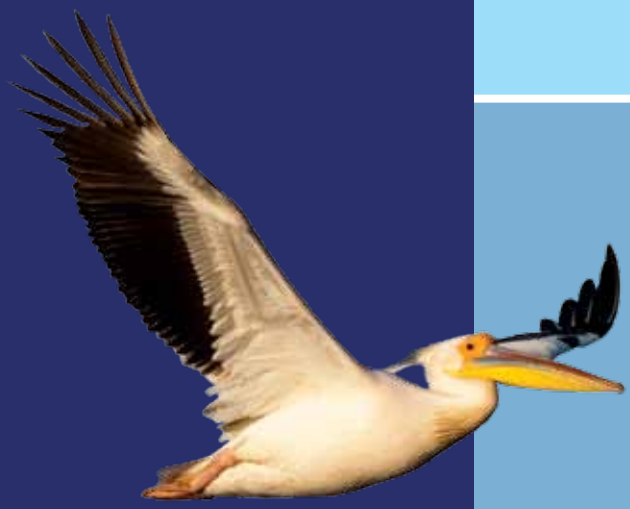

# Wildlife

KNOWN TO USE CALIFORNIA RICELANDS




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# Contents

# Introduction

*California ricelands have become important "surrogate" wetland habitats for many wildlife species. In fact, nearly 230 species are known to use California ricelands.*

*With the extensive loss of about 95 percent of the native wetland habitats in the Central Valley, riceland habitats have become essential to the management of certain wildlife, such as waterfowl and shorebirds. Moreover, many special-status species have also successfully adapted to cultivated ricelands. For some wetland-dependent species, ricelands provide essential wetland-like habitat that has contributed to the stability of populations. In some cases, habitat provided by ricelands has helped to support population increases.*

*This report discusses the general values that California ricelands provide for wildlife. It also examines, in greater detail, the use of ricelands by special-status wildlife species and several other species that depend on the specially-designated shorebird habitat provided by ricelands.*

## WILDLIFE USE OF CULTIVATED RICELANDS

Early in the nineteenth century, the Central Valley was characterized by large numbers of small creeks, sloughs, oxbows and major rivers that were subject to periodic flooding. The scouring associated with seasonal flooding created a mosaic of channels, depressions, lowland swamps, marshes, and hummocks across wide expanses of the Central Valley (Scott and Marquiss 1984). An estimated four million acres of wetlands, together with extensive grasslands, riparian forests, and valley oak woodlands, formed a complex mosaic of habitats that supported enormous flocks of ducks, geese, swans, cranes, shorebirds, various wading birds and other species.

In the mid-nineteenth century, the landscape of the Central Valley began to undergo a gradual conversion to one dominated by intensively managed agricultural lands, finally becoming one of the most productive agricultural regions in the world. This loss of habitat resulted in substantial declines in the estimated 40 million waterfowl, and other waterbird populations that historically used the Central Valley (Elphick and Oring 2003). Despite this enormous habitat loss, three million to six million ducks, geese, and swans continue to winter in California. During their annual cycles, large numbers of shorebirds, pelicans, egrets, herons, ibises, songbirds, and raptors use the Central Valley wetlands. The total annual waterbird count (including migrants) in the region has been estimated as high as 10 to 12 million (Gilmer et al. 1982).

With the gradual loss of wetlands in the Central Valley, wildlife has become increasingly dependent on suitable agricultural lands for food and cover. Certain types of agriculture—chiefly rice cultivation—help to sustain remaining populations by creating valuable habitat that provides functions similar to native valley habitats. Rice cultivation has provided surrogate wetland habitats that serve as essential breeding and wintering habitat for waterfowl, shorebirds, wading birds, and other wildlife (Elphick and Oring 1998). These habitats also provide food and cover for some reptiles, amphibians, and mammals.

Each year, approximately 500,000 acres of land, mainly in the Sacramento Valley, are planted in rice (Buttner 2004, personal communication). Rice fields are flooded during the summer growing season, and as a result of straw burning legislation to improve air quality (Rice Straw Burning Act, 1991), many rice fields are also flooded following harvest in an effort to decompose rice straw (Brouder and Hill 1995). In total, many of these fields are flooded for up to eight months of the year, during which time the rice fields become temporary wetlands with enormous significance to bird popula-

tions wintering and breeding in the Central Valley. In addition to the surrogate wetland values they offer, rice fields also provide a high-value food source from the 75,000 tons of waste grain estimated to remain on the ground following the annual rice harvest in the Central Valley. It is this waste rice grain, as well as other valuable food in rice fields, that enables wintering waterfowl in the Sacramento Valley to gather more than 50 percent of their nourishment from rice farms (Central Valley Joint Venture 2006).

These flooded rice fields are dynamic in their attraction to wildlife and in the habitat values they provide. Habitat quality varies with rainfall, site-specific flooding cycles, management practices, and the particular habitat requirements of each species.

*"The rice fields become temporary wetlands with enormous significance to bird populations wintering and breeding in the Central Valley."*

While specific management practices can influence the value of ricelands (Elphick and Oring 1998), the mere presence of summer and winter-flooded habitat has provided more than 500,000 acres of wetland-like habitat in the Central Valley. This habitat, in conjunction with the abundant food source remaining in rice fields after harvest, has contributed to population increases of many wetland-dependent species. During the winter months, large flocks of water birds forage in flooded rice fields. These shorebird and waterfowl concentrations attract raptors, especially Northern Harrier, Peregrine Falcon and Bald Eagle. Unflooded rice fields also support large rodent populations which in turn attract hundreds of raptors, such as White-tailed Kites, Northern Harriers, Red-tailed Hawks, American Kestrels and Short-eared Owls.

The Central Valley is an essential habitat area for waterfowl (ducks, geese, and swans). It serves as part of an annual bird migration corridor known as the Pacific Flyway. During the 1880s, an estimated four million acres of wetland habitat was available to waterfowl during the winter. Today, just over 205,000 acres of wetlands remain (Central Valley Joint Venture, 2006), supplemented by approximately 500,000 acres of ricelands. This additional surrogate wetland acreage plays an enormous role in sustaining the populations of the 3 to 6 million waterfowl that continue to use the Central Valley during winter. Together, both rice and wetland habitats help establish the Central Valley as the most important waterfowl wintering area in the Pacific Flyway, supporting up to 60 percent of the total flyway population in some years (Central Valley Joint Venture 2006).

Rice farmers also enjoy a healthy symbiotic relationship with the 75,000 acres of managed wetlands in the Sacramento Valley. Rice fields and the adjacent wetlands share the many of the same wildlife species as they move back and forth between the two habitats at various times of the year. In addition, the water released from rice fields is reused to flood about half of the Sacramento Valley's wetlands (Smith, personal communication).

For a variety of reasons—including loss of wetlands, extended periods of drought on the breeding grounds, and loss of nesting habitat—populations of wintering waterfowl in California have declined dramatically since the late 1970s. Through the efforts of waterfowl conservation groups and the proactive management of both breeding and wintering waterfowl habitats by state and federal agencies, the decline in California's waterfowl population slowed, and then started to reverse in the late 1980s. The winter flooding of rice fields in the Central Valley has been an important factor in this recovery. This winter flooding has resulted in an apparent dependence of some waterfowl species on flooded rice fields. For example, more than one million Northern Pintails have been counted in recent years during January waterfowl surveys in the Central Valley. Heitmeyer and Raveling (1988) demonstrated this species' dependence on flooded rice fields during their study of foraging behavior and habitat preferences in the Central Valley.

Overall, ricelands are known to be used by 187 species of birds, 27 species of mammals, and 15 species of reptiles (Appendix A). Of these nearly 230 species, 30 are currently considered special-status species. In addition, 17 of the bird species are part of a specially-designated habitat area that includes rice fields and adjacent wetlands of the Sacramento Valley (See Section 3).

# Special-Status Wildlife Species Use Of Ricelands

***This discussion of special-status species use of ricelands addresses both wetland-dependent species and other species that use ricelands incidentally.***

***Special-status species are those assigned an official designation by a state or federal resource agency that indicates population declines or other reason for particular concern. For purposes of this report, special-status species are defined as:***

- Species listed or proposed for listing as threatened or endangered under the federal Endangered Species Act (ESA) (50 CFR 17.11, and various notices in the Federal Register [FR] [proposed species])
- Species that are included on the federal bird species of conservation concern list for Bird Conservation Region 32 that includes the Central Valley (USFWS 2008)
- Species listed or proposed for listing by the State of California as threatened or endangered under the California Endangered Species Act (CESA) (14 California code of Regulations [CCR] 670.5)
- Animal species of special concern to the California Department of Fish and Game (DFG) (Shuford and Gardali 2008 [birds], Williams 1986 [mammals], Jennings and Hayes 1994 [reptiles and amphibians])
- Animals fully protected in California (California Fish and Game Code, Section 3511 [birds], 4700 [mammals], and 5050 [reptiles and amphibians])
- Bald and Golden Eagles specifically listed by the Bald and Golden Eagle Protection Act (16 U.S.C. 668).

## SPECIAL-STATUS WILDLIFE KNOWN TO USE CALIFORNIA RICELANDS DURING THEIR ANNUAL CYCLE

| Species | Scientific Name | Status* |
|---|---|---|
| **REPTILES** | | |
| Western Pond Turtle | *Actinemys marmorata* | **CSC** |
| Giant Garter Snake | *Thamnophis gigas* | **CE, FE** |
| **BIRDS** | | |
| Fulvous Whistling-Duck | *Dendrocygna bicolor* | **CSC** |
| Tule Greater White-fronted Goose | *Anser albifrons elgasi* | **CSC** |
| Redhead | *Aythya americana* | **CSC** |
| American White Pelican | *Pelecanus erythrorhynchos* | **CSC** |
| Least Bittern | *Ixobrychus exilis* | **CSC** |
| White-tailed Kite | *Elanus leucurus* | **CFP** |
| Bald Eagle | *Haliaeetus leucocephalus* | **BGE, CE, CFP** |
| Northern Harrier | *Circus cyaneus* | **CSC** |
| Swainson's Hawk | *Buteo swainsoni* | **CT, FSCC** |
| Golden Eagle | *Aquila chrysaetos* | **CFP, BGE** |
| Prairie Falcon | *Falco mexicanus* | **FSCC** |
| Peregrine Falcon | *Falco peregrinus* | **FSCC** |
| Lesser Sandhill Crane | *Grus canadensis canadensis* | **CSC** |
| Greater Sandhill Crane | *Grus canadensis tabida* | **CT** |
| Snowy Plover | *Charadrius alexandrinus* | **CSC** |
| Mountain Plover | *Charadrius montanus* | **CSC, FSCC** |
| Whimbrel | *Numenius phaeopus hudsonicus* | **FSCC** |
| Long-billed Curlew | *Numenius americanus* | **FSCC** |
| Marbled Godwit | *Limosa fedoa* | **FSCC** |
| Short-billed Dowitcher | *Limnodromus griseus* | **FSCC** |
| Black Tern | *Chlidonias niger* | **CSC** |
| Burrowing Owl | *Athene cunicularia hypugaea* | **CSC, FSCC** |
| Long-eared Owl | *Asio otus* | **CSC** |
| Short-eared Owl | *Asio flammeus* | **CSC** |
| Bank Swallow | *Riparia riparia* | **CT** |
| Loggerhead Shrike | *Lanius ludovicianus* | **CSC, FSCC** |
| Tricolored Blackbird | *Agelaius tricolor* | **CSC, FSCC** |
| Yellow-headed Blackbird | *Xanthocephalus xanthocephalus* | **CSC** |

** CSC (California Species of Special Concern); FSCC (Federal Bird Species of Conservation Concern); CFP (California Fully Protected); CT (California Threatened); CE (California Endangered); FE (Federally Endangered); BGE (Bald and Golden Eagle Protection Act)*

## REPTILES

### Western Pond Turtle *(Actinemys marmorata)*

The Western Pond Turtle is usually found along the quiet waters of marshes, streams, ponds, and other permanent and ephemeral aquatic habitats from sea level to approximately 4,500 feet. Pond turtles use aquatic habitat for activities such as foraging and temperature regulation. They use upland terrestrial habitats for overwintering, nesting, and dispersal. Within the aquatic habitat, pond turtles require emergent basking sites, such as rocks, logs, emergent vegetation, or undercut areas along a bank to maintain proper temperature regulation. The size of the aquatic habitat can vary considerably. Western Pond Turtles have been found in ephemeral pools of only a few square meters and in water bodies that cover several dozen square kilometers. They are also found in ponds that vary up to 50 percent or more in size during the course of a year and in areas where water is present for only a small portion of the year (Holland 1994). Western Pond Turtles are typically found in aquatic habitat during their active period, from approximately March through September. By October, they usually disappear to overwintering sites, often grasslands adjacent to the aquatic habitat.

Western Pond Turtles consume a variety of foods. The majority of their diet consists of crustaceans, midges, dragonflies, beetles, stoneflies, and caddisflies. They also feed on mammal, bird, reptile, amphibian, and fish carrion. They rarely eat plant matter but have been observed foraging on willow and alder catkins and on ditch grass inflorescences (Holland 1991). Nekton (free-swimming pelagic animals) are important food for hatchlings and juveniles (Holland 1985, Holland 1991).

Western Pond Turtles inhabit streams and canals adjacent to rice fields throughout the northern Sacramento Valley. They may benefit from the abundant invertebrate prey found in flooded rice fields.

The Western Pond Turtle is a California species of special concern.

### Giant Garter Snake *(Thamnophis gigas)*

The Giant Garter Snake is a large, aquatic garter snake historically found throughout the Central Valley from Butte County south to Kern County (U.S. Fish and Wildlife Service 1999). Since the 1940s, the species has been eliminated from the southern portion of its range. The current range extends from near Gridley in Butte County to the Mendota Wildlife Area in Fresno County (U.S. Fish and Wildlife Service 1999). Populations of Giant Garter Snake are limited to ponds, sloughs, marshes, and rice fields of Sacramento, Sutter, Butte, Colusa, and Glenn Counties. Remnant populations also exist along the western border of the Yolo Bypass in Yolo County and along the eastern fringes of the San Joaquin–Sacramento River Delta from the Laguna Creek–Elk Grove region of Sacramento County south to Stockton in San Joaquin County (Hansen 1986, 58 FR 54053, October 20, 1993). Giant Garter Snakes also occur in rice fields in Merced and Fresno Counties (U.S. Fish and Wildlife Service 1999).

The Giant Garter Snake is endemic to emergent wetlands in the Central Valley. The species occurs in marshes, sloughs, ponds, small lakes, and low-gradient waterways such as small streams, irrigation and drainage canals, and rice fields. Giant Garter Snakes require permanent water during the active season (early spring through mid-fall) to maintain dense populations of food organisms. These snakes also require herbaceous emergent vegetation for protective

cover and foraging habitat, as well as open areas and grassy banks for basking. Small mammal burrows and other small crevices in upland habitat are required for winter hibernation sites and refuge from floodwaters (58 FR 54053, October 20, 1993). All three habitat components (cover and foraging habitat, basking areas, and protected hibernation sites) are needed for the species to persist in an area.

The diet of Giant Garter Snakes consists mainly of aquatic prey such as fish and amphibians. Giant Garter Snakes may concentrate feeding efforts at pooled areas that trap and concentrate prey. Native prey species include Sacramento blackfish (Orthodox microlepidotus) and Pacific treefrog (Pseudacris [Hyla] regilla). Nonnative species preyed upon include carp (Cyprinus carpio), mosquitofish (Gambusia affinis), other small fish, and bullfrog (Rana catesbeiana) (U.S. Fish and Wildlife Service 1999).

Loss of wetlands in the Central Valley has resulted in significant population declines of Giant Garter Snake resulting in its current listing as endangered under both the federal and state Endangered Species Acts. The development of ricelands has created an important alternative habitat for Giant Garter Snakes. Some of the most important remaining populations of this species in the American and Butte Basins have been found to depend on flooded rice fields as a primary habitat component.

