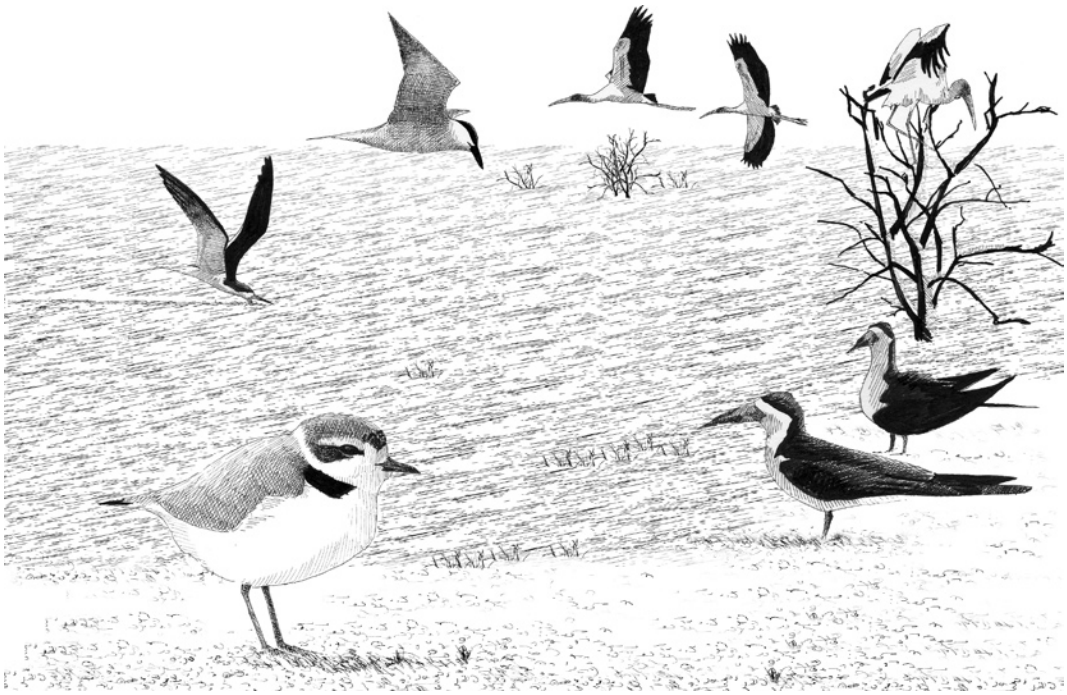
II

Species Accounts



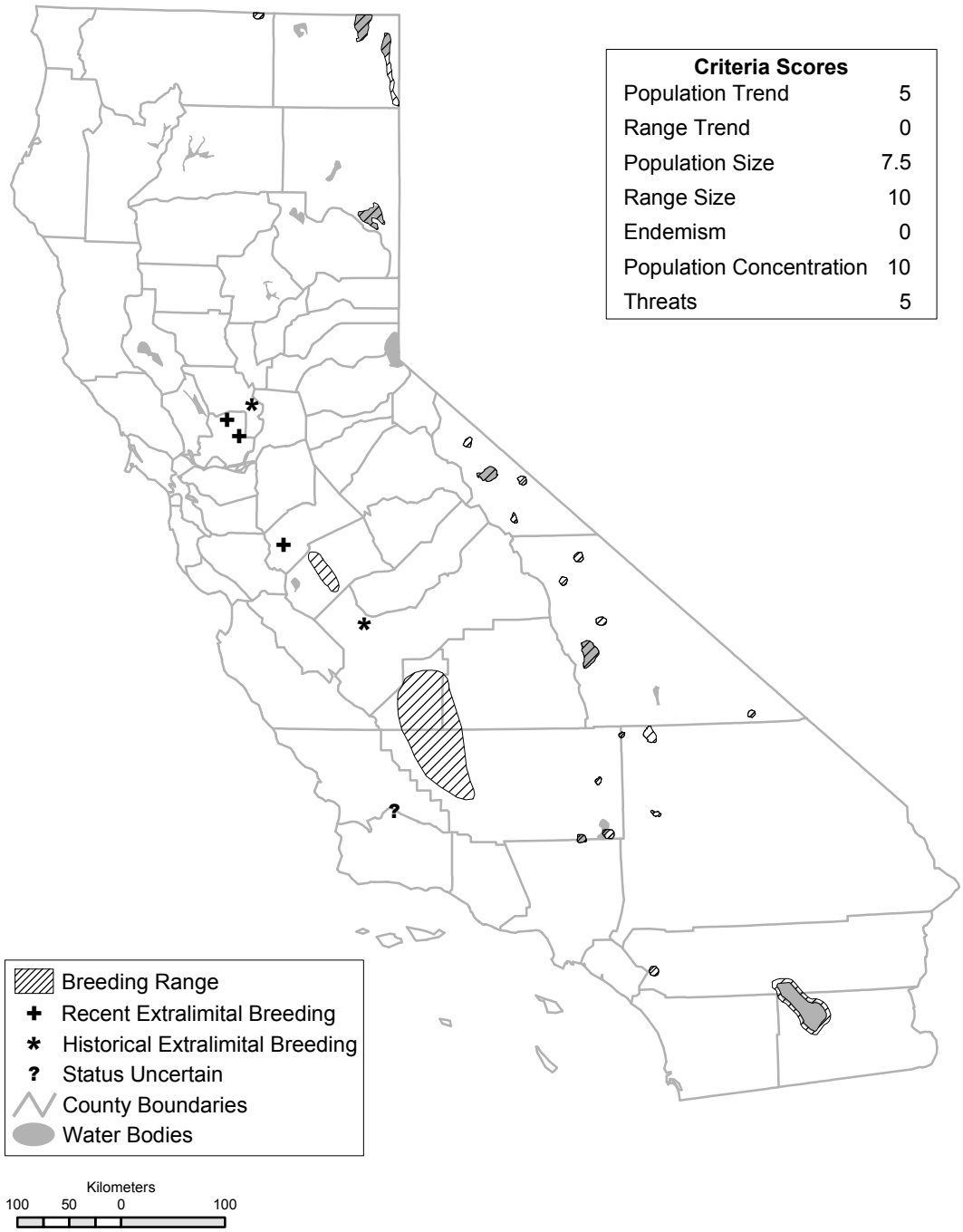
Andy Birch

PDF of Snowy Plover account from:

Shuford, W. D., and Gardali, T., editors. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

SNOWY PLOVER (*Charadrius alexandrinus*) (interior population)

W. David Shuford, Sue Abbott, and Tamiko D. Ruhlen



Breeding range of the Snowy Plover in the interior of California (coastal beach population not mapped). Birds are concentrated mainly at a relatively few alkali or saline lakes in northeastern California and the southern deserts and at agricultural evaporation ponds or remnant alkali playas in the San Joaquin Valley. In winter, birds retreat from higher elevations and, in the interior, concentrate mainly in the Tulare Basin and at the Salton Sea. Occurs more widely during migration.

Special Concern Priority

Currently considered a Bird Species of Special Concern (breeding), priority 3. Included on both prior special concern lists (Remsen 1978, 2nd priority; CDFG 1992).

Breeding Bird Survey Statistics for California

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

General Range and Abundance

A cosmopolitan species, consisting of at least five subspecies (one to two in North America), ranging over parts of five continents (Page et al. 1995b). In North America, breeds on the Pacific and Gulf coasts of the United States and Mexico and locally inland in southern Saskatchewan and