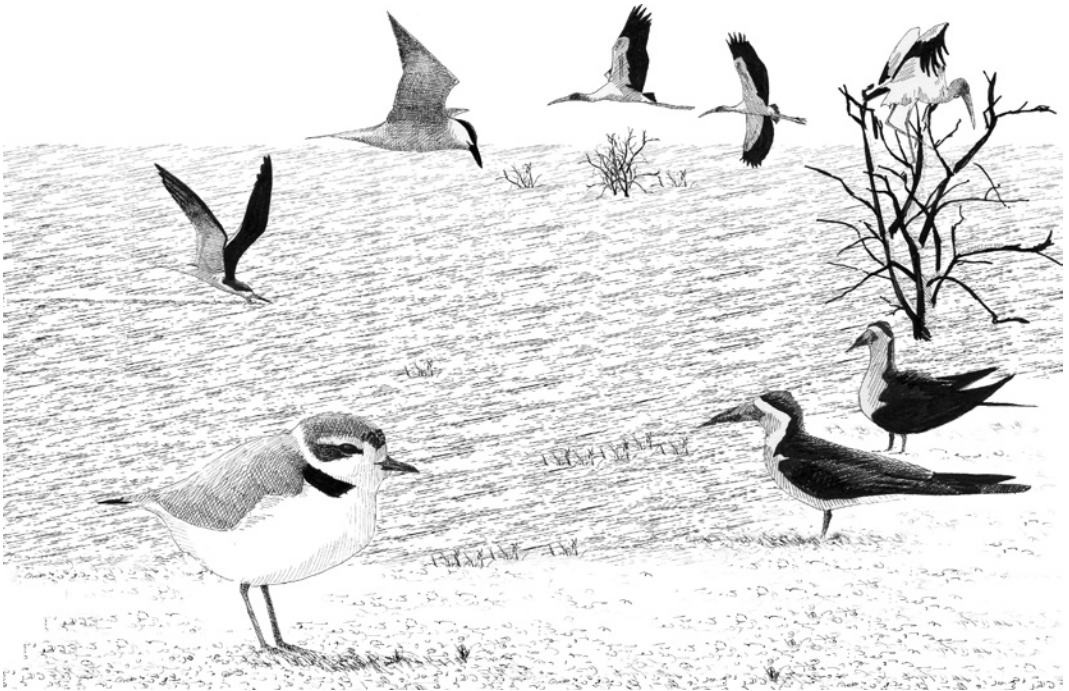


II

SPECIES ACCOUNTS



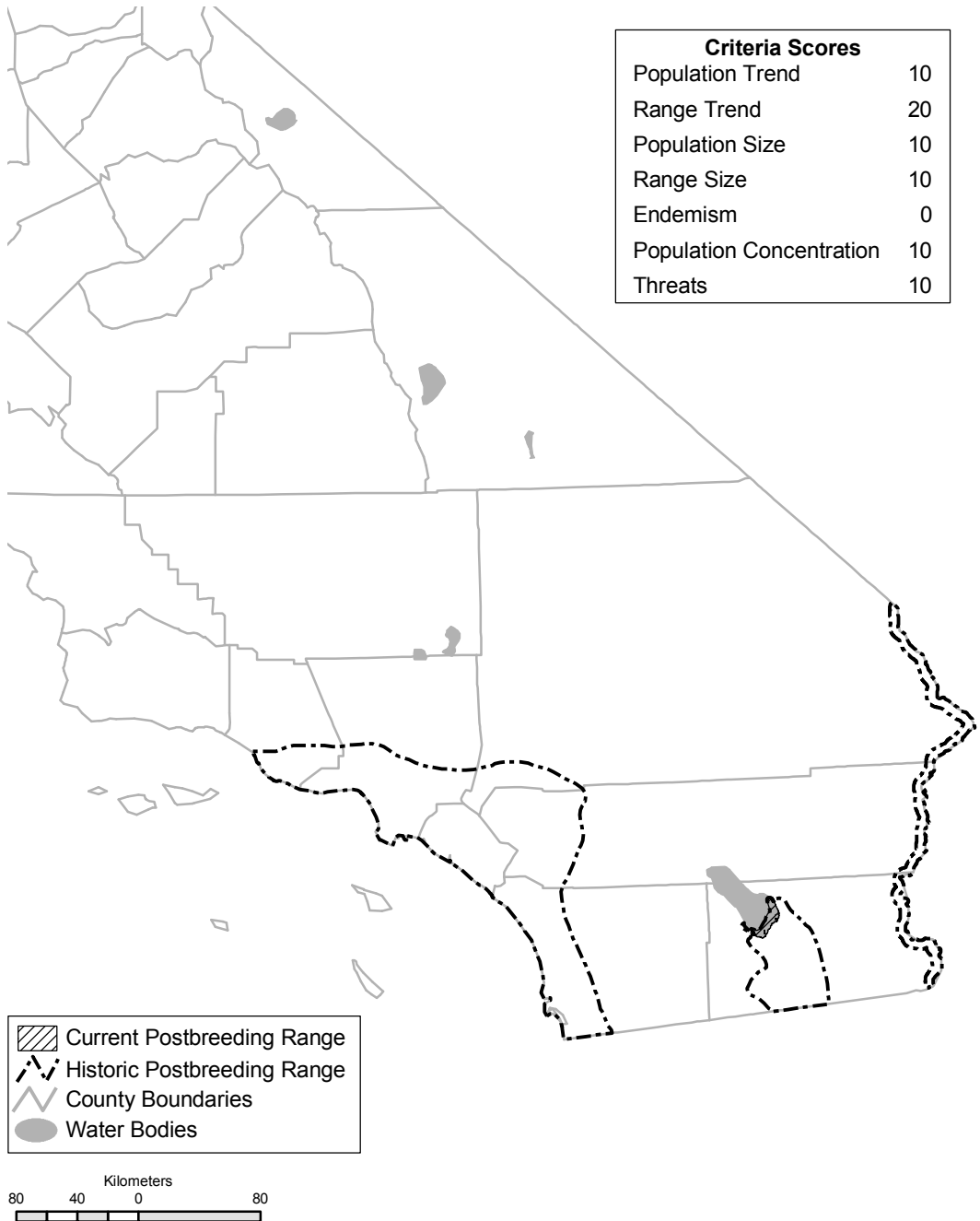
Andy Birch

PDF of Wood Stork account from:

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WOOD STORK (*Mycteria americana*)

KIMBALL L. GARRETT



Current and historic (ca. 1944) postbreeding range of the Wood Stork in California; numbers have always fluctuated considerably from year to year, and individual birds occasionally wander far north of the mapped range. Formerly, the greatest numbers were at the south end of the Salton Sea and adjacent Imperial Valley, and many fewer were on the coastal slope of southern California and in the lower Colorado River valley. Now found in very small numbers only at the southern end of the Salton Sea.

SPECIAL CONCERN PRIORITY

Currently considered a Bird Species of Special Concern (postbreeding), priority 1. Included on CDFG's (1992) unprioritized list but not on the original prioritized list (Remsen 1978).

BREEDING BIRD SURVEY STATISTICS FOR CALIFORNIA

Data inadequate for trend assessment (Sauer et al. 2005).

GENERAL RANGE AND ABUNDANCE

A subtropical and tropical wading bird with a wide distribution from Mexico and the extreme southeastern United States south through much of lowland South America (generally east of the Andes; Blake 1977, Howell and Webb 1995). No subspecies recognized. Within the United States, breeding generally limited to peninsular Florida (very local in the Panhandle), Georgia (mainly coastal plain, but local in southwest), and extreme southern coastal plain of South Carolina; formerly bred in Texas, Alabama, and Louisiana (Coulter et al. 1999). Isolated nesting attempts recorded in California (see below). In western Mexico, Wood Storks nest north to Sinaloa, but numbers have declined in the northern part of the range (Russell and Monson 1998). The species remains a "fairly common to common" resident and local breeder in the remainder of its Mexican range, from Sinaloa and Tamaulipas southward (Howell and Webb 1995). Knoder et al. (1980) recorded breeding colonies of up to 500 nests in several coastal localities from Guerrero to Chiapas. The largest breeding colonies in Mexico are in the southern Gulf of Mexico coast from southeastern Veracruz to central Campeche, where Sprunt (1980) estimated some 15,000 breeding pairs.