*"The development of ricelands has created an important alternative habitat for Giant Garter Snakes."*

## BIRDS

### Fulvous Whistling-Duck *(Dendrocygna bicolor)*

The Fulvous Whistling-Duck is a long-legged duck with brown and cinnamon-colored plumage. Natural habitat includes shallow freshwater marsh, but this species has become closely linked with ricelands throughout much of its range, particularly along the Gulf Coast (Hohman and Lee 2001). Their diet consists of weed seeds, water-seeded rice, and earthworms (Hohman and Lee 2001). In the United States, its breeding population migrates to winter in Mexico. Historically it was an irruptive species that in some years ranged into the Sacramento Valley and southern San Francisco Bay (Hamilton 2008). Although seen in large numbers in the Delta region in 1876, the first nest for the state was not found until 1896 after irrigation took hold in the San Joaquin Valley and their population increased dramatically within a few years to take advantage of an increase in man-made habitat (Barnhart 1901, Hamilton 2008).

Fulvous Whistling-Ducks are rapidly disappearing from California and are primarily confined to the Imperial Valley (Hohman and Lee 2001, Hamilton 2008), where during the 1990s fewer than five pairs were thought to remain (Patten et al. 2003). In the Central Valley, they bred at the Mendota Pool and Wildlife Area, the Woodland Sugar Ponds, and the Kern National Wildlife Refuge as recently as the 1970s to early 1980s. Unexpectedly, one-two breeding pairs with young were discovered in the Tulare Basin area in 2006 (Sterling 2007) when a large influx occurred in the southwest indicated that a population can potentially become re-established in California. Fulvous Whistling-Ducks are known to nest in rice fields. Their range expansion into the United States during the latter half of the nineteenth century was greatly facilitated by rice cultivation that increased the quality and acreage of available habitat (Hohman and Lee 2001). Because large numbers of Fulvous Whistling-Ducks from Mexico had historically wandered to California during wet years, they may potentially recolonize their former range in California. Rice cultivation had played an important role in the historical spread of these ducks in the Central Valley and may play a role in the future, if a large-scale irruption of migrants from Mexico occurs, and summer water is available for their wetland and rice field habitats.

The Fulvous Whistling-Duck is on the California Bird Species of Special Concern Priority 1 list primarily due to loss of nesting habitat and the severe decline in the species range and population in the state (Hamilton 2008).

### Tule Greater White-fronted Goose *(Anser albifrons elgasi)*

The Tule Greater White-fronted Goose is the larger of two North American subspecies of Greater White-fronted Goose (A. albifons). Tule Greater White-fronted Geese breed exclusively in the upper Cook Inlet region of Alaska (Deuel and Takekawa 2008) and winter in the Colusa Basin and Butte Sink region of the Sacramento Valley as well as the Suisun and Napa marshes (Wege 1984, Deuel and Takekawa 2008). Their population is currently estimated at 7,000 to 10,000, but there is no solid evidence of population trends given the lack of accurate historical estimates (Deuel and Takekawa 2008). In contrast with the more common subspecies, Pacific White-fronted Goose (A.a. frontalis), tule geese rarely form flocks larger than 25 individuals (Bauer 1979 in Deuel and Takekawa 2008). During the winter, they forage primarily in harvested rice fields and corn fields along with Pacific White-fronted Geese (Deuel and Takekawa 2008). As is true of most migrating and wintering waterfowl in the Central Valley, ricelands provide a viable surrogate wetland habitat for this species.

The Tule Greater White-fronted Goose is on the California Bird Species of Special Concern Priority 3 list due to the small population size that winters entirely in a small geographic area of California (Deuel and Takekawa 2008).

### **Redhead** *(Aythya americana)*

The Redhead is a diving duck identified by its darker coloration and rounder head profile from the similar Canvasback. A small population breeds in the remnant marshlands in the Central Valley. Population trends from several periods and different techniques documented steady declines throughout the state (Beedy and Deuel 2008). This species is a nest parasite, in that many females do not build nests and incubate eggs. They simply lay their eggs in other waterbirds' nests. The few that do build nests make them in the vegetation of marshes, usually with water depths exceeding two feet. Redheads frequent flooded rice fields where they feed on excess grain, vegetation, and insects, snails and other aquatic invertebrates.

The Redhead is on the California Bird Species of Special Concern Priority 3 list primarily due to extensive loss and degradation of breeding habitat and vulnerability to hunting, contaminants, and disease (Beedy and Deuel 2008).

### **American White Pelican** *(Pelecanus erythrorhynchos)*

The American White Pelican is a large white bird with black flight feathers and long, massive bill. Pelicans eat fish and crawfish that they scoop up in their bills in deep marshes, lakes and ponds. They frequent flooded rice fields for resting and are often found in large flocks. This colonially-nesting species no longer breeds in the Central Valley, but non-breeding or possibly breeding visitors from nesting colonies in northeastern California are common sights during the spring and summer. In winter a larger influx of pelicans visits the Central Valley.

The American White Pelican is on the California Bird Species of Special Concern Priority 3 list primarily due to loss, degradation, and human disturbance of breeding habitat and colonies as well as vulnerability to contaminants and disease (Shuford 2008a).

### **Least Bittern** *(Ixobrychus exilis)*

The Least Bittern is a small heron that is rarely seen due to its cryptic (light brown) coloration and its tendency to hide in dense cattail marshes. Consistent with other members of the heron family, Least Bitterns prey upon fish, frogs, and large invertebrates such as crawfish. Small populations breed in the Central Valley primarily in the Sacramento Valley wildlife refuges and some have been documented to remain throughout the winter. They are sometimes found in cattail-lined rice irrigation ditches, but occurrences within rice fields are not well documented. Their population numbers and trends are not well-documented due to the lack of appropriate, species specific surveys in the region (Sterling 2008).

The Least Bittern is on the California Bird Species of Special Concern Priority 2 list primarily due to loss or degradation of breeding habitat (Sterling 2008).

### **White-tailed Kite** *(Elanus leucurus)*

The White-tailed Kite is a medium-sized hawk identified by its long white tail and distinctive black scapulars (shoulder patches). It is also identified by its habit of hovering (or kiting) while hunting. White-tailed kites breed in riparian corridors and in valley oak savanna in the Central Valley (Moore 2000). They forage in grass-

lands, ricelands and other agricultural fields that support concentrations of small rodent prey (Dunk 1995). Obervers counted 133 White-tailed Kites in rice fields and grasslands during the 2002 Lincoln Christmas Bird Count, with as many as eight individuals seen in a single rice field. This count was the second highest of more than 1,900 counts conducted throughout the continent and highlights the importance of rice fields as winter foraging habitat.

The White-tailed Kite is a California fully protected species. Its population in California has fluctuated dramatically during the past 100 years. In the 1930s, the population declined precipitously, but from the 1950s to the 1970s it rebounded in both numbers and distribution (Eisenmann 1971).

### **Bald Eagle** *(Haliaeetus leucocephalus)*

The Bald Eagle is a large bird of prey belonging to the group of "fish eagles." Adult Bald Eagles are characterized by their distinctive white head and tail and heavy yellow bill. Bald Eagles in California generally nest in ponderosa pine and mixed conifer forests in mountainous regions (Lehman 1979, Detrich 1985, Jurek 1990). Nest sites are always associated with bodies of water, usually lakes and rivers that support abundant fish, waterfowl, or other waterbird prey. During winter, Bald Eagles migrate locally or long distances to sites that are also associated with lakes and rivers. Because of the large wintering waterfowl populations, Bald Eagles are occasionally observed hunting or roosting in the Central Valley during the winter.

Bald Eagles are becoming more regular winter visitors and breeders in the Sacramento Valley. Their populations declined drastically due to the eggshell thinning effects of DDT, but since the ban on the use of that pesticide in the 1970s, populations have rebounded across the continent. In the Central Valley, these eagles are most often found during winter hunting waterfowl concentrated in flooded rice fields. In the spring and summer, eagles are primarily found along the Sacramento, Feather and other rivers where they nest in large riparian trees and prey upon fish.

The Bald Eagle is a California fully protected species, is listed as endangered under California Endangered Species Act and is also federally protected under the Bald and Golden Eagle Protection Act. It is currently considered to be increasing in California (California Department of Fish and Game 2000a).

### **Northern Harrier** *(Circus cyaneus)*

The Northern Harrier is a slender, medium-sized raptor recognized by its distinctive white rump and its low, coursing flight behavior. Closely associated with grasslands and fresh- and salt-water marshes, Northern Harriers are common during the winter and spring/fall migration periods, but are relatively uncommon in the Central Valley during the breeding season. However, the Central Valley supports the largest breeding population in California (Davis and Niemela 2008). They nest on the ground and require adequate cover to conceal their nests from predators (MacWhirter and Bildstein 1996). Ricelands in the Central Valley provide an important wetland substitute for this species. Harriers often hunt for small shorebirds, songbirds, and rodents concentrated in flooded and disked rice fields, as well as in fallow fields that support high densities of voles and other prey (Wilkison and Debban 1980). One hundred seventy-five Northern Harriers were observed in rice fields and grasslands during the 2002 Lincoln Christmas Bird Count. This count was tied for the seventh highest of more than 1,900 counts conducted throughout the continent and, as such, highlights the importance of rice fields as winter foraging habitat.

The Northern Harrier is on the California Bird Species of Special Concern Priority 3 list, primarily due to loss or degradation of breeding habitat (Davis and Niemela 2008).

### Swainson's Hawk *(Buteo swainsoni)*

The Swainson's Hawk is a medium-sized bird of prey that inhabits open country grasslands, shrub-steppes, deserts, and agricultural areas of western North America during the breeding season and winters in grassland and agricultural regions extending from Central Mexico to southern South America (England et al. 1997, Bradbury et al. in preparation). Early accounts described the Swainson's Hawk as one of the most common raptors in California, occurring throughout much of the lowland areas of the state (Sharpe 1902).

With the conversion of native grassland foraging habitat and the loss of riparian forest and oak woodland nesting habitat, the statewide population was reduced substantially. Currently, there are an estimated 700 to 1,000 breeding pairs in the state (Swainson's Hawk Technical Advisory Committee file data), representing less than 10 percent of the historic population (Bloom 1979).

The Central Valley population (between 600 and 900 breeding pairs) extends from Tehama County southward to Tulare and Kings Counties. Despite the loss of native habitats in the Central Valley, the Swainson's Hawk appears to have adapted relatively well to certain types of agricultural patterns in areas where suitable nesting habitat remains. The optimal foraging and nesting habitat conditions in Yolo and portions of Sacramento and San Joaquin counties support the bulk of the Central Valley Swainson's Hawk population (Estep 1989, Estep in preparation).

In the Central Valley, Swainson's Hawks typically forage in agricultural fields that provide accessibility to prey. Flooded rice fields are not suitable for foraging by Swainson's Hawks. However, where rice fields occur within a mosaic of other crop types, disked or fallow rice fields may be used by foraging hawks, and rice field berms are occasionally used for resting and foraging.

The Swainson's Hawk is listed as threatened under California Endangered Species Act and is a federal species of conservation concern (USFWS 2008).

### Golden Eagle *(Aquila chrysaetos)*

The Golden Eagle is a large bird of prey characterized by its dark brown body and golden mantle. Golden Eagles nest throughout much of the state, including the Great Basin, Coast Ranges, and southern California deserts. They also nest around the perimeter of the Central Valley, and a few pairs nest in the valley, including at the Sutter Buttes. Nests are constructed on cliff ledges and in trees. Golden Eagles forage over large open upland habitats, primarily grassland, oak savanna, and shrub-steppe habitats, for ground squirrels, rabbits, and other mammalian prey. They are occasionally observed on the valley floor in agricultural areas and are sometimes seen hunting in fallow or disked rice fields.

The Golden Eagle is a California fully protected species and is also federally protected under the Bald and Golden Eagle Protection Act.

### Prairie Falcon *(Falco mexicanus)*

The Prairie Falcon is a large cliff-nesting falcon. Unlike Peregrine Falcons, Prairie Falcons are not associated with wetland foraging habitat but with open plains and shrub-steppe deserts, where they

range widely in search of mammalian and avian prey (Steenhof 1998). Prairie Falcons are primarily found in the Central Valley during winter, although a few may breed in the surrounding foothills (Hunting 2008). They hunt medium-sized birds, ground squirrels and other small mammals, and reptiles in grasslands and croplands (Steenhof 1998). Prairie Falcons often hunt over fallow and flooded rice fields, where there are concentrations of prey (Steenhof 1998). Nine Prairie Falcons were observed in rice fields and grasslands during the 2002 Lincoln Christmas Bird Count. This count tied for the second highest of more than 1,900 counts conducted throughout the continent and, as such, highlights the importance of rice fields as winter foraging habitat.

The Prairie Falcon is a federal species of conservation concern (USFWS 2008), due primarily to its small statewide breeding population, estimated at 300 to 500 pairs in 1977, (Boyce et al. 1986). Threats to this population include loss of breeding and foraging habitat, human disturbance at nest sites, shooting, and collision with humanmade objects (Hunting 2008).

### **Peregrine Falcon** *(Falco peregrinus)*

The Peregrine Falcon is a large falcon that nests on cliff ledges, typically near fresh- or saltwater marshes or other habitats that support waterfowl, shorebirds, or other waterbird prey. Prior to World War II, Peregrine Falcons nested throughout much of California from sea level to over 7,000 feet, with the densest populations along the coast, in the Cascades, and in the Sierra Nevada (Jurek 1989). Beginning in the 1940s, the widespread use of chlorinated hydrocarbon pesticides, such as DDT, triggered a precipitous decline in Peregrine populations throughout North America and in much of the rest of the world. These pesticides concentrated in the tissues of prey populations and were subsequently passed to the Peregrines themselves, resulting in the inability of the females to form normal eggs. By the late 1960s, the species was seriously threatened over much of its range. Recovery efforts over the past 25 years have brought the estimated breeding population in California from less than 10 active sites in 1975 to more than 2000 in 2006 (California Dept. of Fish & Game). Nationwide recovery efforts were so successful that the species, formerly listed as endangered under the Endangered Species Act, was delisted in 1999 by the U.S. Fish and Wildlife Service. Pesticides still plague nesting Peregrines in California, despite the ban on DDT since 1972 (Risebrough and Monk 1989), but the recovery of this species in California and across North America is encouraging. Peregrine Falcons winter in the Central Valley, where they make long foraging flights over the surrounding wetlands and flooded rice fields, hunting for ducks and shorebirds.

The statewide population of Peregrine Falcons is currently estimated at 215-246 breeding pairs (Comrack and Logsdon 2008).

Although no longer listed under the federal Endangered Species Act, the Peregrine Falcon remains listed as endangered under California Endangered Species Act and a federal species of conservation concern (USFWS 2008).

### **Lesser Sandhill Crane** *(Grus canadensis canadensis)* **and Greater Sandhill Crane** *(Grus canadensis tabida)*

Sandhill Cranes are elegant, long-necked, long-legged birds of open grasslands and freshwater marshes. Only Greater Sandhill Cranes breed in California, nesting in high mountain meadows of the northern Sierra Nevada and Cascade Ranges and large high-desert meadows of northeastern California.

On their wintering grounds in the Central Valley, Sandhill Cranes forage primarily on waste grain in corn, rice, and wheat fields. They gather in large wintering flocks at traditional sites in Merced County, the Delta region, and the northern Sacramento Valley. Many of California's winter population of 5,000 to 6,000 Greater Sandhill Cranes winter in the Butte Sink, where they forage primarily on rice (California Department of Fish and Game 2000b). The coastal segment of the Pacific Flyway population of Lesser Sandhill Crane (approximately 3,800 birds) leaves southeastern Alaska in the fall to winter in the rice fields and refuge systems in the northern Sacramento Valley from Red Bluff to southern Butte County. The eastern segment of this population (approximately 25,000 birds) winters in corn stubble fields near Lodi and a variety of other habitats south to the Carrizo Plains in San Luis Obispo County (Littlefield 2008). Both subspecies wintering in the Sacramento Valley are entirely dependent on state and federal refuge lands and private agricultural lands for winter roosting and foraging habitat. Ricelands provide essential habitat for both subspecies of Sandhill Cranes. Waste grain provides an important food resource, and flooded rice fields are used as roosting sites (Pogsdon 1990).

