DISTRIBUTION, HABITAT ASSOCIATIONS, AND CONSERVATION OF PURPLE MARTINS BREEDING IN CALIFORNIA

Brian David Carlisle Williams

B.S., Saint Mary's College, Moraga, CA 1991

THESIS

Submitted in partial satisfaction of
the requirements for the degree of

MASTER OF SCIENCE

in

BIOLOGY
(Biological Conservation)

at

CALIFORNIA STATE UNIVERSITY, SACRAMENTO

FALL
1998

California Department of Fish and Game, Bird and Mammal Conservation Program Report 98-14

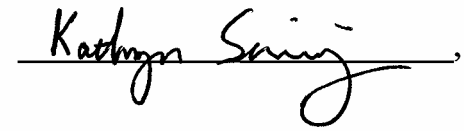
DISTRIBUTION, HABITAT ASSOCIATIONS, AND CONSERVATION OF PURPLE MARTINS BREEDING IN CALIFORNIA

A Thesis

by

Brian David Carlisle Williams

Approved by:

 , Committee Chair

_____, Second Reader

_____, Third Reader

Date:_____

Student: Brian David Carlisle Williams

I certify that this student has met the requirements for format contained in the Guide to Graduate Studies, and that this thesis is suitable for shelving in the Library and credit is to be awarded for the thesis.

_____

Nicolas Ewing, Graduate Coordinator Co-Chair Date

_____

Linnea S. Hall, Graduate Coordinator Co-Chair Date

Department of Biological Sciences

Abstract

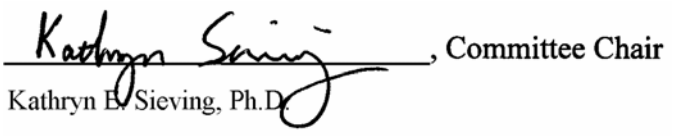
of

DISTRIBUTION, HABITAT ASSOCIATIONS, AND CONSERVATION OF PURPLE MARTINS BREEDING IN CALIFORNIA

by

Brian David Carlisle Williams

Historically, Purple Martins (*Progne subis arboricola*) have been locally distributed and generally uncommon in California. Indications of possible population declines and a limited amount of information and understanding about habitat requirements prompted the California Department of Fish and Game to initiate a study of Purple Martins. I conducted a comprehensive review of Purple Martin distribution and status within California, as well as limited field surveys and observations of habitat associations. Purple Martins still persist locally throughout most of their historical range in California, but have apparently declined in most regions in the state, mostly in lowland areas but also in some forested areas of Southwestern California, Sierra Nevada, and Central Western California, and possibly in other regions; there is no evidence of population increases in the state except possibly Sacramento. Populations are largest in the coastal forests north of San Francisco Bay, but there are significant local populations in Sacramento and the Tehachapi Range. The number of Purple Martins at all known breeding sites is approximately 350 pairs, but I estimate the total population in California to be 800-1000 (range 630-1740) pairs. Martins use a variety of nest substrates including concrete hollow-box bridges, a design in use since the early 1960s. However, most martins still nest in trees in relatively open spaces and most often use very large diameter snags. Large snags supported significantly larger colonies, a factor which may be important in determining persistence in an area. Both the relative scarcity and reduced density of large snags appears to be limiting both their breeding population size and distribution within California. My findings suggest that habitat management and population monitoring are needed for Purple Martins conservation in California; there also appear to be excellent opportunities to manage martins locally using human-provided nest sites. Results of this study are consistent with concurrent observations in Oregon, and are likely to apply to the remaining Purple Martin populations of the Pacific Coast and Intermountain west.



ACKNOWLEDGMENTS

This project proves the value of careful note-taking, as this study would not have been possible without the many people who took the time to record and report their observations. There is still plenty of need for "old-fashioned" Grinnellian science in Ornithology and Conservation Biology.

Many thanks to the volunteers who collected data at the Sacramento colonies: Louise Chadovich, Bea Cooley, Gary Lindlof, Debbie Martin, Andrea Martine, Jessica Martini, Janelle Nolan, Sue Pendleton, Dan Strait, Matt Tofft, and Jonatha Wood.

Thanks to all contributors listed in Appendices B, D, and E who provided information on martin distribution, as well as museum personnel representing the institutions in Appendix A; I have undoubtedly overlooked some of you. Special thanks to James Hill III and Louise Chambers of the Purple Martin Conservation Association who provided me with copies of bird records catalogued at the U.S. National Museum. Jeff Davis and Jim Booker provided access to the Ventana Wilderness and hospitality at the Big Sur Ornithology Lab, Ron Seese of PG&E provided access to the Geysers Leasehold; and Al Brun, Mark Bush, and Mike Johnson at Caltrans arranged for use of their equipment and time.

Special thanks to, Clark Moore, Joe Robinson, David Suddjian, and Lowell Sykes, for their continued monitoring and/or measuring of martin nest sites and Bill Laudenslayer for a thorough critique of a rough manuscript and welcome discussion.

But of course it is four women who deserve the most praise: Lyann Comrack of California Department of Fish and Game who initiated this study and whose enthusiasm

and listening skills got this off to a quick start; my adviser and friend Katie Sieving who gave me the freedom to direct this project and provided self-less and instantaneous feedback at my request; Linnea Hall who provided timely critiques and much needed motivation; and my girlfriend, fiancée, and eventually bride Jill who tolerated this very long project.

Final thanks go to thesis committee members Drs. Mike Baad, Linnea Hall, Katie Sieving, and the late Dr. Miklos Udvardy.

TABLE OF CONTENTS

LIST OF TABLES

Page

TABLE OF FIGURES

Page

INTRODUCTION

The Purple Martin (*Progne subis*) has historically been a widely distributed, although localized, breeder in California. Martins are known to have nested in every region of California except the Mojave and Colorado Deserts and the Great Basin region east of the south-central Sierra Nevada (Grinnell 1915, Grinnell and Miller 1944, Small 1994). A relatively adaptable species, martins were thought to be increasing in urban areas as late as the 1940s (Grinnell and Miller 1944) and 1950s (Garrett and Dunn 1981). But in California and elsewhere on the Pacific coast, populations apparently began to decline at that time (Remsen 1978, McCaskie 1979, Garrett and Dunn 1981, Sharp 1985, DeSante and George 1994). By the mid-1970s the numbers of this species were believed to be greatly reduced in many parts of its range, and the Purple Martin was designated as a California Species of Special Concern by the California Department of Fish and Game in 1978 (Remson 1978). Since then, however, some evidence that suggests that the perceived decline has not continued to the present, or perhaps was not as significant as believed: Breeding Bird Survey (BBS) trend data (courtesy United States Fish and Wildlife Service, USFWS; see also DeSante and George 1994) indicate that California's martin population has remained steady from 1968 to 1994; Roberson (1985) believed that martins were increasing in Monterey County in the 1980s; and Shuford (1993) found no evidence for reported population declines in Marin County or northern California. Consequently, my study was initiated not only to address the uncertainty about the current status and distribution of the Purple Martin in California, but also to more

completely describe and analyze its habitat associations, especially those characteristics that may be used by land managers for conservation applications.

The specific objectives of this study were to document changes in the distributional status of Purple Martins in California dating from the first published ornithological explorations of the mid-1800s; estimate the current breeding population size in California; census the Sacramento colonies; document and analyze the nesting habitat relationships of martins in California; evaluate hypotheses regarding factors that may limit populations in California; and present recommendations for conservation and management.

PURPLE MARTIN BIOLOGY

Purple Martins are large migratory swallows, wintering chiefly in the Amazon basin of Brazil and nesting in North America (Phillips 1986, Brown 1997). They are generally common to abundant in the eastern United States (numbers decrease northward; Price et al. 1995), but depend almost exclusively on artificial, human-provided nest sites, typically multi-compartment nesting structures (also known as "martin houses") or hollow gourds; natural nest sites east of the Rocky Mountains are now very rare (Brown 1997). West of the Rocky Mountains, martins are generally rare, very local, and nest mostly in natural cavities afforded by snags of various tree species (e.g., Bailey 1928,

Grinnell and Miller 1944, Richmond 1953, Svoboda et al. 1980, Stutchbury 1991a, Gilligan et al. 1994, Small 1994, Woodruff 1995, Horvath 1998). Western martins are divided into two sub-species distinct from the nominate *Progne subis subis* of eastern North America. The small and most distinctive desert sub-species *Progne subis hesperia* nests in saguaros (*Carnegiea gigantea*) in Arizona and Mexico (Cater 1944, Phillips et al. 1964, Phillips 1986, Stutchbury 1991a, 1991b); the larger sub-species *P. s. arboricola* breeds in the western Rocky Mountains, Great Basin, and along the Pacific Coast including California (Phillips 1986, Pyle 1997).

In California, adult martins (>2 yrs old) begin arriving at their breeding grounds in March (there are a few undocumented records from late February) and may continue to arrive through mid-May, arriving earliest at warmer lowland and southern sites (Small 1994; BDCW, pers. obs.). Subadults (2 yrs old) also arrive during this period, although, as elsewhere, generally later than adults (Fouts 1989, Morton and Derrickson 1990; BDCW, pers. obs.). At least along the north coast, migrants (mostly, if not all subadults) can be seen through late May and early June on their way to breeding grounds to the north (Small 1994; J. Sterling, pers. comm.; D. Fouts, pers. comm.). Martins are active throughout the day, but they are conspicuous among "diurnal" birds in that they regularly begin song flights well before dawn, a behavior that has been hypothesized to promote coloniality (Morton et al. 1990, Stutchbury 1991a).

Although martins in the west are regularly found nesting as solitary pairs, they are usually found in a gregarious or loosely colonial association (Richmond 1953, Stutchbury

1991a), and Lund (1978) observed that martins were more likely to persist where they nested colonially. Martins have a variety of behaviors that appear to promote a colonial association (Johnston and Hardy 1962; see also Siegel-Causey and Kharitonov 1990). These include the fact that adult male martins may actively recruit second-year males to nest near them, an association which allows adult males to obtain additional matings with females paired to the sub-adult males, and females to obtain matings with larger, older males (Morton et al. 1990, Wagner et al. 1996). Adult martins have also been reported to show strong site-fidelity, returning to the same breeding sites year after year (Allen and Nice 1952, Johnston and Hardy 1962, Lund 1978; but for a critique of these interpretations see Brown 1997).

Breeding occurs in a wide variety of habitats, but two features seem to be required: suitable nesting cavities and relatively open access to them (Allen and Nice 1952). Consequently, martins have been found in almost every habitat where cavities are available. They are generally absent as nesters only from the interior of dense forests and woodlands, or areas of open country or brushlands that do not offer any type of suitable (i.e., appropriate entrance size and dimensions) nesting cavities (Grinnell and Miller 1944, Allen and Nice 1952, Richmond 1953, Stutchbury 1991a, Brown 1997). Most martins in California and the West have nested in snags, although many other natural and man-made sites have been reported (e.g., Grinnell and Miller 1944, Richmond 1953, Yocum and Browning 1968, Lund 1978).

As a secondary cavity-nester dependent on preexisting cavities, martins compete with many other species for access to cavities. Because martins must use cavities with relatively large entrances, they are probably subject to more interspecific competition than smaller cavity nesters; this is because smaller birds can enter through small entrance holes that exclude larger species (van Balen et al. 1982, Robertson and Rendell 1990). Direct competition has been reported with just about every other cavity nester within its range (e.g., Brown 1997). Non-native House Sparrows (*Passer domesticus*) and European Starlings (*Sturnus vulgaris*) are thought to be the most serious competitors for nest sites, partly because of their colonial or semi-colonial nesting (e.g., Richards 1924, Brown 1977, Brown 1997). The starling in particular is dominant over martins in most confrontations (Brown 1997), and starlings have been widely blamed for martin declines in California (e.g., Remson 1978, Roberson & Tenney 1993, Small 1994, Gallagher 1997). However, the outcome of competitive encounters appears to depend mostly on which species first initiates nesting (Brown 1997). Because martins are one of the latest cavity nesters in California, this means that they are probably at a disadvantage when competing for nest sites.

In contrast to the extensive knowledge of the reproductive biology of the eastern subspecies (*Progne subis subis*) which is easily studied owing to its use of easily manipulated man-made nesting compartments (e.g., Allen and Nice 1952, Moss and Camin 1970, Finlay 1971a, Brown 1978a, Walsh 1978, Morton et al. 1990, Wagner et al. 1996), little is known about reproduction in California martins beyond basic phenology. It is known that martins construct nests in existing cavities, and egg laying begins in May

(potentially late April at warmer sites) and extends through June and into July (Sprunt 1942; egg set data collected in this study). Clutches usually consist of 3-6 eggs (usually 5 by adults and 4 by subadults; Hill 1997a, Brown 1997, Horvath 1998), with adult females laying clutches earlier than subadults (in Pennsylvania, adult females lay clutches nine days earlier than subadult females on average, n = 1,941 nests; J. Hill, unpublised data). After a usual incubation period of 15 days, nestlings are tended by adults for about 28 days (range = 26-32) before fledging (Allen and Nice 1952, Hill 1997b, Brown 1997). This protracted nesting stage limits them to raising a single brood (Allen and Nice 1952; *contra* Zeiner et al. 1990 which appears to propagate the generally erroneous statement in Sprunt 1942 and others), with extremely rare second broods (n = 8) having been confirmed only in the southern part of their range in north Texas (where they begin to arrive in February; Brown 1997).

As is typical of swallows, martins forage for flying insects on the wing, although they may alight on the ground to ingest grit, eggshell fragments, and presumably insects and other items (Richmond 1953, Brown 1997). However, their regular foraging range may far exceed other swallows both in altitude and in distance from the nest (Richmond 1953, Marshall 1957, Phillips 1986; BDCW, pers. obs.), and they may regularly commute for many kilometers from a nest site (Cater 1944, Richmond 1953, BDCW, pers. obs.). Insect food is varied and prey consumption is probably proportional to prey availability to some degree (Brown 1997), but martins tend to take larger prey than other swallows (e.g., adult dragonflies; Doolittle 1919, Sprunt 1942, Walsh 1978; BDCW, pers. obs.). Their activity near the nest changes somewhat throughout the breeding season, but

martins tend to be most active near the nest site in the morning (Finlay 1971a; BDCW, pers. obs.) and to a lesser degree in the evening (BDCW, pers. obs.)

Purple Martins usually begin to depart their nesting sites within a few days of fledging, usually in July and early August. They generally depart later along the coast which probably reflects their later arrival (and presumably nest initiation dates) in cooler climates, although they may simply linger longer. After departing their nesting areas, martins are rarely detected anywhere in California (likely because they fly at high altitudes; Phillips 1986), with almost all post-breeding records from the immediate coast (Small 1994, ABN); their post-breeding migration paths and habits in California are largely unknown. Purple Martins in general are known to winter primarily in the Amazon region of Brazil and Bolivia (Sprunt 1942, Phillips 1986, Brown 1997), but no one really knows where California-born martins or other *Progne subis arboricolas* winter (Brown 1997; but one bird banded in Oregon was recovered in Brazil, Hill and Dellinger 1995).

METHODS

BREEDING DISTRIBUTION AND STATUS IN CALIFORNIA

Literature Review

To help reveal both distributional trends and habitat associations of Purple Martins, much of my study relied heavily upon the accumulation of historical records from museum collections, published literature, data bases, and observations from field ornithologists and birders (i.e., bird watchers). Ultimately, breeding season records were gathered from the following sources:

(1) Published literature, including:

a. Breeding Bird Atlases (BBA);

b. Annotated county/regional checklists;

c. Seasonal bird reports from the Middle Pacific Coast Region and Southern Pacific Coast Region of *Audubon Field Notes* (AFN), continued as *American Birds* (AB), *National Audubon Society Field Notes* (NASFN), and *Field Notes* (FN), Volumes 3-51 (19?? – 1997?);

d. Bird reports from *Bird-Lore* (continued as *Audubon* magazine): the San Francisco Region from Vol. 23-38, and the Los Angeles Region from Vol. 23-30 (last published reports from region);

(2) Specimen records and egg sets contained in museum collections (see Appendix A);

(3) Field notes cataloged at the Museum of Vertebrate Zoology (MVZ), University of California, Berkeley;

(4) Nest records contained in the Cornell Lab of Ornithology Nest Record Program, Ithaca, NY;

(5) Unpublished data collected by county Breeding Bird Atlas projects (see Appendix B);

(6) Migration/distribution records collected by the Bureau of Biological Survey and archived at the Patuxent Wildlife Research Center of the United States National Museum (copies provided by the Purple Martin Conservation Association);

(7) USFWS Breeding Bird Survey (BBS) data from 1968-1997 (Table 1 and Appendix C);

(8) California Department of Fish and Game's Natural Diversity Data Base (CNDDB) and other data files and unpublished reports;

(9) Unpublished observation records maintained by the editors of the Middle Pacific Coast Region of *Audubon Field Notes* and its successors from 1954-1991; 1996-1998 (these records are cited as ABN);

(10) Sacramento Audubon Society (SAS) bird record files beginning in 1952;

(11) Unpublished documents, including reports prepared by private consultants; and

(12) Field notes and information shared by field ornithologists, biologists, and birders (see Appendix D and Appendix E).

All records of known or probable nesting martins were entered into a data base (Appendix F). Known or probable nest records were identified using roughly the same criteria as are used in Breeding Bird Atlas projects (Appendix G). In addition to these nesting records, I included all records of repeated sightings in a given area within the known breeding range if at least some of those sightings were from May-July. Almost all June records were assumed to also represent local nesting except for isolated records at known vagrant traps (e.g., Farallon Islands, desert oases) and regular records from the northwestern coast where migrants are regularly seen into early June (many contributors in ABN; Small 1994).

During this review it became apparent that some secondary sources were prone to errors, particularly the successors of *Audubon Field Notes* (as well as the files maintained by its editors). I concluded this for a few reasons: 1) several of my personal contributions were erroneously published; 2) I found conflicting information during several of my concurrent distributional review projects (e.g., Williams 1996, 1997; Williams, unpubl. ms); and 3) observers noted errors in the distributional data I sent for review. Consequently, I tried to verify any dubious records: specifically, reports of martins occurring and/or nesting in unexpected locales (e.g., a supposed record of martins nesting along the lower American River Parkway turned out not to be martins; G. Ewing, pers. comm..), or occurring in very high numbers. I did not, however, exclude any breeding

season records based solely on my skepticism. In sum, it is likely that there are a few factual errors in Appendix F, but most of these are likely to be minor errors that would be impossible to detect without verification by the observer(s). Marginal or dubious records that would provide additional insight into distributional trends are treated cautiously in the Results.

For records that met the aforementioned criteria, I recorded the following information when available: location, including legal description; date(s); numbers of individuals or pairs; nest substrate (defined here as the general type of object supporting the nest, but excluding its specific characteristics; i.e., a snag, not a 100 cm dbh ponderosa pine snag); nest height; vegetation type; reproductive measures such as clutch size; potential disturbances; and any other pertinent information such as the presence of European Starlings or other competitors. For most of these records only very basic information such as location and date were available. I also attempted to describe and mark observations as accurately as possible, updating or clarifying locality names as appropriate. This included contacting observers for specific locality information of martins sighted on BBS routes. I did not verify any museum specimens, but I did not detect any questionable records in the collections data.

I also reviewed not only the BBS data but the BBS trend analyses for California, and I used their trend estimates in my results and discussion (see Geissler and Sauer 1990 for the statistical methodology). For these and other analyses, I used the standard α =

0.05 as the threshold of statistical significance and treated $\alpha = 0.05 - 0.10$ as marginally significant.

Field Surveys

Surveys for Purple Martins in California present special problems. The species' rarity, local distribution, wide-ranging flight, and fairly broad habitat associations (remarkably so for a generally rare bird), make existing standardized surveys and other monitoring schemes (e.g. BBS; MAPS: Monitoring Avian Productivity and Survivorship) generally ineffective for documenting even basic distribution. In addition, martin nest sites are often found in remote and rugged terrain, a difficulty that has been noted in several breeding bird atlas projects (Roberson 1993, Shuford 1993; Gallager 1997). Consequently, I conducted broad-scale searches in generally suitable habitat, a strategy referred to as the "look-see method" by Bibby et al. (1992). The look-see method is very basic and straightforward, and simply involves searching for birds in suitable habitat. This is roughly the same method used in Breeding Bird Atlas projects, with the exception that my searches were more focused on both potential Purple Martin habitat and martins.

From 28 May - 30 June 1993, 4-17 June 1994, 1 June - 7 July 1995, 26-28 June 1997, and 5-8 June 1998, I conducted intermittent surveys specifically for Purple Martins within portions of their historic and presently known range in northern and north-central California. Most of these searches were in areas where breeding had been confirmed or suspected within the past ten to fifteen years, although several areas where martins were reported only prior to that period were also searched. I covered portions of the western

Modoc Plateau; parts of the Casacade range including Lake Shasta; much of the mountainous regions of Lake County including the Geysers Leasehold in Lake and Sonoma counties; northwestern California primarily in southern and central Mendocino County; and parts of Alameda (Mines Rd.), Santa Clara (San Antonio Valley Rd.), and Monterey counties (Big Sur area, Santa Lucia ridge from Posts to Marble Peak). I concentrated on surveying areas where knowledge of bird distribution was less complete, generally avoiding recently studied or frequently birded localities with no reports of martins and other areas that had been ornithologically well-explored in recent years unless visiting them happened to be convenient. I also made opportunistic observations for martins while conducting unrelated field work and Breeding Bird Surveys (mostly the northern Sierra Nevada, Sacramento Valley, and the inner coast ranges of Yolo, Colusa, and Lake counties).

I conducted surveys in potentially suitable habitat during all parts of the day ranging from an hour before sunrise to a half-hour after sunset, although the early evening hours and especially the morning hours were generally the best times to find martins near the nest site. I broadly identified potentially suitable habitats as relatively open areas with multiple nesting cavities offered by snags, hollow box bridges (a concrete bridge used in California since at least the early 1960s), or older towns that could potentially offer suitable nest sites (e.g., Victorian buildings). Additional factors that I anticipated would increase the probability of finding Purple Martins were areas with large and/or numerous snags, especially in relatively open areas; open water, and concentrations of other aerial insectivores (Grinnell and Miller 1944; Sharp 1985). The

only landscapes I did not intentionally survey were continuous, dense (often even-aged) forest; extensive chaparral; treeless valleys without hollow box bridges; xeric, low elevation oak woodlands; and any other landscapes without snags or other nest structures -- habitats in which martins have not been regularly reported in California. Once suitable habitat was located, I proceeded slowly through the area, frequently stopping to scan and listen for martins or to walk to nearby areas to obtain better views, while trying to cover as much of the landscape as possible. When passing through heavily forested or wooded areas or other sites with poor visibility, I stopped only occasionally to listen for martins overhead.

Once I located martins I tried to make local population counts, make general behavioral observations, and find their nest sites. Depending on the number of birds, their cruising range from the nest sites, and habitat accessibility, I spent from thirty minutes to two days in the general area. I counted martins directly, noting the sexes and ages when possible to help differentiate individuals and determine local population sizes. I estimated the total number of local nesting pairs by assuming all females and all adult males were mated, so that the minimum number of pairs was represented by the number of females or adult males, whichever was greater (but was probably at least as many as the total number of males I counted; see Distributional Summary under Methods). Because of the foraging habits of this species, it is certain that I missed individual martins in some areas that I surveyed. However, I doubt that I missed any significant colonies within habitat I identified as suitable. Although this is partly subjective, I did not later find martins in areas I had surveyed previously without detecting them; furthermore, no

one has yet reported martins nesting in an area that did not have martins during my surveys.

It should be noted that my methodology was inherently biased toward known habitat space occupied by martins However, I think this bias was both minor and justified. First, known habitat space is quite broad and very likely to include all habitats in which martins actually nest in California. Second, implementing randomized surveys or surveys stratified by habitat or region would not have been the most efficient way to search for martins if only because there would have been less time for searching for and documenting nesting sites. I could have chosen to survey the Central Valley, the Sierra Nevada, or other lowland sites in the coast ranges and possibly could have turned up a small number of nesting martins. However, based on my personal experience, the literature, and communications with other active ornithologists and birders, my surveys would have been less fruitful in such areas.

Distributional Summary

In my summary of martin distribution, I used a regional approach to distribution based directly on the broad geographic subdivisions of California identified in Hickman (1993) and indirectly recommended by Patten et al. (1995)(Fig. 1). These subdivisions are closely approximated by the bioregions adopted by the State of California Resources Agency and similar to those given in Small (1994). I have, however, made one exception to Hickman by treating the Tehachapi Range as a distinct subdivision rather than a sub-region within the Sierra Nevada. This distinction is not based on physiogeographic

differences *per se*, but rather on the Purple Martin's markedly different status in the Tehachapi Range versus the rest of the Sierra Nevada.

The ranges of dates presented in the results were chosen *post facto* because these periods roughly corresponded with recognizable trends both in Purple Martin populations and field ornithology as practiced in California. The pre-1950 period was post Grinnell and Miller (1944) and little appeared between that publication and the early 1950s. From the 1960s to the 1970s there was a revival of (traceable) field work (Lehman 1994, Patten et al. 1995, Shuford et al. 1996; this study), breeding European Starlings spread rapidly after their first successes in the 1950s (Small 1994), and there was an apparently widespread decline of martins (Remsen 1978). The post-1980 period was marked by increasing field work, and starlings had more or less pervaded available habitat (BBS trend data show a nonsignificant downward trend from 1968 to 1996), despite the statement by Small (1994) that starlings were still rapidly expanding in numbers.

Both the historical (pre-1980) and recent (1980-1998) accounts are based only on the data presented here. I avoided the use of general statements extracted from other references or personal communications, which I have sometimes found to be exaggerative (see also Shuford 1993 for similar comments in his Purple Martin account) and are often untraceable. Consequently, almost all of the references cited as "pers. comm." (personal communication) refer to specific observations that can be found in Appendix F. The distributional narratives in the results are intended to be thorough but not necessarily exhaustive. In regions with many individual records, some localities

within a well-established pattern of distribution are not included in the written accounts, although any unique or marginal records *are* cited. I have also included elevations for the highest known nest sites within the mountainous regions to give a rough picture of elevational limits, which have been previously underestimated in the literature for this species (e.g., Zeiner et al. 1990, Small 1994).

Estimates of breeding population sizes for each region were determined by summing the reported numbers of martins in each county (or part of a county, as appropriate), and then adding numbers based on two assumptions: 1) not all habitat has been surveyed, and 2) population sizes at known sites are probably underestimates. The first extrapolation was independent for each county based on ornithological coverage and the extent of suitable habitat types (aided by descriptions of coverage in Breeding Bird Atlas projects, discussions with field ornithologists, and my readings of bird records and field notes), and ranged from adding just 1-4 small colonies for recently atlased counties such as Marin, Napa, and Orange, to a doubling or tripling of the number of colonies as in Mendocino County. For the second extrapolation, I multiplied approximate numbers of reported martins by 50%, except at censused sites such as Sacramento or other well-studied nest sites. The 50% extrapolation is partly arbitrary, but reasonable based on my field observations and the count data collected during the Sacramento censuses (see below). In some cases, 10-30 minute visits to the large Sacramento colonies actually produced population underestimates greater than 50%, but I believe that an observer would be more likely to detect a greater proportion of martins from small colonies than from large ones such as Sacramento. This is primarily because it is easier to keep track

of a smaller number of martins. Total population numbers, of course, may be expected to vary significantly from year to year (e.g., Mayfield 1969, Brown 1981, Stutchbury 1991a, Brown 1997).

POPULATION ASSESSMENT AT SACRAMENTO'S URBAN COLONIES

Purple Martins have consistently nested in concrete hollow-box bridges (Fig. 2) within the city of Sacramento since at least 1965 (Sacramento Audubon Society). Estimates made by Dan Airola and Jesse Grantham in 1992 (unpublished manuscript) suggested these colonies may represent the largest concentrations of Purple Martins in the state. Because of their accessibility, size, and apparent uniqueness, Sacramento's four colonies (Hwy 50 @T St.; Hwy 50 @ 20th St.; Hwy. 50 @ Hwy. 99 interchange; and Interstate 5 @ I St., next to the Railroad Museum in Old Sacramento) were designated *a priori* as areas of intensive study. With the help of volunteers I began data collection at three of four colony sites in 1993 and at all four sites in 1994 and 1995. The primary objective at these sites was to census the number of breeding pairs. In 1993 we began using Airola and Grantham's methods (unpubl. manuscript) of mapping occupied weep holes, assuming that any hole entered more than once at least one week apart was likely to be a nest. However, since male martins are known to visit, defend, or use cavities other than the nest cavity (Allen and Nice 1952, Brown 1979, Stutchbury 1991a, Brown 1997), and I noted that there was no sign of nesting activity at many of the "nests," we used more detailed behavioral and physical criteria (see Appendix G) in 1994 and 1995.

In order to determine the total number of nesting pairs at each site, I examined the census data using various assumptions. My "official" census estimate uses standard BBA criteria with a few exceptions. The first was the exclusion of the "occupied nest" for reasons mentioned above. The other behavioral observations that I did not use were nest building, carrying nesting material, or fecal droppings on or below the nest hole (see Appendix G). This is because delivery of nesting material to a cavity may not actually confirm an additional nesting pair (Brown 1997), and droppings were observed at several cavities where no other nesting activity was observed. In addition to the "official" estimate, I have included two extrapolations. The first extrapolation assumes that any act of carrying nest material into a hole confirms an active nest; the second assumes that any hole entered more than once on two or more dates at least one week apart is sufficient evidence to confirm an active nest (similar to methods used by Airola and Grantham). Activity at the colonies was recorded on a previously drawn map of the nesting area (Appendix H) for 0.5 –1.0 hour at each colony on each visit. We visited the colonies 1-2 days per week from late April or May through July to early August, when almost all martins had departed.

One of the main difficulties in determining local and regional population sizes is the difficulty in assessing the difference between reported numbers of martins and the actual numbers of martins or nesting pairs. In order to make a rough measurement of this difference, I decided to try to mimic the methods used by a typical birder that would have reported the number of martins they observed. So during the census period in 1994, we also counted individual martins during a randomly pre-determined 10 minute interval. I

felt this 10 minute interval was a reasonable estimate of typical count effort. These data are not presented here, but I did use the results in determining regional population sizes (see below).

Another objective at the Sacramento colonies was to evaluate the effectiveness of devices designed to prevent young from falling out of nests. Airola and Grantham suggested that there was significant hatchling mortality caused by young falling from nests, as the nest compartment is level with the exit hole and there is no physical barrier to prevent active hatchlings from falling. So I inserted flexible, corrugated plastic drainage pipes projecting approximately 7-8 cm above the floor of the nest chamber to create a barrier that young would have to climb in order to fall out. I chose a section of Hwy. 50 with 22 weep holes where martins tended to concentrate, and randomly placed 11 inserts into these holes. Although martins did enter holes with the inserts within the same week and did nest in them, I decided to discontinue the experiment for two reasons. The first was because more martins used cavities without inserts (9 of 11 in 1993; 4 of 11 in 1994, 5 of 11 in 1995) than with them (7 of 11 in 1993; 3 of 11 in 1994, 4 of 11 in 1995) and there was a trend toward reduced use of that section of holes. (I do think, however, that a different type of insert may be effective). The second reason was that fallen hatchlings were often not assignable to a specific hole, especially at the chosen colony site. This was due to the activity of scavengers, transients, and possibly even movements from the fallen hatchlings themselves.

I also set out to make estimates of reproductive success with the use of a small camera designed by Caltrans (California Department of Transportation) to inspect bridges. I satisfactorily inspected four nest compartments on a trial run on 2 July 1993 (3 nests with hatchlings), but the camera malfunctioned after satisfactorily viewing only five nest compartments in 1994 (one nest with six eggs on 24 May), which forced me to terminate that project.

BREEDING HABITAT CHARACTERISTICS

The chief terrestrial feature that clearly affects nesting martins is the nest substrate and conditions immediately surrounding it. These factors include the number of available cavities; cavity conditions; nest height (Stutchbury 1991a); distance to nearest canopy cover (Horvath 1998); and possibly "conspicuousness," which would likely be a function of the size and position of the nest substrate in relation to the size and position of other objects in the landscape. Among snag-nesting birds, measures of these factors include diameter at breast height (dbh) and stage of snag decay. Therefore once each nesting site was located, I recorded general habitat type (dominant vegetation), nest site and snag characteristics (dbh, height, stage of decay), and visually estimated canopy cover. In some cases (n = 5 snags), this information was gathered by others.

Dbh was usually recorded with the aid of a dbh tape measure, but I converted circumference measurements to diameter for snags measured without a dbh tape. If the tree I measured was a weathered snag mostly devoid of bark, I added twice the thickness

of a piece of remaining bark in order for the dbh measure to be meaningfully applied to living trees. Depending on the size and species of the tree, this thickness was usually 5-10 cm. In many cases this produced measurements that were underestimates of the dbh of living trees since the bark and/or sapwood was often partly burned or decayed (e.g. the redwood in Garland Ranch, MTY, that I measured as 271 cm would have been nearer 300 cm if it had not been burned). Most heights were visually estimated, but a few were taken with a clinometer. My work with a clinometer suggests that some of the visually estimated heights reported here may be underestimates by as much as 10%. I also noted snag condition in relation to the snag decay classes shown in Neitro et al. (1985), but I did not classify every snag (n = 11). Several nest snags were not accessible due to steep topography, very dense successional (usually post-fire) communities, limited property access, or because they were partly submerged. Others were so extensively burned or decayed at the base that meaningful measurements (and even species determination for a few trees) were not possible. Therefore I was unable to record dbh or other snag characteristics for 11 terrestrial nest snags that I observed, and all of the submerged snags ($n \geq 10$).

Although I did record data on the apparent number of cavities for a few snags (n = 4), my data are almost meaningless and I did not include them in this study. One problem common to all studies that estimate cavity numbers from the ground is that many apparent cavities are actually false cavities (see Lund 1978, Stutchbury 1991); the other is that even for snags that I measured, I could not always see the entire tree to count apparent cavities (e.g., the redwood in Garland Ranch Regional Park). However, even

for snags I could not access, I was always able to make estimates of canopy cover (n = 35).

Because martins are highly aerial and nest over many types of "ground" cover (e.g., forest, chaparral, bare ground, water), I visually estimated canopy cover at or above nest height within a 100 m radius centered on the nest site. I did this by visually surveying the area for the amount of vegetative cover that exceeded an imaginary horizontal plane through the nest site (Fig. 3). In most cases this plane was not parallel to the actual ground surface; if I had estimated canopy cover parallel to the ground, then most estimates of canopy coverage would have been very low since martins often nest in the tallest trees. My method contrasts with traditional measures of canopy coverage taken from ground level (or estimated from aerial photographs), but my modified technique presumably reflects how martins view the landscape: from the air down and not the ground up. For sites where I could not tell which snag(s) was the exact nest snag (e.g., Shasta Lake, Indian Valley Reservoir), I treated the snag cluster as an individual snag and estimated canopy cover from the approximate center of the cluster. I also noted the distance to the nearest vegetation at or above the nest cavity height in the direction of the cavity, but I did not measure this.

Finally, because martins are often found near water (I saw them bathing and/or drinking several times), I wanted to analyze the relationship between nest sites and distance to water features. However, since martins cruise so widely, it quickly became

apparent that it was nearly impossible to decisively determine the nearest distance to water features accessible to martins.

RESULTS

TRENDS IN BREEDING DISTRIBUTION AND STATUS

I located approximately 310 distinct historical and contemporary nest sites and likely breeding locations through 1998. Of these, approximately 300 locations were historically (<1980) active, and 215 have been recently (≥ 1980) active (Appendix F). Below I summarize the data by region (see Table 2, Fig. 4).

The following regional accounts are generally organized from north to south, with actual records generally listed chronologically within a specified area or subregion. If the unpublished citation was not a first-hand from the observer directly, then the observer is included in one of two ways: in brackets "[ ]" if I have *not* confirmed the sighting with the observer, or by a colon ":" if I did subsequently confirm the record with the observer. For example, many records are based on catalogued records maintained by the editors of the Middle Pacific Coast Region of *Audubon Field Notes*, *American Birds*, *National Audubon Society Field Notes*, and *Field Notes*. If the source was AFN and I did not confirm the record with the observer, the observer is given in brackets (e.g., ABN [J. Smith]). If the source was ABN and I subsequently confirmed it with the observer, then the observer's name follows the general source with a colon (e.g., ABN: J. Smith). I use standardized abbreviations as adopted by Western Field Ornithologists' California Bird

Records Committee to denote the various counties in California (Appendix I). Other abbreviations (museums) are given in Appendix A.

Northwestern California (Klamath North Coast Region)

Historic Information: Martins were locally fairly common to uncommon nesters in this large region, although piecing together the martin's history has been difficult since the region's rugged topography has prevented field ornithologists from exploring much of it (Shuford 1986). Consequently, most of the historical nest sites were described from settled areas or along main transportation routes. Along or near the coast, McClellan (Biological Survey Archives, USNM) reported them nesting in Crescent City, DN, in 1894; in Humboldt County they were known to nest in snags at Eureka and Samoa in the early 1900s (see Appendix F), at the Bayside Golf Course and along the North Fork of Mad River in the late 1950s and 1960 (S. Harris notes [C.F. Yocum]), and near Fieldbrook (S. Harris notes [R. Wilmarth]) and Fickle Hill (Appendix F) in the 1970s. They have apparently always nested along the Mendocino coast as at Gualala and Mendocino in 1894 (Biological Survey Archives, USNM [McClellan]), and Fort Bragg (AFN 10:408; ABN [W. Pursell]) and Westport (Appendix F) in the 1950s. Others nested near Ornbaum Springs west of Yorkville, MEN, in the 1930s (MVZ egg set, specimens; Grinnell 1935), and the Gualala River mouth, SON/MEN, in the 1970s (Appendix F).

Purple Martins occupied sites scattered throughout most of the inland areas of Northwestern California except the highest elevations of the Klamath and Inner Coast

Ranges. Historic inland nesting areas include Bridgeville, HUM, in 1929 (S. Harris notes [G.A. Howett]), and Island Mountain, southwestern Trinity County, where three nests were collected in 1927 (egg set; Harris 1991, 1996); there were sightings near Hyampom and Hayfork, TRI, in the 1940s (A.H. Miller, MVZ notes) and along Hwy. 36 near the Shasta County line (ABN [B.D. Parmeter]) and at Junction City, TRI (J.G. Hewston, pers. comm.), in the 1970s; more sightings near Beegum, TEH, in the 1940s (A.H. Miller, MVZ notes) throughout Lake County including Glenbrook and the nearby Geysers (Mailliard 1919b; Appendix F), Sherwood (location?) in 1942 (MVZ egg set), and Horse Mtn in 1978 (ABN [O.J. Kolkman]). They also nested near Petaluma, SON, in the mid-1800s (Baird 1858); on the slopes of Mount St. Helena, SON/NAP, such as along Ida Clayton Rd. in 1960s and 1970s (Appendix F); and various locations in Napa County including Napa Valley (Bickford 1927), near Angwin and Howell Mtn in the 1940s and 50s (Appendix F), Robert Luis Stevenson State Park and nearby sites at Table Rock and The Palisades since at least the mid-1960s (B. Grummer, pers. comm.), above Lake Berryessa in 1972 (ABN [Fred Barnes]), and at Veeder Mtn in eastern Napa County in 1959 (ABN [H. Cogswell]). Other than the highest peaks, the only part of the region where they have not been reported is the relatively arid eastern portions of the Inner Coast Ranges, although a lack of observers here may be partly responsible. All of the known nest sites have been in snags except for the Gualala R./Hwy. 1 Bridge, SON/MEN, apparently since at least 1975 (Appendix F). However, judging from the historical trend elsewhere in the state as well as the sparse landbird reports from this

region, it is possible there were unreported instances of nesting in buildings of the early settlements of the region.

Recent Information: Relatively speaking, Purple Martins may be more uniformly distributed throughout this region than any other, and they also are most abundant here (Price et al. 1995). In fact, seven of the eight BBS routes that have averaged over one martin sighting per year are in this region, and the other is just outside it in Marin County. Martins are present as nesters from both the northwestern and northeastern edges of the region, as at Lake Earl, DN (A. Barron, pers. comm.; C. Hampy, pers. comm.), and Yreka, SIS (R. Ekstrom, pers. comm.), to the southwestern and southeastern corners of the region as along Fort Ross Rd., SON, and Napa County east of St. Helena (see Appendix F). Other nest sites have been at Glacierview Ranch (1,615 m [5,300 ft.]) and Blue Ridge lookout (1737 m [5,700 ft.]), southwestern SIS, in 1980 (M. Robbins, pers. comm.); in a Wood Duck (*Aix sponsa*) nest box at Essex Pond northeast of Arcata in 1985-86 (Appendix F), and more recently in snags at Shelter Cove, HUM (Appendix F); near a nest box at Weaverville in 1980 (S. Harris notes), and sightings at Junction City in 1984 (J.G. Hewston, pers. comm.), and Ruth Lake and Horse Ridge, TRI, in 1996 (Hunter and Hazard 1998); several locations in Mendocino County including bridges over Juan Creek and Big River (D. Tobkin, pers. comm.), as well as in coast redwood (*Sequoia sempervirens*) snags from Ten Mile River to Pudding Creek (CNDDB; see Appendix F) including one near Fraser Creek with an active Osprey (*Pandion haliaetus*) nest at the top (Appendix F); at the Gualala River Bridge and in nearby snags (Parmeter 1995; Appendix F), and along Fort Ross Rd., SON (B. Parmeter,

pers. comm.). Martins were seen regularly at Lovelady Ranch, southwestern COL, in the mid-1980s (CDFG files [P. Lindley]), and nested in a utility pole near McVicar Audubon Sanctuary at Clear Lake, LAK, at least from 1989-91 (see Appendix F). They now nest in the Elk Mtn Rd. area (Appendix F), in partially submerged snags in Indian Valley Reservoir (BDCW, pers. obs.), and at Glenbrook and the nearby Geysers area, LAK/SON (Williams and Vouchilas; BDCW, pers. obs.), as they have done since the early part of this century (Mailliard 1919). They also occur in remnant snags in the Palisades area of northern Napa County (Napa BBA), east of St. Helena along Howell Mtn. Rd. (Appendix F), and one pair nested in partially submerged snags in the Putah Creek arm of Lake Berryessa in 1993 (Napa BBA).

Estimated Population: 250-650 pairs total. By county: DN = 20-40; SIS = 5-20; HUM = 80-180; TRI = 5-25; SHA = 0-15; TEH = 0-10; MEN = 60-180; GLE = 0-10; LAK = 25-50; COL = 0-5; SON = 25-60; NAP = 25-50; YOL = 0-2; SOL = 0-2.

Cascade Range

Historic Information: Martins have been local and uncommon to rare in the Cascade Range. Townsend (1887) first reported them nesting in buildings at Weed, SIS, in 1883, and Mailliard (1921) found them doing the same in 1920. Mailliard (1921) also recorded them nesting at Bray, SIS, but did not elaborate on the observation. Another sighting was reported northwest of Edgewood, SIS, in 1898 (Merriam 1899). In the 1970s they were found nesting near Copco Lake in northern SIS (Appendix F). Other reports from Siskiyou County include a high count of 45 at Grenada in May 1977 (ABN

[M. Taylor]), Juanita Lake in August in the late 1970s (Appendix F), and 17 from Medicine Lake, SIS, in July 1979 (ABN [B. Yutzy]). It is probable that these latter observations pertain at least partly to migrants, but the dates and locations also suggest that at least some may have nested in the area. In Shasta County, the only semi-historical reports thus far located were in 1978 at Lake Britton (Airola 1980) and a colony nesting in snags in Shasta Lake by 1977 (AB 32:1204; P. Detrich notes). However, judging from the large numbers I suspect the colony at Shasta Lake was present for a decade or more prior to 1977. At the more southerly end of the Cascade Ranges, Townsend (1887) reported nesting martins from the east base of Mt. Lassen, Grinnell et al. (1930) found them near Bogard Ranger Station, and another was collected near Ebey Lake, LAS, in 1937 (UCDZ specimen). Martins were also reported nesting east of Red Bluff (perhaps in the Sacramento Valley?) in 1955 (ABN [Beatrice Nielsen]). Other sightings have come from Lake Almanor, PLU, on 13 May 1962 (ABN [?]) where they were most likely migrants, and at Buck's Lake, PLU, on 13 July 1974 (T. Manolis, pers. comm.).

Recent Information: The only recently active colonies since 1980 have been at Shasta Lake (P. Krumpton pers. comm.; BDCW, pers. obs.), Lake Britton (B. Yutzy, pers. comm.; BDCW, pers. obs.) and small numbers at scattered sites in central Siskiyou County as on the west slope of The Whaleback (1981 m [6,500 ft.]) in 1982, near Orr Lake at Bray in 1982, near Copco Lake (all M. Robbins, pers. comm.), and near Temple Rock (R. Ekstrom, pers. comm.). There have been other scattered sightings in Shasta County's Cascade Region that suggest other nest sites at least on sporadic intervals (Appendix F). As in most of the state, the numbers and nest sites of martins in terrestrial

snags is quite variable, and I have not been able to identify any location where martins may be found dependably, except recently at Lake Britton. The Shasta Lake population utilizes partially petrified, emergent snags along the Pit River arm which was the only arm of the reservoir not logged before inundation in 1944 (P. Detrich, pers. comm.; J. Wood, pers. comm.). Results from my surveys indicate approximately the same number of martins from 1978 (P. Detrich counted 17 pairs on 27 June) as 1994 (I counted minimum 14 pairs on 17 June) and 1995 (I counted minimum 19 pairs on 29 June). However, as snags are lost to attrition this population is likely to disappear without efforts to replace the lost snags (I placed customized nest boxes similar to ones used successfully in Oregon and Vancouver Island on a few of the larger snags, although these were also in the water.). Although an occasional nest may be found on an isolated snag on land (J. Coon, pers. comm.; B. Yutzy, pers. comm.), snag density on land is much lower than in the lake, and the forested conditions may limit accessibility and visibility.

Estimated Population: 35-125 pairs total. By county: SIS = 10-30; MOD = 0-10; SHA = 25-50; LAS = 0-15; TEH = 0-10; BUT = 0-5; PLU = 0-5.

Modoc Plateau

Historic Information: As in the Sierra Nevada, martins seem to have been widely scattered through the region, most often appearing over lakes and rivers. Henshaw (1879) recorded them locally in the pine regions of the mountains, and Merriam (Biological Survey Archives, USNM) found them west of Goose Lake in 1896, but Mailliard (1927) did not record them from Modoc County in 1923-24. The nests that

have been found have been in large, isolated snags, or in the case of colonies at Lava Beds National Monument, below ground in niches of collapsed lava tubes since at least 1899 (A. H. H., Biological Survey Archives, USNM; Yocum and Browning 1968). Dawson (1916) found them nesting in a giant pine (*Pinus* sp.) at Honey Lake, but I have not located any records near Honey Lake since that date. They have nested at least intermittently at Eagle Lake since 1899 (Willard 1899, Sheldon 1907, Dawson 1923; BBS 009) but their regularity and numbers seem to be reduced from that period (Appendix F). Belding (1890) and Mailliard (1919a) also found them nesting in Sierra Valley, where Mailliard suspected that they may have nested in a nest box at Loyalton, SIE, although the account also suggests they may have nested in the cornice of a nearby building as they did elsewhere at this time. Ross (1925) also reported them nesting from atop a barn in Sierra County, but did not give a specific location.

Recent Information: Martins continue to be rare and local nesters on the Modoc Plateau. There are only four known current locations where they nest, but the scattered lava tubes at Lava Beds National Monument may represent the only persistent locations. Other localities in the forested regions include Happy Camp (1676 m [5,500 ft.]), MOD (BDCW, pers. obs.), the Baum Lake/Crystal Lake area, SHA (Appendix F; nest site still not located), and Ahjumawi Lava Springs State Park, SHA (Appendix F). Most of these locations have only a few pairs and actual nest sites probably shift every few years. Martins at Eagle Lake are increasingly rare, and could not be located during this study although they were present through 1992 (BBS 009; G. Alton, pers. comm.). They also appeared to be nesting in cottonwoods (*Populus* sp.) at nearby Willow Creek Valley in

the early 1980s (B. Stovall, pers. comm.), but I did not find them there in 1993. Also in 1993, I found 3-4 pairs in snags remaining atop a rocky ridge from a 1979 and/or 1987 fire near Happy Camp (both lightning caused; Modoc National Forest fire data). This colony appeared to have declined slightly from 3-4 pairs in 1993 to 2-3 pairs in 1998. Although this change in numbers could easily be due to chance, there was clearly a loss of snags during the period including the large snag (not measured) where most activity was concentrated in 1993.

Estimated Population: 18-80 pairs total. By county: SIS = 10-30; MOD = 3-15; SHA = 5-15; LAS = 0-10; PLU = 0-5; SIE = 0-5.

Central Western California

Historic Information: North of Monterey, martins have apparently never been more than uncommon and local, at least since the turn of the century, and were reported most frequently from areas that corresponded with the localized conifer forest of the region as near the coastal ridges in Marin County and the Santa Cruz Mountains. North of San Francisco Bay, martins could be found near Petaluma, SON, in the early 1850s (Baird 1858, Grinnell and Wythe 1927) as well as near Sebastopol in the late 1800s and possibly later (Belding 1890, Grinnell and Wythe 1927); near Olema in the 1880s (Belding 1890), Nicasio (Grinnell and Wythe 1927), Point Reyes in 1894 (ANS specimens), and various locations from the Carson, Bolinas and Inverness Ridges since at least the late 1950s (Appendix F). However, no nesting records exist for the Sacramento/San Joaquin River delta region or other lowland sites around the bay with the

exception of the city of San Francisco in the mid-1800s (Newberry 1957, Ridgway 1877) and probably to the early 1900s when a female with small eggs was collected at Lake Merced on 26 April 1902 (MVZ specimen). Considering Grinnell and Wythe's 1927 treatment of the area, martins must have disappeared by the 1920s. East of San Francisco Bay, Bryant considered martins rare summer residents in Contra Costa County in the 1880s (Belding 1890), and in Alameda County one was collected along Calaveras Creek in 1880 (CAS specimen), found nesting near Cedar Mountain in 1938, and found again at another location in the southeastern corner of the county in 1941 (Seibert 1942; M. Seibert, pers. comm.). South of San Francisco, they were seen regularly in the 1960s and 1970s in coastal San Mateo County (Appendix F); they nested near Santa Cruz from the 1860s through at least the 1950s (Cooper 1870; Appendix F) as well as near Mt. Hermon (Sibley 1952), Bonnie Doon (AFN 9:401 [E.D. Smith]), Big Basin Redwoods State Park in 1977 (ABN [R.A. Morgan]) and other locations in the Santa Cruz Mountains, SCL and SCZ (McGregor 1901, BL 23:209, Sibley 1952). In Santa Clara County they also nested near Los Gatos in 1948-49 (AFN 3:31, 4:34 [E.D. Smith]), near Mt. Hamilton in the 1950s (Sibley 1952; ABN [E.D. Smith]) and 1960s (ABN [J. Kennedy]), and in the east county in San Antonio Valley 1969-74 (Appendix F) and probably at least sporadically much earlier (MVZ specimens).

South of Monterey, martins nested near Pacific Grove until 1957 (ABN [L.R. Hastings]; Roberson 1985) which is about the same time they stopped nesting at Hastings Reservation in the central part of the county where they were seen every year but one from 1938 to 1955 and nested occasionally (Linsdale 1947, Davis et al. 1980; see

Appendix F). In the Santa Lucia Range of Monterey County, martins have been continuously present near the coast ranges where they nest along the ridges (Beck 1899, Jenkins 1906, Pemberton and Carriger 1915, Davis et al. 1980, Cull and Melchert 1980, Roberson 1985; see Appendix F), and they were also considered common near settlements in the upper Salinas Valley (Willett 1908). Martins were also reported nesting in Stony Valley of Ft. Hunter Liggett in 1966 (ABN [W. Reese]), an area near the Nacimiento River and probably similar to the downstream woodlands and savannahs in San Benito County. In San Benito County, martins nested near Paicines around the turn of the century (Mailliard and Mailliard 1901; Appendix F) and at Santa Rita and San Benito peaks in the southeastern corner of the county in 1936 and 1944, respectively (MVZ specimens; Johnson and Cicero 1985). J. E. McLellan (Biological Survey Archives, USNM) found them to be common in the large oaks (*Quercus* sp.) along the Nacimiento River in 1894, and they were also present near Paso Robles and at Santa Margarita, SLO, through at least the 1920s (Swarth 1911, Dawson 1923; LACM specimen). Lehman's (1994) completed a thorough treatment of martins in Santa Barbara County where almost all of the nesting records come from the Central Western Coast region. The majority of these records are from Lawrence Stevens' egg collections from sycamores (*Platanus racemosa*) near the Santa Ynez River at Solvang and Santa Ynez, and nearby Nojoqui Falls where martins have nested continuously since at least the late 1920s. Other nesting locations in Santa Barbara County have been along Foxen Canyon Road through the 1960s (Lehman 1994; Appendix F), the summit of Big Pine Mtn.

(2,073 m [6,800 ft.]) in 1979 (Lehman 1982, 1994), and sightings near Lake Cachuma in the 1960s (Appendix F).

Except for Ridgway's 1877 report of martins using buildings in San Francisco, most documented nesting has been in coniferous snags (n = 19), lowland sycamores (n = 34), and oaks (*Quercus* sp., mostly *Q. lobata*) (n = 8). Martins have not shown any elevational limitations in the region, as they have nested from near sea level to the region's tallest peaks.

Recent Information: Breeding Bird Atlases have been prepared or are being conducted in almost all of the region with the exception of Contra Costa, San Benito, and Santa Barbara counties, and those San Joaquin Valley counties that include the extreme eastern portion of the Inner Coast Ranges. The results from Marin, Monterey, and Sonoma counties have been published by Shuford (1993), Roberson and Tenney (1993), and Burridge (1995), respectively. No martins were found in southern Sonoma County (Parmeter 1995) from 1986-1991, but in Marin County Purple Martins nest in submerged snags in Kent Lake and in Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*) snags on Limantour Rd. (L. Sykes, pers. comm.) and at Lake Ranch Gate on the southern Inverness Ridge (Evens 1993). They may also continue to nest on the Carson and Bolinas Ridges near Kent Lake and Alpine Lake, and have also been seen regularly at Bolinas Lagoon (Shuford 1993; K. Hansen, pers. comm.) and at Five Brooks where they nested on nearby Inverness Ridge through at least the mid-80s (Appendix F). In the east bay, martins are very rare and irregular. They nested in foothill pine (*Pinus sabiniana*)

snags along San Antonio Valley Rd., SCL, in 1982-83, but no martins were found there during the Breeding Bird Atlas from 1988-92 and I found none in 1993. However, a martin seen in southeastern ALA in June 1995 again indicates probable nesting (Alameda County BBA), and sightings near Lafayette, CC, in the mid-80s (Appendix F) also indicate probable sporadic nesting by isolated pairs. Elsewhere north of Monterey, martins are most frequently seen in the Santa Cruz Mountains of SM, SCZ, and SCL where they nest annually in very small numbers near the crest (Santa Cruz BBA; D. Suddjian, pers. comm.) or are seen foraging at nearby lowland sites such as at Pescadero Marsh, SM (Appendix F).

Roberson's (1993) estimations of individual colony sizes may be an overestimate based on my examination of weep holes at the bridge-nesting colonies (martins leave a species-specific type of fecal stain on weep holes), but his estimations for the county are probably accurate and at least two new nest sites have been located since the atlas period: at Michael's Hill on the ridge above Big Sur in 1993 (BDCW, pers. obs.), and a colony in a large redwood at Garland Ranch Regional Park in 1994 (D. Roberson, pers. comm.) where a possible nesting site was reported in 1988. In San Benito County there are no known nest sites although a lack of observers here may be partly responsible. Lehman (1982, 1994) has given an historical account of Santa Barbara County, and sightings in the Los Padres Forest of eastern Santa Barbara County in the 1980s are given in Lentz (1993). The only known areas are now at Nojoqui Falls and probably at scattered locations along the Santa Ynez River, SBA (Lehman 1994). With one possible exception, this region may be the last that hosts martins nesting in lowland sycamore

woodland as at Andrew Molera State Park, MTY; near Atascadero and along Trout Creek, SLO (Marantz 1986; San Louis Obispo County BBA); and at Nojoqui Falls State Park and probably small numbers along the Santa Ynez River, SBA. There was also a pair using a cavity of a cottonwood near Atascadero in the late 1980s (R. Zachary, pers. com.).

Estimated Population: 100-215 pairs total. By county: MRN = 20-35; SF = 0; MTY = 50-100; CC & ALA = 0-5; SM = 0-5; SCL & SCZ = 10-15; SBT = 0-5 ; SLO = 10-20; SBA = 10-30.

Great Central Valley

Historic Information: Purple Martins have historically been present throughout the Central Valley, but populations have apparently been larger and more persistent in the Sacramento Valley than the San Joaquin. In the Sacramento Valley, nesting has been continuous in Sacramento since at least the 1850s where they once nested in trees but eventually switched to buildings (Newberry 1857, Baird 1858, Heerman 1859, Cooper 1870, Ridgway 1877), and martins have been found elsewhere along and near the region's rivers. Along the Sacramento River they nested in and near Chico, BUT (Belding 1890; Appendix F); near Butte City (UCDZ specimen) and north of Glenn, GLE (ABN: S.F. Bailey); Sycamore, COL, in 1938 (UCDZ specimen); Tehama and Red Bluff, TEH (Grinnell et al. 1930); probably near Ball's Ferry, SHA, in 1962 (ABN [P. DeBenedictis]) and Redding. Along the Feather River they nested in buildings at Marysville, YUB, (SAS [M. Perrone]); and near Live Oak, south of Yuba City, and near

the confluence with the Bear River, SUT in the 1970s (ABN [D. Gaines]). In the early 1970s, Gaines (1974) considered them uncommon along the Feather River and rare along the Sacramento River. However, records ceased in the mid-1970s despite frequent surveys for Bank Swallows (*Riparia riparia*) and Yellow-billed Cuckoos (*Coccyzus americanus*) along most of the rivers through at least 1986 (S. Laymon, pers. comm.; B. Garrison, pers. comm.; J. Humphrey, pers. comm.).

