covered well in other books and not repeated here, but we expand some basic topics—for example, plumage and vocalizations—to provide more in-depth coverage. For the same reason, we discuss superspecies complexes, subspecies, and racial distinctions within and among birds unique to coastal Northern California.

## Boundaries

The “Northern California” of our book title is a bit of a misnomer because we include much of what many call the “central coast.” The geographical area covered in this book ranges from the southern border of Monterey County (35.8°N) northward to the Oregon border (42°N), nearly half the length of California’s 840 mi coastline. The area includes two large estuaries—San Francisco Bay and Humboldt Bay. If their serpentine tidal contours are factored in, the area includes well over 1,000 mi of California’s 3,427 mi tidal shoreline.

Many of the 13 counties that make up the region are larger than some states and, in terms of bird species, have greater biodiversity than most. The coastal counties considered here include, from south to north, Monterey, Santa Cruz, San Mateo, San Francisco, Alameda, Contra Costa, Solano, Napa, Marin, Sonoma, Mendocino, Humboldt, and Del Norte (map 1). Those more interior counties (e.g., Napa, Solano) are included because their positions within San Francisco Bay subject them to tidal influence from the Pacific Ocean and they are directly exposed to the marine climate generated by the California Current. Considering the region as a whole, and counting the oceanic waters out to the continental shelf,

well over 500 species of birds have been documented in the region.

These counties are in the Coast Range Bioregion (Evens and Tait 2005), a diverse mix of terrestrial and strictly coastal habitats. Some of the interior reaches of Monterey and Sonoma Counties, for example, are extremely xeric and support near desertlike conditions, as well as dry-country birds like Greater Roadrunner (*Geococcyx californicus*) and California Thrasher (*Toxostoma redivivum*). But this is a book about coastal birds, and we will ignore the more interior reaches (no matter how interesting the birdlife) and concentrate on the regions of each county that are influenced by the coastal climate. If you are interested in more comprehensive coverage of California's rich avifauna, please refer to other books in the California Natural History Guide Series, especially No. 83, *Introduction to California Birdlife* by Evens and Tait (2005).

The coastline is quite well defined, but how far offshore does the coverage of this book extend? Many ocean birds are highly pelagic, rarely seen from land. Many of these are briefly noted in the species accounts, or referred to in the accounts of more thoroughly covered species. We tried to include those species that nest near shore, even if they are not likely to be seen by even the most intrepid observer. For example, several species of storm-petrel nest on islets and sea stacks within sight of headland overlooks, but these sea sprites arrive at and depart from their nesting cavities under the cover of darkness, a behavior thought to reduce the risk of predation by gulls and raptors. These nocturnal pelagic species can be very difficult to observe from land, but occasionally a strong storm or other anomalous weather event will drive the birds shoreward and afford good viewing for the fortunate naturalist. The authors have encountered such phenomena, though rarely, and have included some of those episodically occurring oceangoing birds in the species accounts (see Ashy Storm-Petrel, Red Phalarope).

## Climate

The California Current dominates the climate of coastal Northern California. What controls the California Current? Massive

atmospheric air masses that descend at the equator and rise at the temperate latitudes generate the North Pacific Gyre, a vast oceanic current that circulates clockwise around the North Pacific from the equator north to about 50°N, the latitude of Vancouver Island, British Columbia. The edge of this great gyre spins off smaller “boundary currents” along its outer edge. One of these, the California Current, is born in the Gulf of Alaska by the winds unfurling clockwise off the gyre. The gyre’s winds drive the surface waters of the eastern Pacific in a southeasterly direction, parallel to the coastline of Northern California. As they travel south along our shores, these wind-driven surface waters are deflected offshore by the Earth’s rotation—a phenomenon known as the Coriolis effect. As the surface waters shift offshore, they are replaced by colder waters from deeper in the ocean, a process known as upwelling. These cold upwelling waters are highly oxygenated and productive, supporting a rich community of plankton, the basis of the marine food pyramid. The cold waters of the current also cool and saturate the near-shore marine air and account for the persistent fog banks that shroud the coastline much of the year.

The California Current’s cool marine air moderates the climate; summer temperatures tend not to be very hot, and winter temperatures not too cold (table 1). Rainfall increases from south to north, but precipitation is concentrated in winter months, especially November through February, at least historically. (Spring and early summer precipitation has apparently increased in recent decades.) The latitudinal increase in precipitation is expressed in the habitat types, with moist coniferous forests becoming more extensive to the north as annual rainfall increases.

The upwelling period dominates the coast’s climate from March into August, accounting for relatively windy spring and cool summer temperatures. The persistence of the upwelling pattern, when cold water and increasing day length promote phytoplankton blooms, is of utmost importance to the ocean’s productivity. As the Pacific High pressure system stabilizes in late summer, the California Current abates somewhat, upwelling decreases, and warmer surface waters from offshore move shoreward—a system called the “oceanic period,” usually lasting from late August well into October. During these months, the north coast climate is most benign—storms are rare to

**TABLE 1** Average annual precipitation and range of annual average temperatures from representative localities, south to north.

Site	County	Precipitation (in)	Temperature (°F)
Monterey	Monterey	19.9	48.0–65.0
San Francisco	San Francisco	22.3	51.4–65.1
Mendocino	Mendocino	40.7	48.1–58.6
Arcata	Humboldt	41.9	46.4–55.4
Crescent City	Del Norte	66.8	44.7–59.5

Source: Data from the National Oceanic and Atmospheric Administration.

nonexistent, winds are negligible, and temperatures are mild. The equable autumn weather is followed by the Davidson Current period, from November through February, when warmer subsurface waters move northward between the California Current and the coast. The Davidson period corresponds to the timing of highest precipitation in each of the north coast counties. These various currents exert strong influences on the weather patterns as well as on the ocean's productivity.

It would be comforting to us all, human and bird alike, if the weather patterns were as predictable and regimented as the foregoing discussion suggests. However, the ocean's typical patterns are occasionally disrupted by weather anomalies of global proportions. A periodic weakening of the atmospheric pressure gradient between the Pacific Ocean and the Indian Ocean, known as the Southern Oscillation, seems to occur irregularly every several years and produces atypical ocean temperatures associated with those phenomena we know as El Niño and La Niña. These changing conditions have profound effects on sea surface temperatures (SSTs) and, in turn, on the productivity of the marine waters and the coastal climate. The warmer waters associated with El Niño may initiate a collapse of the marine food web and die-offs of marine birds. The warmer SSTs may also generate high-intensity winter storms, an additional threat to marine birds. *La Nina's* cooler-water episodes may have the opposite effect, with enhanced ocean productivity, but the effect on precipitation is more variable.

For all its potential variability, the climate of Northern California is relatively moderate. This mildness, coupled with its geographic position in the temperate zone and the diversity of habitats provided by the coastal topography, provide conditions that make the region a hotbed of birdlife.

