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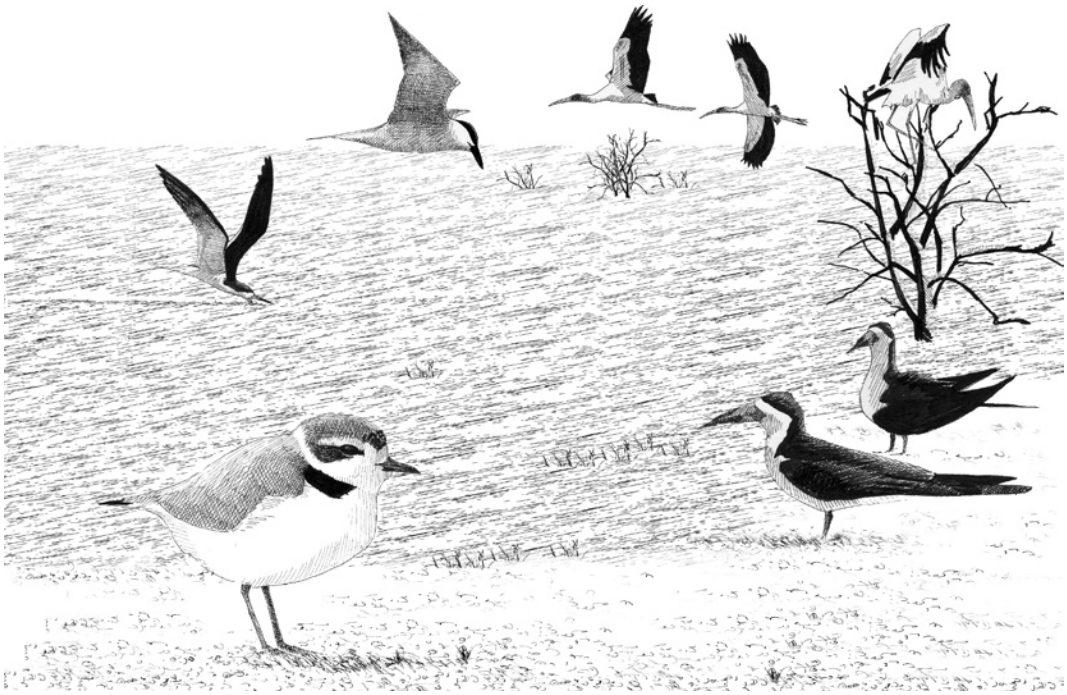

Andy Birch

PDF of Black Tern account from:

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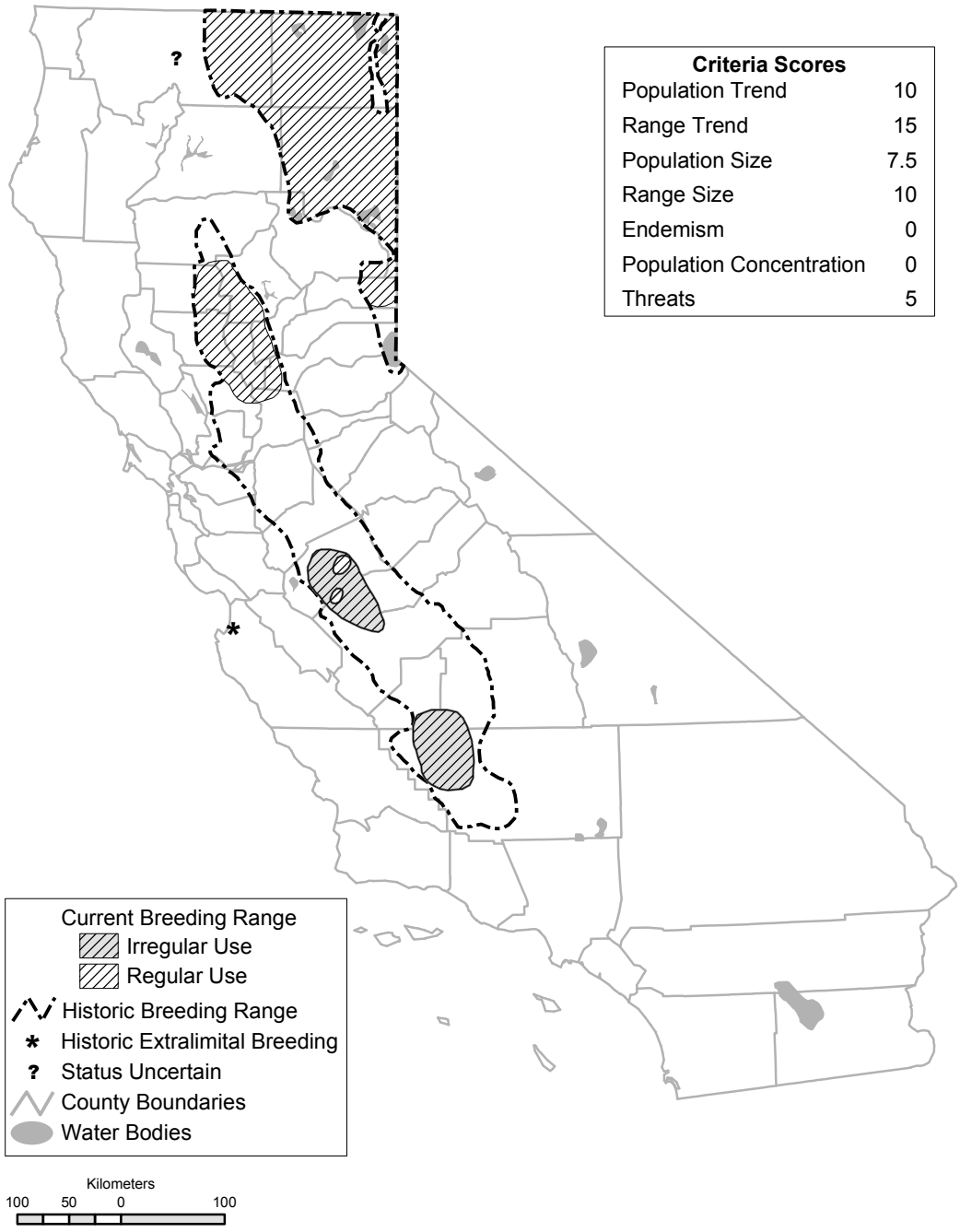
BLACK TERN (*Chlidonias niger*)

W. David Shuford



Current and historic (ca. 1944) breeding range of the Black Tern in California. Overall numbers have declined at least moderately, and the range has retracted greatly in the Central Valley despite adaptation to breeding in rice fields, mainly in the Sacramento Valley. As a breeder, currently extirpated from the Sacramento–San Joaquin River Delta and quasi-extirpated from most of the San Joaquin Valley, where it apparently breeds regularly only in two small areas of rice fields in Merced and Fresno counties. Occurs more widely (mainly in interior) during migration; large numbers of postbreeders or migrants stage at Tule Lake NWR and the Salton Sea.

Special Concern Priority

Currently considered a Bird Species of Special Concern (breeding), priority 2. Included on the previous special concern list (CDFG 1992).

Breeding Bird Survey Statistics for California

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

General Range and Abundance

Two subspecies: *C. n. niger* in the Old World, *C. n. surinamensis* in the New World. In North America, breeds widely across central and southern Canada and the northern United States, reaching its southwestern limit in California's Central Valley (AOU 1998, Shuford 1999). Generally patchily distributed on the fringes of its breeding range; largest concentrations in zones of highly productive wetlands, particularly in the prairies (Dunn and Agro 1995, Peterjohn and Sauer 1997). U.S. breeding population is roughly in the low hundreds of thousands, with that in Canada possibly larger (Shuford 1999). Migrates broadly across North and Middle America to reach wintering grounds mainly in marine and marine-coastal areas of Middle and northern South America (Shuford 1999). Also occurs in these habitats in summer outside the breeding range, mainly from the Gulf coast south to northern South America and at the Salton Sea in southern California (Dunn and Agro 1995).

Seasonal Status in California

Occurs primarily as a migrant and summer resident from mid-April to mid-October (McCaskie et al. 1979, Garrett and Dunn 1981); breeding season extends from early May to early August (Shuford et al. 2001).

Historic Range and Abundance in California

Grinnell and Miller (1944) described the Black Tern as a "locally common" breeder that nested in two distinct areas: the Modoc Plateau region and mountain valleys of northeastern California, and the lowlands of the Central Valley. Apparent nesting at Merritt Lake, Monterey County (Silliman 1915), likely represented an extralimital attempt, as the species has not bred elsewhere on the coastal slope of California.