Irregular northward postbreeding dispersal to the southwestern, Gulf coast, and southern Atlantic states; small flocks or individuals occasionally occur as vagrants far to north of these regions, with great interannual fluctuations in numbers (Lowery 1974, Coulter et al. 1999). Postbreeding numbers have declined in southern California (see below) and in the adjacent Mexicali Valley and Colorado River delta region of Mexico (Ruiz-Campos and Rodriguez-Meraz 1997, Patten et al. 2001).

SEASONAL STATUS IN CALIFORNIA

Apart from extralimital nesting in San Diego County, currently a postbreeding visitor to

California, occurring almost exclusively from late May to mid-September (very rarely early Apr to late Nov; Garrett and Dunn 1981, Patten et al. 2003). Lower Colorado River records since 1974 have been between 9 June and 30 September (Rosenberg et al. 1991). In San Diego County, formerly occurred irregularly in large numbers from July through September, with some as early as late May (very rarely Mar–Apr) and a few lingering to December and January (Unitt 2004).

HISTORIC RANGE AND ABUNDANCE IN CALIFORNIA

Historically, the Wood Stork occurred annually as a nonbreeding visitant to southern California. Principal areas of occurrence included the coast (mainly north to Ventura County), the Imperial Valley and Salton Sea, and the lower Colorado River valley north to Needles, San Bernardino County (Abbott 1931, 1935; Grinnell and Miller 1944). Numbers and areas occupied were variable, with abundance and regularity greatest in Imperial County (Abbott 1935, 1938), but overall storks were considered "locally common" (Grinnell and Miller 1944).

In the Salton Sea area, Wood Storks occurred almost exclusively as postbreeding visitors; numbers varied from year to year, but the species was often "fairly common to abundant" (Patten et al. 2003). In 1938, a year of "exceptional influx," Abbott (1938) reported a high count of 1500–2000 storks in an alfalfa field one mile east of Seeley, Imperial County, on 7 and 17 August. Stork occurrences on the coast were more irregular, but in some years (e.g., 1923, 1934, 1938) "notable invasions" occurred (Abbott 1935, 1938; Unitt 1984). Along the lower Colorado River, early observers considered storks "common to abundant" (Rosenberg et al. 1991), and some birds perhaps occasionally remained through the winter and spring (e. g., flocks reported in Jan through Apr). Storks ranged north rarely to the Bill Williams River delta on the Arizona side of the river.

Formerly, the Wood Stork was "irregularly common" in coastal lagoons of San Diego County from July to September (Unitt 1984, 2004), with maxima including "hundreds" in the Sweetwater River Valley near Dehesa 30 August 1923 and 500 at Agua Hedionda Lagoon 1–14 August 1938 (Abbott 1931, 1938). Unitt (1984) emphasized the great interannual fluctuations in numbers in San Diego County. The species was probably "regular" in coastal Orange County through the

mid-20th century (Hamilton and Willick 1996), with up to 30 at Balboa in August 1934 (Abbott 1935), but few specific records exist. Flocks of 25 or more birds were found in coastal Los Angeles County in the early 20th century (Willett 1912). Numerous records come from further north, in Ventura, Santa Barbara, and San Luis Obispo counties, where storks were decidedly uncommon and irregular (Marantz 1986, Lehman 1994).

Wood Storks were not restricted to the immediate coast. Grinnell (1898) cited an observation of "a large flock on the barley fields" near Claremont, Los Angeles County, in June 1897, and Willett (1912) cited records along the Santa Ana River in Riverside (date unspecified) and near San Bernardino in the summers of 1891 and 1902. Illustrating the propensity of this species to wander, records extended north to Alameda County on the coast and in the interior to Inyo, Fresno, Merced, Siskiyou, and Modoc counties (Grinnell and Miller 1944, McCaskie et al. 1988).

RECENT RANGE AND ABUNDANCE IN CALIFORNIA

Currently, Wood Storks in California are almost entirely limited to the southeastern portion of the Salton Sea (see map). They remained numerous at the Salton Sea until the 1970s (Patten et al. 2003, 2004) and experienced a steep decline thereafter. Numbers on the coast apparently declined greatly after the early 1950s, and only occasional individuals were recorded after the 1960s (Unitt 2004).