*"Ricelands provide essential habitat for both subspecies of Sandhill Cranes. Waste grain provides an important food resource, and flooded rice fields are used as roosting sites."*

The Greater Sandhill Crane is listed as threatened under California Endangered Species Act, primarily because of the loss of suitable breeding habitat, human disturbance, predation on the local breeding population in northeastern California, and the continued loss of winter foraging habitat (California Department of Fish and Game 2000b).

The Lesser Sandhill Crane is on the California Bird Species of Special Concern Priority 3 list, primarily because its foraging and loafing habitat in the Central Valley is rapidly being converted from grain crops to orchards, vineyards, and housing developments.

### **Snowy Plover** *(Charadrius alexandrinus)*

The Snowy Plover is a small, pale shorebird with distinctive black markings on the head and neck. Breeding locations in California include the Pacific Coast, eastern California, and the Salton Sea (Page et al. 1995). One Central Valley population exists year-round in agricultural evaporation ponds in the southern San Joaquin Valley (Shuford et al. 1995, Shuford et al. 2008). Snowy Plovers nest on the ground in the open and are consequently subject to predation and a variety of human disturbances. Coastal populations nest in the sand on beaches or in dry salt flats in lagoons. Inland populations use flats at salt evaporation ponds and river bars. Snowy Plovers feed primarily on terrestrial and aquatic invertebrates.

Snowy Plovers are occasionally found during migration and winter at sewage treatment ponds in the Central Valley (Sterling 2003a) and have been observed occasionally in flooded rice fields (Shuford et al. 1995, Sterling 2003).

The species' inland population is on the California Bird Species of Special Concern Priority 3 list, primarily because of changes in water levels, especially those caused by humans, in addition to nest predation and disturbance.

### **Mountain Plover** *(Charadrius montanus)*

The Mountain Plover is a medium-sized, long-legged, drab-colored shorebird that breeds in the Rocky Mountain region from New Mexico to the Canadian border and winters primarily in California's Central Valley. Mountain Plovers nest primarily in shortgrass prairie but are also found in semi-desert and agricultural landscapes (Knopf 1996).

Mountain Plovers winter in grasslands and disked or burned agricultural fields in the Central Valley from Yolo County south to Kern County, as well as in the Imperial Valley and along the lower Colorado River Valley (Rosenberg et al. 1991, Knopf and Rupert 1995, Patten et al. 2003, Hunting and Edson 2008). Mountain Plovers are not commonly found in rice-cultivated habitats. However, they have been reported to forage occasionally in recently disked rice fields incidentally during migration (Knopf 1996, Edson and Hunting 1999, Hunting and Edson 2008).

The Mountain Plover is a California species of special concern and a federal species of conservation concern (USFWS 2008). It is on the California Bird Species of Special Concern Priority 2 list, primarily because of wintering habitat loss and degradation in California (Hunting and Edson 2008).

### **Whimbrel** *(Numenius phaeopus)*

The Whimbrel is a large brown shorebird that is similar in size and shape to the Long-billed Curlew. Both of these birds tend to forage in upland pastures and tilled cropland as well as in flooded rice fields and other wetlands. Whimbrels nest in the high arctic and winter along the coasts of southern United States south to southern South America (Skeel and Mallory 1996). They migrate through the Central Valley in large flocks during the spring but are rare during fall migration and winter (Shuford et al. 1998). Agricultural fields, including rice are important habitats for Whimbrels in the Central Valley and constitute 50 percent of the habitat use (Shuford et al. 1998). When foraging in rice fields, Whimbrels prey upon crayfish and other invertebrates (Skeel and Mallory 1996).

The Whimbrel is a federal species of conservation concern (USFWS 2008) and is considered a species of moderate to high conservation concern in the U.S. Shorebird Conservation Plan (Brown et al. 2001). The Whimbrel was considered to be of primary conservation importance in the Central Valley, because of its large spring migrant population (up to 45 percent of the Alaskan subspecies population) (Page and Shuford 2000).

### **Long-billed Curlew** *(Numenius americanus)*

The Long-billed Curlew is a large, light brown shorebird with long legs and a very long decurved bill. This is an inland-breeding bird, with only a small number of individuals nesting in extreme northeastern California. However, Long-billed Curlews winter throughout much of the state, including the Central Valley, where the species is a relatively common winter visitor and migrant. Typical winter habitat includes pastures and agricultural fields where curlews probe for invertebrates. While ricelands are not important to the overall wintering population, groups of curlews are regularly observed foraging in flooded and disked rice fields (Shuford et al. 1998).

The Long-billed Curlew is a federal species of conservation concern (USFWS 2008). It is considered highly imperiled in the U.S. Shorebird Conservation Plan (Brown et al. 2001) due to population declines outside of California. However, the small breeding population in northeast California is considered stable and there is no evidence of a decline in the wintering population in California.

### **Marbled Godwit** *(Limosa fedoa)*

The Marbled Godwit is a large, long-legged, cinnamon-plumaged shorebird readily distinguished by its long, straight, bicolored bill (pink at base, black near tip) that is used to probe deeply into mud in search of invertebrate

prey. One small population nests in western Alaska, while the majority nests in the upper Great Plains in southern Canada, Montana and the Dakotas (Gratto-Trevor 2000). Most migrate to spend the winter in coastal California, with some wintering in the lower San Joaquin Valley in the Tulare Lake Basin. A few Marbled Godwits can be found in the Sacramento Valley rice country during spring (April-May) and fall (July-September) migration. Their migration pathway is unusual in that they cross the Sierra Nevada and pass over the Central Valley to reach the coast. The high count for Sacramento Valley rice country was 37 in August 2003 near Davis (Sterling 2003b), whereas 37,000 have been estimated to winter along the coast (Hickey et al. 2003).

Due to population declines and habitat loss on its breeding grounds, the Marbled Godwit is a federal species of conservation concern (USFWS 2008).

### Short-billed Dowitcher *(Limnodromus griseus)*

The Short-billed Dowitcher is a medium-sized, plump shorebird similar to its cousin, the Long-billed Dowitcher. Both species have relatively long bills that they use to probe into deep mud for invertebrate prey. The Short-billed Dowitcher is identified by its different call (a mellow "tu tu tu"), its tail pattern and by its juvenile plumage. It nests further south than its cousin, in boreal wetlands of southern Alaska and central Canada, and winters further south as well to central Peru and Brazil (Jehl, Jr. et al. 2001). As many as 150,000 migrate along the California coast, where some remain to winter (Hickey et al. 2003). However, some migrate through the Central Valley where they feed in rice fields and evaporation ponds. Large-scale shorebird surveys have not distinguished the two species of dowitchers (Shuford et al. 1998). Therefore, the relative abundance of Short-billed Dowitchers in the Sacramento Valley rice country is not well documented. Most of the sightings are of easily-identified juveniles in late August and September, but some vocalizing adults are found during spring as well.

Due to population declines, the Short-billed Dowitcher is a federal species of conservation concern (USFWS 2008).

### Black Tern *(Chlidonias niger)*

The Black Tern is unique among terns in that breeders have a distinctive black head and sooty-colored body. This small tern nests in freshwater habitats and eats insects as well as fish, the principal diet of most terns (Dunn and Agro 1995).

Black Terns nest semicolonially and forage for aerial insects and aquatic invertebrates in freshwater marshes in northeastern California and in rice fields in the Sacramento and in upper San Joaquin Valleys (Dunn and Agro 1995, Shuford et al. 2001, Shuford 2008b). Surveys conducted during the 1998 El Niño year found 2,213 breeding pairs in the Central Valley, of which 90 percent were in rice fields in the Sacramento Valley, and another three percent were in rice fields in the San Joaquin Valley (Shuford et al. 2001, Shuford 2008b). During the early nineteenth century, natural marshes in the San Joaquin Valley sustained large populations of Black Terns. With the loss of these breeding areas, the rice fields of the Sacramento Valley have become this species' stronghold in the Central Valley. The state's only other stronghold is in the natural marshes of northeastern California (Shuford et al. 2001, Shuford 2008b).

The Black Tern is on the California Bird Species of Special Concern Priority 2 list, primarily due to loss and degradation of breeding habitats.

### **Burrowing Owl** *(Athene cunicularia)*

The Burrowing Owl is a small, ground-dwelling owl found throughout most of the western United States. Active both day and night, Burrowing Owls use ground burrows or other cavities for nesting, cover and forage in grasslands and agricultural fields. In California, most nesting burrows are abandoned California ground squirrel burrows.

The species was widespread in California prior to 1945 (Grinnell and Miller 1944), but urbanization and agricultural conversion of nesting areas have reduced the population significantly since then. Existing populations have been reduced to small fragmented groups frequently surrounded by urban development. It's estimated that a decrease of nearly 60 percent in California populations has occurred since the 1980s (DeSante and Ruhlen 1995). Burrow destruction, the effects of grazing, shooting, secondary poisoning from ground squirrel eradication programs, and collisions with automobiles have historically been the most frequently cited factors for this decline (Remsen 1978). However, in the past 20 to 30 years, the increase in commercial and residential development has produced the largest single impact on populations.

In the Sacramento Valley, Burrowing Owls are found in remnant patches of grassland habitat, in ruderal areas, along levees and roadsides, and in agricultural fields. Their territories tend to be very localized, with most owls hunting within 600 meters of their burrows during the breeding season (Gervais and Rosenberg 2008). They forage primarily in grasslands and agricultural fields, where they prey upon large insects, rodents, small birds, reptiles, and frogs at night and sometimes during the day (Haug et al. 1993). Burrowing Owls have been known to nest along rice field berms in the Sacramento Valley and to use fallow and disked rice fields for foraging.

The Burrowing Owl is on the California Bird Species of Special Concern Priority 2 list and is a federal species of conservation concern (USFWS 2008), primarily because of habitat loss and degradation from rapid urbanization and conversion of agricultural lands to orchards and vineyards.

### **Long-eared Owl** *(Asio otus)*

Long-eared Owls are medium-sized owls that nest in dense riparian vegetation and forage primarily in grasslands and agricultural fields, where they prey upon small rodents (Marks et al. 1994). Historically, Long-eared Owls were considered common breeders in large bottomland forests of cottonwood and willows in the Central Valley (Grinnell and Miller 1944). Due largely to loss of habitat, there are no reports of breeding and only a few reports of wintering Long-eared Owls in recent years. Because of their cryptic diurnal and active nocturnal behaviors, these owls are easily overlooked and may be more common than recent records indicate. Long-eared Owls are not currently known to breed in the rice-growing regions of the Central Valley (Hunting 2008). However, they still occasionally occur during winter in the Sacramento Valley, and are known to hunt over grasslands and rice fields at night or roosting in thickets of trees adjacent to their foraging habitat.

The Long-eared Owl is on the California Bird Species of Special Concern Priority 3 list, primarily because of loss and degradation of breeding and foraging habitat.

### **Short-eared Owl** *(Asio flammeus)*

The Short-eared Owl is a medium-sized ground-nesting owl that inhabits marshlands and grasslands throughout North America. In California, Short-eared Owls nest in grasslands and

marsh or seasonal wetland habitats throughout the state, including the Central Valley. They forage in agricultural fields, freshwater marshes, fallow fields, and tall grasslands, where they prey almost exclusively on small rodents (Holt and Leasure 1993, Roberson 2008). Populations in California have declined due to loss of wetland habitats. The rice-growing regions of California are not part of the species' core breeding area, although a few may occasionally breed there, especially during years with high populations of voles (Roberson 2008). During winter, Short-eared Owls may be found flying over disked, fallow, or flooded rice fields at dawn and dusk. They roost in patches of tall grass, sometimes mixed with shrubs that provide concealment from predators.

The Short-eared Owl is on the California Bird Species of Special Concern Priority 3 list, primarily because of habitat loss and degradation.

### **Bank Swallow** *(Riparia riparia)*

Bank Swallows often join other species of swallows that form large flocks in August and early September. These swallows congregate over rice fields and other wetlands, where they prey on concentrations of flying insects. Bank Swallows nest in small burrows that they dig into riverbanks, primarily along the Sacramento and Feather Rivers (Garrison 1999). At nesting colonies, they forage mostly within 200 meters (650 feet) of their nesting burrows, but this range can vary with distances to good foraging areas. With their concentrations of aerial insects, flooded rice fields that are near existing or potential colony sites may play an important role in the success of those colonies.

The Bank Swallow is listed as threatened under the California Endangered Species Act (California Department of Fish and Game 2000c), primarily because of loss of breeding habitat through human activities that alter the flow of rivers and prevent the creation of new nesting sites.

### **Loggerhead Shrike** *(Lanius ludovicianus)*

Loggerhead Shrikes are common in California's rice-growing regions, where resident populations are augmented by wintering birds from migratory populations farther north and east (Humple 2008). They nest in small isolated trees, hedgerows, and shrubs (Yosef 1996), but are most often seen perched on electrical wires and fences in open country. Shrikes eat large insects, small birds, lizards, and rodents they capture in grasslands, ricelands and other agricultural fields (Yosef 1996).

Loggerhead Shrike is on the California Bird Species of Special Concern Priority 2 list, and is a federal species of conservation concern (USFWS 2008), primarily because of habitat loss of breeding and wintering grounds.

### **Tricolored Blackbird** *(Agelaius tricolor)*

Tricolored Blackbird is a blackbird distinguished from the more common red-winged blackbird by white rather than yellow median wing coverts, which form a red and white shoulder patch. The species is largely restricted to California, with the majority of the breeding populations occurring in the Central Valley (Beedy and Hamilton 1999). Tricolored Blackbirds breed in large colonies, primarily in cattail marshes and Himalayan blackberry brambles (Beedy and Hamilton 1999). During the breeding season, they tend to forage within three miles of their breeding colonies (Beedy and Hamilton 1999). Their preferred foraging habitats include ricelands, alfalfa fields, irrigated pastures, grain fields, annual grasslands, and cattle feedlots and dairies (Beedy 2008). Large flocks of hundreds or thousands are not uncommon during winter in rice fields, where

they forage on waste grain, insects (especially grasshoppers), clams, snails, and weed seeds such as water grass (Beedy and Hamilton 1999).

The Tricolored Blackbird is on the California Bird Species of Special Concern Priority 1 list, and is a federal species of conservation concern (USFWS 2008), primarily because of the loss and degradation of habitat from human activities.

### Yellow-headed Blackbird

*(Xanthocephalus xanthocephalus)*

Yellow-headed Blackbird is identified by its very distinct bright yellow head and breast. The species occurs in prairie wetlands and emergent wetlands throughout much of the western United States and Mexico. Yellow-headed Blackbirds nest and roost locally in deep-water tule or cattail marshes in the Central Valley. They form large flocks and forage in agricultural fields where they feed on rice and weed seeds during fall and winter and on a variety of insects during summer (Twedt and Crawford 1995). A few join large flocks of other blackbird species in flooded and disked rice fields (Jones and Stokes file data). While ricelands do not provide nesting habitat for this species, they do provide important summer and winter foraging habitat, particularly in the Sacramento Valley.

*"Ricelands provide an important summer and winter foraging habitat for the Yellow-headed Blackbird, particularly in the Sacramento Valley."*

Yellow-headed Blackbird is on the California Bird Species of Special Concern Priority 3 list (Jaramillo 2008), primarily because of habitat loss through draining of wetlands.