## Habitats

### Ocean and Shoreline

The marine environment along the north coast, under the dominant influence of the California Current, is relatively stable compared with the terrestrial environment—temperatures vary within a relatively narrow range, and the upwelling tendency is very high, supporting a fairly reliable productivity base most years. The ocean's habitat can be partitioned into several zones, based on distance from the shoreline, proximity to the continental shelf, depth, and bathymetry. The terminology of coastal geomorphology is complex and varied (fig. 1), and not all taxonomies are in agreement.

Terms such as *inshore* and *nearshore* are generalities, at best, and there is no single definition for each, but they can be useful terms for describing the habitat preferences of birds and for describing marine habitats with somewhat vague boundaries.

*Inshore* waters, also called the littoral zone, are those closest to the shoreline and generally rather shallow, from the tideline to areas of the ocean beyond the breakers, but within sight of land, roughly a half mile under ideal viewing conditions. Typical birds of inshore waters are loons, grebes, pelicans, and scoters.

*Nearshore* waters are somewhat deeper and extend farther offshore and, for the purposes of this discussion, the area influenced by longshore currents (the upwelling zone). In Northern California, the nearshore zone may extend to the edge of the continental shelf. Many seabirds that habituate nearshore waters may also be found inshore. Typical species include Common Murre, Sooty Shearwater, and Brandt's Cormorant.

*Pelagic* (from the Greek word meaning "open sea") waters, synonymous with *offshore*, are those waters from the continen-

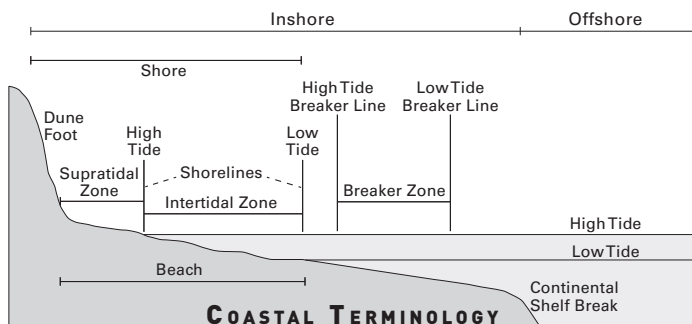


Figure 1.

tal shelf and beyond, and pelagic birds are those that spend most of their lives on the open ocean. This is the realm of albatross, storm-petrels, and puffins, among others.

For this book, we will simplify the terminology and use *shoreline* to include supratidal and intertidal habitats, *nearshore* to refer to portions of the ocean within sight of the shore, and *offshore* (or pelagic) to signify waters not visible from the mainland.

## Tides

The intertidal zone, or shoreline, is the boundary between land and sea. In contrast to the tides of the Atlantic (and much of the world)—which almost always occur twice daily with relatively little difference between successive highs and lows—the Pacific Ocean has a more complex tidal regime. The daily patterns of rising and falling water along the Northern California coast are called mixed tides (or semidiurnal mixed tides) and have relatively greater differences between successive highs and lows. Here, there are two high tides in a 24-hour period, one being higher than the other, and two low tides, one being lower than the other. This Pacific pattern, also known as “diurnal inequality,” has produced the confusing terms *high-high tides* and *low-low tides*, best understood by studying an idealized graphic of a typical 24-hour tidal cycle (fig. 2).

For the curious naturalist visiting the coast, familiarizing yourself with the local tide is a critical consideration for ensur-

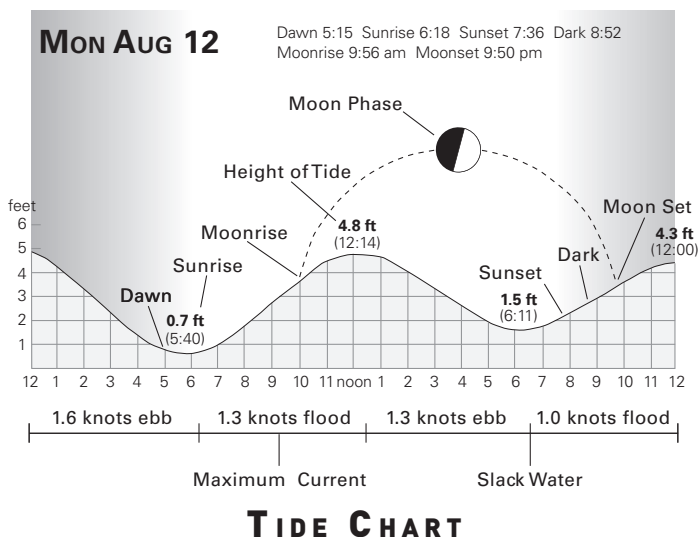


Figure 2.

ing that coastal birds will be most closely observed, but also for your personal safety. When you go into the field to observe waterbirds, it is important that you consult a tide log and plan accordingly. Misjudging the tide can be fatal. Every year in Northern California, fishermen, beachgoers, and hikers get swept off the shore by “sneaker” waves or trapped on some offshore rocks by an incoming tide. In most estuaries—some of the premier birding spots discussed in *Birding Opportunities* and *Roadside Nature Centers*, later in this book, are tidal estuaries and lagoons—it is best to arrive when the tidal flats are exposed and the tide is incoming. Many shorebirds feed at the tide’s edge, and as the tide rises, they are pushed closer and closer to shore, thereby affording the viewer more intimate looks. As the tide covers the flats, foraging shorebirds may retreat to high-tide roosts, such as adjacent salt marsh, levees, or islands, or shift to the outer beach, to either forage or roost. Waterfowl, on the other hand, need some depth of water to forage and raft, therefore as the tide comes in, the waterfowl too will be closer to shore and more closely observed.



Figure 3

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## MARINE SANCTUARIES

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Generous proportions of our coastal waters are set off as National Marine Sanctuaries protecting one of the world's most diverse ecosystems and productive seabird nesting and foraging areas. The Monterey Bay National Marine Sanctuary (NMS) stretches from south of Monterey County to Marin County, encompassing a shoreline length of 276 mi and 6,094 sq mi of ocean. The Gulf of the Farallones NMS and the adjacent Cordell Bank NMS add another 1,811 sq mi combined to the north.

The coastline includes a diverse mix of habitats—rocky shore, islets, and sea stacks, sweeping sandy beach, dunes and coastal swales, wide river mouths and coastal plains, tidal inlets and estuaries, coastal lagoons and embayments. The variety of habitats on the Northern California coast makes it one of the most attractive and biologically productive habitats in the world.