southwestern Montana (irregular), the Central Valley of California, Great Basin, Southwest, southern Great Plains, and central Mexico. Also breeds on various Caribbean Islands. In winter, occurs more widely in coastal areas and remains inland mainly in arid regions with mild temperatures in south-central and southern California, Arizona and New Mexico (irregularly), and central Mexico (Page et al. 1995b, Shuford et al. 1995). Most plovers breeding inland in the West winter on the coast of California, Baja California, and the Gulf of California (Page et al. 1995a, b). The size of the nesting population in western North America is 10,000–20,000 individuals (Page and Stenzel 1981, Herman et al. 1988, Page et al. 1991, Palacios et al. 1994, Page et al. 1995b). Hereafter, only the interior population of California is considered further because the population on the Pacific coast is listed as federally threatened.

Seasonal Status in California

Occurs year round in California, though seasonal status varies regionally; inland breeders vacate high elevations in winter (Oct–Mar), but some remain year round, mainly in the San Joaquin Valley and at the Salton Sea (Page et al. 1995b, Shuford et al. 1995). Breeds from March to September; plovers initiate nests as early as the second week of March in southern deserts (Owens Lake southward; Ruhlen et al. 2006) but not until late April at high elevations in the Great Basin (Page et al. 1995b, G. Page pers. comm.).