Martins appear to have been much less common in the San Joaquin Valley, although the species once nested in Stockton (Belding 1890, 1901a, 1901b, 1905), and perhaps near Buena Vista Lake where at least two specimens were collected on 31 May 1921 (UCLA specimens), and again in March 1929 (UCLA specimen). The species was also noted by Gaines (1977) along the San Joaquin River from southern San Joaquin to the central Stanislaus County area on 29 June 1977. Other observations occurred near Riverview [loc.?] 27 April 1907 (Tyler 1913) and on the same date 67 years later in Fresno (AB 28:849 [R. Hansen]), but both probably pertain to migrants; however, localized nesting of isolated pairs could have occurred. Martins also nested on the southwest edge of the region on the west side of the Temblor Range in the San Juan Valley near Shandon, SLO, through at least the 1930s (Dawson 1923; WFVZ egg set).

As Gaines noted in 1973 (Gaines 1976), martins usually used western sycamores (n = 7) for nest sites, although nests also were found in oaks (n = 1), cottonwoods (n = 1), and apparently large willows (n = 1; Mallette 1987). Other tree nests (n = 5+) were not reported as to species, but the proportion would likely reflect the numbers given above.

Although martins once nested in buildings (n = 6+) in Sacramento, Stockton, Marysville, and probably Chico and other towns, they are no longer known to utilize buildings as nest sites anywhere in California.

Recent Information: Downtown Sacramento is the only location within the Central Valley where martins are known to nest. At least 60-70 pairs nested each year from 1991 to 1995 (D. Airola and J. Grantham, unpubl. data; this study). Although other regions may support greater numbers, the colonies here support one of the largest known concentrations of martins in the western United States along with areas in coastal Oregon (Fouts 1989, Fouts 1996; D. Fouts, pers. comm.) and Vancouver Island, British Columbia (NASFN 49:968), where small martin colonies have expanded tremendously in just a few years with the provision of individual nest boxes. The only other report of a recent sighting in the nesting period was along the San Joaquin River at Mendota Pool on 15 May 1983 (ABN [F. Gibson]), but this may have been a migrant. Small (1994) stated that martins have recently nested along the Sacramento River west of Sacramento, but I am not aware of any substantiating evidence.

Although no one ever made a thorough census of the martin population in Sacramento prior to 1991, it is apparent that they have increased after their transition to bridges in the 1960s. Shown in Table 3 are the number of nests at the four colony sites active during the census period

Estimated Population: 70-175 pairs total. By county: TEH = 0-10; GLE = 0-10; BUT = 0-5; COL = 0-5; SUT = 0-5; YUB = 0-5; PLA = 0; YOL = 0-2; SAC = 70-100; SOL = 0-2; SJ = 0-2; CC = 0-2; ALA = 0-2; STA = 0-2; MER = 0-2; MAD = 0-2; FRE = 0-2; SBT = 0; KIN = 0-2; TUL = 0-2; KER = 0-5; SLO = 0-5; SBA = 0.

Sierra Nevada

Historic Information: Despite not having been included by Verner et al. (1980) as a breeding species in the western Sierra Nevada, Purple Martins were at one time distributed locally throughout most of the Sierra Nevada (Cooper 1870, Belding 1890, Grinnell 1915) and have nested continuously in the region since before the turn of the century (Appendix F). Known nesting locations included Oroville, BUT (CNRP, E.A. Pugh 1969); both in oaks and buildings at Grass Valley, NEV (Richards 1924); Lincoln (Adams 1909a, Adams 1909b) and Auburn, PLA (Adams 1909a, Bryant 1924, Grinnell and Miller 1944; SAS [G. McCaskie 1958, 1961]); Placerville (Barlow 1901, Ray 1914, Grinnell and Miller 1944) and Peavine Ridge (1,829 m [6,000 ft.]), ED (Barlow 1901); Murphys (Belding 1890), and probably near Arnold, CLV (R. Jurek, pers. comm.); Crocker's, near Hodgdon, TUO (Fisher 1893); Yosemite Valley (Emerson 1893) and nearby foothills (Emerson 1893, Fisher 1893), and Coulterville, MRP (Grinnell and Storer 1924); probably near Bass Lake, MAD (MVZ specimen); at Hume (1,524 m [5,000 ft.]) and Sequoia Lakes (1,585 m [5,200 ft.]), and near Pine Mountain, FRE (Appendix F); and in Sequoia National Park, TUL (Sumner and Dixon 1953; Appendix F). Of the five known localities where martins once nested in buildings in towns -

Lincoln, Auburn, Placerville, Grass Valley, and Oroville – martins apparently disappeared before the 1980s at all of them. The small colony at Oroville was not known to nest there after 1974. Although Gaines (1992) "discarded" Emerson's 1893 record from Yosemite Valley, Emerson's observations there are consistent with their historical distribution, especially considering the more open habitats of the valley at that time. Specific historical nesting information from the Sierra Nevada was sparse, but reported nesting sites were in buildings (n = 5), oaks (n = 3) and conifers (n = 1).

Recent Information: They are very rare and local in the southern Sierra with apparently annual nesting in Fresno County in both the Sierra and Sequoia National Forests. Localities include Fence Meadow Ridge (1,585 m [5,200 ft.]), Shaver Lake (1,676 m [5,500 ft.]; R. Acker, pers. comm.), Teakettle Experimental Forest (1,829 m [6,000 ft.]; J. Davis, pers. comm.), and occasional sightings in the northern portion of Tulare County and parts of Kern as in a burned/logged area on southwest Breckenridge Mtn (2,286 m [7,500 ft.]) in 1994 (NASFN 47:1151; M.O. Chichester, pers. comm.). The nesting sites of the small colony near Mariposa (Gaines 1992) were never actually located by the observer, but birds were last reported there in about 1987 (C. Lyons, pers. comm.). Another colony was found in 1984 near Jawbone Falls (1743 m [5,720 ft.]), TUO (K. Burnett, pers. comm.), but martins have not been seen there since the nest snag fell in 1985. I have been unable to determine their present status in the central Sierra Nevada; there may be irregular or remote small colonies, but I could not locate any definite records and I did not conduct field surveys there. Martins were reported from Pine Mountain Lake, TUO, in the early 1990s but my discussion with the observer left

doubt that they were in fact martins (not included in Appendix F). Regardless, they appear to be very local and rare at best. There have been no definite nesting records in the northern Sierra Nevada since last seen at the county courthouse in Auburn in the late 1970s (Mallette 1987; B. Mallette, pers. comm.). The exact fate of that Auburn colony is unknown, but there are cavities there still used by European Starlings and House Sparrows (BDCW, pers. obs.). It is possible that renovation of the courthouse during the late 1970s and early 1980s (?) discouraged nesting martins. The only recent sightings I am aware of are from Auburn on 12 April 1990 (ABN [D. Shuford]), Grass Valley on 3 June 1990 (ABN: Bruce Deuel), and Pike, SIE, 23 July 1983 (ABN: R.A. Erickson). These sightings indicate a possibility of rare and irregular nesting attempts by isolated pairs. However, a very recent sighting of at least ten birds north of Wolf Mountain, NEV, on 27 June 1998 (BDCW, pers. obs) almost certainly represents local nesting. I could not locate the nest site during an abbreviated search, but another search is planned for 1999.

All definite nest records since 1980 have been in conifer snags (n = 4).

Estimated Population: 10-140 pairs total. By county: LAS = 0-5; PLU = 0-5; BUT = 0-5; SIE =0-5; YUB = 0-10; NEV = 3-10; PLA = 0-5; ELD = 0-5; SAC = 0; AMA = 0-5; ALP = 0; CLV = 0-10; TUO = 0-15; MNO = 0; MRP = 0-10; MAD = 0-10; FRE = 5-20; INY = 0; TUL = 0-10; KER = 0-10.

Tehachapi Range

Historic Information: Although generally restricted in their travels, early ornithologists found martins locally but apparently regularly in the very large oaks of this range. J. E. McLellan reported them near Tehachapi in 1894 (Biological Survey Archives, USNM), and specimens were collected from nearby Keene in 1904 (LACM specimens). Fisher (1893) and Grinnell (1905b) found them nesting at Fort Tejon, Lamb and Howell (1913) found them nesting at Castac Lake, and Howard Cogswell saw them nearby at Lebec, KER, in 1952 (H. L. Cogswell notes).

Recent Information: The large, old oaks of this range provide enough nest sites to make the Tehachapis a very important region for nesting martins. In fact, this may be the only remaining region in the species' range where martins regularly nest in oaks. Although European Starlings are numerous at lower elevations, there are apparently enough cavities to support a substantial population of Purple Martins, mostly at higher elevations in the 1,200–1,850 m (4,000-6,000 ft.) range. They have been found nesting locally but regularly in the hills surrounding Bear Valley Springs (G. Hightower, pers. comm.; C. & J. Moore, pers. comm.), apparently where competition with starlings is frequent. They were also noted in the Tunis Ridge area on the Tejon Ranch in the mid-1980s (30-35 birds seen 21 May 1982), where Jesse Grantham thought there may be from 40-50 to 100 pairs in the area (J. Grantham, pers. comm.). Unfortunately, restricted access in most of the region has prevented a more complete survey. Block (1989) conducted field work in the area and did detect martins, but I have not been able to review his work.

Estimated population: 100-200 pairs total. By county: KER = 100-200.

East of Sierra Nevada

Historic Information: No known nesting records.

Recent Information: No known or suspected nesting records, although the species may occasionally be recorded as a late migrant as at Oasis Ranch, MNO, 31 May 1982 (S.F. Bailey notes). The source of such migrants is unknown, but could represent migrants heading to nesting locations in the Pacific Northwest or possibly vagrants from non-western populations.

Estimated Population: Zero.

Southwestern California

Historic Information: Although always localized within the region, Purple Martins were at one time fairly common in mountainous areas with an abundance of suitable nest snags, and were also present in the lower foothills and valleys where their colonization of adjacent urban areas was relatively well documented. In the mountainous districts, they have nested from the extreme north end of the region to the south end where martins of presumably the same race nest in similar mountainous areas of northern Baja California (Phillips 1986). They nested near Frazier Mtn Park, KER (AFN 6:265; Garrett and Dunn 1981); at Barley Flats (Edwards 1914), Charlton Flat, Pine Flats, the summit of Mt. Wilson (1,737 m [5,700 ft.]; Bryant 1924, Ross 1925; Appendix F), Chilao (Garrett and Dunn 1981), and elsewhere in the San Gabriel Mountains, LA (see

Appendix F). They were present but apparently relatively uncommon in the San Bernardino Mountains (Belding 1890, Grinnell 1908; Appendix F). They nested at various locations within the Santa Ana Mountains including Trabuco Canyon, ORA, and along the east side of the summit ridge in Riverside County (Pequegnat 1951; Biological Survey Archives, USNM [F.M. and V. Bailey]; see Appendix F); several places within the San Jacinto Mountains, RIV, including Fuller's Mill (1,798 m [5,900 ft.]), Lake Hemet and Hemet Valley, Kenworthy (Grinnell and Swarth 1913), and Hathaway Canyon (SBCM egg sets; see Appendix F); and in the higher ranges of San Diego County (Garrett and Dunn 1981; Unitt 1984) including the Palomar, Laguna, and Cuyamaca Mountains. Nest records from those area include Julian and the Laguna Mountains (Appendix F).

Widely reported colonization of urban areas in the late 1800s through the mid 1900s included at least eleven lowland towns: Santa Barbara (Ross 1925, SBMNH egg set); Santa Paula (Willett 1912) and probably Ventura, VEN (CM egg set); Long Beach (Willett 1912, 1933), Los Angeles (Perez 1910, WFVZ egg sets, Willett 1933), Pasadena (Osburn 1909, Bryant 1924, Willett 1933), Whittier (BL 23:208, AFN 7:291 [J. Tremontano]), and possibly Monrovia, LA (Garrett and Dunn 1981); Balboa and Balboa Isle (Ross 1925, Von Bloeker 1942; J.T. Marshall, pers. comm.), Santa Ana (Biological Survey Archives, USNM. [F.M. and V. Bailey], Bryant 1924), El Modena (Biological Survey Archives, USNM [F.M. and V. Bailey]), and possibly Anaheim, ORA (MVZ 136341); possibly Beaumont (UI 1960) and Riverside, RIV (FMNH 20720); and

Escondido, SD (Hatch 1896). No martins have been reported from these sites in recent years and apparently none of these colonies still exist.

Martins also nested in sycamores and oaks at other lowland and foothill locations such as near the coast at Gaviota, SBA (Lehman 1994); near Santa Paula, VEN (Evermann 1886); probably near the old Nigger Slough, near Gardena, LA (FMNH 141749-51); at Irvine and O'Neill Parks (see Appendix F), and possibly near San Juan Capistrano, ORA (Biological Survey Archives, USNM [F.M. and V. Bailey]; UCLA11811); and Escondido (WFVZ egg set; Sharp 1907), and San Onofre, SD (Dixon 1906; see Appendix F). Martins are no longer known to nest at most of these localities.

Reported nest substrates were in conifers (n = 21), buildings (n = 11), sycamores (n = 11), oaks (n = 5), and at least one partially submerged cottonwood in Lake Henshaw, SD (WFVZ egg set).

Recent Information: Nesting is now confined to only the higher ridges in the parts of the western Transverse Ranges, and the San Gabriel, San Bernardino, Santa Ana, and San Jacinto mountains (very rare and possibly irregular), and in the Palomar, Cuyamaca, and Laguna mountains (uncommon) in San Diego County. The only lowland locations where martins may nest is near San Onofre, SD (but there is no recent infomation from the site; P. Unitt, pers. com.), despite nesting at several sites in the 1970s (Sexton and Hunt 1979; see Appendix F). In the San Gabriel Mountains, the only known recent sightings are near Big Santa Anita Canyon (AB 47:1151; M. San Miguel pers. comm.), near Charlton Flat in 1986 (J.T. Marshall, pers. comm.), and one pair nesting in

a bigcone Douglas-fir (*Pseudotsuga macrocarpa*) snag in Powell Canyon, SBE, in 1990 (S.J. Meyers, pers. comm.). In the San Bernardino Mountains, at least one pair has nested near the head of the East Fork of Hemlock Creek from at least 1989-93 (S.J. Meyers, pers. comm.). The only recent evidence from the Santa Anas has been a pair just west of Trabuco Peak in 1988 and to the south in nearby Leach Canyon in 1985 (Orange Co. BBA). The species has also been seen in the San Jacintos in 1984 along Mellor Ranch Rd., and 1-2 birds also appeared near Lake Hemet in 1993 and 1996 (AB 47:1151; NASFN 50:997) where they probably nest in the area.

Within the region, the species appears to be most numerous in San Diego County. It is seen relatively frequently in the Palomar Mountains although the locations of the present nest sites are unknown (J.D. Robinson, pers. com; San Diego Co. BBA data). It may be most abundant in the Cuyamacas where nests have been reported from near Camp Cuyamaca in 1985 (CDFG files), Cuyamaca Peak (1,981 m [6,500 ft.]) since at least the mid-1980s (B. McCausland, pers. comm.; J.D. Robinson, pers. comm.), near Stonewall Mine Rd. in 1994-95 (P. Pryde, pers. comm.; B. McCausland, pers. comm.), and near Descanso in 1991-92 (G. Wynn, pers. comm.). They also nest at various locations in Laguna Recreation Area (B. McCausland, pers. comm.; see Appendix F), and a recent nest was found in the southern end of the county at Corte Madera Ranch (San Diego BBA data). A nest in a utility pole was also reported in 1998 along McGee Rd. in the northern end of the county (San Diego BBA data). Recent sightings at other locations include Volcan Mountain in 1993 (AB 47:1151 [P. Unitt]), Hot Springs Mtn in 1993 and

1998 (B. McCausland, pers. comm; P. Unitt, pers. comm.) and near Santa Ysabel and Lake Henshaw (B. McCausland, pers. comm.; San Diego BBA data).

Recently occupied nest sites have been in conifers (n = 12), sycamores (n = 2), a utility pole (n = 1) and a specialized nest box placed upon a snag on Palomar Mtn in 1985 (AB 39:963, J. Robinson, pers. comm.; see Mallette 1987). The sycamore-utilizing martins were last reported at O'Neill Park in Trabuco Canyon, ORA, in 1981 (Gallagher 1997), and the birds near San Onofre in 1978 may no longer be present.

Estimated Population: 50-160 pairs total. By county: KER = 0-10; SBA = 0-10; VEN = 0-15; LA = 5-15; SBE = 5-10; RIV = 5-20; ORA = 2-5; SD = 30-70; IMP = 0-5.

Mojave Desert Region

Historic Information: I have not located any mid-breeding season records in the region, although the species can be a very rare migrant, like one collected at Yermo, SBE, on 28 August 1910 (SBCM specimen).

Recent Information: No known or suspected nesting records. Migrants appear rarely but annually at desert oases such as Furnace Creek Ranch in Death Valley (e.g., 3 June 1989, AB 43: 537).

Estimated Population: Zero.

Colorado (Sonoran) Desert Region

Historic Information: There are apparently no published nesting records for the region, although migrants are recorded annually at oases such as the Salton Sea and lower Colorado River Valley, IMP (Garrett and Dunn 1981, Rosenberg et al. 1991). Rosenberg et al. (1991) did not find any records of nesting in the Colorado River Valley even though a distinct race of the Purple Martin (*Progne subis hesperia*; see summary in Unitt 1984) nests in saguaros in the deserts of Arizona and Mexico. (There are saguaros in California, but these were historically very rare and are now extremely rare [Rosenberg, et al. 1991, Hickman 1993]). However, two specimen records from Bard on 8-9 May 1921 (UCLA 5477, 5491) and one near Palo Verde on 13 May 1967 (LACM 66335) suggest limited numbers could have nested along the Colorado River. Of course, it is more probable that these were migrants headed toward breeding localities further north or wanderers from the desert race; without more details of these records, their historical status in this region is uncertain although they were undoubtedly very rare and local at best.

Recent Information: No known or suspected nesting records, only migrants (e.g., Massey 1998).

Estimated Population: Zero.

BREEDING BIRD SURVEY (BBS) RESULTS

There are 38 distinct BBS routes (of more than 200) on which Purple Martins have been detected in California (Appendix C). Of these routes, only eight have averaged at least one individual per survey from 1968-1997 (Table 1). Purple Martins were detected only once on 16 of the 38 routes on which martins have ever been detected, and on seven other routes martins have been detected only twice (Appendix C).

Purple Martin trend analysis from 1968-1996 exhibits a larger 95% confidence interval (-14.8 to 24.0) than has been seen for any species detected on 14 or more routes (a criterion used by the BBS in trend analyses) in California, except for Caspian Tern (*Sterna caspia*), Willow Flycatcher (*Empidonax traillii*) and Ruby-crowned Kinglet (*Regulus calendula*) (BBS trend data, courtesy Bruce Peterjohn, NBS). This large variation even exceeds that exhibited in colonial species such as Tricolored Blackbirds (*Agelaius tricolor*; known to be inadequately surveyed by the BBS), nomadic and irregular species such as Red Crossbills (*Loxia curvirostra*), and even non-passerines such as Osprey which are obviously very local. However, the 1994 BBS analysis did indicate a significant downward trend ($0.01<P< 0.05$) from 1968-1979 during which time detection on routes in the Southwestern Coast region ceased (Appendix C). The 1996 BBS trend analysis produced a marginally significant decline for the same time period ($P = 0.06$), though with such high variance this P value is probably significant

The Purple Martin was also one of only six passerines (among those detected on 14 or more routes: Ruby-crowned Kinglet; Mountain Bluebird, *Sialia currucoides*;

California Thrasher, *Toxostoma redivivum*; Black-chinned Sparrow, *Spizella atrogularis*; Lawrence's Goldfinch, *Carduelis lawrencei*) to have been detected on fewer routes (of those analyzed by the BBS) from 1980 to 1996 (n = 9) than from 1968 to1979 (n = 12), despite an increase in the number of routes in the state. Using all California routes on which martins were ever detected, martins were recorded on 30 routes during the 15 year interval from 1968 to 1982, but on only 21 routes during the 15 year interval from 1983-1997.

HABITAT RELATIONSHIPS

The bulk of the Purple Martin population (>70%) in California still uses trees as nest sites, particularly large remnant snags of coniferous species such as ponderosa pine (*Pinus ponderosa*), Douglas-fir, and coast redwood. The average dbh of 17 nesting stags measured in the study was 119 cm (47 in) (SD = 62, range 36-271). Excluding the three coast redwood snags that have been measured (two by me, the other reported by Bob Celentano to the CNDDB) decreases the mean to 99 cm (SD = 43, range 36-165). Excluding the two knobcone pines measured by Davis Suddjian increases the mean to 130 cm (SD = 57, range 58-271). The average dbh of 12 yellow pine (usually *P. ponderosa*, but possibly also *P. jeffreyi*) and Douglas-fir snags (one each measured by D. Suddjian and L. Sykes) was 110 cm (43 in) (SD = 36 cm, range 58-165). This is very similar to the 120 cm mean (SD = 39, range 51-227) of Douglas-fir snags used in Oregon (Horvath 1998). Table 4 summarizes these measurements. Even the smallest mean is significantly larger ($P < .001$, $t = 4.48$, $df = 16$) than the 50-53 cm dbh range often used to

classify snags as "large" snags (Bull 1983, Schreiber and deCalesta 1992, Saab and Dudley 1998). The number of nesting pairs was also significantly greater in larger trees than smaller ones ($P < .001$, $t = 4.25$, $df = 15$). A simple linear regression of nesting pairs by dbh demonstrated the same relationship ($r^2 = 0.66$; Fig. 5). Terrestrial coniferous nest snags that I observed but did not measure (n = 11) were at least two Douglas-firs in Napa County; one Douglas-fir or ponderosa pine in Lake County; two ponderosa pines in the vicinity of Michael's Hill, Monterey County; one Douglas-fir or ponderosa pine in The Geysers, Sonoma County; two coast redwoods along Branscomb Rd. north of Westport and two more redwoods near Cleone in Mendocino County; and one yellow pine north of Happy Camp Mountain in Modoc County. Among oak and sycamore nesting martins, nest trees were mostly living and large. The sycamores used at Andrew Molera Sate Park, Monterey County, are approximately 100-200 cm dbh, but I did not measure exact nest trees. Oaks used in the Tehachapi Range were also reported to be very large (C. Moore, pers. com), but these have not been measured.

Average snag height was 24 m (80 ft) (n = 17, SD = 12.4, range 8-45). This compares to the 19 m height (SD = 9.9, range 6-44, n = 22) reported by Horvath (1998). Nest cavities were usually located within the top 5 m of the snag, but I did not measure this. These tall snags were often isolated, but martins were most often found where clusters of snags occurred, though these "clusters" were often scattered over 10 km^2 or more, a situation very similar to that reported by Stutchbury (1991a).

All occupied snags were soft snags, with some having broken tops as well as having lost a considerable amount of bark, an observation noted by other observers (e.g., Dawson 1923, Bailey 1928; L. Comrack pers. comm. to Ron Schlorff 1985). The stage of decay ranged from 2-4 for Douglas-fir, which, in western Oregon, would represent snags that have been dead for approximately 5 to 125 years (Cline et al. 1980, Neitro et al. 1985). However, at least in one case this decay stage was relevant only to the dead upper portion of the tree (a dead top redwood) that martins were using and not the living lower portion. In Thomas et al.'s (1979) generalized classification of snag decay conditions this would range from stage 4 (loose bark) to stage 7 (decomposed). The exceptions to this trend appeared to be sycamores and oaks, many of which are still alive. However, there are just a few areas where martins are still known to use these hardwoods ($n = 5$), a number that has been reduced substantially from the number of historically occupied areas ($n \geq 30$) where the majority of lowland natural nest sites in Central Western California, Southwestern California, and the Sacramento Valley were in sycamores and oaks (Table 5).

The other recent trend has been the adoption of hollow-box bridges as nest sites, and these support a significant portion (~10-15%) of California' nesting martins (approximately 110 pairs). As of 1998, there were at least twelve bridges known to have hosted nesting Purple Martins, and another one that has been rumored to do so (Table 6). However, it is important to note that all of these adopted bridges are in areas where martins were already known or suspected of breeding nearby; in other words it is unlikely that any bridge currently utilized for nesting is (or was) situated outside of the cruising

radius of martins using nearby nesting sites. In Sacramento, martins transitioned from downtown buildings to bridges from about 1965-1974 (SAS; Airola and Grantham, unpubl. ms). Along Hwy. 1 in Mendocino and Sonoma counties, the Juan Creek Bridge is 5-6.5 km from the Westport/Wages Creek area (see Appendix F); the Big River site is next to the town of Mendocino and within 3-4 kilometers of Van Dam State Park, where martins were sighted previously and still occur nearby; Van Arsdale Reservoir is 6.5-8 km from the previously (and still) occupied Elk Mtn area, Lake County; and the Gualala River bridge is about 1.5 km from Gualala where martins were found before the turn of the century and where they very likely occurred in the area (and still occur; see Appendix F) until occupation of the bridge by 1975. Along Hwy. 1 in Monterey County, each occupied bridge is within 1.5-6.5 km of previous sightings in the Big Sur Region, Julia Pfeiffer Burns State Park, and the coastal ridge to the east. Whether martins use the Pine Valley bridge in San Diego County is unclear, but this site is near previously known nesting sites in Pine Valley and near the Laguna Mountains (see Appendix F). Note also that these bridges are over water, wooded areas, parking lots, and city streets, but nesting over highways or other high-speed roadways has not yet been reported.

Of the 35 nest sites at which I classified canopy cover (Table 7), all were in areas where canopy cover at or above nest height was less than 50% within a 100 m radius of the nest ($P < 0.001$, Kolmogorov-Smirnov $d_{max} = 18.0$), the majority less than 10% ($P < .001$, Chi-square = 51.6, df = 1) (Fig. 6). Traditional measures of canopy cover would have ranged from near 0 % to near 100% since martins nested in tall snags emerging above many habitat types ranging from water to nearly closed-canopied successional

woodland or mixed forest. I also observed that the nearest vegetation at or above the nest cavity height in the direction of the cavity was no closer than approximately 15 m (50 ft.) and was usually much greater. The nesting area with the greatest canopy cover at or above nest height was around the very large, living sycamores at Big Sur and Andrew Molera State Park, MTY.

DISCUSSION

SUMMARY OF DISTRIBUTIONAL RESULTS

Conclusively determining population trends with historical, non-systematic data is always difficult due to the variable extent of both historical and recent ornithological coverage. However, my findings from the distributional analysis confirm observations from many observers that there has been a reduction in numbers of Purple Martins throughout most of California since the late 1800s and early 1900s. This finding is undoubtedly real, since the recent increase in the number of field observers would tend to positively bias distributional changes (see Shuford et al. 1995), and I found no evidence of significant distributional expansions or population increases in any part of California with the possible exception of Sacramento (at least since the 1950s; numbers may not be significantly greater than the mid-1800s; see Heerman 1859, Ridgway 1877). The latter case is unusual considering the fact that of at least 20 urban sites active from the late 1800s through the 1970s, Sacramento is the only one remaining. Outside of towns and cities, lowland martin distribution appears to have contracted farther during the last 20-30

years (Table 2), such that lowland martin populations are much reduced in each region in the state, particularly the Central Valley, Central Western Coast, Sierra Nevada foothills, and Southwestern Coast. This shift is also reflected in martin use of nest substrates, as the use of sycamores and oaks (outside of the Tehachapi Range) is now rare; prior to the 1950s, Miller (1951) considered oak woodlands to support more martins that any habitat type other than the coastal forests. However, even in the forested regions of California, there have been declines in Southwestern California and at least parts of the Sierra Nevada, Central Western Coast, and probably other regions. In some regions, namely Northwestern California, the Cascade Range, and the Modoc Plateau, there were not enough historical data to conclusively determine population trends, although in the case of the Modoc Plateau the dramatic disappearance of martins from the adjoining areas of Oregon (Horvath 1998) is strong evidence that martins have also declined throughout the Modoc. Regardless, there has been no sign of range expansion or population increases in any of the northern regions of the state, and in some places apparent lowland contractions have taken place. Using population estimates by county and regions, I estimate that there may be approximately 800-1000 pairs of nesting martins (range 630-1740), although martins at known nest areas only account for approximately 350 pairs.

DISTRIBUTIONAL ECOLOGY OF PURPLE MARTINS IN CALIFORNIA

Purple Martins have always been widely distributed yet locally concentrated in California (and the western U.S.), and the various factors influencing their breeding

distribution have puzzled ornithologists (e.g., Grinnell and Storer 1924, Gaines 1992, Roberson 1993, Shuford 1993). Even Grinnell and Miller (1944) noted that while the species was fairly common, “many apparently suitable localities lacked this swallow.” While the rationale for that statement is not entirely clear, the usual puzzlement is caused by lack of martins where "apparently suitable" snags are available. The ensuing debate (if there is one) is typically over whether local food resources or some other factor restricts martins to local sites (Shuford 1993); in the end, such efforts to explain their enigmatic distribution have been unattempted, or remain speculative and inconclusive.

Unfortunately, trying to refine our understanding of this phenomenon is difficult for a few reasons. The first is that measurable factors typically used to describe breeding habitat for other species (e.g., plant community structure, plant species associations) may not be adequate for characterizing habitat relationships for this very wide-ranging aerial insectivore. Other than the availability and suitability of nest cavities, there are apparently few small-scale terrestrial or vegetative features that affect its local nesting distribution (see Brown 1997). It is for this reason that the use of relatively detailed plant community classifications (such as Holland 1986; see Appendix J) to describe and predict the range of Purple Martins, as desired by the California Department of Fish and Game in this study, has limited applications. Rather than responding to dominant plants or plant associations, martins may respond more to rare resources such as a lone snag or other physical attribute (e.g., building, bridge, lava tube, nest box). Alternatively, non-terrestrial or landscape-scale factors (features that may need to be measured over several square kilometers) that may significantly influence the species’ distribution include aerial

insect availability, especially larger insects such as adult dragonflies (see Doolittle 1919, Sprunt 1942, Walsh 1978; BDCW, pers. obs.); the presence of open water for drinking and bathing (and insect production; see Jackson and Tate 1974); and weather-related phenomena such as temperature, humidity, and perhaps the relationship of prevailing winds to local topography (conditions that may allow birds to forage more efficiently at distances away from the nest and/or to carry insects toward the nest sites). Such general features would be consistent with their habitat associations elsewhere (Brown 1997) and may explain why their density is highest in the relatively warm and humid Gulf States region of the southeastern U.S. (Peterjohn and Sauer 1995; Price et al. 1995), but these have not been directly studied. Another relationship that could inhibit our understanding of habitat relationships is the fidelity that martins show to existing breeding areas (Allen and Nice 1952, Johnston and Hardy 1962, Finlay 1971b, Lund 1978). Even though martins may, and often must, switch nest sites over time, they do not appear to readily colonize sites outside of traditional nesting areas in the west, and even in the east where martin housing may be relatively widespread and common, martins occur more frequently and in higher numbers in long-established martin houses than recently established ones (Jackson and Tate 1974). Theses observations coupled with the tendency of martins to select their specific type of natal nest substrate (i.e., wooden vs. aluminum housing; Hill 1994) would probably cause a lack of response to certain habitat features, and thus such behaviors could be masking the species' "real" relationship to such features (Wiens et al. 1986). Lastly, martins are relatively rare in California, and such rare species may not quickly respond to changes in habitats, if they respond at all (Brawn

and Balda 1988a). Despite these limitations, however, I believe that my study offers additional evidence that shows physical access to a cluster of suitable cavities is the most important limiting factor within their California (and western) range, as well as the most important determinant of whether or not martins persist in a given area.

Cavity Limitation and Snag Size

Virtually all of the published literature discussing populations of western Purple Martins has focused on cavity availability as the primary factor affecting the distribution and abundance of nesting populations. Cavity availability has been suggested as responsible for both local and regional population increases (Willett 1912, BL 25:227-228, Grinnell and Miller 1944, Lund 1977, Lund 1978, Fouts 1989, Fouts 1996, Horvath 1998) and population declines (Richmond 1953, Lund 1978, Remson 1978, Garrett and Dunn 1980, Sharp 1985, Roberson 1993). Not all cavity nesting birds are limited by nest sites in all situations (Brawn and Balda 1988a, Waters et al. 1990), but a lack of cavity limitation in secondary cavity nesters generally pertains to species with generalized cavity associations (i.e., species that can use a broad range of entrance sizes), multipurpose territories, and feeding habits that are directly related to the amount of terrestrial feeding substrate (e.g., foliage, bark)(Brawn and Balda 1988a). Martins do not fit these criteria. Their habits - use of cavities with relatively large entrance size, selection of open areas, and lack of defended feeding territories - are consistent with other findings that secondary cavity nesting birds that nest in relatively scarce substrates such as snags are limited primarily by a lack of nest sites (Hejl 1994). This seems to be

especially true of aerial insectivores such as Violet-green Swallows (*Tachycineta thalassina*) (Scott 1979, Scott and Oldemeyer 1983, Brawn and Balda 1988a), and these conditions may be expected to reach their peak in species that nest colonially or gregariously (Siegel-Causey and Kharitonov 1990) and select specific nest substrates, like Bank Swallows (Laymon et al. 1988). To a lesser degree, the preceding conditions also apply to Purple Martins, a species that may not select a specific substrate, but nonetheless appears to have specific preferences for sites with multiple unused cavities and certain characteristics (Stutchbury 1991a, Horvath 1998, this study). In fact, just as Lund (1978) noted in Oregon, definite localized population increases detected in this study were invariably related to local cavity increases, and furthermore, that persistent nesting areas are characterized by numerous, persisting cavities. Another observation that supports the cavity limitation hypothesis is that, within the present California range of the martin that I surveyed, I never encountered habitat that I would classify as excellent (i.e., with a concentration of numerous, very large snags dead for at least five years and located in an open area especially near water) without finding martins. Of course, a cluster of many cavities is naturally local, and this provides the best single explanation for why martins are local (Siegel-Causey and Kharitonov 1990). Combine this with the fact that not all snags may have suitable or available cavities, and this begins to help elucidate the martin's enigmatic distribution. This realization - physical access to multiple cavities is likely to be the most important determinant of whether or not martins exist and persist in a given area - helps to explain the positive relationship between Purple Martins and old, tall, large diameter trees.

Although the data presented here support the observation that martins choose very large trees for nesting, I did not try to rigorously demonstrate selection of such trees. In order to statistically demonstrate nest snag selection (versus association), one must find a significant difference between characteristics of used snags and non-used snags. In order to be meaningful, data on non-used snags must be collected within localized areas where martins are nesting, since it is not safe to assume that martins ever evaluated potential habitat away from nesting areas. (It is also possible that measuring snags outside of local nesting areas could be misleading since martins could be responding to factors other than nest site characteristics). But more importantly, comparisons among snags are confounded by not knowing if the non-used snags contain suitable cavities (i.e., cavities with suitable entrance diameters, volume, and condition) since woodpeckers are known to make many false cavities during cavity construction (see Neitro et al. 1985). In fact, Lund (1978) reported that 50% of apparent cavities he examined (presumably in pilings) were false cavities not suitable for martins; Stutchbury (1991a) found the same problem in saguaros. Unfortunately, many of the occupied snags I observed were old, soft snags without bark and considerably weathered, an observation noted by several other observers. Because this type of snag is dangerous to climb (Lilly 1992) and I had no field assistants, I did not try to examine nest cavities. However, such a positive relationship with large snags may be testable by comparing the persistence of lone pairs or small colonies with the persistence of larger colonies which tend to nest either in larger snags or in areas with high snag density (see also Lund 1978). I believe the last observation offers real potential in determining the persistence of a colony: the larger the

colony, the longer it may be able to persist in the face of temporary reproductive failure or other unfavorable demographic and environmental factors. It is also probable that martins benefit from nearby conspecifics in exploiting unpredictable food sources (Siegel-Causey and Kharitonov 1990), and social facilitation in general may benefit martins in ways we do not understand (Siegel-Causey and Kharitonov 1990). Although I did not collect enough data to properly analyze the relationship between colony size, persistence, snag diameter and height, and snag density, I believe that my limited data tend to support this positive correlation. The only site where a single pair of nesting martins was closely monitored was at a utility pole (which would likely represent the smallest "snag" found in this study) at Clear Lake, LAK. A pair of birds occupied this pole for three years (1989-1991), but martins have not been seen in the area subsequently, even though the pole is still standing (G. Dishman, pers. comm.). Another pair was reported using a utility pole in Pope Valley, NAP, in 1993, but I could not find them there in 1994.

Despite the problems with demonstrating nest snag selection, it is clear that the most consistent, long-term relationship between Purple Martins and their nesting habits in California is their association with old, tall, large diameter trees of all kinds. Grinnell and Miller (1944) summarized this relationship by noting that while exceptions existed, martins were typically found in "…areas where large trees occur…." The following are some of the comments included in the literature from California and nearby Oregon, listed chronologically:

"…nesting in holes of large trees…." (Cooper 1870)

"…preferring the dead tops of the loftiest red woods…." (Cooper 1970)

"…some old oaks…" (Emerson 1893)

"…nesting in woodpeckers' holes in the large oaks…." (Fisher 1893)

"…in a blasted pine stub some sixty feet from the ground." (W. W. Price *in* Barlow 1901)

"…in holes of lofty oaks." These oaks included "…an immense white oak, said to be the largest in California. It was 27 feet in circumference at the base, and was one of many others nearly as large.…" (Grinnell 1905b).

"…in a tall dead sycamore." (Dixon 1906)

At the top of a "…bare stub of an immense fir tree, about eighty feet high, and probably six feet through at the base." (Edwards 1914)

"A colony of about twenty pairs was nesting in large dead pine…." (Van Rossem 1914)

"…occupying a hollow limb in a giant pine…." (Dawson 1916)

"…about…a giant oak…." (Dawson 1923)

"A colony…nesting…in dead stubs of a large living sycamore…" (Grinnell et al. 1930)

From Lake County, Oregon: "…in the tops of a clump of giant old yellow pines…" (Gabrielson and Jewitt 1940)

From Mount Nebo, Oregon: "…close groups of magnificent, gray, coniferous snags almost devoid of limbs and from 150 to 200 feet in height." These "…huge snags…" were "…supporting what appeared to be the major Purple Martin colony for this part of the county…." (Richmond 1953)

"…utilize old, tall sycamores, pines, etc…." (Garrett and Dunn 1981)

On the two known nest sites in Marin County: "…in a large dead snag…" and in an area of "…numerous large snags." (Shuford 1993)

"…most are situated high in large dead snags." (Shuford 1993)

A variety of factors could account for a relationship between Purple Martins and big trees. Such trees are more likely to persist than smaller trees (Keen 1955, Bull 1983, Neitro et al. 1985, Morrison and Raphael 1993), attract large woodpeckers (Scott 1978, Thomas et al. 1979, Mannan et al. 1980, Raphael and White 1984, Nietro et al. 1985, Schreiber and deCalesta 1992, Saab and Dudley 1998), and contain more cavities per tree (Scott 1978, Scott and Oldemeyer 1983). Tall trees are also likely to offer suitable

nesting cavities longer than shorter trees which are more quickly obstructed by regenerating forest in successional habitats, and higher nesting cavities are likely to be safer from terrestrial predators (Nilsson 1984, Morton and Derrickson 1990, Li and Martin 1991). Various authors have also reported that martins avoid nesting in lower cavities in favor of the highest cavities, both in martin houses (Morton and Derrickson 1990, Brown 1997) and saguaros (Stutchbury 1991a). This apparent preference for high nest sites, presumably at least in part to avoid terrestrial predators, tends to be corroborated the observation that martins tend to nest lower above water than above land (Horvath 1998, BDCW, pers. obs.). It may also be possible that very large trees are more visibly conspicuous to martins, and attract martins more readily than small trees. Prospecting martins may locate potential nesting habitat by looking for conspicuous features in the landscape that they have associated, either innately or through previous experience, with success in finding suitable cavities (Johnston and Hardy 1962).

The 119 cm mean dbh reported here (110 cm excluding redwoods and knobcone pines), is much larger than the largest minimum size class recommended for snag retention in U.S. Forest Service guidelines (though these vary by district and local use; e.g., see Morrison et al. 1986), and is also more than double the 50-53 cm minimum diameter often used to classify snags as "large snags" (e.g., Neitro et al. 1985, Schreiber and deCalesta 1992, Saab and Dudley 1998; G. Studinski, pers. comm.), despite a small sample size. Furthermore, this average may be smaller than average for snags used by martins in forested areas of northern California for at least three reasons. First, the two knobcone pines (36 and 38 cm dbh) represent a 12% contribution to the mean dbh of nest

snags used by martins. This percentage is disproportionately large, as this association has not previously been reported in the literature and is undoubtedly rare, if only because small snags are not likely to attract big excavators. Secondly, the bulk of the martin population nests in coastal northwestern California where large coast redwoods and Douglas-firs are likely to provide a substantial number of nest sites. Finally, inaccessible nest snags that I did not measure were clearly larger than the two smallest snags I measured, which were satellites around obviously larger snags with a greater number of martins (above Conn Valley Rd., Napa County, and near SMUD Geo-1 in The Geysers, Sonoma County). This phenomenon is understandable since historical logging practices were concentrated in the most accessible places first, leaving only relatively inaccessible trees (Evans 1993, Henson and Usner 1993, Hejl 1994). Of course, large trees are most valuable commercially, and in most places large, old trees are now uncommon (Henson and Usner 1993, Hejl 1994; BDCW, pers. obs.), especially on privately owned timberlands (Bolsinger 1980, Gutierrez 1994; BDCW, pers. obs.). Very large snags are also relatively more rare in the open successional habitats that martins use, and generally will not be replaced in any area where current silvicultural practices are used to optimize timber production (e.g., see Thomas et al. 1979, Mannan et al. 1980, Neitro et al. 1985, Li and Martin 1991, Ohman et al. 1994).

Other Effects of Forest Management on Martin Habitat

Forest management practices may also affect martins in other ways. Johnson and Cicero (1985), for example, noted that the major change on San Benito Mountain from

1944-1984 was the transition to a denser forest, causing some changes in the mountain's breeding avifauna, including the loss of Purple Martins. Twentieth century fire suppression has caused the same successional trend in the San Bernardino Mountains (Minnich et al. 1995), the Sierra Nevada (McKelvey et al. 1996), and likely the great majority of the forested areas of the state. This trend has widespread consequences, (e.g., see Biswell 1989, Hejl 1994, McKelvey 1996), one of which is the very likely negative impact on Purple Martins (Marshall 1963, Brawn and Balda 1988b). In the forested areas of California where the bulk of martins nest (and historically nested; e.g., Cooper 1870, Grinnell 1898, Willett 1912, Grinnell and Miller 1944), fire suppression practices undoubtedly play an important role in reducing the amount of habitat available to some colonies. This can occur by 1) allowing successional growth to overtake nesting snags and visually obstruct the airspace around the nest site, and 2) by preventing the creation of accessible snags, even where very large green trees may be fairly common. Marshall's (1957, 1963) research in Arizona and Mexico provides valuable insight into the effect of fire suppression on martins. From 1951-1953, Marshall compared the avifauna between the mountains of southern Arizona and the Sierra Madre of Mexico. Among his most significant observations was that the forests and woodlands of Arizona had become denser than the otherwise similar forests and woodlands of Mexico. The only major difference in climate and/or management to which he could attribute this pattern was that fires in Mexico were allowed to burn, while in Arizona fires were suppressed. Not coincidentally, Marshall only found martin colonies in the tall, well-spaced snags of the Sierra Madre forests; he did not find martins in the mountains of southern Arizona,

despite their historical presence in the region. In addition to the two obvious effects of fire suppression listed above, it is also well documented that suppression practices have increased the frequency of catastrophic fires. Such fires generally promote the succession to denser, even-aged stands of smaller trees rather than open areas of larger trees, and in some areas may even reduce the range of coniferous forest (Henson and Usner 1993). While such catastrophic fires are generally regrettable, they do have the potential to create very good, short-term (<100 years) martin habitat such as the 1955 Haystack fire west of Yreka (the only reliable Siskiyou County location outside of Lava Beds; R. Ekstrom, pers. comm.) and the 1977 Marble-Cone fire in the Santa Lucia Range of Monterey. Unfortunately for the martins, salvage logging practices not only reduce the density of snags, but quite understandably tend to eliminate the largest trees since these are the most valuable (e.g., see Cline et al. 1980). I observed this practice in burn areas such as the Fountain Fire (64,000 acres in 1992) and Lost Fire (20,000 acres in 1987; both M. Whitesman, pers. comm.) in Shasta County and the 1997 (?) burn west of Indian Valley Reservoir in Lake County where extensive snag removal eliminated otherwise potentially excellent nesting habitat. In fact, among areas I visited in this study it was very apparent that snag retention on logged or burned forest varied between private vs. public lands as well as among various forest service districts. There was a tendency for concentrations of martins to be found on unlogged private (non-commercial) lands such as in Napa County and The Geysers, or in protected wild areas such as the Ventana Wilderness and Garland Ranch Regional Park, rather than on commercial forest lands or even national forests without deliberate retention of multiple large snags (G. Studinski,

pers. com.). Even without salvage logging *per se*, it is a routine practice to remove snags on ridges (the most common topographic relationship detected in this study) as they are considered fire hazards (Neitro et al. 1985; Fay Yee, Jackson State Demonstration Forest, pers. comm.).

On the other hand, such losses to succession and salvage logging may be locally offset by logging of dense forests, especially in the dense redwood and fir forests of Northwestern California where martins occur in some logged areas as long as large snags persist (this study; for Oregon, see Schreiber and deCalesta 1992, Gilligan et al. 1994). This phenomenon is precisely why determining population trends in this region is inconclusive: the widespread opening of dense forests may have counterbalanced presumed population losses due to reduced numbers of large snags and competition with European Starlings. However, in this productive region even tall snags may be quickly overtaken by forest regeneration, especially from rapidly growing redwood crown-sprouts (Shoenherr 1992, Henson and Usner 1993; B. Celentano, notes to CNDDB). It is likely that the natural grassy balds and regular fires (Raphael et al. 1988, Schoenherr 1992) of the region provided the necessary openings for martins before widespread timber harvesting in the region.

An inspection of the BBS data led me to an interesting finding that may help elucidate this discussion of snag associations and forest management. The only route with a clearly increasing trend in the number of martins during this study was Glen Ellen in Napa County, with a lesser increase on the Point Reyes route (BBS routes 14-202 and

14-071; see Appendix C). This increase is directly attributable to the number of martins in the Howell Mountain/Conn Valley Rd. area east of St. Helena (BBS data; G. Clifton, pers. comm.; BDCW, pers. obs.). This site was the location of a 1978 burn (2, 025 acre Deer Park Fire - ?) burn, leaving many Douglas-fir snags. Unlike most burned lands I visited during this study, however, the landowners intentionally left the burned forest untouched, allowing unmanipulated forest succession and numerous snags atop the ridges and hillsides (pers. comm. with the caretaker of Glendale Ranch). In June 1994 there were at least nine pairs of martins here. This is not an overwhelming concentration of martins, nor are the snags exceptionally large, but the burn size and snag density here probably represent conditions that martins historically encountered, and which, if more widespread, would almost certainly support additional colonies of Purple Martins in California.

Population Changes and an Examination of Other Potential Limiting Factors

An interesting trend since the 1960s has been the local adoption of concrete hollow-box bridges as nest sites. On the one hand this is yet another example that confirms the species' exceptional flexibility in selection of nest *substrates*. Nest sites have ranged from snags and nest boxes to rock piles, cut banks (M. Udvardy, pers. comm.) and cliffs (Bancroft 1930), caves, niches in buildings, wooden pilings, and even moving equipment such as a pivoting bridge in Oregon (Richmond 1953) and an oil rig in Florida (Maehr et al. 1988; see also Brown 1997). Just as very large snags are not *absolutely* required for nest sites, neither are snags (see Gray and Craig 1991). But the

other interesting fact is that these bridges offer a *concentration* of large cavities. Despite all kinds of man-made structures that are routinely used by similar sized cavity nesters such as starlings, this particular bridge type is the only man-made nest site martins have adopted in recent years, and various colonies seem to have done this independently. Moreover, none of the adopted bridges (at least undisturbed ones) have yet been permanently abandoned. This is important evidence that martins select nesting areas with multiple, concentrated nest cavities. It may be just a matter of time before martins begin to expand into other bridges throughout their range, especially within a few kilometers of existing colonies. This appears to be the case in Sacramento County, where martins seen at a bridge near Antelope in July 1998 (S. Abbott, pers. com.) offered the first evidence of significant range extension since the Sacramento colonies were first recorded in the 1800s. Martins may also be attracted to the spacious cavities of these bridges, since martins are known to select larger cavities (Brown 1997), and large cavities promote larger clutch sizes of secondary cavity nesting birds (Robertson and Rendell 1990; BDCW, unpubl. data). However, the suitability of these bridges as nest sites is questionable since premature fledging (due to poor nest cavity design; see Brown 1978b for a similar critique of nest box designs) could cause significant losses of nestlings and lower productivity. In addition, not all bridges are suitable. The major reason for this is that not all bridges are in areas open enough to be accessible to martins; others may be unsuitable due to high-speed traffic which may discourage or kill martins.

The most conspicuous and dramatic distributional trend detected in this study was the confirmation of population declines and/or contractions in the lowland areas of the

state. In some cases, especially the coastal areas of Southwestern California, habitat destruction has undoubtedly caused local losses of lowland nest sites, as Evermann's (1886) descriptions of Ventura County's Santa Clara River Valley would tend to confirm. At sites where martins nested in buildings, demolitions, renovations (In 1959 Edwin Pickett noted that the destruction and repair of old buildings in downtown Sacramento eliminated many nesting sites; ABN), altered construction techniques, or even earthquakes (see Appendix F for L. Stevens' comment about the 1925 earthquake in Santa Barbara. And could the disappearance of martins from San Francisco be due to the loss of nest sites provided by brick buildings in the 1906 earthquake?) may have made once-occupied buildings unsuitable or unavailable. But loss of cavities due to habitat destruction, building changes, or attrition cannot be the only factor, since there appear to be numerous cavities still remaining at several once occupied but now vacated nesting areas, including at long time nesting areas such as Irvine Park, O'Neill Park, the Santa Ynez River Valley, the Salinas River Valley, and several old buildings. Of course, in northern California, lowland nesting martins have also disappeared in areas where habitat still exists (e.g., Sacramento Valley, Sierra Nevada foothills). Losses of foraging habitat and decreased insect availability may be partly responsible, but it would be difficult to reconcile that assumption with the large Sacramento colony that has grown significantly since the late 1960s - early 1970s period. A more plausible hypothesis is a loss of available nest cavities, primarily due to competition with European Starlings. This explanation seems to be more consistent with the distributional findings than any other single factor, including habitat loss or deterioration. First, starlings are generally

expected to compete with Purple Martins, since both species are secondary cavity nesters that need relatively large entrance holes (see van Balen et al. 1982, Nilsson 1984, Weitzel 1988). Starlings are also early and usually multi-brooded and colonial nesters (Cabe 1993, Shuford 1993; BDCW, pers. obs.), and starlings generally outcompete martins in direct interaction (Brown 1997). Thus, martins would either be forced to abandon a nest site or wait until the limited cavities are vacated. In the eastern U.S. where martins and starlings may occur together in high densities, starlings may quickly occupy unmanaged martin housing to the exclusion of martins, especially in smaller colonies (Brown 1977, Brown 1981, Brown 1997). Second, the timing of martin decline in the 1950s-1970s was the main period of European Starling colonization and expansion in California (Small 1994). Third, European Starlings are now nearly ubiquitous nesters in California, especially in lowland areas, and they are usually absent only from dense forests, extensive chaparral, and high elevations (Roberson and Tenney 1993, Small 1994, Stafford 1995, Gallagher 1997; BDCW, pers. obs.). These are exactly the opposite trends exhibited by martins: the latter have declined most conspicuously in lowland areas since the 1950s and persist in good numbers only where starlings are uncommon or absent (Roberson 1993, Shuford 1993, Burridge 1995, Gallagher 1997; this study) or where cavities are very abundant and starling foraging habitat is limited (as in downtown Sacramento). Finally, European Starling population expansion leveled off in the 1980s and 1990s (1996 BBS trend data and analysis; see also Cabe 1993, Johnston and Garrett 1994), a period during which martin populations did not show any obvious patterns of regional decline.

In addition to the circumstantial evidence given above, Horvath (1998) also implicated starlings as a major reason why martins have declined in Oregon. Specifically, he mentioned that an increase of starlings at Coos Bay (where there is plentiful foraging habitat for starlings) in the 1960s and 1970s was marked by a concurrent loss of martins, so that martins are now rare at Coos Bay. Conversely, at nearby Tenmile Lake where the forested surroundings offer little foraging habitat for starlings, Horvath reported that starlings were uncommon and martins were numerous. In California, probably the best location to examine the present (and past) effects of competition with starlings is in the Tehachapi Range. This is because both martins and starlings are relatively numerous, interspecific interactions have been detected, and there appears to be some segregation by elevation and habitat (C. Moore). Eventually however, competition with starlings here may be minor compared with the more significant long-term threat due to a lack of oak regeneration (e.g., Adams et al. 1990).

Although European Starlings appear to be an important cause of martin declines in lowland areas through at least the 1970s and early 1980s, there are other factors that could limit the availability of nest cavities, such as a lack of production due to a decline in primary cavity excavators. However, this does not appear to be the case in lowland areas or elsewhere in the state. At every occupied, recently occupied, and unoccupied breeding location in appropriate habitat with snags, I encountered at least one species of large woodpecker (Lewis' Woodpecker, *Melanerpes lewisii*; Northern Flicker, *Colaptes auratus*; Acorn Woodpecker, *Melanerpes formicivorus*; and Hairy Woodpecker, *Picoides villosus*, though it is not clear if all cavities excavated by this species are large enough for

martins), but usually two and sometimes three. In addition, California BBS trend data from 1968-1996 do not indicate significantly negative trends for any of these larger primary cavity excavators in California except for an annual 1.2% decline of Northern Flickers from 1968-1996 (P = .02). Though a loss of cavity-excavating flickers (an important excavator in snags that martins use) could be significant, I suspect this decline is more apt to reflect loss of habitat rather than a decline of flickers within existing habitat. Also, this trend only reflects California's breeding population, not the large wintering population which also excavates cavities (though this population also may have declined; see Morrison and Morrison 1983). Of course, the majority of lowland martins in the south and central coastal areas and the Central Valley appeared to use sycamores, and sycamores tend to form numerous natural cavities even without the aid of woodpecker excavation (Finn 1991; Appendix F comments; BDCW, pers. obs.).

As martins are cavity nesters, availability of nest sites is an obvious factor to investigate. But I should at least briefly explore other hypotheses that could be invoked when trying to explain trends in California martins populations. Considering all the historical and recent information, it would seem logical that limited food availability would be another reason why martins have always been relatively local, and, as Grinnell and Miller (1944) noted, do not saturate apparently suitable habitat. This hypothesis has merit. First, the temporal and spatial distribution of aerial insects is likely to be patchy over large regions with varied vegetation and topography (Pedgley 1990, Siegel-Causey and Kharitonov 1990), and this would tend to promote local breeding of martins (Siegel-Causey and Kharitonov 1990). Second, the fact that martins did not obviously increase in

Sacramento (or at any other bridge site) during the 1992-1995 census period suggests a limiting factor other than nest cavity availability. Third, I noted a tendency of martins to forage in the direction of the prevailing wind, especially from ridges in mountainous areas (e.g. Happy Camp, Michaels' Hill). Using the wind to aid in gliding, especially by gliding downward into the wind then using the wind to push martins back to higher elevations, could considerably reduce daily energy expenditure (Utter and LeFevre 1970, Hails 1979); this would presumably reduce the time required for maintenance foraging and therefore decrease the time between food delivery to the nest (Walsh 1978). Theoretically, such behaviors would promote greater reproductive success and larger numbers of nesting martins; in turn, this would promote increased resilience and persistence at such locations. This phenomenon could help explain why martins seem to be most numerous along the coast where relatively consistent westerly winds allow birds to forage toward the coast, then ascend to nest sites without much energy expenditure. It is also consistent with Pedgley's (1990) assertion that "...mountains, and particularly coastal mountains, are likely to be the places most favourable to the concentration of flying insects, because of the variety and frequency of suitable atmospheric disturbances." (Of course, there are alternative explanations, not the least of which is that such topographical conditions would be expected to be positively correlated with fire frequency and hence snag distribution).

It is frustrating, then, to realize that it would be difficult to test this food-limiting hypothesis either by directly measuring aerial insect availability or making indirect measures of suitable foraging conditions, such as the simple but effective soil

penetrometer measurements used by England and Laudenslayer (1989) to describe Bendire's Thrasher distribution. And it would be especially difficult to test the effects of food availability on reproductive success for Purple Martins, even in managed colonies (hypothetical in California) where collection of reproductive data is possible. Although such studies have been successfully undertaken for Tree Swallows (*Tachycineta bicolor*) (Hussell and Quinney 1987), martins generally forage at heights (perhaps especially in California and the west, as martins regularly forage at heights above those described by Brown 1997; e.g., see Richmond 1953) where meaningful, ground-based collection of aerial insect samples would be difficult. In addition, martins feed more frequently on larger prey than other swallows, prey such as adult dragonflies (order Odonata) that are likely to be more diffuse and therefore more difficult to sample with methods other than visual counts. Nonetheless, food availability does not appear to be the primary factor in limiting martins within their known California range, for reasons discussed previously as well as the fact that if invertebrate availability or quality were significantly reduced throughout all areas where martins have declined, then populations of other aerial insectivores might also be expected to be reduced.

The population trends of aerial insectivores in California are mixed. BBS trend analyses do not indicate any significant downward trends for White-throated Swifts (*Aeronautes saxatalis*), Tree Swallows, or Cliff Swallows (*Hirundo pyrrhonota*); however, Vaux's Swifts (*Chateura vauxi*), Violet-green, Northern Rough-winged (*Stelgidopteryx serripennis*), and Barn Swallows (*Hirundo rustica*) have declined. Of course, these birds may occur in different habitats and are also affected by the availability

of particular types of nest sites. These sites are very different in Northern Rough-winged Swallow, Cliff Swallow, and Barn Swallow, and are only sometimes shared by Tree Swallows which usually require close proximity to water and often select small snags (Schreiber and deCalesta 1992; BDCW, pers. obs.). Vaux's Swifts and Violet-green Swallows were the most common aerial associates of Purple Martins in this study (BDCW, pers. obs.), and are most similar to Purple Martins in nesting habits (see Marshall 1957), especially since both Vaux's Swifts (Bull and Ohmann 1993) and Violet-green Swallows (San Miguel 1985, Schreiber and deCalesta 1992; BDCW, unpubl. notes) have been shown to select large trees. It is interesting then that both of these species have shown consistent declining trends: a significant annual 5.2 decline ($P = 0.02$) in Vaux's Swifts and a marginally significant 1.8 annual decline in Violet-green Swallows ($P = 0.07$; and the –2.8 trend from 1980-1996 is significant, $P < 0.01$). It seems likely that all three of these species are being negatively affected by a loss of large trees, particularly large snags.