For the Salton Sea, few quantitative data exist prior to the 1960s. Patten et al. (2003) cited a flock of 2000 at the south end of the Salton Sea on 18 July 1974, and Garrett and Dunn (1981) noted high counts there of 1000 birds on 18 September 1964 and 650 birds in late July 1977; these are the last years in which such large concentrations occurred. The great majority of birds at the Salton Sea have concentrated at the south end, in Imperial County (Garrett and Dunn 1981); the species is scarce at the north end, in Riverside County (about 10 records, generally of single birds; Patten et al. 2003). Peak numbers of individuals reaching the Salton Sea remained in the 200–300 range through 1987, but since have remained mostly under 75 (only 12–20 in some years; Patten et al. 2004). Occurrences there are currently limited to the southern and southeastern shores of the sea, particularly along the lowermost portions and delta of the Alamo River and adjacent shoreline north to the Wister Unit of the Imperial WA.

Along the lower Colorado River, the largest flock recorded was 230 birds on 16 July 1959 near Laguna Dam, Imperial County (Rosenberg et al. 1991); maximum concentrations in the 1980s in that region (at Cibola NWR, just across the border in Arizona), were of 10–50 birds (Rosenberg et al. 1991). There are few records for the California side of the river since the 1970s.

Coastal occurrences were always erratic, but years of occurrence dropped steeply after about 1960 and have today declined to near zero. In San Diego County, where storks were formerly most numerous, the last large concentration reported was of 300 birds at Buena Vista Lagoon in July and August 1953 (Unitt 2004); occurrences declined greatly through the 1950s, with the last substantial flocks noted in 1961 (Unitt 1984). A single pair attempted to nest near Imperial Beach in the spring 1987, and what may have been the same pair nested in a heronry within the San Diego Wild Animal Park in San Pasqual in 1989 and 1991 (Unitt 2004). In all these attempts eggs were laid but did not hatch. One individual remained in the colony at the Wild Animal Park as of 2003 (Unitt 2004). Storks were last recorded in Orange County when up to five were found on 8–9 September 1971 (Hamilton and Willick 1996); there are no records for Los Angeles County since February 1982 (Long 1993). The most recent record for Santa Barbara County, where storks apparently were always rare, was 5 June to 1 August 1983 at Sandyland Slough in Carpinteria (Lehman 1994). There is one recent vagrant record for Monterey County (10–31 Jul 1976 in Big Sur; Roberson 2002).

ECOLOGICAL REQUIREMENTS

At the Salton Sea, Wood Storks forage in shallow bays, marshy backwaters, canals, and drains, being most numerous around the mouths of the New and Alamo rivers (Garrett and Dunn 1981), especially the latter in recent years (Patten et al. 2003). Resting and roosting birds use partly submerged trees and shrubs in backwater areas or large snags near the water's edge. They have been found in flooded fields with Ring-billed Gulls (*Larus delawarensis*), herons, and White-faced Ibis (*Plegadis chihi*), but not in recent years. Several accounts from the first half of the 20th century described storks in the hundreds or even low thousands foraging in irrigated alfalfa or other damp fields in the Seeley–El Centro–Calexico area of the southern Imperial Valley (Howell 1920; Abbott 1931, 1938; Hill and Wiggins 1948). Storks occupy

“irrigated fields, canal banks, and marshy backwaters” along the lower Colorado River (Rosenberg et al. 1991). These authors attributed the former abundance of this species in that area to the availability of fish stranded each year by receding floodwaters; with damming, channelization, and water flow management, such flooding no longer occurs. Along the coast, storks are found mainly in coastal estuaries, but also ponds and lakes inland from the ocean (Rechnitzer 1956).

This species is largely a tactile forager, catching aquatic prey with a bill-snapping reflex (Coulter et al. 1999). It feeds primarily on fish but also on aquatic snails, crustaceans, amphibians, and occasionally even birds, mammals, and plant material. Its diet is not well studied in California. Rechnitzer (1956) provided some prey data from coastal southern California and the south end of the Salton Sea, where the diet included several fish species, aquatic insects, tadpoles, and vegetable material (including seeds of mesquite, *Prosopis* spp.). Storks are known to take dead fish at fish kills (Coulter et al. 1999). They consume about 520 g (live weight) of food per day (Coulter et al. 1999). Average lengths of fish prey taken in two Florida sites were 41 mm and 54 mm (Coulter et al. 1999). Postbreeding birds engage in nocturnal foraging in the southeastern United States, even in nontidal habitats (Bryan et al. 2001b); the extent of night feeding in California is unknown. Birds roost and loaf in trees, generally over or near water, but also on levees and along the edges of canals.