Historic Range and Abundance in California

For the interior of California, Grinnell and Miller (1944) reported documented nesting at Los Banos, Merced County; (formerly) Buena Vista Lake, Kern County; Lake Elsinore, Riverside County; and the Salton Sea, Imperial County, and breeding season observations from Goose Lake, Modoc County; Firebaugh, Fresno County (actually 12 mi east of Firebaugh in Madera County; J. G. Tyler field notes); Tulare Lake, Kings County; and Owens Lake, Inyo County. A historical nest record also exists for Riego, Sutter County, in the southern Sacramento Valley (Henderson and Page 1981, England 1998). Grinnell and Miller (1944) described California's coastal and inland plovers collectively as "locally common." Destruction of wetland habitat in the Central Valley was extensive prior to 1945, and the loss of much of the terminal alkaline lake habitat in the Tulare Basin likely had a substantial effect on nesting plovers.

Recent Range and Abundance in California

Although further work has expanded areas of known occurrence, the overall outline of the breeding range today is probably similar to that in 1944 (see map). Plovers currently nest locally in the interior of the state in the Central Valley (mainly the southern San Joaquin Valley); the Klamath Basin (sporadically), Modoc Plateau, and Great Basin desert of northeastern and east-central California; and in the Mojave and Colorado deserts. Knowledge of the status of plovers breeding inland was greatly expanded by statewide surveys that estimated 1843 adults in 1978 (Henderson and Page 1981) and 1745 in 1988 (Page et al. 1991). Sites that held >10% of the interior total on either of these surveys included the agricultural evaporation ponds in the Tulare Basin, the Alkali Lakes in Surprise Valley, Honey Lake, Mono Lake, Owens Lake, and the Salton Sea. The following sections provide detail on the status in particular regions of the state.

Northeastern California. Plovers breed here mainly at Goose Lake and the (Upper, Middle, and Lower) Alkali Lakes, Modoc County, and Honey Lake, Lassen County, where estimated numbers of adults at each site on statewide surveys in 1978 and 1988, respectively, were 33 and 4, 358 and 494, and 208 and 155 (Henderson and Page 1981, Page et al. 1991). In the Klamath

Basin, plovers have nested sporadically at Lower Klamath NWR, Siskiyou County, since at least 1957, when a nest was found on a dike of an impoundment (Giles and Crabb 1958). In recent years, plovers have bred irregularly (max. count 14 adults, 8 young) at White Lake, where they tend to nest on the Oregon side of the lake then move to the California portion as waters recede from evaporation (Summers 1982, Shuford et al. 2006). The statewide survey in 1978 found no plovers on the California side (Henderson and Page 1981; lake not censused on the 1988 survey).

Central Valley. Within this broad region, Snowy Plovers have bred irregularly in small numbers north to the southern Sacramento Valley, where since 1945 nesting has been documented at only three sites, all in Yolo County (England 1998, D. Feliz in litt.): Davis sewage ponds in 1963, Woodland Sugar Ponds in 1970, and Yolo Bypass WA in 1998 and 2006.

In the San Joaquin Valley, Snowy Plovers likely nested at some of the large terminal lakes in the Tulare Basin until their demise in the late 1940s and early 1950s. Subsequently, most plovers in this region have nested in various human-altered habitats, particularly agricultural evaporation ponds. On the 1978 statewide survey, the two plovers at Goose Lake, Kern County, a remnant of a formerly much larger terminal lake, and one at Corcoran Reservoir, Kings County, were the only ones detected for the few sites surveyed in the San Joaquin Valley (Henderson and Page 1981). Although no evaporation ponds were surveyed that year, two relatively small sets were created in the early 1970s, and a large set was in operation in 1978 (Moore et al. 1990). Most sets of these ponds were created in the early 1980s and were rapidly colonized by nesting plovers, such that two sets of newly developed ponds in Kings County held at least 126 adult-sized plovers, estimated to represent 60 nesting pairs, in 1982 (Ivey 1984). Surveys of 12 evaporation pond systems in Kings, Tulare, and Kern counties in 1987 found a maximum of 181 adult-sized plovers and recorded over 60 nest attempts (Roster et al. 1992). Of 241 plovers counted in the San Joaquin Valley in 1988, 191 were in ponds receiving agricultural drainwater (Page and Bruce 1989, Page et al. 1991). The median number of adult-sized plovers was 137 (range = 71–213) on May surveys each year in 1994–2001 at eight sets of remaining evaporation ponds and three associated sets of ponds at compensation or alternative wetlands in the Tulare Basin (T. Palmer, J. Seay/H. T. Harvey & Associates, and R. Hansen/Hansen Biological Consulting unpubl. data). Plovers also nest in small numbers at sites not regularly surveyed, as indicated by six adults and one brood at an alkaline pond at a food processing plant in Lemoore, Kings County, on 27 May 2003 (W. D. Shuford pers. obs.).