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## Bays and Estuaries

Officially called the “closed waters zone,” the bays and estuaries of the north coast are bodies of water where freshwater mixes with seawater to create some of the region's most productive and sensitive habitats—emergent wetlands, tidal flats, and eel-grass beds (“sea grass meadows”). Among the diverse mosaic of habitats on the Northern California coast, the estuaries, in particular, are important to birds. This reality is reflected in the official recognition of these estuaries by international organizations and the federal government. San Francisco Bay is considered a Site of Hemispheric Importance for Shorebirds, the highest possible ranking, by the Western Hemisphere Shorebird Reserve Network. Significant portions of San Francisco Bay and Humboldt Bay are incorporated into the National Wildlife Refuge system. Bolinas Lagoon and Tomales Bay are designated Wetlands of International Importance by the Ramsar Convention on Wetlands because of their value to wintering birds, among other criteria.

## Tidal Marshes

The vegetated intertidal zone and adjacent upland transition zones fringe the landward edges of the estuaries. Tidal marshes provide a productive ecological function for the estuarine environment, acting as filters for upland runoff, nursery grounds for a variety of fish and invertebrates, and foraging and nesting grounds for birds. The value of these habitats has increased as their extent has been reduced since the European colonization of California. The tidal marsh habitat of San Francisco Bay, by far the largest estuary in our region, was reduced by 78 to 88 percent between 1850 and 2000. In Humboldt Bay, an even larger proportion of historic tidal marsh was diked and drained for agricultural uses during European settlement. What were once tidally driven systems characterized by a salt-brackish-freshwater mosaic of marshland became highly fragmented with dikes and levees, isolated from tidal influence, and converted to uses for agriculture, industry (e.g., salt evaporation ponds), landfills, and urban infrastructure. Happily, since the last decades of the 20th century, some of these degraded historic marshlands have been (and are being) restored to tidal influence and regaining some of their former natural value. In San Francisco Bay there are numerous marsh restoration projects, with the ultimate goal of 100,000 acres of rejuvenated tidelands. In Humboldt Bay, the Arcata Marsh and Wildlife Sanctuary (307 acres), dedicated in 1981, serves as an object lesson in restoring the productivity to wetlands formerly covered by a landfill, lumber storage, and sewage oxidation ponds. At the south end of Tomales Bay, 550 acres of historic wetlands that had been diked for pastureland in the 1940s were returned to tidal action by the National Park Service in 2008; the site is rapidly reverting to natural habitat and a bird-rich environment.

Some characteristic birds of the tidal marsh are Song Sparrow, Marsh Wren, Common Yellowthroat, California Black Rail, and California Clapper Rail.

## Tidal Flats

Tidal flats are nonvegetated, soft-sediment habitats in the shallow intertidal shoals of estuaries and other low-energy marine environments. Highly productive and nutrient rich, with dense

concentrations of organisms living in the mud (infauna), tidal flats are primary foraging areas for myriad waders and other waterbirds and account for the large flocks of Arctic shorebirds that pass through during migratory periods, many of which remain through the winter months. Tidal flats also provide a buffer between deeper waters and the vegetated shoreline, dissipating wave energy and reducing erosion along the shore. Many of the shorebirds you will see foraging at the edge of the tide probe the mudflats for invertebrates, each species having developed its particular bill length and shape, and feeding method, to exploit the various prey items that burrow in the substrate. Thus we see different-sized “probers,” each sharing the same habitat and finding sustenance (pl. 1).

Not all tidal flat specialists are probers; those with larger eyes and relatively shorter bills, like the Black-bellied Plover (pl. 2), find prey by sight and pick it off the surface. Some waterfowl, most notably Green-wing Teal, siphon food off the damp surface of the mud, and egrets and herons poke around shallow standing pools or the vegetated edge of the tidal flat for whatever morsels they can find.

### Salt Pannes and Salt Ponds

San Francisco Bay holds the largest extent of this habitat type in our region. Before European colonization, the bay had about 8,000 acres of natural salt pannes—large, shallow saline ponds scattered along the backshore of tidal marshes. Salt pannes were, and are, particularly attractive habitat for long-legged waders—avocets, stilts, and yellowlegs. With urbanization of the estuary and an increase in the demand for salt in the mid-1800s, salt ponds were constructed, replacing tidal marsh and associated habitats, in effect mimicking the native salt pannes. By the beginning of the 21st century, salt ponds covered nearly 35,000 acres. These salt ponds, and the associated levees, are attractive to large numbers of shorebirds as foraging areas and to several species as nesting habitat—most notably American Avocet (pl. 3); Black-necked Stilt; Western Snowy Plover; California Gull; and Forster’s, Elegant, and Least Terns.

Salt ponds vary greatly in their value as bird habitat, depending on differences in salinity, size, depth, and the resulting community of invertebrates. Nevertheless, in their entirety, shallow saline ponds and those pannes that still exist are bird-

wealthy environments. Undoubtedly the abundance of locally nesting shorebirds—especially American Avocet and Black-necked Stilt—has increased with the expansion of salt-pond habitat. Western Sandpiper, too, once described as a “sparing winter visitor” (Grinnell et al. 1918) in San Francisco Bay, has become the most abundant wintering shorebird in the Bay Area, concurrent with the development of artificial salt ponds.

## Open Bay Waters

Protected from Pacific swells, open bay waters provide rafts of waterbirds with roosting areas and foraging opportunities. In the larger embayments, large flocks of canvasbacks, scoters, scaup, buffleheads, grebes, coots, and gulls are often found loafing in leeward waters just offshore. These waterbirds gather in October and remain through the winter months, sometimes forming vast flocks, especially in protected coastal bays where hunting is not allowed. San Francisco, Humboldt, and Tomales Bays support large proportions of populations of some species during winter, and provide safe refuges (in some portions) from depredations by hunters in fall.

In each of the larger bays, submerged pastures of eelgrass (*Zostera marina*) provide critical foraging habitat for Black Brant, a sea goose, but also for diving ducks—especially scaup and scoters—that forage on herring roe and other invertebrate prey that abounds within the eelgrass beds.

## Outer Coast: Beaches and Rocky Shore

Although the sandy beaches may appear to be barren, if beautiful, habitat, they are actually dynamic ecological engines. Walk the beach in the morning after a high tide and notice the wrack line, tangled debris of marine algae (“seaweed”), shore-cast carrion, and discarded crab carapaces. Often the tracks in the sand show that foxes, coyotes, skunks, raccoon, gulls, ravens, or vultures have already investigated the newly arrived bounty for edible morsels. Lift a blade of bull kelp and note the teaming amphipods and beach hoppers, already busy decomposing the detritus. And this is just the life visible to the naked eye.