# Shorebird Use Of Ricelands

***Like waterfowl, shorebirds have benefited from ricelands in the Central Valley. The northern Central Valley is a site of international stature within the Western Hemisphere Shorebird Reserve Network (WHSRN) because of its importance to large numbers of wintering and migrating shorebirds (WHSRN 2003). Based upon endorsements from scientific reviewers, the highly respected Manomet Center for Conservation Sciences recommended that the ricelands and wetlands of the Sacramento Valley be designated as a "Shorebird Site of International Significance." With this action, the Sacramento Valley's rice fields (which comprise nearly 90 percent of the designated 620,000-acre area) are included within the Western Hemisphere Shorebird Reserve Network. The Sacramento Valley is one of the largest North American sites within this network to be formally recognized for providing this beneficial ecological environment. Figure 1, on page 22, provides a detailed map of this special shorebird habitat area.***

Disked rice fields in this shorebird habitat area provide foraging habitat for Killdeer, Black-bellied Plovers, Long-billed Curlews, and a variety of other shorebirds during fall, winter and spring seasons. Whimbrels benefit from rice field use during spring migration. In fact, the vast majority of California shorebird species are attracted to flooded fields (Elphick and Oring 1998, Day and Colwell 1998, Shuford et al. 1998, Elphick 2000). Highlighting the importance of flooded rice fields, extensive surveys conducted from 1992 to 1995 found that those fields held 23 to 30 percent of all shorebirds in the Central Valley (Shuford et al. 1998). Particularly high concentrations were noted in the rice-dominated Colusa, Butte, Sutter, Yolo, and American basins in the Sacramento Valley (Shuford et al. 1998).

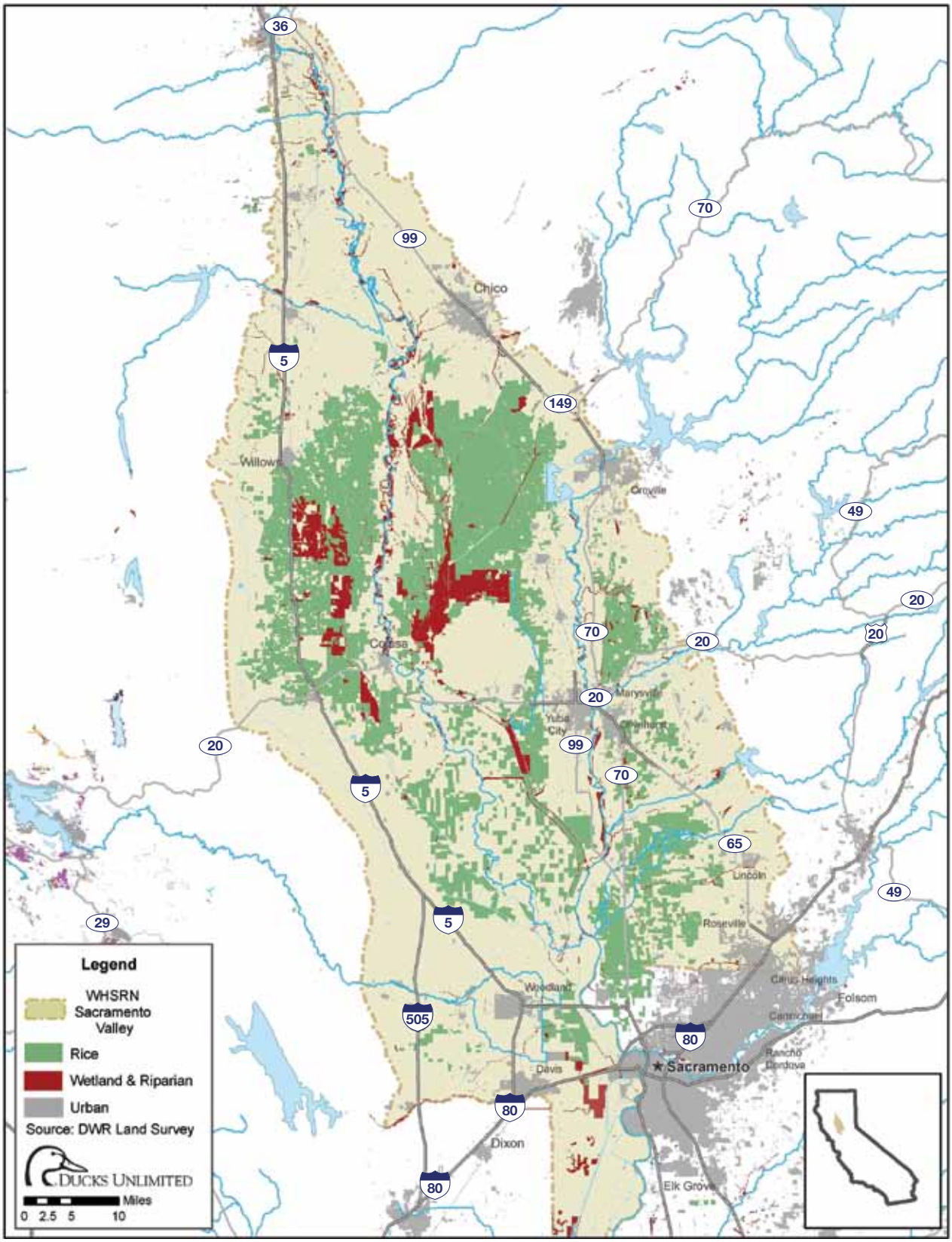
During winter and spring migration in the Sacramento Valley, rice fields, wildlife refuges, and managed wetlands in hunting clubs provide extensive habitat for shorebirds (Page and Shuford 2000). Of the key habitats surveyed from 1992 to 1995, flooded rice fields constituted more than 143,000 acres (21 percent) of the total available shorebird habitat (Shuford et al. 1998). In addition to providing key wetland habitats for shorebirds, rice fields also play a key role in connecting available habitat between the coast, the Sacramento Valley, and the San Joaquin Valley. Maintaining a large-scale mosaic of wetland habitats in a region as large as the Central Valley is vital to the conservation of waterbirds (Haig et al. 1998). This connectivity is especially important during migration when shorebirds require habitat for refueling and resting, and during winter when some species, such as Dunlin and Long-billed Dowitcher populations, move inland from the coast and San Francisco Bay to flooded rice fields in the Sacramento Valley (Shuford et al. 1998).

*"During winter and spring migration in the Sacramento Valley, rice fields, wildlife refuges, and managed wetlands in hunting clubs provide extensive habitat for shorebirds."*

The importance of flooded, disked (or fallow) rice fields is most pronounced during fall migration (July–October) when there is a scarcity of available shorebird habitat in the Sacramento Valley. August is the low point for shorebird numbers during fall migration because managed wetlands are not usually flooded until September or October. Much of the rice crop is mature at this time, making use by shorebirds limited due to the dense canopy of rice plants (Shuford et al. 1998). However, most fields are flooded immediately following harvest (September through early November), providing quality habitat at this time.

Christmas Bird Count data also illustrates the importance of flooded rice fields to shorebirds, particularly

## FIGURE 1: SPECIAL SHOREBIRD HABITAT AREA



wintering Greater Yellowlegs, Dunlin and Long-billed Dowitchers. Only four of 118 Christmas Bird Counts in California are situated within the rice-growing region of the Sacramento Valley. However, these four Christmas Bird Counts rank high for all three of these species with 5 to 22 percent of the total count for all of the 118 California Christmas Bird Counts. The Lincoln Christmas Bird Count in 2004 was an informative addition as it ranked second in the state for Greater Yellowlegs and Dunlin, and had 6 and 16 percent, respectively, of the totals counted in California.

Because of the concern for shorebird populations across the continent, a nationwide conservation plan was developed in an effort to maintain and restore habitats that support adequate shorebird populations in the Western Hemisphere (Brown et al. 2001). This plan is divided into regions. The Southern Pacific Coast Regional Shorebird Conservation Plan covers coastal California and the Central Valley region (Page and Shuford 2000, Hickey et al. 2003) and components of that plan have been incorporated into the Central Valley Joint Venture Implementation Plan (2006) which has set habitat conservation objectives based upon prescribed acreages of flooded rice, semi-permanent and permanent wetlands. These plans encourage harvesting of rice fields by conventional methods (not stripping), maintaining suitable water depths at appropriate levels for a variety of shorebirds and waterbirds, increasing acreage of seasonally-flooded rice fields and other wetlands, and conservation and agricultural easements. The regional plan also ranks species by their national conservation importance (Page and Shuford 2000). In addition to the six special-status shorebirds described in Section 2 (Snowy Plover, Mountain Plover, Marbled Godwit, Whimbrel, Long-billed Curlew and Short-billed Dowitcher), flooded rice fields are of particular importance to the eleven species that are described in this section.

*"During late winter and spring, Black-bellied Plovers are found in increasing abundance in managed wetlands and agricultural fields, including flooded rice fields."*

### **Black-bellied Plover** *(Pluvialis squatarola)*

The Black-bellied Plover is a medium-sized shorebird. These plovers breed in the arctic tundra of Alaska, Canada and Eurasia and migrate south to winter along the coasts of the United States and Latin America as well as in the Central Valley (Paulson 1995). They have black bellies only during their spring/summer breeding plumage, and during winter they are uniformly gray. During late summer and early winter, most Black-bellied Plovers in the Central Valley are at evaporation and sewage ponds. During late winter and spring, Black-bellied Plovers are found in increasing abundance in managed wetlands and agricultural fields, including flooded rice fields (Shuford et al. 1998). They are also found on upland pastures and dry, tilled fields, sometimes in association with flocks of Killdeer. Black-bellied Plovers forage on earthworms, large insects and crustaceans by plucking them off the surface of mud or dry soil (Paulson 1995).

Although there has been a measurable population decline, the Black-bellied Plover lacks major threats, and has a wide distribution and large population. Therefore, it is considered a species of low conservation concern in the U.S. Shorebird Conservation Plan (Brown et al. 2001).

### **Killdeer** *(Charadrius vociferus)*

The Killdeer is a medium-sized shorebird, about the size of a robin, with two distinct black bands across its chest. Killdeer breed throughout North America and is a familiar bird in the Central Valley. Killdeer nest extensively in this rice-growing region. Eggs are placed in rudimentary nests on scrapes on gravel, bare

soil or short grass, edges of roads, parking lots, gravel bars along rivers and even on gravel roofs (Jackson and Jackson 2000). This shorebird species is one of the few that frequents upland pastures, tilled fields, and grasslands more often than traditional shorebird habitat such as managed and natural wetlands.

Although common during the summer in the Central Valley, Killdeer populations increase during the winter to as many as 17,000 with the arrival of migrants from Canada and elsewhere. This large population was the primary reason that Killdeer are considered of primary conservation importance in the Central Valley (Page and Shuford 2000). Within the Central Valley region, the Sacramento Valley harbors the highest populations of Killdeer during the winter with approximately 50 percent of the population concentrated in agricultural fields, and during the late summer with approximately 70 percent in agricultural fields and managed wetlands (Shuford et al. 1998). Ricelands provide important foraging habitat during these seasons.

### Black-necked Stilt *(Himantopus mexicanus)*

The Black-necked Stilt is a large, slender black and white shorebird with bright red legs. Stilts breed in wetlands and playa lakes in the western United States, along the eastern coast and throughout much of Latin America (Robinson et al. 1999). Stilts are common breeding and wintering birds throughout the wetlands of the Central Valley. They are one of the few birds that breed in rice fields and place eggs in rudimentary nests (scrapes on bare ground) on dikes, levees, and islets (Robinson et al. 1999). Stilts forage exclusively in shallow wetlands, including flooded rice fields, where they prey upon aquatic insects (Robinson et al. 1999).

Compared to the San Joaquin and Tulare basins, relatively few stilts are found throughout much of the year in the rice-growing region (Shuford et al. 1999). However, during spring breeding season there is a population shift with an influx of stilts into newly flooded rice fields (Shuford et al. 1999). Because of its stable population size and large distribution, the Black-necked Stilt is considered a species of low conservation concern in the U.S. Shorebird Conservation Plan (Brown et al. 2001).

### American Avocet *(Recurvirostra americana)*

The American Avocet is a tall, striking shorebird with black and white plumage augmented in the spring by cinnamon color on the head and neck. Avocets breed throughout the interior western United States and winter along the coasts of the southern United States and Mexico (Robinson et al. 1997). They are year-round residents of the Central Valley, although the majority leave the Sacramento Valley during the winter (Shuford et al. 1998). Avocets are most often found in wetlands including flooded rice fields where they forage on aquatic insects in the water. They use their recurved bill in feeding by sweeping it back and forth through water, snatching prey (Robinson et al. 1997). They also forage by plucking, probing and pecking at prey in water and mud. In the Central Valley, most avocets are in the evaporation ponds and managed wetlands in the Tulare Basin and San Joaquin Valley, and to a lesser extent in the rice fields of the Sacramento Valley (Shuford et al. 1998).

The coast and the Central Valley harbor the largest wintering populations of American Avocet. Therefore, both the coast and the Central Valley are considered of primary conservation importance to the species (Page and Shuford 2000). Because there are threats to its wintering grounds, the American Avocet is considered a species of moderate conservation concern in the U.S. Shorebird Conservation Plan (Brown et al. 2001).

### **Greater Yellowlegs** *(Tringa melanoleuca)*

The Greater Yellowlegs is a medium-sized shorebird, with slender proportions and gray plumage contrasting with its long, bright yellow legs. They breed in the boreal forest region of Canada and Alaska and winter from southern United States south to southern South America (Elphick and Tibbitts 1998). Greater Yellowlegs migrate and winter throughout the Central Valley, where many are found in the flooded rice fields of the Sacramento Valley. Unlike many other shorebird species that probe mud, Yellowlegs prey upon invertebrates in the water and therefore, are closely tied to shallow wetlands, including flooded rice fields (Elphick and Tibbitts 1998). They do not form large flocks as many other shorebird species, but sometimes congregate in large mixed-species concentrations of foraging shorebirds.

*"The rice-growing region becomes even more important to Yellowlegs during spring migration as greater than 60 percent of the Central Valley population is found there."*

The wintering population in rice fields was estimated at 12,300 birds (Elphick and Tibbitts 1998). This large population was the primary reason why Greater Yellowlegs was considered of primary conservation importance in the Central Valley (Page and Shuford 2000). Christmas bird count data demonstrates the relative importance of ricelands as 20 percent of all Yellowlegs counted throughout California were found on the four counts conducted in the rice-growing region. The rice-growing region becomes even more important to Yellowlegs during spring migration as greater than 60 percent of the Central Valley population is found there (Shuford et al. 1998). This influx of birds is likely due to the spring flooding of rice fields that provides excellent habitat for foraging Yellowlegs.

### **Western Sandpiper** *(Calidris mauri)*

The Western Sandpiper is a small shorebird that breeds in the arctic tundra of Alaska and migrates to winter along the coasts of the United States and Latin America (Wilson 1994). Western Sandpipers forage on insects in mud and shallow water, often in large flocks and in association with other small shorebirds. They migrate through the Central Valley in large numbers with counts up to 146,000 during spring migration (Shuford et al. 1998). During the winter, fewer than 9,000 have been counted in the Central Valley, with most found in the San Joaquin Valley (Shuford et al. 1998). Only a few remain in the rice-growing region of the Sacramento Valley during the winter.

Because over one million Western Sandpipers migrate along the coast and through the Central Valley of California, both the coast and the Central Valley are considered of primary conservation importance to the Western Sandpiper (Page and Shuford 2000). Because of a measurable population decline, threats to the non-breeding habitats and its limited breeding range (Alaska), the Western Sandpiper is considered a species of high conservation concern in the U.S. Shorebird Conservation Plan (Brown et al. 2001).

### **Least Sandpiper** *(Calidris minutilla)*

The Least Sandpiper is a small, brown shorebird that breeds in the arctic tundra of Alaska and Canada and migrates to winter in the southern United States and northern Latin America (Cooper 1994). Least Sandpipers forage on insects in mud and shallow water, often in association with Dunlin and Western Sandpipers, but they tend to prefer shallower water depths than those species.