Northeastern California. Historic locations of confirmed breeding include Tule Lake and Alturas Meadow, Modoc County; Grasshopper Meadows/Lake and Eagle Lake, Lassen County; and Lake Tahoe, El Dorado County (Grinnell and Miller 1944, egg set data). The southeastern breeding limit was at Lake Tahoe, where terns nested primarily at Rowlands Marsh near the mouth of the Upper Truckee River (Orr and Moffitt 1971). That colony held over 100 pairs.

Central Valley. Grinnell and Miller (1944) reported nesting along the Sacramento and San Joaquin rivers (latter near Merced) and at Los Banos, Merced County; Laton and Firebaugh, Fresno County; and Buena Vista Lake, Kern County. They noted a partial shift of breeding terns from former wetlands to rice fields, but it is unclear how widespread or numerous they were in rice, which in 1943 totaled 96,000 ha in California (see Shuford et al. 2001). The Black Tern formerly was described as very numerous in the San Joaquin Valley (references in Shuford et al. 2001). One of few early quantitative estimates was of a colony of "about 200 pairs" at Buena Vista Lake in June 1921 (A. J. van Rossem egg data slip, WFVZ #2470).

Recent Range and Abundance in California

The outline of the breeding range today remains largely unchanged in northeastern California, except where the species is extirpated to the south at Lake Tahoe (Shuford et al. 2001). By contrast, the range has changed substantially in the Central Valley (see map). Black Terns are extirpated from the Sacramento–San Joaquin River Delta, and in the San Joaquin Valley, formerly a center of abundance, they now breed mostly in two small areas of rice fields in the San Joaquin Basin. The species is quasi-extirpated in the Tulare Basin, where it nests irregularly and locally in ephemeral habitats mainly in extremely wet years. Statewide surveys in 1997–1998 estimated 4153 breeding pairs of Black Terns in California, 47% in northeastern California and 53% in the Central Valley (Shuford et al. 2001).

Northeastern California. Habitat loss and degradation via development and lowering of water levels eliminated breeding Black Terns at Lake Tahoe (Orr and Moffitt 1971, Cogswell 1977, Shuford et al. 2001). Today the species reaches its southern limit in the Sierra Nevada at Sierra Valley, Plumas and Sierra counties, and at Kyburz Flat, Sierra County, where breeding is irregular, particularly at Kyburz (Shuford et al. 2001). The known elevational limit of breeding is at 6560

ft (2000 m) at Boot Lake, Lassen County, in the Warner Mountains. Attribution of nesting to Shasta Valley, Siskiyou County (Zeiner et al. 1990, Small 1994), west of the known breeding range, lacks documentation. Extensive wetland loss, particularly in the Klamath Basin, may have been partially offset on the Modoc Plateau by historic creation of shallow-water reservoirs for livestock grazing and recent enhancement for waterfowl (Shuford et al. 2001).

In 1997, about 1940 pairs nested at 60 widely scattered sites; about 70.5%, 22.0%, and 7.6% of the terns were in Modoc, Lassen, and Siskiyou counties, respectively (Shuford et al. 2001). The 10 sites with >50 pairs, together comprising 58.7% of the regional population, were Barnum Flat Reservoir, Siskiyou County; Weed Valley, Widow Valley, Bucher Swamp, Boles Meadow, Egg Lake, and Taylor Creek wetlands, Modoc County; and Ash Valley, Red Rock Lakes complex, and Eagle Lake, Lassen County. State and federal refuges held <4% of the population, U.S. Forest Service and private lands most of the rest.

Central Valley. Black Terns were severely affected by the great historic loss of wetlands in the Central Valley and massive alteration of its natural hydrologic regime, which radically reduced the extent and frequency of floods that once periodically inundated many thousands of hectares to create ephemeral wetland habitat (Shuford et al. 2001). Still, today in the closed Tulare Basin in extreme winters floodwaters are diverted into shallow storage basins or run unchecked into fields, leaving potential breeding habitat. Extensive wetland loss in the Sacramento Valley was offset by expansion of rice to the current annual level of 160,000 to 200,000 ha, which may far exceed the average extent of shallow-water wetlands available there previously in summer (Shuford et al. 2001). By contrast, wetlands lost in the San Joaquin Valley have been replaced to only a tiny degree by rice, which has declined there since the mid-1950s. Terns formerly bred in rice fields as far south as Kern County but no longer do so.