If insect declines were responsible for martin declines, perhaps by causing reduced reproductive success and/or longevity, a relation to pesticide use or other contaminants might be found. If contaminants on the breeding grounds were responsible, one might expect fairly widespread declines, but especially in those areas with the highest exposure. Presumably, these would be in agricultural and urban areas. Pesticides and other airborne chemicals are probably relatively uncommon along the north coast where not only applications occur less widely but also where prevailing westerly winds would help push polluted air eastward. This area, of course, is where martins are most

numerous. Since pesticides are used most commonly in urban and agricultural lowlands, one cannot rule out the possibility that pesticides have reduced habitat suitability for lowland nesting martins because these areas are where martins have declined the most. A notable exception, however, is Sacramento, which sits in the Central Valley and is directly east of large-scale agriculture in Yolo County. In addition, although Pacific Coast martin populations declined throughout their range after the 1940s –1960s (see Horvath 1998), they have increased tremendously in the Pacific Northwest with nest box programs (Fouts 1989, 1996; NASFN 49: 968; Horvath 1998). So, again, while insect availability is far from a trivial factor, nest site availability probably supercedes insect availability as the most important limiting factor.

Despite the recent tendency to attribute the decline in many of our breeding birds to factors on their wintering grounds (e.g., consult the papers in Hagan and Johnston 1992), perhaps from habitat loss or pesticides (e.g., Dickcissles, *Spiza americana*, and Swainson's Hawks, *Buteo swainsoni*), evidence suggests that such causes are not responsible for depressing martin populations. James Hill, executive director of the Purple Martin Conservation Association (pers. comm.), has noted that wintering martins are especially abundant about plantations, and they roost by the thousands in city parks or even in industrialized areas (Hill 1988; Hill 1993). Although they do feed over habitats such as agricultural fields that may be sprayed with insecticides, potentially subjecting martins to both direct and indirect exposure, it seems less likely an aerial insectivore would be affected, since their prey would be grounded and therefore unavailable. Regardless, if population declines were generated by any factors away from the breeding

grounds, one would expect declines in California martin populations to be widespread, assuming (1) that winter distribution is similar for all martins that breed in California (i.e. lowland nesting martins do not winter separately from mountain nesting martins); and (2) martins return to previous nest sites first without looking for more favorable sites. These two assumptions are probably safe ones, since adult martins show high fidelity to previous nest sites (Allen and Nice 1952, Johnston and Hardy 1962, Lund 1978; but see Brown 1997 for a caution against making conclusions from finite study areas). The main distributional trends discussed previously conflict substantially with this expectation, and suggest that increased mortality or lower productivity caused by factors generated away from the breeding grounds would be of minor significance.

Another possibility, considering California's rapid human population growth, is for human disturbance to have caused at least local population declines in Purple Martins. However, unlike many species of sensitive or otherwise rare birds, Purple Martins seem to be rather unaffected by generalized human activity. Although pairs or colonies may respond with alarm calls to an approaching visitor, this behavior is generally short-lived towards those who show no interest in harassing them (BDCW, pers. obs.), and allow closer approach than most other birds of similar size and under the same disturbance regimes (Cooke 1980, Williams 1994). In addition, the literature is full of examples of colonies that tolerated an extraordinary array of human disturbances while still successfully raising a brood (e.g., Richmond 1953). Moreover, it is very unlikely that human disturbances in urban areas are now different from human disturbances fifty years ago, yet almost all urban populations have disappeared.

Finally, there may be underlying climatic changes driving this entire process, perhaps by creating intolerable physiological conditions in California (or decreased food supplies; see above). Johnson (1994) analyzed the distributional changes among 24 species of passerines and hypothesized that the most consistent climatic variable that could account for such widespread changes in California and the western U.S. (from the 1960s) was increased summer moisture and humidity, with lesser effects from increased temperature. Invoking the same argument to explain martin declines is counterintuitive since such conditions would be expected to aid range expansion in California. Martins are generally found in more humid regions within the western U.S. and their eastern abundance is greatest where summer humidity and temperature are generally highest. In Arizona, martins even time their breeding to coincide with the summer rainy season (Stutchbury 1991a), much later than martins at other low latitude locales such as southern California and Texas. It is also counterintuitive, since unlike the marginal range changes reported by Johnson, martin declines have taken place not at the margins, but within its range. Moreover, you would not expect martin populations in California to exhibit clearly distinct population trends from populations in the Pacific Northwest, yet the nesting population there has definitely increased in recent years while there is no evidence for increasing populations anywhere in California (with the probable exception of Sacramento where an increasing number of available nest sites is almost certainly responsible).

MANAGEMENT IMPLICATIONS

One of the problems with conserving Purple Martins and martin habitat has been both a lack of information and false information. For example, the final environmental impact statement for the very large Cleveland Fire area on the El Dorado National Forest (El Dorado National Forest 1993) did not include Purple Martins as possibly occurring in the region, despite having historically nested in the project area (Barlow 1901). This is not surprising considering that important references such as Verner et al. (1980) did not include martins as nesters in the entire western Sierra Nevada, despite having continuously nested in the region. In addition, other important and comprehensive management publications such as Ruggiero et al. (1991) did not list Purple Martins in any of the papers dealing with management of Douglas-fir forests, although Purple Martins are probably most closely associated with Douglas-fir than any other tree in northwestern California and Oregon (Horvath 1998, this study). Clearly, there is a need for some solid information on both the historical context of Purple Martins and their management.

Snag and Forest Management

The most significant threat to the bulk of California's Purple Martin population (which utilizes open forests and woodlands for nesting) appears to be the loss of tall, large diameter snags. Shortages of snags are not new. Although their studies were conducted at the margins of the martin's range, both Morrison et al. (1986), and Ohman et al. (1994) concluded that snag density is below not only ideal conditions for cavity nesting birds in general, but that snag conditions on at least selected federal lands were

also below forest service guidelines (Morrison et al. 1986, Morrison and Raphael 1993). In very few places I visited did there appear to be adequate retention of clusters of large snags in areas that had been recently burned or logged. Potentially exacerbating this problem are the recent salvage logging proposals that may worsen conditions that are already less than marginal. Furthermore, this study provides evidence that established guidelines for cavity nesting birds are probably inadequate to provide for Purple Martin habitat. I would caution those urging management for any single wildlife species, but managing for forests and woodlands with a number of large dead and dying trees provides multiple benefits for a broad spectrum of wildlife (Thomas et. al 1979, Neitro et al. 1985, Schreiber and deCalesta 1992, Hejl 1994). Therefore managing for martin habitat is not a single species issue.

In general, I would suggest that land managers try to mimic historical conditions, namely by allowing forest fires when possible, and more importantly, by retaining clusters of large snags when fires do occur (many authors have suggested this, even for Puprle Martins: e.g., Jackman and Scott 1975. See also Saab and Dudley 1998). More specifically, open clusters of several snags ≥100 cm dbh should be retained (or created) if populations are to persist in a defined region, but managers should try to retain as many snags as possible that are ≥70 cm dbh. Snags smaller than this are not likely to host a persistent colony of martins unless snags occur at high densities and favorable places, such as at large bodies of water. Snags should also be as tall as possible, especially in forested areas or where succession could soon overtake short snags. Snags shorter than

6-8 m are not likely to be used unless they occur in very favorable sites such as bay-shores. If topping is considered desirable, it should be done not less than 12 m (40 ft) from the ground, preferably as high as possible. When considering timber harvesting, priority for retaining snags should be on sites where snags are most likely to persist and be accessible and attractive to martins. This means that snag reserves should be located in relatively open areas (0-40% canopy cover at or above nest height), remote from starling foraging habitat, and near bodies of open water. Such reserves may be best located on or near ridges where it would likely take longer for successional growth to overtake nest snags (and martins may prefer ridges for other reasons; see Discussion), yet near patches of woodland or forest that could serve as a source of cavity-excavating woodpeckers as well as reduce the amount of habitat available to starlings. Tree species selection should also be considered, as Douglas-fir (Cline et al. 1980, Lowell et al. 1992) and redwood are most resistant to decay. Local knowledge of other conditions that may enhance snag longevity (such as soil drainage; e.g., Keen 1955) should also be considered. Horvath (1998) independently recommended the best long-term strategy would be to retain more snags greater than 100 cm dbh and 20 m tall. He added that such snags should be more than 10 m from large live trees.

Of course, retention of large snags is dependent on the existence of large trees, and this may require longer stand rotation in managed forests. Local forest models of snag recruitment may be applied to determine recruitment rates for suitable snags, but in most areas of California this will require trees well over 100 years old (e.g., Mannan et al. 1980).

Mitigation Guidelines

The most important part of mitigating for martin habitat loss (as is required for government agencies by the California Environmental Quality Act, as Purple Martins are presently listed as a "Species of Special Concern" by the California Department of Fish and Game), is recognizing if martins even exist in the area. This is best achieved by consulting the available literature and local bird experts, and by on-site surveys. If surveys are conducted, I recommend the use of "look-see" methods described below to search for nesting martins. If nesting habitat will be unavoidably lost, I recommend following the management guidelines discussed previously. However, it it should be recognized that restoration of martin habitat (i.e., growing big trees) will require a very long-term perspective. If those guidelines are not attainable, then it may be worth thinking about placing nest boxes in the area if the site meets the criteria mentioned below. However, one must realize that such strategies may quickly fail without long-term monitoring and maintenance. If there is no locally acceptable alternative, I recommend exploring the adoption of offsite mitigation banks, although the site must be very carefully selected in order to increase the probability of use by martins.

Monitoring

Breeding Bird Survey data are the primary source of information for determining broad-scale population trends for most of California’s birds. However, because Purple Martins are generally local and rare, the BBS will generally detect only the most general Purple Martin population trends in California or elsewhere on the west coast. It is clear

that another method must be adopted to monitor martins. Of course, this not just a problem unique to martins, and many techniques have been devised to monitor bird populations (e.g., Bibby et al. 1992, Ralph et al. 1993).

The best existing surveys, although not ongoing, are associated with the various county breeding bird atlas projects, and the atlas results are generally the most recent and thorough sources of information of local bird distribution in California. Observers familiar with local habitat and bird populations put in many hours in the field covering defined geographical areas, often more remote ones than are covered by more casual birders (the source of most distributional records). Using these methods, observers can more efficiently accumulate observations of martins than if using other methods such as point counts. However, breeding bird atlases also have limitations - especially so for Purple Martins. For example, there are several counties that have been atlased in which only a percentage of blocks were surveyed, usually excluding those that were most remote. Because Purple Martins are so localized, a random selection of blocks could miss some or all of the breeding population of a county; excluding remote blocks may even be more biased against finding Purple Martins. In the Sonoma County Breeding Bird Atlas, for example, 12 blocks were not accessed due to steep topography, rough terrain, or private land, especially the mountain ridges in the eastern part of the county (where it shares its border with NAP & LAK) and the coastal northwestern mountains away from the immediate coast. These areas are some of the most likely to host nesting martins. Another problem with atlas design is that not all of the assigned geographical area (often 5 km x 5 km) must be covered, so colonies can be missed. For example, the

one day that I spent in the Santa Lucia Range of Monterey County in 1993, I found a nesting colony of 4-5 pairs that was unrecorded during the 1988-1992 atlas period. Although the possibility exists that the particular colony did not exist during the years of the atlas project, it is more likely that this colony was overlooked. A final shortcoming of atlas design is a lack of population numbers. Few atlases contain population estimates, although with some additional effort estimates of populations sizes are possible (see Roberson and Tenney 1993, Shuford 1993). Another associated problem, although not a fault of atlas design, is determining actual nesting status. Many martins travel well over a 1.5 km from the nest on a daily basis, and Richmond (1953) found that martins nesting on forested ridges in Oregon had a daily cruising radius of up to 32 kilometers (20 miles). This can be a problem because locally nesting martins will often visit non-used nest sites (BDCW, pers. obs.), possibly even during these longer excursions from the nest site (Brown 1997; BDCW, pers. obs). This can exacerbate atlas efforts by producing probable nesting evidence in blocks adjacent to those where the birds are actually nesting.

I recommend that future survey and/or monitoring efforts use the general area search (i.e., look-see) methods used in my study and indirectly recommended by Shuford (1993) and others. This method is the same as the methodology that has been used in searching for other colonial species that shift breeding places over time, such as Bank Swallows (Laymon et al. 1988) and Tricolored Blackbirds (Beedy and Hamilton 1997). The main difference between surveying for martins and other colonial species is that martins may occur in a broad range of habitats and in remote locations. Consequently, conducting surveys for martins is likely to be less efficient. Assuming that resources are

limited, the most important consideration when designing a survey methodology is the objective of the study. If the main objective is to find martins (i.e., as in a distributional study), I believe that surveys can be made more efficient by observing the following:

Selection of Survey Area and Identification of Special Habitat Features

Conduct suveys in:

1. Areas where martins have been sighted within the last 5-10 years, and any area that historically hosted nesting martins.

2. Low to mid-elevation forests that have experienced large fires within the past 50-60 years. Fires seem to be the main cause of mortality among snags used by martins. Very recent fires (less than 5 years) may not be worth surveying because cavities would probably be few and martins would be unlikely to colonize so soon.

3. Hollow box bridges, primarily along coastal highways but also elsewhere.

4. Ridges with accessible snags.

5. Landscapes with multiple cavities, especially as afforded by numerous large trees and where starlings are not abundant.

Sample Protocol

Dates: Behavior at the nest varies significantly during the breeding cycle and counting is easiest before egg-laying and after hatching (when the adults are most active outside of the nest). However, at sites with multiple martins, it is likely that there will be many stages occurring simultaneously. Surveys should probably wait until most migrants have arrived, which in most areas in California is by mid-May. Surveys may detect martins at nest sites through mid-August, but some nesters may begin to depart the nest area by early-July or earlier.

Time of Day: Martins can be detected at any time of day, but they are most vocal in the pre-dawn hour and within the first few hours of the morning. The early evening within an hour of darkness also tends to be a period of renewed activity near the nest. This may be the best time to count martins during the incubation period as females may emerge from nesting cavities and large foraging groups may occur. They tend to be less vocal in the afternoon and evening, and it is possible to miss martins near the nest site at this time if visits are short (less than 0.5 –2.0 hours, depending mostly on how many birds are nesting in the area).

Population Estimates: The best way to count nesting sites would be by mapping the use of cavities, but this is often impractical. At least try to follow BBA criteria, noting specific behaviors to identify martins as confirmed or probable nesters. If the nest site is not located, try to count number of individuals by sex. It seems reasonable to conclude that in almost all cases the minimum number of nesting

pairs can be estimated by the number of adult males; in many situations this still will likely be an underestimate.

Cautions: Beware of vocal imitation by other species. Martins are loud and conspicuous near nesting areas, and birds that imitate are likely to incorporate martin vocalizations. I spent 25 minutes trying to find distant martins calling from a canyon south of Table Mountain in Napa County. It turned out to be a California Thrasher giving a loud and excellent imitation of a Purple Martin, and the thrasher was distant enough that only the loud martin imitation could be heard.

Opportunities for Management Using Nest Boxes

There is very good potential for increasing Purple Martin colony size and reproductive success in several areas in California by using starling-proof nest boxes or even hollow gourds. The most important dimension for such boxes is the location and size of the entrance: the 3.2 cm high x 7 cm wide (1 ¼ in x 2 ¾ in) opening should be flush with the floor and one side (D. Fouts, pers. com.; Horvath 1998). The floor space should also be ample; one proven design has an internal floor space of 25 cm x 15 cm (10 in x 6 in) and 18 cm (7 ¼ in) height. The latter dimensions are not as critical as the entrance size; use the most efficient design based on available materials. For individuals and groups who may be interested in experimenting with various ways to attract Purple Martins, the following checklist criteria are meant to help to decide whether or not their efforts would be worthwhile. I also recommend consulting Richmond (1953), Lund (1977, 1978), Sharp (1985), Fouts (1989, 1996), and Horvath (1998).

Checklist criteria for deciding the feasabiliity of using nest boxes (starling-proof) to enhance Purple Martin breeding efforts:

(1) Persons are willing to monitor and maintain all boxes on at least an annual basis, preferably as frequently as possible to collect reproductive information.

(2) Vandalism is not expected to be a problem.

(3) Purple Martins have previously been found in the area.

(4) The area has a limited supply of existing nest cavities.

(5) The site is removed from areas where House Sparrows are common or likely to colonize.

(6) The site is within a few kilometers of a body of open water.

Efforts to attract martins may be most effective along the north coastal California bays and lagoons where insects and martins are most plentiful. This region is also structurally and ecologically similar to areas in coastal Oregon where there are established populations of martins using nest boxes (Lund 1977, Fouts 1989, Fouts 1996; Horvath 1998). The Purple Martin Conservation Association may also be willing to aid such efforts as well as publish any results.

Table 1. BBS routes in California that have averaged at least one Purple Martin per year, excluding years in which the route was not completed. Range gives the numbers observed during all years; (n) gives the total number of surveys completed. The 1990-97 column shows the average number counted during that period and the number of years the route was completed (maximum possible n = 8 years). Trend is from visual inspection of the data, and is not a statistical analysis.

Route	County	Mean, Range (n)	1990-97 (n)	Trend
014 Fish Rock	Mendocino/Sonoma Counties	6.9, 0-15 (29)	7.6 (8)	variable-steady
005 Honeydew	Humboldt County	4.3, 0-15 (22)	0.8 (6)	decreasing
183 Bartlett Springs	Lake County	4.2, 0-12 (21)	0.7 (3)	decreasing
075 Rio Dell	Humboldt County	2.3, 0-11 (20)	0.2 (6)	decreasing
182 Laytonville	Mendocino County	2.1, 0-11 (23)	0.6 (5)	variable
006 Holmes	Humboldt County	1.5, 0-8 (23)	0.1 (7)	decreasing
071 Point Reyes	Marin County	1.5, 0-8 (23)	3.5 (8)	variable-increasing
202 Glen Ellen	Napa County	1.3, 0-10 (26)	4.3 (8)	increasing

Table 2. Summary of Purple Martin nesting status in California.

REGION	PRE-1950s	1950s-1970s	1980-1998	Nest Substrates[1] - % of Population	Estimated Nesting Population
Northwestern California	Local, fairly common to uncommon	Unknown, probably similar to Pre-1950	Difficult to tell; probably similar to pre-1950	conifer snags - hollow bridges - submerged snags - 5%	250-650 pairs
Cascade Range	Very local, rare to uncommon	Unknown; no reports during period	Status apparently similar to pre-1950s	submerged snags - conifer snags - (buildings)	35-125 pairs
Modoc Plateau	Very local, rare to uncommon	Unknown	Difficult to tell; probably similar to pre-1950	lava tubes – 50% conifer snags -	18-80 pairs
Central Western California	Local, fairly common to rare	Status similar to pre-1950, but with general loss of lowland populations	Status similar to post-1950: local and uncommon to rare	conifer snags - hollow bridges – 10% floodplain[2] - 20% submerged snags (oak woodland) - ? (buildings)	100-210 pairs
Central Valley	Local and uncommon in towns and along major rivers	Status similar to pre-1950	Definite range contraction; only known from Sacramento	hollow bridges – 95%+ (floodplain) - ? (buildings)	70-170 pairs
Sierra Nevada	Very local, uncommon to rare	Definite range contraction	Status apparently similar to post-1950s	conifer snags – 90%+ (oak woodland) - ? (buildings)	20-120 pairs
Tehachapi Range	Local, fairly common to uncommon	Unknown; no reports during period	Difficult to tell; probably similar to pre-1950 but less numerous at lower elevations	oak woodland – 100%	100-200 pairs
East of Sierra	None (but see Ridgway 1877, Ryser 1985 or Alcorn 1988)	None	None		zero
Southwestern California	Local, uncommon to fairly common; expanded into urban districts	Definite range contraction, especially from lowland sites	Continued range contraction; almost restricted to highest mountains	conifer snags – 90%+ hollow bridges? (floodplain) - ? (lowland buildings) (oak woodland) - ? (submerged snags)	50-160 pairs
Mojave Desert	None	None	None		zero
Colorado Desert	None	None	None		zero

[1] Nest substrates no longer known to be used in a region are enclosed in parentheses.

[2] Floodplain nest substrates consist mostly of western sycamore (*Platanus racemosa*), but also include valley oak (*Quercus lobata*), cottonwoods (*Populus* sp.), and arborescent willows (*Salix* sp.).

Table 3. Number of nesting pairs and hours censused at each Sacramento colony. In parentheses are the two alternative population estimates (see Methods).

Location	**1993**	**hrs.**	**1994**	**hrs.**	**1995**	**hrs.**
Interstate 5 @ I St.	not censused	N/A	15 (24-25)	23	13 (15-21)	11
Hwy. 50 @ 20th St.	? (?-48)	6	27 (32-39)	16	25 (28-40)	15
Hwy. 99 @ Broadway	3 (3-10)	6.5	2 (2-4)	13	1 (1-3)	6.5
Hwy. 50 @ 34th & T Sts.	? (?-30)	5	~18? (~22?-27)*	?	~25? (~27?-38)*	?
Total	? (?-88+)	17.5	~62 (~80-98)	52	~64 (~71-106)	32.5

Table 4. Size of conifer snags used as nest sites by Purple Martins during this study. Dimensions (dbh = diameter at breast height; height = to top of tree) are in centimeters and meters respectively, with English units in brackets. Pairs indicates minimum number of Purple Martins nesting in the snag.

County	Site	YR	Species	dbh [in]	Ht [ft]	Pairs	Comments
Lake	Geysers, Lakeview Rd.	1995	ponderosa pine	110 [43"]	31 [100']	1+	
Lake	Glenbrook Rd./Kelsey Cr.	1994	Douglas-fir?	142 [56"]	14 [45']	2-3	
Lake	Howard Mill, 1 mi. N	1995	Douglas-fir	130 [51"]	43 [140']	2-3	
Lake	Howard Mill, ½ mile N	1994	ponderosa pine	119 [47"]	26 [85']	1-2	
Lake	Little Round Mtn.	1994	Douglas-fir or Ponderosa pine	165 [65"]	8 [27']	1+	
Lake	Little Round Mtn.	1995	Douglas-fir?	58 [23"]	14 [45']	1	
Marin	Limantour Rd.	1998	Douglas fir	162 [64"]	40 [130']	2+	
Mendocino	Cleone	1997	coast redwood	150 [59"]	23 [75']	3+	nearby snags inaccessible
Mendocino	Pudding Cr./Little V. Crk.	1992	coast redwood	208 [82"]	15 [50']	3+	
Modoc	Happy Camp Mtn.	1998	yellow pine	74 [29"]	11 [35']	2-3	nearby non-used snag was 48 cm
Monterey	Michael's Hill, NE	1993	Ponderosa pine	117 [46"]	??	1+	
Monterey	Garland Ranch, Redwood Cyn.	1994	coast redwood	271 [107"]	45 [150']	6+	dbh from a partly burned tree. In life = 290-300
Napa	Howell Mtn./Conn Valley	1994	Douglas-fir	84 [33"]	17 [55']	1+	
Napa	Glendale Ranch East	1994	Douglas-fir	N/A	30 [100']	1	not accessible to base
Santa Cruz	Barrett Canyon	1989	Douglas-fir	96 [38"]	44 [144']	1	
Santa Cruz	Gamecock Canyon	1996	knobcone pine	38 [15"]	22 [72']	1	
Santa Clara	Croy Ridge	1988	knobcone pine	36 [14"]	20 [66']	1	
Sonoma	Geysers, SMUD Geo 1	1994	Douglas-fir or ponderosa pine	61 [24"]	12 [40]	1	other inaccessible snags all larger

Table 5. Known locations where martins used oaks or sycamores for nesting.

Region	Co.	Site	Substrate	Pairs	Extant	Year
CV	BUT	Sacramento River, near Chico	oaks & sycamores	3+	no	1903-1906
CV	SAC	Sacramento	sycamore	2	no	1979
CV	TEH	Sac River, Tehama & Woodson Br.	sycamores	6+	no	1924-1973
CV	TEH	Red Bluff, Silva's	sycamores and cottonwoods	4+	no	1928-1976
CW	ALA	Cedar Mtn.	oak	1+	no	1938
CW	MTY	San Antonio River	oaks	3+	no	1894+
CW	MTY	Big Sur & Andrew Molera S.P.	sycamores	3-6?	YES	1971-1997
CW	MTY	Hastings Reservation	oaks	2+	NO	1942-1950+
CW	SBA	Foxen Canyon	sycamore	1+	no	1937-1969
CW	SBA	Nojoqui Falls S.P. (Gaviota)	sycamores	6+	YES	1932-1994
CW	SBA	Santa Ynez River (Santa Ynez, Solvang, Buellton)	sycamores	17+	yes	1928-36
CW	SBA	Alisal Ranch	sycamores	4+	?	1928-1938
CW	SCL	San Antonio Valley Rd.	oak	1+	no	1971
CW	SCZ	Ben Lomond Mtn.	oaks	3+	no	1898+
CW	SLO	Paso Robles	oak	6	no	1912+
CW	SLO	Shandon district	oak	1+	no	1932+
CW	SLO	Atascadero?	sycamores	2+	yes	1912-1996
CW	SLO?	Mansfield	oaks	4+	no	1894+
SN	MRP	Yosemite Valley	oaks	1+	NO	1893
SN	NEV	Grass Valley	oaks	4+	no?	1920s
SW	LA	San Fernando Valley, west of	oaks	2+	no	1890's
SW	ORA	Irvine Park	sycamore	1+	no	1960
SW	ORA	Caspers (Starr-Viejo)	sycamore	1+	no	1960-1979
SW	ORA	Fullerton, near	sycamore	1+	no	1899+
SW	ORA	Trabuco Canyon (O'Neill Park)	sycamores	2+	no	1907-1980
SW	SBA	Gaviota, near	sycamore	1+	no	1932
SW	SD	Cuyamaca, Green Valley	oak	1+	no?	1954
SW	SD	Pine Valley	oak	1+	no	1974
SW	SD	Laguna Ranch	oaks	2+	?	1894+
SW	SD	Julian	oaks	2+	no?	1915
SW	SD	Escondido	sycamore	1+	?	1902
SW	SD	San Onofre	sycamores	6+	?	1904-1978
TH	KER	Bear Valley Springs	oaks	30+	YES	190?-1998
TH	KER	Tejon Ranch	oaks	15-50	YES	1891-1986

Table 6. Bridges occupied by nesting Purple Martins. All of these are the hollow-box type. "Year" denotes the year in which martins were first reported using the bridge.

Co.	Site	Year	1998	Pairs	Comments
MEN	Hwy. 1/Big River	1986	unknown	1-2	Retrofit construction on this bridge in 1996? may have caused at least temporary abandonment
MEN	Hwy. 1/Juan Creek	1986	assumed	1-3	
MEN	Van Arsdale Res./Eel River Rd.	1993?	unknown	1-3	
MTY	Hwy. 1/Buck Creek	1992	assumed	2-6	My examination of weep holes suggested 4-5 pairs in 1993. See methods for Sacramento sites.
MTY	Hwy. 1/Torre Canyon	1981	assumed	10-15?	Examination of weep holes suggested 4-5 pairs in 1993. The 10-15 estimate (Roberson 1993) seems too great.
SAC	Capital City Freeway/?? St.		unknown	1-2	Apparently abandoned for several years, probably due to construction under bridge. I first saw them return in 1997.
SAC	I-5/Railroad Museum	1974	yes	15-20	Transitioned from nesting in downtown building to bridges from about 1965-1974.
SAC	Hwy. 50/34th St.	1973	yes	18-28	
SAC	Hwy. 50/20th St. RR	1967	yes	25-30	
SAC	Hwy. 99/Hwy. 50	1991	assumed	1-4	
SAC	Antelope Rd./Roseville Rd	1998	probable	2-3?	
SD	Pine Valley Bridge	199(?)	unknown	?	Second-hand reports of possible bridge use.
SON	Hwy. 1/Gualala River	1975	assumed	3-5?	

Table 7. Canopy cover (at or above nest cavity) as visually estimated within a 100 m radius of nest sites I visited during this study.[1]

County	**Location**	**Year**	**Cover**	Comments
LAK	Geysers, Lakeview Rd./High V. Crk.	1995	3	Ponderosa pine 116cm dbh, 100 ft.; 80 ft. cavity
LAK	Glenbrook Rd./Kelsey Cr.	1994-95	2	Douglas-fir (?) 142cm dbh, 45 ft.; cav. 30 ft.+
LAK	Howard Mill, 1 mi. N	1995	1	Dg.-fir 130cm dbh, 140 ft; cav. 90 ft.+
LAK	Howard Mill, 1/2 mi. N	1994	1	Pond. pine 119cm dbh, 85 ft.; cav. 70 ft.
LAK	Indian Valley Res., Kowalski Ranch	1995	1	Submerged *P. lambertiana* snags
LAK	Indian Valley Res./Cache Creek	1995	2	Submerged oaks, gray pines in reservoir
LAK	Indian Valley Res./Stanton Cr.	1995	1	Submerged *P. lambertiana* snags
LAK	Little Round Mtn.	1994	1	Snag (Dg.-fir or pine) 165cm dbh, 27 ft.
LAK	Little Round Mtn. SE	1995	1	Douglas-fir (?) 58cm dbh, 45 ft.; cavity 35 ft., above NOFL nest.
MEN	Cleone, MP 66.65	1997	1	Redwood 150cm dbh, 75ft. Others not measured
MEN	Cleone, MP 66.65	1997	1	Redwood snag not measured
MEN	Cleone, MP 66.65	1997	1	Redwood snag not measured
MEN	Van Arsdale Res./Eel R. Bridge	1994	2	At least one pair in weep hole over water.
MOD	Happy Camp	1993	1	Pine snag on ridge overlooking burn.
MOD	Happy Camp	1993,98	1	Pine cm dbh, ft.
MTY	Andrew Molera SP	1997?	1	sycamore
MTY	Andrew Molera SP	1998	2	sycamore
MTY	Andrew Molera SP	1993	3	in scattered sycamores.
MTY	Big Sur Town	1993	3	At least one nest in sycamore.
MTY	Buck Creek/Hwy 1	1993	2	At least four holes occupied. 4 ad. males; one subadult pair.
MTY	Garland Ranch, Redwood Cyn.	1998	1	Redwood 271cm dbh; 45m.
MTY	Michael's Hill	1993	2	Also include E edge of Sect. 7.
MTY	Michaels' Hill NE	1993,98	1	
MTY	Michael's Hill NE-2	1993,98	2	
NAP	Howell Mtn./Conn V. Rds.	1994	2	Douglas-fir 84cm dbh, 55 ft.
NAP	Howell Mtn./Conn V. Rds., N	1994	2	Large Douglas-fir from 1978 fire.
NAP	Howell Mtn./Conn V. Rds., NE	1994	1	Douglas-fir, 100ft, cavity at 60 ft.
SHA	Shasta Res., Pit Arm	1994-95	1	Submerged snags.
SHA	Shasta Res., Pit Arm	1994-95	1	Submerged snags.
SHA	Shasta Res., Pit Arm	1994-95	1	Submerged snags.
SHA	Shasta Res., Pit Arm ()	1994-95	1	Submerged snags.
SIS	LBNM, Post Office Cave	1993	1	
SIS	LBNM, Skull Ice Cave	1998	1	
SON	Geysers, SMUD Geo 1 (1)	1994	1	61cm dbh. Other colonial snag larger
SON	Geysers, SMUD Geo 1 (2)	1994	1	Large snag not accessible

[1] Classes of Percent Canopy Cover: 1 = <10%; 2 = 10-24% ; 3 = 25-49% ; 4 = 50-75% ; 5 = >75%

Figure 1. Regions used in describing breeding range (from Hickman 1993).

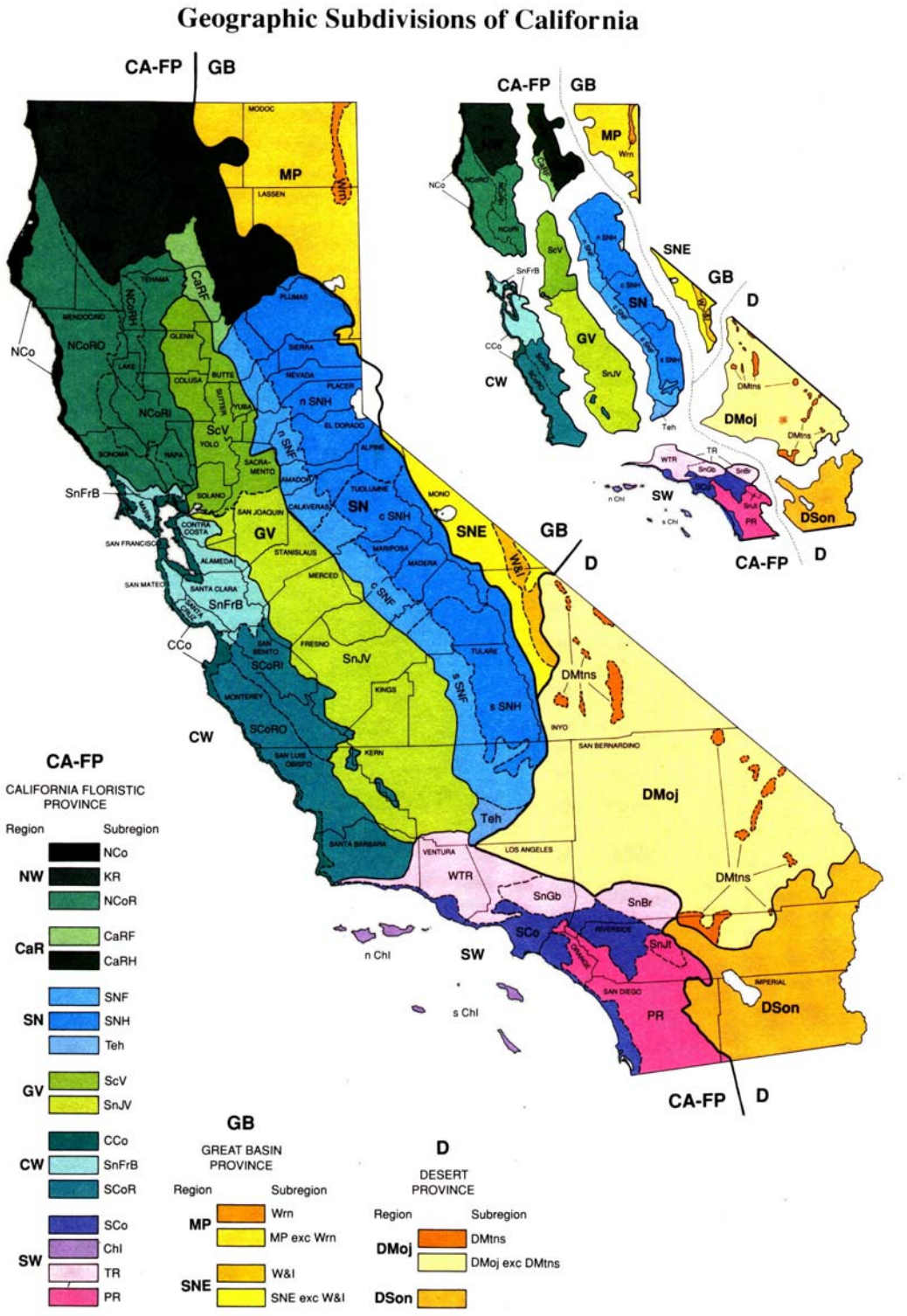


Figure 2. Diagram of hollow concrete box bridge used by nesting martins.

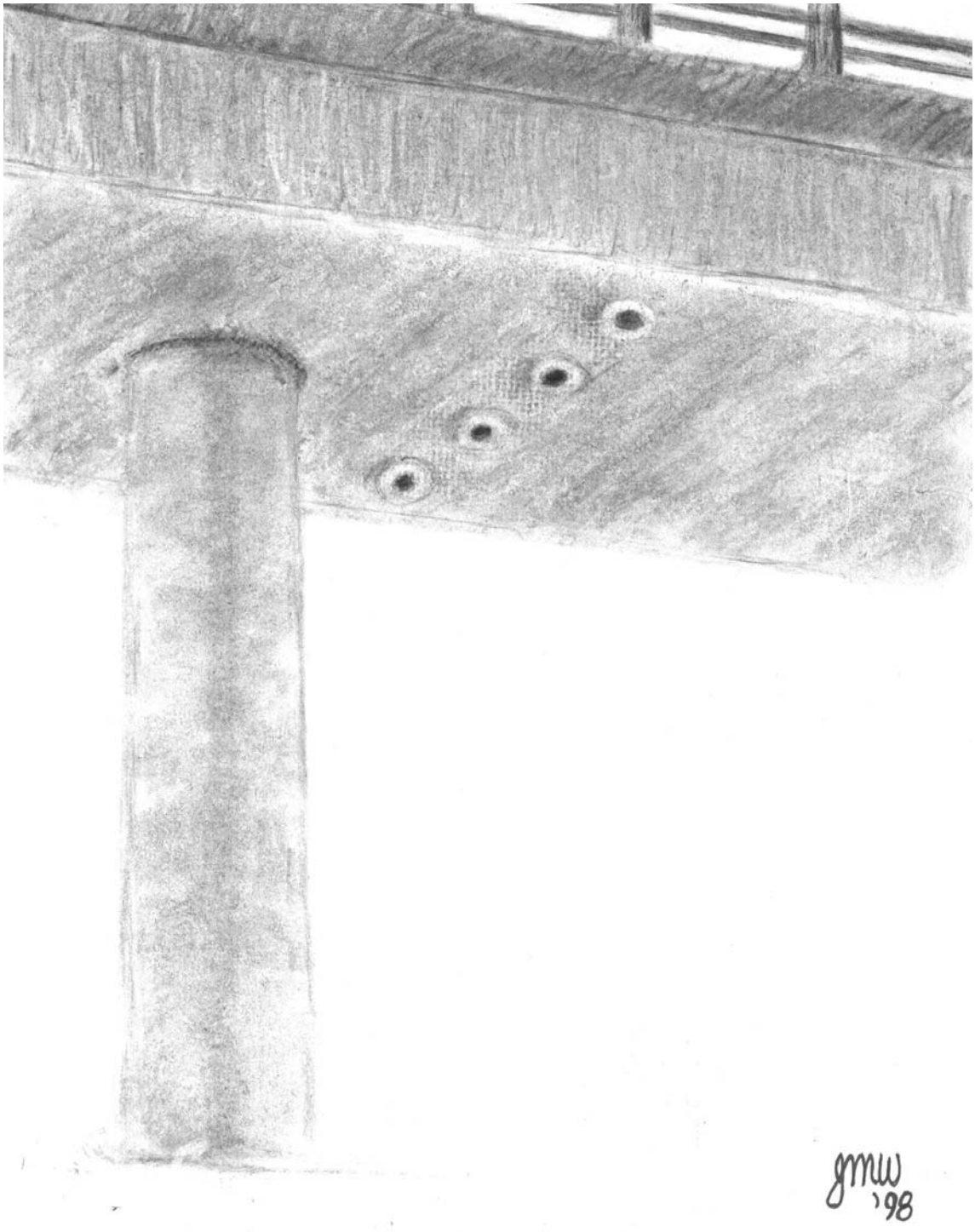


Figure 3. Method used in estimating canopy coverage. Canopy cover taken above a horizontal plane through the nest cavity.

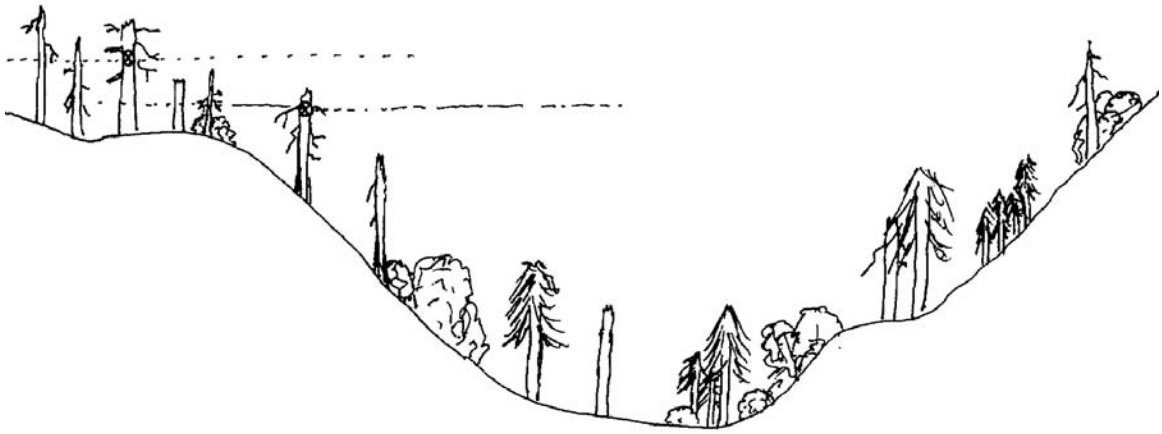


Figure 4. Approximate percentage of Purple Martin population by region.

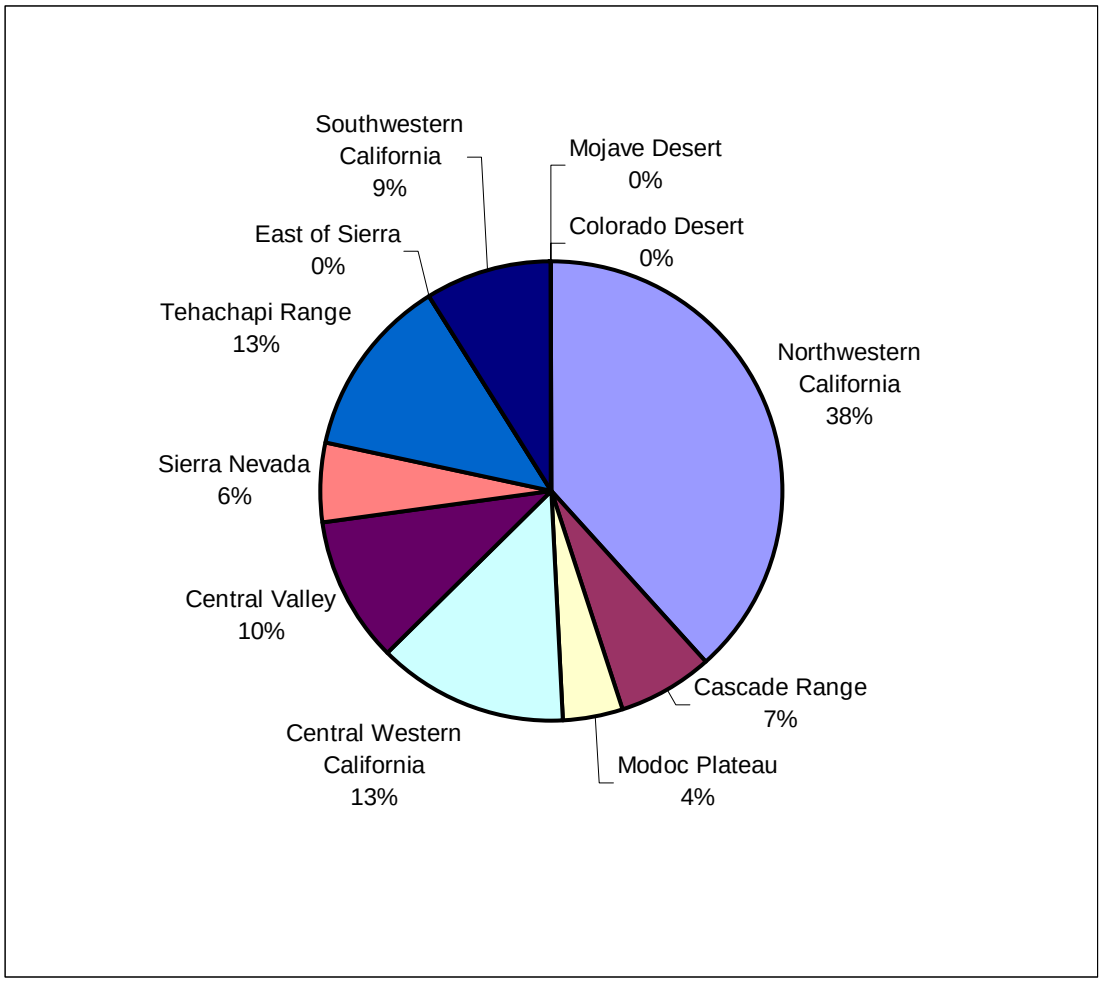
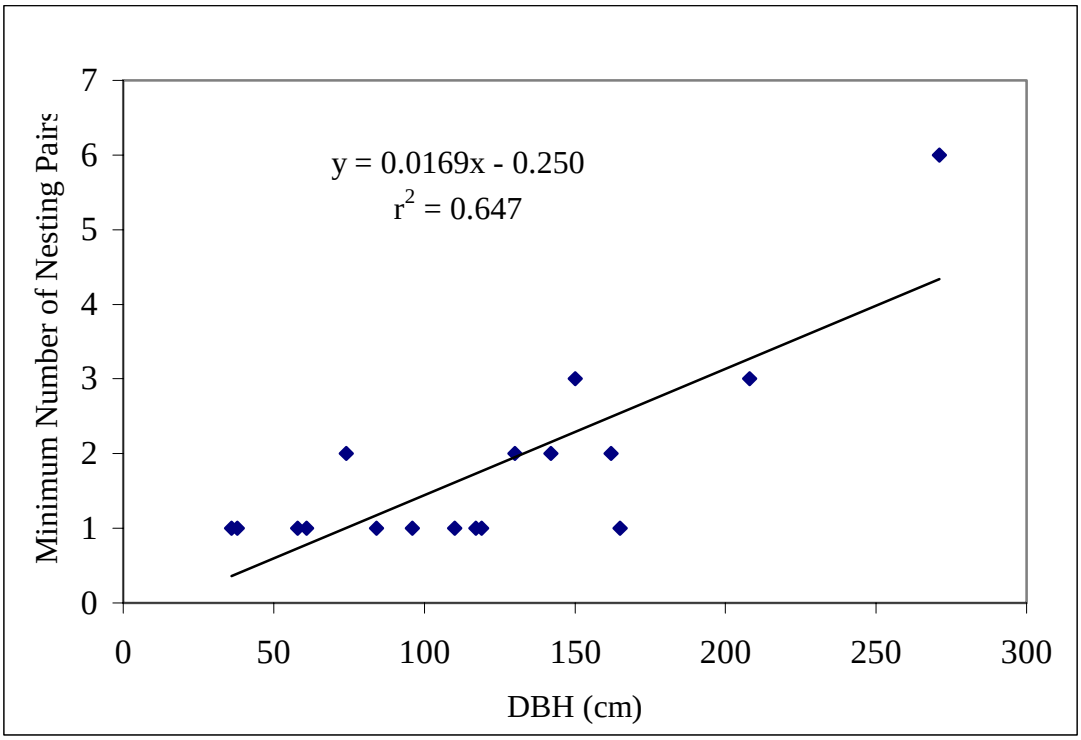


Figure 5. Effect of tree diameter on the number of nesting pairs (data fitted with a simple linear model).



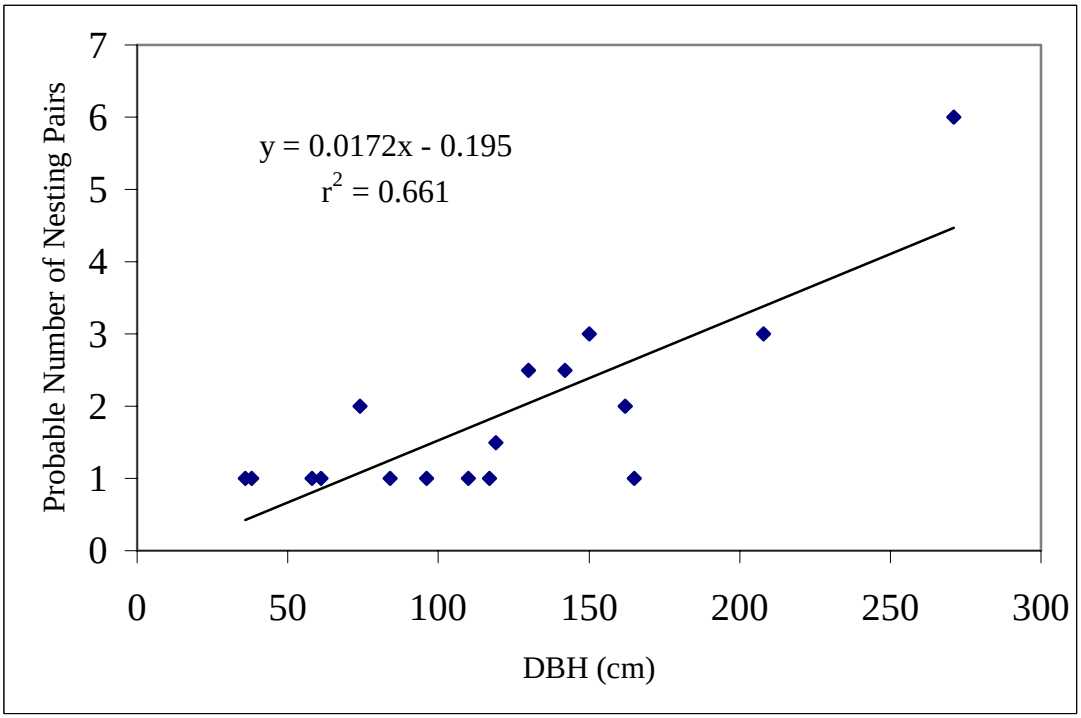
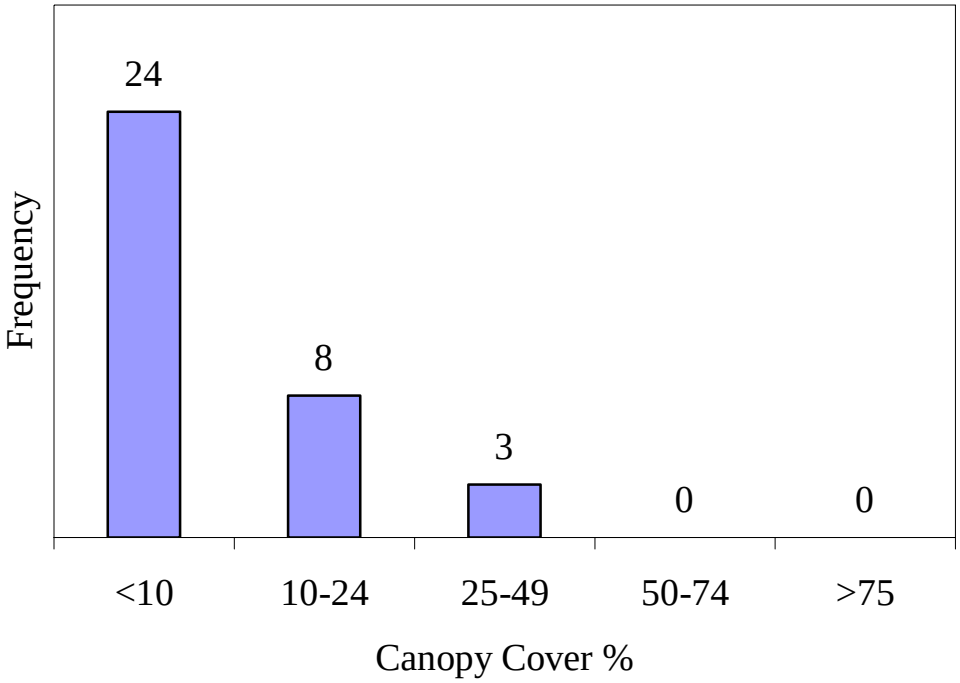


Figure 6. Canopy cover at or above nest cavity height within 100 m of the nest.



APPENDICES

Appendix A. Museum Collections.

Museums with Purple Martins from California

(ANS) The Academy of Natural Sciences, Philadelphia, PA (7 specimens)
(CAS) California Academy of Sciences, San Francisco (1 egg set; 51 specimens)
(CHAS) Chicago Academy of Sciences, Chicago, IL (1 specimen)
(CM) The Carnegie Museum of Natural History, Pittsburg, PA (1 egg set; 9 specimens)
(CSUS) California State University, Sacramento (3 specimens)
(CU) Cornell University, Ithaca, NY (2 specimens)
(MNH) Delaware Museum of Natural History, Greenville, DE (3 specimens)
(DMNH) Denver Museum of Natural History, Denver, CO (1 egg set; 1 specimen)
(FMNH) Field Museum of Natural History, Chicago, IL (13 specimens)
(HSU) California State University, Humboldt (2 specimens; 2 egg sets, 4 specimens Eureka H.S.)
(LACM) Los Angeles County Museum of Natural History (9 specimens)
(MLZ) Moore Laboratory of Zoology, Occidental College, Los Angeles (1 specimen)
(MVZ) Museum of Vertebrate Zoology, University of California, Berkeley (4 egg sets; 71 specimens)
(OM) Oakland Museum (2 specimens)
(PSM) Slater Museum of Natural History, The University of Puget Sound, Tacoma, WA (3 egg sets)
(SBCM) San Bernardino County Museum (7 egg sets; 5 specimens)
(SBMNH) Santa Barbara Museum of Natural History (10 egg sets; 11 observations on file)
(SDM) San Diego Natural History Museum (10 specimens)
(SDSU) San Diego State University (3 specimens)
(SFSU) San Francisco State University (1 specimen)
(SJSU) California State University, San Jose (6 specimens)
(UCDZ) University of California, Davis (3 specimens)
(UCLA) University of California, Los Angeles (13 specimens)
(UCM) University of Colorado Museum, Boulder, CO (1 specimen)
(UF) Florida Museum of Natural History, University of Florida, Gainesville, FL (1 egg set)
(UI) Museum of Natural History, University of Illinois at Urbana-Champaign, Urbana, IL (2 specimens)
(UM) University of Michigan, Museum of Zoology, Ann Arbor, MI (1 specimen)
(UNSM) University of Nebraska State Museum, Lincoln, NE (1 specimen)
(WFVZ) Western Foundation of Vertebrate Zoology, Camarillo, CA (25 egg sets; 3 specimens)

Museums without Martins from California

American Museum of Natural History (??: no database)
Bell Museum of Natural History, University of Minnesota, St. Paul, MN (none)
Bishop Museum, Honolulu, HI (none)
Brigham Young University, Provo, UT (none)
Buffalo Society of Natural Sciences, Buffalo, NY (none)
California State University, Long Beach (none)
California State University, Sonoma (none)
Canadian Museum of Nature, Ottawa, Ontario, Canada (none)
Dallas Museum of Natural History, Dallas, TX (none)
Florida State University, Tallahassee, FL (none)
Museum of Comparative Zoology, Harvard University, Cambridge, MA (??: no database)
Museum of Natural Science, Louisiana State University, Baton Rouge, LA (none)
Museum of Science, Boston, MA (none)
National Museum of Natural History, Washington, D.C. (??: no database)
Nevada State Museum, Carson City, NV (none)
North Carolina State Museum of Natural Sciences, Raleigh, NC (none)
Oklahoma Museum of Natural History, The University of Oklahoma, Norman, OK (none)
Princeton Museum of Natural History, Princeton University, Princeton, NJ (none)
Purdue University, Lafayette, IN (none)

Royal Ontario Museum, Toronto, Ontario, Canada (none)
Texas A&M University, College Station, TX (none)
The Burke Museum, University of Washington, Seattle, WA (none)
The Cleveland Museum of Natural History (none)
The University of Arizona, Tucson, AZ (none)
The University of Iowa, Iowa City, IA (none)
The University of Kansas, Lawrence, KS (none)
Tillamook County Pioneer Museum, Tillamook, OR (none)
University of California, Santa Barbara (none)
University of California, Santa Cruz (none)
University of Connecticut, Storrs, CT (none)
University of Georgia, Athens, GA (none)
University of Montana, Missoula, MT (none)
University of Nevada, Reno, NV (none)
University of Oregon, Eugene, OR (none)
University of Utah, Salt Lake City, UT (none)
Utah Museum of Natural History (none)
Washington State University, Pullman, WA (none)

Requests sent, no information received

California State University, Chico
California State University, Fresno
California State University, Hayward
California State University, Los Angeles
Charleston Museum, Charleston, SC
Cincinnati Museum of Natural History, Cincinnati, OH (1720 Gilbert Ave. Cincinnati, OH 45202 513-621-3889).
Colorado State University, Fort Collins, CO
Milwaukee Public Museum, Milwaukee, WS
Oregon State University, Corvallis, OR
Patuxent Wildlife Research Center, Laurel, MD
Peabody Museum, Yale University, New Haven, CT
Sesepe Museum of Comparative Oology (does it still exist?)
Southwestern College, Winfield, KS
University of Louisville, Louisville, KY
University of Massachusetts, Amherst, MA
University of Miami, Coral Gables, FL
University of Nevada, Las Vegas, NV
University of New Mexico, Albuquerque, NM
University of the Pacific, Stockton, CA
University of Wisconsin, Madison, WS
Virginia Polytechnic Institute and State University, Blacksburg, VA
Walla Walla College, College Place, WA
Whitman College, Walla Walla, WA

Appendix B. Purple Martins Reported in County Breeding Bird Atlas Projects.[1]

County (Years Incl.)	# Blocks Confirmed	# Blocks Probable	# Blocks Possible	# Blocks Observed	# Blocks Surveyed	Source/Contact
Alameda (95-96)[2]	0	0	1			Bob Richmond
Humboldt (95-97)[2]	7	8	12			John Hunter (Rob Hewitt??)
Los Angeles (95-97)[2]	0	2	6		~130	Mark Wimer
Marin (76-82)[3]	3	5	16		221	Shuford 1993
Monterey (88-92)[4]	9	2	7	3	385	Roberson & Tenney 1993
Napa (89-93)	3	1	1		90	Robin Leong
Orange (85-90)	0	2	0	N/A	111	Gallagher 1997
Riverside (?-92?)						Barbara Carlson
Sacramento (88-92)	2	0	0	2	135	Tim Manolis
San Bernardino (87-92)	0	?	?			Barbara Carlson
San Diego (97-98)[2]	7	7	1	2	~330	Phil Unitt
San Francisco (91-92)						S. F. Bailey?
San Luis Obispo (89-92)	1	0	2			Mildred Comar
San Mateo (91-95)						
Santa Clara (88-92)	1	4	1			Bill Bousman
Santa Cruz (87-93)	2	4	0		71	David Suddjian
Sonoma (86-91)[5]	3	2	4		195 (166)	Burridge 1995

[1] For an explanation of breeding codes, refer to Appendix G.
[2] Atlas project in progress as of 1998.
[3] Based on 2.5x2.5 km grid rather than more standard 5 km grid or 3 mi grid.
[4] Some blocks in more remote areas not adequately covered.
[5] Twelve blocks in more remote northern and eastern sections were not surveyed.