Evenly distributed throughout the Central Valley, they are common during migration and winter in the rice-growing region of the Sacramento Valley (Shuford et al. 1998).

Although there has been a measurable population decline, the Least Sandpiper lacks major threats, and has a wide distribution and large population. Therefore, it is considered a species of low conservation concern in the U.S. Shorebird Conservation Plan (Brown et al. 2001).

### **Dunlin** *(Calidris alpina)*

The Dunlin is a small shorebird that breeds in the arctic tundra of Alaska and Canada and migrates to winter in the southern United States and northern Mexico (Warnock and Gill 1996). Dunlin forage in large flocks in shallow wetlands and sometimes in muddy, tilled fields on insects, worms and other invertebrates (Warnock and Gill 1996). Their spring migration through the Central Valley occurs during April, when most other shorebirds are passing through. However, during fall migration, most arrive in October, nearly two to three months later than other shorebirds. Dunlin populations in the Central Valley are largest during wet winters when there is a movement of coastal populations to the Central Valley (Warnock et al. 1995 and Shuford et al. 1998). Approximately 60 percent of all of the Dunlin in the Central Valley in January have been documented in the rice fields in the Sacramento Valley (Shuford et al. 1998). Christmas bird count data demonstrates the relative importance of the ricelands as up to 22 percent of all Dunlin counted throughout California were found on the four counts conducted in the rice-growing region.

Because over 250,000 (50 percent of the pacifica subspecies) Dunlin winter or migrate along the coast and through the Central Valley of California, both the coast and the Central Valley are considered of primary conservation importance to the pacifica subspecies of Dunlin (Page and Shuford 2000). There has been a measurable population decline of the pacifica subspecies of Dunlin. Therefore, it is considered a subspecies of high conservation concern in the U.S. Shorebird Conservation Plan (Brown et al. 2001).

### **Long-billed Dowitcher**
*(Limnodromus scolopaceus)*

The Long-billed Dowitcher is a plump, medium-sized shorebird with a relatively long bill that it uses to probe for worms in mud. Long-billed Dowitchers breed primarily in Alaska and easternmost Siberia and migrate to winter along the coastal United States, the Central Valley, and throughout Mexico (Takekawa and Warnock 2000). They commonly migrate and winter throughout wetland habitats in the Central Valley where they often forage on insects, worms and other invertebrates in flooded rice fields (Elphick and Oring 1998). Peak counts in the Central Valley are over 100,000, with more dowitchers in the Sacramento Valley than elsewhere in the Central Valley (Shuford et al. 1998). Many move inland in winter from the coast and the San Francisco Bay Estuary to the flooded rice fields of the Sacramento Valley (Shuford et al. 1998).

Christmas Bird Count data demonstrates the relative importance of the ricelands as up to 16 percent of all Long-billed Dowitchers counted throughout California were found on the four counts conducted in the rice-growing region. This large population was the primary reason why the Central Valley was considered of primary conservation importance to the Long-billed Dowitcher (Page and Shuford 2000). Because of its large and stable population and lack of threats, the Long-billed Dowitcher is considered a species of low conservation concern in the U.S. Shorebird Conservation Plan (Brown et al. 2001).

### **Wilson's Snipe** *(Gallinago delicata)*

The Wilson's Snipe is a medium-sized plump shorebird, similar in size and shape to the Dowitcher. This species was recently thought to be a subspecies of the Common Snipe that is found in Eurasia. It breeds throughout much of the interior western United States, Canada and Alaska and winters throughout most of the United States, Mexico and Central America (Mueller 1999). Snipe forage on aquatic insects, crustaceans, worms and other invertebrates in shallow wetlands, ricelands, and muddy fields (Mueller 1999). They form small flocks during migration, but in winter they are primarily solitary. However, they will sometimes congregate at prime foraging areas.

Although there are no direct counts of this species, its regional population is thought to be large and was the primary reason why the Central Valley was considered of primary conservation importance to the Wilson's Snipe (Page and Shuford 2000). Because its large global population has had measurable declines, the Wilson's Snipe is considered a species of moderate conservation concern in the U.S. Shorebird Conservation Plan (Brown et al. 2001).

### **Wilson's Phalarope** *(Steganopus tricolor)*

Wilson's Phalarope is a medium-sized, colorful shorebird. It is one of few species where the female is larger and more brightly colored and where the male provides all of the care of the young, including incubation of eggs (Colwell and Jehl 1994). Wilson's Phalaropes breed throughout the interior western United States and Canada and the Great Lakes region (Colwell and Jehl 1994). They do not breed in the Central Valley, but arrive in late summer when they prepare for migration to southern South America by foraging in evaporation ponds, sewage ponds and sometimes in wetlands, including flooded rice fields (Shuford et al. 1998). About 90 percent of the Wilson's Phalaropes in the Central Valley occur in the evaporation ponds of the Tulare Basin in late summer, and only about seven percent are found in the Sacramento Valley during this period (Shuford et al. 1998).

Because there has been a measurable population decline, and threats to a limited wintering range, the Wilson's Phalarope is considered a species of high conservation concern in the U.S. Shorebird Conservation Plan (Brown et al. 2001).

# Wading Bird Use Of Ricelands

***Wading birds have greatly benefited from ricelands in the Central Valley (e.g. Elphick and Oring 1998, Elphick 2008, Eadie et al. 2008). In the rice-growing regions of the world, flooded rice fields and irrigation canals provide important habitat for waders (herons, egrets, bitterns and ibis), waterfowl (swans, geese and ducks), rails (including coots and moorhens), small grebes, and marsh terns (e.g. Fasola 1978, Fasola et al. 1996, Shuford et al. 1996, Elphick 1998, Lane and Fujioka 1998, Shuford et al. 2001, Tourenq et al. 2004, Eadie et al. 2008). Additionally, unflooded and fallow rice fields provide important habitat for geese, cranes, large herons and egrets (Elphick 1998, Fasola et al. 1996, Eadie et al. 2008).***

Flooded rice fields not only provide a surrogate wetland value for many waterbirds during years of normal rainfall (Elphick 2000), they also alleviate the effects of drought on these species when seasonal wetlands are dry. Waders and other birds may respond to drought conditions by assessing available habitat at larger scales than normal (Tourenq et al. 2004), thereby changing the number and distribution of their nesting colonies in the region. During the breeding season, the most important rice fields are within the waders' commuting distance from wildlife refuges, natural wetlands and riparian areas where they nest. In the Central Valley, proximity to wildlife refuges is a key to predicting occurrences of many species in rice fields during winter as well (Elphick 2008). Consequently, the geographic placement of the many federal, state and private wetlands is an important factor for these birds within a larger landscape of rice fields that provide connections between those wetlands. This is important because connectivity of fragmented wetlands is a vital component to waterbird conservation on a large landscape scale (Haig et al. 1998).

Studies of waders from the Central Valley and beyond provide insight into their ecology and how it relates to their conservation. Great Blue Herons nest colonially near areas of rice fields, wetlands and other foraging habitats in order to reduce their energetic costs of commuting (Gibbs 1991, Elphick 2008). In a study in Maine, the number of breeding pairs in a colony was directly proportional to the amount of available foraging habitat (Gibbs 1991). In Northern Italy, nesting colonies of waders were spaced apart so that each colony had a similar acreage of rice fields within a seven-mile commuting distance (Fasola 1978). In Southern France, most species of waders selected areas surrounded by rice fields for nesting colonies (Tourenq et al. 2004). And throughout much of the Mediterranean, local populations of herons and egrets obtain 50 to 100 percent of their prey in rice fields (Fasola et al. 1996). These studies demonstrate that the rice fields play a key role in the conservation of waders in the Central Valley.

*"Flooded rice fields not only provide a surrogate wetland value for many waterbirds during years of normal rainfall (Elphick 2000), they also alleviate the effects of drought on these species when seasonal wetlands are dry."*

Fallow fields, irrigation canals and unflooded rice fields also play a role in waterbird ecology and conservation.

Fallow fields are important for foraging habitat for upland birds, but can also serve as breeding habitat for American Bittern and ducks such as Mallard and Gadwall (Central Valley Joint Venture 2006). Vegetated irrigation canals also serve as breeding and/or foraging habitat for Pied-billed Grebes, American Bitterns, American Coots, Common Moorhens, Virginia Rails and Soras. Sandhill Cranes, Great Egrets, Black-crowned Night-Herons and Great Blue Herons often hunt for voles, pocket gophers and macro-invertebrates in dry

fields. Great Blue Herons and Sandhill Cranes were found significantly more often in unflooded fields during a study in the Central Valley (Elphick and Oring 1998). Likewise, nearly all Greater White-fronted, Snow and Ross Geese were found in unflooded fields (Elphick and Oring 1998). In contrast, flooded rice fields are vital to ducks such as Mallard, Northern Pintail, Northern Shoveler, American Green-winged Teal, Gadwall and American Wigeon (Elphick and Oring 1998). These abundant ducks enhance the benefits of winter flooding by increasing the decomposition of rice straw, so flooding is a mutual benefit for ducks and rice farmers (Bird et al. 2000). By increasing the proportion of flooded rice fields within a three-mile area, farmers would expect an increased number of ducks in any given field (Elphick 2008), thereby accelerating straw decomposition. Winter flooding of rice fields not only greatly increases waterbird density and the number of species, it also greatly enhances their conservation value (Elphick and Oring 2003). So although fallow and unflooded rice fields are important for several species, the overall value of winter flooding should not be underestimated.

Although comprehensive data is lacking on overall populations of waders and their nesting colonies in the Central Valley, the region undoubtedly supports one of the largest populations in the western United States. Most species are very common, characteristic birds of rice fields. Regardless, the conservation of waterbirds and their habitats is a conservation concern. As such, the North American Waterbird Conservation Plan created an overarching framework for the conservation of 210 species of waterbirds and their habitats in North and Central America and the Caribbean (Kushlan et al. 2002). There is currently a plan in development specifically for California, of which the Central Valley is a primary targeted region. In lieu of this plan, the 2006 Central Valley Joint Venture's Implementation Plan currently addresses waterbird conservation through the protection or enhancement of existing wetlands established for waterfowl. Currently, the acreages of flooded rice fields have already met the plan's objectives in providing essential foraging and nesting rice field habitat for a variety of waterbirds (Central Valley Joint Venture 2006). However, the large geographic scales of these plans may overshadow the importance of small wetland complexes (Haig et al. 1998), so it is critical for conservation planning to recognize the connectivity of small wetlands and the rice fields surrounding them as a single mosaic of waterbird habitat. At any scale, the protection of ricelands will continue to play an integral role in bird conservation within the Central Valley.

In addition to the special-status wading bird species described in Section 2 (American White Pelican and Least Bittern), ricelands are also of particular importance to several more species of waders which are described below.

### American Bittern *(Botaurus lentiginosus)*

The American Bittern is a solitary, long-necked wader found year-round in emergent marsh habitats throughout much of the Central Valley, Modoc Plateau and isolated wetlands in coastal and southern California. Cryptically colored, this species is typically found in cattail/bulrush–dominated emergent marshes, where its coloration and slow-moving behavior help to conceal it from both prey and potential predators (Gibbs et al. 1992). Its diet consists mainly of small fish, amphibians, and invertebrates. American Bittern populations have declined primarily as a result of the loss of marshlands in California (Peterjohn and Sauer 1993). While American Bitterns prefer to remain concealed in dense marsh vegetation, they are often found feeding in rice fields and rice irrigation ditches in the Central Valley.

The American Bittern was a California species of special concern (Remsen 1978) but is not on the current list (Shuford and Gardali 2008). The wildlife refuge and rice-growing regions of the Sacramento Valley represent this species' population stronghold in California.

### **Great Blue Heron** *(Ardea herodius)*

The Great Blue Heron is a large wader with dark blue-gray plumage and a distinctive presence. Found throughout California, it hunts alone or in congregations of waders in flooded or dry rice fields where it feeds on voles, frogs, fish, snakes, crayfish and other prey (Butler 1992). Great Blue Herons nest in colonies, often in large trees near marshes and rice fields, and often in colonies of Great Egrets (Butler 1992). A characteristic bird of wetlands throughout California, it is commonly seen in flooded rice fields, agricultural ditches, pastures and wetlands in the rice-growing region of the Central Valley.

### **Great Egret** *(Ardea alba)*

The Great Egret is a large, long-necked white wader with long, black legs and a yellow bill that it uses for stabbing and eating voles, frogs, fish, crayfish, insects and other prey (McCrimmon et al. 2001). A commonly-seen bird in rice fields, Great Egrets often congregate in large flocks with other wading birds where food sources are abundant. They nest in colonies, often building large stick nests in trees near marshes and rice fields. Although primarily considered a wetland bird, Great Egrets are often seen hunting in dry rice fields and grasslands, especially during periods when rice fields are not flooded. Once the primary species used in the feather (plume) trade in the 19th and early 20th centuries, it was hunted to near extinction in California and elsewhere in the United States, but Migratory Bird Treaty Act protections enacted in 1913 enabled its populations to rebound to where it is now common throughout the wetlands of its historic range (McCrimmon et al. 2001).

### **Snowy Egret** *(Egretta thula)*

The Snowy Egret is a medium-sized wader, smaller than its cousin, the Great Egret, but similar in having all white plumage. Its yellow feet and black bill further distinguish this species from other white waders. Snowy Egrets congregate in flooded rice fields where they prey upon small fish and aquatic invertebrates—a more selective diet than other waders (Parsons and Master 2000). Their foraging success increases with the number of congregating waders (Erwin 1983, Master et al. 1993). They are also not as likely to be found in dry rice fields or upland areas as are larger waders. Snowy Egrets breed in colonies in densely vegetated cattail and bulrush marshes. As with the Great Egret, it was nearly hunted to extinction for its plumes, but its populations have rebounded to where it is now common throughout the wetlands of its historic range (Parsons and Master 2000).

### **Green Heron** *(Butorides virescens)*

One of the smallest waders, the Green Heron is dark, olive-green with a rufous-brown neck and head, crowned by a black cap. The least gregarious of herons and egrets, it is often found alone in flooded rice fields, especially near riparian areas where it nests in trees. In the Central Valley, it is also the only non-colonial nesting species of the group. Green Herons prey primary upon fish, but will also eat frogs, other small vertebrates, crayfish and a variety of snails and insects (Davis and Kushlan 1994). When hunting, they are the least active of all herons (Kushlan 1976), and often stand motionless at the edge of rice fields, agricultural ditches and marshes. They are not as easily observed as other herons and egrets due to their small stature, dark, cryptic coloration, solitary nature, and hunting technique.

### Black-crowned Night-Heron
*(Nycticorax nycticorax)*

The Black-crowned Night-Heron is a stocky, short-necked, medium-sized wader that nests colonially in densely-vegetated cattail and bulrush marshes, but also sometimes in trees (Davis 1993). Found throughout the world, it is common in the rice-growing region of the Central Valley. It has distinctive differences in immature and adult plumages, with immature birds sporting brown and white plumages similar to the American Bittern, and adults with black backs and caps, and gray underparts and wings. Black-crowned Night-Herons also differ from other waders, having relatively shorter, thicker, non-stabbing bills that they use to grasp frogs, nestling birds and eggs, voles, fish, earthworms, freshwater clams, snails, crawfish and insects (Davis 1993). During the breeding season, they hunt throughout the day and night due to the demands of feeding their young, but otherwise they are primarily nocturnal hunters at least in part to avoid competition for food and foraging areas with other waders (Davis 1993, Watmough 1978). In the non-breeding season, they communally roost during the day in trees in riparian areas, parks, and even in suburban neighborhoods.