Cogswell (1977) concluded that tern numbers declined initially from wetland loss, increased with expansion of rice culture, and declined again "recently," perhaps from pesticide accumulation. The anecdotal nature of his and others' claims of declines (AFN 24:638, AB 32:1205, AB 39:98) or upswings (AB 31:1185) in tern numbers in the Sacramento Valley in the 1970s and 1980s makes them hard to evaluate. Numbers of Black Terns recorded on surveys of pheasant broods in Butte County, 1976 to 1992, did not show a significant temporal trend but appeared to track the county's rice acreage (Shuford et al. 2001).

In 1998, following an El Niño winter, an estimated 2213 pairs bred in the Central Valley, of which 1987±594 were in Sacramento Valley rice fields (Shuford et al. 2001). Although birds were spread widely in rice, the largest numbers were in the northern Colusa Basin. In the San Joaquin Valley, about 75 pairs bred at five sites in the San Joaquin Basin (70 pairs at two rice areas) and 151 pairs bred at six sites in the Tulare Basin. Refuges or reserves held <1% of Central Valley terns, private lands the rest. The current tenuous status of breeding Black Terns in the San Joaquin Valley documents a major population decline there over the past 100 years and an apparent shift of abundance to the Sacramento Valley. The latter area, however, may always have been an important, though poorly documented, breeding area.

Migratory stopovers. Tule Lake NWR, Siskiyou and Modoc counties, is a very important post-breeding or migratory stopover for Black Terns in late summer, when they appear to be attracted to large numbers of damselflies (D. Mauser in Shuford et al. 2004). Since at least 1949, thousands have been recorded from July to early September, with peak estimates reaching 19,000 birds (Shuford et al. 2001, 2004). The only other major stopover site in the state is the Salton Sea, Riverside and Imperial counties, outside the breeding range. Up to 15,000 have been estimated there in early August (Patten et al. 2003), but the only census, 13–16 August 1999, tallied 4011 individuals (Shuford et al. 2002). Small (1994) implied numbers have declined at the Salton Sea since 1987, but there is no evidence of this (M. Patten in litt.); numbers of migrants have declined historically on the southern California coast (Garrett and Dunn 1981).

Ecological Requirements

Information on ecological requirements of the Black Tern in California are restricted mostly to general accounts of habitat and nest-site use as described below. Diet studies are lacking in California, but elsewhere breeding Black Terns are mainly insectivorous. Fish, however, make up a large part of the diet in some habitats and regions (Dunn and Agro 1995) and may dominate the diet by mass and provide an important source of calcium (Beintema 1997). Black Terns nest semicolonially in favorable, protected areas of marshes (Dunn and Agro 1995, Shuford 1999). Nests are small cuplike gatherings of vegetation

usually built on floating substrates—typically anchored to (or lodged in) emergent vegetation or beds of submerged rooted aquatics—or on small mounds or other nonfloating substrates within a marsh matrix.

Northeastern California. Most breeding marshes are dominated by low (<1 m) emergents, typically spikerush (*Eleocharis* spp.) or *Juncus* spp. (Gould 1974, Shuford et al. 2001), and vegetative cover (vs. open water) usually is >80% (Shuford et al. 2001). A floating Yellow Pond-lily (*Nuphar luteum* ssp. *polysepalum*), Water Smartweed (*Polygonum amphibium* var. *stipulaceum*), and taller emergents, such as *Scirpus* spp., have been key plants locally (Orr and Moffitt 1971, Shaw 1998, Shuford et al. 2001). At Lower Klamath NWR, terns have nested in shallowly flooded units dominated by residual barley stubble and algae mats (Shuford et al. 2001). Most floating nests are over water 25 to 80 cm deep and supported by emergent vegetation, abandoned nests of grebes or Forster's Terns (*Sterna forsteri*), floating boards or logs, floating cow pies, muskrat rafts, reed or algal debris, or small earthen hummocks (Orr and Moffitt 1971, Gould 1974, Shaw 1998, Shuford 1999).