Appendix C. Breeding Bird Survey data. Mean (and SD) reports the number of martins counted per survey averaged over "n" years.

Route	COUNTY	Route Name	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Mean	SD	n
14 004	DN	Crescent Cty	-	-	-	-	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		0.1	0.3	3
14 005	HUM	Honeydew	3	11	2	-	6	4	9	7	15	0	2	2	8	2	10	1	7	-	-	-	-	-	-	2	-	0	2	0	0	1	4.3	4.2	18
14 006	HUM	Holmes	0	0	4	0	4	8	0	6	2	0	1	5	3	0	0	0	-	-	-	-	-	-	-	0	0	0	0	0	0	1	1.5	2.4	9
14 009	LAS	Eagle Lake	-	0	3	0	0	0	0	0	-	0	1	1	0	6	1	2	0	1	0	1	0	0	1	3	1	0	-	-			0.9	1.4	11
14 011	MEN/LAK	Hullville	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	5	6	3	0	0	1	7	0	-	-	1	-	0		0.9	2.0	7
14 014	MEN/SON	Fish Rock	1	4	10	1	-	0	1	7	4	6	9	2	13	9	5	7	5	12	11	15	9	7	12	14	6	4	7	5	7	6	6.9	4.1	28
14 017	CLV	Cottage Spgs	0	0	0	0	3	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.4	1.1	1
14 025	SBT	Tres Pinos	7	-	-	0	0	0	0	0	-	0	0	1	0	2	0	0	0	0	0	0	0	0	0	-	-	-	-	0	0	0		0.5	1.5	3
14 032	MTY/SLO	Parkfield	2	-	0	0	0	0	0	0	0	0	0	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0			0.1	0.5	1
14 038	SBA	Santa Ynez	-	0	0	0	0	0	0	0	0	0	0	-	0	1	0	0	0	0	4	0	0	0	0	-	-	0	0	0	0		0.2	0.8	2
14 047	SD/RIV	Oak Grove	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	-	0	0	0			0.0	0.2	1
14 071	MRN	Point Reyes	-	-	2	0	1	0	0	0	0	-	0	0	0	0	-	-	-	-	0	0	1	2	1	4	5	8	4	2	0	4	1.5	2.2	11
14 074	HUM	Martins Fy	-	-	-	-	-	-	-	-	1	0	0	0	0	0	0	-	0	-	-	0	0	0	-	-	-	-	-	-	-		0.1	0.3	1
14 075	HUM	Rio Dell	-	-	-	-	8	4	6	1	-	2	-	6	11	0	6	0	0	-	-	0	0	0	-	0	0	1	0	0	0		2.3	3.4	9
14 077	SHA	Shasta Lake	-	-	-	-	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0.2	0.6	2
14 083	MRN	Fairfax	-	-	-	-	6	0	0	0	0	-	0	-	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0		0.3	1.3	1
14 105	ORA	El Toro	-	-	-	-	-	0	0	0	-	0	0	0	2	0	0	0	0	-	0	0	-	-	-	-	-	-	-	0	0		0.1	0.5	1
14 107	RIV	Lake Hemet	-	-	0	0	0	0	0	-	0	0	-	-	-	2	-	-	-	-	0	-	-	-	-	-	0	0	0	-	-		0.2	0.6	1
14 118	VEN	Lockwood Val	-	-	0	0	0	0	0	0	0	0	0	-	0	0	0	0	1	0	0	0	0	0	0	-	-	-	-	0	0		0.1	0.2	1
14 120	SD	Cp Pendleton	-	-	0	0	0	0	0	0	8	0	1	0	0	-	-	-	-	-	0	0	0	0	0	0	0	0	-	-	-		0.5	1.8	2
14 121	SD	Mt. Laguna	-	-	0	0	0	0	3	0	-	0	-	-	0	0	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-		0.3	0.9	1
14 122	SD	Cuyamaca Pk	-	-	0	1	0	0	0	0	0	0	-	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0.1	0.3	1
14 123	SLO/MTY	Adelaida	-	-	2	-	1	0	0	0	0	0	0	-	0	0	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0		0.2	0.5	2
14 138	SLO	Creston	-	-	-	-	0	2	0	0	0	0	-	-	-	0	0	0	0	0	-	-	-	-	0	0	-	0	-	-	0	0	0.1	0.5	1
14 160	MEN	Longvale	-	-	-	-	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	0	0		0.1	0.5	1
14 163	SHA	Redding	-	-	-	-	0	-	-	0	0	1	-	0	0	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-		0.1	0.4	1
14 164	TRI	Junction Cty	-	-	-	-	1	0	0	0	0	0	0	-	0	0	0	0	2	-	-	-	-	-	-	0	0	0	0	0	0		0.2	0.5	2
14 173	MTY	Lockwood	-	-	-	-	4	7	1	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0.6	1.8	3
14 176	MOD	Clear Lake Res	-	-	-	-	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	1	-	0	0	0	0	0	0	0	0		0.0	0.2	1
14 178	HUM	Alderpoint	-	-	-	-	0	-	0	0	0	0	0	0	0	0	0	2	0	0	0	3	0	-	-	0	0	2	0	-	0		0.4	0.9	3
14 182	MEN	Laytonville	-	-	-	-	0	0	3	1	1	1	2	2	1	2	2	1	4	2	5	4	11	4	0	2	-	-	-	0	0	1	2.1	2.4	18
14 183	LAK	Bartlett Sps	-	-	-	-	7	10	12	6	5	4	3	8	2	5	5	3	3	3	5	4	1	1	1	1	0	-	-	-	-	-	4.2	3.1	20
14 193	SON	Bodega Bay	-	-	-	-	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0		0.2	0.7	2
14 198	SIS	Yreka	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0		0.1	0.5	2
14 199	SIS	Bartle	-	-	-	-	0	0	0	-	-	0	-	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		0.0	0.2	1
14 200	HUM	Korbel	-	-	-	-	0	1	3	3	0	0	0	0	0	0	0	0	0	0	-	0	0	-	-	0	-	-	0	0	1	4	0.6	1.2	5
14 202	SON/NAP	Glen Ellen	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	4	4	10	8	1.3	2.8	6
14 900	SIS	Iron Gate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	3	0	0	0	0	0		0.4	1.1	1
		TOTALS	13	15	24	3	42	39	38	31	36	17	19	27	40	30	29	16	27	26	28	28	24	17	22	29	15	21	18	11	18	27	0.8	1.3	

Appendix D. Contributors, Geographical Extent of Contributions, and Affiliations.

Contributor	Geographical Area	Affiliation
Steve Abbott	Citrus Heights	Birder
Ray Acker	Sierra National Forest, Fresno Co.	Biologist, Sierra National Forest
J. Garth Alton	Northern California	BBS volunteer
John R. Arnold	Sonoma County	Professor Emeritus, CSU Sonoma
Sarah & Paul Baldwin	Boggs Lake, Lake County	Naturalists
Stephen F. Bailey	California	Ornithologist, Pacific Grove Mus. Nat. Hist.
Allen Barron	Del Norte County	Subregional ed. *Field Notes*
Melinda S. Benton	San Bernardino National Forest	Biologist, San Bernardino NF
Jack Boothe	Lake County	Biologist, Dept. Fish and Game
William G. Bousman	Santa Clara County	Project Coordinator, Santa Clara BBA
Cheryl Boyd	San Diego County	Biologist, Cleveland National Forest
Muriel Bramwell	Del Norte County	BBS volunteer
Kathy Burnett	NF, Tuolumne County	Biologist
Betty Burridge	Sonoma County	Coordinator, Sonoma County BBA
Bob Celentano	Mendocino County	Biologist, Calif. Dept. Fish and Game
Ted Chandik	San Mateo & Monterey Cos.	Birder
Mark O. Chichester	Kern County	BBS Volunteer
Bob Clement	Mendocino Co.	Birder
Glenn Clifton	Napa County	BBS volunteer
Howard L. Cogswell	California	Retired ornithologist, CSU Hayward
John Coon	Siskiyou and Shasta counties	Biologist, Redding BLM
Jeff Davis	N. California	Ornithologist
Phil Detrich	Shasta Lake, Shasta Co.	Biologist, Forest Service
Bruce Deuel	Northern California	Biologist, Dept. Fish and Game
Glenn Dishman	Clear Lake, Lake County	Docent
Sharon Dougherty	San Bernardino NF	District Biologist, San Bernardino NF
Art Edwards	Alameda & Santa Clara Co., N. CA	Birder
Raymond D. Ekstrom	Siskiyou Co.; Modoc Co.	Subregional ed. *Field Notes*; Birder
Bruce G. Elliot	Monterey Co.	Senior Biologist Supervisor, DFG
A. Sidney England	Northern California	Biologist
Felippa Errecart	Northern California	Birder
Richard A. Erickson	California	Consulting Ornithologist, LSA Associates
Gil Ewing	Sacramento	Birder
Lynn D. Farrar	Contra Costa County	Birder
David Fouts	Oregon and Washington	Purple Martin colony manager
Helen Green	California	Birder
Barry Garrison	Sacramento Valley	Biologist, Calif. Dept. Fish and Game
R. H. Gerstenberg	Fresno County	Instructor, Kings River Community College
Jesse Grantham	California	Ornithologist, National Audubon Society
Bill Grummer	Napa County	Park Ranger, Robert Louis Stevenson S.P.
Robb Hamilton	Orange County	Biologist, LSA Associates, Inc.
Calvin Hampy	Lake Earl Wildlife Area, DN	Manager, Lake Earl Wildlife Area
Deyea Harper	Sonoma County	BBS volunteer
Keith Hansen	Marin County	Birder, Bird artist extraordinaire

Contributor	Geographical Area	Affiliation
Dr. John G. Hewston	Humboldt & Trinity Cos.	BBS Volunteer
Gayle Hightower	Bear Valley, Kern County	Birder
Joan Humphrey	Sacramento Valley	Field ornithologist
John Hunter	Trinity and Humboldt counties	Biologist, U.S. Fish and Wildlife Service
Dianne Ingram	Sequoia and Kings Canyon N.P.	Biologist, S&KCNP
Ronald Jurek	Calaveras and Napa counties	Biologist, Calif. Dept. Fish and Game
Bob Keiffer	Mendocino County	BBS volunteer, Subregional Ed. *Field Notes*
Paula Krumpton	Shasta Lake Ranger District	Biologist, Shasta NF
Bill Laudenslayer	Shasta & Modoc Cos.	Research Wildl. Ecol., PSW Res. Stn, Fresno
S. A. Laymon	California	Field ornithologist
Paul Lehman	Santa Barbara County	Field ornithologist
Gary S. Lester	Humboldt & Del Norte Cos.	BBS volunteer; subregional ed. *Field Notes*
Phyllis Lindley	Lake and Colusa Counties	BBS volunteer
Cliff Lyons	Mariposa County	Birder
Robert D. Mallette	Sacramento V., Auburn, Placer Co.	Biologist (retired), Dept. Fish and Game
Tim Manolis	Butte Co., Sacramento Co., N. CA	Field ornithologist, BBS volunteer
Cutis Marantz	San Luis Obispo County	Field ornithologist
Joe T. Marshall	Southern California	Retired ornithologist, USNM
Bill McCausland	San Diego County	San Diego Audubon Society, BBS volunteer
Kate McCurdy	Yosemite N.P.	Wildlife Technician, YNP
Peter Metropulos	San Mateo County	Sub-regional editor, *Field Notes*
Steven J. Meyers	Riverside and San Bernardino Co.	Field ornithologist, Tierra Madre Consult's.
Clark and Jean Moore	Bear Valley Springs, Kern County	Birders
Benjamin D. Parmeter	Sonoma County; N. California	Birder
Michael Perrone	Yuba Co.; N. California	Birder
Bill Perry	Gualala River, SON/MEN	Audubon member
Phil Pryde	San Diego County	Birder
Eleanor Pugh	Butte Co.; N. California	BBS volunteer, birder
Bob Richmond	Alameda Co., E. San Francisco Bay	Coordinator, Alameda BBA
Mike Robbins	Siskiyou County	BBS volunteer, birder
Don Roberson	Monterey County	Regional Editor, *Field Notes*
Joseph D. Robinson	Palomar Mountain, San Diego Co.	Purple Martin enthusiast
Mike M. Rogers	Santa Clara County	Post-atlas compiler, Santa Clara BBA
Mike San Miguel	Los Angeles County	Birder
Milton L. Seibert	Alameda County	Field ornithologist (retired)
Lori Stansbury	Upper Lake Ranger Dist., Lake Co.	District biologist, Mendocino NF
John Sterling	Northern California	Field Ornithologist, Smithsonian Institution
Brad Stovall	Lassen County	Birder
Chris Stromsness	Lava Beds. N.M.	Birder
George Studinski	Modoc	Biologist, Modoc National Forest
David L. Suddjian	Santa Cruz and Santa Clara Co.	Field ornithologist, Subregional ed. *FN*
Vic Sylvester	California	Purple Martin enthusiast
Carolyn Titus	Sacramento	Birder

Contributor	Geographical Area	Affiliation
Dorothy Tobkin	Mendocino County	Birder
Dr. Miklos Udvardy	El Dorado County	Emeritus Professor of Biology, Calif. St. Univ., Sacramento (deceased)
Phil Unitt	San Diego County	Ornithologist, San Diego Nat. Hist. Museum
Jerry White	Lake & Mendocino Cos.	Sub-regional Editor, *Field Notes*
Mike Whitesman	Shasta County	California Dept. Forestry and Fire Protection
Jon Winter	Northern California	Biologist, Res. Manage. International, Inc.
Jeff Wood	Shasta Lake Ranger District	Biologist, Shasta-Trinity N.F.
Gail Wynn	San Diego County	Purple Martin enthusiast
Bob Yutzy	Shasta Co.	Field ornithologist
Roger Zachary	San Luis Obispo County	Birder

Appendix E. National Forests and Ranger Districts Contacted via Forest Service Memo.

Angeles
Cleveland (present)
- Descanso RD (present; C. Boyd)
- Palomar RD (no info)

El Dorado
- Amador RD
- Georgetown RD
- Pacific RD
- Placerville RD

Inyo
Klamath
- Goosenest RD (no info)
- Happy Camp RD (no info)
- Scott River RD (no info)
- Ukonom RD (no info)
- Oak Knoll RD (no info)
- Salmon River RD (no info)

Lassen
- Almanor RD
- Eagle Lake RD
- Hat Creek RD

Los Padres
Mendocino (present)
- Corning RD
- Covelo RD
- Stonyford RD
- Upper Lake RD (present; L. Stansbury)

Modoc (present)
- Big Valley RD (?)
- Devils Garden RD (?)
- Doublehead RD (no info)
- Warner Mountains RD (No info)

Plumas
San Bernardino (present; S. Dougherty, M.S. Benton)

Sequoia
Shasta-Trinity
- Big Bar RD (no info)
- Hayfork RD
- McLoud RD
- Mt. Shasta RD
- Shasta Lake RD (present; P. Krumpton)
- Weaverville RD
- Yolla Bolly RD (no info)

Sierra
- Mariposa RD (no info)
- Minarets RD (no info)
- Pine Ridge RD (present; R. Acker)
- Kings River RD (present; R. Acker)

Six Rivers
Stanislaus
Tahoe (No known records ?)
- Nevada City RD
- Foresthill RD (No known records; M. Triggs)
- Truckee RD
- Lake Tahoe Basin Management Unit (No records)

Appendix F. Confirmed and Probable Nest Records.[1]

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
ALA	Arroyo Mocho	1959	May	3	ABN (GGAS)	MD				obs.	?			?		
ALA	Calaveras Creek	1880	Jun	16	CAS 53138	MD				coll. F	1+			Emerson	W	O
ALA	Cedar Mtn., near	1938	Jun	12	WFVZ EGG SET; M. Seibert; Seibert 19	MD				EGG SET (5)	1	QD	"[ACWO] cavity...30 ft...dead part of white oak."	Carriger	H	W
ALA	Livermore	1973	May	2	ABN (?)	MD	3S	2E		obs. pair	1+			?		
ALA	Patterson Pass	1962	May	6	ABN (L. Farrar)	MD	3S	3E		obs. 10-15	5+		Seen by Marie Mans same place 4/14; may nest in vicinity	Farrar	L	
ALA	Patterson Pass	1973	May	29	ABN (?)	MD	3S	3E		obs. pair	1+			?		
ALA	SE corner	1941	Jun	29	Seibert (1942)	MD				obs. 6	1+		"...probably regular in limited numbers...Mt. Hamilton Range."	Seibert	M	
ALA	SE corner	1995	Jun	13	Alameda BBA: B. Richmond	MD				obs. F	1+		Near mile marker 14.0. UTM 625-155.	Richmond	B	
BUT	Big Chico Creek, mouth	1974	May	9	P. Metropulos	MD				obs. 2	?		Not known to nest at location	Metropulos	P	
BUT	Butte Creek	1974	May	25	P. Metropulos	MD				obs. 1	?		Not known to nest at location	Metropulos	P	
BUT	Chico	1884	May	22	Belding (1890)	MD				obs. 4	2+			Proud	W	
BUT	Chico	1885	Apr	13	Belding (1890)	MD				obs. 1+	1+		"...heading direct for the old breeding place."	Proud	W	
BUT	Chico	1906	Jul	8	Bunnell	MD				obs. pair	1	ed	"A pair...over the principal street...and roost on a church...."	Bunnell		
BUT	Chico	1963	Jul	12	ABN (Thomas Rogers)	MD				obs. 4	1+		"Uncommon locally."	Rogers	T	
BUT	Chico, W of at Phelan Ranch	1903	Jun	8	C. H. Merriam	MD				ON	3+	WS	"Small colony in sycamores..."; between (1/2) Chico and Sac R.	Merriam	C	H
BUT	Golden State Island	1974			S. Laymon	MD	21N	1W		obs.	?			Laymon	S	A
BUT	Oroville	1969			CNRP; AFN 23:692 (E.A. Pugh)	MD	19N	4E		ON	3	ED	At least three pairs nested in red tiles at the edge of a roof.	Pugh	E	A
BUT	Oroville	1974	Apr	19	S. Laymon	MD	19N	4E		ON	1	ED		Laymon	S	A
BUT	Oroville	1976	Mar	24	T. Manolis	MD	19N	4E		obs.	1+		"Early."	Graves	N	
BUT	Oroville, Huntoon Street	1973	Apr	22	ABN (G. Nielson); T.D. Manolis	MD	19N	4E		NB (2)	1+	ED	"Building nest."	Nielson	G	
BUT	Sac R., near Murphy Slough	1976			J. Snowden	MD				ON	1+	WS	Pair appeared to be trying to use hole in sycamore	Snowden	J	
BUT	Sac. R., near Chico	1904	Aug		Hollister	MD				ON	2+	WS	"Several...about some immense sycamores...."	Hollister		
BUT	Sac. R., near Chico	1906	Jul	11	Bunnell	MD				obs. several	2+	Q	"Several...about a dead oak...and high over the fields."	Bunnell		
BUT	Sac. R., near Hamilton City	1963	Jul	10	ABN (Emilie Hodnette)	MD				obs. 12+	2+			Hodnette	E	
CC	Contra Costa County	188(4)			Belding (1890)	MD				obs.	1+		"Rare summer resident."	Bryant	W	E
CC	Lafayette	1985	Apr	25	ABN, L.D.Farrar	MD				obs. 1	?			Farrar	L	D
CC	Lafayette	1987	May	25	ABN, L.D.Farrar	MD				obs. 1	?			Farrar	L	D
CC	Lafayette	1987	Jun		ABN, L.D.Farrar	MD				obs. 2	1+		One on 3 Jun, two on 21 June	Farrar	L	D
CC	Lafayette Ridge	1979	Jul	22	ABN, L.D.Farrar	MD				obs. 30	?		"All immatures." [unusual - B.W.]	Farrar	L	D
CLV	Arnold	1972	Jun	27	BBS, R. Jurek	MD	5N	15E		obs. 3	2+		BBS route	Jurek	R	
CLV	Murphys	1877	Mar	15	Belding (1878, 1890)	MD	3N	14E		coll. M	1+			Belding	L	
CLV	Murphys	1877	Mar	13	Belding (1978)	MD				obs.	1+		First arrival.			
CLV	Murphys	1885	Apr	25	Belding (1890)	MD	3N	14E		obs. 2	1+		"They were quite numerous in...previous years."	Snyder	J	P
COL	Lovelady Ranch, W Co.	1984-85			CDFG files (P. Lindley)	MD	16N	7W	21	obs.	1+		"Regularly seen during nesting season at pond."	Lindley	P	
COL	Sacramento River, N of Colusa	1973			ABN (D. Gaines)	MD				obs. "a few"	2+			Gaines	D	
COL	Sycamore	1938	Jul	8	UCZD 1176	MD	15N	1W		coll. M	?			Emlen	J	T
DN	County Dump	1990	Apr	26	ABN (A.D. Barron)	HU				ON (2)	1	#	"Two birds entering cavity."	Barron	A	D
DN	Crescent City	1894			McLellan	HU				ON	2+	C	7/27-8/6/84; "...breeding in...woodpecker holes in the fir trees."	McLellan		
DN	Crescent City, Temple St.	1976			R.A. Erickson notes	HU				obs. 1	1+		June 23; July 15	Marshall	W	G
DN	Hiouchi, 5 mi. N	1976	Jun	15	R.A. Erickson notes	HU				obs. 2M	1+			Marshall	W	G
DN	Kellogg Rd., W of Fort Dick	1981			R.A. Erickson notes	HU				ON (2-5)	2+		At least one pair at nest site.	Erickson	R	A
DN	Kellogg Rd., W of Fort Dick	1982	Apr		R.A. Erickson notes	HU				obs. 3-8	3+		8 seen on 23 April, 3 on 29 April.	Erickson	R	A
DN	Klamath	1983	Jul		ABN, R.A. Erickson notes	HU				obs. 1	1+		July 17, 23	Erickson	R	A
DN	Klamath Glen	1982	Jul	9	ABN (B.D. Parmeter)	HU				obs. 1	1+			Parmeter	B	D
DN	Klamath, Yurok Exp. Forest	1985	Jun	26	R.A. Erickson notes	HU				obs. 2	1+			Erickson	R	A
DN	Klamath, Yurok Exp. Forest	1988	Jul	19	ABN, R.A. Erickson notes	HU				obs. 1	?			Erickson	R	A
DN	Lake Earl WA	1981	May	2	S. Harris notes	HU				obs. 20	?			McKey	T	
DN	Lake Earl WA, near	1993			G. S. Lester	HU				ON	1+	C	In remnant snags in pine/spruce dune forest.	Lester	G	
DN	Lake Talawa	1975	May	5	R.A. Erickson notes	HU				obs. 6	?			Summers	S	
DN	Lake Talawa	1984	May	14	ABN (D. DeSante)	HU				obs. 4	?			DeSante	D	

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
DN	Lake Talawa	1987	Apr	27	ABN (A.D. Barron)	HU				obs. 8	?			Barron	A	D
DN	Requa	1983	Jul	17	R.A. Erickson notes	HU				obs. 1	1+			Erickson	R	A
DN	Smith River estuary	1983	Jul	23	ABN, R.A. Erickson notes	HU				obs. 1	1+			Erickson	R	A
ED	Placerville	1900	Jun	4	Barlow (1901)	MD	10N	11E		ON	2+	ED		Barlow		
ED	Placerville, Cary House	1913	May	13	Ray (1914)	MD	10N	11E		ON	2+	ED	"...old-time colony..."	Ray	M	S
ED	Salmon Falls Rd.	1973	July	14	J.V. Remson MVZ notes; R.A. Erickson	MD				obs. 4-6	1+		One male and 3 female-plumaged in digger-pine/chaparral.	Remson	J	V
ED	Slippery Ford, 4 mi. NE	1896	Jul		Barlow (1901)	MD				ON	2+	P	Nest 60 ft. in pine snag on Peavine Ridge.	Price	W	W
FRE	Fence Meadow Lookout	198(1-4)			R. Acker	MD	11S	26E	19	obs.	?		Seen several times in early 80's from the lookout.	Acker	R	
FRE	Fence Meadow Ridge	1990	Jun		R. Acker	MD	11S	25E	1	ON (6-8)	2-4	C	Entering ACWO holes in snag.	Acker	R	
FRE	Fence Meadow Ridge	1992	May		R. Acker	MD	11S	25E	1	obs. 1	?		Single birds seen several times April-May.	Acker	R	
FRE	Fresno	1904	Aug	22	Tyler (1913)	MD				obs. 1	?					
FRE	Fresno	1974	Apr	27	AB 28:849 (R.&K. Hansen, J. Silva)	MD				obs. 2M,F	?			Hansen	R	
FRE	Fresno	1982	Apr	13	ABN (K. Hansen)	MD				obs. 2M	?			Hansen	K	
FRE	Hume Lake	1971			ABN (T. Chandik+), R.A. Erickson note	MD	13S	28E		obs. 6-7+	1+		Family group of 7+ on 2-6 Aug; 6 on 21 Jul.	Erickson	R	A
FRE	Hume Lake	1972			R.A. Erickson notes	MD	13S	28E		obs. 5+	2+		"several" from 31 July - 5 August	Erickson	R	A
FRE	Hume Lake	1985	Jun	23	ABN (D. Yee)	MD	13S	28E		obs. 2	1+		Pair copulating. "KH says another colony 10 mi. downslope." [?]	Yee	D	G
FRE	Kings Canyon NP, Zumwalt Meadows	1974	Jul	5	ABN (D. DeSante, J. Farness)	MD				obs. F	?			DeSante	D	
FRE	Lost Meadow	1984	Jun	25	CDFG files (J. Halstead)	MD	10S	25E	25	obs. M	?		Saw only one bird in Dinkey area entire summer.	Halstead	J	A
FRE	Mendota Pool, E bank	1983	May	15	ABN (F. Gibson)	MD				obs. 1	?			Gibson	F	
FRE	N Fk. Sycamore Cr., head	198(3)			R. Acker	MD	10S	24E	25	obs. 1	?			Acker	R	
FRE	Pine Ridge, 1.25 mi. W	1965	May	19	ABN: H.L. Cogswell	MD	10S	24E	18	obs. 4	2+		"Probable nesting area - old burn."	Cogswell	H	L
FRE	Riverview (loc?)	1907	Apr	27	Tyler (1913)	MD				obs.	?			Wear	W	
FRE	Sequioa Lake	1973			ABN (G. Potter)	MD	14S	27E		obs.	?			Potter	G	
FRE	Sequoia Lake	1974	Jul		ABN (D. DeSante, J. Farness)	MD	14S	27E		obs. 3 pair	3			DeSante	D	
FRE	Sequoia Lake	1980	May	1	ABN (R. Gerstenberg)	MD	14S	27E		ON (6)	3+	s	"Six at nest tree."	Gerstenberg	R	
FRE	Sequoia Lake	1981	Jun	30	AB 35:976 (G. Potter), ABN	MD	14S	27E		obs. pair+imms.	1+	c	First...positive nesting evidence since 1st observed...1973; Millwood Rd	Potter	G	
FRE	Sequoia Lake	1984	May	3-4	ABN (R. Gerstenberg)	MD	14S	27E		obs. 4	2+			Gerstenberg	R	H
FRE	Sequoia Lake	1987	May	3	ABN (SS; R.H. Gerstenberg)	MD	14S	27E		ON (10?)	5	C		S	S	
FRE	Sequoia Lake	1988			ABN (G. Potter)	MD	14S	27E		obs. 6	1+			Potter	G	
FRE	Sequoia Lake	1993			D. Ingram	MD	14S	27E		obs.	?		Mixed conifer forest burned in 1956.	Ingram	D	
FRE	Sequoia Lake, YMCA camp	1984-88			R. H. Gerstenberg	MD	14S	27E		ON	2-3	PP	Old snag (Magee 1955 fire?) starting to deteriorate	Gerstenberg	R	
FRE	Shaver Lake	1990	Jul	24-25	ABN (R. Cineball)	MD				obs. 12-15	2+			Cineball	R	
FRE	Sierra High School	1980-85			R. Acker	MD	10S	23E	27	obs.	?		Regular in evening; [prob nest to S (Black Mtn.) or E - B.W.]	Acker	R	
FRE	Teakettle Exp. Forest, SE	1990	Jul	18	J. Davis	MD	11S	27E	27	ON (8)	2+	PP	Ponderosa Pine snag in recent burn area	Davis	J	
FRE	Trimmer Ranger Station	1980	Jul		R. Acker	MD	12S			obs. 2-3	?		Regular in evening.	Acker	R	
GLE	Butte City, 2mi W	1938	Jul	7	UCDZ 1177	MD	19N	2W		coll. F	?			Emlen	J	T
GLE	Glenn, N of	1975	Jul	5	ABN: S.F. Bailey	MD				obs. pair	1+			Bailey	S	F
HUM	Alderpoint BBS	1993	Jun		BBS 178 (D. Fix)	HU				obs.	?			Fix	D	
HUM	Arcata Marsh Project	1990	Jun	26	S. Harris notes (?)					FL?	1+		Reported 6 adults and newly fledged young??	?		
HUM	Arcata, Fickle Hill	1974	May		S. Harris notes, R.A. Erickson notes	HU				obs. 3	2+		Seen on 7th and 23rd, heard on 20th.	Harris	S	
HUM	Arcata, Fickle Hill	1975			S. Harris notes; R.A. Erickson notes	HU				obs. 3-6	3+		3 on 27 May, 6 on 1 June (RAE)	Harris	S	
HUM	Arcata, Fickle Hill	1977	May	23	S. Harris notes	HU				obs. 3	2+			Harris	S	
HUM	Arcata, Fickle Hill	1980	Apr	27	ABN (R. LeValley); S. Harris notes	HU				ON (4)	2+	c	"Investigating holes."	LeValley	R	
HUM	Arcata, Fickle Hill, Carr Ranch	197(8)			J. G Hewston	HU				CF (3+)	2+	C	Nesting in hollow snags; they have since fallen.	Hewston	J	G
HUM	Arcata, Sunnybrae	1960	Jun	28	S. Harris notes (C.F. Yocum)	HU				obs. Several	3+			Yocum	C	F
HUM	Arcata, Sunnybrae	1969	May	17	S Harris notes (C.F. Yocum)	HU				obs. 2+	1+		At least one pair may be nesting	Yocum	C	F
HUM	Arcata, Sunnybrae	1985	Jul		S. Harris notes (P. Springer)	HU				obs. 2	1+			Springer	P	
HUM	Bayside	1989			R.A. Erickson notes	HU				obs. 1-2	1+		Seen on six dates in 1989.	Erickson	R	A
HUM	Bayside Golf Course	1957	Jul	26	S. Harris (C.F. Yocum)	HU				ON (3M,5F)	2-3	C	Nesting in tall snag.	Yocum	C	F
HUM	Bayside Golf Course	1960	Jun	11	S. Harris (C.F. Yocum)	HU				ON (3+)	2+	CR	"More than one pair nesting in redwood snag..."	Yocum	C	F
HUM	Big Lagoon	1949	Aug	9	MVZ 118528	HU				coll. F (juv.)	?			Miller	A	H
HUM	Big Lagoon	1949	Aug	10	MVZ 118529	HU				coll. M	?			Miller	A	H
HUM	Big Lagoon	1962	Jul	29	B.D. Parmeter	HU				obs. 5	1+		Together at south end of lagoon.	Parmeter	B	D
HUM	Big Lagoon, 1.5 mi. inland	1949	Aug	8-19	H.L. Cogswell & A.H. Miller MVZ notes	HU	9N	1E		FY; obs. 30+	6+	C	Most in tall dead trees of 3 yr. old burn in Maple Creek Valley	Cogswell	H	L
HUM	Briceland	1979	Apr	21	S. Harris (Herbert Sisherold)	HU				obs. 9-10	5+			Sisherold	H	
HUM	Briceland, near	1993	Jun	13	D. Fix, S. Harris notes	HU				obs. M	1+			Fix	D	

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
HUM	Bridgeville	1929	Jun	19	S. Harris (G.A. Howett)	HU	1N			EGG SET (5)	1+	c		Howett	G	A
HUM	Dinsmore Airport	1996	Jun	20	Hunter and Hazard (1998)	HU				obs. 1	1+			Schmidt	G	A
HUM	Dry Lagoon	1982	Jun	5	AB 36:1013 (J. Sterling); S. Harris notes	HU				obs. 45			"Mostly females." At least most are migrants.	Sterling	J	
HUM	Espa Lagoon	1972	Jul		R.A. Erickson notes	HU				obs. 6			"Almost nightly at 2000 hrs."	Strachan	G	J
HUM	Espa Lagoon, Gold Bluffs Beach	1983			ABN (G.J. Strachan)	HU				obs. 1	?		"About five nesting in past."	Strachan	G	J
HUM	Essex Pond	1985			S. Harris notes (Fred Broreman?)	HU	6N	1E		ON (1)	1	BX	Pair raised young in Wood Duck box.	Brorerman	F	
HUM	Essex Pond	1986			S. Harris (P. Springer); ABN	HU	6N	1E		ON (M, F)	1	BX	Nest in WODU box: 24 May, 25 Jun, 31 Jul (2 ad. + 2 young)	Springer	P	
HUM	Eureka	1897	Jun	15	PMCA (F.J. Smith) - mus?	HU	5N	1W		EGG SET (5)	1+	CR	Nest 25 ft. up in burned redwood in ravine in city limits.	Smith	F	J
HUM	Eureka	1905	Jun	28	WFVZ EGG SET	HU	5N	1W		EGG SET (5)	1+	C	"...spruce stump...40ft up...in flicker's...cavity." town outskirts	Davis	J	M
HUM	Eureka	1907	Jun	21	PSM 15383	HU	5N	1W		EGG SET (4)	1+	c		Smith	F	J
HUM	Eureka, N of off Old Arcata Rd.	1974	Jun	9	ABN, R.A. Erickson notes	HU	5N	1W		ON (2 pair)	2	C	Two pairs at nesting snag.	Erickson	R	A
HUM	Eureka, nr.	1917	Jun	22	S. Harris notes (Clay)	HU				obs.	1+			Clay		
HUM	Fairhaven	1980	Jun	1	ABN (J. Sterling)	MD				obs. 8	?			Sterling	J	
HUM	Fairhaven	1981	May	2	R.A. Erickson notes	HU				obs. 8	?			Erickson	R	A
HUM	Fairhaven	1988	Jun	20	R.A. Erickson notes	HU				obs. M,F	1+			Erickson	R	A
HUM	Fieldbrook, 1-2 mi. N	1971	May	14	S. Harris (R. Wilmarth)	HU	7N	1E		ON	2+	C	"Nesting colony."	Wilmarth	R	
HUM	Fortuna	1962	Jul	21	ABN; B. D. Parmeter	HU				obs. 6	1+		Also on 14 Jul; frequent after this date overhead	Parmeter	B	D
HUM	Fortuna	1963	Jun	25	B.D. Parmeter	HU				obs.	?		Fairly common.	Parmeter	B	D
HUM	Friday Ridge Rd.	1983	Jun	27	ABN (R.A. Erickson)	HU				obs. 1	1+			Erickson	R	A
HUM	Garberville, near	1974	Jun	6	S. Harris notes	HU				obs. 2+	1+			Harris	S	
HUM	Garberville, SW Sprowel Creek	1998	Jun	11	ABN (D. Fix)					obs. M	1+			Fix	D	
HUM	Harris, SE Co.	1983	Jun	5	S. Harris (P.&V. Springer)	HU				obs. pair	1+			Springer	P	
HUM	Kneeland, near	1921	Jun	12	S. Harris (Clay)	HU				obs.	1+			Clay		
HUM	Lawrence Creek (Rice?)	1913	Jun	7	S. Harris (Benjamin Marshall)	HU				ON; coll. M	1+	P	Nesting in tall dead pine.	Smith	F	J
HUM	Mad River, N Fk.	1960	Jun	1	S. Harris (C.F. Yocum)	HU				ON (6+)	3+	s	"Several using snags."	Yocum	C	F
HUM	Maple Creek, 1 mi. N of Mad R.	1942	Sep	8	A.H. Miller MVZ notes	HU				obs. 2+	1+		"Heard almost daily here."	Miller	A	H
HUM	Mattole River	1894	Jun	20	MVZ 5884	HU				coll. M	1+			Bancroft	F	W
HUM	Miranda, Cathey Rd.	1993			G.S. Lester	HU	2S	3E	27	ON	2+	C	Possible colony at snag on ridge line on grassy bald.	Lester	G	S
HUM	Miranda, W Salmon Creek	1970			S. Harris notes (C.F. Yocum)	HU				obs. 1-6	3+		Seen from 6/6 to 7/20 Q38(3M, 3F)	Yocum	C	F
HUM	Mt. Lassic	1983	Jun	6	S. Harris (P.&V. Springer)	HU				obs. 1	1+			Springer	P	
HUM	Mt. Lassic	1988	Jun	23	ABN (R.A. Erickson); Hunter and Hazar	HU	1S	5E		obs. 1	?			Erickson	R	A
HUM	N.F. Mad River/Hwy. 299	1954	Jul	20	S. Harris notes	HU				obs.	1+			?		
HUM	Orick	1982	Jun	5	S. Harris notes (J. Sterling)	HU				obs. 3	1+			Sterling	J	
HUM	Petrolia	1986	Aug	23	ABN (B.E. Deuel)	HU				obs. 2	?			Deuel	B	E
HUM	Reed Mtn. Summit, S Co.	1998	Jul	21	ABN (D. Fix, J.C. Power)					obs. 1	1+	s		Fix	D	
HUM	Samoa	1905	Jul	23	S. Harris notes (Wesley Dean)	HU	5N	1W		EGG SET (4)	1+	C	In snag of spruce grove 3 miles from Samoa P.O.	Dean	W	
HUM	Samoa	1915	May	12	S. Harris (Benjamin Marshall)	HU	5N	1W		coll. ad. F	1+		In dead spruce on peninsula.	Smith	F	J
HUM	Samoa	1954	Jun	9	S. Harris notes (C. F. Yocum)	HU	5N	1W		obs. Several	3+			Yocum	C	F
HUM	Samoa	1955	Jun	30	S. Harris notes (C. F. Yocum)	HU				obs 2F	1+		At North Spit	Yocum	C	F
HUM	Samoa	1972	Jul	22	ABN (L.C. Binford)	HU	5N	1W		obs. 2M	1+			Binford	L	C
HUM	Samoa	1988	Jun	20	ABN (R.A. Erickson)	HU	5N	1W		obs. pair	1+			Erickson	R	A
HUM	Shelter Cove	1990	Apr	9	S. Harris notes (G. S. Lester)	HU				obs. 7	4+			Lester	G	S
HUM	Shelter Cove	1993			G.S. Lester; R. Hewitt (S. Harris notes)	HU	5S	1E		ON (5+)	3+	C	A reliable summer location in old burn.	Lester	G	S
HUM	Shelter Cove	1994	Jul	16	NASFN 48:986 (R. Hewitt)	HU	5S	1E		ON (40)	15+	C		Hewitt	R	
HUM	Shelter Cove	1997	May	4-5	ABN (D. Fix, J.C. Power)	HU	5S	1E		obs.	5+		"Numerous"	Fix	D	
HUM	Shelter Cove	199(0)			B. Widdowson	HU	5S	1E		ON	2+	C	Nesting in snags.	Widdowson	B	
HUM	Trinidad	1972	Jul	23	ABN (L.C. Binford)	HU				obs. F	1+			Binford	L	C
HUM	Trinidad Head	1998	Jun	7	ABN (M. Morris)	HU				obs. 6, ON	3+		On antennas on top of Head, chattering, and poking into holes in tubing	Morris	M	
HUM	Walker Pt.	1917	Jun	26	S. Harris notes (Clay)	HU	5S	5E		obs.	?			Clay		
IMP	Bard	1921	May	8	UCLA 5477	SB	16S	23E		coll. F	?		Migrant?	Canfield	M	
IMP	Bard	1921	May	9	UCLA 5491	SB	16S	23E		coll. M	?		Migrant?	Canfield	M	
IMP	Palo Verde	1978	Apr	17	AB 32:1056 (K.V. Rosenberg)	SB				obs. 1	?			Rosenberg	K	V
IMP	Palo Verde,15mi S, 4.5E	1967	May	13	LACM 66335	SB				coll. M	?		Migrant?	Northern	J	R
KER	Bear Valley, Bear Mountain	1995			C.&J. Moore	MD		31E		FY	6+	Q		Moore	C	
KER	Bear Valley, Black Oak Hill	1994			C.&J. Moore	MD		31E	7	obs. 2	1+			Moore	C	
KER	Bear Valley, Black Oak Hill	1995			C.&J. Moore	MD		31E	7	ON (4)	2+	Q		Moore	C	

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
KER	Bear Valley, Black Oak Hill	1996			C.&J. Moore	MD		31E		ON	2+	Q		Moore	C	
KER	Bear Valley, Four Island L.	1982			M.O. Chichester	MD	32S	31E		obs.	1+			Haight	J	
KER	Bear Valley, Four Island L.	1984			M.O. Chichester	MD	32S	31E		obs. 2	1+	Q	at lake; oaks of hillside 1.5 miles away (May 27, Jul 4)	Chichester	M	O
KER	Bear Valley, Four Island L.	1986	June	8	M.O. Chichester	MD	32S	31E		obs. 2	1+		at lake	Chichester	M	O
KER	Bear Valley, San Juan Trail	1995			C.&J. Moore	MD		31E		obs. 2	1+			Moore	C	
KER	Bear Valley, San Juan Trail	1996			C.&J. Moore	MD		31E		ON	2+	Q		Moore	C	
KER	Bear Valley, Sycamore Canyon	1990			C.&J. Moore	MD		31E	5	ON	3+	Q		Moore	C	
KER	Bear Valley, Sycamore Canyon	1991			C.&J. Moore	MD		31E	5	ON	3+	Q		Moore	C	
KER	Bear Valley, Sycamore Canyon	1994			G. Hightower	MD		31E	5	ON (4 pair)	4	Q	Nest in very large oaks; many EUST.	Hightower	G	
KER	Bear Valley, Sycamore Canyon	1995			G. Hightower; C.&J. Moore	MD		31E	5	obs. 7	4+			Hightower	G	
KER	Bear Valley, Sycamore Canyon	1996			C.&J. Moore	MD		31E		ON	2+	Q		Moore	C	
KER	Breckenridge Mtn.	1993	Jul	11	AB 47:1151; M.O. Chichester	MD	28S	31E	36	obs. M	1+	c	"Burned/logged area with snags on west face of mountain."	Chichester	M	O
KER	Buena Vista Lake	1921	May	30	UCLA 5221-22	MD				coll. 2M	2+			VanRossem	A	J
KER	Buena Vista Lake	1929	Mar	25	UCLA 32407	MD				coll. M	?			Stevenson	J	O
KER	Frazier Mtn. Park	1973			Garrett and Dunn (1981)	SB	9N	20W		ON	1+	s				
KER	Frazier Mtn. Park, nr. entrance	1952	May		AFN 6:265 (A. Small?)	SB	9N	20W		obs. several pairs	4+		"...several pairs had taken residence by the end of May...."	Small	A	
KER	Keene	1904	Jul	21	LACM 13623-25	MD	31S	32E		coll. 2F; date	2+			Richardson	C	H
KER	Lake Castac	1912	Jun	14	UCLA 7931	SB	9N	19W		coll. M	1+			Howell	A	B
KER	Lake Castac	1912	Jun	13	Lamb & Howell (1913)	SB	9N	19W		ON	5	Q	Not seen elsewhere on Tejon Ranch.	Lamb	C	
KER	Lebec	1952	Jun	15	H. Cogswell notes	SB	9N	19W		obs. 2	1+		Seen in probable nestin area.	Cogswell	H	L
KER	Old Fort Tejon	1891	Jun	28	Fisher (1893)	SB	9N	19W		ON	4+	Q		Fisher		
KER	Old Fort Tejon	1904	Jul	19	Grinnell (1905)	SB	9N	19W		ON	3-4	Q	Nests in oaks.	Grinnell	J	
KER	Tehachapi, N end of valley	1894	Jun	7-15	McLellan	MD	32S	33E		obs. several pairs	4+	Q	"vicinity...large oaks...north end of valley...undoubtedly nest."	McLellan		
KER	Tejon Ranch	1982	May	21	J. Grantham	MD				ON (35)	17+	Q	N slope, Grapevine Pass E to Pretoria Canyon	Grantham	J	
KER	Tejon Ranch	1986	Apr	8	J. Grantham	MD				obs.	15+			Grantham	J	
KER	Tejon Ranch	1994	Sep		S. Laymon	MD				obs.	?			Laymon	S	A
KER	Tejon Ranch, Tunis Ridge	1985	May	12	J. Grantham	MD				ON (12)	6+	Q	in oaks near BM 5026	Andaloro	L	
LA	Arcadia	1983			AB 37:1028 (Fred Heath)	SB				obs. 45	10+		"...up to 45 (including young of the year)...throughout the summer...."	Heath	F	
LA	Arcadia	1996			NASFN 50:997 (M. San Miguel)	SB				obs. 10	5+		6/1-7/19; nest site not located	San Miguel	M	
LA	Big Santa Anita Canyon	1993			AB 47:1151 (M. San Miguel)	SB	1N	11W		obs. 2	1+		Regular at mouth of canyon 5/31-6/24.	San Miguel	M	
LA	El Monte	1951	May	12	AFN 5:276 (Burden)	SB				obs. 4	2+		At San Gabriel River Wildlife Sanctuary	Burden		
LA	Gardena, Nigger Slough	1917	May	21	FMNH 141749-51	SB				coll. M, 2F	?					
LA	Lake Cassac?	1912	Jun	14	SBCM 36325-26	SB				coll. 2M	2+			Lamb	C	
LA	Long Beach	1904			Willett (1912)	SB				obs.	?			Swarth		
LA	Long Beach	1920			BL 22: 234	SB				ON	1+	ED?				
LA	Long Beach	1921	Mar	30	BL 23:150 (Schneider)	SB				obs.	1+		"...took up their regular quarters in...Long Beach...on March...30...."	Schneider	F	B
LA	Long Beach	1924	Jul	17	BL 26:345-347 (Schneider)	SB				FY	3+	ED?		Schneider	F	B
LA	Long Beach	1961	Jul	30	AFN 15:493 (A. Small)	SB				obs. 1			Flying over Long Beach Freeway.	Small	A	
LA	Long Beach	19(30)			Willett (1933)	SB				ON	1+	ED	Nesting in buildings.			
LA	Los Angeles	1910	Jun	17	WFVZ EGG SET	SB				EGG SET (5)	1+	ED	"on drain pipe under eaves of school...40 ft."	Perez	R	M
LA	Los Angeles	1910	Jun	2	WFVZ EGG SET	SB				EGG SET (5)	1+	ED	"water pipe under eaves...outside of schoolhouse"	Snyder	G	K
LA	Los Angeles	1910	Jun		Perez (1910)	SB				NEST	?	ED		Perez	R	M
LA	Los Angeles	1921	Jul	15	BL 23: 256 (Schneider)	SB				ON (25)	5+	ED	"About 25 about cornices of Broadway building 7/15, and again	Schneider	F	B
LA	Los Angeles, Echo Park	1922	Jun	22	BL 24:289-290 (Schneider)					FL	3+		Fed young August 1-2, up to 18 Aug 6.	Schneider	F	B
LA	Los Angeles, Echo Park	1923			BL 25:227-228, BL 25:332-333					ON	4+	ED	About buildings in town and Echo Park; undoubtedly increasing			
LA	Monrovia	1951			AFN 6:39 (Rogers)	SB				obs.	1+		"foraging...throughout...summer over...northern...Monrovia."	Rogers		
LA	Monrovia	1973			Garrett and Dunn (1981)	SB				ON	1+					
LA	Mt. Wilson	1895	Jun	22	MVZ 36720-21	SB	2N	11W		coll. 2M	2+			Grinnell	J	
LA	Mt. Wilson	1895	Jun		CAS 40776-79	SB	2N	11W		coll. 2M,2F	2+			Swarth	H	S
LA	Mt. Wilson	1895	Jun		MVZ 10026-29	SB	2N	11W		coll. 2M,2F	2+			Judson	W	B

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
LA	Mt. Wilson	1895	May	25	LACM 10283-84	SB	2N	11W		coll. M, F	1+			Gaylord	H	A
LA	Mt. Wilson	1897	May	22	CAS 36430	SB	2N	11W		coll. F	1+			Swarth	H	S
LA	Mt. Wilson	1904	May	19	CAS 36431-33	SB	2N	11W		coll. 2M,F	2+			Swarth	H	S
LA	Mt. Wilson	1904	May	19	CAS 40780-81	SB	2N	11W		coll. M, F	1+			Swarth	H	S
LA	Pasadena	1906			Osburn (1909)	SB	1N	12W		ON	3+	ED	Nesting in building.	Osburn	P	I
LA	Pasadena	1920			BL 22: 234, Bryant (1924)	SB	1N	12W		ON	8+	ED	"...large numbers...around the main office buildings...."	Bryant	H	C
LA	Pasadena	1923			BL 25: 332-333	SB				ON	3+	ED	Occupied their usual quarters at Pasadena			
LA	Pasadena	1924			BL 26:198-199; BL 26:345-347	SB				ON, FY	3+	ED	Colony arrived in late March; feeding young July 10	Schneider	F	B
LA	Pasadena, Hotel Maryland	1909			Osburn (1909)	SB	1N	12W		NB	30	ED	Nesting in building.	Osburn	P	I
LA	San Fernando Valley, West of	1890s			Grinnell (1898)	SB				NB	1+	Q	Ralph Arnold noted nest building by April 1 in oaks west of valley	Arnold	R	
LA	San Gab. Mtns., Angeles Crest Hwy	1952	May	11	AFN 6:265 (A. Small?)	SB				ON (8)	4	C	"small colony of 4 pairs..." at lone dead conifer.	Small	A	
LA	San Gab. Mtns., Barley Flats	1895	Jul	10	MVZ 36722	SB	2N			coll. F	1+			Grinnell	J	
LA	San Gab. Mtns., Barley Flats	1913	May	14	WFVZ EGG SET	SB	2N			EGG SET (3); 1 infr	3-4	c	"very locally distributed....rarer breeding birds"	Edwards	H	A
LA	San Gab. Mtns., Charlton Flat	1936	Apr		J.T. Marshall	SB				ON (12)	6+	PC	Nesting in Coulter Pines	Marshall	J	T
LA	San Gab. Mtns., Charlton Flat	1945	Jul	20	H. Cogswell notes	SB				obs. 5	1+	c	Appeared in Aud. Mag. 47 (suppl.)	Groner	D	
LA	San Gab. Mtns., Charlton Flat	1955	May	10	WFVZ 43078	SB				coll. F	1+			Bleitz	D	
LA	San Gab. Mtns., Charlton Flat	1958			AFN 12:437 (Thomas Howell)	SB				ON	1+	s		Howell	T	R
LA	San Gab. Mtns., Charlton Flat	1959			AFN 13:456 (A. Small?)	SB				ON	1+	s	"....reported as nesting..."			
LA	San Gab. Mtns., Charlton Flat	1960			AFN 14:478 (A. Small?)	SB				ON	1+	s	"...again nested successfully...near Charlton Flats...."	Small	A	
LA	San Gab. Mtns., Charlton Flat	1986	Apr	26	J.T. Marshall notes	SB				obs. M	1+		One M overhead 3 mi. N of La Canada; nest site not located. EUST only	Marshall	J	T
LA	San Gab. Mtns., Chilao	1897	Jul	7	MVZ 36724-25	SB				coll. 2M	2+			Grinnell	J	
LA	San Gab. Mtns., Chilao	1961	Jun	10	AFN 15:493 (R.&M. Wilson)	SB				obs.	1+			Wilson	R	
LA	San Gab. Mtns., Chilao	1962	Jun	9	H. Cogswell notes	SB				ON	1+	s	Also in Western Tanager 29:8.			
LA	San Gab. Mtns., Chilao	197(5)			Garrett and Dunn (1981)	SB				ON	1+	s	Nested to at least the mid 1970's.			
LA	San Gab. Mtns., Chilao Flats	1961	Apr	14	UCLA 40246	SB	3N	11W		coll. M	1+			Hardy	J	W
LA	San Gab. Mtns., Pine Flats	1897	May	18	CAS 36429	SB	3N	9W		coll. F	1+			Judson	W	B
LA	San Gab. Mtns., Pine Flats	1897	Jul	2	MVZ 36723	SB	3N	9W		coll. F	1+			Grinnell	J	
LA	Sangus, vicinity	1904	Jul	16	LACM 13624	SB	4N	16W		coll. M	1+			Richardson	C	H
LA	Tujunga Canyon, head	1895	Jun	20	LACM 10282	SB				coll. M	?		Which Tujunga Cyn.?	Daggett	F	S
LA	Van Nuys Airport, 1mi.W	1967	May	3	LACM 77699	SB				coll. ad. F	?		Migrant?	Hannum	R	G
LA	Whittier	1920			BL 22: 234	SB	2S	11W		ON	1+	ED				
LA	Whittier	1921	Mar	27	BL 23:150 (Schneider)	SB	2S	11W		obs.	1+		"...took up their regular quarters in Whittier...on March 27...."	Schneider	F	B
LA	Whittier	1924	Mar		BL 26:198-199	SB	2S	11W		ON	3+	ED	Colony arrived in late March			
LA	Whittier	1928			BL 23:208, Willett (1933)	SB	2S	11W		ON	1+	ED	Arrived at nesting site	Schneider	F	B
LA	Whittier	1947	Apr		H. Cogswell notes	SB	2S	11W		ON	2+	ED	Using old theater 4/11, 4/17, 4/25	Cogswell	H	L
LA	Whittier	1948	May	10-14	H. Cogswell notes	SB	2S	11W		ON	2+	ED	Nesting in crevices in old theater	Cogswell	H	L
LA	Whittier	1953	Mar	8	AFN 7:291 (John Tremontano)	SB	2S	11W		obs. 1	?			Tremontano	J	
LAK	Bartlett Springs Rd.	1982	Apr	29	AB 36:891 (J. Evens); ABN	MD				ON (5)	3+	c	"Nesting here."	Evens	J	
LAK	BBS 011	1971	Jun	8	BBS 011 (E.A. Pugh)	MD				obs. 1	1+			Pugh	E	A
LAK	Boggs Lake	1978	Jun	24	ABN (B. Bu)	MD	12N	8W		obs. 4	2+			Bu	B	
LAK	Boggs Lake	1984	Jul		CDFG files (P. & S. Baldwin)	MD	12N	8W		obs. 6 (fim)	1	c	Over lake and on trees, but not nesting at lake.	Baldwin	P	
LAK	Boggs Lake	1985			CDFG files (P. & S. Baldwin)	MD	12N	8W		obs. 6 (fim)	1+	c	Still no suspected of nesting at lake.	Baldwin	P	
LAK	Boggs Lake	1986	May	22	P. & S. Baldwin	MD	12N	8W		obs. 1	?		Over lake.	Baldwin	P	
LAK	Boggs Lake	1986	Jul	24	ABN: J. Winter	MD	12N	8W		obs. 40	7+		(Thought to have nested at lake, but did not. - B.W.)	Winter	J	
LAK	Boggs Lake	1987			P. & S. Baldwin	MD	12N	8W		ON	1-2	PP	In large dead 60 ft. pines at lake shore; seen regularly.	Baldwin	P	
LAK	Boggs Lake	1988	Jun		P. & S. Baldwin	MD	12N	8W		obs. 1	0			Baldwin	P	
LAK	Boggs Lake	1988	Jul	24	ABN (J.R. White)	MD	12N	8W		obs. 5	1+			White	J	R
LAK	Boggs Lake	1989	May	20	J. White	MD	12N	8W		obs. 1	?			White	J	
LAK	Boggs Lake	1991			P. & S. Baldwin	MD	12N	8W		obs. 2	0		Maximum of 2 seen over lake during period.	Baldwin	P	
LAK	Clear L., Lucerne	1981	Jun	1	SAS (J. Hornstein)	MD				obs. 3	1+		[Not far from Bartlett Peak - B.W.]	Hornstein	J	