Sandy beaches support a somewhat more modest community of shorebirds than the tidal flats of the estuaries. The emblematic bird of the outer beach is the Sanderling (pl. 4),

a chunky, pot-bellied, Arctic-nesting shorebird that spends the nonnesting season along our shores, chasing the receding waves out to forage in the swash zone, then racing back up the beach before the next wave washes in. Willets, too, are common shorebirds of the outer beach, larger than the Sanderlings and more aggressive, often trying to steal morsels from their smaller cousins, or from others of their own kind. The main prey for these sandy beach shorebirds are mole crabs, also called sand crabs (*Emerita analoga*). Like Sanderlings, mole crabs occur on most beaches in North and South America. No larger than a child's thumb, these burrowing crustaceans migrate up and down the beach in the zone of wet sand washed by waves. Unlike most crabs, these have no claws. Efficient burrowers, they stay mostly buried in the damp sand, always facing seaward, only their eyes and antennae protruding. As the waves wash in, they unfurl their long antennae and filter plankton from the seawater. Mole crabs can be incredibly abundant, with several thousand individuals in every square yard of beach, which explains the abundance of Sanderlings.

The outer beaches and associated foredunes are also critical habitat for the federally threatened Western Snowy Plover, a small, sand-colored shorebird that nests, though sparsely, along the more remote sections of our beaches. Increasing coastal development has eliminated or greatly reduced plovers from many of the north coast beaches (Pajaro Dunes in Monterey, Stinson Beach in Marin). Small numbers of plovers persist, and a few of those are still able to fledge young on beaches actively protected by public agencies—for example, Point Reyes National Seashore (Marin Co.) and MacKerricher State Park (Mendocino Co.)—if they are able to evade the depredations of the marauding Common Ravens, whose numbers have increased dramatically in recent decades.

Most rocky shore habitat is on the rugged outermost coast, at the foot of steep headlands, pinnacles, pillars, tombolos, islands, islets, and sea stacks, confronting the brunt of the Pacific's most powerful elements.

Compared with the sandy beach, the rocky shore is a harsh environment, continually pummeled by waves, and crowded with dense communities of tough invertebrates—mussels, limpets, barnacles, and sea stars—whose entire evolution has focused on holding fast to the rocks. Most of the birds that

frequent this habitat, many habitually and exclusively, have evolved with equal prowess to pry, chip, or chisel these tenacious animals loose. The physical model for each avian “rock star” is similar: stout bill, thick legs, relatively heavy body, and large eyes, all the better to see you with in a misty, low-light environment. Most of these rocky shore birds sport dark gray or black plumage, blending in with the generally dark pallet of the rocks on which they roost and forage. Perhaps the most emblematic bird of this habitat, and the only shorebird that nests in this extreme environment, is the Black Oystercatcher (pl. 5).

The methods used for extracting meat from their tough prey items are as varied as the predators’ bills: oystercatchers jab mussels and sever the abductor mussel or use the bill as a lever to pry chitons loose; turnstones peck and probe beneath algae or in crevices; Surfbirds tug, pull, and peck, breaking barnacles loose and swallowing them whole. Whatever works.

## Nearshore Waters

For the purposes of this book, the “nearshore waters” include the open ocean from the low-tide line out to the visible horizon. Of course this distance varies with weather, the elevation of the observer, and the power of the optics being used, but it’s a convenient concept. A more formalized approach identifies the nearshore zone as marine waters up to 328 ft in depth, so there is a large overlap between the formal definition and this approach. The nearshore waters in Northern California are relatively shallow and overlie the continental shelf, the gently sloping margin of the continent that extends offshore until it breaks and drops off precipitously at the continental slope. The shelf is relatively narrow in most sections of our region but varies from 4 to 20 mi in width. (Worldwide, continental shelves average about 40 mi in width. But the topography of the ocean floor is as varied as that found on the land; in a few places, submarine canyons, with depths up to several thousand feet, come closer to shore. Monterey Bay is the most prominent example, where the deep water of Monterey Submarine Canyon (fig. 4) bisects the continental shelf and approaches within a few hundred feet of shore.

The dominant habitat types of the nearshore waters are

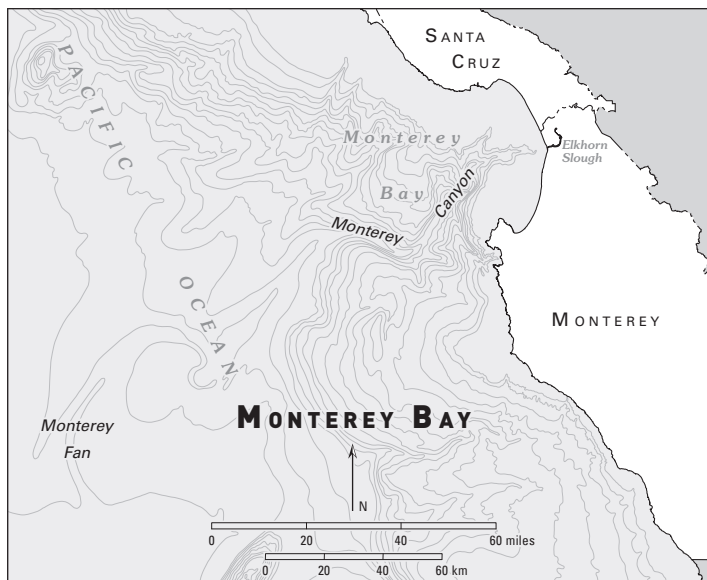


Figure 4.

submerged boulder fields; seafloor composed of shale, sand, or mud; and kelp forests. Boulder fields occur off headlands and resistant geological formations where the wave energy is most intense. Sandy bottoms occur intermittently along the coast, with finer sands accumulating in shallower waters where wave action is gentle, and coarser sands accumulating where wave energy is more intense. Muddy bottoms occur where silt and clay settle out from land runoff, at the mouths of rivers and estuaries. (Also, the percentage of mud, silt, and clay increases as depth increases on the shelf.) Kelp forests are common in areas with rocky substrates, whether off headlands or along calmer shores, and may extend for miles along the coast in waters up to about 100 ft deep. Marine birds are often associated with these different habitats as determined by the nature of the bottom. Pelagic Cormorants, for example, search for small octopi amid the crevices of boulder fields. Harlequin Ducks, too, seem to prefer rocky shorelines and substrates with boulders and cob-

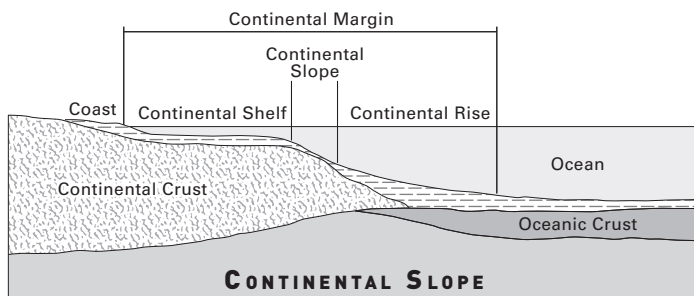


Figure 5.

bles. Common Loons tend to favor calmer water with sandy or muddy bottoms for pursuing schooling fish. Great Blue Herons may use the floating bulbs of kelp as perches for hunting Kelp Pipefish (*Syngnathus californicus*) or even a Sarcastic Fringehead (*Neoclinus blanchardi*). Surf Scoters dive among the stalks for sessile crustaceans, and turnstones search the shore near kelp beds, plying the windblown blades for amphipods.