Central Valley. Black Terns formerly nested here in ephemeral, early successional habitats created by natural overflow of rivers and lakes or by flood irrigation of pasturelands (Shuford et al. 2001). Today few of the valley's terns breed in marshes or overflow habitats. Valleywide in 1998, about 2057 pairs (93.0%) bred in rice fields, 151 (6.8%) in flooded agricultural fields, and 5 (0.2%) in emergent wetlands of low stature (Shuford et al. 2001). In the Sacramento Valley, a few pairs exceptionally have initiated nesting in sedges in the corner of a rice field (Shuford et al. 2001) and, in 2002, at a duck club pond dominated by spikerush interspersed with open water (C. Isola in litt.) and at a large wetland unit at Sacramento NWR (M. Wolder in litt.). Of 226 pairs in the San Joaquin Valley in 1998, 66.8% were in flooded agricultural fields with residual crops or weeds, 31.0% were in rice, and 2.2% were in emergent wetlands of low stature. In the Sacramento Valley, Lee (1984) reported nests in rice fields were built on top of dirt mounds, about 10 cm high, unintentionally created during field preparation. Water depths at nests ranged from 5 to 15 cm before farmers raised water levels in July.

Threats

Northeastern California. Since a 1995 reordering of water priorities in the Klamath Basin, refuges have experienced shortages of water or inappropriate timing of water delivery each year from 2001 to 2004; this should continue into the foreseeable future (Shuford et al. 2004) and likely will reduce overall tern breeding habitat. Concern has been expressed over the potential impacts on waterbirds of increasing human recreation at Eagle Lake (Gould 1974, Shaw 1998). This is not likely to be a widespread regional problem, however, given the shallow, densely vegetated marshes preferred by the terns are not suitable for fishing and boating.

Central Valley. The region's terns currently are vulnerable to lack of protection on private lands and potential changes in water allocation priorities to accommodate California's burgeoning human population. Large shifts from rice to other less water-consumptive crops likely would greatly impact terns. Agricultural practices that rapidly draw down water levels in rice fields have exposed tern nests to rat predation only to later destroy renesting attempts when fields are reflooded above initial levels (Lee 1984). Three egg yolks collected from a colony in rice fields in the Sacramento Valley in 1969 had 8.0, 9.1 and 11.8 ppm DDE (Greenberg 1972), but there is no evidence of deleterious effects of pesticides or other agricultural chemicals on terns breeding there. Dunn and Agro (1995) and Weseloh et al. (1997) reviewed the impacts of contaminants in Black Tern eggs but found no evidence of impaired reproduction. They concluded direct chemical toxicity is generally not a problem with these terns, but pesticides may reduce favored insect foods. Loss of insect diversity or biomass might lead to chick starvation.

Management and Research Recommendations

- Focus on restoring, enhancing, and providing long-term protection for suitable wetlands and on maintaining isolation of colonies from humans and ground predators.
- Protect key stopover areas, such as Tule Lake and the Salton Sea.
- Conduct research on the foraging and nesting ecology of Black Terns in California, on movements of banded birds with changing water conditions, and on population demography to identify which breeding habitats are sources or sinks for the overall population.

Northeastern California

- Try to establish spikerush-dominated marshes, the species' main breeding habitat in the region, on refuges that currently hold few breeding Black Terns.

- Secure an adequate long-term water supply for refuges in the Klamath Basin to enable effective management for the region's breeding terns.

Central Valley

- Consider enhancing tern habitat primarily in years of exceptional runoff, when it will do the most good, thereby exploiting the tendency of seabirds to exhibit boom and bust cycles of productivity. In such years, try to increase limited breeding on newly restored wetlands on refuges near Los Banos by spreading water over larger areas within the Eastside Bypass near Los Banos and the James Bypass/Fresno Slough south of Mendota WA, or by drawing water from upstream, circulating it through refuge ponds, and draining it back into the bypass downstream. Maintain a slow but steady flow to reduce the chances of botulism.
- When possible, flood fields containing residual vegetation or crop stubble for use as breeding habitat. Explore retiring fields with marginal crop yields and putting them in a conservation bank to be flooded when water is available. Weigh such flooding against possible mortality of waterbirds from botulism disease outbreaks, which might be reduced by rotating fields to be flooded and choosing areas with no prior evidence of disease.
- Expand research to address concerns about the potential effects of agricultural pesticides and crop cultivation practices on Black Terns (Lee 1984).
- Conduct studies to assess whether the value of rice fields to Black Terns equals that of ephemeral overflow habitat or natural marshes.

Monitoring Needs

The state's breeding population should be monitored every three to five years, during typical climatic and habitat conditions, using methods responsive to the shifting of breeding locations.

Northeastern California. Terns should be surveyed in mid-June by counts of undisturbed adults taken from peripheral or within-wetland sites where observers do not attract mobbing terns. Surveys should be based on a random or stratified sampling of a subset of potential breeding sites, accounting for the difficulty of reaching some.