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
LAK	Clear L., McVicar And. Sanct., nr.	1991	Apr	30	ABN; B. McIntosh	MD	12N	7W	4	ON (4)	2	UP		McIntosh	B	
LAK	Clear L., McVicar And. Sanct., nr.	1989-91			G. Dishman	MD	12N	7W	4	ON	1	UP	Nest in utility pole; PUMA absent 1992-94; EUST 93	Dishman	G	
LAK	Clear L., McVicar And. Sanct., nr. Hwy 2	1984	Apr	21	J. R. White	MD	12N	7W	4	obs. M, F	1		In conflict with ACWO for cavity in utility pole (McVicar?)	White	J	R
LAK	Clear L., Soda Bay	1976	May	29	ABN (C. P)	MD		8W		obs. M	?			P	C	
LAK	Clearlake Park, 3 mi. N	1948	May	2	A.H. Miller MVZ notes	MD		7W		obs. 1	1+		Began singing near shore at 4:15 AM	Miller	A	H
LAK	Cobb Mountain	1981			AB 35:860 (J.Matzinger); ABN	MD	11N	8W		ON (2)	1+	C	"Nesting."	Matzinger	J	P
LAK	Cobb Mountain	1990	Apr	16	J. White	MD	11N	8W		obs. 1	1+			Matzinger	J	
LAK	Cobb Valley	1981			AB 35:976 (J. Matzinger); ABN	MD				obs.	2+		"More than usual numbers through period."	Matzinger	J	
LAK	Detert Reservoir	1986	Jul	22	ABN: J. Winter	MD	10N	6W		FY (8-10)	2+	e	Adults feeding young and breeding in snag in lake.	Winter	J	
LAK	Eel R./FS M-8	1995	Jun	4	B. Williams	MD	18N	10W		obs. 11	5+		Not nesting under bridge.	Williams	B	
LAK	Elk Mountain	1993			L. Stansberry	MD				obs.	1+		Nest site not located.	Stansberry	L	
LAK	Elk Mtn. Rd.	1989	Jul	14	J. R. White	MD				obs. 6	1+		Nest site not located.	White	J	R
LAK	Elk Mtn. Rd./17N36	1984	May	31	BBS 011; P. Lindley	MD	17N	10W	14	obs. 2	1+			Lindley	P	
LAK	Elk Mtn. Rd./17N36	1985	May	25	BBS 011; P. Lindley	MD	17N	10W	14	obs. 6	3+			Lindley	P	
LAK	Elk Mtn. Rd./17N36	1986	Jun	20	BBS 011; P. Lindley	MD	17N	10W	14	obs. 3	2+			Lindley	P	
LAK	Elk Mtn. Rd./17N36	1990	Jun	14	BBS 011; P. Lindley	MD	17N	10W	14	obs. 3	1+			Lindley	P	
LAK	Elk Mtn., 1.5 mi. E	1983	May	15	ABN (P. Unitt)	MD	17N	9W		obs. M	1+			Unitt	P	
LAK	Geysers	1986	Jul	22	ABN: J. Winter	MD				FY (5)	1+	e		Winter	J	
LAK	Geysers Unit 21	1983			?	MD	11N	8W	8	ON (2-3 pair)	2-3	DF	Nesting in broken top Douglas fir snag.	?		
LAK	Geysers, Lakeview Rd./High V. Crk.	1995	Jun	7	B. Williams	MD	11N	8W	6	ON	1+	PP	Ponderosa pine snag DBH=116cm, 100 ft.; cavity at 80 ft.	Williams	B	
LAK	Geysers, w. of Cobb Mtn.	1979			Williams and Vouchilas (1988)	MD				obs.	?		Calculated density 15 birds/40 ha.			
LAK	Geysers, w. of Coldwater Creek Rd.	1978			Williams and Vouchilas (1988)	MD	18N	8W	19	obs.	?		Calculated density 9 birds/40 ha.			
LAK	Glenbrook	1919	Jun	4	CAS 19921-19924	MD	12N	8W		coll. 2F,2M	3+		One female with undeveloped organs. L. Little also	Mailliard	J	
LAK	Glenbrook	1919	May	1	CAS 19920	MD	12N	8W		coll. M	3+			Mailliard	J	
LAK	Glenbrook	1919	Jun	4	CAS 8522	MD	12N	8W		EGG SET (1)	3+	PP	Small colony nesting near top of dead Ponderosa pine.	Mailliard	J	
LAK	Glenbrook	1919	Apr	27	Mailliard (1919)	MD	12N	8W		ON	2+	e	Inspecting many trees.	Mailliard	J	
LAK	Glenbrook Rd./Kelsey Cr.	1994	Jun	7-8	B. Williams	MD	12N	8W		ON (5+)	2-3	C	Doug fir (?) snag DBH=142cm, 45 ft.; cavities all above 30 ft.	Williams	B	
LAK	Glenbrook Rd./Kelsey Cr.	1995	Jun	7	B. Williams	MD	12N	8W		ON (3+)	1-2	C	Nesting in same snag as 1994.	Williams	B	
LAK	Horse Mtn, nr., s. of L. Pillsbury	1978	Jul	8	ABN (O.J. Kolkman)	MD				ON	3+	C	"Several pairs nesting."	Kolkman	O	J
LAK	Howard Mill, 1 mi. N	1995	Jun	4	B. Williams	MD	17N	10W	23	ON (5)	2-3	DF	Doug fir snag DBH=130cm, 140 ft; cavities above 90 ft.	Williams	B	
LAK	Howard Mill, 1/2 mi. N	1994	Jun	10	B. Williams	MD	17N	10W	23	ON	1-2	PP	Ponderosa pine snag DBH=119cm, 85 ft.; cavities at 70 ft.	Williams	B	
LAK	Hull Mtn. Rd.	1971	May	22	ABN (B. McLean)	MD				obs.	?			McLean	B	
LAK	Indian Valley Res.	1998	Jul	25	B. Williams	MD	15N	6W		ON (3)	2+	e		Williams	B	
LAK	Indian Valley Res., Kowalski Ranch	1995	Jun	3	B. Williams	MD	15N	6W	8	ON (2+ pair)	2+	PL	Nesting in drowned *P. lambertiana* snags	Williams	B	
LAK	Indian Valley Res./Cache Creek	1995	Jun	3	B. Williams	MD	15N	6W	18	ON (2+ pair)	2+	VS	Nesting in drowned oaks and digger pines in reservoir	Williams	B	
LAK	Indian Valley Res./Stanton Cr.	1995	Jun	3	B. Williams	MD	15N	6W	9	ON (2+ pair)	2+	PL	Nesting in drowned *P. lambertiana* snags	Williams	B	
LAK	Lake Co.	1892	May	16	UNSM 10236	MD				coll. ?	?			Jenks	I	C
LAK	Little Round Mtn.	1992			L. Stansberry	MD	17N	10W	9	ON	1+	C		Stansberry	L	
LAK	Little Round Mtn.	1993	May		L. Stansberry	MD	17N	10W	9	ON	4	C		Stansberry	L	
LAK	Little Round Mtn.	1994	Jun	10	B. Williams	MD	17N	10W	9	ON (2)	1+	C	Snag (sp.?) DBH=165cm, 27 ft.	Williams	B	
LAK	Little Round Mtn.	1995	Jun	4	B. Williams	MD	17N	10W	9	ON	1	C	Doug fir (?) snag DBH=58cm, 45 ft.; cavity 35 ft., abv. NOFL nest.	Williams	B	
LAK?	Eel R. Bridge/FS M-6	1984			BBS 011; P. Lindley	MD				obs. 3	1+		Obs 3 on 5/31, 1 on 6/2.	Lindley	P	
LAK?	Eel R. Bridge/FS M-6	1990	Jun	14	BBS 011; P. Lindley	MD				obs. 4	2+			Lindley	P	
LAS	Bogard Ranger Station	1929	Jun	22	Grinnell et al. (1930)	MD		8E		obs. several	5+			Grinnell	J	
LAS	Eagle Lake	1899	Jun	22	UI 1957	MD				coll. M	1+			Willard	J	M
LAS	Eagle Lake	1905	Jul		Sheldon (1907)	MD				coll.	?			Sheldon		
LAS	Eagle Lake	1906	Jul		CAS 59111,13	MD				coll. 2M	2+			Sheldon	H	H
LAS	Eagle Lake	1974	Jun	18	ABN (P. Metropulos)	MD				obs. 6	3+		"6 migrants - one pair nested" [?-B.W.]	Metropulos	P	
LAS	Eagle Lake	1978	Jun	5	T. Manolis	MD				obs.	?			Laymon	S	A
LAS	Eagle Lake	1970s			G. Alton	MD				obs.	1+		in barn area; sometimes near airport snags	Alton	G	

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
LAS	Eagle Lake, Christie CG	1985	Jul	14	AB 39:959 (D.Shuford, D.Beall); ABN	MD	31N	10E	3	ON (pair)	1	C	Pair at isolated snag, 1/4 mi. N of campground.	Shuford	D	
LAS	Eagle Lake, Gallatin Beach	1969	Jun	23	T. Manolis	MD	31N	11E		obs.	?			Manolis	T	D
LAS	Eagle Lake, S end	1988	Aug	15	ABN; S.F. Bailey	MD	31N			obs. 5-10	?			Bailey	S	F
LAS	Eagle Lake, W shore	1979	Jun	11	ABN (S.A. Laymon)	MD	31N	10E		obs. 2	1+			Laymon	S	A
LAS	Honey Lake	1912	Jun	4	Dawson (1916); Dawson (1923)	MD				ON (pair)	1	P	"occupying...giant pine overlooking the lake"	Dawson	W	L
LAS	Lassen Co.	1899	Jul		CAS 59112,14	MD				coll. M, F	1+	c	Probably Eagle Lake.	Willard	J	M
LAS	Mt. Lassen, E base	1884	Jun	6	Townsend (1887)	MD				ON	6+	P	Colony in large dead pine.	Townsend		
LAS	Powerline Rd. (near Ebey Lake)	1937	Aug	2	UCDZ 2688	MD	33N	7E	29	coll. F	?					
LAS	Willow Creek Valley	1981	Jul	21-31	AB 35:976 (B. Stovall); ABN	MD	31N	12E		obs. 9 (2ad,7juv)	2+		Suspected breeding for years; 1st good evidence.	Stovall	B	
LAS	Willow Creek Valley	1982			ABN (B.Stovall)	MD	31N	12E		obs. 3-6 ad.,4juv.	2+		2 on 4/17; 6 on 5/26; 7 in July.	Stovall	B	
LAS	Willow Creek Valley	1981-83			CDFG files (D. Airola)	MD	31N	12E		obs.	?			Stovall	B	
MAD	Bass Lake	1929	May	8	MVZ 78196	MD	7S	22E		coll. M	1+			Bassett	F	N
MAD	San Joaguin Exp. Range	1985	Apr	17-18	ABN (J. Lovio, Z. Labinger)	MD				obs. 1-3	?			Lovio	J	
MEN	Big River, 2 mi. E of mouth	1997	Jul	16	B. Williams	MD	17N	17W		obs. 2+	1+		Nest site not located.	Williams	B	
MEN	Big River, nr. Hansen's Curve	1994	May	24	CNDDB (J. Dreier)	MD	17N	17W	35	obs. 2	1+			Dreier	J	
MEN	Big River/Hwy. 1	1986	Jun	25	D. Tobkin	MD	17N	17W		ON	1+	BR	Nesting activity in drain holes.	Tobkin	D	
MEN	Big River/Hwy. 1	1989	May	6	D. Tobkin	MD	17N	17W		ON	1+	BR		Tobkin	D	
MEN	Big River/Hwy. 1	1991	May	27	ABN (D. Tobkin)	MD	17N	17W		obs. 3	1+			Tobkin	D	
MEN	Big River/Hwy. 1	1992	Jul	26	R.J. Keiffer	MD	17N	17W		ON (pair)	1+	BR	Nesting in weep holes in bridge.	Keiffer	R	J
MEN	Big River/Hwy. 1	1994			D. Tobkin	MD	17N	17W		NB (2-4)	2	BR		Tobkin	D	
MEN	Big River/Hwy. 1	??			B. Williams	MD	17N	17W		ON	?	BR		Williams		
MEN	Buck Rock	1984			CDFG files; B. Clement	MD	24N	10W	27	obs. M	1+		Seen all summer.	Clement	B	
MEN	Cleone, MP 66.65	1997	Jun	28	B. Williams	MD	19N	17W		ON	3+	CR	Redwood snag DBH=150cm, 75ft. Others not measured	Williams	B	
MEN	Eel R. N of Ukiah?	1975	Jun	15	ABN (P. Metropulos)	MD				obs. 3	1+			Metropulos	P	
MEN	Elk, N of near MP 35.2	1987	Jul	25	D. Tobkin	MD				obs. 4	2+		"...seems to be a likely spot for nesting."	Tobkin	D	
MEN	Fort Bragg	1956	Jul	10	AFN 10:408 (R. Coy); ABN	MD	18N	17W		FY	1+	C	"In old trees."; also 5 on 7/29.	Coy	R	
MEN	Fort Bragg, E of	1959	Jun	13	ABN (W.M. Pursell)	MD	18N	17W		obs.	1+			Pursell	W	M
MEN	Frazer Cr., 1 mi. e. of Hwy. 1	1994	Apr	17	CNDDB (J. Dreier)	MD	20N	17W	27	ON (6)	3+	C	Osprey nest on top of snag.	Dreier	J	
MEN	Gualala	1894	Jul	11-15	McLellan	MD				ON	2+	DF	"Breeding in woodpecker holes in dead fir trees."	McLellan		
MEN	Gualala Co. Park	1993	Jul	24	D. Tobkin	MD				obs. 3 pair	3+			Tobkin	D	
MEN	Juan Creek/Hwy. 1	1986	Aug	9	D. Tobkin	MD	21N	18W		NY	1+	BR	Nesting in weep holes in bridge.	Tobkin	D	
MEN	Juan Creek/Hwy. 1	1989	Jul	22	D. Tobkin	MD	21N	18W		ON (pair)	1+	BR		Tobkin	D	
MEN	Juan Creek/Hwy. 1	1991	Aug	2	D. Tobkin	MD	21N	18W		obs. F	?			Tobkin	D	
MEN	Juan Creek/Hwy. 1	1992			D. Tobkin	MD	21N	18W		obs. 4-6	2-3			Tobkin	D	
MEN	Juan Creek/Hwy. 1	1993			D. Tobkin	MD	21N	18W		obs. 1-5	2-3	BR	Two pair of adults feeding fledglings on 8/11.	Tobkin	D	
MEN	Juan Creek/Hwy. 1	1994			D. Tobkin	MD	21N	18W		NB (1-2)	1+	BR	Nesting in weep holes in bridge.	Tobkin	D	
MEN	MacKerricher SP	1990	Aug		ABN (R.J. Keiffer, D. Tobkin)	MD				obs. 1-3	?		Obs. 3 on 8/19, 1 on 8/26	Keiffer	R	J
MEN	MacKerricher SP	1993	Jul		D. Tobkin	MD				obs. 1-4	2+		Obs. 2M, 2F on 7/17.	Tobkin	D	
MEN	MacKerricher SP, Sandhill Lake	1989			D. Tobkin	MD				obs. 4		s	"lots of good snags"	Tobkin	D	
MEN	Mendocino	1894	Jul	16-18	McLellan	MD				ON	2+	c	"It is common and breeds in the abandoned woodpecker holes."	McLellan		
MEN	Mendocino	1992	Aug	1	R.J. Keiffer notes (D. Tobkin)	MD				obs. 2	1+			Tobkin	D	
MEN	Navarro River mouth	1960	Jun	13	S. Harris notes (Harris & Yocum)	MD				obs. 7+	3+			Harris	S	
MEN	Ornbaum Springs	1935	Jul	6	MVZ EGG SET 3928	MD	12N	13W		EGG SET (1), comp	1+	s		Miller	A	H
MEN	Ornbaum Springs, 4 mi. W	1934	Jul	19	MVZ 107194	MD	12N	13W		coll. M	1+			Moffitt	J	
MEN	Ornbaum Springs, 7 mi. W Yorkville P.O.	1936	May	16	MVZ 107195	MD	12N	13W		coll. M	1+			Moffitt	J	
MEN	Point Arena, 3 mi. NE	1973	Jul	16	ABN (O. J. Kolkman)	MD				obs. several	2+			Kolkman	O	J
MEN	Pudding Creek	1990	Aug		ABN; D. Tobkin	MD				obs. 3-9	?		Obs. 3 on 8/14, 9 on 8/17	Tobkin	D	
MEN	Pudding Creek/Little V. Creek	1992	Jul		CNDDB (B. Celentano)	MD	19N	17W	35	NY	4-6	CR	Large burned redwood snag in 1985-86 clearcut	Dreier	J	
MEN	Sinkyone Wilderness, nr. Usal Camp	1997	Jun	27	B. Williams	MD	23N	18W		obs. 1	1+		Nest not located.	Williams	B	
MEN	Sinkyone Wilderness, Orchard Camp	1997	Jun	28	B. Williams	MD	24N	18W		obs. 2	1+		Nest not located.	Williams	B	

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
MEN	Ten Mile R., Middle Fk., lower	1994	May	19	CNDDB (J. Dreier)	MD	20N	17W	25	obs. 2	1+			Dreier	J	
MEN	Ten Mile R., S Fk. at Green Acres	1994	May	25	CNDDB (J. Dreier)	MD	19N	17W	13	obs.	1+			Dreier	J	
MEN	Ten Mile R., S Fk. nr. Brower's Gulch	1994	May	25	CNDDB (J. Dreier)	MD	19N	16W	18	obs.	1+			Dreier	J	
MEN	Ten Mile R., S Fk., 1.5 mi. SE Brower's G	1994	May	25	CNDDB (J. Dreier)	MD	19N	16W	20	obs.	1			Dreier	J	
MEN	Ten Mile R./Hwy. 1	1990	Aug	26	D. Tobkin	MD				obs. F	?			Tobkin	D	
MEN	Ten Mile R./Hwy. 1	1993	Jun	17	D. Tobkin	MD				obs. F	1+			Tobkin	D	
MEN	Ten Mile R./Mill Creek mouth	1994	Apr	22	CNDDB (J. Dreier)	MD	20N	17W	35	obs. 2	1+			Dreier	J	
MEN	Ukiah	1974	May	31	ABN (O.J. Kolkman)	MD				obs. 2	?			Kolkman	O	J
MEN	Ukiah	1994	May	28	R.J. Keiffer notes (C. E. Vaughn)	MD				obs. 2	1+		Flying low over Deerwood Park area	Vaughn	C	E
MEN	Ukiah	1995	Jun	17	R.J. Keiffer notes (C. E. Vaughn)	MD				obs. 1	1+		Seen at sewage treatment plant	Vaughn	C	E
MEN	Usal Rd./Hwy. 1	1997	Jun	27	B. Williams	MD	22N	18W		obs. 3+	2+		Nest not located.	Williams	B	
MEN	Van Arsdale Res./Eel River Bridge	1993	May	14	R.J. Keiffer notes (J. White)	MD	18N	11W	29	obs. 1	1+	BR		White	J	
MEN	Van Arsdale Res./Eel River Bridge	1994	Jun		B. Williams, R.J Keiffer notes	MD	18N	11W	29	ON (2-4)	1+	BR	At least one pair nesting in weep hole over water.	Williams	B	
MEN	Van Arsdale Res./Eel River Bridge	1995	May	11-13	R.J. Keiffer notes (Demian Ebert)	MD	18N	11W	29	obs. 5-6	2-3	BR		Ebert	D	
MEN	Van Arsdale Res./Eel River Bridge	1996			R.J. Keiffer	MD	18N	11W	29	ON	2-3	BR	Three pair on 5/2; Four seen 6/30.	Keiffer	R	J
MEN	Van Dam SP	1982	Jul	8	ABN (B.D. Parmeter)	MD				obs. 2	1+			Parmeter	B	D
MEN	Westport	1908	Aug	10	FMNH 141752-53	MD	21N	17W		coll. M,F	?			Marsden		
MEN	Westport	1955	Jul	15	AFN 9:401 (Mrs. R. Coy); ABN	MD	21N	17W		ON	2	C	Nesting in "big stump."; 3 fledglings on 7/15	Coy	R	
MEN	Westport, Branscomb Rd.	1996	May	26	R.J. Keiffer	MD				ON	2+	CR	Apparently nesting in snags about 1/2 mile E of Hwy. 1	Keiffer	R	J
MEN	Westport, Branscomb Rd.	1997	Jun	??	B. Williams	MD				ON		CR		Williams	B	
MEN	Westport, Wages Creek mouth	1952	Jul	19	CSUS 327-29	MD	21N	17W		coll. M, 2F	2+			French	C	C
MEN	Westport, Wages Creek mouth	1988	May	15	ABN, R.A. Erickson notes	MD	21N	17W		obs. 2M, F	1+			Erickson	R	A
MER	Los Banos	1998	May	16	ABN (K. Van Vuren)	MD				obs. M	?			Van Vuren	K	
MER	Santa Nella, 5 mi. N on I-5	1984	May	11	ABN (K.L. Hainebach)	MD				obs. M	?			Hainebach	K	L
MNO	Mono Hot Springs	1974	Jun	22	ABN (R. H)	MD				obs. 1	?			H	R	
MNO	Oasis Ranch	1982	May	31	S.F. Bailey	MD				obs. 1	?			Bailey	S	F
MOD	Canby, 17.6 mi. W, 10.4 N	1963	May	19	MVZ 150010	MD	43N	7E	6	coll. F	1+		Very fat (61.3g).	Thaeler	C	
MOD	Goose Lake, W of st Willow Creek	1896	Aug	7	C. H. Merriam	MD		11E		obs. several	2+	P	Over "Willow Creek...and a number...about a large, dead pine."	Merriam	C	H
MOD	Happy Camp	1993	May	29-30	B. Williams	MD	42N	7E	4-35	obs. 6 (3-4 ad. M)	3-4		Nesting along west side of ridge overlooking open burn.	Williams	B	
MOD	Happy Camp	1998	Jun	7	B. Williams	MD	42N	7E		ON (5)	2-3	P	Yellow pine snag DBH=74cm; ht=35'	Williams	B	
MOD	Happy Camp	1990-2			B. Landenslayer	MD	42N	7E		obs. 6-10	2+		In large burn (~19897)	Landenslayer	B	
MOD	Hensky Wetland	1988	Aug	14	ABN; S.F. Bailey	MD	43N	7E	35	obs. 5	?		Probably post-breeding (B.W.)	Bailey	S	F
MOD	Whitehorse Flat Res.	1981	Jun	27	R. D. Ekstrom	MD	40N	5E		ON	1+	C	Nest near SW side of lake, above the road.	Ekstrom	R	D
MRN	Alpine Lake	1959	Apr	12	ABN: H.L. Cogswell	MD				obs. 1	1+		West side	Cogswell	H	L
MRN	Alpine Lake	1969	Jul	18	ABN (W.M. Pursell)	MD				obs. 20	4+			Pursell	W	M
MRN	Alpine Lake	1971	May	18	ABN (W.M. Pursell)	MD				obs. pair	1+		"None further up mountain where usually some."	Pursell	W	M
MRN	Alpine Lake	1973	Jul		ABN (W.M. Pursell)	MD				obs. 20	4+			Pursell	W	M
MRN	Alpine Lake	1974	May	6	ABN (W.M. Pursell)	MD				obs. pair	1+			Pursell	W	M
MRN	Alpine Lake	1981	Jul		AB 35:976 (I. Timossi); ABN	MD				FY	1+		"Adults feeding fledlings."	Timossi	I	
MRN	Alpine Lake	1982	Jun		Shuford (1993)	MD				FY	2+		May have nested near Kent Lake.	Timossi	I	
MRN	Alpine Lake	1986	Jun	15	ABN (D.A. Holway)	MD				obs. 15+	8+	c	"Fifteen+ heard at dawn."	Holway	D	A
MRN	Bear Valley	1993	Jun		B. Williams	MD				obs. 1	1+		Foraging over visitors center	Williams	B	
MRN	Bear Valley	1996	Aug	17	NASFN 51:116 (R. Stallcup)	MD				obs. 55	?		perched in douglas fir at dawn	Stallcup	R	
MRN	Bolinas Lagoon	1931	May	2	Allen (1931)	MD				obs.	1+			Swanton	H	
MRN	Bolinas Lagoon	1983			ABN (D. DeSante)	MD				obs. pair	1+		"May have nested in poles in Bolinas Lagoon."	DeSante	D	
MRN	Bolinas Lagoon	1990			ABN (K. Hansen)	MD				obs. 2-14	2+		Observed from 1 May-6 Jul	Hansen	K	
MRN	Bolinas Lagoon	1991			ABN (K. Hansen)	MD				obs. 5-25	4+		Observed 5-25 from 2 Jun-15 Jul; assumed nesting near	Hansen	K	
MRN	Bolinas Ridge	1959	Apr	12	ABN: H.L. Cogswell	MD				obs. 1	1+			Cogswell	H	L
MRN	Bolinas Ridge	1962	Apr	22	ABN (P. DeBenedictis)	MD				ON (3)	1+	C	"At nest sites."	DeBenedictis	P	
MRN	Bolinas Ridge, Lagunitas Crk.	1973	Jun	30	ABN (S.F. Bailey)	MD				obs. 1	1+			Bailey	S	F

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
MRN	Bolinas Ridge, nr. Audubon Cyn.	1982	Jul	4	ABN (D. Shuford)	MD				CF (3+)	2+	c		Shuford	D	
MRN	Bolinas Ridge, nr. Sam P. Taylor SP	1987	Jul	5	ABN (L. Silver)	MD				obs. 4-5	2+			Silver	L	
MRN	Carson Ridge	1978	May	16	ABN (G. Beebe)	MD				obs. M	1+			Beebe	G	
MRN	Carson Ridge	1981	Jun	8	ABN (D.Shuford)	MD				obs. 2	1+			Shuford	D	
MRN	Carson Ridge	1986	Apr	22	ABN (J.M. S)	MD				obs. 1	1+			S	J	M
MRN	Carson Ridge	1986	Apr	26	ABN (M.A. Danielson)	MD				obs. 1	?			Danielson	M	A
MRN	Carson Ridge, summit lot	1985	May	23,25	ABN (D.A. Holway)	MD				obs. 1+	1+		Regularly seen here in previous Springs.	Holway	D	A
MRN	Carson Ridge-Kent Lake	1982	Jun	5	ABN (D. Shuford)	MD				obs. 15	8+		"Stronghold in area."	Shuford	D	
MRN	Fairfax	1990	May	23	ABN (R. Ackley)	MD				obs. 4-5	2+		Not far from Alpine Lake	Ackley	R	
MRN	Five Brooks	1980			ABN (J. Evans); Shuford (1993)	MD				CN (pair)	1+	c	"Female carrying nesting material." on 5/31; F seen 6/14.	Evens	J	
MRN	Five Brooks	1981	Jun	15	ABN (D. Shuford)	MD				obs. 2	1+			Shuford	D	
MRN	Five Brooks	1981			ABN (B.&C. Yutzy)	MD				obs. 4-6	1+		"Adults and young."	Yutzy	B	
MRN	Five Brooks	1984	May	29	ABN (J. Richmond)	MD				obs. 2M, F	1+			Richmond	J	
MRN	Five Brooks	1985	Jul	20	ABN (B.D. Parmeter)	MD				obs. 1	1+			Parmeter	B	D
MRN	Five Brooks	1986			ABN: J. Winter (D.D. K; G. Feller)	MD				obs. 1-4	1+		Seen 4/9, 4/18, 6/24.	Feller	G	
MRN	Five Brooks	1987	Jul	18	ABN (M.L. Rosegay)	MD				obs. 2-3 (1M)	1+			Rosegay	M	L
MRN	Five Brooks	1988			ABN (m.ob.)	MD				obs. 1-12	?		Many sightings May-Aug.			
MRN	Five Brooks	1989	May	13	ABN (D. Sg)	MD				obs. 2	1+			Sg	D	
MRN	Five Brooks	1990	Aug		ABN (G. Fi+)	MD				obs. 4-6 (3M)	?		Obs 4 on 8/18, 6 on 8/20.	Fi	G	
MRN	Five Brooks	1998	Jul		L. Sykes	MD				obs. 7	4+			Sykes	L	
MRN	Inverness Ridge	1973	Jun	20	S.F. Bailey	MD				obs. F	1			Bailey	S	F
MRN	Inverness Ridge, above Five Brooks	1977	Jun		Shuford (1993)	MD				FY	1+	c		Stewart	R	M
MRN	Inverness Ridge, above Five Brooks	1980	Jul	5	ABN (D. Shnford, I. Timossi)	MD				obs. 2 pair	2+			Shuford	D	
MRN	Inverness Ridge, above Five Brooks	1981			AB 35:860 (G. Hugenberg+); ABN (D. S	MD				ON (6)	3+	C	"Nesting." on 5/25; also seen in June.	Hugenberg	G	
MRN	Inverness Ridge, Bolema Tr.	1976	Jun	12	ABN (L.C. Binford)	MD				obs. pair	1+			Binford	L	C
MRN	Inverness Ridge, Firtop	1978	May	12	ABN (G. Beebe)	MD				obs. M	1+			Beebe	G	
MRN	Inverness Ridge, Five Brooks Tr.	1984	Jun	12	ABN (G. Geupel)	MD				ON (2 pair)	2	C	Two pair "at the usual snag" at trail intersection.	Geupel	G	R
MRN	Inverness Ridge, Limantour Rd.	1995	Jun	12	NASFN 49:978 (Jack Dineson)	MD				ON (4)	2+	DF	Reported as new site for Marin County	Dinesen	J	
MRN	Inverness Ridge, Limantour Rd.	1997			ABN (ES, G. Finger, JMR, +)	MD				ON	2-3+	C		S	E	
MRN	Inverness Ridge, Limantour Rd.	1998	Jul		L. Sykes	MD				ON (9)	2-4	DF	Nesting in Douglas fir snag	Sykes	L	
MRN	Inverness Ridge, Olema/Bolinas Tr. Junct.	1986	May	18-25	ABN (J. Morlan)	MD				ON (2M,3F)	3	C	Prospecting holes in snags, harassed by EUST	Morlan	J	
MRN	Kent Lake	1977	May	31	Shnford (1993)	MD				NY	1+	C		Stewart	R	M
MRN	Kent Lake	1981	Jul		AB 35:976 (G. McCurdy); Shnford (199	MD				FY	2+	c	"Adults feeding fledglings." 7/23. Eight counted 7/18.	McCurdy	G	F
MRN	Kent Lake	1982			ABN (B. Lenarz)	MD				obs.	1+		"Confirmed breeding."	Lenarz	B	
MRN	Kent Lake	1984			AB 38:1059 (J. Evens); AFN	MD				ON (30)	5+	C	High count 30, 7 Aug; entering nest snag on 25 Jun, 25 Jul.	Evens	J	
MRN	Kent Lake	1985			ABN (J. Evens)	MD				ON (15)	7+	C	Using 3 nest trees. Two males first seen 19 April.	Evens	J	
MRN	Kent Lake	1989	Jul	20	B. Noble	MD				obs. 45	8+		At ridges above the lake.	Noble	B	
MRN	Kent Lake	1995	Mar	31	NASFN 49:306 (J. Evens)	MD				obs. 1	1+		Reported as one of two colonies in Marin Co.	Evens	J	
MRN	Kent Lake	1998			L. Sykes	MD				ON (7)	3+	DF	Nesting in submerged firs in reservoir	Sykes	L	
MRN	Kent Lake, pump station	1998			L. Sykes	MD				ON (7)	3+	DF	Nesting in submerged firs in reservoir	Sykes	L	
MRN	Lagunitas Lake	1972	Jun	1	AB 26:902 (W.M. Pursell); ABN	MD				obs. pair	1		Fewer numbers correlated with increase in woodland EUSTs.	Pursell	W	M
MRN	Lighthouse Rd. (?)	1962	Jul	7	ABN (Grace Miller)	MD				obs.	?		"Colony nesting." [?]	Miller	G	
MRN	Olema	1884	May	8	Belding (1890)	MD				obs. 1+	1+		First seen; breeds.	Ingersoll	A	M
MRN	Palomarin	1979	Jun	18	ABN (PRBO)	MD				obs. 6	2+					
MRN	Palomarin	1984			AB 38:1059	MD				obs. 1-4	?		Nine sightings 12 Jun-3 Jul; "exceptionally good numbers and regularity."			
MRN	Phoenix Lake	1931			Allen (1931)	MD				obs.	1+		Seen near lake on May 5, June 6 (Mrs. Kelley), and June 14	Kelley		
MRN	Point Reyes	1894	May	22	ANS 45646-48	MD				coll. 2M, 1F	2+					
MRN	San Geronimo	1898	Aug	11	CAS 53140,42	MD				coll. 2juv.	1+			Mailliard	J	
MRN	Shroyer Mtn, NE of Lucas Valley	1982	Jun	6	ABN (B. Lenarz)	MD				obs. pair	1+		"One pair foraging for several hours."	Lenarz	B	
MRP	Coulterville	1920s			Grinnell and Storer 1924	MD				obs.	?		"...appearing occasionally, in spring, ...east of Coulterville."	McLean	D	

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
MRP	Mariposa, dump	1985-?			Gaines (1992); C. Lyons	MD				obs.	3+			Lyons	C	
MRP	Yosemite Valley	1893	Jun	20-25	Emerson (1893)	MD				obs. 1+	1+	QK	Heard in old oaks near Stoneman House; seen in foothills	Emerson	W	O
MRP?	Crocker's (?)	1880s			Fisher (1893)	MD				obs.	?			Belding	L	
MTY	Anderson Peak	1991	Jun	23	Roberson (1993); MTY BBA	MD				ON (2)	1	c		Hohenberger	C	
MTY	Anderson Peak	1998	May	17	ABN (Tam?)	MD				obs. 6 pair	6+	c		Am	T	
MTY	Andrew Molera SP	1971	May	8	ABN (E.A. Pugh)	MD	19S	1E		ON (4)	2+	WS	"Four inspecting holes in sycamore."	Pugh	E	A
MTY	Andrew Molera SP	1977	Jul	23	ABN (T. Bledsoe)	MD	19S	1E		obs. 10 (8ad.,2juv.)	4+			Bledsoe	T	
MTY	Andrew Molera SP	1985	Jun	8	ABN (D. Roberson, K.L. hainebach)	MD	19S	1E		obs. 7-8	4+			Roberson	D	
MTY	Andrew Molera SP	1986	Mar	24	AB 40:520 (J. Buntin, R.F. Tintle+)	MD	19S	1E		obs.	1+		First arrival.	Buntin	J	
MTY	Andrew Molera SP	1986	Jul	3	ABN (B.G. Elliott)	MD	19S	1E		obs. 12 (4M)	4+			Elliott	B	G
MTY	Andrew Molera SP	1990			ABN (D. Roberson+)	MD	19S	1E		obs.	6		"About six pairs."	Roberson	D	
MTY	Andrew Molera SP	1991			Roberson (1993); ABN (m.ob.)	MD	19S	1E		obs. 10-12	5+			Brr	B	
MTY	Andrew Molera SP	1993	Jun	15-16	B. Williams	MD	19S	1E		ON (4M, F)	4-6	WS	Nesting in scattered sycamores.	Williams	B	
MTY	Andrew Molera SP	1994	Jun	30	H. Green	MD	19S	1E		NY(5)	1+	WS		Green	H	
MTY	Big Creek	1990	Jun	7	MTY BBA	MD				obs.	?			Bailey	S	F
MTY	Big Creek region	1909			Pemberton & Carriger (1915)	MD				ON	5+	c	"...especially numerous...."	Pemberton		
MTY	Big Creek, Highlands Camp	1978			Cull and Melchert (1980)	MD			31	ON	2+	P	Nesting in pine snag.	Cull	R	
MTY	Big Creek, upper	1905			Jenkins (1906)	MD	21S			ON (several pair)	4+	P	"Several pairs were...occupying hollow pine trees...."	Jenkins	H	O
MTY	Big Creek, upper	1992	Jun	29	MTY BBA	MD				obs.	?			Bailey	S	F
MTY	Big Creek, vicinity	1905			Jenkins (1906)	MD				obs.	?		"A number of flocks...flying in the vicinty of..."	Jenkins	H	O
MTY	Big Sur Coast	1982	Jun	19	ABN (A. Baldridge)	MD				obs. 12	6+			Baldridge	A	
MTY	Big Sur Redwoods S.P.	1942	Apr	25-26	R.W. Storer MVZ notes	MD				obs. 5+	3+	CR	Several pairs at large redwood snag, N end of valley; sketch.	Storer	R	W
MTY	Big Sur River	1910	Jul		CAS 17740-42	MD				coll. 2M,F	2+			Beck	R	H
MTY	Big Sur Town	1990			Roberson (1993)	MD				ON	3-6	WS	In sycamores.			
MTY	Big Sur Town	1992	Jun	9	Roberson (1993)	MD				obs.?	2+			Weed	B	
MTY	Big Sur Town	1993	Jun	16	B. Williams	MD				ON (4+)	2+	WS	At least one nest in sycamore next to Hwy. 1.	Williams	B	
MTY	Big Sur, few mi. S	1956	Jul	14	ABN (R.D. R)	MD				obs. 10+	2+			R	R	D
MTY	Big Sur, just S	1976	Jul	25	AB 30:1000 (T. Schulenberg+); ABN	MD				obs. 22	4+			Schulenberg	T	
MTY	Bixby Canyon	1970			Roberson (1993)	MD				none	0		Colonies disappeared before 1970.			
MTY	Bixby Canyon	1979	May		ABN (B.G. Elliott)	MD				none	0		Perhaps due to felling of snags formerly used.	Elliott	B	G
MTY	Bixby Canyon	1980	Apr	12	ABN (B.G. Elliott)	MD				obs.	1+			Elliott	B	G
MTY	Buck Creek/Hwy 1	1992	Jul	7	Roberson (1993)	MD		3E		ON	3-6	BR		Bailey	S	F
MTY	Buck Creek/Hwy 1	1993	Jun	16	B. Williams	MD		3E		ON (5M, 1F)	4-6	BR	At least four holes occupied. 4 ad. males; one subadult pair.	Williams	B	
MTY	Carmel	1939	May	23	CHAS 5281	MD				coll. F	?			Boke	R	L
MTY	Carmel Highlands				Roberson (1993)	MD				ON						
MTY	Carmel Valley	1903	Jun	14	FMNH 141754	MD				coll. M	?			Bishop	L	B
MTY	Carmel Valley, 8 mi. up	1921	Jul	23	FMNH 141755-56	MD				coll. M,F	?			Bishop	L	B
MTY	Castro Canyon	1980	Apr	12	ABN (B.G. Elliott)	MD				obs.	1+			Elliott	B	G
MTY	Chalk Peak, S of	1988	May	30	ABN (D. Roberson, R.E. R)	MD				obs. 1	1+		"Previously unreported site."; Near SLO border	Roberson	D	
MTY	Chalk Pk., 2 mi. S	1919	Jun	22	MVZ 31131	MD				coll. M				Hunt	R	M
MTY	Chews Ridge	1936	Jun	17	MVZ 92076-78	MD				coll. 3M	3+			VonBlocker	J	C
MTY	Chews Ridge	1968	Apr	21	ABN (D. DeSante+); M.Perrone	MD				ON (2)	1+	s	near Tassajara Hot Springs	DeSante	D	
MTY	Chews Ridge	1969	May	11	ABN (L.C. Binford, T. Chase)	MD				obs. F	1+			Binford	L	C
MTY	Chews Ridge	1982	May	7	AB 36:891(D. Roberson); ABN	MD				obs. 2	1+		"Where they formerly nested...."	Roberson	D	
MTY	Chews Ridge	1983	Jun	11	ABN (D. Roberson)	MD				obs. M	1+			Roberson	D	
MTY	Chews Ridge	1985	Jun	8	ABN (B. Weed)	MD				obs. 3	2+			Weed	B	
MTY	Chews Ridge	1990	May	12	MTY BBA; ABN (M. Feigner, R.E. R)					obs. 2	1+			Feigner	M	
MTY	Chews Ridge				Roberson (1993)	MD				obs.?				Travaille	K	
MTY	Chew's Ridge	1936	Jul	6	SJSU specimens (1646, 1647)	MD				coll. M, juv. M	1+	c	5,000 ft. Elevation			
MTY	Chews Ridge, China Camp	1971	Jun	7	ABN (T. Chandik); Ted Chandik	MD				obs. M	1+		nest site not located.	Chandik	T	

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
MTY	Chews Ridge, China Camp	1991	May	12	ABN (M. Feigner.)	MD				obs. 1	1+			Feigner	M	
MTY	Cholame Creek	1950			Roberson (1993)	MD				obs.	?		Once regular, gone by 1950s	McMillan	I	
MTY	Cone Peak	1991	Jul	26	MTY BBA	MD				obs. 1+	?			Roberson	D	
MTY	Cone Peak, E (7 mi. E Lucia)	1959	Jun	7	AFN 13:452 (V.L. Yadon); ABN	MD				obs. 2+	1+		Seen with 10 BLSW and VGSW	Yadon	V	L
MTY	Cone Peak, N	1992	Jul	26	S.F. Bailey	MD				obs. 5	1+			Bailey	S	F
MTY	Ft. Hunter Liggett, Stoney Lake	1966	Apr	23	ABN (William Reese)	MD				ON	1+	s	"Nesting holes chosen by this date."; Not present 4/10.	Reese	W	
MTY	Gamboa Point	1979			ABN, B.G. Elliott	MD				obs.	?		"Third consecutive year returned."; Not seen since 1979	Elliott	B	G
MTY	Garland Ranch R.P.	1977	May	1	ABN: H.L. Cogrwell	MD				obs. 2+	1+			Cogswell	H	L
MTY	Garland Ranch R.P., Redwood Cyn.	1988	May	20	MTY BBA	MD				obs.	?			Suddjian	D	L
MTY	Garland Ranch R.P., Redwood Cyn.	1994	May	28	D. Roberson	MD				ON	6-8	CR	In "...huge standing dead redwood...."; Was poss. BBA site	Roberson	D	
MTY	Generals Reservoir	1991	Jun	5	Roberson (1993); MTY BBA	MD				ON	1	s		Roberson	D	
MTY	Greenwood Park	1957			Roberson (1985)	MD				ON	1+		Last known nesting pair on Monterey Peninsula.			
MTY	Grimes Canyon/ Hwy 1	1990	Jun	9	ABN (R.F. Tittle)	MD				obs. 2	?			Tittle	R	F
MTY	Hastings Reservation	1942			Linsdale (1947), Davis et al. (1980)	MD				ON	2+	QL	Nested in cavities in lone valley oaks on flats and hilltops.			
MTY	Hastings Reservation	1948			Davis et al. (1980)	MD				ON	1+	s				
MTY	Hastings Reservation	1950	Apr	2	AFN 4:259 (J.M. Linsdale)	MD				obs.	?		First arrival.	Linsdale	J	M
MTY	Hastings Reservation	1951			Davis et al. (1980)	MD				ON	1+	s				
MTY	Hastings Reservation	1984	Jun	9	ABN (M. Green)	MD				obs. 1	?		1st record in about 20+ years; probably from Chew's Ridge.	Green	M	
MTY	Jolon	1894	Mar		McLellan	MD				ON	3+		"Common."	McLellan		
MTY	Junipero Serra	1992	Jul	7	MTY BBA	MD				obs.	?			Tittle	R	F
MTY	Mal Paso Canyon	1970			Roberson (1993)	MD				none	0		Colony gone before 1970.			
MTY	Mal Paso Cyn., 1/4 mi. from coast	1964	Jun	26	ABN (V.L. Yadon, R.L. Branson)	MD				obs. 2	1+		"Apparently successful nesting." [? - B.W.]	Yadon	V	L
MTY	Michael's Hill	1993	Jun	17	B. Williams	MD	20S	3E	8	ON (8+)	5-7	PP	Also include E edge of Sect. 7.	Williams	B	
MTY	Miller Canyon	1936	Jul	3	MVZ 92075	MD				coll. M	1+			VonBloeker	J	C
MTY	Monterey Co.	1897	Jun	26	SJSU specimen (242)	MD				coll. F	1+					
MTY	Pacific Grove	1956			ABN (L.R. Hastings)	MD				NY	1-2		Nest fledged young by mid-July.	Hastings	L	R
MTY	Pacific Valley (Gorda)	1905			Jenkins (1906)	MD		5E		obs. several	5+		"a number of flocks...." June-July.	Jenkins	H	O
MTY	Pacific Valley (Gorda)	1992			Roberson (1993)	MD				none	0		Many EUST now, but no martins.			
MTY	Pat Springs, ridge to E	1992	Jun	28	Roberson (1993); MTY BBA	MD				FY	8-10			Roberson	D	
MTY	Pfeiffer Big Sur SP	1966	Apr	2	ABN (R.L. Branson+)	MD				obs. 1	?			Branson	R	L
MTY	Pfeiffer Big Sur SP	1989	May	8-9	ABN (A. Kratter)	MD				obs. 6	?			Kratter	A	
MTY	Pine Ridge	1989	Jun	1	Roberson (1993); MTY BBA	MD				obs. 10+	5+			Travaille	K	
MTY	Pine Valley	1988	Apr	16	MTY BBA	MD				obs. 10+	?			Travaille	K	
MTY	Pine Valley	197(?)			CDFG files (B. Clement)	MD				ON	1+	PP	In *P. ponderosa* snags, year before Marble Cone fire.	Clement	B	
MTY	Robinson Canyon, mouth	1966			Roberson (1993)	MD				obs.	?			Baldridge	A	
MTY	San Antonio River	1894			McLellan	MD				ON	3+	Q	"Common."; In large oaks	McLellan		
MTY	San Martin Top, ridge above	1992	May	24	Roberson (1993); MTY BBA	MD				ON	5-8	C		Tittle	R	F
MTY	Santa Lucia Mountains	1938	Apr	8	BL 40: 228	MD				obs.	1+			Linsdale	J	M
MTY	Torre Canyon/Hwy. 1	1981			AB 35:976 (D. Roberson); ABN	MD	20S	3E		ON (15)	3+	BR	High count 15 from 24 Jun-18 Jul	Roberson	D	
MTY	Torre Canyon/Hwy. 1	1982	Apr	23	ABN (D. Roberson)	MD	20S	3E		obs. 3 pair	3+			Roberson	D	
MTY	Torre Canyon/Hwy. 1	1988			ABN (D. Roberson, C. Bissel)	MD	20S	3E		obs. 5+	3+	BR	"Back nesting...where apparently absent last few years."	Bissel	C	
MTY	Torre Canyon/Hwy. 1	1990	Jun		MTY BBA; ABN (R.F. Tittle)	MD	20S	3E		obs. 6	3+			Tittle	R	F
MTY	Torre Canyon/Hwy. 1	1993	Jun	16	B. Williams	MD	20S	3E		ON (4M, 3F)	4-5	BR		Williams	B	
MTY	Torre Canyon/Hwy. 1	1988-92			Roberson (1993)	MD	20S	3E		ON	10-15	BR	Active (at least most years) since at least 1981.			
MTY	Vincente Crk, S. Access Rd	1979			Cull and Melchert (1980)	MD			32	ON		s				
NAP	Almaden	1950	May	30	AFN 4:259 (Nielson)	MD				obs. 5	2+			Melchert	D	
NAP	Angwin	1977	May	14	J. Winter	MD				obs. 1	?		Nest site not located. Ask Wayne Tilley	Nielson	G	
NAP	Angwin, 2.5 mi. NW nr. Granite L.	1940	Jul	15	Bill Grummer (D.V. Hemphill)	MD	9N	6W	25	ON	1+	c		Winter	J	
NAP	Angwin, 2.5 mi. NW nr. Granite L.	1941	Jul	15	Bill Grummer (D.V. Hemphill)	MD	9N	6W	25	ON	1+	c		Hemphill	D	V
NAP	Capell Creek Cyn., nr. Berryessa	1972			ABN (F. Barnes)	MD		3W		ON	4+	s	Colony seen in June-July.	Hemphill	D	V
														Barnes	F	

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
NAP	Howell Mountain	1958	Apr	10	AFN 12:381 (D.V. Hemphill); ABN	MD		5W		obs.	?			Hemphill	D	V
NAP	Howell Mtn./Conn V. Rds.	1992	May	30	BBS 202; G. Clifton	MD	8N	5W	29	ON (2)	1+	DF	Nesting in snags from 1978 fire.	Clifton	G	
NAP	Howell Mtn./Conn V. Rds.	1993	May	30	BBS 202; G. Clifton	MD	8N	5W	29	ON (6)	3+	DF	Nesting in snags from 1978 fire.	Clifton	G	
NAP	Howell Mtn./Conn V. Rds.	1994	Jun	6	B. Williams	MD	8N	5W	20	obs. 18	8-11	df	18 emergered in late evening; at least 8 pair in vicinity.	Williams	B	
NAP	Howell Mtn./Conn V. Rds.	1994	May	28	BBS 202 (G. Clifton)	MD	8N	5W	29	obs. 4	2+	df		Clifton	G	
NAP	Howell Mtn./Conn V. Rds.	1994	Jun	5-6	B. Williams	MD	8N	5W	29	ON	1-2	DF	Nesting in 55 ft. Doug-fir snag (DBH = 84 cm)	Williams	B	
NAP	Howell Mtn./Conn V. Rds.	1995	May	29	BBS 202 (G. Clifton)	MD	8N	5W	29	obs. 4	2+			Clifton	G	
NAP	Howell Mtn./Conn V. Rds., N	1994	Jun	5-6	B. Williams	MD	8N	5W	20	ON (3+)	2+	DF	Nesting in large Doug-fir snag from 1978 fire.	Williams	B	
NAP	Howell Mtn./Conn V. Rds., NE	1994	Jun	6	B. Williams	MD	8N	5W	21	ON (2)	1+	DF	Nesting in 100 ft. Doug-fir snag from 1978 fire; cavity at 60 ft.	Williams	B	
NAP	Jameson Canyon, SE Co.	1984	Apr	17	ABN (M. Rippey)	MD				obs. F	?			Rippey	M	
NAP	Lake Hennessey	1994	Jun	5-6	B. Williams	MD	7N	5W		obs. 1+	?		Singing before dawn, but none seen later. Probable commuters.	Williams	B	
NAP	Mt. St. Helena	1989	Jul	1	B. Grummer	MD				obs. 4+	2+		Foraging with WTSW and VGSW.	Grummer	B	
NAP	Napa Valley	1800s			Bickford (1927)	MD				ON	2+			Leach	F	A
NAP	Palisades	1977-80			CDFG files (B. Grummer)	MD	9N	6W	7	ON	2+	DF	Nesting in large dead doug firs created by 1964 fire.	Grummer	B	
NAP	Palisades, N	1992	Jun	3	Napa BBA (B. Grummer)	MD	9N	6W	7	NY	10	DF	Scattered colony with approximately 10 pairs; Doug-fir snags.	Grummer	B	
NAP	Palisades, NE	198(7)			R. Jurek	MD	9N	6W	8	ON	1+	DF		Jurek	R	
NAP	Palisades, SE	1984	Jun	12	B. Grummer (M.J. Berner)	MD	9N	6W		obs. 2	1+			Berner	M	J
NAP	Pope Valley	1993			B. Grummer	MD				ON (pair)	1	UP	Using former ACWO cavity in utility pole. UTM 550-275	Grummer	B	
NAP	Putah Creek, above L. Berryessa	1993			Napa BBA (M. and B. Irwin)	MD	10N	5W	16?	NY (pair)	1	s	Pair at nest 5/19, 6/19.	Irwin	M	M
NAP	Putah Creek, above L. Berryessa	19(80)			B. Grummer	MD				ON	1+	s	Nesting in snags along Putah Creek.	?		
NAP	Robert Louis Stevenson SP	1980	Jun	15	B. Grummer	MD	9N	7W		ON	1+	DF	Snags from 1964 fire	Grummer	B	
NAP	Robert Louis Stevenson SP	1985	May	23	R. Leong	MD	9N	7W		obs. 1	1+		Over ridge on east side of park.	Leong	R	
NAP	Robert Louis Stevenson SP	1986	Apr		ABN (B.D. Parmeter); B. Grummer	MD	9N	7W		ON (pair)	1+	DF		Parmeter	B	D
NAP	Robert Louis Stevenson SP	1977-81			CDFG files (B. Grummer)	MD	9N	7W	1	ON	2+	DF	Nesting in large dead doug firs created by 1964 fire.	Grummer	B	
NAP	Robert Louis Stevenson SP	1978-81			CDFG files (B. Grummer)	MD	9N	7W	2	ON	2+	DF	Nesting in large dead doug firs created by 1964 fire.	Grummer	B	
NAP	St. Helena, near	1990	Apr	20	Napa BBA (L. and A. Angel)	MD				obs. 2+	1+			Angel	L	
NAP	Table Rock	1977-80			CDFG files (B. Grummer)	MD	9N	7W	2	ON	2+	DF	Nesting in large dead doug firs created by 1964 fire.	Grummer	B	
NAP	Table Rock, 1/2 mi. NE	1988	Jun	23	B. Grummer (M.J. Berner)	MD	9N	6W	7	obs. 2+	1+			Berner	M	J
NAP	Veeder Mtn, near Lokoya	1959	Jul	19	ABN: H.L. Cogswell	MD				obs. 2 pair	2+	DF	Two pair "...on partly dead Douglas-fir in semi-forested area."	Cogswell	H	L
NAP?	Mt. St. Helena	1969	May	17	ABN (Eugene Hunn)	MD				obs. pair	1+			Hunn	E	
NEV	Grass Valley, downtown	1990	Jun	3	ABN (B. Deuel)	MD	16N	8E		obs. F	?			Deuel	B	E
NEV	Grass Valley, downtown	1910-24			Richards (1924)	MD	16N	8E		ON	3+	D,	Fairly common in oaks and buildings, decreasing.	Richards	E	B
NEV	Wolf Mountain	1998	Jun	27	B. Williams	MD	15N	8E		obs. 10+	5+			Williams	B	
ORA	Anaheim	1920	Aug	2	MVZ 136341	SB				coll. F	?			Clabaugh	E	D
ORA	Balboa	1919			Ross (1925)	SB				ON (1)	1	ED	One pair first colonized building	Greeley	J	P
ORA	Balboa	1920	Jul		Ross (1925), BL 22:234	SB				ON	2+	ED		Ross	R	C
ORA	Balboa	1923			BL 25:332-333	SB				ON	3+	ED	Occupied their usual quarters at Balboa			
ORA	Balboa	1924	Jul		Ross (1925)	SB				ON (14 nests)	14	ED		Ross	R	C
ORA	Balboa	1932			J.T. Marshall	SB				ON	1+	ED	Nesting in building.	Marshall	J	T
ORA	Balboa City	1939	Jun	9	WFVZ EGG SET	SB				EGG SET (4)	1+	ED	"ledge under eaves...bowling alley...20'...water"	Hall	E	M
ORA	Balboa Isle	1939	Jun	9	WFVZ EGG SET	SB				EGG SET (4)	2+	ED	"ledge under eaves...Pavilion...20' above water"	Hall	E	M
ORA	Balboa Isle	1939	Jun	9	WFVZ EGG SET-2	SB				EGG SET (5); fresh	2+	ED	"ledge under eaves of Pavilion...20 ft over water"	Hall	E	M
ORA	Balboa Isle	1942	Jul	26	Von Bloeker (1942)	SB				ON	5+	ED	"large nesting colony...at the Balboa pavilion...."	Bloeker	J	C
ORA	Balboa Isle	1943			H. Cogswell notes	SB				ON	6+	ED	Also in Aud. Mag 45 (suppl.)	Smith	H	
ORA	Balboa Isle	1955	Mar	9	H. Cogswell notes	SB				ON	2+	ED	On schedule at Pavilion as last 24 years, also And Mag. (suppl:319)	Stultz	A	
ORA	Capistrano Beach	1907	Jul	12	F.M. & V. Bailey	SB				obs. 2	?		"Two...were seen...on the ocean beach."	Bailey	F	M
ORA	Caspers Regional Park (=Starr-Viejo)	1979			AB 33:898	SB				ON	2+	s				
ORA	Caspers Regional Park (=Starr-Viejo)	1960?			Sexton and Hunt 1979	SB				ON	1+	WS				
ORA	Coal Canyon (loc?)	1990	May	31	R.A. Erickson notes	SB				obs. F	1+			Erickson	R	A
ORA	El Modena	1907	Jul	20-21	F.M. & V. Bailey	SB				obs. 3	?		on wires	Bailey	F	M