In the northern San Joaquin Valley, plovers formerly nested at Kesterson Reservoir on Kesterson NWR, Merced County. Agricultural drainwater was first delivered to this site in 1971, and it increased greatly as a proportion of total inflow from 1978 to 1981; drainwater inflows were halted in 1986, and the facility was dewatered in response to bird deformities attributed to high concentrations of selenium (Ohlendorf 2002). Ivey (1984) reported two pairs of plovers with broods at Kesterson in 1981; this site was not covered on the statewide survey in 1978, but the 1988 survey estimated 8 adults (Page and Bruce 1989). Snowy Plovers also breed at least irregularly within the Grasslands Ecological Area around Los Banos, Merced County; L. Rupert (in litt.) found four adult plovers and a nest on an alkali pond bottom at a duck club in May 2003. A few plovers also have bred irregularly at the Modesto sewage ponds, Stanislaus County: a male with young in 1986 (AB 40:1250, MPCR files) and young seen in 2004 (J. Gain in litt.).

Southern Great Basin. In this region, Snowy Plovers breed mainly at Mono Lake, Mono County, and Owens Lake and Deep Springs Lake, Inyo County, where numbers of adults were 384 and 342, 499 and 195, and 13 and 7 on surveys in 1978 and 1988, respectively (Henderson and Page 1981, Page et al. 1991). Small numbers nest irregularly at Bridgeport Reservoir, Long Valley (Crowley Lake, Little Aklali Lake), and Adobe Valley, Mono County, and at Salt Lake (Saline Valley) and Tinemaha Reservoir, Inyo County (Henderson and Page 1981, Page et al. 1991, Shuford and Metropulos 1996). The Mono County sites, at 6500–6900 ft (1980–2100 m) elevation, represent the highest breeding locations in the state (Shuford and Metropulos 1996).

Lakewide surveys were conducted at Owens Lake 14 times from 1978 to 2004 (Ruhlen et al. 2006). After the steep decline from 499 adults in 1978 to 195 in 1988, numbers of adults ranged from 101 to 203 (mean = 138) on nine subsequent counts from 1990 to 2001. After shallow flooding to control dust began in 2001, numbers of adults increased to 272 in 2002, 401 in 2003, and 658 in 2004; the latter is the highest known total for any inland (or coastal) site in California. Flooded areas now account for 85% of the adults

at Owens Lake. At Mono Lake, numbers have declined during a period of shrinking nesting habitat with increasing water level: 384 in 1978, 342 in 1988, 119 in 2001, and 98 in 2002 (Page et al. 1991, PRBO unpubl. data).

Mojave and Colorado deserts. Snowy Plovers have bred at ten sites in this region. By far the most important is the Salton Sea, Imperial and Riverside counties, where surveys estimated 226 adults in 1978, 198 in 1988, and 221 in 1999 (Henderson and Page 1981, Page et al. 1991, Shuford et al. 2004). Other breeding sites where plovers were recorded on statewide surveys are Tecopa Marsh, Inyo County; Koehn Lake, Kern County; Rosamond Lake, Kern and Los Angeles counties; China Lake, Kern and San Bernardino counties; and Searles and Harper lakes, San Bernardino County. Collectively, these six sites held an estimated 116 adult plovers in 1978 (China Lake not covered) and 101 in 1988 (Page et al. 1991). Additional sites where a few plovers nest sporadically on Edwards Air Force Base are sewage ponds in Kern County (M. Heindel in litt.) and Piute Ponds, immediately adjacent to the Los Angeles County portion of Rosamond Lake (K. Garrett in litt., K. Molina pers. comm.). Nearby, a few plovers (at least formerly) bred irregularly at the Lancaster sewage ponds, Los Angeles County (K. Garrett in litt.).