Breeding habitat in Mexico consists mainly of tall trees (often mangroves) around or within freshwater, brackish, and salt marshes (Howell and Webb 1995); storks nest colonially, often with other ciconiiform species (Coulter et al. 1999). The isolated nesting attempts in California have been within ardeid colonies.

The proximal causes of the timing and extent of postbreeding northward dispersal are uncertain but are likely related to breeding success and to changes in water levels and food availability (Coulter et al. 1999). Given the vastly larger breeding colonies in southeastern Mexico (southeastern Veracruz, Tabasco, Campeche) relative to those of the Pacific coast, plus regular sightings of flocks in the Mexican interior (Knoder et al. 1980, Howell and Webb 1995), it is possible that some California birds come from colonies in southeastern Mexico, but this is certainly unproven. Northward postbreeding dispersal involves all age groups, but is skewed toward immature birds (Coulter et al. 1999).

THREATS

Threats are best considered by separating factors operating outside of California from those within the state. It appears almost certain that most of the decline of this species in California is due to extrinsic factors operating within the species' range in Mexico.

Population declines in portions of the southeastern United States are mainly attributable to loss of area or quality of wetland foraging habitats through draining of marshes and swamps and unnatural water management practices (Coulter et al. 1999). Southeastern U.S. populations were listed as federally endangered in 1984. Contaminants (organochlorines, PCBs, mercury) have been found in eggs and adults in this region, but there is little evidence of impacts on populations (Coulter et al. 1999). Mercury concentrations, however, were recently found to be of concern in postfledging juveniles in Georgia (Bryan et al. 2001a). Human disturbance has resulted in abandonment or reproductive failure at nesting colonies (Coulter et al. 1999). There are few data on threats and recent trends in Mexican breeding colonies, but it is likely that many of the factors cited above (disturbance to marshes, loss of trees required for nesting, contaminants, and human disturbance) are also operative there.

Within California, the loss or modification of wetlands on the coast and along the lower Colorado River has certainly reduced suitable habitat; as noted above, modification of natural flooding regimes along the lower Colorado River has substantially reduced foraging opportunities. Considerable foraging habitat remains at the Salton Sea, though loss of habitat quality may be a factor there. For example, efforts from the 1970s to the 1990s to stabilize the shoreline of the sea through construction of seawalls has reduced shallow water foraging habitat. Also, tall snags that formed a favorite roosting site near the mouth of the Alamo River for many years were mostly burned or cut in the 1990s. Most importantly, projected reductions in freshwater and agricultural wastewater flows into the Salton Sea (CH2M HILL 2002) threaten to severely reduce freshwater and brackish river and delta habitats important to foraging storks. Finally, contaminants, including but not limited to organochlorine residues and selenium, are documented in Salton Sea nearshore substrates (Setmire et al. 1993) and could potentially impact Wood Storks.

MANAGEMENT AND RESEARCH RECOMMENDATIONS

- Form partnerships with Mexican wildlife agencies and biologists to gain a fuller understanding of breeding habitat threats, population dynamics, and postbreeding dispersal in Mexico.
- Maintain appropriate freshwater input at the south end of the Salton Sea to insure continued existence of brackish delta habitats; as appropriate, follow additional recommendations for habitat quality of the Salton Sea as outlined in Shuford et al. (2000).
- Retain snags used for roosting and loafing in delta areas of the southern and southeastern shores of the Salton Sea; plant or encourage growth of cottonwoods and other tall native trees near the mouths of the Alamo and New rivers to encourage growth of roosting substrate.
- Protect and restore coastal estuaries in southern California, important former (and potentially future) habitat for this species within California.
- Refine our knowledge of habitat use by post-breeding storks at the Salton Sea through systematic data collection.
- Monitor movements of California birds back to neotropical breeding colonies, through methods such as satellite tracking, to determine source colonies of our post-breeding visitors.