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
ORA	Fullerton	1942			H. Cogswell notes	SB				ON	4+		Also in Aud. Mag 44	White		
ORA	Fullerton, near	1899	May	6	DMNH EGG SET 4050	SB				EGG SET (4)	1+	WS	Nesting in woodpecker cavity in dead sycamore.	Dunn	H	H
ORA	Irvine Lake	1949			AFN 3:252 (Ralph Mall)	SB				obs.	2+		"seen regularly" in nesting season	Mall	R	
ORA	Irvine Lake	1953	Jun	21	AFN 7:291 (A. Small?)	SB				obs. 20	6+					
ORA	Irvine Park	1960			AFN 14:478 (A. Small?)	SB				ON	1+	WS	"again successfully nested at Irvine Park...."	Harding	M	
ORA	Irvine Park	1961	Jul	8	AFN 15:493 (R.&M. Wilson)	SB				obs.	1+			Wilson	R	
ORA	Irvine Park	1962			AFN 16:448 (A. Small)	SB				obs.	3+		"...present in very good numbers...." in spring	Small	A	
ORA	Leach Canyon	1985			Gallagher (1997)	SB				ON (1 pair)	1+	bs	visiting probable nest site	Gochenour	V	
ORA	San Juan Capistrano	1917	May	23	UCLA 11811	SB				coll. M	?			Howell	A	B
ORA	Santa Ana	1907	Jul	20-21	F.M. & V. Bailey	SB	5S			ON	2+	ED	Seen entering holes in top of tall brick building.	Bailey	F	M
ORA	Santa Ana	19(20)			Bryant (1924)	SB	5S			ON	3+			Bryant	H	C
ORA	Sunset Beach	1917	May	23	LACM 1918	SB				coll. F	?			Wyman	L	E
ORA	Trabuco Canyon	1977	Aug	10	A. Edwards	SB				obs. 8	2+			Edwards	A	
ORA	Trabuco Canyon (lower)	1907	Jul	16	F.M. & V. Bailey	SB				obs. 4-5	1+	WS	"In the sycamores."	Bailey	F	M
ORA	Trabuco Canyon (upper)	1907	Jul	16	F.M. & V. Bailey	SB				obs. 2	1+			Bailey	F	M
ORA	Trabuco Canyon, O'Neill Park	1959			AFN 13:456 (Margaret Harding)	SB				ON	1+	WS	"...reported as nesting..."	Harding	M	
ORA	Trabuco Canyon, O'Neill Park	1961	Jul	8	AFN 15:493 (R.&M. Wilson)	SB				obs.	1+			Wilson	R	
ORA	Trabuco Canyon, O'Neill Park	1962			AFN 16:448 (A. Small)	SB				obs.	3+		"...present in very good numbers...." in spring	Small	A	
ORA	Trabuco Canyon, O'Neill Park	1965	May	22	R. Jurek notes	SB				obs. 4	2+	WS	Perched in sycamore.	Jurek	R	
ORA	Trabuco Canyon, O'Neill Park	1979			AB 33:898	SB				ON	1+	WS				
ORA	Trabuco Canyon, O'Neill Park	1980			Garrett and Dunn (1981)	SB				ON	1+	WS				
ORA	Trabuco Canyon, O'Neill Park	1981	Jul	12	Gallagher (1997)	SB				obs.	1+	ws	Last known sighting.	Hays	L	
ORA	Trabuco Peak, just W	1988	Jun	4	Gallagher (1997)	SB	5S	6W	26	ON (2)	1+	bs	visiting probable nest site	Woodroof	W	
PLA	Auburn	1959	Apr	8	ABN (G. McCaskie); SAS (G. McCaskie	MD	12N	8E	15	ON (50)	20+	ED		McCaskie	R	G
PLA	Auburn	1961	Mar	18	SAS (G. McCaskie)	MD	12N	8E	15	obs.	1+		"First reached Auburn."	McCaskie	G	
PLA	Auburn	1976	Apr	11	ABN (B. Barnes)	MD				obs. 1	?			Barnes	B	
PLA	Auburn	1977	Aug	9	ABN (B. Barnes)	MD				obs. 10	2+			Barnes	B	
PLA	Auburn	1978			ABN, SAS (B. Barnes)	MD				obs. 1-12	2+		Over the Water Treatment Ponds	Barnes	B	
PLA	Auburn	1990	Apr	12	ABN (D. Shuford)	MD				obs. F	?			Shuford	W	D
PLA	Auburn Courthouse	190(8)			Adams (1909)	MD	12N	8E	15	ON	?	ED		Adams		
PLA	Auburn Courthouse	198(0)			Mallette (1987), B. Mallette	MD	12N	8E	15	ON	6	ED	nesting in Cliff Swallow pot?	Mallette	B	
PLA	Auburn, nr.	1980	Jul	8	ABN (B. Barnes)	MD				obs. 8	1+			Barnes	B	
PLA	Lincoln, Gladding/McBean	1890-09			Adams (1909)	MD	12N	6E		ON	3-8	ED		Adams		
PLU	Buck's Lake, NW dam	1974	Jul	13	T. Manolis	MD				obs. F	?			Manolis	T	D
PLU	Lake Almanor	1962	May	13	ABN (P. DeBenedictis)	MD				obs. 3M, F	?		"...with many other swallows, possibly migrants."	DeBenedictis	P	
RIV	Beaumont	1910	Jun	28	UI 1960	SB	3S	1W		coll. M	1+			Rossem	A	V
RIV	Lakeview	1996	May	24	NASFN 50:333 (D. R. Willick)	SB	4S	2W		obs. 1	?			Willick	D	R
RIV	Riverside	1896	Apr	19	FMNH 20720	SB				coll.				Heller		
RIV	San Bern. Mtns., Hathaway Canyon	1897	Jun	6	SBCM EGG SET	SB		1E		EGG SET (5)	4	BC	"dead spruce 70 ft from ground...3 other nests"	Gilman	A	F
RIV	San Bern. Mtns., Little Hathaway Cyn, he	1897	Jun	6	SBCM EGG SET	SB				EGG SET (5), not in	4	BC	"woodpecker hole...65 ft...in spruce"	Gilman	A	F
RIV	San Jacinto Mtns.	1914	Jul	17	CAS 53141	SB				coll. F	2+			VanRossem	A	J
RIV	San Jacinto Mtns.	1914	Jul	17	UCLA 10630	SB				coll. M	2+			VanRossem	A	J
RIV	San Jacinto Mtns.	1914	Jul	17	Del.MNH 007155-56	SB				coll. M,F	2+			VanRossem	A	J
RIV	San Jacinto Mtns.	1979			AB 33:898	SB				ON	6-8+					
RIV	San Jacinto Mtns., Fuller's Mill	1908	Jul	3	MVZ 1874-75	SB				coll. 2F	2+			Taylor	W	P
RIV	San Jacinto Mtns., Fuller's Mill	1908	Jun	22	MVZ 1876	SB				coll. M	1+			Richardson	C	H
RIV	San Jacinto Mtns., Fuller's Mill	1908			Grinnell and Swarth (1913)	SB				obs.	3+		"fairly common"; was highest elevation (5900 ft)	Grinnell	J	
RIV	San Jacinto Mtns., Hemet L., above	197(9)			Garrett and Dunn (1981)	SB				ON	1+	C				
RIV	San Jacinto Mtns., Hemet L., near	1993	Jul	10	AB 47:1151 (G. Hazard)	SB				obs. 1	1+			Hazard	G	
RIV	San Jacinto Mtns., Hemet Lake	1908	Aug	11	MVZ 2996	SB	6S	3E		coll. M	?			Swarth	H	S

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
RIV	San Jacinto Mtns., Hemet Lake	1908	Aug		Grinnell and Swarth (1913)	SB	6S	3E		obs. 15+	?		"...many appeared daily..."; not visited before August.	Grinnell	J	
RIV	San Jacinto Mtns., Hemet Lake	1996	May	25	NASFN 50:997 (M.M. Rogers)	SB	6S	3E		obs. 2	1+			Rogers	M	M
RIV	San Jacinto Mtns., Hemet Valley	1883	Jun	13	SDNHM	SB				coll. M	1+					
RIV	San Jacinto Mtns., Hemet Valley	1893	Jun	13	CM 16765	SB				coll. F	1+			Stephens	F	
RIV	San Jacinto Mtns., Hemet Valley	1908			Grinnell and Swarth (1913)	SB				ON	10+	P	"Abundant" in clumps of pines scattered in valley.	Grinnell	J	
RIV	San Jacinto Mtns., James Reserve	1974	Jun	16	J.V. Remson MVZ notes	SB				obs. 2M,2F	2+			Remson	J	V
RIV	San Jacinto Mtns., James Reserve	1974	Jun	15	J.V. Remson MVZ notes	SB				obs. M,F	1+			Remson	J	V
RIV	San Jacinto Mtns., Kenworthy	1908	May		MVZ 2333-40	SB				coll. 5M,3F	4+	P		Grinnell	J	
RIV	San Jacinto Mtns., Kenworthy	1908	Jun	9	MVZ 2341	SB				coll. M	1+	P		Grinnell	J	
RIV	San Jacinto Mtns., Kenworthy	1908			Grinnell and Swarth (1913)	SB				ON	10+	P	"Especially numerous in the vicinity of Kenworthy."	Grinnell	J	
RIV	San Jacinto Mtns., Mellor Ranch Rd.	1984	Jul	29	S. J. Meyers	SB	4S	2E	17	ON (pair)	1	#	in snag ~25 ft. in chaparral	Meyers	S	J
RIV	San Jacinto Mtns., W Palm	1893	Jun	28	CM 16764	SB				coll. M	1+			Stephens	F	
RIV	Santa Ana Mtns., Bear Springs	1938	Apr	16	Pequegnat (1951)	SB				ON	1+	BC	Nesting in dead spruce.	Pequegnat	W	
RIV	Santa Ana Mtns., Horsethief	1938	Jun	13	Pequegnat (1951)	SB				ON	1+	PC	Nesting in Coulter pine stump.	Pequegnat	W	E
RIV	Santa Ana Mtns., Indian Pine Forest	1938	Jun	13	Pequegnat (1951)	SB				ON	1+	PC	Nesting in Coulter pine stump.	Pequegnat	W	E
SAC	Sacramento	1853			Baird (1858)	MD				coll. M	1+			Heerman		
SAC	Sacramento	1853			Heerman (1859)	MD				ON	?	#	"very abundant, breeding in large numbers in the hollow trees"	Heerman		
SAC	Sacramento	1867			Ridgway (1877)	MD				ON	?	#	"very abundant"	Ridgway	R	
SAC	Sacramento	1923	Jul		Bryant (1924)	MD				FL	10+	ED	"...very numerous in the downtown district...."	Bryant	H	C
SAC	Sacramento	1924	Apr	24	Bryant (1924)	MD				ON (6)	8+	ED	Nesting in cornice of building on K St.	Bryant	H	C
SAC	Sacramento	1954	Aug	11	AFN 9:53 (A. Meuser)	MD				obs.	1+		last date at nest site	Meuser	A	
SAC	Sacramento	1955	Jul	20-27	AFN 9:401 (E.R. Pickett)	MD				NY	2+	ED		Pickett	E	R
SAC	Sacramento	1955	Mar	11	ABN (D. McLean)	MD				obs. 35	15+	ED	Sacramento City Hall	McLean	D	
SAC	Sacramento	1956			AFN 10:279; 10:361; 10:408	MD				obs.			Numbers perhaps greater than 1955. Stayed longer, mild.	Pickett	E	R
SAC	Sacramento	1957			AFN 11:375 (D. McLean)	MD				obs.	?		Numers perhaps 50% lower than 1956	McLean	D	D
SAC	Sacramento	1967			AFN 21:537-538 (A.J. Argante, B. Kimb	MD				ON	2+	#	Two nests in palm tree; losing sites to urban redevelopment	Argante	A	J
SAC	Sacramento	1970	Aug	2	AFN 24:714 (B. Kimball)	MD				obs. 2	1+		"...sitting on lamp posts under a freeway...."	Kimball	B	
SAC	Sacramento	1970			AFN 24:714 (B. Kimball)	MD				ON	2+	ED	Nesting under roof tiles of old buildings as for decades.	Kimball	B	
SAC	Sacramento	1971			AB 25:624; 25:796 (A.Meuser, B.Kimball	MD				ON		BR	Nesting under freeway.	Kimball	B	
SAC	Sacramento	1975			AB 29:905; 29:1028 (B.Kimball)	MD				NY	5+		Several colonies produced young.	Kimball	B	
SAC	Sacramento	1979			ABN (B. Kimball+)	MD				NY	15	WS	Included 2 nests and 8 young in sycamore.	Kimball	B	
SAC	Sacramento	1980			ABN (m.ob.)	MD				obs.	12+			Kimball	B	
SAC	Sacramento	1981			AB 35:860 (B.&H. Kimball); ABN (m.o	MD				obs. 21	11+			Kimball	B	
SAC	Sacramento	1984			AB 38:955; 39:98 (B.&H. Kimball)	MD				obs.			First arrival 3/23; Departure 9/13.	Kimball	B	
SAC	Sacramento	1860s			Cooper (1870)	MD				obs. many	5+		"numerous"	Cooper	J	G
SAC	Sacramento	1987	Apr	5	ABN (E. Greaves)	MD				ON (12)	6+	BR	"Traditional nest site under freeway."	Greaves	E	D
SBA	Alisal Ranch	1928	Jun	3	? EGG SET; PMCA	SB				EGG SET (5)	3+	WS	"In...cavity...40 ft. Three pair in same limb."	Stevens	L	T
SBA	Alisal Ranch	1935	Jun	2	WFVZ EGG SET	SB				EGG SET (5)	3+	WS			L	T
SBA	Alisal Ranch	1935	Jun	2	WFVZ EGG SET-2	SB				EGG SET (5); fresh	3+	WS	"cavity 60 ft...Small colony nesting in tree"	Stevens	L	T
SBA	Alisal Ranch	1936	Jun	7	SBMNH EGG SET	SB				EGG SET (4)	1+	WS	"dead sycamore...woodpecker cavity...25 ft"	Stevens	L	T
SBA	Alisal Ranch	1937	Jun	3	PSM 15382	SB				EGG SET (5)	1+	WS		Stevens	L	T
SBA	Alisal Ranch	1938	May	29	SBMNH EGG SET	SB				EGG SET (4)	1+	WS	"natural cavity in sycamore...25 ft from ground"	Stevens	L	T
SBA	Alisal Ranch (Nojoqui Falls?)	1937	Jun	6	? EGG SET; PMCA	SB				EGG SET (4)	1+	WS	"In natural cavity of sycamore...20 ft...."	Stevens	L	T
SBA	Big Pine Mountain	1979	Jul		AB 33:898; Lehman (1982, 1994)	SB				ON (1)	1	PJ	Nest in Jeffry Pine at summit.			
SBA	Buellton	1930	May	25	SBMNH EGG SET	SB	6N	32W		EGG SET (3)	1+	WS	"in sycamore 35 ft high"	Stevens	L	T
SBA	Don Victor Valley	1981	Apr	29	Lehman (1982, 1994)	SB				obs. 6	3+		"...may nest in the nearby Madulce Peak area."			
SBA	Don Victor Valley	1982	May		Lehman (1982, 1994)	SB				obs. 3+	1+					
SBA	Don Victor Valley	1981-82	May		J. Grantham	SB				obs.	?			Grantham	J	
SBA	Foxen Canyon	1937	Jun	13	? EGG SET; PMCA; Lehman (1994)	SB				EGG SET (4)	1+	WS	"woodpecker hole in dead limb of sycamore 25 ft"	Stevens	L	T
SBA	Foxen Canyon	1958	Apr	30	SBMNH; Lehman (1982, 1994)	SB				obs. 3	1+					

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sh.	Comment	Observer	First	Init.
SBA	Foxen Canyon	1958			Lehman (1982, 1994)	SB				ON	3+	s				
SBA	Foxen Canyon	1961	May	22	SBMNH; Lehman (1982, 1994)	SB				obs. 2	1+					
SBA	Foxen Canyon	1961			Lehman (1982, 1994)	SB				ON	1+	s				
SBA	Foxen Canyon	1966			Lehman (1982, 1994)	SB				ON	1+	s				
SBA	Foxen Canyon	1967			Lehman (1982, 1994)	SB				ON	1+	s				
SBA	Foxen Canyon	1969			Lehman (1982, 1994)	SB				ON	1+	s				
SBA	Gaviota, near	1932	May	21	SBMNH EGG SET; Lehman (1994)	SB				EGG SET (3); fresh	1+	WS	"woodpecker's hole in sycamore...60 ft [high]"	Stevens	L	T
SBA	Happy Canyon	1934	Apr	24	Lehman (1994; Rett)	SB				obs. several pairs	4+			Rett	E	Z
SBA	Lake Cachuma	1968			Lehman (1982, 1994)	SB				obs. 3	?		Up to three from 4/9-5/1.			
SBA	Lake Cachuma	1969			Lehman (1982, 1994)	SB				obs.	?					
SBA	Lake Los Carneros	1964			SBMNH	SB				obs.			Seen on multiple dates.			
SBA	Los Olivos, near	1980			Lehman (1982, 1994)	SB				obs. 2	?					
SBA	Nojoqui Falls	1932			Lehman (1982, 1994)	SB	5N	31W		EGG SET	1+	WS				
SBA	Nojoqui Falls	1937	Jun	6	SBMNH EGG SET	SB	5N	31W		EGG SET (4)	1+	WS	"natural cavity in sycamore 40 ft from ground"	Stevens	L	T
SBA	Nojoqui Falls	1937	Jun	6	SBMNH EGG SET-2	SB	5N	31W		EGG SET (4)	1+	WS	"woodpecker cavity 40 ft...in sycamore"	Stevens	L	T
SBA	Nojoqui Falls	1957	May	17	SBMNH	SB	5N	31W		obs. 6	2+					
SBA	Nojoqui Falls	1962			AFN 16:448 (A. Small)	SB	5N	31W		obs.	2+			Small	A	
SBA	Nojoqui Falls	1962	May	1	SBMNH	SB	5N	31W		obs. 2	1+					
SBA	Nojoqui Falls	1964	Jul	1	SBMNH	SB	5N	31W		obs. 29	5+					
SBA	Nojoqui Falls	1965	Apr	2	SBMNH	SB	5N	31W		obs. 4	2+					
SBA	Nojoqui Falls	1974	Mar	15	Lehman (1982, 1994)	SB	5N	31W		obs. 15	8+					
SBA	Nojoqui Falls	1975	Mar	11	Garrett and Dunn (1981); Lehman (1982	SB	5N	31W		obs. 4	2+					
SBA	Nojoqui Falls	1978	Aug	9	R.A. Erickson notes	SB	5N	31W		obs. 7	2+			Erickson	R	A
SBA	Nojoqui Falls	1979			AB 33:898	SB	5N	31W		ON	3-4	WS				
SBA	Nojoqui Falls	1980			Lehman (1982)	SB	5N	31W		ON (8-12)	4+	WS				
SBA	Nojoqui Falls	1981	May		J. Grantham	SB	5N	31W		ON (6)	3+	WS	in sycamores	Grantham	J	
SBA	Nojoqui Falls	1982			Lehman (1982)	SB	5N	31W		ON (15)	7+	WS				
SBA	Nojoqui Falls	1983	Jul		AB 37:1028 (P.E. Lehman)	SB	5N	31W		ON	4+	WS		Lehman	P	E
SBA	Nojoqui Falls	1993			Lehman (1994); P. Lehman	SB	5N	31W		ON (12)	6+	WS		Lehman	P	
SBA	Nojoqui Falls	1994	May	5	H. Green	SB	5N	31W		ON (3)	2+	WS	Pair together in sycamore.	Green	H	
SBA	Refugio Pass	?			Lehman (1994)	SB				obs.	?		Probably bred here many years ago.			
SBA	Reyes Peak Rd.	1958	Jun	3	SBMNH	SB				obs. 1	?					
SBA	San Rafael Mtn.	1989	Jun	10	Lentz (1993); Lehman (1994)	SB				obs. 6	3+			Hardie	G	
SBA	San Rafael Mtn., Mission Pine Basin	1982	Jun	19	Lentz (1993); Lehman (1982, 1994)	SB				ON (14)	6+	PP	"...nesting in holes in Ponderosa Pines..."	Lentz	J	
SBA	Santa Agueda Creek	1928	Jun	3	SBMNH EGG SET	SB				EGG SET (6); fresh	1+	s	"woodpecker cavity...5 other pair...in same stub"	Stevens	L	T
SBA	Santa Barbara	1924			Ross (1925)	SB				ON	?		"colony"	Ross		
SBA	Santa Barbara Co.	1932	Jun	5	SBMNH EGG SET	SB				EGG SET (3); comp	1+	WS	"natural cavity of sycamore..30 ft from ground"	Stevens	L	T
SBA	Santa Barbara, Fed. Building	192(0)			Dawson (1923); Lehman (1982,1994)	SB				ON (12)	6+	ED	Museum of Art	Dawson	W	L
SBA	Santa Barbara, State St.	1925	Jun	24	UF 61036	SB	4N			EGG SET (5)	4+	ED	"Several pairs nest on the buildings..." in cornices, before 6/29 quake	Badger	M	C
SBA	Santa Ynez	1928	Jun	3	PSM 15381	SB				EGG SET (5)	?	WS		Stevens	L	T
SBA	Santa Ynez	1928	Jun	3	SBCM EGG SET	SB				EGG SET (5); fresh	8	WS	8 pair in same stub 30 ft high atop sycamore.	Stevens	L	T
SBA	Santa Ynez	1928	Jun	3	? EGG SET; PMCA	SB				EGG SET (6)	4	WS	"In sycamore stump 35 ft...four pair nesting in tree."	Stevens	L	T
SBA	Santa Ynez River mouth, near	1996	May	24	NASFN 50:333 (Brad Hines)	SB				obs. 1	?			Hines	B	
SBA	Santa Ynez, near	1964	May		Lehman (1982, 1994)	SB				obs. 3-4 pair	3-4					
SBA	Santa Ynez, near	1965	Apr	24	SBMNH; Lehman (1982, 1994)	SB				obs. 10	5+					
SBA	Santa Ynez, near	1986	Jul	9	Lehman (1994)	SB				obs. 4	1+					
SBA	Santa Ynez, near	1992	Jun	28	Lehman (1994)	SB				obs. 6	1+					
SBA	Santa Ynez, near	1980-81			Lehman (1982, 1994)	SB				obs. 1	?					
SBA	Solvang	1928	Jun	3	? EGG SET; PMCA	SB				EGG SET (5)	1+	WS	"In natural cavity of sycamore 25 ft..."	Stevens	L	T
SBA	Solvang	1928	Jun	3	WFVZ EGG SET	SB	6N	31W		EGG SET (5)	1+	WS	"in natural cavity of sycamore...35 ft."	Stevens	L	T

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
SBA	Solvang	1931	Jun	7	WFVZ EGG SET-2	SB	6N	31W		EGG SET (4)	2+	WS	"in natural cavity of sycamore"	Stevens	L	T
SBA	Solvang	1931	Jun	7	WFVZ EGG SET	SB	6N	31W		EGG SET (4), fresh	2+	WS	"natural cavity of sycamore 35 ft. from ground"	Stevens	L	T
SBA	Solvang	1932	May	21	WFVZ EGG SET	SB	6N	31W		EGG SET (4) fresh	1+	s	"woodpecker cavity 60 ft. from grounnd"	Stevens	L	T
SBA	Solvang	1932	May	30	SBMNH EGG SET	SB	6N	31W		EGG SET (4); fresh	1+	WS	"natural cavity in sycamore...30 ft from ground"	Stevens	L	T
SBA	Solvang	1932	May	30	SBCM EGG SET	SB	6N	31W		EGG SET (5)	1+	WS	"natural cavity in sycamore 35 ft from...ground"	Stevens	L	T
SBA	Solvang	1936	Jun	7	SBCM EGG SET	SB	6N	31W		EGG SET (6)	1+	WS	"natural cavity in sycamore...20 ft from ground"	Stevens	L	T
SBA	Solvang	1980			Lehman (1982)	SB				obs. 5	2+					
SBA	Solvang	1982	Jul	7	Lehman (1982)	SB				obs. 4	1+					
SBA	West Big Pine Mountain	1981	Jul	1	Lehman (1982); Lentz (1993)	SB	7N			ON (2 pair)	2+	P	"...frequented a large, dead pine...."	Lentz	J	
SBE	Allison's (6100 ft)-?	1948	Jun	17	SBCM EGG SET	SB				EGG SET (4)	4+	P	"12 ft...dead pine....several pairs...very high"	Hanna	W	C
SBE	Bear Lake, E end	1905	Aug	2	Grinnell (1908)	SB				FL	1+		Observed family group.	Grinnell	J	
SBE	Big Bear Lake, near	1947	Jun	14	WFVZ EGG SET	SB				EGG SET (3); fresh	1+	C	"natural cavity...top of 30 ft dead fir tree"	Hall	E	M
SBE	San Bern. Mtns., Heaps Peak	1946	May	18	H. Cogswell notes	SB				obs. 2 pair	2+	c	Also appeared in And. Mag. 48 (suppl)	Cogswell	H	L
SBE	San Bern. Mtns., Heaps Peak	1947			H. Cogswell notes	SB				ON (15)	7+	c	Nesting colony in dead trees: 5/24, 6/29.	Cogswell	H	L
SBE	San Bern. Mtns., Heaps Peak	1950	Apr		H. Cogswell notes	SB				ON (3)	1+		Seen near snag on 4/23 and 4/29	Cogswell	H	L
SBE	San Bern. Mtns., Heaps Peak	1951	Apr	4	H. Cogswell notes	SB				obs. 5	2+	c		Cogswell	H	L
SBE	San Bern. Mtns., Hemlock Creek, E Fork	1989	May	18	S.J. Meyers	SB	1N	2W	14	ON (pair)	1	BC	*P. Macrocarpa* snag, ~70 ft., in dense chaparral	Meyers	S	J
SBE	San Bern. Mtns., Hemlock Creek, E Fork	1992	May	13	S.J. Meyers; C. McGaugh	SB	1N	2W	14	obs. pair	1		nest not seen	Meyers	S	J
SBE	San Bern. Mtns., Hemlock Creek, E Fork	1993	May	14	AB 47:1151; S Meyers	SB	1N	2W	14	ON (2)	1	BC	Pair at ~40 ft. *P. macrocarpa* snag.	Meyers	S	J
SBE	San Bern. Mtns., Lake Arrowhead, near	197(5)			Garrett and Dunn (1981)	SB				ON	1+	s				
SBE	San Bern. Mtns., Mountain Home, near	1918	Jul	4	WFVZ EGG SET	SB	1S	1W		EGG SET (6)	1+	P	"40 ft up in dead pine snag."	Edwards	H	A
SBE	San Bern. Mtns., Oak Glen	1910	Aug		Van Rossem (1914)	SB	1S	1W		ON	10-20	P	Colony in large dead pine.	Pierce	W	M
SBE	San Bern. Mtns., Powell Cyn.	1990	Apr	25	S.J. Meyers; C. McGaugh	SB	2N	5W	9	ON (pair)	1	BC	"~40 ft, *P. macrocarpa* snag"; site is 1 mi. E of Cajon Mtn.	Meyers	S	J
SBE	San Bernardino Mtns.	1910	Jun	28	MVZ 102819	SB				coll. F	1+			VanRossem	A	J
SBE	San Bernardino Mtns.	1910	Jun		UCLA 10628-29	SB				coll. M, F	1+			VanRossem	A	J
SBE	San Gab. Mtns.	1966	May	1	SBCM 36524	SB				coll. M	1+			Cardiff	E	
SBE	San Gab. Mtns., San Sevaine Flats	1965	Apr	25	SBCM 36323	SB	2N	6W		coll. M	1+			Cardiff	E	
SBT	Paicines	1896	May		CAS 53128,31,33	MD	14S	6E		coll. 3M	3+			Mailliard	J	
SBT	Paicines	1898	Jun	21	CAS 53129-30,37	MD	14S	6E		coll. 2M,F	2+			Mailliard	J	
SBT	Paicines	1898	Jun	12	CAS 53127,34-35	MD	14S	6E		coll. 3M	3+			Mailliard	J	
SBT	Paicines	1898	Jul	10	CAS 53132	MD	14S	6E		coll. M	1+			Mailliard	J	
SBT	Paicines	1898	Jun	21	FMNH 43148	MD	14S	6E		coll. M	?			Mailliard	J	W
SBT	Paicines	1899	Apr		CAS 53136,39	MD	14S	6E		coll. 2F	2+			Mailliard	J	
SBT	Paicines	1903	Jun	13	CU 8736	SB	14S	6E		coll. M	1+		Collected on Paicines Ranch.	Fuertes	L	A
SBT	Paicines	1905	Mar	23	CAS 53119-20	SB	14S	6E		coll. 2M	2+			Mailliard	J	
SBT	San Benito Pk., 1 mi. SE	1944	Aug	6-12	R.W. Storer MVZ notes	MD	18S	12E		obs.	2+		"A few seen and heard over camp and over stream below camp."	Storer	R	W
SBT	San Benito Pk., 1 mi. SE	1944	Aug	9	Johnson & Cicero (1985)	MD	18S	12E		obs.	?		"overhead frequently"	Miller	A	H
SBT	Santa Rita Pk., 1 mi. S	1936	Jun	21	MVZ 69659-60	MD	18S	12E		coll. 2M	?			Palmer	F	G
SCL	Croy Ridge	1987	Jun	13	ABN (D.L. Suddjian)	MD	10S	2E		obs. 2	1+	c	"Pair flying east over ridge; good breeding habitat."	Suddjian	D	L
SCL	Croy Ridge	1988	Jun	25	SCL BBA, D.L. Suddjian, ABN	MD	10S	2E		ON	1	PA	Pair observed once at hole in knobcone pine (1,880 ft.)	Suddjian	D	L
SCL	Loma Prieta	1985	May	25	ABN (J. Mariani)	MD	9S	1E	34	obs. 2	1+			Mariani	J	
SCL	Loma Prieta	1988	May	24	SCL BBA, D.L. Suddjian	MD	9S	1E	34	obs. 2M,F	1+	c		Suddjian	D	L
SCL	Loma Prieta	1989	Jun	10	SCZ & SCL BBA, D.L. Suddjian	MD		1E		obs. pair	1+	c		Morgan	R	A
SCL	Loma Prieta	1990	Jul	8	ABN (R. Cowell)	MD		1E		obs. M, 2F	1+			Cowell	R	
SCL	Loma Prieta	1994			NASFN 48:986 (S.C. Rottenborn)	MD		1E		obs.	2+	c	"Possibly the last nesters in SCL."	Rottenborn	S	C
SCL	Loma Prieta	1987	Jul	9	ABN (D.L. Suddjian)	MD	9S	1E	34	obs. 1	?		At summit.	Suddjian	D	L
SCL	Loma Prieta, Barrett Canyon	1989	Jul	9	D.L. Suddjian	MD	9S	1E	26	NY	1	DF	Nest in burned Douglas fir snag (3,150 ft.).	Suddjian	D	L
SCL	Los Gatos	1948	Aug	3	AFN 3:31 (E. Smith)	MD				FY	1+	c	"...feeding young out of nest...."; Last seen 8/15	Smith	E	
SCL	Los Gatos	1949	Aug	15	AFN 4:34 (E. Smith)	MD				obs.	?		Latest date reported.	Smith	E	
SCL	Los Gatos, St. Joseph's Hill	1991	Apr	22	ABN (Mi. F)	MD				obs. 2	?			F	M	

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sh.	Comment	Observer	First	Init.
SCL	Mt. Hamiliton, S of at Bollinger Ridge	1986	Jun	16	ABN (B.G. Elliott)	MD				obs. 2M, F	2+		S of Mt. Hamilton	Elliott	B	G
SCL	Mt. Hamilton	1891	Apr	25	SJSU specimen (903)	MD				coll. F	1+					
SCL	Mt. Hamilton	1964	May	10	ABN (J. Kennedy)	MD				ON (35)	15+	n	"Nesting in trees."	Kennedy	J	
SCL	Mt. Hamilton Rd., Smith's Cr.	1901	Jun	5	MVZ 36719	MD				coll. M	1+			Anderson	M	P
SCL	Mt. Hamilton, Kincaid Rd.	1956	Apr	29	ABN (E.D. Smith)	MD				obs. M	?			Smith	E	D
SCL	Mt. Hamilton, near	1891	Apr	25	CAS 77098	MD				coll. M	1+			Hyde	J	M
SCL	Pine Ridge, E of Madrone	1951	Jun	18	Sibley (1952)	MD				obs. 2+	1+			Seibert	M	S
SCL	San Antonio Valley	1908	Apr	4	MVZ 56562-63	MD				coll. M	?		[Data label says ALA; Should this be in SCL? - BW]	Pemberton	J	R
SCL	San Antonio Valley Rd.	1969	May	8-10	ABN (Eugene Hunn)	MD				obs. 2 pair+	2+			Hunn	E	
SCL	San Antonio Valley Rd.	1971			ABN (TS,BR,RAR)	MD		4E		ON (2-5)	2+	QD	Nesting in blue oak near ALA Co.; (pair) 6/27, (5) 7/4			
SCL	San Antonio Valley Rd.	1973			ABN: A. Edwards (G. Bing); S.F. Bailey	MD				obs. 3-6	1-3		Observed 3 on 5/5; 6 on 6/30 near San Antonio Junction	Edwards	A	
SCL	San Antonio Valley Rd.	1974			ABN: A. Edwards, J.V. Remsen, MVZ n	MD				obs. 1-3	1+		Near San Antonio Junction, obs. M on 5/5; F on 7/14.	Bailey	S	F
SCL	San Antonio Valley Rd., MP 10.44	1982			AB 36:891(T.Gates, J.Richmond); ABN:	MD		4E		ON	1-2	PL	At least one pair nesting in holes of gray pines west side of road	Edwards	A	
SCL	San Antonio Valley Rd., MP 10.44	1983			ABN (T.Gates+); H. Green; A. Edwards	MD		4E		ON	1-2	PL	At least 2M, 1F. Nesting trees later fell.	Edwards	A	
SCL	San Jose	1954	Aug	21	SJSU specimen (2285)	MD				coll. juv. M	?					
SCL	Santa Clara Co.	1951	Jun		AFN 5:307	MD				obs.			"...observed in at least six locations in SCL and SCZ in June."			
SCL	Summit Ridge, Loma Prieta	1996	Jul	24	M.M. Rogers	MD		1E		FL	1	c	[UTM 1.25 6.55]	Rogers	M	M
SCL	Summit Ridge, Loma Prieta	1997	May		ABN (RWR, MJM+)	MD				obs. 1-4	2+		Seen in both SCL and SCZ	R	R	W
SCL	Summit Ridge, Loma Prieta	1998	May		ABN (RWR, FV, NL)	MD				ON (5-6)	3+	c				
SCL	Summit Ridge, Lomita	1988	May	10	ABN: D.L. Suddjian	MD	9S	1E		obs. pair	1+		Same as SCZ record.	Snddjian	D	L
SCL	Summit Ridge, Lomita	1995	Jul	21	M.M. Rogers	MD	9S	1E		FY	1	C	Pair with 2 young at SCZ Co. Line. [UTM 99.05 7.05]	Rogers	M	M
SCZ	B.B. Redwoods SP	1984	May	30	AB 38:955 (G.J. Strachan); ABN	MD				obs. 6+	3+		Nest not located.	Strachan	G	J
SCZ	B.B. Redwoods SP, N of (China Grade)	1977	Jun	20	AB 41:1484 (R.A. Morgan,S+S. Singer);	MD				ON (2)	1	C	Nest observed; incorrectedly published as 1987 (D.L. Snddjian)	Morgan	R	A
SCZ	B.B. Redwoods SP, Pine Mtn.	1987	Jun	30	ABN: D.L. Suddjian	MD	9S			obs. pair	1+	c		Suddjian	D	L
SCZ	Ben Lomond Mountain	1898	May		McGregor (1901)	MD				ON	3+	Q	"Common, breeding in dead oaks."	Kaeding	H	B
SCZ	Bonny Doon	1955	Jul	16	AFN 9:401 (E.D. Smith); ABN	MD	10S	3W		NY	1+	c	Adults feeding young in the nest.	Smith	E	D
SCZ	Boulder Creek	1938	Aug	21	BL 40: 467 (Allen)	MD	10S	3W		obs. 2	?			Allen	A	S
SCZ	Castle Rock SP	1978	Jul	4	ABN (E. Makishima+)	MD	8S	2W		obs. 1	?			Makishima	E	
SCZ	Felton, near	1927	Jun	18	SBCM EGG SET	MD	10S	2W		EGG SET (4)	1+	P	"flicker's old nesting cavity 30 ft...dead pine"	Vrooman	A	G
SCZ	Forest of Nisene Marks SP	1979			CDFG files (B. Clement)	MD				ON	1+	CR	Nesting in old redwood stag.	Clement	B	
SCZ	Forest of Nisene Marks SP	1984			CDFG files (B. Clement)	MD				obs.	?		Seen in upper parts of park; nest site not located.	Clement	B	
SCZ	Highland Way	1988	Jun	13	ABN (D.L. Snddjian)	MD				obs. F	1+		"Not far from 5/19 and 5/24 sightings...."	Suddjian	D	L
SCZ	Kaiser Quarry, S. of Scott's V.	1988	Jul	25	ABN (D.L. Suddjian)	MD				obs. F	?		"...not noted on 6/4 visits."	Suddjian	D	L
SCZ	Liddell Creek	1899	Jun	4	MVZ 92072	MD	10S	3W		coll. M	1+					
SCZ	Liddell Creek	1899	Jun	4	MVZ EGG SET 6267	MD	10S	3W		EGG SET (4); comp	1+	C				
SCZ	Loma Prieta Mt, 2.5 mi. S	1940	May	29	SFSU specimen	MD	10S	1E	10	coll. M	1+		Collected at FFA Camp; only SFSU specimen.	Vrooman	A	G
SCZ	Mt. Hermon, near	1950	Jun		Sibley (1952)	MD	10S	2W		ON (1 pair)	1	c	Entered cavity 6/1; feeding young several days later.	Sibley	C	G
SCZ	Pine Mtn.	1991	Jun	3	ABN (R.Merrill)	MD	9S			obs. 1	1+	c	[UTM 6510]	Smith	E	
SCZ	Santa Cruz	1866	Apr	26	Cooper (1870)	MD				obs.	?		"None build in or near the town."	Merrill	R	V
SCZ	Santa Cruz	1893	Apr		ANS 46845,48	MD				coll. M, F	1+			Cooper		
SCZ	Santa Cruz	1894	Aug	12	ANS 46846	MD				coll. F	1+					
SCZ	Santa Cruz	1894	Jul	1	ANS 46847	MD				coll. F	?					
SCZ	Santa Cruz	1896	Aug	12	Del.MNH 007157	MD				coll. M	?					
SCZ	Santa Cruz	1903	Jun	14	MVZ egg cat. 6265	MD				EGG SET (5); comp	1+			Atkinson	C	
SCZ	Santa Cruz	1937	Jul	11	MVZ 87990-91	MD				coll. 2M	2+			Vrooman	A	G
SCZ	Santa Cruz	1939	Jul		MVZ 87992-93; 93637-38	MD				coll. 2M,2F	2+			Streator	C	P
SCZ	Santa Cruz	1939	Apr	15	MVZ 90631	MD				coll. F	1+			Streator	C	P
SCZ	Santa Cruz	1939	May	7	MVZ 90630	MD				coll. M	1+			Streator	C	P
SCZ	Santa Cruz	1941	Jun	29	MVZ 87994	MD				coll. F	1+			Streator	C	P
SCZ	Santa Cruz	1955	Jul		ABN (W.B. Minturn)	MD				obs. 1-5	1+			Minturn	W	B

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
SCZ	Santa Cruz	1956	Jul	28	ABN (W.B. Minturn)	MD				obs. 4	1+			Minturn	W	B
SCZ	Santa Cruz	19?	Apr	20	MVZ 92073	MD				coll. F	?			Streator	C	P
SCZ	Santa Cruz Co.	1896	Jun	10	MVZ 92074	MD				coll. M	1+			Miller???	A	H
SCZ	Santa Cruz Co.	1922	Jun	14	WFVZ EGG SET	MD				EGG SET (4)	1+	P	" top of a dead pine stub 30 ft. from ground"	Vroomen	A	G
SCZ	Santa Cruz Co.	1951	Jun		AFN 5:307	MD				obs.			"...observed in at least 6 locations in SCL and SCZ in June."			
SCZ	Santa Cruz, 10 mi. W	1946	Jul	19	MVZ 97213	MD				coll. M	1+			Streator	C	P
SCZ	Santa Cruz, 6 mi. N on Hwy.1	1956	May	30	ABN (W.B. Minturn)	MD				obs. 3	1+			Minturn	W	B
SCZ	Santa Cruz, Graham Hill	1905	Jun	4	MVZ egg cat. 6266	MD				EGG SET (4); comp	1+			Bailey	H	F
SCZ	Santa Cruz, near	1955	Jul	24	AFN 9:401 (E.D. Smith); ABN	MD				FY (10)	2+		Fledglings seen.	Smith	E	D
SCZ	Santa Cruz, near	18907			McGregor (1901)	MD				obs.	?		"A common summer visitor near Santa Cruz"	Fiske	E	H
SCZ	Santa Cruz, U.C.	1987	May	5	ABN (D.L. Suddjian)	MD				obs. pair	?			Suddjian	D	L
SCZ	Santa Rosalia Mtn.	1988	May	10	D.L. Suddjian	MD	10S	1E	15	obs. 5	2+	c	Along Aptos Fire Rd.	Suddjian	D	L
SCZ	Summit Meadows	1987	May	7	ABN (D.L. Suddjian)	MD				obs. 21 (17M)	17+?		flying up San Lorenzo River Canyon and over ridge	Suddjian	D	L
SCZ	Summit Ridge	1987	Jun	13	ABN: D.L. Suddjian	MD	10S	2E	17	obs. M, F	1+	c		Suddjian	D	L
SCZ	Summit Ridge	1993	May	12	D.L. Suddjian	MD		1E	2	obs. pair	1+	c	Also in SCZ Co.	Suddjian	D	L
SCZ	Summit Ridge, Croy Ridge	1993	Jul	12	D.L. Suddjian	MD		2E	21	obs. pair	1+	c	Also in SCL Co.	Suddjian	D	L
SCZ	Summit Ridge, Gamecock Canyon	1996			D.L. Suddjian	MD				NY	1	PA	Seen 6/19; Nest with young in knobcone pine 7/31	Suddjian	D	L
SCZ	Summit Ridge, Hwy. 17	1966	Apr	23	ABN (J.&?Greenberg)	MD				obs. 6	3+			Greenberg	J	
SCZ	Summit Ridge, Lomita	1988	May	10	ABN: D.L. Suddjian	MD	9S	1E		obs. pair	1+		Same as SCL record.	Suddjian	D	L
SCZ	Swanton Rd., N of	1986	Jul	11	ABN (D.L. Suddjian)	MD	10S			obs. pair	1+			Suddjian	D	L
SD	Ballina	1889	Jul	13	SDNHM 1253	SB				coll. F	1+					
SD	Buckman Springs	1945	May	31	SDNHM 19153	SB				coll. M	1+					
SD	Campo	1917	May	14	FMNH 141757-58	SB				coll. 2M	?		?	Kimball	H	H
SD	Campo	1917	May	12	UMZ 128919	SB				coll. M	1+			Kimball	H	H
SD	Campo, near	1877	Apr	2	UCM 10949	SB				coll. F	?					
SD	Corte Madera Ranch	1998	Jun	20	San Diego BBA (?)	SB				ON	1+					
SD	Cuyamaca Camp, 1mi. S	1985	Jul		CDFG files (L. Comrack)	SB				ON (16)	3	PJ	In 70ft., 3ft DBH Jeffrey Pine snag, very unstable	Hund	G	
SD	Cuyamaca Lake	1923	Jul	4	SDNHM 32112-15	SB				coll. 4M	2+					
SD	Cuyamaca Lake	1959	May	25	SDSU 909	SB				coll. unk. sex	1+			Lotz	R	
SD	Cuyamaca Lake	1978	Apr	29	AB 32:1056; Unitt (1984)	SB				obs. 12	6+			Cardiff	E	A
SD	Cuyamaca Lake	1991	Jul	3	C. Boyd (C. Edwards)	SB				obs. 3 pair	3+			Edwards	C	
SD	Cuyamaca Lake	1994	Jul	17	J.D. Robinson	SB				obs. 23	5+		Feeding over lake	Robinson	J	D
SD	Cuyamaca Peak	1978	Jul	29	AB 32:1209 (C.G. Edwards); Unitt (1984	SB	14S	4E		obs. 17	3+		Up to 17 in July included juveniles.	Edwards	C	G
SD	Cuyamaca Peak	1979			AB 33:898	SB	14S	4E		ON	3+	s				
SD	Cuyamaca Peak	1983	Jul	6	AB 37:1028 (C.G. Edwards)	SB	14S	4E		obs. 20	5+			Edwards	C	G
SD	Cuyamaca Peak	1993	Jun		B. McCausland	SB	14S	4E		ON (12+)	6+	C	Sites "always very prominent, isolated, large tall dead trees."	McCausland	B	
SD	Cuyamaca Peak	1994	Jun	11	J.D. Robinson	SB	14S	4E		ON (2 trees)	4	C		Robinson	J	D
SD	Cuyamaca Peak	1980s	Jun		B. McCausland	SB	14S	4E		ON	5+	C	Sites "always very prominent, isolated, large tall dead trees."	McCausland	B	
SD	Cuyamaca Peak	1990-92	Jun		B. McCausland	SB	14S	4E		ON (12+)	6+	C	Sites "always very prominent, isolated, large tall dead trees."	McCausland	B	
SD	Cuyamaca, Green Valley	1954			E. A. Pugh	SB				ON	1+	Q	"...using an enormous old oak tree that had a hollow in the trunk."	Pugh	E	
SD	Cuyamaca, Stonewall Mine Rd.	1993			P. Pryde	SB				obs.	1+			Pyde	P	
SD	Cuyamaca, Stonewall Mine Rd.	1994	Apr	16	P. Pryde; B. McCausland	SB				obs. 6-8	3+		"Contending with ACWO and EUST"	Pryde	P	
SD	De Luz	1956	Jul	8	AFN 10:411 (J. Lane+)	SB				ON	6+		"Six...nests noted at De Luz...."	Lane	J	
SD	Descanso	1991-92			G. Wynn	SB				ON (1 pair)	1	UP	Probable nest in utility pole	Wynn	G	
SD	Escondido	1896	Jun	11-12	Hatch (1896)	SB	12S	2W		ON 3-4 pr.; coll F	3-4	ED	Female with egg 6/12/1896; on eaves of college building.	Hatch		
SD	Escondido	1902	Jul	14	CU 46101	SB	12S	2W		EGG SET (?)	1+			Dixon	J	B
SD	Escondido	1902	Jun	2	WFVZ EGG SET	SB	12S	2W		EGG SET (5); fresh	1+	WS	"hole in large sycamore 14 ft up"	Dixon	J	B
SD	Escondido	1904-06			Sharp (1907)	SB	12S	2W		ON	1		Rare but regular before last date in 1904.	Sharp		
SD	Farmland	1948	Jun	21	SDSU 207	SB				coll. M	2+		Farmland near nesting colony	Lee	J	
SD	Hot Springs Mtn.	1993			B. McCausland	SB				obs.	1+		Nest site not located.	McCausland	B	

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sh.	Comment	Observer	First	Init.
SD	Hot Springs Mtn.	1998	Jun	25	San Diego BBA; P. Unitt	SB				obs. F	1+	c	North base of mountain; suitable snags in area.	Unitt	P	
SD	Julian	1884	Apr	4	Belding (1890)	SB				obs. 1+	1+		Arrival	Goss	N	S
SD	Julian	1888	May	17	WFVZ 348	SB				coll. M	1+			Ingersoll	A	M
SD	Julian	1889	Jun	8	SDNHM 1252	SB				coll. M	1+					
SD	Julian	1892	Apr	13	CM 16766-67	SB				coll. M, F	1+			Stephens	F	
SD	Julian	1908	Jul	26	MVZ 3795	SB				coll. F	1+			Stephens	F	
SD	Julian	1915	Jun	29	UCLA 483-84	SB				coll. ad. M,F	1+			Dickey	D	R
SD	Julian	1915	Jun	15	WFVZ EGG SET	SB				EGG SET (4)	1+	QK	"natural cavity in black oak...35 ft."	Dickey	D	R
SD	Julian, near	1915	Jun	22	WFVZ EGG SET	SB				EGG SET (3)	1+	QK	"natural cavity in dead limb of black oak...20 ft"	Huey	L	M
SD	Julian, S of	1998	Jun	10	San Diego BBA (Ed Hall)	SB				ON	1+			Hall	E	
SD	Laguna Mtn.	1979			AB 33:898	SB				ON	1+	s				
SD	Laguna Mtn., 4 mi. NW	1957	Apr	30	CM 137556	SB				coll. M	1+			Haller	K	W
SD	Laguna Mtns.	1993			AB 47:1151 (P.A. Ginsberg)	SB				ON	3-4	s	3-4 pair at nest holes in May and June.	Ginsberg	P	A
SD	Laguna Mtns., Agua Dulce Crk.	1976	Jul	24	Unitt (1984)	SB				obs. 1	1+			Unitt	P	
SD	Laguna Mtns., Agua Dulce Crk.	1993			B. McCausland	SB				obs. 1	1+		Nest site not located.	McCausland	B	
SD	Laguna R.A., Kitchen Cr. Rd.	1992			B. McCausland	SB	15S	5E	22	ON	2+	P	1/4 mi. S of Hwy in "...large, isolated dead pine...."	McCausland	B	
SD	Laguna R.A., Kitchen Cr. Rd.	1993	May		B. McCausland	SB	15S	5E	22	ON (6)	3+	P	1/4 mi. S of Hwy in "...large, isolated dead pine...."	McCausland	B	
SD	Laguna R.A., Morris Ranch Rd.	1994			B. McCausland	SB	15S	5E	23	ON (pair)	1	P	Nesting in lone dead pine	McCausland	B	
SD	Laguna Ranch	1894	Apr		(Nat. Arch.: McLellan)	SB				ON	2+	Q	"in...large oaks"	McLellan		
SD	Lake Henshaw	1932	Jun	3	WFVZ EGG SET	SB				EGG SET (5)	1+	CO	"dead cottonwood stub...in water"	Dixon	J	B
SD	Lake Henshaw	1932			Willett (1933)	SB				NE	20	s	Two sets of eggs collected on 6/3/32.	Dixon	J	B
SD	Lake Henshaw	1994			J. D. Robinson	SB			15	ON	1+	s		Robinson	J	
SD	Lake Henshaw	1998			B. Mulrooney	SB				FY	1+		Feeding young at lake	M	B	
SD	Lake Henshaw	1998?	Jul	17	San Diego BBA data (C. Edwards)	SB				obs. 12	2+			Edwards	C	
SD	McGee Rd.	1998			San Diego BBA (J. Hargrove)	SB				ON	2+	UP		Hargrove	J	
SD	Palomar Mtn.	1955	May	10	WFVZ 43077	SB				coll. M	1+			Bleitz	D	
SD	Palomar Mtn.	1955			AFN 9:404 (Eleanor Beamer)	SB				ON	2+	C	"small...colony...where they were unknown previously...."	Beamer	E	
SD	Palomar Mtn.	1976	Jun	27	J.V. Remsen MVZ notes	SB				obs. 2	1+		In state park.	Remsen	J	V
SD	Palomar Mtn.	1979	Aug	6	AB 33:898 (R. Higson); Garrett and Dunn	SB				obs. 65	10+		Garrett and Dunn assumed these to be fall migrants; I do not.	Higson	R	
SD	Palomar Mtn.	1979			AB 33:898	SB				ON	4+	C				
SD	Palomar Mtn.	1983			AB 37:1028 (R. Higson)	SB				ON	45?	C	"...45 pairs nested on Mt. Palomar...."	Higson	R	
SD	Palomar Mtn.	1985	Jun		AB 39:963 (J. Robinson)	SB				ON	3-4	BX	"...nesting in a 'bird house' placed on top of a large dead tree...."	Robinson	J	
SD	Palomar Mtn.	1988	Jun		J.D. Robinson	SB				ON	5	c	Five pair at an old snag 1/2 mile from the cabin.	Robinson	J	D
SD	Palomar Mtn.	1998			B. Mulrooney	SB				obs.				M	B	
SD	Palomar Mtn., nr. Observatory	1978	Jul	16	AB 32:1209 (P. Unitt); Unitt (1984)	SB				obs. 8	2+		"...flying around holes near the...Observatory...."	Unitt	P	
SD	Palomar Mtns., Lower Doane V.	1978	Jul	16	Unitt (1984)	SB				obs. 3	2+			Unitt	P	
SD	Pauma Valley	1953	Jun	11	AFN 7:291 (Eleanor Beamer)	SB				obs. 2	1+			Beamer	E	
SD	Pine Valley	1895	Jun	12	CM 16762-63	SB				coll. M, F	1+			Anthony	A	W
SD	Pine Valley	1974	Jun		AB 28:950; Unitt (1984)	SB				obs. 2 pair	2+		Not from 1975-1983.			
SD	Pine Valley	1974			J.D. Robinson	SB	15S	4E	36	ON (pair)	1	s		Robinson	J	D
SD	Pine Valley	1970-74			J.D. Robinson	SB	15S	4E	36	ON	5	Q	"Nested in gnarled oak snag ~30 ft."; snag fell in 1975	Robinson	J	D
SD	Pine Valley Bridge/I-8	199(?)			J.D. Robinson	SB	15S	4E	34	obs.	?		Second-hand reports of birds using bridge.	Robinson	J	D
SD	Poway	1883			Belding 1890 (Blaisdell)	SB				obs.	2+		"Common."	Blaisdell	F	E
SD	San Diego Co.	1921	Jun	18	WFVZ EGG SET	SB				EGG SET (4); fresh	1+	P	"30 ft. in pine...at end of 10 ft. dead limb"	Field	P	H
SD	San Onofre	1904	May	28	MVZ 36726-27	SB				coll. 2F	2+	WS		Dixon	J	S
SD	San Onofre	1904	May		MVZ 36728-29	SB				coll. 2M	2+	WS		Pinger	P	
SD	San Onofre	1904	May	30	Dixon (1906)	SB	9S	7W		NE (4)	3+	WS	Set of four fresh eggs in natural cavity of sycamore	Dixon	J	
SD	San Onofre	1905	Mar	27	Dixon (1906)	SB				NEST	1+	WS	Nest near complete 12 ft. Up in sycamore	Dixon	J	
SD	San Onofre	1906	Mar	31	Dixon (1906)	SB				ON	6+	WS	Three pairs examining ACWO cavities in a tall dead sycamore	Dixon	J	
SD	San Onofre	1917	May	23	SDNHM 32116	SB				coll. F	1+	WS				
SD	San Onofre	1977			Garrett and Dunn (1981)	SB				ON	1+	WS				
SD	San Onofre, Horno area	1978	Jul	16	AB 32:1209 (A. Fries); Unitt (1984)	SB				ON	6	WS	At least six nest holes occupied; note *AB* says "July 6" not 16th.	Fries	A	

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
SD	Santa Ysabel	1890	Jun	18	SDNHM 1254	SB				coll. F	1+					
SD	Santa Ysabel	1892	Jun	25	CM 16758-59	SB				coll. M, F	1+			Anthony	A	W
SD	Santa Ysabel	1893	Jul	01	FMNH 6559	SB	12S	3E		coll. M	?					
SD	Santa Ysabel, Mesa Grande Rd.	1994			B. McCausland	SB				obs. pair	1			McCausland	B	
SD	Volcan Mt., near Julian	1993			AB 47:1151 (P. Unitt); B. McCausland	SB				obs. 3-4	2+		May-June	Unitt	P	
SF	Lake Merced	1902	Apr	26	MVZ 56561	MD				coll. F	1+		"Eggs very small."[?]	Pemberton	J	R
SF	San Francisco, city	1855			Newberry (1857)	MD				obs.	2+		"Not uncommon about San Francisco...."	Newberry	J	C
SF	San Francisco, city	1867	Jun		Ridgway (1877)	MD				ON	?	ED	"Very abundant about old buildings."	Ridgway	R	
SHA	Ahjumawi L.S. SP	1990	May	26	ABN (R. Leong?)	MD	38N			obs. 6	3+			Leong	R	
SHA	Ahjumawi L.S. SP, Big Lake	1988	Aug	15	ABN; S.F. Bailey	MD	38N	5E		obs. 2+	?			Bailey	S	F
SHA	Ahjumawi L.S. SP, Big Lake	1992	May		B. Yutzy	MD	38N	5E		obs. 2	1+			Bidstrup	F	
SHA	Ahjumawi L.S. SP, Big Lake	198(7)			B. Yutzy	MD	38N	5E		obs. 1-2	1+			Yutzy	B	
SHA	Ahjumawi L.S. SP, Horr Pond	1992			J. Davis	MD	38N			ON	2-3	PP	Investigating cavities in snags on N side of pond, 4/15-5/15.	Davis	J	
SHA	Ball's Ferry	1962	Jun	11	ABN (P. DeBenedictis)	MD				obs. F	1+			DeBenedictis	P	
SHA	Baum Lake	1978	Jul	13	ABN (J. Morlan)	MD	36N	4E		obs. F	1+			Morlan	J	
SHA	Baum Lake	1980	Jul	30	H. Green	MD	36N	4E		obs. 2	1+			Green	H	
SHA	Baum Lake	1990	Jun	23	ABN (D. Murphy)	MD	36N	4E		obs. 5+	3+		"Usual location."	Murphy	D	P
SHA	Baum Lake	1995	Jul		B. Williams	MD	36N	4E		obs. 2	1+		Nest site not located.	Williams	B	
SHA	Cassel	1985	Jul	14	AB 39:959 (S. Brown); ABN	MD	35N	4E		obs. 10	2+		"Evidence nested in martin house." [none actually recorded - B.W.]	Brown	S	
SHA	Cassel	1986	Jun	25	ABN (S. Brown)	MD	35N	4E		obs. 3	1+		"Usual breeding area."	Brown	S	
SHA	Cassel	1987	Jul	5	ABN (S. Brown)	MD	35N	4E		obs. 5	1+		"Fledglings together in dead tree."	Brown	S	
SHA	Cassel	199(0)			B. Laudenslayer	MD	35N	4E		obs. 3-4	1+		Nest site not located.	Laudenslayer	B	
SHA	Crystal Lake	1980	Jun	21	ABN (D. Murphy)	MD	36N	4E		obs. F	1+			Murphy	D	P
SHA	Crystal Lake	1982	Jun	26	ABN (?)	MD	36N	4E		obs. pair	1+					
SHA	Crystal Lake	1983	Jul	16	ABN (D. Murphy)	MD	36N	4E		obs. 7	1+			Murphy	D	P
SHA	Crystal Lake	1986	Jun	28	ABN (D. Murphy)	MD	36N	4E		obs. 3M, 2F	3+		"Usual here."	Murphy	D	P
SHA	Crystal Lake	1984-85			CDFG files (D. Murphy)	MD	36N	4E		obs.	1+		Colony probably at top of hill, near GBHE rookery.	Murphy	D	P
SHA	Fort Crook	1894			USNM Archives (Streator)	MD				ON	3+	P	"Common breeding in dead pine trees."; 26 May-2 Jun	Streator		
SHA	Hat Creek powerhouse #2	1985	May	19	ABN (B. Peck)	MD	36N	4E		obs. M	?			Peck	B	
SHA	Hat Creek powerhouse #2	1992	May	12	B. Yutzy	MD	36N	4E		obs. M	?			Peck	B	
SHA	Hat Creek, 2 mi. SW	1993	May	30	B. Yuzty	MD	34N	4E		obs. 2M	2+		In heavily logged area.	Yutzy	B	
SHA	Hatchet Mtn. Rd.	1985	Jun	8	AB 39:959 (B.&C. Yutzy); ABN	MD	35N	2E		obs. 2	1+		Pair at microwave station.	Yutzy	B	
SHA	Lake Britton	1979	May	27	Airola (1980)	MD		3E		obs.	?			DeBenedictis	P	
SHA	Lake Britton	1997	Jul	6	FN 51:1050 (B. Yutzy)	MD				obs. 25	7+			Yutzy	B	
SHA	Lake Britton	1998	Jun		B. Williams	MD				obs. 5+	3+			Williams	B	
SHA	Redding	1977	May	12	ABN (S.A. Laymon)	MD				obs. 1	?		Found exhausted after heavy rain.	Laymon	S	A
SHA	Shasta Res.	1987			ABN (B.&C. Yutzy)	MD				obs. 3	1+	C	"Nest hole and snag, new site."; 6 Jun-7 Jul	Yutzy	B	
SHA	Shasta Res., Holiday Harbor	1990-93			B. Yutzy	MD				obs. 1-2	?			Yutzy	B	
SHA	Shasta Res., Lakeview Resort	1993	May	12	J. Coon	MD	34N	4W	11	obs. pair	1			Coon	J	
SHA	Shasta Res., Lakeview Resort	1993	May	10	B. Yutzy	MD				ON (pair)	1	C		Yutzy	B	
SHA	Shasta Res., Pit Arm	1978	Jun	27	AB 32:1204; P. Detrich	MD				ON (29+ ad.)	17+	C	American Birds incorrectly states 30 pair.	Detrich	P	
SHA	Shasta Res., Pit Arm	1994	Jun	17	B. Williams	MD				ON (36+ ad.)	14+	C	Nesting in drowned snags.	Williams	B	
SHA	Shasta Res., Pit Arm	1995	Jun	29	B. Williams	MD				ON (30+ ad.)	19+	C	Nesting in drowned snags.	Williams	B	
SHA	Soldier Mountain L.O.	1984	May	19	AB 39:955 (B.&C. Yutzy); ABN	MD				obs. M, F	1+		Sixth May-June record from e. SHA	Yutzy	B	
SIE	Pike	1983	Jul	29	ABN (R.A. Erickson)	MD	18N	9E		obs. 4	?			Erickson	R	A
SIE	Sierra Valley	188(5)	Jun	18-21	Belding (1890)	MD				ON (6+)	3+	BX?	"...common; breeding...martin houses recently erected...."	Belding	L	
SIE	Sierra Valley, Loyalton	1919	Jun	6	Mailliard (1919)	MD	21N	15E	13	obs. 8+	4+	BX?	Thought to be using "martin house." [poss. bank building - B.W.]	Mailliard	J	
SIS	Barnum Flat Res.	1989	Jun	18	BBS, R. D. Ekstrom	MD	40N	4E	3	obs. 1	1+			Ekstrom	R	D
SIS	Blue Ridge L.O.	1980	Jun	21	M. Robbins	MD	39N	12W	10	ON	3	C	steep, Ceanothus covered old burn	Robbins	M	
SIS	Bray	1920			Mailliard (1921)	MD	44N	1W		ON	1+	c	Found nesting from 28 May-5 June	Mailliard		
SIS	Bray, Orr Lake	1982	May	30	M. Robbins	MD	44N	1W	17	ON	3	C		Robbins	M	
SIS	Butte Valley	1977	May		ABN (M. Taylor)	MD				obs.	1+			Taylor	M	
SIS	Copco Lake	1976	May	8	R. D. Ekstrom	MD	48N	4W		ON	1+	C		Ekstrom	R	D