Farther out, but within sight of land, the larger, flocking fish eaters (Brandt's Cormorants, Brown Pelicans, and Western and Clark's Grebes), and of course the opportunistic gulls, have a common nearshore presence. Among the coastal nesting seabirds—Common Murres, Pigeon Guillemots, Marbled Murrelets—the nearshore zone is their bailiwick as well.

## Offshore Waters

This oceanic zone begins beyond sight of land at depths of 300 feet or more and extends beyond the continental shelf. To reliably experience its birdlife, as well as the marine mammals that occur here, a boat trip out of one of the coastal ports is recommended—from Monterey Bay, San Francisco, Bodega Bay, or Fort Bragg. The “featureless plain” characterization of the Pacific Ocean is an illusion. Birds and other marine life tend to concentrate where upwelling is strongest or currents converge, in the vicinity of submarine canyons or submerged banks, or where the shelf breaks at the continental slope (fig. 5). The submarine topography causes mixing of waters and nutrients that

generate productivity of microscopic organisms (phytoplankton and zooplankton) that form the basis of the oceanic food chain.

## Taxonomy: Subspecies, Species, and Superspecies

Taxonomy is the science of classification of animals and other organisms sorted systematically into categories that ladder down from the most general to the most specific (from the same Latin root as the word *species*). For example, a Brown Pelican (pl. 6) is in the:

Kingdom Animalia  
    Phylum Chordata  
        Class Aves  
            Order Pelicaniformes  
                Family Pelicanidae  
                    Genus *Pelicanus*  
                        Species *occidentalis*

A species is the ultimate expression of evolution. Speciation does not happen suddenly, but unfolds through the dynamic interaction of groups of organisms with the environment and the selective pressures exerted upon them. To explain the variation within and among species, taxonomists have come up with many concepts, two of which—*subspecies* and *superspecies*—are useful for framing the core concept of species and for understanding variation in birds. It is important to remember, however, that these classifications are somewhat speculative, often controversial, and always open to revision. Determinations about whether two populations should be considered different species or just different subspecies can be very difficult to make in some cases, even for taxonomists. (In fact, there are two dominant approaches to vertebrate taxonomy: the *biological* species concept and the *phylogenetic* species concept. Traditionally, birds have been evaluated by the former. See the glossary for definitions of each.)

Superspecies include pairs or groups of species that are very similar physically (phenotypically) but are geographically

isolated from one another (allopatric) during the reproductive phase of their life cycle. Superspecies do not hybridize to any significant extent and have diverged from one another fairly recently in evolutionary time. When a superspecies includes two species (e.g., Common and Yellow-billed Loons), those species are called “sister species” or “sibling species.” When a superspecies group consists of several species (e.g., the pink-legged Pacific gulls), it is usually called a superspecies *complex*.

These are some of the superspecies that occur on the Northern California coast:

- Common and Yellow-billed Loons
- Western and Clark’s Grebes
- Tundra and Trumpeter Swans
- Blue-winged and Cinnamon Teal
- Greater and Lesser Scaup
- Short-billed and Long-billed Dowitchers
- California, Herring, Western, and Glaucous-winged Gulls
- Spotted and Barred Owls
- Rufous and Allen’s Hummingbirds
- Townsend’s and Hermit Warblers

Subspecies, on the other hand, are groups of *phenotypically variable* (slightly different in plumage or measurements) members of the same species, with each of the subspecies essentially equivalent to a geographical race. A subspecies is considered a “species in the making” because it represents a geographic segment of a species’ population that has distinct differences in coloration, and perhaps size and physiology. These differences, in turn, often correspond to differences in habitat selection and behavior. Where the ranges of subspecies overlap, interbreeding will occur. Perhaps the most common example in our region is the Yellow-rumped Warbler, composed of two subspecies, the Myrtle and the Audubon’s. Another example is the Song Sparrow of San Francisco Bay: three distinct subspecies—Alameda, San Pablo, and Suisun—are resident in different geographical areas of the salt marshes around the bay shore.

So, superspecies and subspecies bracket the principal and most basic category of taxonomic and biological classification, the species. (The word *species* is both singular and plural.) A species is recognized based on its geographic distribution and its physical characteristics—where it breeds and what it

looks like. The determination and naming of species status is an ongoing scientific endeavor, reflecting the changing nature of our knowledge and the changing nature of the environment. As genetic analysis becomes more sophisticated and precise, new species are discovered within a given genus and a single species is “split” into two, or sometimes more. Genetics (i.e., DNA sequence analysis) has become a primary tool in taxonomy; however, natural history—especially breeding behavior, vocalizations, and habitat preferences—also plays an informative role in the assignment of species (and subspecies) status. For North American birds, the final arbiter of taxonomy is the American Ornithologists’ Union (AOU) Committee on Classification and Nomenclature, a group of professional ornithologists that reviews the literature and the evidence and is continually revising the list of North American birds. The taxonomy used in this book follows the seventh edition of the AOU Check-list of North American Birds through the 53rd supplement (2012). (The AOU has relied mostly on the biological species concept in categorizing North American birds.)

Each species is given a two-part name composed of a generic name and a specific name. Thus, a Canada Goose (*Branta canadensis*) (pl. 7) belongs to the genus *Branta*, which includes several species, and the species *canadensis*, which identifies only one species. But, there are several subspecies of the Canada Goose, and each is given a third name to indicate its subspecific status. The most common one in our region, the large “honker,” is assigned the subspecies name *moffitti*; thus the full name is *Branta canadensis moffitti*. Currently, seven subspecies of Canada Goose are recognized, collectively known as “the greater Canada Goose complex.” In 2004 the AOU split *Branta canadensis* into two separate species, the larger Canada Goose (*B. canadensis*) and the smaller Cackling Goose (*B. hutchinsii*). The way these species are divided is illustrative of the methods used to categorize birds by taxonomists. The Canada Goose includes larger-bodied, more southerly breeding populations, whereas the Cackling Goose is smaller bodied and breeds farther north, in the Arctic tundra. Also, notice the name of the new species: “cackling” describes one characteristic in which it differs from the larger group, the “honkers,” illustrating how natural history (in this case vocalizations) as well as genetics inform decisions about taxonomic classification and nomen-

clature. Five subspecies are considered under Cackling Goose, sometimes referred to as “the lesser Canada Goose complex.”

Not all species are as variable as the “white-cheeked goose complex” described above. Some species are ecologically or behaviorally isolated enough to maintain a discrete population. The Common Loon (pl. 8), for example, is considered monotypic; that is, there are no subspecies. Although there is considerable variation in size and the measurements of other characters (bill length, wing chord, etc.) within the species when it is distributed over an area with differing environmental conditions, variation tends to follow a gradual geographical distribution. That continuum of change is termed “clinal” variation. The observer would not be able to differentiate a Common Loon that breeds in northern Alaska from one that breeds in Oregon, though the more northern birds are apt to have slightly longer wings or bills than the more southerly nesting individuals.