### White-faced Ibis *(Plegadis chihi)*

The White-faced Ibis is a dark, long-legged wader with a long decurved bill and metallic bronze and brown plumage. White-faced Ibis populations are local throughout the western United States, with principal breeding concentrations in the Great Basin, along the gulf coast, and in California's Central Valley. White-faced Ibis inhabit freshwater wetlands, such as shallow grassy marshes, flooded rice fields and cattail/bulrush marshes. They also feed in flooded meadows and agricultural fields, especially flood-irrigated or cut alfalfa in the Central Valley (Ryder and Manry 1994, Sterling pers. obs.). Ibis nest in large colonies in dense tule and cattail marshes which also serve as nighttime roosts throughout the year. They do not eat rice or other plant material, but prey upon crayfish, insect larvae, and earthworms (Ryder and Manry 1994).

Population declines were already apparent in the 1940s (Grinnell and Miller 1944). This decline continued through the mid 1980s with the continuing loss of wetland habitats, particularly in the Central Valley. However, with the increase of ricelands, ibis populations have begun to rebound. Down to only 200 individuals wintering in the state due to habitat loss and pesticides (Remsen 1978, Henny and Herron 1989), White-faced Ibis populations have increased dramatically in California since the 1980s during both winter (Shuford et al. 1996) and the spring-summer breeding seasons and are now considered yearlong residents (Ryder and Manry 1994). This increase parallels that in the Great Basin, where populations nearly tripled from 1985 to 1997 (Earnst et al. 1998). Displaced birds from flooded colonies the Great Salt Lake Basin during 1980s were thought to drive the tremendous population growth in Oregon during this time (Ivey et al. 1988). The expansion in Oregon, as well as the flood or drought-induced displacement of birds from Great Basin breeding sites, very likely played a direct role in the colonization of the Central Valley, the Klamath Basin and the Modoc Plateau during the late 1980s (Shuford et al. 1996). Unprecedented numbers of ibis were found throughout much of California in spring of those years. These displaced birds arrived in those areas at a time when summer water was becoming available for breeding waterfowl in refuges and rice was established as an important crop in much of the Klamath, Modoc Plateau, Sacramento Valley landscapes. This situation created both excellent breeding habitat in the newly-created summer wetlands as well as excellent foraging habitat in the rice fields. Although systematic breeding censuses have not been conducted in the Central

Valley, it is clear that the ibis breeding population increased dramatically in the past twenty years as several colonies with thousands of nesting pairs are now thriving from Glenn to Kern County where none appeared in the past.

The wintering ibis population also increased dramatically in the Central Valley. Rice fields north of Marysville (in an area called "District 10") harbor important concentrations of wintering ibis. This area had some of the highest counts of ibis in California during the 2000–2002 Christmas Bird Counts with 3,460, 498, and 857 birds counted, respectively. During the 2000 counts, 27 percent of all ibis recorded in California were in the District 10 rice fields. The magnitude of the species' increase in the Sacramento Valley is illustrated by comparison with counts in earlier years. Only 110 and 75 ibis were counted at the same location during January surveys in 1994 and 1995 respectively, and none were counted in 1993 (Shuford et al. 1996).

The importance of rice as foraging habitat for ibis in the Sacramento Valley cannot be overstated, they forage extensively in flooded rice fields. During the winter of 1994–95, 53 percent of all Sacramento Valley White-faced Ibis were found in rice stubble fields within three miles of managed wetlands (Shuford et al. 1996). Ibis can also be found foraging in large numbers in rice fields during the summer. They depend heavily on ricelands, especially during the late summer and fall when many wildlife refuges and other managed wetlands are dry.

The White-faced Ibis was a California species of special concern (Remsen 1978) but is not on the current list (Shuford and Gardali 2008). However, because of the species' population increase, it is a tremendous conservation success story. By providing large expanses of prime foraging habitat in spring, summer and winter, rice cultivation plays an important role in the population and range expansion of this species in California.



# Literature Cited


**Aigner, P., J. Tecklin, and C. Koehler. 1995.** *Probable breeding population of the Black Rail in Yuba County, Calif. West. Birds 26: 157-160.*

**Amaral, M.J. 1985. The Aleutian Canada Goose.** *In Audubon Wildlife Report. R.L. DiSilvestro (ed). National Audubon Society, New York, NY.*

**Barry, S. J.** *Unpublished data on Western Spadefoot. Dixon, CA.*

**Barnhart, F.S. 1901.** *Evolution in the Breeding Habits of the Fulvous Tree Duck. Condor 3:67-68.*

**Bauer, R.D. 1979.** *Historical and Status Report of the Tule White-fronted Goose. In Management and Biology of Pacific Flyway Geese (R.L. Jarvis and J.C. Bartonek, eds.), pp. 44-55, OSU Bookstores, Inc., Corvallis, OR.*

**Bechard, M.J., and J.K. Schmutz. 1995. Ferruginous Hawk (Buteo regalis).** *In The Birds of North America, No. 172 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.*

**Beedy, E.C. 2008. Tricolored Blackbird.** *In California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. (D. Shuford and T. Gardali, eds.). Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California and California Department of Fish and Game, Sacramento, CA.*

**Beedy, E.C., and B.E. Deuel. 2008. Redhead.** *In California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. (D. Shuford and T. Gardali, eds.). Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California and California Department of Fish and Game, Sacramento, CA.*

**Beedy, E.C., and W.J. Hamilton III. 1999. Tricolored Blackbird (Agelaius tricolor).** *In The Birds of North America, No. 423 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.*

**Bird, J.A., G.S. Pettygrove and J.M. Eadie. 2000.** *The impact of waterfowl foraging on the decomposition of rice straw: mutual benefits for rice growers and waterfowl. J. Applied Ecology 37:726-741.*

**Bloom, P.H. 1980. The status of the Swainson's Hawk in California.** *California Department of Fish and Game, Nongame Wildlife Investigations. Project Report W-54-R-12, Sacramento, CA.*

**Boyce, D.A., Jr., R.L. Garrett, and B.J. Walton. 1986.** *California Prairie Falcon populations. Raptor Research 20:71-74.*

**Bradbury, M., Estep, J.A., and D. Anderson.** *In Preparation. Migratory patterns and wintering range of the Central Valley Swainson's Hawk.*

**Brouder, S. M. and J. E. Hill. 1995.** *Winter Flooding of Ricelands Provides Waterfowl Habitat. California Agriculture, 49, pp. 58.*

**Brown, S., C. Hickey, B. Harrington, and R. Gill, eds. 2001.** *The U.S. Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, MA.*

**Butler, Robert W. 1992. Great Blue Heron (Ardea herodias)**, *In The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/025doi:10.2173/bna.25*

**Buttner, Paul.** *California Rice Commission.*

**California Department of Fish and Game.** *Inventory of California Swainson's Hawk Breeding Pairs. 2005–06 date. In preparation.*


SECTION 5

**California Department of Fish and Game. 1992.** *Draft Bird Species of Special Concern list.*

**California Department of Fish and Game. 2000a.** *Bald Eagle. In The Status of Rare, and Endangered Animals and Plants in California. http://www.dfg.ca.gov/hcpb/ cgi-bin/read_one.asp?specy=birds&idNum=26*

**California Department of Fish and Game. 2000b. Greater Sandhill Crane.** *In The Status of Rare, and Endangered Animals and Plants in California. http://www.dfg.ca.gov/hcpb/cgi-bin/read_one.asp?specy=birds&idNum=48*

**California Department of Fish and Game. 2000c.** *Bank Swallow Species Account http://www.dfg.ca.gov/hcpb/species/jsp/more_info.jsp?specy=birds&idNum=81*

**Central Valley Joint Venture. 1990.** *Central Valley Joint Venture Implementation Plan – Conserving Bird Habitat. U.S. Fish and Wildlife Service, Portland, OR.*

**Central Valley Joint Venture. 2006.** *Central Valley Joint Venture Implementation Plan – Conserving Bird Habitat. U.S. Fish and Wildlife Service, Sacramento, CA.*

**Colwell, M.A., and J.R. Jehl, Jr. 1994. Wilson's Phalarope (Phalaropus tricolor).** *In The Birds of North America, No. 83 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.*

**Cooper, J.M. 1994. Least Sandpiper (Calidris minutilla).** *In The Birds of North America, No. 115 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.*

**Comrack, L. A. and R. J. Logsdon. 2008.** *Status review of the American Peregrine Falcon (Falco peregrinus anatum) in California. California Department of Fish and Game, Wildlife Branch, Nongame Wildlife Program Report 2008-06. 36pp. + appends.*

**Davis, J.N. and C.A. Niemela. 2008. Northern Harrier.** *In California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. (D. Shuford and T. Gardali, eds.). Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California and California Department of Fish and Game, Sacramento, CA.*

**Davis, Jr., William E. 1993. Black-crowned Night-Heron (Nycticorax nycticorax)**, *In The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/074doi:10.2173/bna.74*

**Davis, Jr., W. E. and J. A. Kushlan. 1994. Green Heron (Butorides virescens)**, *In The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/129doi:10.2173/bna.129*

**Day, J.H. and M.A. Colwell. 1998.** *Waterbird Communities in Rice Fields Subjected to Different Post-harvest Treatments. Colonial Waterbirds 21:185-197.*

**Detrich, P.J. 1985.** *The status and distribution of bald eagle in California. M.S. thesis. California State University, Chico. Chico, CA.*

**Deuel, B. and J.Y. Takekawa. 2008. Tule Greater White-fronted Goose.** *In California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. (D. Shuford and T. Gardali, eds.). Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California and California Department of Fish and Game, Sacramento, CA.*

**Dunk, J. R. 1995. White-tailed kite (Elanus leucurus).** *In The Birds of North America, No 178. (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and the American Ornithologists Union, Washington, DC.*

**Dunn, E.H. and D.J. Agro. 1995. Black Tern (Chilodonias niger).** *In The Birds of North America, No. 147 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.*

**Eadie, J.M., C.S. Elphick, K.J. Reinecke, and M.R. Miller. 2008.** *Wildlife values of North American rice-lands. In: Conservation in Ricelands of North America (S. W. Manley, ed.). The Rice Foundation. pp. 7-90.*

**Earnst, S.L., L. Neel, G.L. Ivey, and T. Zimmerman. 1998***. Status of the White-faced Ibis: breeding colony dynamics of the Great Basin Population, 1985-1997. Colonial Waterbirds 21:301-476.*

**Eddleman, W., R. Flores, and M. Legare. 1994. Black Rail (Laterallus jamaicensis).** *In The Birds of North America, No. 123 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA and The American Ornithologists' Union, Washington, D.C.*

**Edson, L. and K. Hunting. 1999.** *Current Status of the Mountain Plover in the Central Valley. Central Valley Bird Club Bulletin 2:17-25.*

**Eisenmann, E. 1971.** *Range expansion and population increase in North and Middle America of the White-tailed Kite (Elanus leucurus). American Birds 25:529-536.*

**Elphick, C.S. 2008.** *Landscape effects on waterbird densities in California rice fields: taxonomic differences, scale-dependence, and conservation implications. Waterbirds 31: 62-69.*

**Elphick, C.S. 2004.** *Assessing conservation trade-offs: Identifying the effects of flooding rice fields for waterbirds on non-target bird species. Biological Conservation 117:105-110.*

**Elphick, C.S. 2000.** *Functional Equivalency between Rice Fields and Seminatural Wetland Habitats. Conservation Biology 14:181-191.*

**Elphick, C.S. 1998.** *Waterbird conservation and ecology: the role of rice field management in habitat restoration. Ph.D. dissertation. University of Nevada, Reno.*

**Elphick, C.S., and L.W. Oring. 2003.** *Effects of rice field management on winter waterbird communities: conservation and agronomic implications. Agriculture, Ecosystems and Environment 94:17-29.*

**Elphick, C.S. and L.W. Oring. 1998.** *Winter Management of Californian Rice Fields for Waterbirds. Journal of Applied Ecology 35:95-108.*

**Elphick, C.S., and T.L. Tibbitts. 1998.** *Greater Yellowlegs (Tringa melanoleuca). In The Birds of North America, No. 355 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.*

**England, A.S. M.J. Bechard, and C.S. Houston. 1997. Swainson's Hawk (Buteo swainsoni).** *In The Birds of North America, No. 265 (A. Poole and F. Gill, eds.) The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.*

**Erwin, R. M. 1983.** *Feeding habitats of nesting wading birds: spatial use and social influences. Auk 100: 960–970.*

**Estep, J.A. 1989.** *Biology, movements, and habitat relationships of the Swainson's Hawk in the Central Valley of California, 1986-1987. California Department of Fish and Game, Nongame Bird and Mammal Section, Sacramento CA.*

**Evens, J. G., G. W. Page, S. A. Laymon; and R. W. Stallcup. 1991.** *Distribution, relative abundance and status of the California Black Rail in western North America. Condor 93:952-966.*

**Fasola, M., L. Canova, and N. Saino. 1996.** *Rice fields support a large portion of herons breeding in the Mediterranean Region. Colonial Waterbirds 19 (Special Publication 1):129-134.*

**Fasola, M. and F. Barbieri. 1978.** *Factors affecting the distribution of heronries in northern Italy. Ibis 120:537-540.*

**Garrett, K. and J. Dunn. 1981.** *Birds of Southern California. Los Angeles Audubon Soc., Los Angeles, CA. pp. 408.*

**Garrison, B. A. 1999. Bank Swallow (Riparia riparia).** *In The Birds of North America, No. 414 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA and The American Ornithologists' Union, Washington, DC.*

**Garrison, B.A. 1990.** *Trends in Winter Abundance and Distribution of Ferruginous Hawks in California. Transcripts of the Western Section of Wildllife Society, 26:51-56.*

**Gervais, J. and D. Rosenberg. 2008. Burrowing Owl.** *In California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. (D. Shuford and T. Gardali, eds.). Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California and California Department of Fish and Game, Sacramento, CA.*

**Gibbs, J.P. 1991.** *Spatial relationships between nesting colonies and foraging areas of Great Blue Herons. Auk 108:764-770.*

**Gibbs, J.P., S. Melvyn and F.A. Reid. 1992. American Bittern.** *In The Birds of North America, No. 18. (A. Poole, P. Stettenheim, and F.Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.*

**Gilmer, D.S., M.R. Miller, R.D. Bauer, and J.L. LeDonne. 1982.** *California's Central Valley wintering waterfowl: concerns and challenges. Proceedings of the North American Wildlife and Natural Resources Conference 47:441-452.*

**Gratto-Trevor, Cheri L. 2000. Marbled Godwit (Limosa fedoa).** *In The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/492doi:10.2173/bna.492*

**Gregg, M.A., T.M. Eckhardt, and P.F. Springer. 1988.** *Population, distribution, and ecology of Aleutian Canada geese on their migration and wintering areas, 1986-1987. California Department of Fish and Game, Nongame Bird and Mammal Section Report. Job EW86-II-1. 33 pp. Sacramento, CA.*

**Grinnell, J. and A. Miller. 1944.** *The Distribution of the Birds of California. Pacific Coast Avifauna No. 27. pp. 615.*

**Haig, S.M., D.W. Mehlman and L.W. Oring. 1998.** *Avian Movements and Wetland Connectivity in Landscape Conservation. Conservation Biology 12:749-758.*

**Hall, J. A. 1998. Scaphiopus intermontanus.** *In SSAR: Catalogue of American amphibians and reptiles. 650.1-650.17.*

**Hamilton, R. 2008. Fulvous Whistling-Duck.** *In California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. (D. Shuford and T. Gardali, eds.). Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California and California Department of Fish and Game, Sacramento, CA.*

**Hansen, G.M. 1986.** *Status of the Giant Garter Snake (thamnophis Thamnophis couchi gigas) in the southern Sacramento Valley during 1986. Final Report, California Department of Fish and Game, Sacramento, CA.*

**Haug, E.A., B.A. Millsap, and M.S. Martell. 1993. Burrowing Owl (Speotyto cunicularia).** *In The Birds of North America, No. 562 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA and The American Ornithologists' Union, Washington, DC.*

**Haig, S.M., D.W. Mehlman and L.W. Oring. 1998.** *Avian Movements and Wetland Connectivity in Landscape Conservation. Conservation Biology 12:749-758.*