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
SIS	Copco Lake	1977	May		ABN (M. Taylor)	MD	48N	4W		obs.	1+			Taylor	M	
SIS	Copco Lake	1982	Aug	2	ABN (S.J)	MD	48N	4W		obs. 5	1+			J	S	
SIS	Copco Lake	1970s			R. D. Ekstrom	MD	48N	4W		ON	1	C	Pair using snag at N shore; snag has since fallen.	Ekstrom	R	D
SIS	Copco Lake, Sloan Butte	1980-93			M. Robbins	MD	48N	4W	19	obs. 4+	2-4			Robbins	M	
SIS	Edgewood, 6 mi. NW	1898			Merriam (1899)	MD				obs. 1	1+			Fisher	W	K
SIS	Glacierview Ranch	1985	Jun	4	M. Robbins	MD	37N	10W	8	ON	1	c	edge of meadow	Robbins	M	
SIS	Greenhorn Park, nr. Yreka	1979	Aug	6	ABN (R. D. Ekstrom)	MD				obs. 7	?		Thought to be migrants.	Ekstrom	R	D
SIS	Grenada (7E of at Salt Lake?)	1977	May		AB 31:1044 (fide M. Taylor); ABN	MD	44N	6W		obs. 45	?		45 was high count throughout May.	Taylor	M	
SIS	Gunsight Ridge, W of Yreka	1991-94			R. D. Ekstrom	MD	45N	7W		obs. 4	2+	s	Many snags from 1955 Haystack Fire, but nest not located.	Ekstrom	R	
SIS	Juanita Lake, W of MacDoel	1976	Aug	21	ABN (S. S)	MD	46N	2W		obs. 2	?			S	S	
SIS	Juanita Lake, W of MacDoel	1979	Aug	11	ABN (R. D. Ekstrom)	MD	46N	2W		obs. 6	?		"May have bred there."	Ekstrom	R	D
SIS	Klamath Basin	1980	Apr	26	ABN (S. Summers)	MD				obs.	?		First arrivals	Summers	S	
SIS	Lake Abrams	1980	Jul	27	ABN (B.&C. Yutzy)	MD				obs. 7	1+		"Probably nested nearby."	Yutzy	B	
SIS	Lava Beds NM	1899	Jul	4-11	(Nat Arch. A.H. H)	MD				ON	4+	CV	"...considerable numbers near the ice caves,...breeding...."	H	A	H
SIS	Lava Beds NM	1942	Mar	23	D. Fisher et al. (?)	MD				ON ("abundant")	4+	CV	[abundant in March? - B. W.]			
SIS	Lava Beds NM	1966			Yocum and Browning (1968)	MD				ON	2+	CV	"...nest in rock crevices at mouths of caves"	Yocum	C	F
SIS	Lava Beds NM	1978			ABN (T. Lund)	MD				ON	?	CV	Tom Lund has photos of martins nesting in caves	Lund	T	
SIS	Lava Beds NM	1979	Jul	24	ABN (B.&C. Yutzy)	MD				obs. 2	1+	CV	"Cave nesting."	Yutzy	B	
SIS	Lava Beds NM	1979	May	24-26	AB 33:804 (T. Lund)	MD				ON	21	CV	21 pair censused. Population "...has declined in recent years"	Lund	T	
SIS	Lava Beds NM	1980	May	31	ABN (S.A. Laymon+)	MD				obs. 12	6+			Laymon	S	A
SIS	Lava Beds NM	1983	Jul	3	R.A. Erickson notes	MD				obs. 3	2+			Erickson	R	A
SIS	Lava Beds NM	1997	May	26	ABN (B & C. Yutzy)	MD				obs. 3	2+			Yutzy	B	
SIS	LBNM, Dragonhead Cave	1991	Jun	9	CNRP (J. Gowan)	MD				NE (6 pair)	6	CV	Two females on eggs, 4 NB; nests below ground.	Gowan	J	W
SIS	LBNM, Post Office Cave	1980	Jun	24	ABN (D. Murphy)	MD	45N	4E	27	obs. F	1+			Murphy	D	P
SIS	LBNM, Post Office Cave	1984			CDFG files (D. Murphy)	MD	45N	4E	27	ON (1-2 pair)	1+	CV		Murphy	D	P
SIS	LBNM, Post Office Cave	1986	Jul	24	ABN (D. Murphy)	MD	45N	4E	27	obs. 19+	3+			Murphy	D	P
SIS	LBNM, Post Office Cave	1992	Jul	7	J. Coon	MD	45N	4E	27	ON (30)	6+	CV		Coon	J	
SIS	LBNM, Post Office Cave	1993	May		B. Williams	MD	45N	4E	27	ON	2+	CV		Williams	B	
SIS	LBNM, Schonchin Collapse	1991	Jun	10	CNRP (J. Gowan)	MD	45N	4E		NE (2 pair)	2	CV	One female on eggs, another building nest.	Gowan	J	W
SIS	LBNM, Schonchin turn-off, nr.	1983	May	1	ABN, C. Stromsness	MD				obs. 1	1+			Stromsness	C	
SIS	LBNM, Schonchin turn-off, nr.	1984	May	20	ABN, C. Stromsness	MD				obs. 2	1+		west of Lava Beds Rd.	Stromsness	C	
SIS	LBNM, Schonchin turn-off, nr.	1985			M. Robbins	MD	45N	4E		ON	1-2	CV		Robbins	M	
SIS	LBNM, Skull Ice Cave	1998	Jun	7	B. Williams	MD				obs. 3	2+			Williams	B	
SIS	LBNM, Skull Ice Cave, nr.	1985	May	26	ABN; S.F. Bailey	MD				obs. 15 (5 ad.M)	6+			Bailey	S	F
SIS	Medicine Lake	1979	Jul	24	ABN (B.&C. Yutzy)	MD	43N	3W		obs. 17	4+			Yutzy	B	
SIS	Salt Lake, 4 mi. E of Grenada	1983	May	9	R. D. Ekstrom	MD				obs. 2	2		Not known to nest nearby.	Ekstrom	R	D
SIS	Salt Lake, 4 mi. E of Grenada	1984	May	5	R. D. Ekstrom	MD				obs. F			Not known to nest nearby.	Ekstrom	R	D
SIS	Shasta Valley W.A.	1998	May	28	ABN (R. Ekstrom)	MD				obs. 50	?		During storm on snags in Trout Lake, but seen in smaller numbers prior	Ekstrom	R	
SIS	Temple Rock, 1.5 mi NE	1992	Jun		BBS 198, R. D. Ekstrom	MD	45N	4W	14	obs. 1	1+			Ekstrom	R	D
SIS	Temple Rock, 1mi. NE	1985	Jun		BBS 198, R. D. Ekstrom	MD	45N	4W	15	ON (pair)	1+	C		Ekstrom	R	D
SIS	The Whaleback	1982	Jun	7	M. Robbins	MD	43N	4W	35	ON	6	C	chaparral covered old burns with numerous snags	Robbins	M	
SIS	Tule Lake, area	1899	Jul	4-11	(Nat Arch) A.H. H	MD				ON	2+	C	"...heavily timbered country...in dead trees."	H	A	H
SIS	Weed	1883			Townsend (1887)	MD	41N			ON	3-4	ED	About buildings.	Townsend		
SIS	Weed	1920	May		Mailliard (1921)	MD	41N			ON	1+			Mailliard	J	
SJ	Stockton	1878			Belding (1878)	MD				obs.	10+		"...common or even abundant..."	Belding	L	
SJ	Stockton	1879	Mar		Belding (1890)	MD				obs. 6	3+		First arrival March 1; Both sexes common by March 12.	Belding	L	
SJ	Stockton	1885	Mar		Belding (1890)	MD				obs. 6+	3+		First arrival March 6. Common by March 21.	Snyder	J	J
SJ	Stockton	1886	Mar	5	Belding (1890)	MD				obs. M	1+		First arrival.	Belding	L	
SJ	Stockton	1895	Jun	3	WFVZ EGG SET	MD				EGG SET (4); comp	1+	ED	"hole in the side of a brick building"	Sampson	W	B
SJ	Stockton	1900			Belding (1901a)	MD				ON	?	ED?		Belding	L	

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
SJ	Stockton	1901			Belding (1901b)	MD				ON	6+	ED	"...the Western Martin is still very common...."	Belding	L	
SJ	Stockton	1903	Mar	7	Belding (1904)	MD				obs.			arrived	Belding	L	
SJ	Stockton	1905			Belding (1905)	MD				ON	1+		Arrived 2 March; nested here.	Belding	L	
SJ	Stockton	1879+			Belding (1905)	MD				ON	1+			Belding	L	
SLO	Atascadero	1992			SLO BBA	MD	28S	12E		ON	1+		Long time location.			
SLO	Atascadero Crk., 1 mi. W on Hwy. 41	1987	Jun	27	A. Edwards notes	MD				ON	1+		One perched on "big tree stub"	Edwards	A	
SLO	Atascadero Crk., W of Atascadero	1985	Mar	24	Marantz (1986); C. Marantz	MD	28S	12E		obs. 1	1+			S	G	P
SLO	Atascadero Crk., W of Astascadero	1986	Mar	25	Marantz (1986); C. Marantz	MD	28S	12E		obs. 5	3+		"...early arrivals at a breeding location."	Marantz	C	
SLO	Atascadero, 7 mi. N	1931	Apr	11	SJSU specimen (1937)	MD				coll. F	1+					
SLO	Black Mountain (=Bl. Butte?)				Marantz (1986); C. Marantz	MD				obs.	?		Regular in summer, but nest site not located.	Marantz	C	
SLO	Cuesta Ridge				Marantz (1986); C. Marantz	MD				obs.			Regular in summer, but nest site not located.	Marantz	C	
SLO	Lopez Reservoir, Camp French	1983-84			CDFG files (M. T. Hanson)	MD	31S	14E	22	obs.	1+		Seen regularly at Camp French BSA camp	Hanson	M	T
SLO	Los Osos	1981	Jul	17	Marantz (1986)	MD				obs. 1	?		Not known to nest nearby.	R	J	
SLO	Paso Robles, Sacramento Ranch	1912	Apr	5	Dawson (1923)	MD				ON	6+	Q	Six pairs at "...a giant oak...in the hills...Sacramento Ranch."	Dawson	W	L
SLO	Santa Margarita	1921	Apr	8	LACM 4413	MD	29S			coll. F	1+			Wyman	L	E
SLO	Shandon district	1932	May	28	WFVZ EGG SET	MD				EGG SET (5); fresh	1+	Q	"hole in...limb of oak...25 ft. from ground"	Cotter	M	T
SLO	Shandon district, San Juan V.	1914	Apr	17	Dawson (1923)	MD				obs. 1+	1+			Dawson	W	L
SLO	Trout Creek, E of Snta. Margarita				Marantz (1986); C. Marantz	MD				ON	1+	s	Birds entering cavity	Marantz	C	
SLO?	Mansfield	1894			(Nat Arch.: McLellan)					ON	2+	Q	Common 3/28-30,4/5-8; "...in the large oaks along the Nacimiento."	McLellan		
SM	Alpine Rd., Portola Valley	1975	Jun	26	ABN (P. Metropulos)	MD				obs. 4	2		Two pairs west of Skyline Blvd.	Metropulos	P	J
SM	Ano Nuevo	1964	Jul	4	ABN (T. Chandik)	MD				obs. 1	?			Chandik	T	
SM	Ano Nuevo	1976	Jul	11	P. J. Metropulos	MD				obs. 1	?			Metropulos	P	J
SM	Ano Nuevo	1977	Jun	18	P. J. Metropulos	MD				obs. M,F	1			Metropulos	P	J
SM	Ano Nuevo	1978	May	29	P. J. Metropulos	MD				obs. M,F	?			Metropulos	P	J
SM	Ano Nuevo	1981	Jul	5	ABN: A. Edwards	MD				obs. 1	?			Edwards	A	
SM	Ano Nuevo	1990	Jun	16	P. J. Metropulos	MD				obs. 1	?			Strachan	G	
SM	Atherton, Catalpa Dr.	1984	Jun	5	P. J. Metropulos	MD				obs. 1	?		Felt to be a migrant.	Metropulos	P	J
SM	Belmont	1975	Apr	19	AB 29:905 (P.J. Metropulos)	MD				obs. 1	?			Metropulos	P	J
SM	Burlingame	1987	Aug		P. J. Metropulos	MD				obs. 3	1+		Family group.	Allen	F	
SM	Burlingame	1989	Aug	18	P. J. Metropulos	MD				obs. 4	1+		Two adults, 2 immatures returned for third consecutive year.	Allen	F	
SM	Burlingame	1990	Aug	10	ABN (P. Metropulos)	MD				obs. 2	?		Seen in area where nesting suspected in nearby Hillsborough	Metropulos	P	J
SM	Butano Creek, Canyon Road	1977	Jul	31	ABN (P. Metropulos)	MD				obs. 4	1+		"Pair of adults feeding fledglings"	Metropulos	P	J
SM	Cahill Ridge	1994	Jun	4	P. J. Metropulos	MD				obs. M,F	1+			Manumoser	M	J
SM	El Granada	1992	Jul	2	P. J. Metropulos	MD				obs. 4	1+		Male and 3 immatures.	Sauppe	B	
SM	Half Moon Bay	1965	Jun	19	ABN (T.&Z. Chandik); Ted Chandik	MD				obs. 2	?		note date incorrectly published as 14th.	Chandik	T	
SM	Half Moon Bay	1966	Jul	17	ABN (T.&Z. Chandik); Ted Chandik	MD				obs. 3	?			Chandik	T	
SM	Hillsborough, Black Mtn./Vista Rds.	1990			ABN (P. Metropulos)	MD				obs. M,F	1+		"Stongly suspected nesting of 1-2 pairs...."; Obs. 5/28, 7/2	Metropulos	P	J
SM	Los Gatos, mtns. above	1956	Jul	21	AFN 10:408 (F. Dieterich); ABN	MD				FY (10+)	2+	a	Feeding fledglings.	Dieterich	F	
SM	Memorial County Park	1977	Jul	2	P. J. Metropulos	MD				obs. 1	?			Metropulos	P	J
SM	Pescadero Marsh	1965	Jul	17	ABN (T.&Z. Chandik); Ted Chandik	MD				obs. 2	?			Chandik	T	
SM	Pescadero Marsh	1967	Jun	24	ABN (T.&Z. Chandik); Ted Chandik	MD				obs. M	?			Chandik	T	
SM	Pescadero Marsh	1973	Jun	17	P. J. Metropulos; ABN (M.C. R.)	MD				obs. 2M,2F	2+		One seen on 23rd.	Metropulos	P	J
SM	Pescadero Marsh	1976	Jul	15	P. J. Metropulos	MD				obs. 5	1+			Metropulos	P	J
SM	Pescadero Marsh	1976	Jun	15	R.A. Erickson notes	MD				obs. F	1+			Erickson	R	A
SM	Pescadero Marsh	1977	Aug	6	P. J. Metropulos	MD				obs. 5	?		Two also seen July 30.	Metropulos	P	J
SM	Pescadero Marsh	1978	Jul	11	ABN (P. Metropulos)	MD				obs. F				Metropulos	P	J
SM	Pescadero Marsh	1981	Jul	17	ABN (T. Chandik)	MD				obs. 2	1+			Chandik	T	
SM	Pescadero Marsh	1982	Jul	11	ABN (K.L. Hainebach)	MD				obs. M	1+			Hainebach	K	L
SM	Pescadero Marsh	1983	Jul	14	ABN (P. Metropulos)	MD				obs. 3	1+		"Wanderers from nearby nest site in Santa Cruz Mtns.?"	Sauppe	B	
SM	Pescadero Marsh	1984	May	27	P. J. Metropulos	MD				obs. 7	?			Metropulos	P	J

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
SM	Pescadero Marsh	1986			ABN (P.J. Metropulos, D.L. Suddjian)	MD				obs. 1-3	1+		Obs. May-Jul.	Metropulos	P	J
SM	Pescadero Marsh	1987	Aug	3	P. J. Metropulos	MD				obs. 3	?			Richter	C	
SM	Pilarcitos Lake	1992	Jul	14	P. J. Metropulos	MD				obs. 3	1+		Male and two immatures - see El Granada record.	Metropulos	P	J
SM	Pilarcitos Lake	1997	Jun	7	ABN (P. J. Metropulos)	MD				obs. M	1+		Singing heard at 2 AM	Metropulos	P	J
SM	Pillar Point	1976	Jun		P. J. Metropulos	MD				obs. M,2F	1+		Seen from 9th to 11th.	Metropulos	P	J
SM	Pomponio S.B./S of (Hwy 1)	1989	May	29	ABN (J. Broyles)	MD				obs. several	?			Broyles	J	
SM	Princeton Harbor	1973	Jul	6	J.V. Remson MVZ notes; R.A. Erickson	MD				obs. 2M,2F	2+		"Landed on sandy neach in harbor...."	Remson	J	V
SM	Redwood City	1899	Jul	15	CAS 77099	MD				coll. M	?			Littlejohn	C	
SM	Redwood City	1910	May	1	CAS 77101,03	MD				coll. 2M	?			Littlejohn	C	
SM	Sawyer Ridge	1994	May	30	P. J. Metropulos	MD				obs. 1	1+			Mammoser	M	J
SM	Searsville Lake	1904	May		CAS 77100,-02,-04-05	MD				coll. 2M,2F	2+			Littlejohn	C	
SM	Searsville Lake	1950	May	13	AFN 4:259 (E. Smith)	MD				obs. 6	3+			Smith	E	
SM	Skyline Dr.	1984			CDFG files (D. Murphy)	MD				obs.	2+		Small colony found on Skyline Dr. ?	Murphy	D	P
SM	Skyline Dr./Page Mill Rd.	1981	May	31	AB 35:860 (D.Houle); ABN	MD				obs.	?			Houle	D	
SM	Sweeney Ridge	1997			ABN (P. J. Metropulos)	MD				obs. 2-3	1+		PJM suspects these represent the only nesting pair in SM.	Metropulos	P	J
SOL	Green Valley Falls	1980	May	10	R. Leong	MD				obs. 1	?		No known nest site nearby.	Leong	R	
SON	Annapolis	1982	Jun	6	ABN (B.D. Parmeter)	MD				obs. 1	1+			Parmeter	B	D
SON	Bodega Harbor	1976	Aug	3	ABN (J. Richmond, W.M. Pursell)	MD				FY (5 [3 imm.])	1+		"Two adults feeding three young."	Richmond	J	
SON	Bodega Harbor, Sewage Ponds	1980	Jun	12	ABN (D. Beall, P. Oetzel)	MD				obs. 2	?			Beall	D	
SON	Bohemian Grove (?)				B.D. Parmeter	MD				ON		c	One colony.	Parmeter	B	D
SON	Cazadero Area	1928			Grinnell (1928)	MD				obs.	1+		Seen while camped near Cazadero.	Hansen	H	E
SON	Cazadero Area	1990	Jun		B.D. Parmeter	MD				obs.	?			Parmeter	B	D
SON	Duncan's Mill	1967	Jun	10	B.D. Parmeter	MD				obs. 1	1+		In canyon above pond.	Parmeter	B	D
SON	Fort Ross/Black Mtn. Rds.	1990	Jun	16	Sonoma BBA; B.D. Parmeter	MD				ON (4)	2+	C	Approx. 150 yds. west of turnoff to Black Mtn Cons. Camp.	Parmeter	B	D
SON	Fort Ross/Niestrath Rds.	1990	Jun	16	B.D. Parmeter	MD				ON (8)	4+	C	At two dead snags on hillside to south, 1/2 mi. E	Parmeter	B	D
SON	Fort Ross/Niestrath Rds., E of	1990	Jun	16	B.D. Parmeter	MD				ON (3-4)	2+	C	At snag on N-facing slope.	Parmeter	B	D
SON	Geysers Rd.	1997	May	13	ABN (D. Nelson)	MD				obs. 4	2+			Nelson	D	
SON	Geysers, SMUD Geo1	1994	Jun	9	B. Williams	MD	11N	8W	21	ON (1 pair)	1	C	DBH=61cm; Other colonial snag much larger, inaccessible	Williams	B	
SON	Geysers, SMUD Geo1	1995	Jun		B. Williams	MD	11N	8W	21	obs.	1+			Williams	B	
SON	Gualala River/Hwy. 1	1975	Jul	23	ABN (O.J. Kolkman); B.D. Parmeter	MD	11N	15W		obs. 8	2+	BR	"Common at bridge" on 6/8. Eight on 7/23.	Kolkman	O	J
SON	Gualala River/Hwy. 1	1976	Jun	6	B.D. Parmeter	MD	11N	15W		obs. M, 2F	2+			Parmeter	B	D
SON	Gualala River/Hwy. 1	1976	Jul	13	J. R. Arnold	MD	11N	15W		ON (20)	7+	BR		Arnold	J	R
SON	Gualala River/Hwy. 1	1977	Jun	5	ABN (B.D. Parmeter)	MD	11N	15W		NB (2M,2F)	2+	BR	"One male carrying nest material."	Parmeter	B	D
SON	Gualala River/Hwy. 1	1978	May	20	ABN (B.D. Parmeter)	MD	11N	15W		obs. 7M, F	3+			Parmeter	B	D
SON	Gualala River/Hwy. 1	1979	Jun	3	ABN (B.D. Parmeter)	MD	11N	15W		obs. 10	5			Parmeter	B	D
SON	Gualala River/Hwy. 1	1980	Jun	6-8	ABN; B. D. Parmeter	MD	11N	15W		obs. 10	5+			Parmeter	B	D
SON	Gualala River/Hwy. 1	1981	Jun	13	B.D. Parmeter	MD	11N	15W		obs. 12	6+			Parmeter	B	D
SON	Gualala River/Hwy. 1	1982	Jun	5	ABN (B.D. Parmeter)	MD	11N	15W		obs. 9	5+			Parmeter	B	D
SON	Gualala River/Hwy. 1	1983	Jun	5	ABN (B.D. Parmeter)	MD	11N	15W		obs. 6	3+			Parmeter	B	D
SON	Gualala River/Hwy. 1	1984	May	26	B.D. Parmeter	MD	11N	15W		obs. 10M,4F	8+			Parmeter	B	D
SON	Gualala River/Hwy. 1	1985	Jun	7	ABN (B.D. Parmeter)	MD	11N	15W		obs. 13	7+			Parmeter	B	D
SON	Gualala River/Hwy. 1	1986			Parmeter 1995; ABN (R.A. Erickson); B	MD	11N	15W		NY (7, 4M)	4+	BR	Nesting in holes under bridge.	Parmeter	B	D
SON	Gualala River/Hwy. 1	1988	May	21	B.D. Parmeter	MD	11N	15W		obs. 7M, 2F	5+			Parmeter	B	D
SON	Gualala River/Hwy. 1	1989	May	29	ABN (B.D. Parmeter)	MD	11N	15W		obs. 7	4+			Parmeter	B	D
SON	Gualala River/Hwy. 1	1990	Jun	10	B.D. Parmeter	MD	11N	15W		obs. 5M, F	4+			Parmeter	B	D
SON	Gualala River/Hwy. 1	1991	Jun	2	B.D. Parmeter	MD	11N	15W		obs. 4M, 2F	4+			Parmeter	B	D
SON	Gualala River/Hwy. 1	1993			S. Hayes, B. Perry	MD	11N	15W		NY (7)	2+	BR		Hayes	S	
SON	Gualala, 3 mi.E	1990	Jun	10	Parmeter 1995; Sonoma BBA	MD				ON	1+	C		Hudspeth	R	
SON	Ida Clayton Rd.	1962			ABN; J. R. Arnold; B.D. Parmeter	MD				ON (30)	8+	P	Colony in dead pine 6/16; Obs. 30 on 7/5 (7-9 PM)	Arnold	J	R
SON	Ida Clayton Rd.	1964	May	13	B.D. Parmeter	MD				obs. 3	2+			Parmeter	B	D

Cnty	Location	Year	M	D	Source	BM	T	R	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
SON	Ida Clayton Rd.	1965	May	22	ABN; B.D. Parmeter	MD				obs. 2M,2F	2+		"Fairly commonly heard."	Parmeter	B	D
SON	Ida Clayton Rd.	1967	May		B.D. Parmeter	MD				obs.	1+		Fairly common.	Parmeter	B	D
SON	Ida Clayton Rd.	1971	May	8	ABN (B. McLean); B.D. Parmeter	MD				obs. 4	2+		Near Sugarloaf Peak	Parmeter	B	D
SON	Ida Clayton Rd.	1973	May	11	ABN (J.H. H?)	MD				obs. 4	2+			H	J	H
SON	Ida Clayton Rd.	1974	May	11	ABN (J. Guggolz); B.D. Parmeter	MD				obs. 1	1+			Guggolz	J	
SON	Ida Clayton Rd.	1974	May	11	B.D. Parmeter	MD				obs. M	1+			Parmeter	B	D
SON	Ida Clayton Rd.	1986	Apr	26	B.D. Parmeter	MD				obs. M	?		in sage area	Parmeter	B	D
SON	Ida Clayton Rd.	1990	Apr	18	ABN (J.M. Richmond)	MD				obs. M	?			Richmond	J	M
SON	Ida Clayton Rd.	1963-64			B.D. Parmeter	MD				obs.	2+			Parmeter	B	D
SON	Jenner	1955			ABN (JK)	MD				obs. 3-11	2+		First arrivals	K	J	
SON	Jenner	1956	Apr	28	ABN (JK)	MD				obs. 1	1+		First arrivals			
SON	Jenner	1957	Apr	2	ABN (JK)	MD				obs. 4	2+		First arrivals			
SON	Jenner	1958	Apr		ABN (JK)	MD				obs. 1-4	2+		First arrival 4/7; 4 seen 4/23.	K	J	
SON	Jenner	1970	Jul	27	ABN (GH)	MD				obs. 1	?			H	G	
SON	Mt. St. Helena, sw. slope	1989	Jul	1	Napa BBA (B. Grummer)	MD	9N	7W		obs. 20	6+		Foraging within one mile of potential snags.	Grummer	B	
SON	Mt. St. Helena, top	1986			Sonoma BBA; ABN; B. D. Parmeter	MD				obs. 2-4	1+		Obs. 4 on 4/20; Pair on 5/17.	Parmeter	B	D
SON	Old Stage Rd., E Gualala	1982	Jun	6	ABN (B.D. Parmeter)	MD				obs. 1	?			Parmeter	B	D
SON	Petaluma	1856	Apr		Baird (1858)	MD				coll. M,F	1+			Samuels	E	
SON	Petaluma Marsh	1979	Jul	6	S.F. Bailey	MD				obs. 20	?			Bailey	S	F
SON	Pine Flat Rd.	1970	Jul	18	B.D. Parmeter	MD				obs. 2	1+			Parmeter	B	D
SON	Pine Flat Rd.	1989	Jul	22	Sonoma BBA	MD				obs. pair	1+		Nest site not located.	Rudesill	R	
SON	Pine Flat Rd.	1992	May	16	Parmeter (1995)	MD				obs.	?			Nelson	D	
SON	Pine Flat Rd.	1997	May		ABN (D. Nelson, CL, LL, suzanne Coge	MD				obs. 1-5	2+			Nelson	D	
SON	Pine Flat Rd.	1993-94	May		Parmeter (1995)	MD				obs.	?			Nelson	D	
SON	Plantation	1962	Sep	2	B.D. Parmeter	MD				obs. 4	1+		Circling about trees on the ridge.	Parmeter	B	D
SON	Plantation Sch. Camp, Oliver L.	1986	May	11	ABN (B. Lenarz)	MD				obs.	?		Not seen at same location 5/23.	Lenarz	B	
SON	Salt Point SP	1972	Jul	13	ABN (F. Barnes)	MD				obs. 8	2+			Barnes	F	
SON	Salt Point SP, Fisk Mill	1984	May	24	AB 38:955 (D. Ellis); ABN	MD				obs. 8	4+		Near Fisk Mill Cove; adequate nesting trees nearby.	Ellis	D	
SON	Sebastopol, vicinity	1885	Apr		Belding (1890)	MD				obs. 2+	1+		First seen April 17. "rare; breeds."	Holmes	F	H
SON	Sebastopol, vicinity	197			Grinnell and Wythe (1927)	MD				obs.			"...known to have remained through the nesting season...."			
SON	Sonoma Co. coast	1968	Jul	4	ABN (J. Hornstein, J. Harper)	MD				obs. 9	?			Hornstein	J	
SUT	Feather River, E of Dingville	1971			SAS; B. Mallette	MD	13N	3E		ON	2+	S	Obs 4/4 near Dingville; 5/9 Dingville to Star Bend rookery.	Mallette	B	
SUT	Feather River, N of Nicolaus	1973			ABN (D. Gaines)	MD				ON	1+	#	[Probably at/near 1972 site - B.W.]	Gaines	D	
SUT	Feather River, S of Yuba City	197(5)			Mallette (1987); B. Mallette	MD				obs.	2+		nest not located	Mallette	B	
SUT	Feather River/Bear River	1972	Jul	14	SAS (D. Gaines)	MD				ON (5-6)	1-2	#	In old woodpecker hole west side of river near Cypress Ave.	Gaines	D	
SUT?	Feather River, near Live Oak	1973			ABN (D. Gaines)	MD				ON	1+	#	[Probably at/near 1962 site - B.W.]	Gaines	D	
SUT?	Feather River/Honcut Creek	1962	Jul	11	ABN (F.G. Evenden); SAS (H. Leach)	MD	17N	3E		obs.	3+	#	"Large colony" at confluence.	Leach	H	
TEH	Beegum, 2 mi. SE	1943	Jun	15	A.H. Miller, MVZ notes	MD	29N	9W		obs. 1+	1+		"Heard overhead at camp in blue oaks...." 1,650 ft. elev.	Miller	A	H
TEH	Beegum, 2 mi. SE	1946	May	25	A.H. Miller, MVZ notes	MD	29N	9W		obs. 1+	1+		"Heard singing overhead on three occasions."	Miller	A	H
TEH	Dog Island	1980	May	4	ABN (B. Yutzy)	MD				obs. M, F	1+			Yutzy	B	
TEH	Red Bluff	1920s?			Grinnell et al. (1930)	MD				obs.	?		?			
TEH	Red Bluff, Diversion Dam	1976	Jun	12	S. Laymon	MD				obs. 1	?			Laymon	S	A
TEH	Red Bluff, E of	1955			ABN (Beatrice Nielsen)	MD				ON	1+	#	"Nested."	Nielsen	B	
TEH	Red Bluff, Silva's	1928	Apr	13	Grinnell et al. (1930)	MD				ON	4+	WS	Nesting at tops of sycamores and cottonwoods.	Grinnell	J	
TEH	Red Bluff, Todd Island	1976	Jul	12	S. Laymon	MD				obs. 1	?			Laymon	S	A
TEH	Red Bluff-Woodson Bridge	1975	Jul	26	ABN: S. Laymon	MD				obs. 14 (8 imm.)	2+			Laymon	S	A
TEH	Sac River, Vina-Chico	197(2)	Jul		T. Manolis	MD				obs. 4-6	1+		Foraging over river, prob. early July	Manolis	T	D
TEH	Tehama, 1 mi. N	1924	May	14	MVZ 45417-20	MD	25N	2W		coll. 3M,F	2+	WS	(coll with A.E.)	Grinnell	J	
TEH	Tehama, 1 mi. N	1924	May	14	Grinnell et al. (1930)	MD	25N	2W		ON	4+	WS	In sycamore.	Grinnell	J	
TEH	Woodson Bridge-Copeland Bar	1973			Gaines (1976); ABN	MD	24N	2W		ON (3 pair)	3+	WS	Nesting in sycamores	Gaines	D	
TRI	Black Lassic	1977	Jun	23	Hunter and Hazard (1998)	HU	1S	6E		obs. 5	3+			Anderson	D	A

Cnty	Location	Year	M	D	Source	BM	T	R.	S	Evidence	Pr.	Sb.	Comment	Observer	First	Init.
TRI	Black Lassic	1989	Jul	15	J. E. Hunter notes	MD				obs.	1+	c	Date and number approximate.	Ogan	C	
TRI	Black Lassic	1998	Jul	8	ABN (T. W. Leskiw)	HU	1S	6E		obs. M,F	1+	c		Leskiw	T	W
TRI	Claire Engle Res., Trinity Center	1996	Aug	16	ABN (J. E. Hunter, G.C. Hazard, T. Lesk	MD	36N	7W		obs. 3	?			Hunter	J	E
TRI	Hayfork, 2 mi. E	1943	Jun	18	A.H. Miller, MVZ notes	MD	31N	11W		obs. 1+	1+		"Heard in flight over hill east of Duncan Gulch." 2,400 ft.	Miller	A	H
TRI	Horse Ridge	1996	Jun	2	Hunter and Hazard (1998)	MD	28N	12W		obs. 2	1+	c		Elias	E	E
TRI	Hwy. 36 at Shast Co. line	1979	Apr	13	ABN (B. D. Parmeter+)	MD	29N	9W		obs. 1	?			Parmeter	B	D
TRI	Hyampom, 2 mi. W (1,200 ft.)	1946	Jun	4	A.H. Miller, MVZ notes	HU	3N	6E		obs.	1+		"Heard singing overhead in the oak and Douglas fir timber."	Miller	A	H
TRI	Island Mountain	1927	Jun	21-23	Harris (1991)	HU	5S	6E		EGG SETs - 3(4)	3+	C	All sets of four eggs each; one set pipped.	Atwell	G	
TRI	Junction City	1972	Jun	13	BBS 164, J.G. Hewston	MD	33N			obs. 1	1+		Seen across river from Junction City (Stop #2).	Hewston	J	G
TRI	Junction City	1984	Jun	15	BBS 164, J.G. Hewston	MD	33N			obs. 2	1+		Seen across river from Junction City (Stop #2).	Hewston	J	G
TRI	Ruth Lake	1996	May	29	Hunter and Hazard (1998)	HU		7E		obs. 6	3+		Hunter and Hazard (1998) state this as the high count in Mad River RD.	Elias	E	E
TRI	Weaverville	1980	May	18	S. Harris	MD	33N			obs. 2	1		Near nest box.	Harris	S	
TRI	Weaverville	1998	Jul	2	ABN: J. E. Hunter	MD	33N			obs. 1	1+			Hunter	J	E
TUL	Blue Ridge	1980	Sep		AB 35:222 (R. Hansen; J. Schmidt)	MD				obs. 1	?		One seen on 10th and 24th.	Hansen	R	
TUL	Sequoia NP, General Grant Grove	1989	Aug	6	D. Ingram	MD				obs.	?		(Probably from Sequoia L. population. - B.W.]	Ingram	D	
TUL	Sequoia NP, Lion Meadow	1991	May	16	D. Ingram	MD				obs.	?	c	In *P. ponderosa* forest burned 1984. Near General Grant grove.	Ingram	D	
TUL	Sequoia NP, Potwisha	1987	Apr	21	D. Ingram	MD				obs.	?		In blue oak woodland burned 1979. No known nest site.	Ingram	D	
TUL	Sequoia NP, Woverton Mdw.	1968			D. Ingram	MD				obs.	?					
TUO	Cherry Lake Dam	1984	Jun	28	Gaines (1992); J. Winter	MD				obs. F	1+		Old burn with many dead snags.	Winter	J	
TUO	Hwy 108, S of Hwy 49	1987	Jun	24	ABN: D.L. Suddjian	MD				obs. M	1+			Suddjian	D	L
TUO	Jawbone Falls, .7 mi. NE	1984			K. Burnett	MD	2N	18E	23	ON	2-4	C	Snag (in area of 1973 fire) fell by 1985.	Burnett	K	
VEN	Hidden Valley	1942			H. Cogswell notes	SB				ON	2+		Also And. Mag. 44	Griffith	R	
VEN	Mt. Pinos	1904	Jun	29	Grinnell 1905	SB		21W		obs. 3	2+			Grinnell	J	
VEN	Mt. Pinos area	1974	Aug	17	S.F. Bailey	SB				obs.	?			Bailey	S	F
VEN	Santa Paula	1910?			Willett (1912)	SB	3N	21W		ON	1+			Burt	H	C
VEN	Santa Paula, vicinity	1880			Evermann (1886)	SB				ON	2+		"...moderately common...."; probably in sycamores or cottonwoods	Evermann	B	W
VEN	Sherwood Lake	1942	May	22	WFVZ EGG SET	SB				EGG SET (5)	1+	s		Baumgardt	J	H
VEN	Ventura	1913	May	3	CM 1610	SB				EGG SET (3); comp	1+			Percy	E	J
YOL	Fremont Weir	1969	May	7	SAS; B. Mallette	MD	11N	3E		ON	1+	s	"Nesting."	Mallette	B	
YUB	Beale AFB	1967	Jul	19	M. Perrone	MD				obs. ?	?			Perrone	M	
YUB	Beale AFB	1968	Jul	3	M. Perrone	MD				obs. 2	?		1968 was last year Perrone covered at Beale AFB	Perrone	M	
YUB	Beale AFB [?]	1967	Jun	29	ABN, M. Perrone	MD				obs. 3-4	?			Perrone	M	
YUB	Marysville	1884	Mar		Belding (1890)	MD	15N			obs. 5+	3+		First male March 17. "Bulk arrived by March 21..."	Peacock	W	F
YUB	Marysville	1885	Mar		Belding (1890)	MD	15N			obs. 6+	3+		"Common; breeds."	Peacock	W	F
YUB	Marysville	1911	Jul	3	DMNH 5482	MD	15N			coll. F	1+			Muller	C	S
YUB	Marysville	1960			SAS (M. Perrone)	MD	15N			obs.	1+			Perrone	M	
YUB	Marysville	1966	May	14	SAS (M. Perrone)	MD	15N			obs. 3	1+	ED	"Nesting in downtown Marysville; first time since 1960."	Perrone	M	
YUB	Marysville	1967?			T. Manolis	MD	15N			ON	1+	ED		Manolis	T	D
YUB	Yuba River, Park's Bar	1968	Jul	31	SAS (M. Perrone); ABN	MD	16N	6E		obs. 5	?		"Breeding?"	Perrone	M	

[1] Explanation of Codes and Abbreviations Used in Appendix F.

1. **Cnty** – California county abbreviations (see Appendix I).
2. **Location** – Locality name, with the specific location following the general location. All names should be found in the appropriate DeLorme Atlases.
3. **Year** – Year. Probable year or a range of years may be given depending on the quality of available information.
4. **M** – Month. This may be omitted if the observation took place over many months or if the information was unavailable. See Comments.
5. **D** – Date. This may be omitted if the observation took place over many days or if the information was unavailable. See Comments.
6. **Source** – Primary source is listed first. See Methods, and Appendices A and D.
7. **BM** – Baseline and Meridian, the reference points for the following legal descriptions.
8. **T** – Township.
9. **R** – Range.
10. **S** - Section.
11. **Evidence** – physical evidence for probable or known nesting. See Methods and Appendix G.
12. **Pr**. – Minimum number or range of pairs reported. See Methods.
13. **Sb.** – Nesting substrate. This is case sensitive and hierarchical. CAPITAL LETTERS denote confirmed use of nest substrate. Small letters denote suspected substrate:

BR = bridge	**BX** = Nest Box	**ED** = edifice (a building)	**UP** = utility pole	**C** = conifer snag, unspecified or uncertain of ID	**h** = hardwood	**s** = snag

BC – Big-cone spruce	**P** = *Pinus* (pine)	**Q** = *Quercus* (=oak)
	PA – *P. attenuata* (knobcone pine)	**QD** – *Q. douglasii* (blue oak)
DF – Douglas fir	**PC** – *P. coulteri* (Coulter pine)	**QK** – *Q. kelloggii* (black oak)
	PJ – *P. jeffreyi* (Jeffrey pine)	**QL** – *Q. lobata* (valley oak)
WS = western sycamore	**PP** – *P. ponderosa* (ponderosa pine)	

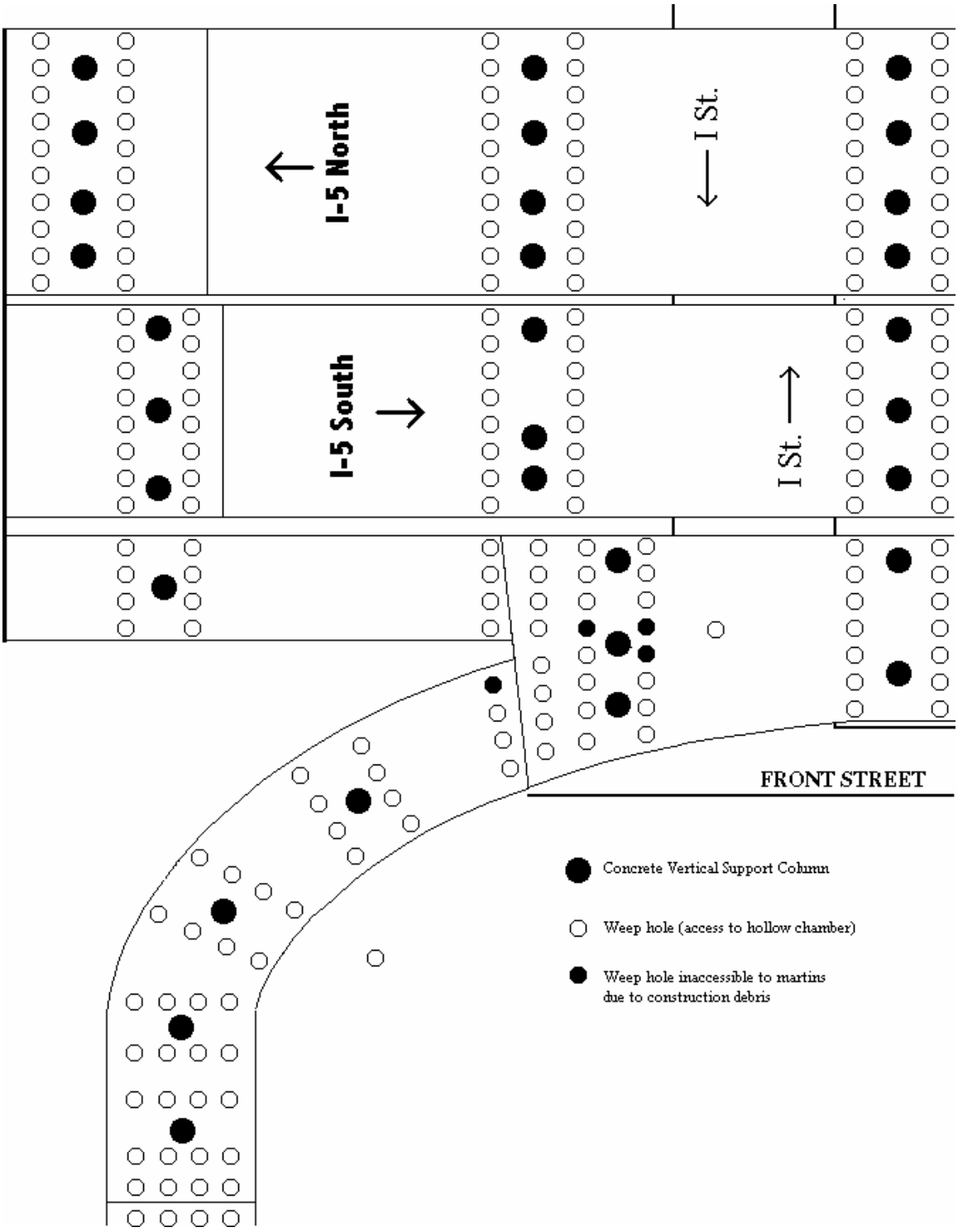
14. **Comment** – Various comments, usually details of the sighting, or pertinent comments from the Observer.
15. **Observer** – Last Name of Observer, who is not necessarily the same as the Source.
16. **First** - Firs Initial of Observer.
17. **Init**. – Middle Initial of Observer.

Appendix G. Breeding Bird Atlas Nesting Confirmation Codes Used inThis Study.[1]

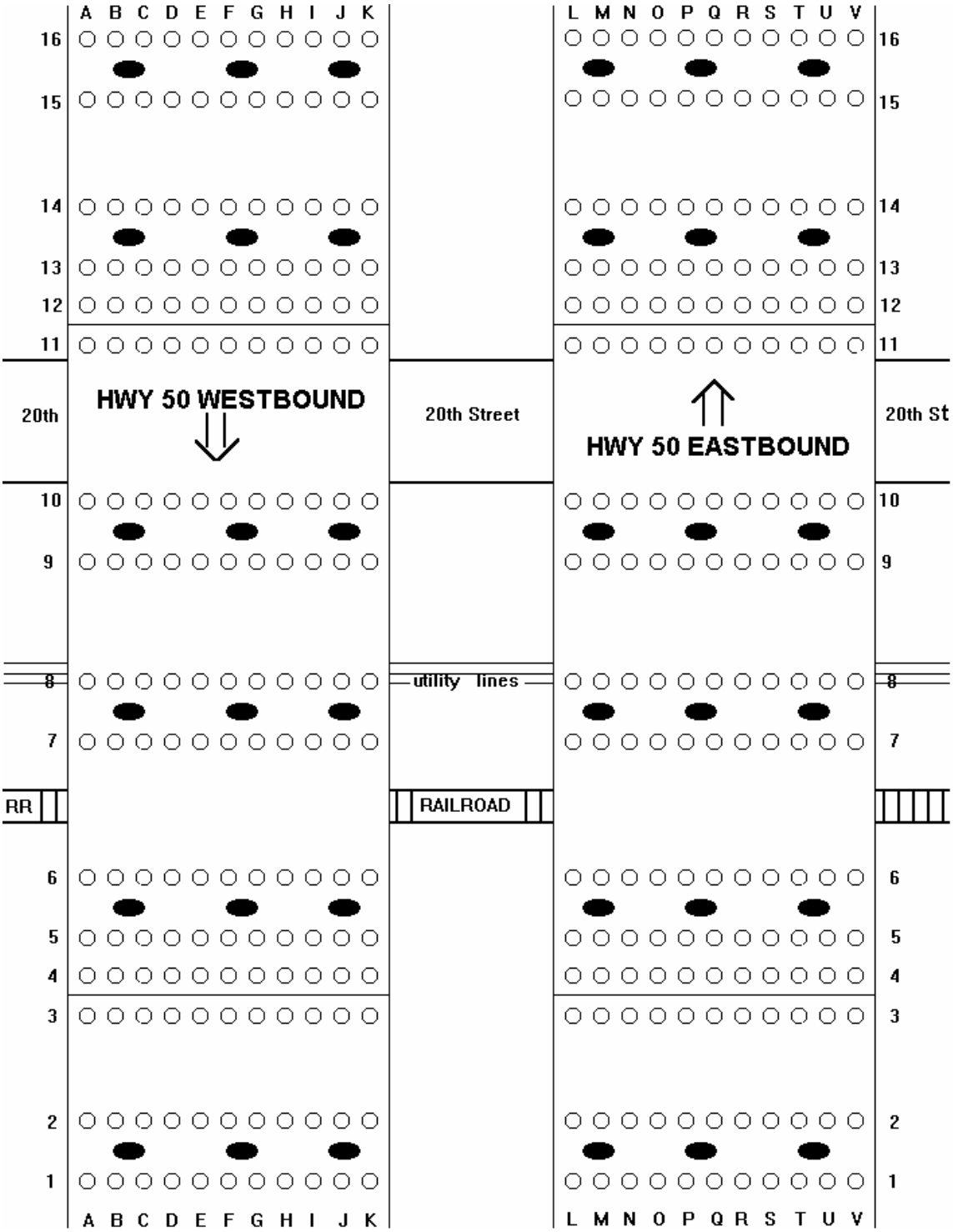
CONFIRMED	Evidence	Appendix B	Sacramento
NY	Nest with young seen or heard	x	x
NE	Nest with eggs	x	x
ON	Occupied nest. Included adult perched at or entering cavities. This may include the standard BBA code of N (visiting probable nest site). We did not use the code as confirmation of nesting in a particular cavity at our Sacramento study site since cavities not used as nest sites may also be occupied.	x	x
FS	Fecal sac carried by adult or found below nest cavity		x
FY	Adults seen feeding young in or out of nest. At Sacramento we used this code only for adults seen or feeding young *in* the nest cavity.	x	x
CF	Adults carrying food but young not seen, and nest site usually not located. In Sacramento, only for adults carrying food *into* a cavity.	x	x
FL	Fledgling observed	x	
DY	Dead young, hatchlings or recent fledglings found below nest cavity. Used with caution since the birds could have moved (or have been carried) away from the space below a specific cavity.		x
NB	Adults seen with nest material at or near nest site. At Sacramento this code was used only for birds carrying material *into* a specific cavity. Note that seeing physical manipulation of the nest itself is generally not possible for a cavity nester.	x	x
CN	Adult seen carrying nesting material, but nest site not located	x	
NEST	Nest collected, but eggs were not reported	x	
EGG SET	Eggs collected from nest. All are museum collections	x	
PROBABLE			
coll.	One or more individuals were collected within or near potentially suitable habitat within a date span that suggests local nesting.	x	
obs.	One or more birds observed in habitat, area, or region within a date period that suggests local nesting. No distinction was made among various behaviors (e.g., singing male, territorial behavior), only that these birds did not offer confirmation of nesting. Note that this category may include standard BBA category codes of POSSIBLE (present in suitable habitat during nesting season, which, in the instances reported in this study, I believe offer probable nesting evidence in a region, but perhaps not in a specific area) and OBSERVED (present, but not known to nest within a specified area).	x	
d	Droppings (fecal material) seen below or on nest cavity. Must be used with caution, but with experience such markings can be separated from other cavity nesters such as European Starlings, House Sparrows, and White-throated Swifts.		x

[1] Note that CONFIRMED nest evidence codes are all capitalized; PROBABLE codes are in small letters.

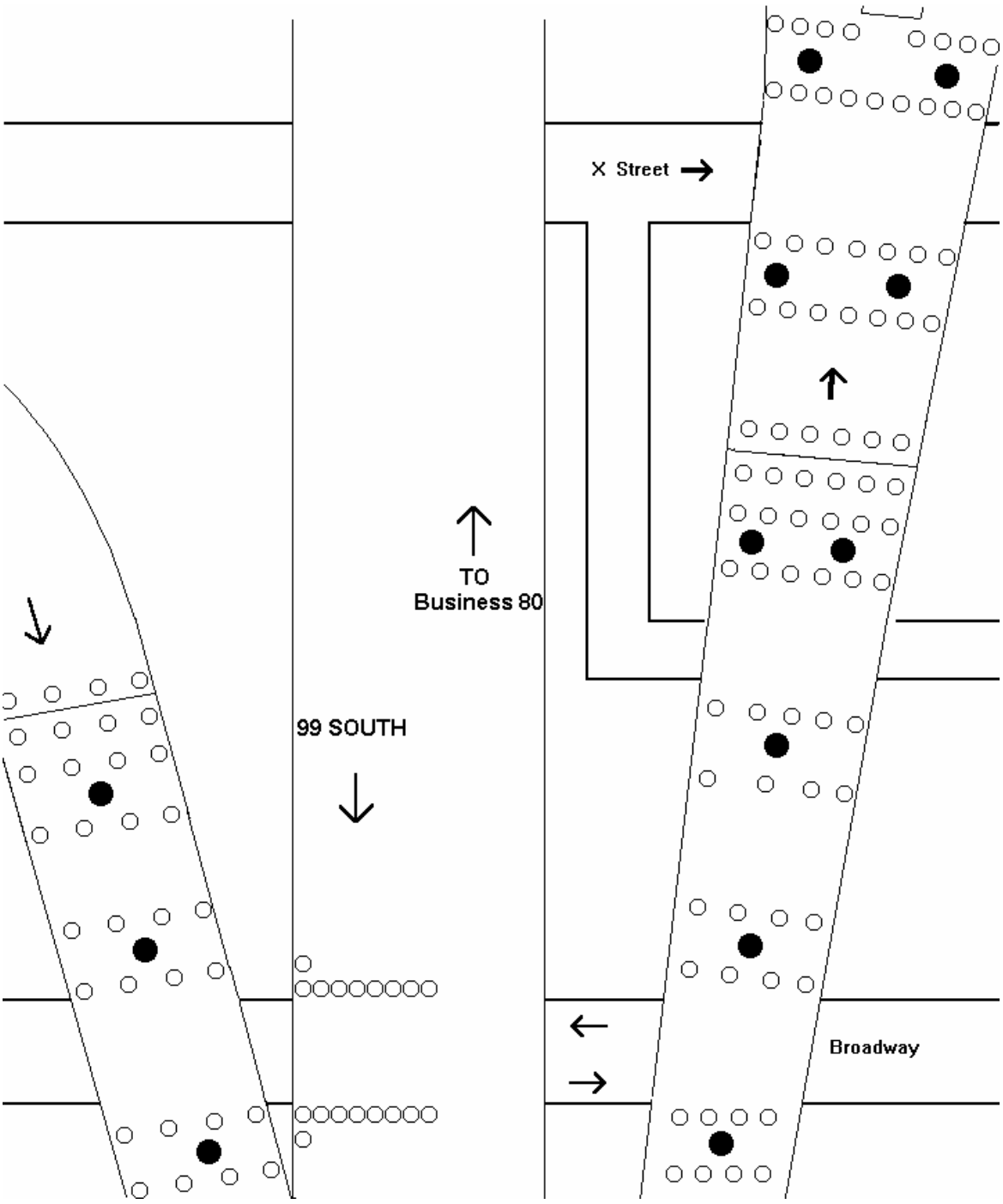
Appendix H. Bridge Maps of Sacramento's Nesting Colonies.



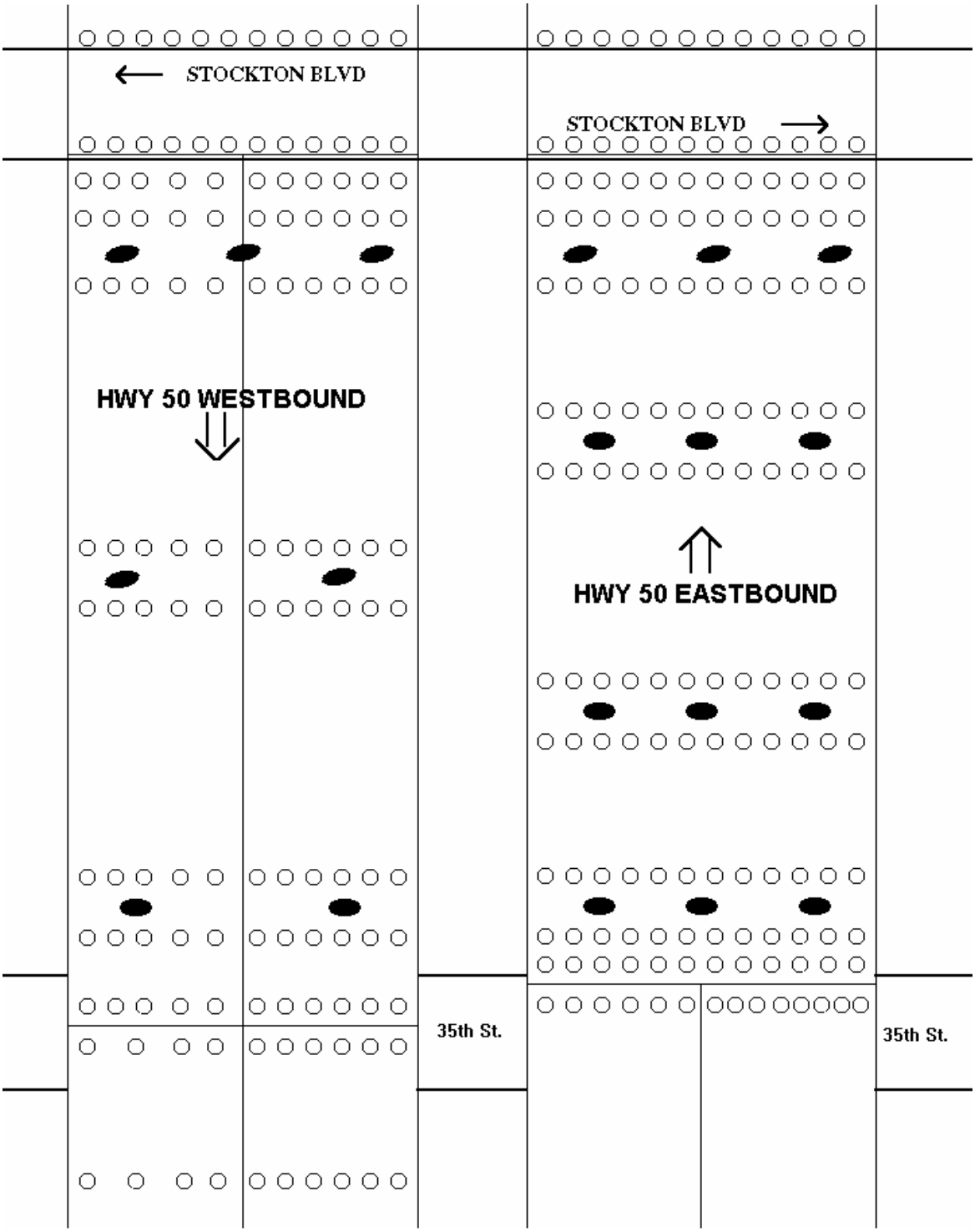
Highway 50 at 20th Street



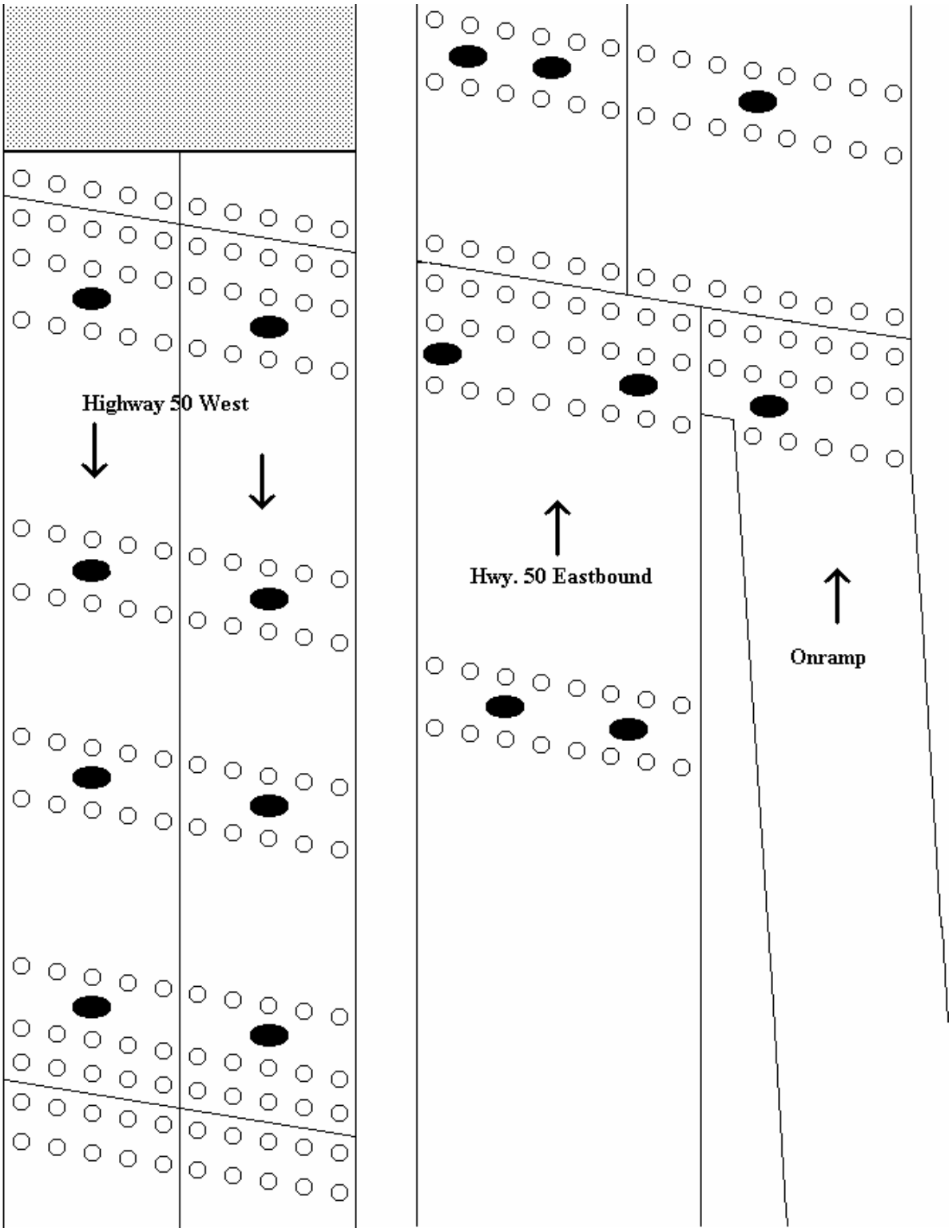
Highway 99 at Broadway.