Even monotypic species like the Common Loon can interbreed with closely related species in certain, and usually rare, circumstances. There are five species of loons, all in the same genus *Gavia*, thus they are called “congeners.”

The Common Loon is most closely related to the Yellow-billed Loon, and as discussed above, the pair forms a superspecies. Indeed, hybrids have been reported between these two, as well as other, congeners.

These examples are given not to confuse the reader, but to illustrate that species boundaries are “somewhat mutable,” that evolution is always testing biological fitness, improvising, searching for new shapes and sizes to adapt to a potentially changing environment. Evolution is a dynamic ongoing process.

## Plumage of Birds

All birds have feathers, and they are the only animals that do. Simply put, feathers define birds. Feathers are an ingenious evolutionary invention that enables flight and provides insulation, waterproofing, and camouflage (cryptic coloration) as well as brilliant breeding plumage. Composed of the protein

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## FEATHERY TERMS

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**Down** Soft and fluffy, without interlocking barbules, down provides warmth and buoyancy. Newborn chicks are covered with *natal down*. In adult birds, *body down* underlies the contour feathers of the plumage. *Powder down* is an uncommon feather type that grows continuously and therefore is not molted but sloughs off “feather dust” that serves to protect the other contour feathers. Powder down is found on members of the heron family, as well as on some parrots and pigeons.

**Bristles** Hairlike and stiff, bristles often surround the beak or eyes (as whiskers or eyelashes do in mammals); their function is not well understood but is likely sensory.

**Filoplumes** Also hairlike and occurring mostly on the nape or crown, filoplumes are thought to provide insulation as well as to have decorative and sensory functions.

**Semiplumes** Midway between down feathers and contour feathers, semiplumes add warmth and fill out the smoothness of the plumage.

**Remiges** The primary flight feathers of the wings, remiges are long, stiff, and attached directly to the bones with ligament. Note that on many larger birds—swans, geese, cranes, pelicans, gulls—the tips of the remiges are darker, with concentrations of melanin for added strength and durability.

**Rectrices** The tail feathers, rectrices are also stiff and strong, but only the central ones are attached to the bone by ligament. The rectrices are the rudders of the birds in flight, and they aid in balance and maneuverability.

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beta-keratin, feathers have evolved into a variety of structures—from the flimsy topknot of a California Quail to the stiff wing feather of a Brown Pelican. There are two basic types of feathers—down and contour feathers—and each of these is modified into various types to serve specific functions in a bird’s life.

Because waterbirds are a primary consideration of this book, a brief discussion of the uropygial gland is worthwhile. Also called the “preen gland” or “oil gland,” it is located near the base of the tail (on the rump) and is present in most species but best developed in aquatic birds, such as petrels, pelicans, ducks, and the Osprey. The gland secretes oil that the bird applies to its feathers with its bill. This oil is a diester wax called uropygiol, hence the name of the gland. Although the wax helps protect the feathers—and perhaps the bill and legs—the act of preening also aids in waterproofing by creating an electrostatic charge to the feathers. Most waterbirds have well-developed oil glands, but the structure of their feathers also contributes to their ability to survive in their watery world. (Interestingly, the gland may play a role in sexual selection, because the secretion in females has been found to emit a specific odor.)

## Molt (or Moults)

Feathers are fragile and need to be replaced regularly if they are to maintain their usefulness. Feather wear (abrasion), and therefore the process of feather replacement, is determined by a bird’s life activity, which is determined in turn by its behavior, distribution, habitat preferences, and genetic heritage. The causes of feather wear are many: damage by contact with vegetation, rocks, and other birds; friction with the air during flight; and perhaps most important, loss of structural integrity through exposure to sunlight. In general, the feathers of birds that migrate wear more readily than those of nonmigratory (sedentary) birds; this may be more the result of exposure to solar radiation than of abrasion. Birds that live in habitats with intense solar radiation or harsh vegetation will experience more wear than those living in shady forests.

Molt is a *cyclical process* of feather restoration that all birds must undergo. During normal molt, a new feather begins growing within the follicle and pushes out the old feather. Thus, when a feather drops, it is already being replaced, leaving no significant gaps in the plumage. The main flight feathers, remiges and rectrices, are molted symmetrically on the right and left sides, so direct flight is balanced. (Some species, such as waterfowl, loons, and rails, molt all flight feathers at once and go through a brief flightless phase, however.) Although feathers

grow through follicles as human hair does, the process is not continuous. Molting patterns are highly variable and have been organized into four basic “strategies.” This is a complex subject, well beyond the scope of this book, but for the curious naturalist, an exciting area of exploration. Full treatment can be found in Pyle (1997, 2008) and Howell (2010).

Molt can be “complete,” that is, all feathers are replaced, or “partial,” meaning only certain feathers are replaced. Molting is energy intensive, and most species do not molt during those periods when their energy is needed for critical life functions—migration and reproduction. Most birds undergo complete molt after the nesting season, in late summer and early fall, but molt can be protracted, lasting well into winter and spring.

Once the Common Loon (pl. 9) completes its partial spring body molt, which will take several weeks, it will be in full breeding (or alternate) plumage. During the winter, when it is most likely to be seen in Northern California, it will be in a duller wintering (basic) plumage. The nomenclature of molts and plumages of birds is complex (some would say arcane) and undergoing revision as molting strategies are better understood. For the amateur birder, and for the purposes of this book, we will simply use the terms *nonbreeding* (or sometimes *wintering*) and *breeding* plumage to describe the annual feather and plumage cycles of birds. The more formal names for these feather cycles are, typically, *basic* (nonbreeding) plumage and *alternate* (breeding) plumage, regardless of the season during which the plumage is acquired. However, this general terminology should be reversed when considering the ducks (family Anatinae):

The bright plumages of adult male ducks (other than Ruddy Duck) in late autumn and winter should be considered basic plumages, which are completely renewed annually as in other birds. The ephemeral and highly variable cryptic plumages found in spring and summer presumably have evolved more recently, primarily in those species benefiting from an ensuing camouflaged plumage, and thus should be considered the alternate plumages (Pyle 2005).

It is also helpful to determine the ages of birds as revealed by their plumage. Juvenal plumage is the first covering of feathers that replaces the downy feathers of the chick. It is distinctly

different from either alternate or basic plumage (pl. 10), and some groups of birds, particularly sandpipers, sport the juvenal plumage through the first summer and fall. In Great Britain, the term *juvenile plumage* is used; for all intents and purposes, the terms are synonymous. Here, the term *juvenal plumage* is used to describe *juvenile* birds that have not yet attained an adult plumage. It is part of the “first plumage cycle,” which also includes “formative” (postjuvenile) and sometimes first-alternate plumages, considered “immature” here. Once a bird has fully matured, it will be referred to as an adult having “definitive” adult plumage or as being in the “definitive plumage cycle.” Some species (e.g., gulls) exhibit identifiable second-, third-, or fourth-cycle plumages that we refer to as “subadult.” Be aware that terms within these cycles continue to be a field of exploration (and debate) that awaits investigation by the curious naturalist.

