

## Purple Martin

(*Progne subis*)

### Legal Status

*Federal:* None.

*State:* Species of Special Concern.



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*Global and State Conservation Status:* G5S3: Global Rank, G5 = Secure: Common; widespread and abundant; State Rank, S3 = Vulnerable: Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

Note: The state breeding population is estimated at 1700-2700 individuals (Airola and Williams 2008).

*Recovery Plan:* None.

### Species Description and Life History

Purple martins are the largest swallows in North America (Brown 1997). Males (>2 years old) are also unique among swallow in having dark bellies, but females and first-year males are similar to other swallows in color pattern and can be distinguished by their large size and pronounced brownish or grayish collars around their napes (Brown 1997). A substantial amount of research has been done on local purple martin populations in the Sacramento region (e.g., Airola and Grantham 2003, Airola and Kopp 2007, Airola et al. 2008).

Purple martin populations in California as a whole, and in the Central Valley in particular, have declined dramatically since the 1970s, when the population of the non-native, competing European starling (*Sturnus vulgaris*) increased dramatically (Airola and Grantham 2003, Airola and Williams 2008). The Central Valley nesting population is now limited to <175 pairs and is confined to the urban Sacramento region, with sporadic nesting in Yolo and Placer Counties (Airola et al. 2008).

### Seasonal Patterns

In California, purple martins arrive in small numbers from wintering grounds in South America by early March (Hill 1999, Dodge 2007). In fall, they leave breeding areas to migrate to South America by late August-September (Green 2005). Locally the first migrants arrive in mid-late March and depart by early to mid-August (Airola,

unpublished data). In both directions, they follow a typical swallow pattern of leisurely movements that lasts for several months (Brown 1997).

### *Reproduction*

The breeding season extends from April to August, peaking in June (Green 2005, Airola unpublished data). Males usually arrive on the breeding grounds before females (Brown 1997). Pairs nest colonially or singly, depending on the availability of nest sites (Green 2005). While purple martins nest almost exclusively in human-made nest boxes in eastern North America (Doughty and Fergus 2002), in western states they primarily nest in abandoned woodpecker cavities or other natural or artificial cavities (Green 2005).

Since the mid-1970s, all known nesting in the Central Valley has occurred within highway bridges (i.e., elevated freeways and longer overpasses; Airola and Grantham 2003, Leeman et al. 2003, Airola and Kopp 2007). A clutch of 3-8 eggs (average 4-5) is laid during late April to mid-June (Brown and Brown 1996) with incubating lasting approximately 15-18 days (Brown 1997), and the young fledge at approximately 26-31 days (Green 2005). Purple martins seldom, if ever raise two broods in one season (Brown 1997, contra Green 2005). Estimates of annual reproductive success have ranged from 1.2 young per nest in Michigan to 4.2 young per nest in Texas (Brown 1997). Reproduction in Sacramento, which was assessed only in 2007, was estimated as an average of 3.4 young per nest (Airola et al. 2008). Survival rates of adults and first-year birds in Sacramento, which have been studied intensively during 2003-2008, range from 44-75% per year (Airola unpublished data). Annual mortality appears to have a strong influence on the size of the breeding population.

### *Home Range/Territory Size*

No information exists on how far birds will range looking for nest sites in spring or how far breeders typically travel from nest sites while foraging (Brown 1997). Relocation studies (Southern 1968) suggest that homing ability of breeders is well developed over moderate to long distances, indicating that they are relatively familiar with a large area surrounding their breeding sites (Brown 1997). In Sacramento, martins frequently forage above urban nesting areas when conditions are favorable, but also appear to depart from colonies, often to the west suggesting use of the Sacramento River and Yolo County flood bypass and farmlands (Airola personal observation).

As a colonial species, purple martins maintain territories only in the area around nesting cavities (Brown 1997). Little is known about territoriality in western populations that typically nest in natural or artificial cavities (Brown 1997). Martins nesting in the Sacramento region readily nest in “weep holes” that are adjacent to each other (7.5 m apart) in the undersides of bridges.