Highway 50 at Stockton Blvd. (contiguous with and considered as 34th and T Street)



Highway 50 at 34th and T Streets.



Appendix I. Standardized Abbreviations of California Counties as Adopted by the California Bird Records Committee of the Western Field Ornithologists.

ALA	Alameda
AMA	Amador
BUT	Butte
CLV	Calaveras
COL	Colusa
CC	Contra Costa
DN	Del Norte
ELD	El Dorado
FRE	Fresno
GLE	Glenn
HUM	Humboldt
IMP	Imperial
INY	Inyo
KER	Kern
KNG	Kings
LAK	Lake
LAS	Lassen
LA	Los Angeles
MAD	Madera
MRN	Marin
MRP	Mariposa
MEN	Mendocino
MER	Merced
MOD	Modoc
MTY	Monterey
NAP	Napa
NEV	Nevada
ORA	Orange

PLA	Placer
PLU	Plumas
RIV	Riverside
SAC	Sacramento
SBT	San Benito
SBE	San Bernardino
SD	San Diego
SF	San Francisco
SJ	San Joaquin
SLO	San Luis Obispo
SM	San Mateo
SBA	Santa Barbara
SCZ	Santa Cruz
SHA	Shasta
SIE	Sierra
SIS	Siskiyou
SOL	Solano
SON	Sonoma
STA	Stanislaus
SUT	Sutter
TEH	Tehama
TRI	Trinity
TUL	Tulare
TUO	Tuolumne
VEN	Ventura
YOL	Yolo
YUB	Yuba

Appendix J. Plant Communities Occupied by Purple Martins.

The following are plant communities identified in Holland (1986) in which the Purple Martin is known or suspected of nesting. However, martins probably do not identify nesting areas based on plant community type, but instead partly select nesting areas based on habitat structure, nest cavity availability, and aerial insect availability (see text).

Riparian Communities:
North Coast Alluvial Redwood Forest
Central Coast Cottonwood-Sycamore Riparian Forest
Southern Cottonwood-Willow Riparian Forest (?)
Great Valley Cottonwood Riparian Forest (rare)
Great Valley Mixed Riparian Forest
Great Valley Oak Riparian Forest
Aspen Riparian Forest (?)
Modoc-Great Basin Cottonwood-Willow Riparian Forest (?)
Sonoran Cottonwood-Willow Riparian Forest (?)
Sycamore Alluvial Woodland
Southern Sycamore-Alder Riparian Woodland

Woodland Communities:
Oregon Oak Woodland (?)
Black Oak Woodland (?)
Valley Oak Woodland
Blue Oak Woodland (rare)
Alvord Oak Woodland (?)
Open Englemann Oak Woodland (?)
California Walnut Woodland (?)
Open Digger Pine Woodland (?)
Serpentine Digger Pine-Chaparral Woodland
Nonserpentine Digger Pine-Chaparral Woodland
Digger Pine-Oak Woodland
Juniper-Oak Cismontane Woodland
Northern Juniper Woodland (?)

Forest Communities:
Mixed Evergreen Forest
Coast Live Oak Forest (?)
Canyon Live Oak Forest
Black Oak Forest (rare)
Tan-Oak Forest (rare)
Aspen Forest (?)
Sitka Spruce-Grand Fir Forest
Western Hemlock Forest (?)
Alluvial Redwood Forest
Upland Redwood Forest
Coastal Douglas-fir-Western Hemlock Forest
Upland Douglas-fir Forest
Beach Pine Forest (?)
Northern Bishop Pine Forest
Southern Bishop Pine Forest (?)
Monterey Pine Forest (rare)
Coast Range Mixed Coniferous Forest
Santa Lucia Fir Forest (?)
Upland Coast Range Ponderosa Pine Forest
Maritime Coast Range Ponderosa Pine Forest
Coulter Pine Forest
Bigcone Spruce-Canyon Oak Forest
Westside Ponderosa Pine Forest
Eastside Ponderosa Pine Forest
Sierran Mixed Conifer Forest
Sierran White Fir (?)
Big Tree Forest (?)
Jeffrey Pine Forest
Jeffrey Pine-Fir Forest
Washoe Pine-Fir Forest (?)

LITERATURE CITED

Adams, Ernest. 1909a. Notes from Placer County. Condor 11: 174. ["The only places I have met them in this county - nesting- were at the pottery in Lincoln and at the Court House in Auburn. There appear to be but a few pairs at each place. I was told that from three to eight pairs nested at Lincoln for about twenty years, but succeeding years do not see them increasing in numbers altho (sic) the nests were not disturbed."].

Adams, H. Ernest. 1909b. Land birds of Placer County. Placer Co. Inst. Research. ["Summer visitant to suitable localities throughout the Sonoran Zones and up into the Transition. At Lincoln the first arrivals…were noted on March 14 and 16."].

Adams, Theodore E., Jr., Peter B. Sands, William H. Weitkamp, and Neil K. McDougald. 1990. Blue and valley oak seedling establishment on California's hardwood rangelands. Pgs. 41-47 *in* Richard B. Standiford (tech. coord.). Proceedings of the symposium on oak woodlands and hardwood rangeland management; October 31-November 2, 1990; Davis California. U.S. Forest Servive Gen. Tech. Rep. PSW-126. Pacific Southwest Research Station, Berkeley, CA.

Airola, Daniel A., ed. 1980. California Wildlife Habitat Relationships program. Northeast Interior Zone. Volume III. Birds. U.S. Dept. Agriculture, For. Serv., Lassen Nat. For., Susanville, CA. [Includes only these records for the Modoc Region and East of Sierra Regions: Lava Beds NM (L.R. Mewaldt), Lake Britton 5/27/79 (?), Eagle Lake (BBS 009), four at Lake Almanor 5/13/62 (ABN), and Mono Hot Springs 6/22/74 (ABN)].

Alcorn, J. R. 1988. The birds of Nevada. Fairview West Publishing, Fallon, NV.

Allen, Robert W., and Margaret M. Nice. 1952. A study of the breeding biology of the Purple Martin (*Progne subis*). Am. Midl. Nat. 47: 606-665.

Bailey, Florence Merriam. 1928. Birds of New Mexico. New Mexico Dept. Game and Fish.

Baird, Spencer F. 1858. Birds. Pgs. 314-315 *in* Reports of Explorations and surveys to ascertain the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean. Volume IX. Washington, D.C. [Summarizes specimens from the many field parties. Two birds from Petaluma, SON, 1856, one from Sacramento].

Bancroft, Griffing. 1930. The breeding birds of central Lower California. Condor 32: 20-49.

Barlow, Chester. 1901. A list of the land birds of the Placerville—Lake Tahoe Stage Road. Condor 3: 150-184. [Summarizes findings from field work 1893-1901. "On June 4, 1900, a number…were circling about the Cary House at Placerville, in the top brick-work of which they appeared to be nesting." ; "Found nesting, in July 1896 in holes in a blasted pine stub some sixty feet from the ground. This was on top of the Peavine Ridge, about four miles northeast of Slippery Ford." (W.W. Price).].

Beck, R. H. 1899. Notes on the Black Swift in Monterey Co., Cal. Bull. Cooper Ornith. Club 1: 94. [Nesting in trees along tops of ridges in June.].

Beedy, Edward C., and William J. Hamilton III. 1997. Tricolored Blackbird status update and management guidelines. Jones and Stokes Associates, Inc. 97-099. Prepared for U.S. Fish and Wildlife Service and Calif. Dept. Of Fish and Game, Sacramento, CA.

Belding, Lyman. 1878. A partial list of the birds of central California. Proc. U.S. National Mus. 1: 388-449.

Belding, Lyman. 1890. Land birds of the Pacific District. Occasional Papers of the California Academy of Sciences II., San Francisco, CA.

Belding, Lyman. 1901a. Summer birds of Stockton, California. Bird-Lore 3: 104-105.

Belding, Lyman. 1901b. Birds of Stockton and vicinity. Bird-Lore 3: 137-138.

Belding, Lyman. 1905. Date of arrival of Purple Martin at Stockton, Cal. Condor 7: 113. [Several early March arrival dates: 1st (1879); 6th (1885); 5th (1886); 9th (1900); 7th (1903); 2nd (1905). "On the last date a male and female were seen on their favorite perch near a nesting site which this pair had probably used several summers and are nesting in this summer."].

Bibby, Colin J., Neil D. Burgess, and David A. Hill. 1992. Bird census techniques. Academic Press Inc., San Diego, CA.

Bickford, E. L. 1927. Western Robin nesting at Napa. Condor 39: 163. ["Mr. Frank A. Leach, a pioneer resident of Napa Valley…tells me…the Western Martin, now non-resident, was, however, very common, and nearly every settler put up a box or a keg on a pole as an invitation to nest."].

Biswell, Harold H. 1989. Prescribed burning in California wildlands vegetation management. Univ. Calif. Press, Berkeley, CA.

Block, William M. 1989. Spatial and temporal patterns of resource use by birds in California oak woodlands. Ph.D. Dissertation, Univ. Calif. Berkeley.

Bolsinger, Charles L. 1980. California forests: trends, problems, and opportunities. USDA For. Serv. Resource Bull. PNW-89. Pacific Northwest Forest and Range Exp. Stn., Portland, OR.

Brawn, Jeffrey D. and Russell P. Balda. 1988a. Population biology of cavity nesters in northern Arizona: do nest sites limit breeding densities? Condor 90: 61-71.

Brawn, Jeffrey D., and Russell P. Balda. 1988b. The influence of silvicultural activity on ponderosa pine forest bird communities in the southwestern United States. Bird Conservation 3:3-21.

Brown, Charles R. 1977. Purple Martins versus starlings and House Sparrows in nest site competition. Bull. Texas Ornith. Soc. 10: 31-35.

Brown, Charles R. 1978a. Clutch size and reproductive success of adult and subadult Purple Martins. Southwest. Nat. 23: 597-604.

Brown, Charles R. 1978b. Inadequacies in the design of Purple Martin houses. Bird Banding 49: 321-325.

Brown, Charles R. 1979. Territoriality in the Purple Martin. Wilson Bull. 91: 583-591.

Brown, Charles R. 1981. The impact of starlings on Purple Martin populations in unmanaged colonies. Am. Birds 35: 266-268.

Brown, Charles R. 1997. Purple Martin (*Progne subis*). *In* The Birds of North America, No. 287 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Bryant, Harold C. 1924. Sacramento's Western Martin colony. Condor 26: 195. [Colony in Sacramento between J&K Streets. Urban colonies in Pasadena, Santa Ana, Los Angeles, Stockton, Auburn, and Placerville; also in Weed, SIS, and 1 pair on Mt. Wilson in "…an old pine stub…."; "…nests in larger colonies in cities than elsewhere…."].

Bull, Evelyn L. 1983. Longevity of snags and their use by woodpeckers. Pages 64-67 *in* Snag habitat management: proceedings of the symposium. (Jerry W. Davis, Gregory A. Goodwin, and Richard A. Ockenfels, tech. coords.). USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Gen. Tech. Rep. RM-99. Fort Collins, CO

Bull, Evelyn L., and Janet E. Ohmann. 1993. The association between Vaux's Swifts and old growth forests in northeastern Oregon. West. Birds 24: 38-42.

Burridge, Betty, ed. 1995. Sonoma County Breeding Bird Atlas. Madrone Audubon Society, Inc., Santa Rosa, CA.

Cabe, Paul R. 1993. European Starling (*Sturnus vulgaris*). *In* The Birds of North America, No. 48 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Cater, Milam B. 1944. Roosting habits of martins at Tucson, Arizona. Condor 46: 15-18.

Cline, Steven P., Alan B. Berg, and Howard M. Wight. 1980. Snag characteristics and dynamics in Douglas-fir forests, western Oregon. J. Wildl. Manage. 44: 773-786.

Cooke, A. S. 1980. Observations on how close certain passerine species will tolerate an approaching human in rural and suburban areas. Biol. Cons. 18: 85-88.

Cooper, James G. 1870. Ornithology. Volume I. Land Birds. Geological Survey of California. University Press, Welch, Bigelow, and Co., Cambridge, MA. [Not seen in Colorado Valley. Earliest coastal date was April 29 when thought to be migrating through San Francisco. "They resort chiefly to the warm valleys of the interior, nesting in holes of large trees from near San Diego….I also found them nesting on the summits of the Coast Range…, but preferring the dead tops of the loftiest red woods….They are numerous at Sacramento…, and probably through most of the Sierra Nevada…."; First arrival in Santa Cruz 4/26/1866, "…but none build in or near town."; Field work mostly 1860-65.].

Cull, Rebecca, and David Melchert. 1980. Birds. Pgs. 25-66 *in* John Carothers, Rebecca Cull, Laurie Daniel, David Melchert, and Roland White. Terrestrial vertebrates of the Landels-Hill Big Creek Preserve, Monterey County, California. Environmental Field Program, Publication No. 3. Univ. Calif. Santa Cruz. [Locally common…only in pine forests: 3-4 pairs in pine snag below Highland's Camp in 1978; another colony on Vicente Creek side of S. Access Rd. 1979].

Davis, John, Walter D. Koenig, and Pamela L. Williams. 1980. Birds of Hastings Reservation, Monterey County, California. West. Birds 11: 113-128. [Annual 1938-55 except one year; nested 1942,48,51; last recorded 1958].

Dawson, William L. 1916. A personal supplement to the distributional list of the birds of California. Condor 18: 22-30. ["…Honey Lake in Lassen County may be farther east and north than any previously recorded breeding station. We found a single pair on the 4th of June, 1912, occupying a hollow limb in a giant pine overlooking the lake."].

Dawson, William L. 1923. The birds of California. South Moulton Co., CA. ["Summer resident of very local distribution, in sections offering nesting facilities; hence, practically confined to timbered areas, save as found (increasingly?) in cities and towns." Nest locations: six pairs "about…a giant oak…" in the hills of the Sacramento ranch beyond Paso Robles, SLO, 4/5/12; a pair in a pine tree Eagle Lake 6/4/12; San Juan Valley near Shandon, SLO, 4/17/14; pines and oaks on lower ridges of the San Jacinto Range, RIV.].

DeSante, David F., and T. Luke George. 1994. Population trends in the landbirds of western North America. Pgs. 173-190 *in* Joseph R. Jehl and Ned K. Johnson, eds. A century of avifaunal change in western North America. Studies Avian Biol. No. 15.

Dixon, Joseph. 1906. Land birds of San Onofre, California. Condor 8: 91-98. [Common at and within a six-mile radius of San Onofre on all visits from 5/27-30/1904; 3/25 -4/2/1905; 3/23-4/1/1906. Nesting in sycamores. Set of four eggs 5/30/04; Nest near completion 3/27/05; In 1906, "we found six pairs of Martins that were selecting nesting sites. In one place there were a number of California Woodpeckers' holes in a tall dead sycamore."].

Doolittle, E. A. 1919. Food of young Purple Martins. Bird-Lore 21: 305-306.

Edwards, H. Arden. 1914. Bird notes from the Sierra Madre Mountains, Southern California. Condor 16: 207-210. [Pair nesting at very top of a "…bare stub of an immense fir tree, about eighty feet high, and probably six feet through at the base," at Barley Flats, Angeles NF, with five other species of cavity nesters].

El Dorado National Forest. 1993. Cleveland Fire Area Recovery Project: final environmental impact statement. USDA Forest Service, Pacific Southwest Region, Camino, CA.

Emerson, W. Otto. 1893. Random bird notes from Merced Big Trees and Yosemite Valley. Zoe 4: 176-182. ["The notes…were heard in some old oaks near the Stoneman House, like the old farm-place of my eastern home. At two camping-places in the foothills I noticed some young martins."; June 1893].

England, A. Sidney, and William F. Laudenslayer, Jr. 1989. Review of the status of Bendire's Thrasher in California. Calif. Dept. Fish and Game, Wildl. Mange. Div. Admin. Rep. 89-3.

Evens, Jules G. 1993. The natural history of the Point Reyes Peninsula. Pont Reyes National Seashore Association, Point Reyes, CA.

Evermann, Barton W. 1886. A list of the birds observed in Ventura County, California. Auk 3: 86-94, 179-186. ["Summer resident; moderately common, nesting usually in holes in trees (prob. sycamores or cottonwoods - B.W.). It does not seem to have adopted, to any great extent, the custom of nesting in boxes…." Based on observations near Santa Paula from August 1879 to July 1881.].

Finlay, J. Campbell. 1971a. Breeding biology of Purple Martins at the northern limit of their range. Wilson Bull. 83: 255-269.

Finlay, J. Campbell. 1971b. Post-breeding nest cavity defense in Purple Martins. Condor 73: 381-382.

Finn, Monica Susan. 1991. Ecological characteristics of California *sycamore (Platanus racemosa* Nutt.). Unpubl. MS Thesis, Calif. State Univ., Los Angeles.

Fisher, Albert K. 1893. Report on the ornithology of the Death Valley expedition of 1891, comprising notes on the birds observed in southern California, southern Nevada, and parts of Arizona and Utah. Pgs. 7-158 in N.A. Fauna No. 7, Part II. U.S. Dept Agriculture, Div. Ornithology. and Mammalogy, Washington, D.C.:7-158. ["A colony…was found breeding at Old Fort Tejon…June 28, 1891, by Dr. Merriam and Mr. Palmer. They were nesting in woodpeckers' holes in the large oaks in front of the old fort, where three were killed. Mr. Belding noted the species at Crocker's, 21 miles northwest of the Yosemite Valley, in May."].

Fouts, David R. 1989. The plight of the Purple Martin in the Pacific Northwest. Purple Martin Update 1(3): 8-10. Purple Martin Conservation Association, Edinboro, PA.

Fouts, David R. 1996. Ten years helping Purple Martins in the Pacific Northwest. Purple Martin Update 7(1): 7-11. Purple Martin Conservation Association, Edinboro, PA.

Gabrielson, Ira N. and Stanley G. Jewitt. 1970. Birds of the Pacific Northwest. Dover Publications, Inc., New York. (Dover reprint of *Birds of Oregon*, 1940).

Gaines, David. 1974. A new look at the nesting riparian avifauna of the Sacramento Valley, California. West Birds 5:61-80. [Listed as uncommon (occupied 20-40% suitable habitat on Feather River from Oroville to its confluence with the Sacramento River at Verona; rare (< 20%) from Red Bluff to Colusa; and was not recorded from Knights Landing, YOL, to Babel Slough in 1973. It was generally presumed to have maintained or increased numbers from historic levels].

Gaines, David. 1976. Birds in riparian habitat of the upper Sacramento River. Calif. Dept. Fish and Game, Memorandum Report. [Three pairs nesting in sycamores along Sacramento River near Deer Creek/Woodson Bridge area, TEH, 1973].

Gaines, David. 1977. The status of selected riparian forest birds in California: a preliminary survey and review. Calif. Dept. Fish and Game, Nongame Wildl. Invest. Sect. Draft Rep. [Observed 6/29/77 along San Joaquin River very near the confluence with the Stanislaus River.]

Gaines, David. 1992. Birds of Yosemite and the East Slope. 2nd ed. Artemesia Press, Lee Vining, CA. [Near Mariposa; 1893 in Yosemite Valley; sighting at Cherry Lake Dam in 1986].

Gallagher, Sylvia Ranney. 1997. Atlas of breeding birds, Orange County, California. Sea and Sage Audubon Press, Irvine, CA.

Garrett, Kimball, and Jon Dunn. 1981. Birds of Southern California: status and distribution. Los Angeles Audubon Society. ["Rather rare and very local summer resident in woodlands of the foothill portions of District C and in District M…." Lists known breeding locations through the 1970s.].

Geissler, Paul H., and John R. Sauer 1990. Topics in route regression analysis. Pgs. 54-57 *in* Sauer, John R., and Sam Droege, eds. Survey designs and statistical methods for the estimation of avian population trends. U.S. Fish Wildl. Serv. Biol. Rep. 90(1).

Gilligan, Jeff, Mark Smith, Dennis Rogers, and Alan Contreras. 1994. Birds of Oregon. Cinclus Publications, McMinnville, OR.

Gray, Russell D., and John L. Craig. 1991. Theory really matters: hidden assumptions in the concept of "habitat requirements." Proc. International Ornithological Congress 20: 2553-2560.

Grinnell, Hilda. 1928. Minutes of Cooper Club meetings, northern division. Condor 30: 363-364. [Seen near Cazadero, SON, by boy scout troop].

Grinnell, Hilda. 1935. Minutes of Cooper Club meetings. Condor 37: 290-292. [Alden Miller described nest from burned snag in Mendocino Co. (probably Ornbaum Springs - B.W.)].

Grinnell, Joseph. 1898. Birds of the Pacific slope of Los Angeles County. Pasadena Academy of Sciences, Publication No. II. Pasadena, CA. [Common mostly in mountains nesting "…in the tall dead firs….A few breed in the oak districts…west of San Fernando Valley" where they were building nests by 1 April (Ralph Arnold).].

Grinnell, Joseph. 1905a. Summer birds of Mt. Pinos, California. Auk 22: 378-391. ["Only noted once: three were seen flying about over the summit of Mount Pinos on June 29."; field work from June-July 1904].

Grinnell, Joseph. 1905b. Old Fort Tejon. Condor 7: 9-13. ["A few western martins had nests safely ensconced in holes of lofty oaks."; These oaks included "…an immense white oak, said to be the largest in California. It was 27 feet in circumference at the base, and was one of many others nearly as large.…"; July 19-26, 1904, within 2 miles of fort.].

Grinnell, Joseph. 1908. The biota of the San Bernardino Mountains. Univ. Calif. Publ. Zool. 5: 1-170. ["…surprised to find…(it)…a very rare species in the San Bernardino Mountains." Only observation of a family of five near the east end of Bear Lake 8/2/05].

Grinnell, Joseph. 1915. A distributional list of the birds of California . Pacific Coast Avifauna No. 11: 1-217.

Grinnell, Joseph, and Tracy I. Storer. 1924. Animal life in the Yosemite. Univ. Calif. Press, Berkeley, CA. ["Not seen by us. Reported in Yosemite Valley June 20 to 25, 1893, and in foothills along Coulterville road. Lives in open, nesting in cavities in dead trees. In pairs." "It is strange that it should be so rare in the Yosemite region, where the great range of conditions afforded would surely meet its needs in one place or another.]

Grinnell, Joseph, Joseph Dixon, and Jean M. Linsdale. 1930. Vertebrate natural history of a section of California through the Lassen Peak region. Univ. Calif. Publ. Zool. 35: 1-594. ["…seen frequently in May…at various points along the Sacramento River." Definite locations: "several pairs…among the tops of dead sycamores and cottonwoods…" at Silva's (S of Red Bluff) 4/13/28; "A colony…nesting…in dead stubs of a large living sycamore…" near the river one mile above Tehama 5/14/24 (4 specimens collected); Red Bluff; and "several pairs…over the meadow at Bogard R. S…" near many dead trees 6/22/29. Also includes Townsend's (1887) and Sheldon's (1907) nest sites.]

Grinnell, Joseph and Alden H. Miller. 1944. Distribution of the birds of California. Pacific Coast Avifauna No. 27.

Grinnell, Joseph and Harry S. Swarth. 1913. An account of the birds and mammals of the San Jacinto area of Southern California. Univ. Calif. Publ. Zool. 10 (10): 197-406. [Abundant breeding in pines of Hemet Valley (= Garner Valley), esp. Kenworthy; fairly common at Fuller's Mill (~ Pine Wood, 5,900 ft); many at Hemet Lake in August].

Grinnell, Joseph and Margaret Wythe. 1927. Directory to the bird-life of the San Francisco Bay region. Pacific Coast Avifauna No. 18, Cooper Ornithological Club. [Through nesting season near Sebastopol, SON, Olema, and Nicasio, MRN; nests in pines and oaks, not yet about buildings; (lists other locations where birds have been seen, most or all of which probably pertain to migrants except in Mt. Hamilton Range, SCL, and possibly Searsville Lake, SM - B.W.)].

Gutierrez, R., J. 1994. Changes in the distribution and abundance of Spotted Owls during the past century. Studies Avian Biol. 15: 293-300.

Hagan, John M. III, and David W. Johnston. 1992. Ecology and Conservation of neotropical migrant landbirds. Smithsonian Institution Press, Washington, D.C.

Hails, C. J. 1979. A comparison of flight energetics in hirundines and other birds. Comp. Biochem. Physiol. 63A: 581-585.

Harris, Stanley W. 1991. Northwestern California birds. Humboldt State Univ., Arcata, CA.

Harris, Stanley W. 1996. Northwestern California birds (2nd Ed.). Humboldt State Univ., Arcata, CA.

Hatch, J. Maurice. 1896. The Western Martin and the California Cuckoo at Escondido, Calif. Auk 13: 347. [3-4 pairs at college building 11-12 June 1896].

Heerman, A. L. 1859. Report upon birds collected on the survey. Pgs. ? *In* R.S. Williamson, 1853, Report of explorations in California to connect with the routes near the 35th and 32nd parallels of north latitude, Part IV, Zoological report No. 2. Washington D.C. ["Very abundant, breeding in large numbers in the hollow trees which are still left standing in the city of Sacramento."]

Hejl, Sallie J. 1994. Human-induced changes in bird populations in coniferous forests in western North America during the past 100 years. Studies Avian Biol. 15: 232-246.

Henshaw, H. W. 1879. Ornithological report upon collections made in portions of California, Nevada, and Oregon. Appendix L *in* G. M. Wheeler. United States Geographical Surveys West of the One-hundredth Meridian. ["Colonies encountered at numerous localities among the pine woods of the mountains where they are quite local." Californian observations were east of the edge of the Sierra-Cascade axis from May 12 - October 1, 1877.].

Henson, Paul and Donald J. Usner. 1993. The natural history of Big Sur. University of California Press, Berkeley, CA.

Hickman, James C., ed. 1993. The Jepson manual: higher plants of California. Univ. Calif. Press, Berkeley, CA.

Hill, James R., III. 1988. A tale of two cities: the Purple Martin on its Brazilian wintering grounds. Purple Martin Update 1(4): 1-5. Purple Martin Conservation Assoc., Edinboro, PA.

Hill, James R., III. 1993. A giant martin roost on the Amazon River. Purple Martin Update 4(4): 28-29. Purple Martin Conservation Assoc., Edinboro, PA.

Hill, James R. III. 1994. Do Purple Martins imprint on the type of housing they fledge from? Purple Martin Update 5(4): 13. Purple Martin Conservation Assoc., Edinboro, PA.

Hill, James R. III. 1997a. Sex/age differences in the breeding success and mate choice of Purple Martins. Purple Martin Update 7(3): 28-29. Purple Martin Conservation Assoc., Edinboro, PA.

Hill, James R. III. 1997b. The Purple Martin prognosticator. Purple Martin Update 7(4): 6-7. Purple Martin Conservation Assoc., Edinboro, PA.

Hill, James R. III, and Thomas B. Dellinger. 1995. Purple Martin recoveries south of the border. Purple Martin Update 6(4): 24-25. Purple Martin Conservation Assoc., Edinboro, PA.

Holland, Robert F. 1986. Preliminary descriptions of the terrestrial natural communities of California. Calif. Dept. Fish and Game, Sacramento, CA.

Horvath, Eric. 1998. Distribution, abundance, and nest site characteristics of Purple Martins in Oregon. Report to Oregon Dept. Fish and Wildlife.

Hunter, John E., and Gjon C. Hazard. 1998. Birds of the Mad River Ranger District, Six Rivers National Forest. West. Birds 29: 65-82.

Hussell, David J. T., and T. E. Quinney. 1987. Food abundance and clutch size of Tree Swallows *Tachycineta bicolor*. Ibis 129: 243-258.

Jackman, Siri M., and J. Michael Scott. 1975. Literature review of twenty three selected forest birds of the Pacific Northwest. USDA. Forest Service, Portland, OR.

Jackson, Jerome A. and James Tate, Jr. 1974. An analysis of nest box use by Purple Martins, House Sparrows, and starlings in eastern North America. Wilson Bull. 86: 435-449.

Jenkins, Hubert O. 1906. A list of birds collected between Monterey and San Simeon in the Coast Range of California. Condor 8: 122-130. ["Number of flocks" at Big Creek and Pacific Valley; several pairs nesting in pines at Big Creek; two collected].

Johnson, Ned K. 1994. Pioneering and natural expansion of breeding distributions in western North American birds. Pgs. 27-44 in Joseph R. Jehl and Ned K. Johnson, eds. A century of avifaunal change in western North America. Studies Avian Biol. No. 15.

Johnson, Ned K. and Carla Cicero. 1985. The breeding avifauna of San Benito Mountain, California: evidence for change over one-half century. West. Birds 16: 1-23. [Recorded in 1936,44; not recorded 1983-84].

Johnston, Richard F., and Kimball L. Garrett. 1994. Population trends of introduced birds in western North America. Studies Avian Biol. 15: 221-231.

Johnston, Richard F., and John William Hardy. 1962. Behavior of the Purple Martin. Wilson Bull. 74: 243-262.

Lamb, Chester, and A. Brazier Howell. 1913. Notes from Buena Vista Lake and Fort Tejon. Condor 15: 115-120. [Several pairs nesting in a large dead oak at Lake Castac; no others observed].

Laymon, Stephen A., Barrett A. Garrison, and Joan M. Humphrey. 1988. Historic and current status of the Bank Swallow in California, 1987. Calif. Dept. Fish and Game, Wildl. Manage. Div. Admin. Rep. 88-2, Sacramento, CA.

Lehman, Paul E. 1982. The status and distribution of the birds of Santa Barbara County, California. M.A. Thesis, Univ. Calif. Santa Barbara, CA.

Lehman, Paul E. 1994. The birds of Santa Barbara County, California. Vertebrate Museum, Univ. Calif. Santa Barbara. [Nest locations:].

Lentz, Joan E. 1993. Breeding birds of four isolated mountains in southern California. West. Birds 24: 201-234. [Rare and irregular on Big Pine Mtn. 1981-1993. Not recorded on Figueroa Mtn., SBA, or Pine Mtn., VEN, from near annual summer visits 1981-1993. Not recorded from Mt. Pinos 1988-1992. Two pair on West Big Pine Mtn. 7/1/81; Six on San Rafael Mtn. 6/10/89; Fourteen nesting in *P. ponderosa* 3 mi. NE of San Rafael Mtn. 6/19/82.].

Li, Pingjun, and Thomas E. Martin. 1991. Nest-site selection and nesting success of cavity-nesting birds in high elevation forest drainages. Auk 108: 405-418.

Lilly, S. J. 1992. The tree worker's manual. Ohio Agricultural Education Curriculum Materials Service, Columbus, Ohio. 143 pp.

Linsdale, Jean M. 1947. A ten-year record of bird occurrence on the Hastings Reservation. Condor 49: 236-241.

Lowell, Eini C., Susan A. Willits, and Robert L. Krahmer. 1992. Deterioration of fire-killed and fire-damaged timber in the western United States. USDA Forest Service Gen. Tech. Rep. 292, Pacific Northwest Research Station, Portland, OR.

Lund, Tom. 1977. Purple Martins in western Oregon, part 1: status and conservation. Oregon Birds 3(6): 5-10.

Lund, Tom. 1978. The Purple Martin in the western United States, part two: it's a question of holes. Oregon Birds 4(2): 1-9.

Maehr, David. S., James L. Schortemeyer, E. Darrell Land, and Deborah K. Jansen. 1988. An unusual nest site for Purple Martins. Florida Field Naturalist 16: 35-37.

Mailliard, Joseph. 1919a. Notes from the Feather River country and Sierra Valley, California. Condor 21:74-77. [Family (?) at Loyalton about buildings and martin house; possibly nested in nest box (poss. building - B.W.)].

Mailliard, Joseph. 1919b. Notes on the avifauna of the Inner Coast Range of California. Proc. Calif. Acad. Sciences, vol. 9, no. 10: 273-296. [A small flock was inspecting trees at Glenbrook, LAK, 28 April 1919].

Mailliard, Joseph. 1921. Notes on the birds and mammals of Siskiyou County, California. Proc. Calif. Acad. Sciences, vol.11, no.5: 73-94. [Recorded only at Weed and Bray; no other details. Field work from 10 May-16 June 1920].

Mailliard, Joseph. 1927. The birds and mammals of Modoc County, California. Proc. Calif. Acad. Sciences, ser. 4, vol.16, no.10, pp261-359. [Not recorded during the breeding seasons from 1923-24].

Mailliard, Joseph and John W. Mailliard. 1901. Birds recorded at Paicines, San Benito Co., California. Condor 3: 120-127. ["Common summer resident. Breeds in the neighborhood but site of present colony not known. Noted as early as March 30." Results of 2-10 day trips in various periods from 1888-1901.].

Mallette, Bob. 1987. The largest North American swallow? Outdoor California 48: 23-25. [Observed 12 nesting at courthouse in Auburn; six pairs along Feather R.; downtown Sacramento].

Mannan, R. William, E. Charles Meslow, and Howard M. Wight. 1980. Use of snags by birds in Douglas-fir forests, western Oregon. J. Wildl. Manage. 44: 787-797.

Marantz, Curtis. 1986. The birds of San Luis Obispo County, California: their status and distribution. Unpubl. Senior Project. Calif. Polytechnic State Univ., San Luis Obispo. ["A rare to uncommon and local summer resident in District I…." Known nest sites: Trout Creek, Hwy 41 just west of Atascadero; regular in summer at Black Mountain and Cuesta ridge.].

Marshall, Joe T., Jr. 1957. Birds of pine-oak woodland in southern Arizona and adjacent Mexico. Pacific Coast Avifauna 32: 1-125.

Marshall, Joe T., Jr. 1963. Fire and birds in the mountains of southern Arizona. Pgs. 135-141 *in* Proceedings of the Tall Timbers Fire Ecology Conference, Tall Timbers Research Station, Tallahassee, FL.

Massey, Barbara W. 1998. Guide to the birds of the Anza-Borrego Desert. Anza-Borrego Desert Natural History Association, Borrego Springs, CA.

Mayfield, Harold F. 1969. Purple Martin population changes over fifteen years. Auk 86: 522-528.

McCaskie, Guy. 1979. Southern Pacific Coast Region. American Birds 33: 804-807.

McGregor, Richard C. 1901. A list of the land birds of Santa Cruz County, California. Pacific Coast Avifauna, No. 2. ["Common, breeding in dead oaks" on Ben Lomond Mtn. 1898 (Kaeding). "A common summer visitor near Santa Cruz." (Fiske)].

McKelvey, Kevin S., Carl N. Skinner, Chi-ru Chang, Don C. Erman, Susan J. Husari, David J. Parsons, Jan W. van Wagendonk, and C. Phillip Witherspoon. 1996. An overview of fire in the Sierra Nevada. *In* Sierra Nevada Ecosystem Project: Final Report to Congress, vol. II, Assessments and scientific basis for management options. Centers for Water and Wildland Resources, Univ. Calif., Davis.

Merriam, C. Hart. 1899. Results of a biological survey of Mount Shasta, Northern California. N. A. Fauna, No. 16. ["Not observed by us, but recorded by C. H. Townsend….One seen about 6 miles northwest of Edgewood (SIS) by Walter K. Fisher; Results form survey from Sisson to Mt. Shasta, July 15-October 3, 1898.].

Miller, Alden H., 1951. Ana analysis of the distribution of the birds of California. Univ. Calif. Publ. Zool. 50: 531-644.

Minnich, Richard A., Michael G. Barbour, Jack H. Burk, and Robert F. Fernau. 1995. Sixty years of change in California conifer forests of the San Bernardino Mountains. Cons. Biol. 9: 902-914.

Morrison, Michael L., and Sherry W. Morrison. 1983. Population trends of woodpeckers in the Pacific Coast region of the United States. Am. Birds 37: 361-363.

Morrison, Michael L., Mark F. Dedon, Martin G. Raphael, and Michael P. Yoder-Williams. 1986. Snag requirements of cavity-nesting birds: are USDA Forest Service guidelines being met? West. J. Applied Forestry 1: 38-40.

Morrison, Micahel L., and Martin G. Raphael. 1993. Modeling the dynamics of snags. Ecol. Applications 3: 322-330.

Morton, Eugene S., and Kim C. Derrickson. 1990. The biological significance of age-specific return schedules in breeding Purple Martins. Condor 92: 1040-1050.

Morton, Eugene S., Lisa Forman, and Michael Brawn. 1990. Extrapair fertilizations and the evolution of colonial breeding in Purple Martins. Auk 107: 275-283.

Moss, W. Wayne, and Joseph H. Camin. 1970. Nest parasitism, productivity, and clutch size in Purple Martins. Science 168: 1000-1003.

Neitro, William A., R. William Mannan, Douglas Taylor, Virgil W. Binkley, Bruce G. Marcot, frank F. Wagner, and Steven P. Cline. 1985. Snags. Pgs. 129-169 *In* E. Reade Brown, tech. ed. Management of wildlife and fish habitats in forests of western Oregon and Washington. Part 1 - chapter narratives. USDA Forest Service, Pacific Northwest region, publication no. R6-F&WL-192-1985. Portland, OR.

Newberry, J. C. 1857. Report upon the birds. Part IV. Zoological Report, Chapter II *in* Lieutenant R. S. Williamson and Henry L. Abbot. 1855. Explorations for a railroad route from the Sacramento Valley to the Columbia River. ["Not uncommon about San Francisco and the towns in the Sacramento Valley."]

Nilsson, Sven G. 1984. The evolution of nest-site selection among hole-nesting birds: the importance of nest predation and competition. Ornis Scandinavica 15: 167-175.

Ohman, Janet L, William C. McComb, and Abdel Azim Zumrawi. 1994. Snag abundance for primary cavity-nesting birds on nonfederal forest lands in Oregon and Washington. Wildl. Soc. Bull. 22: 607-620.

Osburn, Pingree I. 1909. Notes on the nesting of the Western Martin. Condor 11: 208. [Colony in building in Pasadena increased from a few pairs to 30 pairs from 1905-1909; seen regularly in mountains six miles back].

Parmeter, Benjamin D. 1995. Purple Martin. Pg. 106 *in* Betty Burridge. Sonoma County breeding bird atlas. Madrone Audubon Society, Inc., Santa Rosa, CA.

Patten, Michael A., Philip Unitt, Richard A. Erickson, and Kurt F. Campbell. 1995. Fifty years since Grinnell and Miller: where is California ornithology headed? West. Birds 26: 54-64.

Pedgley, D. E. 1990. Concentration of flying insects by the wind. Phil Trans. R. Soc. Lond. B 328: 631-653.

Pemberton J. R. and H. W. Carriger. 1915. A partial list of the summer resident landbirds of Monterey County, California. Condor 17: 189-201. [Only on coastal slopes and pine and redwood belts; especially numerous in Big Creek region].

Pequegnat, Willis E. 1951. The biota of the Santa Ana Mountains. Journal of Entomology and Zoology 42 (3,4). ["Locally common…conifer belt, usually above 3500 feet. Earliest date of arrival, April 2; nesting in dead spruce at Bear Springs on April 16, 1938. Nesting in Coulter pine stump at Horsethief and Indian Pine forests on June 13, 1938."].

Perez, R. M. 1910. The Western Martin nesting in Los Angeles. Condor 12: 133. [Two nests at school in June 1910].

Peterjohn, Bruce G., and John R. Sauer. 1995. Purple Martin population trends from the North American Breeding Bird Survey, 1966-1994. Purple Martin Update 6(2): 2-8. Purple Martin Conservation Association, Edinboro, PA.

Phillips, Allan, Joe Marshall, and Gale Monson. 1964. The Birds of Arizona. Univ. Arizona Press, Tucson, AZ.

Phillips, Allan R. 1986. The known birds of North and Middle America. Part 1. Denver Museum of Natural History, Denver, CO.

Price, Jeff, Sam Droege, and Amy Price. 1995. The summer atlas of North American birds. Academic Press Inc., San Diego, CA.

Pyle, Peter. 1997. Identification guide to North American birds. Part I. Slate Creek Press, Bolinas, CA.

Ralph, C. John, Geoffrey R. Geupel, Peter Pyle, Thomas E. Martin, and David F. DeSante. 1993. Handbook of field methods for monitoring landbirds. USDA Forest Service Gen. Tech. Rep. PSW-GTR-144. Pacific Southwest Research Station, Albany, CA.

Raphael, Martin G., and M. White. 1984. Use of snags by cavity-nesting birds in the Sierra Nevada. Wildlife Monographs 86: 1-66.

Raphael, Martin G., Kenneth V. Rosenberg, and Bruce G. Marcot. 1988. Large-scale changes in bird populations of Douglas-fir forests, northwestern California. Bird Conservation 3: 63-83.

Ray, Milton S. 1914. Some discoveries in the forest at Fyffe. Condor 16: 57-70. ["…old-time colony…circling about the eaves of the Cary house…just as I have seen them in numerous seasons before…, and, perhaps just as they did in the golden days of '49…."; Placerville, May 13, 1913.].

Remson, J.V., Jr. 1978. Bird species of special concern in California. Calif. Dept. Fish and Game, Nongame Wildlife Investigations, Wildl. Manage. Branch Admin. Rep. No. 78-1.

Richards, E. B. 1924. A list of the land birds of the Grass Valley District, California. Condor 26: 98-104. ["A few years ago this bird was a fairly common summer visitant, nesting in the oaks and under the eaves in the business part of the town. During the last five or six years it has become irregular, and of decreasing numbers. The ever increasing colony of English Sparrows may be responsible for its desertion."].

Richmond, Stanley M. 1953. The attraction of Purple Martins to an urban location in western Oregon. Condor 55: 225-249.

Ridgway, Robert. 1877. Part III, Ornithology. Pgs. 307-669 i*n* Clarence King. 1877. Report of the U.S. Geological exploration of the fortieth parallel. Professional Papers of the Engineer Department, U.S. Army, No. 18. Washington, D.C. [Very abundant in San Francisco ("swarmed about old buildings on city streets") and Sacramento].

Roberson, Don. 1985. Monterey birds. Monterey Peninsula Audubon Society, Carmel, CA.

Roberson, Don. 1993. Purple Martin. Pgs. 226-227, 250 *in* Don Roberson and Chris Tenney, eds. Atlas of the breeding birds of Monterey County, California. Monterey Peninsula Audubon Society, Carmel, CA.

Roberson, Don, and Chris Tenney, eds. 1993. Atlas of the breeding birds of Monterey County, California. Monterey Peninsula Audubon Society, Carmel, CA.

Robertson, Raleigh J., and Wallace B. Rendell. 1990. A comparison of the breeding ecology of a secondary cavity nesting bird, the Tree Swallow (*Tachycineta bicolor*), in nest boxes and natural cavities. Can. J. Zool. 68: 1046-1052.

Rosenberg , Kenneth V., Robert D. Ohmart, William C. Hunter, and Bertin W. Anderson. 1991. Birds of the lower Colorado River valley. Univ. Arizona Press, Tucson, AZ.

Ross, Roland C. 1925. Western Martin colonies. Condor 27: 209. [Urban nest sites: Santa Barbara, Balboa, Sierra Co. atop a barn (apparently not same location as Mailliard 1919), and Pasadena. The Balboa colony in buildings began 1919, fourteen pairs by 1924. Also conspicuous on Mt. Wilson].

Ruggiero, Leonard F., Keith B. Aubry, Andrew B. Carey, and Mark H. Huff, tech. coords. 1991. Wildlife and vegetation of unmanaged Douglas-fir forests. USDA Forest Sevice Gen. Tech. Rep. 285, Pacific Northwest Research Station, Portland, OR.

Ryser, Fred Jr. 1985. Birds of the Great Basin. Univ. Nevada Press, Reno, NV.

Saab, Victoria A., and Jonathan G. Dudley. 1998. Responses of cavity-nesting birds to stand-replacement fire and salvage logging in ponderosa pine/Douglas-fir forests of southwestern Idaho. USDA Forest Service Research Paper RMRS-RP-11. Rocky Mountain Research Station, Ogden UT.

San Miguel, George L. 1985. Lower elevation breeding in the Sierra foothills. West. Tanager 52(3): 1-4.

Schoenherr, Allan A. 1992. A natural history of California. Univ. Calif. Press, Berkeley, CA.

Schreiber, B., and D.S. deCalesta. 1992. The relationship between cavity-nesting birds and snags on clearcuts in western Oregon. For. Ecol. Manage. 50: 299-316.

Scott, Virgil E. 1978. Characteristics of ponderosa pine snags used by cavity-nesting birds in Arizona. J. For. 76: 26-28.

Scott, Virgil E. 1979. Bird response to snag removal in ponderosa pine. J. For. 77: 26-28. [VGSW declined most]

Scott, Virgil E., and John L. Oldemeyer. 1983. Cavity-nesting bird requirements and response to snag cutting in ponderosa pine. Pages 19-23 *in* Snag habitat management: proceedings of the symposium (Jerry W. Davis, Gregory A. Goodwin, and Richard A. Ockenfels, tech. coords.). USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Gen. Tech. Rep. RM-99. Fort Collins, CO

Seibert, Milton L. 1942. Occurrence and nesting of some birds in the San Francisco Bay region. Condor 44: 68-72. [Nest in oak near Cedar Mtn. 1938; also SE Alameda Co. 1941].

Sexton, Charles W., and George L. Hunt. 1979. An annotated checklist of the birds of Orange County, California. University of California, Irvine. [Uncommon. Nest locally in conifers or sycamores - Irvine, O'Neill, Starr-Viejo Parks, Irvine L.; formerly at Balboa; population reduced, suspected because of EUST preemption of nest sites].

Sharp, Brian. 1985. Guidelines for the management of the Purple Martin, Pacific Coast population. U.S. Fish Wildlife Service., Portland, OR.

Sharp, C. S. 1907. The breeding birds of Escondido. Condor 9: 84-91. [Rare; one pair nested in sycamore next to barn until 1904].

Sheldon, Harry H. 1907. A collecting trip by wagon to Eagle Lake, Sierra Nevada mountains. Condor 9: 185-191. [Fairly common at Eagle Lake in 1905; coll. juv. and adults]

Shuford, W. David. 1986. Have ornithologists or breeding Red-breasted Sapsuckers extended their range in coastal California? West Birds 17: 97-105.

Shuford, W. David. 1993. The Marin County breeding bird atlas: a distributional and natural history of coastal California birds. California Avifauna Series 1. Bushtit Books, Bolinas, CA. [Nesting confirmed in three atlas blocks: Inverness Ridge, Bolinas Ridge above Kent Lake, near Alpine Lake.]

Shuford, W. David, Stephen A. Laymon, and Sam Fitton. 1995. Fifty years after Grinnell and Miller: organizing for a better future. West. Birds 26: 205-212.

Shuford, W. David, Catherine M. Hickey, Rebecca J. Safran, and Gary W. Page. 1996. A review of the status of the White-faced Ibis in winter in California. West. Birds 27: 169-196.

Sibley, Charles G. 1952. The birds of the south San Francisco Bay region. [Uncommon. Gives only two records of known nesting: Mt. Hermon 1950, SCZ(?); Cedar Mtn., ALA, 1938; other sight records including Pine Ridge, SCL, 6/18/51.]

Siegel-Causey, Douglas, and Sergei P. Kharitonov. 1990. The evolution of coloniality. Current Ornithology 7: 285-330.

Small, Arnold. 1994. California birds: their status and distribution. Ibis Publishing Company, Vista, CA.

Sprunt, Alexander, Jr. 1942. Purple Martin. Pgs. 489-509 *in* Arthur C. Bent. Life histories of North American flycatchers, larks, swallows, and their allies. U.S. Nat. Mus. Bull. 179, Smithsonian Institution.

Stafford, Lynn. 1995. European Starling. Pg. 140 *in* Betty Burridge. Sonoma County breeding bird atlas. Madrone Audubon Society, Inc., Santa Rosa, CA.

Stutchbury, Bridget J. 1991a. Coloniality and breeding biology of Purple Martins (*Progne subis hesperia*) in saguaro cacti. Condor 93: 666-675.

Stutchbury, Bridget. 1991b. Desert Martins. Purple Martin Update 3(2). Purple Martin Conservation Assoc., Edinboro, PA. [Desert martins dependent on large saguaros; nest in exploded colonies]

Sumner, Lowell and Joseph S. Dixon. 1953. Birds and mammals of the Sierra Nevada. Univ. Calif. Press, Berkeley. [Nested in buildings in Los Angeles since 1920s; listed as summer resident in Sequoia N.P. (Fry 1934), but not common; no records from Kings Canyon N.P.; nests chiefly in woodpecker cavities at upper edge of blue oaks, lower portion of ponderosa pine forest].

Svoboda, Peggy L., Kimberley E. Young, and Virgil E. Scott. 1980. Recent nesting records of Purple Martins in western Colorado. West. Birds 11: 195-198.

Swarth, H. S. 1911. Field notes from south-central California. Condor 13: 160-163. [Seen at Santa Margarita, SLO, in late May-June; assumed nesting nearby].

Thomas, Jack Ward, Ralph G. Anderson, Chris Maser, and Evelyn L. Bull. 1979. Snags. *In* Jack Ward Thomas, ed. 1979. Wildlife habitats in managed forests: the Blue Ridge Mountains of Oregon and Washington. USDA Forest Service Agric. Handbook No. 553. Portland, OR.

Townsend, Charles H. 1887. Field notes on the mammals, birds and reptiles of Northern California. Proc. U.S. Nat. Mus., vol. 10: 159-24? ["…not common…" in areas surveyed. "A few were…about…buildings (at Weed)….A colony of a dozen or more was…in a large dead pine on the edge of the forest at the eastern base of Mount Lassen on June 6" (1884). Collected four eggs from the only reachable nest at 20 ft.].

Tyler, John G. 1913. Some birds of the Fresno District, California. Pacific Coast Avifauna, No. 9. Cooper Ornithological Club, Hollywood , CA. [Records only the following through 1912 on the valley floor near Fresno: near Riverview on 4/27/07 (by Winifred Wear), and migrants at Fresno on 8/22/04 and mid-August 1904.].

Unitt, Philip. 1984. The birds of San Diego County. Memoir 13, San Diego Society of Natural History, San Diego, CA. [Discusses recent and historical status along with migratory status. Includes taxonomic review.]

Van Rossem, Adriaan. 1914. Notes from the San Bernardino Mountains. Condor 16: 145-146. ["A colony of about twenty pairs was nesting in large dead pine near Oak Glen. Several smaller colonies were found in the surrounding country." Summer 1910].

Verner, Jared, Edward C. Beedy, Stephen L. Granholm, Lyman V. Ritter, and Edward F. Toth. 1980. Birds. Pgs. 75-319 *in* Jared Verner and Alan S. Boss, tech. coords. California wildlife and their habitats: western Sierra Nevada. Gen. Tech. Rep. PSW-37. USDA Forest Service, Pacific Southwest For. and Range. Exp. Station, Berkeley, CA. [Listed as having occurred five or fewer times above 1,000 ft. from the SHA-SIS boundary on the north to Hwy. 178 in KER on the south; not included as a nesting species.]

van Balen, J. H., C. J. H. Booy, J. A. van Franeker, and E. R. Osieck. 1982. Studies on hole-nesting birds in natural nest sites 1. Availability and occupation of natural nest sites. Ardea 70: 1-24.

Von Bloeker, Jack C., Jr. 1942. Minutes of Cooper Club meetings, Southern Division. Condor 44: 288 ["…a large nesting colony…was observed at the Balboa Pavilion…." On 26 July 1942 on a trip with Dr. Adele Grant.]

Wagner, Richard H., Malcom D. Schug, and Eugene S. Morton. 1996. Condition-dependent control of paternity by female Purple Martins: implications for coloniality. Behav. Ecol. Sociobiol. 38: 379-389.

Walsh, Helene. 1978. Food of nestling Purple Martins. Wilson Bull. 90: 248-260.

Waters, Jeffrey, R., Barry R. Noon, and Jared Verner. 1990. Lack of nest site limitation in a cavity-nesting bird community. J. Wildl. Manage. 54: 239-245.

Weitzel, Norman H. 1988. Nest-site competition between the European Starling and native breeding birds in northwestern Nevada. Condor 90: 515-517.

Wiens, John A., John T. Rotenberry, and Beatrice Van Horne. 1986. A lesson in the limitations of field experiments: shrubsteppe birds and habitat alteration. Ecology 67: 365-376.

Willard, John M. 1899. Bull. Cooper Ornith. Club 1: 81. [Several nests found in Lassen Co., 19-20 June 1899; (6+ pair - B.W.)]

Willett, George. 1908. Summer birds of the upper Salinas Valley and adjacent foothills. Condor 10: 137-139. [Common, mostly around settlements (probably near San Miguel? - B.W.); no more details]

Willett, George. 1912. Birds of the Pacific slope of Southern California. Pacific Coast Avifauna No.7. ["Fairly common summer resident, locally, mostly in timbered regions of the mountains and higher foothills. Of late years, seems to be increasing in numbers in the lowland towns, nesting in crevices in buildings." Records not given elsewhere in this bibliography: Long Beach 3/24/04 by Swarth; breeding at Santa Paula, VEN, by H.C. Burt]

Willett, George. 1933. A revised list of the birds of southwestern California. Pacific Coast Avifauna No. 21. ["Fairly common summer resident, locally. Originally confined to timbered regions…now found also in various lowland towns, nesting in crevices in buildings." New records: Whittier; about twenty pairs nesting at Lake Henshaw, SD, by J.B. Dixon 1932.].

Williams, Brian D. C. 1994. Impact assessment of recreational activities on avian use of Spenceville Wildlife Area, Yuba and Nevada counties, CA: The impact of recreational activity on avian use of riparian areas, the effects of field trials on sensitive wintering birds, and birds of Spenceville Wildlife Area. Draft final report to the Calif. Dept. Fish and Game, Oroville, CA.

Williams, Brian D. C. 1996. Seasonal checklist of the birds of Placer County. Published by the author.

Williams, Brian D. C. 1997. Seasonal checklist of the birds of Nevada County. Published by the author.

Williams, Richard D., and Catherine Vouchilas. 1988. Geysers wildlife investigations: birds. Pacific Gas and Electric Company, Technical and Ecological Services Rep. 417-88.91. San Ramon, CA. [Martins over cypress, serpentine chaparral in 1978, montane chaparral on the west slope of Cobb Mountain 1979].

Woodruff, Roger D. 1995. Purple Martins in the Inland Northwest. Purple Martin Update 6(1): 24-26. Purple Martin Conservation Assoc., Edinboro, PA. [Reviews and discusses the nesting status in eastern Washington and Oregon, and Idaho.].

Yocum, Charles F. and M. Ralph Browning. 1968. Noteworthy records of birds of Lava Beds National Monument, Siskiyou, and Modoc counties, California. Murrelet 49(3): 36-37. [Nesting in collapsed lava tubes 1966].

Zeiner, David C., William F. Laudenslayer, Jr., Kenneth E. Mayer, and Marshall White, eds. 1990. California's Wildlife. Volume II: birds. California Dept. Fish and Game, Sacramento.