MONITORING NEEDS

Since declines in California undoubtedly result from reduced populations and diminished breeding success in source areas (presumed to be colonies along the Pacific coast of western Mexico, but perhaps also those on the southern Gulf of Mexico coast), recovery in California is clearly linked to monitoring and protection of Mexican breeding colonies. Wood Storks are adequately monitored in California at present because virtually all sightings away from the Salton Sea are reported in *North American Birds*, and Salton Sea postbreeding populations are readily censused. An effort should be made to determine age ratios of Wood Storks appearing in California each year.

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LITERATURE CITED

- Abbott, C. G. 1931. Wood Ibises summering in San Diego County, California. *Condor* 33:29–30.
- Abbott, C. G. 1935. Another invasion of Wood Ibises in southern California. *Condor* 37:35–36.
- Abbott, C. G. 1938. An exceptional influx of Wood Ibises into southern California. *Condor* 40:257.
- Blake, E. R. 1977. *Manual of Neotropical birds*, vol. 1. Univ. Chicago Press, Chicago.
- Bryan, A. L., Jr., Jagoe, C. H., Brant, H. A., Gariboldi, J. C., and Masson, G. R. 2001a. Mercury concentrations in post-fledging Wood Storks. *Waterbirds* 24:277–281.
- Bryan, A. L., Jr., Snodgrass, J. W., Robinette, J. R., Daly, J. I., and Brisbin, I. L., Jr. 2001b. Nocturnal activities of post-breeding Wood Storks. *Auk* 118:508–513.
- California Department of Fish and Game (CDFG). 1992. Bird species of special concern. Unpublished list, July 1992, Calif. Dept. Fish & Game, 1416 Ninth St., Sacramento, CA 95814.
- CH2M HILL. 2002. Imperial Irrigation District water conservation and transfer project draft habitat conservation plan: Draft environmental impact report/environmental impact statement, prepared for Imperial Irrigation District and U.S. Bureau of Reclamation by CH2M HILL, 155 Grand Ave., Suite 1000, Oakland, CA 94612.
- Coulter, M. C., Rodgers, J. E., Ogden, J. C., and Depkin, F. C. 1999. Wood Stork (*Mycteria americana*), in *The Birds of North America* (A. Poole and F. Gill, eds.), no. 409. Birds N. Am., Philadelphia.
- Garrett, K., and Dunn, J. 1981. *Birds of Southern California: Status and Distribution*. Los Angeles Audubon Soc., Los Angeles.
- Grinnell, J. 1898. *Birds of the Pacific slope of Los Angeles County*. Pasadena Acad. Sci. Publ. 2.
- Grinnell, J., and Miller, A. H. 1944. The distribution of the birds of California. *Pac. Coast Avifauna* 27.
- Hamilton, R. A., and Willick, D. R. 1996. *The Birds of Orange County, California: Status and Distribution*. Sea and Sage Press, Sea and Sage Audubon Soc., Irvine, CA.
- Howell, A. B. 1920. The Wood Ibis as a winter visitant to California. *Condor* 22:75.
- Howell, H. M., and Wiggins, I. L. 1948. Ornithological notes from Lower California. *Condor* 50:155–161.
- Howell, S. N. G., and Webb, S. 1995. *A Guide to the Birds of Mexico and Northern Central America*. Oxford Univ. Press, Oxford.
- Knoder, C. E., Plaza, P. D., and Sprunt, A., IV. 1980. Status and distribution of the Jabiru Stork and other water birds in western Mexico, in *The birds of Mexico*:

- Their ecology and conservation (P. P. Schaeffer and S. M. Ehlers, eds.), pp. 58–127. National Audubon Soc., W. Education Ctr., Richardson Bay Wildl. Sanctuary, 376 Greenwood Beach Rd., Tiburon, CA 94920.
- Lehman, P. E. 1994. The Birds of Santa Barbara County, California. Vert. Mus., Univ. Calif., Santa Barbara.
- Long, M. C. 1993. Birds of Whittier Narrows Recreation Area, Los Angeles County, California. Whittier Narrows Nature Center Associates, 1000 N. Durfee Ave., South El Monte, CA 91733.
- Lowery, G. H., Jr. 1974. Louisiana Birds, 3rd ed. Louisiana State Univ. Press, Baton Rouge.
- Marantz, C. A. 1986. The birds of San Luis Obispo County, California: Their status and distribution. Senior thesis, Biol. Sci. Dept., Calif. Polytechnic State Univ., San Luis Obispo.
- McCaskie, G., DeBenedictis, P., Erickson, R., and Morlan, J. 1988. Birds of northern California: An annotated field list, 2nd ed. (reprinted with supplement). Golden Gate Audubon Soc., Berkeley, CA.
- Patten, M. A., Erickson, R. A., and Unitt, P. 2004. Population changes and biogeographic affinities of the birds of the Salton Sink, California/Baja California. *Studies Avian Biol.* 27:24–32.
- Patten, M. A., McCaskie, G., and Unitt, P. 2003. Birds of the Salton Sea: Status, Biogeography, and Ecology. Univ. Calif. Press, Berkeley.
- Patten, M. A., Mellink, E., Gómez de Silva, H., and Wurster, T. E. 2001. Status and taxonomy of the Colorado Desert avifauna of Baja California. *Monogr. Field Ornithol.* 3:29–63.
- Rechnitzer, A. B. 1956. Foraging habits and local movements of the Wood Ibis in San Diego County, California. *Condor* 58:427–432.
- Remsen, J. V., Jr. 1978. Bird species of special concern in California: An annotated list of declining or vulnerable bird species. Nongame Wildl. Invest., Wildl. Mgmt. Branch Admin. Rep. 78-1, Calif. Dept. Fish & Game, 1416 Ninth St., Sacramento, CA 95814.
- Roberson, D. 2002. Monterey Birds, 2nd ed. Monterey Peninsula Audubon Soc., Carmel, CA.
- Rosenberg, K. V., Ohmart, R. D., Hunter, W. C., and Anderson, B. W. 1991. Birds of the Lower Colorado River Valley. Univ. Ariz. Press, Tucson.
- Ruiz-Campos, G., and Rodríguez-Meraz, M. 1997. Composición taxonómica y ecológica de la avifauna de los ríos El Mayor y Hardy, y áreas adyacentes, en el Valle de Mexicali, Baja California, México. *Anales Inst. Biol. Mex.* 68:291–315.
- Russell, S. M., and Monson, G. 1998. The Birds of Sonora. Univ. Ariz. Press, Tucson.
- Sauer, J. R., Hines, J. E., and Fallon, J. 2005. The North American Breeding Bird Survey, results and analysis 1966–2004, version 2005.2. USGS Patuxent Wildl. Res. Ctr., Laurel, MD. Available at www.mbr-pwrc.usgs.gov/bbs/bbs.html.
- Setmire, J. G., Schroeder, R. A., Densmore, J. N., Goodbred, S. L., Audet, D. J., and Radke, W. R. 1993. Detailed study of water quality, bottom sediment, and biota associated with irrigation drainage in the Salton Sea area, California, 1988–90. U.S. Geol. Surv., Water-Resources Invest. Rep. 93-4014. U.S. Geol. Surv., Federal Bldg., Rm. W-2233, 2800 Cottage Way, Sacramento, CA 95825.
- Shuford, W. D., Warnock, N., Molina, K. C., Mulrooney, B., and Black, A. E. 2000. Avifauna of the Salton Sea: Abundance, distribution, and annual phenology. Contribution No. 931 of Point Reyes Bird Observatory [now PRBO Conserv. Science]. Final report for EPA Contract No. R826552-01-0 to the Salton Sea Authority, 78401 Highway 111, Suite T, La Quinta, CA 92253.
- Sprunt, A., IV. 1980. Populations of wading birds and other colonial nesting species on the Gulf and Caribbean coasts of Mexico, in *The birds of Mexico: Their ecology and conservation* (P. P. Schaeffer and S. M. Ehlers, eds.), pp. 3–16. National Audubon Soc., W. Education Ctr., Richardson Bay Wildl. Sanctuary, 376 Greenwood Beach Rd., Tiburon, CA 94920.
- Unitt, P. 1984. The birds of San Diego County. *San Diego Soc. Nat. Hist. Memoir* 13.
- Unitt, P. 2004. San Diego County bird atlas. *Proc. San Diego Soc. Nat. Hist.* 39.
- Willett, G. 1912. Birds of the Pacific slope of southern California. *Pac. Coast Avifauna* 7.