### *Foraging Behavior and Diet*

Martins forage for insects on long, gliding flights 30 to 150 m (100-500 ft) above the ground (Brown 1997), Martins avoid foraging in the rain or when the temperature is below 55°F (13°C) (USFS 2008). Much of the diet consists of larger insects, including beetles, true bugs, flies, dragonflies and damselflies, leafhoppers, grasshoppers and crickets, butterflies and moths, wasps and bees, and caddisflies (Brown 1997). Dragonflies and Lepidoptera appear to be important as food sources for nestlings in Sacramento, with breeding timed to coincide with periods of high abundance of these prey.

### **Habitat Requirements and Ecology**

#### *Nesting*

In the Central Valley, purple martins historically occurred in valley foothill and montane hardwood, valley foothill and montane hardwood-conifer, and riparian habitats (Green 2005), as well as in buildings in urban areas and towns (Grinnell and Miller 1944). Since arrival of the European starling in the 1970s, nesting by martins has been all but eliminated in lowland riparian, oak woodland areas (Airola and Grantham 2003, Airola and Williams 2008). They also occur in coniferous habitats, including closed-cone pine-cypress, ponderosa pine, Douglas-fir, and redwood forests (Green 2005) and are most numerous in coastal forests of redwood and Douglas-fir (Airola and Williams 2008). Although most foothill woodland habitat in the state is now unoccupied, purple martins within this habitat would most likely occur in denser woodlands (>60% canopy) or more open, ungrazed wooded areas that are less likely to provide foraging habitat for European starlings (Williams 1998). Nests in woodland habitats are often located in tall, old, trees or snags that extend above the main canopy to create an open foraging condition from the nest site.

Nest sites are often within 300 meters of water (Dawson 1923, Wiggins 2005, Green 2005), although in California, they often select nest trees on ridgelines and other topographically prominent positions (Williams 1988) presumably farther than 300 m from water. Many of the colonies in Sacramento are further than 1.5 km from water bodies. Most birds in North America occur at elevations less than 2,600 m (Brown 1997). California pairs nest mainly below about 1,800 m (6,000 ft), with most pairs nesting in lowland coastal forests. During migration, purple martins are found in a variety of open habitats, including coastal and interior wetlands, lakes and reservoirs, wet meadows, and grasslands (Green 2005).

#### *Foraging*

Purple martins nearly exclusively take flying insects at all times of the year (Brown 1997). Foraging occurs over most open habitat generally near nest sites, including moist habitats and open water with abundant aerial insect prey. Foraging may also occur over agricultural crops such as rice. Individuals may forage individually, with colony mates,

and may join migrating or foraging flocks of swallows (USFS 2008). The species is highly social and in the East, where they are abundant, they often congregate in large roosting flocks in the fall, but few migratory roosts have been reported in the West. Purple martins also flock in large roosts at their South American wintering grounds (Brown 1997). Small numbers have been seen roosting during the daytime with other swallows at the Yolo Bypass Wildlife Area.

## Species Distribution and Population Trends

### *Distribution*

The breeding range of the purple martin extends from central Alberta to the Gulf of Mexico east of the dry western section of the Great Plains (Brown 1997). In western North America, smaller populations are known mainly from coastal regions of British Columbia south to California and in scattered inland areas. In California, martins are relatively common on the north coast and occur locally in inland areas, including the Modoc Plateau, Sierra Nevada, interior and central coast range, and mountains of Southern California (Airola and Williams 2008). The Sacramento population (83-175 pairs over 1992-2008) in the Sacramento area is the last remnant of a formerly more widespread Central Valley population. Purple martins winter primarily in central South America (Brown 1997, Doughty and Fergus 2002). The few available band returns suggest that western martins populations may winter in different areas than eastern populations (C. Finlay, pers. comm.).

### *Population Trends*

Purple martin numbers have declined markedly in recent decades due to competition for nest cavities from European starlings and house sparrows (*Passer domesticus*), removal of snags (especially from burned areas), and possibly from the loss of riparian habitat and pesticide use (Airola and Williams 2008). Starling competition with martins has been facilitated by conversion of natural habitats to developed areas and agricultural uses which provides high quality starling foraging habitat (Williams 2002, Airola and Williams 2008). For these reasons, they have been eliminated from much of their historical range in lowland Southern California and the Central Valley, and numbers have been reduced elsewhere (Remsen 1978, Airola and Williams 2008).