## Dimorphism and Monomorphism

*Dimorphism* literally means “two forms,” and *monomorphism* means “one form.” Sexual dimorphism, in which the male and the female of a given species differ in looks, is a common trait among birds. Among California’s coastal birds, the waterfowl provide perhaps the most obvious examples of sexual dimorphism. The definitive adult plumages of a male and female Mallard, for example, are quite distinct and easily recognized. But dimorphism can be subtle as well. The sexes of many of the shorebirds differ in bill shape or size, but are virtually identical in plumage. In the Long-billed Curlew (pl. 11), the female’s bill is noticeably longer than the male’s bill, and each is shaped somewhat differently. The male’s bill follows an even curve for its entire length, whereas a female’s bill is somewhat straighter along its length but has a more abrupt curve at the end.

Perhaps no species are entirely monomorphic, but the term is used to describe those in which males and females are virtually indistinguishable, at least to human eyes. Adult Common Murres (pl. 12) show no discernable dimorphism, but the bill of the male is slightly longer and deeper than that of the female, and the wing may be slightly longer; however, neither

character is obvious in the field. Most species that display little sexual dimorphism share a more egalitarian lifestyle; they tend to behave similarly and participate equally when nesting and chick rearing.

## Seasons and Migration

Although the coast of Northern California is battered by winter storms, assailed by occasional gale-force winds in spring, and often blanketed with fog in summer, millions of birds of many species live here year-round. They are *permanent residents*, and during normal weather, survival and reproductive success is very high.

Many more birds of other species are *migrants*. Some that nest here fly to the American tropics or beyond during our winter, and others nest far to the north and east but come to spend the winter here. Other cohorts of birds (especially some of the plovers and sandpipers) are found on the coast during spring and fall only—just passing through.

Though we speak of four seasons, the timing of occurrence and passage of the many species varies and overlaps so much that it is impossible to define bird seasons by date. We have tried to provide the seasons of occurrence for each species in the Seasonal Occurrence Charts at the end of the book. Birding along the Northern California coast can be exciting and productive any time of year, and any given month will contain its own community of birds to behold. That said, there are some generalities to keep in mind.

### Winter

During winter, generally November through March and into April, coastal bays, harbors, lagoons, and river mouths may be crowded with ducks, grebes, and loons as herons and egrets patiently ply the shore and kingfishers watch the still waters from overhanging perches. While Sanderlings, Willets, Marbled Godwits, plovers, and flocks of gulls frequent beaches that are safe from disturbance, a Peregrine Falcon or Merlin is probably perusing the panorama from a distant perch.

## Spring

During spring, generally March into early May, most wintering waterbirds depart and multitudes of migrant waterbirds pass through. Although the numbers of migrant waterbirds are countless, gross estimates are possible. Over a million Pacific Loons and perhaps one-third of a million Black Brant fly north over nearshore waters in April and May. Well over a million shorebirds—mostly Western Sandpipers, Dunlin, and dowitchers—move through the estuaries en masse during the last 10 days of April. Most of these marvelous birds, heading to the far north to nest, are dressed in their finest breeding plumages.

## Summer

Summer, generally May and June, is the slow season for birds on the immediate coast. Although no bird season conforms to our Roman calendar, the bird summer is the most difficult to define. Anna's Hummingbird may begin its nesting season by early December and hatch chicks by the New Year. Clapper Rails set up nesting territories as early as February. Different species in different habitats begin and conclude reproductive efforts right on through the summer months, ending with late fledglings in October. So, the nesting seasons of our local breeders overlap with the migratory seasons of our winter residents and migratory visitors.

The first southbound migrant shorebirds appear in the last few days of June, adults having completed nesting efforts and still wearing their breeding (alternate) plumage, which they retain into mid-July, when the first juvenile shorebirds begin to arrive. These early migratory pulses are really the beginning of the fall season, at least waterbird-wise.

## Fall

Fall is the most exciting bird season along the coast. Along with the astonishing numbers of winter arrivals and passing travelers, the possibility of encountering rare species is far greater than in any other season. At least half of the many millions of birds in motion are youngsters, "birds of the year," only a few months old. A small percentage of these are equipped

with genetically faulty compasses that cause the birds, on their maiden voyage, to wander off course or follow the wrong bearing and end up outside the species' usual migratory pathways, far from where they are supposed to be. Migrating birds are subject to the "coastal effect," a tendency to pile up while following the coast, especially during fall migration. (Most land birds try to avoid crossing the air mass that overlies vast expanses of water.) This phenomenon is most pronounced in young birds, those embarking on their first long-distance journey, and adds a special level of excitement to the autumn migratory period.

Perhaps the most emblematic avian event of fall along our shores is the arrival of "the three amigos"—Brown Pelicans, Heermann's Gulls, and Elegant Terns—moving north from their nesting grounds in Mexico. They come to forage in the cool, nutrient-rich waters here, returning south, many to Mexico, by October.

## Ethics of Birding

Life is not particularly easy for birds or other wild animals, and they generally perceive humans as predators, for good reason. Their lives are devoted to survival in an environment that is often hostile, and all of their waking energy is devoted to "making a living" and reproducing. When you observe animals, it is important to keep this reality in mind and to remember that "observation is not interaction." In other words, keep a respectful distance so you do not flush a bird or otherwise alter its behavior.

It is understandable that we may want a little better look, or a closer photograph, but if we cause the creature to fly, or scurry for cover, we are approaching too closely. We now have access to high-powered optics—binoculars, telescopes, and telephoto lenses—that allow us to get "up close and personal" with wild animals from a comfortable and respectful distance. If you can manage to spend the extra money for clearer or more high-end optics, you will not regret it, and you will reduce your need to intrude into a bird's personal space and increase the quality of your viewing experience.

Birds are most vulnerable to disturbance during the nesting phase of their life cycle. Approaching a nest, or removing

vegetation that helps hide a nest, exposes the bird and its young to predation and nesting failure. Predators—especially jays, ravens, gulls, and foxes—cue on human scent and movement and may investigate human trails in search of food.

The famous axiom “leave only footprints” is also a good guideline to keep in mind when visiting natural habitats. In parks, preserves, or wildlife refuges open to the public, stay on the maintained paths and follow the rules. They are developed for a reason—to protect the natural resources and the wildlife from undue disturbance.

Respect private property and the privacy of residents. If you want to access private lands, make an effort to contact the landowners beforehand; explain your interest and why their properties may support interesting birdlife. Many people are happy to share their environment if approached respectfully. If access is refused, take “no” for an answer.