Southern coastal slope. Lake Elsinore, Riverside County, a terminal lake on the coastal slope of southern California, apparently had nesting plovers in 1974, but not on the statewide surveys in 1978 (high lake level) and 1988 (Henderson and Page 1981, Page et al. 1991).

Ecological Requirements

In the interior of California, Snowy Plovers breed on barren to sparsely vegetated flats and along shores of alkaline and saline lakes, reservoirs, ponds, braided river channels, agricultural wastewater ponds, and salt evaporation ponds (Page et al. 1995b).

Plovers can nest and raise broods even where just a small seep is their only source of water. Adults and broods typically forage near shallow water (1–2 cm deep)—sometimes up to 4 km from their nests—and on dry flats. Nest distance to water ranges from 1 m to 3 km (Henderson and Page 1979), but varies considerably by microhabitat, with island nests and those in shallow flood areas at Owens Lake much closer to water than those in natural areas on alkali flats (Henderson and Page 1979, Ruhlen et al. 2006). On alkali flats, plovers usually nest in areas of moderate relief and often cluster near wet or dry channels or depressions sculpted by runoff flowing onto, or pooling on, the playa (R. P. Henderson and W. D. Shuford pers. obs.). Plovers will move broods long distances to feed. Terrestrial and aquatic invertebrates, including flies, beetles, hemipterans, and brine shrimp, are the main prey items of interior plovers (Page et al. 1995b).

Henderson and Page (1981) found that 40% of nests at interior lakes were partially concealed by an object within 15 cm, such as a stick, rock, or clump of vegetation. At Owens Lake, nests in natural areas were on dry alkali flats; in 105 (64%) of 165 cases, they were near distinctive features, such as dry washes, sparse patches of salt grass, rocks, woody debris, unimproved roadsides, or vehicle tracks (Ruhlen et al. 2006). Nest placement after 2001 was strongly affected by the presence of shallow flood areas, and in 2003 three nests were on gravel islands created specifically for plover nesting. At San Joaquin Valley evaporation ponds, nests were on salt crust or hard clay surfaces of levees, spits, and islands; over 60% of nests had no plant cover, and none were found where plant cover was >75% (Barnum et al. 1992).

Threats

Habitat management and changes in water levels, particularly if human induced, may pose the greatest threat to inland-nesting Snowy Plovers. Interior alkaline and saline lakes are subject to a high degree of natural seasonal and annual water level and salinity fluctuations, and local avifauna must disperse when conditions are no longer favorable (Jehl 1994). The health of a population depends on the availability of backup sites that can be used when conditions change. Even in remote areas of the state, demand for water for irrigation and other human needs reduces water flowing to terminal lakes, causing some (e.g., Alkali Lakes in Surprise Valley, Honey Lake) to dry up earlier in the season or more often on an annual basis than they might if no water diversions occur.

Human-induced change to water levels during the breeding season can impact nesting success. At the Piute Ponds on Edwards Air Force Base, Los Angeles County, ponds that fluctuate from totally dry to extremely high water levels cause problems for nesting plovers (K. Molina pers. comm.). As noted above, Snowy Plovers at Owens Lake have increased in response to shallow flooding as part of an ongoing dust mitigation project. Although the overall effects of this flooding so far have been positive, the long-term effect of all dust control measures is uncertain (Ruhlen et al. 2006). Dense

vegetation has been planted in some areas of the lake bed, and it might increase naturally in others in response to long-term shallow flooding, if so reducing suitable nesting habitat. As dust mitigation is the primary goal of the project, there are protections in place that guarantee the maintenance of only about 10% of the currently flooded acreage; the remainder may eventually be replaced if other more efficient or cost-effective means for dust control can be implemented.

Elevated levels of heavy metals and trace elements may affect plovers at agricultural wastewater ponds (Barnum et al. 1992). Concentrations of selenium at such ponds may reach toxic levels that have been shown to impact other waterbirds (Ohlendorf 2002). Even when selenium concentrations are relatively low, evaporation ponds are not necessarily reliable for plovers, as lower commodity prices may force growers to greatly reduce the acreage in production, thus limiting the water and hence foraging habitat at ponds (J. Seay pers. comm.).