**Heitmeyer, M.E. and D.G. Raveling. 1988.** *Winter Resource Use by Three Species of Dabbling Ducks in California. Final Report. Delta Waterfowl and Wetlands Research Station, R.R. 1, Portage La Prairie, Manitoba R1N 3A1 Canada.*

**Henny, C.J., and G.B. Herron. 1989.** *DDE, selenium, mercury, and White-faced Ibis reproduction at Carson Lake, NV. Journal of Wildlife Management 53:1032-1045.*

**Hickey, C., W.D. Shuford, G.W. Page, and S. Warnock. 2003.** *Version 1.1. The Southern Pacific Shorebird Conservation Plan: A strategy for supporting California's Central Valley and coastal shorebird populations. PRBO Conservation Science, Stinson Beach, CA.*

**Hill, J.E., S.R. Robert, D.M. Brandon, S.C. Scardaci, J. F. Williams, C.M. Wick, W.M. Canevari and B.L. Weir. 1992.** *Rice Production in California. Cooperative Extension, University of CA, Davis, Publication 21498.*

**Hohman, W.L. and S.A. Lee. 2001. Fulvous Whistling-Duck (Dendrocygna bicolor).** *In The Birds of North America, No. 562 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA and The American Ornithologists' Union, Washington, DC. Holland DC.*

**Holland, D.C. 1985b.** *Western Pond Turtle Clemmys marmorata: Feeding. Herpetological Review 16(2):112-3.*

**Holland, D.C. 1991.** *A synopsis of the ecology and status of the Western Pond Turtle (Clemmys marmorata) in 1991. Report to National Ecology Research Center, U.S. Fish and Wildlife Service, San Simeon, CA.*

**Holland, D.C. 1994.** *The Western Pond Turtle: Habitat and history final report. Prepared for the U.S. Department of Energy. Portland, OR.*

**Holt, D.W. and S.M. Leasure. 1993. Short-eared Owl (Asio flammeus).** *In The Birds of North America, No. 562 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA and The American Ornithologists' Union, Washington, DC.*

**Humple, D. 2008. Loggerhead Shrike.** *In California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. (D. Shuford and T. Gardali, eds.). Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California Monograph #1and California Department of Fish and Game, Sacramento, CA.*

**Hunting, K. 2008. Long-eared Owl.** *In California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. (D. Shuford and T. Gardali, eds.). Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California and California Department of Fish and Game, Sacramento, CA.*

**Hunting, K. 2008. Prairie Falcon.** *In California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. (D. Shuford and T. Gardali, eds.). Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California and California Department of Fish and Game, Sacramento, CA.*

**Hunting, K. and L. Edson. 2008. Mountain Plover.** *In California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. (D. Shuford and T. Gardali, eds.). Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California and California Department of Fish and Game, Sacramento, CA.*

**Hunting, K. 2000.** *Ferruginous Hawk. In Grassland Bird Conservation Plan. California Partners in Flight. http://www.prbo.org/calpif/htmldocs/species/grassland/fehaacct.html*

**Ivey, G.L., M.A. Stern, and C.G. Carey. 1988.** *An increasing White-faced Ibis population in Oregon. West. Birds 19:105-108.*

**Jackson, B.J.S., and J.A. Jackson. 2000. Killdeer (Charadrius vociferus).** *In The Birds of North America, No. 517 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.*

**Jehl, Jr., Joseph R., Joanna Klima and Ross E. Harris. 2001. Short-billed Dowitcher (Limnodromus griseus).** *In The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/564doi:10.2173/bna.564.*

**Jennings, M. R., and M. Hayes. 1994.** *Amphibian and reptile species of special concern in California. Sacramento. California Department of Fish and Game.*

**Jurek, R.M. 1989.** *Five-year status report, American Peregrine Falcon. California Department of Fish and Game, Nongame Bird and Mammal Section. Sacramento, CA.*

**Jurek, R.M. 1990.** *California Bald Eagle breeding population survey and trend, 1970-90. California Department of Fish and Game. Nongame Bird and Mammal Section. Sacramento, CA.*

**Knopf, F.L. 1996. Mountain Plover (Charadrius montanus).** *In The Birds of North America, No. 211 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.*

**Knopf, F.L. and J.R. Rupert. 1995.** *Habits and Habitats of Mountain Plovers in California. Condor 97:743-751.*

**Kushlan, J.A. 1976.** *Feeding behavior of North American herons. Auk 93:86-94.*

**Kushlan, James A., Melanie J. Steinkamp, Katharine C. Parsons, Jack Capp, Martin Acosta Cruz, Malcolm Coulter, Ian Davidson, Loney Dickson, Naomi Edelson, Richard Elliot, R. Michael Erwin, Scott Hatch, Stephen Kress, Robert Milko, Steve Miller, Kyra Mills, Richard Paul, Roberto Phillips, Jorge E. Saliva , Bill Sydeman, John Trapp, Jennifer Wheeler, and Kent Wohl. 2002.** *Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1. Waterbird Conservation for the Americas, Washington, DC, 78 pp.*

**Lane, S.J. and M. Fujioka. 1998.** *The impact of changes in irrigation practices on the distribution of foraging egrets and herons (Ardeidae) in the rice fields of central Japan. Biological Conservation 83:221-230.*

**Lehman, R.N. 1979.** *A survey of selected habitat features of 95 Bald Eagle nest sites in California. (Administrative Report 79-1.) California Department of Fish and Game, Wildlife Management Branch. Sacramento, CA.*

**Littlefield, C. 2008. Lesser Sandhill Crane.** *In California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. (D. Shuford and T. Gardali, eds.). Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California and California Department of Fish and Game, Sacramento, CA.*

**MacWhirter, R.B., and K.L. Bildstein. 1996. Northern Harrier (Circus cyaneus).** *In The Birds of North America, No. 210 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.*

**Manolis, T. 1978. 1978.** *Status of the Black Rail in central California. West. Birds 9:151-158.*

**Marks, J.S., D.L. Evans, and D.W. Holt. 1994. Long-eared Owl (Asio otus).** *In The Birds of North America, No. 133 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.*

**Master, T. L., M. Frankel and M. Russell. 1993.** *Benefits of foraging in mixed-species wader aggregations in a southern New Jersey saltmarsh. Colon. Waterbirds 16: 149–157.*

**McCrimmon, Jr., Donald A., John C. Ogden and G. Thomas Bancroft. 2001. Great Egret (Ardea alba)**, *In The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/570doi:10.2173/bna.570*

**Moore, J. 2000. White-tailed Kite.** *In Grassland Bird Conservation Plan. California Partners in Flight. http://www.prbo.org/calpif/htmldocs/species/grassland/wtkiacct.html*

**Morey, S. 1998. Pool duration influences age and body mass at metamorphosis in the western spadefoot toad: implications for vernal pool conservation.** *In Witham, C. W., ed. Ecology, conservation, and management of vernal pool ecosystems. Sacramento, California. California Native Plant Society.*

**Morey, S. and D. Guinn. 1992. Activity patterns, food habits, and changing abundance in a community of vernal pool amphibians.** *In Williams, D. F., S. Byrne, and T. A. Rado, eds. Endangered and sensitive species of the San Joaquin Valley, California. Sacramento. California Energy Commission.*

**Mueller, H. 1999. Common Snipe (Gallinago gallinago) [Wilson's Snipe (Gallinago delicata)].** *In The Birds of North America, No. 417 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.*

**Page, G.W. and W.D. Shuford. 2000.** *Southern Pacific Coast Regional Shorebird Conservation Plan Version 1.0 in U.S. Shorebird Conservation Plan. http://shorebirdplan.fws.gov/RegionalShorebird/RegionalPlans.htm*

**Parsons, Katharine C. and Terry L. Master. 2000. Snowy Egret (Egretta thula)**, *In The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/489doi:10.2173/bna.489*

**Patten, M.A., G. McCaskie, and P. Unitt. 2003.** *Birds of the Salton Sea: status, biogeography, and ecology. University of CA Press, Berkeley, Los Angeles and London. pp. 363.*

**Paulson, D.R. 1995. Black-bellied Plover (Pluvialis squatarola).** *In The Birds of North America, No. 186 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.*

**Peterjohn, B.G. and J.R. Sauer. 1993.** *North American breeding bird survey annual summary, 1990-91. Bird Populations 1:1-15.*

**Remsen, J. V. 1978.** *Bird species of special concern in California. Prepared for the California Department of Fish and Game. Sacramento, CA.*

**Roberson, D. 2008. Short-eared Owl.** *In California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. (D. Shuford and T. Gardali, eds.). Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California and California Department of Fish and Game, Sacramento, CA.*

**Robinson, J.A., L.W. Oring, J.P. Skorupa, and R. Boettcher. 1997. American Avocet (Recurvirostra americana).** *In The Birds of North America, No. 275 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.*

**Robinson, J.A., J.M. Reed, J.P. Skorupa, and L.W. Oring. 1999. Black-necked Stilt (Himantopus mexicanus).** *In The Birds of North America, No. 449 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.*

**Rosenberg, K.V., R.D. Ohmart, W.C. Hunter, and B.W. Anderson. 1991.** *Birds of the Lower Colorado River Valley. University of AZ Press, Tuscon, AZ. pp. 416.*

**Ryder, R.A. and D.E. Manry. 1994. White-faced Ibis (Plegadis chihi).** *In The Birds of North America, No. 130 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.*

**Scott, L.B., and S.K. Marquiss. 1984.** *A historical overview of the Sacramento River. In California Riparian Systems. R.E. Warner and K.M. Hendrix, eds. pp 51-57. University of California Press, Berkley, CA.*

**Sharp, C.S. 1902.** *Nesting of Swainson's Hawk. Condor 4:116-118.*

**Shuford, W.D. and T. Gardali, eds. 2008.** *California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California and California Department of Fish and Game, Sacramento, CA.*

**Shuford, W.D. 2008a. American White Pelican.** *In California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. (D. Shuford and T. Gardali, eds.). Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California and California Department of Fish and Game, Sacramento, CA.*

**Shuford, W.D. 2008b. Black Tern.** *In California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. (D. Shuford and T. Gardali, eds.). Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California and California Department of Fish and Game, Sacramento, CA.*

**Shuford, W.D., S. Abbott, and T.D. Ruhlen. 2008. Snowy Plover.** *In California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. (D. Shuford and T. Gardali, eds.). Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California and California Department of Fish and Game, Sacramento, CA.*

**Shuford, W.D., J.M. Humphrey, and N. Nur. 2001.** *Breeding Status of the Black Tern in California. Western Birds 32:189-217.*

**Shuford, W. D., G. W. Page, and K.E. Kjelmyr. 1998.** *Patterns and Dynamics of Shorebird Use of California's Central Valley. Condor 100:227-244.*

**Shuford, W.D., C.M Hickey, R.J. Safran, and G.W. Page. 1996.** *A Review of the Status of the White-faced Ibis in Winter in California. Western Birds 27:169-196.*

**Shuford, W.D., G.W. Page, and C.M. Hickey. 1995.** *Distribution and Abundance of Snowy Plovers wintering in the Interior of California and Adjacent States. Western Birds 26:82-89.*

**Skeel, M.A., and E.P. Mallory. 1996. Whimbrel (Numenius phaeopus).** *In The Birds of North America, No. 219 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.*

**Spear, L. B., S. B. Terrill, C. Lenihan, and P. Delevoryas. 1999.** *Effects of temporal and environmental factors on the probability of detecting California Black Rails. Journal of Field Ornithology. 70 (4): 465-480.*

**Smith, David.** *California Department of Fish and Game.*

**Stebbins, R.C. 1951.** *Amphibians of western North America. Berkeley. University of California Press.*

**Stebbins, R.C. 1985.** *A field guide to western reptiles and amphibians. Houghton Mifflin Co. Boston.*

**Steenhof, K. 1998. Prairie Falcon (Falco mexicanus).** *In The Birds of North America, No. 346 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.*

**Sterling, J. 2003a.** *Central Valley Bird Highlights: March—May 2003. Central Valley Bird Club Bull. 6 No. 3.*

**Sterling, J. 2003b.** *Central Valley Bird Highlights: August-November 2003. Central Valley Bird Club Bull. 7:13-16.*

**Sterling, J. 2006.** *Central Valley Bird Highlights: August-November 2006. Central Valley Bird Club Bull. 10:23-28.*

**Sterling, J. 2008. Least Bittern**. *In California Bird Species of Special Concern: a ranked assessment of species, subspecies and distinct populations of birds of immediate conservation concern in California. (D. Shuford and T. Gardali, eds.). Studies of Western Birds 1. Western Field Ornithologist's Union, Camarillo, California and California Department of Fish and Game, Sacramento, CA.*

**Storer, T. I. 1925.** *A synopsis of the amphibia of California. University of California Publication of Zoology 27:1-343.*

**Takakawa, J.Y. and N.D. Warnock. 2000.** *Long-billed Dowitcher (Limnodromus scolopaceus). In The Birds of North America, No. 493 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.*

**Tecklin, J. 1999.** *Distribution and abundance of the California Black Rail (Laterallus jamaicensis coturniculus) in the Sacramento Valley region with accounts of ecology and call behavior of the subspecies. Draft report for the Californiia Dept. of Fish and Game, Contract Nos. FG6154WM and FG6154-1WM.*

**Tourenq, C., S. Benhamou, N. Sadoul, A. Sandoz, F. Mesleard, J.-L. Martin, and H. Hafner. 2004.** *Spatial relationships between tree-nesting heron colonies and rice fields in the Camargue, France. Auk 121:192-202.*

**Trapp, J.L. 1995.** *Migratory nongame birds of management concern in the United States: the 1995 list. U.S. Fish and Wildlife Service. Washington, DC, 15 pp.*

**Twedt, D.J., and R.D. Crawford. 1995. Yellow-headed Blackbird (Xanthocephalus xanthocephalus).** *In The Birds of North America, No. 192 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.*

**U.S. Fish and Wildlife Service. 1999.** *Draft Recovery Plan for the Giant Garter Snake (Thamnophis gigas), U.S. Fish and Wildlife Service, Portland, OR.*

**U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008.** *United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. [Online version available at http://www.fws.gov/migratorybirds/*

**Warnock, N., G. W. Page, and L.E. Stenzel. 1995.** *Non-migratory movements of Dunlin on their California wintering grounds. Wilson Bulletin 107: 131-139.*

**Warnock, N.D., and R.E. Gill. 1996. Dunlin (Calidris alpina).** *In The Birds of North America, No. 203 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.*

**Watmough, B. R. 1978.** *Observations on nocturnal feeding by Night Herons Nycticorax nycticorax. Ibis 120: 356–358.*

**Wege, M.L. 1984.** *Distribution and abundance of Tule Geese in California and southern Oregon. Wildfowl 35:14-20.*

**Wilkison, G.S. and K.R. Debban. 1980.** *Habitat Preference of Wintering Diurnal Raptors in the Sacramento Valley. Western Birds 11:25-34.*

**Williams, D.F. 1986.** *Mammalian species of special concern in California. California Department of Fish and Game, Sacramento, CA.*

**Yosef, R. 1996. Loggerhead Shrike (Lanius ludovicianus).** *In The Birds of North America, No. 346 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.*

**Western Hemisphere Shorebird Reserve Network. 2003.** *www.manomet.org/WHSRN. Appendix A. Wildlife Species Known to Use California Ricelands.*