Wear muted colors and walk softly through the forest, around the marsh, or across the field. You will be more likely to go unnoticed, and will likely see more wildlife. Also, studies have found that wildlife in general (birds in particular) are less likely to flush when a human approaches at an oblique angle rather than straight toward the subject. So, when walking from your car to the shoreline of a lagoon to view a flock of shorebirds, do not walk directly toward them; rather, veer off to the side. You may also want to position yourself with the sun at your back, for better lighting and to be less visible to the birds you are observing.

Humans are social animals and often enjoy the company of others, but this natural inclination can disturb wildlife and cause animals to avoid an area where there is a high level of human activity. Best to travel in small groups, or even singly. The larger the group, the less you will see and the more impact you will have on the environment. If you are in a group, even a small one, speak softly, or not at all. Some of our most memorable birding experiences have occurred solo—sitting quietly by a pond at dusk, scanning a marsh while backlit by the morning sun, or having a glass of wine on the deck and watching the feeder and birdbath.

Which brings us to an oft-asked question: Is it OK to feed the birds? There are various views on this subject. Perhaps the best answer is to cultivate native food plants in your yard,

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## CITIZEN SCIENCE

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Birding, or bird-watching, is a pastime, a sport, and an avocation that often develops into a passion. The skills of observation acquired through the pursuit of birds dovetail nicely with the scientific method, and the participation of “citizen scientists” in data collection enhances various scientific investigations.

Birders contribute to ongoing research projects that are nationwide in scope. National Audubon’s Christmas Bird Count has been collecting information on winter bird populations throughout North America (and beyond) for well over a century. The North American Breeding Bird Surveys (U.S. Geological Survey and partners) monitor the status and trends of nesting bird populations. Observers who volunteer for Cornell Lab of Ornithology’s Project Feeder Watch or the Great Backyard Bird Count provide indices of overwintering species.

There are also many regionally focused projects that involve citizen scientists, most of which are fostered by research or land management organizations. Most programs require some degree of training, but the hosting organizations are pleased to accommodate enthusiastic volunteers. Following are a few examples of ongoing projects that welcome citizen scientists:

**Coastal California Shorebird Survey—San Francisco Bay,** a cooperative effort between Point Blue Conservation Science (formerly PRBO), the San Francisco Bay Bird Observatory (SFBBO), U.S. Geological Survey (USGS), and Audubon California, documents numbers and distribution of wintering shorebirds across the extensive Bay Area wetlands. ►

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**Save Our Shorebirds Surveys—Mendocino** is hosted by the Mendocino Coast Audubon Society conducting seasonal censuses along that coastline.

**Colonial Waterbird Survey (PRBO, SFFBO, and Audubon Canyon Ranch)** monitors population trends of a variety of colonial nesting birds with a focus on herons and egrets in the greater San Francisco Bay Area.

**The Landbird Project at SFBBO's Coyote Creek Field Station (Alameda County)** enlists volunteers to study dispersal, migration, behavior, social structure, life span, survival rate, reproductive success, and population growth.

**Hawk Watch (Golden Gate Raptor Observatory)** monitors migrating raptors every fall, August to November, at Marin Headlands above the Golden Gate.

**COASST** is a citizen science project dedicated to involving volunteers in the collection of high-quality data on the status of coastal beaches and the trends of seabirds. COASST volunteers systematically count and identify bird carcasses that wash ashore along ocean beaches from Northern California to Alaska. Volunteers need no experience with birds, just a commitment to survey a specific beach (about 0.75 mile) each month.

**Peregrine Falcon Nest Survey**, a project of the Santa Cruz Predatory Bird Research Group, offers citizen scientists an opportunity to participate in one of the world's most successful programs to rehabilitate a formerly endangered raptor.

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thereby complementing natural food sources. Of course, not all of us own property or have access to open spaces. If you live in an apartment, a rental unit, or in the city, then a seed feeder, birdbath, or hummingbird feeder is likely to attract birds to your home. This is a good thing, at least for you, but there are a few precautions to consider:

- Keep feeders or baths clean and change the water (or nectar) regularly.
- Place feeders or baths near cover so that the birds have a route of escape in case a predator attacks.
- Make sure those windows that reflect light have stickers or shades that will reduce glare and so reduce, or prevent, window strikes. Windows are a major source of bird mortality.
- Make sure that no house cats have access to the bird-feeding area; house cats are major predators and cause untold numbers of bird deaths every year in every region.
- Be consistent. If you commit to feeding birds, try to keep the feeders well stocked.

It is important to understand that by feeding, you are subsidizing the local avifauna and may be attracting undesirable birds to your property—House Sparrows, Eurasian Starlings, Eurasian Collared Doves, jays—that may compete with, exclude, or even deplete more desirable species. So, feeding birds is an individual decision and should be informed by the circumstances of your home turf.

In the technological age in which we live, recordings of bird vocalizations are readily available and can even be broadcast from your smartphone. These programs are helpful tools for learning to recognize species by ear. However, during the nesting season, in particular, they should be used with extreme caution. Birds sing to advertise their territory and attract mates. When we play the territorial song of a warbler or a thrush within an occupied territory, simply to attract a bird into our field of vision, the bird whose territory we are invading may perceive us as intruders or competitors, and may expend extra energy to fend us off and exert his territorial imperative. Energy expended is energy wasted and may compromise the bird's reproductive success. This precaution is especially

**TABLE 2** Counties of the Northern California coast, south to north; size of each; total number of bird species recorded as of August 2012; and bird species per square mile. (The smallest, San Francisco County, includes the closely observed Southeast Farallon Island, a magnet for vagrant species.)

County	Size (sq mi)	Number of Bird Species	Species / Square Mile
Monterey	3,771.07	486	0.129
Santa Cruz	607.16	433	0.713
San Mateo	1,304.01	453	0.347
San Francisco	232	458	1.974
Marin	828.20	485	0.585
Sonoma	1,768.23	422	0.239
Mendocino	3,878.14	410	0.106
Humboldt	4,052.22	455	0.112
Del Norte	1,229.75	427	0.347

important regarding the rarer and at-risk species—owls, rails, and many passerines.

Excellent advice on the ethics of using taped vocalizations to attract or view birds is given on David Sibley's website *Proper Use of Playback in Birding*. It is too long to summarize here, but the primary guidance is to exercise respect and be courteous to the bird (and other birders) by limiting the volume and frequency of the playback.

The American Birding Association (ABA) has developed a document, *ABA Principles of Birding Ethics*, that addresses the issue of ethical, or respectful, nature watching quite thoroughly.

The coast of Northern California hosts a remarkable diversity of avifauna and arguably offers the most exciting opportunities for the field ornithologist in North America. The total number of species recorded to 2012 for each county (table 2) gives the reader an idea of just how diverse a region it is.