Central Valley. This population should be monitored by a set of standardized roadside transects in rice fields in the Sacramento Valley run in early June.

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Literature Cited

American Ornithologists' Union (AOU). 1998. Checklist of North American Birds, 7th ed. Am. Ornithol. Union, Washington, DC.

Beintema, A. J. 1997. European Black Terns (*Chlidonias niger*) in trouble: Examples of dietary problems. Colonial Waterbirds 20:558–565.

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.

Cogswell, H. L. 1977. Water Birds of California. Univ. Calif. Press, Berkeley.

Dunn, E. H., and Agro, D. J. 1995. Black Tern (*Chlidonias niger*), in the Birds of North America (A. Poole and F. Gill, eds.), no. 147. Acad. Nat. Sci., Philadelphia.

Garrett, K., and Dunn, J. 1981. Birds of Southern California: Status and Distribution. Los Angeles Audubon Soc., Los Angeles.

Gould, G. I., Jr. 1974. Breeding success of piscivorous birds at Eagle Lake, California. Master's thesis, Humboldt State Univ., Arcata, CA.

Greenberg, D. 1972. Black Tern survey Sutter County, California, 1969–71. Unpublished report, Wildl. Mgmt. Branch Special Wildl. Invest., 19 May 1972, Calif. Dept. Fish & Game, 1416 Ninth St., Sacramento, CA 95814.

Grinnell, J., and Miller, A. H. 1944. The distribution of the birds of California. Pac. Coast Avifauna 27.

Lee, R. C., Jr. 1984. Nesting biology of the Black Tern (*Chlidonias niger*) in rice fields of the Central Valley, California. Master's thesis, Calif. State Univ., Sacramento.

McCaskie, G., DeBenedictis, P., Erickson, R., and Morlan, J. 1979. Birds of northern California: An annotated field list, 2nd ed. Golden Gate Audubon Soc., Berkeley.

Orr, R. T., and Moffitt, J. 1971. Birds of the Lake Tahoe Region. Calif. Acad. Sci., San Francisco.

Patten, M. A., McCaskie, G., and Unitt, P. 2003. Birds of the Salton Sea: Status, Biogeography, and Ecology. Univ. Calif. Press, Berkeley.

Peterjohn, B. G., and Sauer, J. R. 1997. Population trends

of the Black Tern from the North American Breeding Bird Survey, 1966–1996. Colonial Waterbirds 20:566–573.

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.

Shaw, D. W. H. 1998. Changes in population size and colony location of breeding waterbirds at Eagle Lake, California, between 1970 and 1997. M.S. thesis, Calif. State Univ., Chico.

Shuford, W. D. 1999. Status assessment and conservation plan for the Black Tern (*Chlidonias niger surinamensis*) in North America. U.S. Fish & Wildl. Serv., Denver Federal Ctr., Denver, CO 80225-0486.

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

Shuford, W. D., Thomson, D. L., Mauser, D. W., and Beckstrand, J. 2004. Abundance, distribution, and phenology of nongame waterbirds in the Klamath Basin of Oregon and California in 2003. Final report to U.S. Fish & Wildl. Serv., Klamath Basin NWR Complex, 4009 Hill Rd., Tulelake, CA 96134. Available from PRBO Conserv. Science, 3820 Cypress Dr., #11, Petaluma, CA 94954.

Shuford, W. D., Warnock, N., Molina, K. C., and Sturm, K. K. 2002. The Salton Sea as critical habitat to migratory and resident waterbirds. Hydrobiologia 473:255–274.

Silliman, O. P. 1915. Another Mexican Ground Dove for California, and other notes. Condor 17:207.

Small, A. 1994. California Birds: Their Status and Distribution. Ibis Publ., Vista, CA.

Weseloh, D. V. C., Rodrigue, J., Blokpoel, H., and Ewins, P. J. 1997. Contaminant concentrations in eggs of Black Terns (*Chlidonias niger*) from southern Ontario and southern Quebec, 1989–1996. Colonial Waterbirds 20:604–616.

Zeiner, D. C., Laudenslayer, W. F., Jr., Mayer, K. E., and White, M. 1990. California's Wildlife, vol. II, birds. Calif. Statewide Wildl. Habitat Relationship System, Calif. Dept. Fish & Game, 1416 Ninth St., Sacramento, CA 95814.

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