### *Distribution and Population Trends in the Plan Area*

There were no known purple martin nesting records in Yolo County prior to 2003 (Williams 1998). Based on records from surrounding counties, purple martins may have nested historically in Yolo County along the Sacramento River, in adjacent oak savannas, oak forests of the Coast Range near Lake Berryessa, and in the Capay Valley. The only known nesting was in a bridge in Davis in 2003 (Yolo County Audubon 2004, Airola et al. 2004), which was not occupied thereafter (Airola et al. 2008). The closest known active nesting colony to Yolo County, in the I Street bridge off-ramp adjacent to the Sacramento River in the City of Sacramento, supported 29-37 nesting pairs between 2002

and 2005, but has subsequently declined to 6 pairs in 2008 (Airola et al. 2008). Recent nesting population declines at this site and elsewhere in Sacramento has prompted experimental installation of artificial nesting boxes nearby in the Yolo Bypass Wildlife Area in 2008 (Airola et al. 2008).

### **Threats to the Species and Other Conservation Issues**

#### *Predation*

Owls and snakes are the primary predators of purple martins, particularly in the eastern U.S., but other known predators include hawks, jays, crows, magpies, squirrels, raccoons, and domestic cats (Brown 1997). Green (1997) reported that adults and eggs are not often preyed upon in California. In Sacramento, bridge nesting sites appear to be highly secure from predators, but predation from owls and hawks likely occurs outside nest sites. Urban sites appear to have elevated mortality from vehicle collisions and feral cat predation (Airola and Kopp 2007).

#### *Competition for Nest Sites*

The primarily known threat to breeding purple martins is competition for nesting cavities from European starlings and house sparrows (Garrett and Dunn 1981, Unitt 1984, Lehman 1994, Airola and Grantham 2003, Airola and Williams 2008). These introduced bird species are known to destroy eggs and kill or wound nestlings (USFS 2008). European starlings may prevent martins from breeding by occupying all available nest sites (Brown 1997), although nest sites are super-abundant in existing Sacramento bridge colonies (Airola and Grantham 2003, Leeman et al. 2003). Decline of martins in the Central Valley and the disappearance of nesting populations from woodland areas and urban buildings coincided with the population increase of starlings in the 1970s (Airola and Grantham 2003). Martins are unlikely to colonize or persist wherever European starlings are numerous (i.e., lowlands, agricultural valleys, urban areas, etc.) (USFS 2008, Airola and Williams 2008). Localized starling and house sparrow control in the vicinity of active nest sites and erection of starling-resistant nest boxes is a potential habitat improvement action (Stephenson and Calcarone 1999, Airola et al. 2008).

#### *Loss of Snags and Other Natural Cavities*

Loss of snags, especially for timber salvage after wildfire, is a threat to martin populations in forested areas, especially on upper slopes and ridgetops favored by martins (Airola and Williams 2008). Starling competition appears to be more important than snag loss as a population limitation in lowland areas.

#### *Diseases and Body Parasites*

Purple martins apparently suffer from avian pox (Avipoxvirus) in Arkansas, as well as avian botulism at a colony in Indiana; hundreds of birds were killed almost overnight by fungal infections of *Aspergillus fumigatus* in Kansas (Brown 1997). Body parasites

include cimicid bugs, ticks, fleas, dipterans, dermestid beetles, lice, mites, nematodes, trematodes, and protozoans (Brown 1997). West Nile virus was detected by its antibody in one of over 30 purple martins tested in Sacramento (S. Wright, pers. comm.) indicating little susceptibility in purple martins in Sacramento.

#### *Human Disturbance and Habitat Changes*

Bridge nesting martin populations may be affected by habitat changes at nest sites and human disturbance. Martins require open conditions for access to and protection of nest sites. Land use changes beneath or adjacent to bridge colonies that restrict air space and flight paths have caused abandonment of nest sites (Airola and Grantham 2003), and pose a continuing threat to remaining Sacramento populations (Airola et al. 2008). Construction and maintenance activities in and adjacent to bridge nesting sites also pose potential threats to nesting birds, but martins are tolerant of substantial levels of human disturbance, and exclusion of nesting birds from bridge sites to avoid disturbance may do more harm than good by displacing birds from their traditional nest sites (Airola and Grantham 2003, Airola et al. 2008, Airola et al., in review).

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