# Appendix:

## *Wildlife Known to Use California Ricelands*

| Common Name | Scientific Name |
|---|---|
| **BIRDS** | |
| Pied-billed Grebe | *Podilymbus podiceps* |
| Eared Grebe | *Podiceps nigricollis* |
| Western Grebe | *Aechmophorus occidentalis* |
| Clark's Grebe | *Aechmophorus clarkii* |
| American White Pelican | *Pelecanus erythrorhynchos* |
| Double-crested Cormorant | *Phalacrocorax auritus* |
| American Bittern | *Botaurus lentiginosus* |
| Great Blue Heron | *Ardea herodias* |
| Great Egret | *Ardea alba* |
| Snowy Egret | *Egretta thula* |
| Little Blue Heron | *Egretta caerulea* |
| Cattle Egret | *Bubulcus ibis* |
| Green Heron | *Butorides virescens* |
| Black-crowned Night-Heron | *Nycticorax nycticorax* |
| Glossy Ibis | *Plegadis falcinellus* |
| White-faced Ibis | *Plegadis chihi* |
| Fulvous Whistling-Duck | *Dendrocygna bicolor* |
| Tundra Swan | *Cygnus columbianus* |
| Whooper Swan | *Cygnus cygnus* |
| Trumpeter Swan | *Cygnus buccinator* |
| Greater White-fronted Goose | *Anser albifrons* |
| Snow Goose | *Anser caerulescens* |
| Ross' Goose | *Anser rossii* |
| Brant | *Branta bernicla* |
| Canada Goose | *Branta canadensis* |
| Cackling Goose | *Branta hutchinsii* |
| Wood Duck | *Aix sponsa* |
| Green-winged Teal | *Anas (c.) carolinensis* |
| Mallard | *Anas platyrhynchos* |
| Northern Pintail | *Anas acuta* |
| Garganey | *Anas querquedula* |
| Blue-winged Teal | *Anas discors* |
| Cinnamon Teal | *Anas cyanoptera* |
| Northern Shoveler | *Anas clypeata* |
| Gadwall | *Anas strepera* |
| Eurasian Wigeon | *Anas penelope* |
| American Wigeon | *Anas americana* |
| Canvasback | *Aythya valisineria* |
| Redhead | *Aythya americana* |
| Tufted Duck | *Aythya fuligula* |

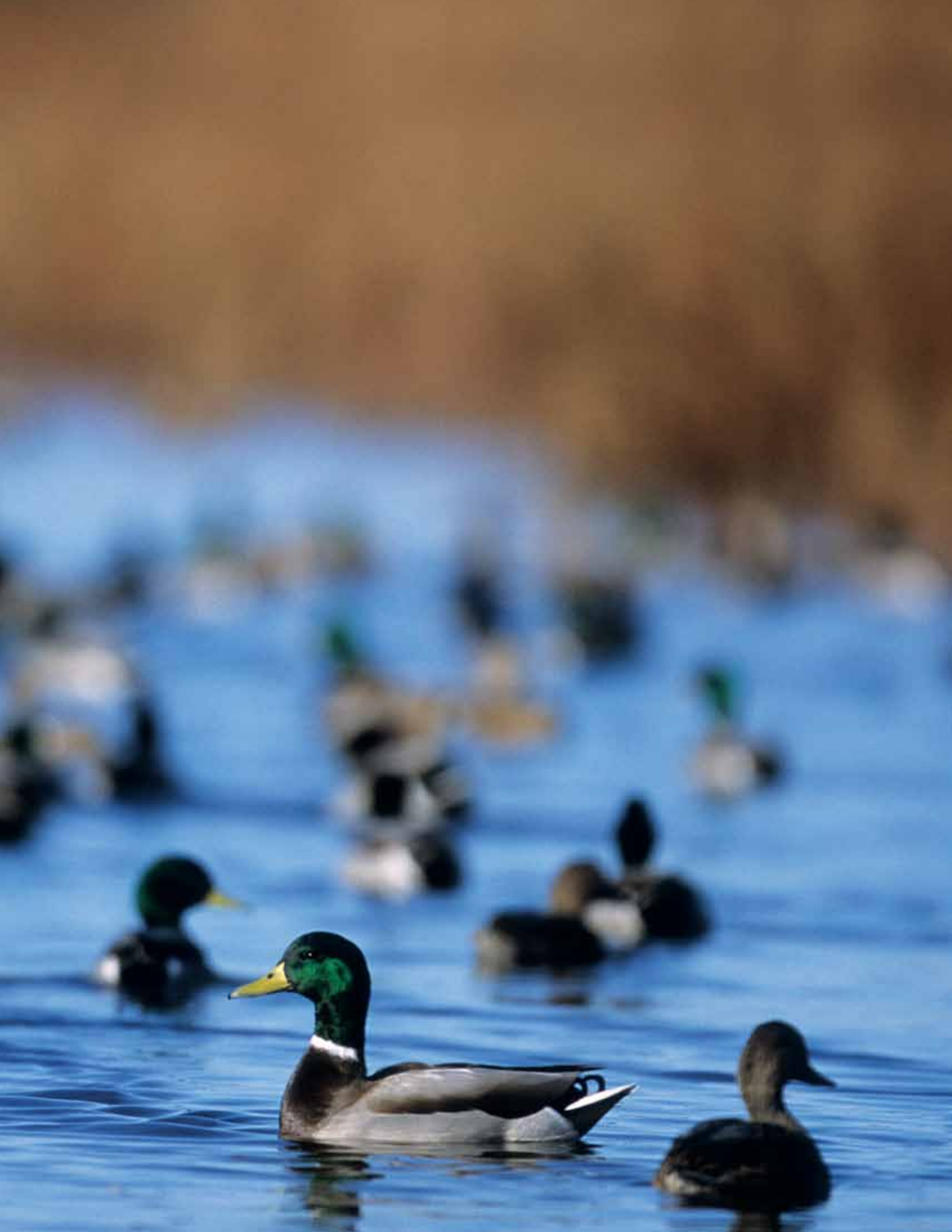
| Common Name | Scientific Name |
|---|---|
| Ring-necked Duck | *Aythya collaris* |
| Greater Scaup | *Aythya marila* |
| Lesser Scaup | *Aythya affinis* |
| Common Goldeneye | *Bucephala clangula* |
| Bufflehead | *Bucephala albeola* |
| Hooded Merganser | *Lophodytes cucullatus* |
| Common Merganser | *Mergus merganser* |
| Ruddy Duck | *Oxyura jamaicensis* |
| Turkey Vulture | *Cathartes aura* |
| White-tailed Kite | *Elanus leucurus* |
| Bald Eagle | *Haliaeetus leucocephalus* |
| Northern Harrier | *Circus cyaneus* |
| Sharp-shinned Hawk | *Accipiter striatus* |
| Cooper's Hawk | *Accipiter cooperii* |
| Red-shouldered Hawk | *Buteo lineatus* |
| Swainson's Hawk | *Buteo swainsoni* |
| Red-tailed Hawk | *Buteo jamaicensis* |
| Ferruginous Hawk | *Buteo regalis* |
| Rough-legged Hawk | *Buteo lagopus* |
| Golden Eagle | *Aquila chrysaetos* |
| American Kestrel | *Falco sparverius* |
| Merlin | *Falco columbarius* |
| Peregrine Falcon | *Falco peregrinus* |
| Gyrfalcon | *Falco rusticolus* |
| Prairie Falcon | *Falco mexicanus* |

| Common Name | Scientific Name |
|---|---|
| Ring-necked Pheasant | *Phasianus colchicus* |
| Virginia Rail | *Rallus limicola* |
| Sora | *Porzana carolina* |
| Common Moorhen | *Gallinula chloropus* |
| American Coot | *Fulica americana* |
| Sandhill Crane | *Grus canadensis* |
| Black-bellied Plover | *Pluvialis squatarola* |
| Pacific Golden-Plover | *Pluvialis fulva* |
| American Golden-Plover | *Pluvialis dominicus* |
| Snowy Plover | *Charadrius (a.) nivosus* |
| Semipalmated Plover | *Charadrius semipalmatus* |
| Killdeer | *Charadrius vociferus* |
| Black-necked Stilt | *Himantopus mexicanus* |
| American Avocet | *Recurvirostra americana* |
| Greater Yellowlegs | *Tringa melanoleuca* |
| Lesser Yellowlegs | *Tringa flavipes* |
| Solitary Sandpiper | *Tringa solitaria* |
| Willet | *Catoptrophorus semipalmatus* |
| Spotted Sandpiper | *Tringa macularia* |
| Whimbrel | *Numenius phaeopus* |
| Long-billed Curlew | *Numenius americanus* |
| Marbled Godwit | *Limosa fedoa* |
| Ruddy Turnstone | *Arenaria interpres* |
| Black Turnstone | *Arenaria melanocephala* |
| Red Knot | *Calidris canutus* |
| Sanderling | *Calidris alba* |
| Semipalmated Sandpiper | *Calidris pusilla* |
| Western Sandpiper | *Calidris mauri* |
| Least Sandpiper | *Calidris minutilla* |
| Baird's Sandpiper | *Calidris bairdii* |
| Pectoral Sandpiper | *Calidris melanotos* |
| Sharp-tailed Sandpiper | *Calidris acuminata* |
| Dunlin | *Calidris alpina* |
| Curlew Sandpiper | *Calidris ferruginea* |
| Stilt Sandpiper | *Micropalama himantopus* |
| Ruff | *Philomachus pugnax* |
| Short-billed Dowitcher | *Limnodromus griseus* |
| Long-billed Dowitcher | *Limnodromus scolopaceus* |
| Jack Snipe | *Lymnocryptes minimus* |
| Wilson's Snipe | *Gallinago delicata* |
| Wilson's Phalarope | *Steganopus tricolor* |
| Red-necked Phalarope | *Phalaropus lobatus* |
| Long-tailed Jaeger | *Stercorarius longicaudus* |
| Franklin's Gull | *Larus pipixcan* |
| Mew Gull | *Larus canus* |

| Common Name | Scientific Name |
|---|---|
| Ring-billed Gull | *Larus delawarensis* |
| California Gull | *Larus californicus* |
| Herring Gull | *Larus argentatus* |
| Thayer's Gull | *Larus thayeri* |
| Glaucous Gull | *Larus hyperboreus* |
| Glaucous-winged Gull | *Larus glaucescens* |
| Caspian Tern | *Sterna caspia* |
| Forster's Tern | *Sterna forsteri* |
| Black Tern | *Chlidonias niger* |
| Mourning Dove | *Zenaida macroura* |
| Barn Owl | *Tyto alba* |
| Great Horned Owl | *Bubo virginianus* |
| Burrowing Owl | *Speotyto cunicularia* |
| Long-eared Owl | *Asio otus* |
| Short-eared Owl | *Asio flammeus* |
| Lesser Nighthawk | *Chordeiles acutipennis* |
| Vaux's Swift | *Chaetura vauxi* |
| Belted Kingfisher | *Megaceryle alcyon* |
| Northern Flicker | *Colaptes auratus* |
| Black Phoebe | *Sayornis nigricans* |
| Say's Phoebe | *Sayornis saya* |
| Western Kingbird | *Tyrannus verticalis* |
| Horned Lark | *Eremophila alpestris* |
| Tree Swallow | *Tachycineta bicolor* |
| Violet-green Swallow | *Tachycineta thalassina* |
| Northern Rough-winged Swallow | *Stelgidopteryx serripennis* |
| Bank Swallow | *Riparia riparia* |
| Cliff Swallow | *Hirundo pyrrhonota* |
| Barn Swallow | *Hirundo rustica* |
| Western Scrub-Jay | *Aphelocoma californica* |
| Yellow-billed Magpie | *Pica nuttalli* |
| American Crow | *Corvus brachyrhynchos* |
| Common Raven | *Corvus corax* |
| Bewick's Wren | *Thryomanes bewickii* |
| Marsh Wren | *Cistothorus palustris* |
| Western Bluebird | *Sialia mexicana* |
| Mountain Bluebird | *Sialia currucoides* |
| Hermit Thrush | *Catharus guttatus* |
| American Robin | *Turdus migratorius* |
| Northern Mockingbird | *Mimus polyglottos* |
| American Pipit | *Anthus rubescens* |
| Northern Shrike | *Lanius excubitor* |
| Loggerhead Shrike | *Lanius ludovicianus* |
| European Starling | *Sturnus vulgaris* |
| Yellow-rumped Warbler | *Dendroica coronata* |

| Common Name | Scientific Name |
|---|---|
| Common Yellowthroat | *Geothlypis trichas* |
| Blue Grosbeak | *Guiraca caerulea* |
| Lazuli Bunting | *Passerina amoena* |
| Spotted Towhee | *Pipilo maculatus* |
| California Towhee | *Pipilo crissalis* |
| Vesper Sparrow | *Pooecetes gramineus* |
| Lark Sparrow | *Chondestes grammacus* |
| Savannah Sparrow | *Passerculus sandwichensis* |
| Fox Sparrow | *Passerella iliaca* |
| Song Sparrow | *Melospiza melodia* |
| Lincoln's Sparrow | *Melospiza lincolnii* |
| White-throated Sparrow | *Zonotrichia albicollis* |
| Golden-crowned Sparrow | *Zonotrichia atricapilla* |
| White-crowned Sparrow | *Zonotrichia leucophrys* |
| Harris' Sparrow | *Zonotrichia querula* |
| Dark-eyed Junco | *Junco hyemalis* |
| McCown's Longspur | *Calcarius mccownii* |
| Lapland Longspur | *Calcarius lapponicus* |
| Chestnut-collared Longspur | *Calcarius ornatus* |
| Bobolink | *Dolichonyx oryzivorus* |
| Red-winged Blackbird | *Agelaius phoeniceus* |
| Tricolored Blackbird | *Agelaius tricolor* |
| Western Meadowlark | *Sturnella neglecta* |
| Yellow-headed Blackbird | *Xanthocephalus xanthocephalus* |
| Rusty Blackbird | *Euphagus carolinus* |
| Brewer's Blackbird | *Euphagus cyanocephalus* |
| Great-tailed Grackle | *Quiscalus mexicanus* |
| Brown-headed Cowbird | *Molothrus ater* |
| House Finch | *Carpodacus mexicanus* |
| Lesser Goldfinch | *Spinus psaltria* |
| American Goldfinch | *Spinus tristis* |
| House Sparrow | *Passer domesticus* |

| Common Name | Scientific Name |
|---|---|
| **MAMMALS** | |
| Virginia opossum | *Didelphis virginiana* |
| Ornate shrew | *Sorex ornatus* |
| California myotis | *Myotis californicus* |
| Red bat | *Lasiurus borealis* |
| Hoary bat | *Lasiurus cinereus* |
| Pallid bat | *Anthrozous pallidus* |
| Brazilian free-tailed bat | *Tadarida brasiliensis* |
| Desert cottontail | *Sylvilagus audubonii* |
| Black-tailed jackrabbit | *Lepus californicus* |
| California ground squirrel | *Spermophilus beecheyi* |
| Botta's pocket gopher | *Thomomys bottae* |
| Western harvest mouse | *Reithrodontomys megalotis* |
| Deer mouse | *Peromyscus maniculatus* |
| California vole | *Microtus californicus* |
| Muskrat | *Ondatra zibethicus* |
| Black rat | *Rattus rattus* |
| Norway rat | *Rattus norvegicus* |
| House mouse | *Mus musculus* |
| Coyote | *Canis latrans* |
| Red fox | *Vulpes fulva* |
| Gray fox | *Urocyon cinereoargenteus* |
| Mink | *Mustela vison* |
| Western spotted skunk | *Spilogale putorius* |
| Striped skunk | *Mephitis mephitis* |
| River otter | *Lutra canadensis* |
| Black-tailed deer | *Odocolieus hemionus* |
| Beaver | *Castor canadensis* |
| **REPTILES** | |
| Western toad | *Bufo boreas* |
| Pacific treefrog | *Pseudacris regilla* |
| Bullfrog | *Rana catesbeiana* |
| Western pond turtle | *Actinemys marmorata* |
| Western fence lizard | *Sceloporus occidentalis* |
| Coast horned lizard | *Phrynosoma coronatum* |
| Western skink | *Eumeces skiltonianus* |
| Coachwhip | *Masticophis flagellum* |
| Racer | *Coluber constrictor* |
| Gopher snake | *Pituophis melanoleucus* |
| Common king snake | *Lampropeltis getulus* |
| Common garter snake | *Thamnophis sirtalis* |
| Western garter snake | *Thamnophis elegans* |
| Giant garter snake | *Thamnophis gigas* |
| Western rattlesnake | *Crotalus viridis* |



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