To restore the ecosystem, some large projects have been proposed at the Salton Sea to reduce salinity and offset effects of water transfers to urban centers (Molina and Shuford 2004). If any such projects were placed in shallow water or alkali flat habitat that currently exists, they might impact nesting habitat for plovers (Shuford et al. 2004). Birds at the Salton Sea may also be exposed to contaminants from agricultural and industrial runoff. No large-scale effects of contaminants have yet been documented for other species (Molina and Shuford 2004), but the effects on nesting and wintering Snowy Plovers are unknown for lack of contaminant analysis. Other species of shorebird have died at the Salton Sea from botulism and avian cholera outbreaks (Friend 2002). Floodwaters from summer monsoons on the western side of the Salton Sea negatively impact nesting plovers (K. Molina pers. comm.), though such natural phenomena should not be considered threats unless exacerbated by human activities.

The levels and effects of recreation remain largely undocumented for the interior. On the coast, where recreational activities generally are much higher than at plovers' inland breeding sites, human disturbance appears to reduce Snowy Plover chick survival on beaches (Ruhlen et al. 2003). Also, disturbance may affect interior plovers that winter on Pacific Coast beaches (Lafferty 2001). Some areas of the Salton Sea are heavily used by people, on foot and on off-road vehicles, which may impact plovers (Henderson and Page 1979, K. Molina pers. comm.).

Few studies of Snowy Plover breeding success have been conducted in the interior of California, and thus the effect of predation on interior plovers is largely unknown. At Mono Lake, low nesting density increased nest success, as predators more easily locate clumped nests (Page et al. 1983). There are a variety of potential predators of Snowy Plovers and their nests and chicks (Henderson and Page 1979). Those of most concern are the Common Raven (*Corvus corax*), American Crow (*Corvus brachyrhynchos*), and California Gull (*Larus californicus*), which have increased by rapidly adapting to human changes in the environment, thereby elevating predation levels on other species. Effective management of predators has greatly enhanced the nesting success of Snowy Plovers on the California coast (Neuman et al. 2004).

Management and Research Recommendations

- Ensure that breeding areas receive adequate high-quality water and that diversions do not eliminate or degrade important nesting habitats.
- Ensure that regional efforts to restore wetlands in the southern San Joaquin Valley include creation of some playa lake habitats suitable for plovers, not just freshwater wetlands.
- Ensure that proposed plans for restoration of the Salton Sea provide for adequate habitat for breeding and wintering plovers and that contaminants, particularly selenium, are not concentrated in diked impoundments.
- Collect data on annual productivity at locations where water management changes are proposed or enacted. Protect, enhance, or restore habitats that may be negatively impacted or threatened by water management practices.
- Focus on protecting and enhancing important breeding sites by first determining source areas for the overall population that produce young above the levels needed to replace adult mortality. In the meantime, protect or enhance all sites that currently have large populations of breeding plovers.
- Identify and protect key stopover and wintering areas for Snowy Plovers, such as the Salton Sea, San Joaquin Valley evaporation ponds, and coastal beaches.
- Assess the impact of human recreation at breeding and wintering sites. In areas in

the interior, such as the Salton Sea, where there are plans to promote economic and recreational development, manage these activities to maintain isolation of important nesting areas.
- Assess the impact of environmental toxins to plovers at sites where dangerous concentrations have been measured.
- Conduct research on the ecology and biology of the Snowy Plover in the interior of California, particularly to identify limiting factors to aid management and protection efforts.
- In areas where high levels of predation augmented by human activities may be limiting the productivity of a local population, conduct predator surveys to identify management needs.

Monitoring Needs

Current broad-scale surveys, such as the Breeding Bird Survey and Christmas Bird Count, are inadequate for monitoring changes in the population dynamics of Snowy Plovers. Systematic ongoing monitoring is needed using consistent methods and survey routes. Comprehensive surveys should be conducted at sites in the interior of the state, during a brief period between 24 May and 7 June, once every three to five years at all locations with suitable nesting habitat and annually at key areas with large populations. Observers should distinguish the age and sex of all plovers, so that adult-sized juveniles at the time of the survey are not considered in calculating the size of the nesting population. As males are easier to detect than females during the nesting period, a correction to adjust for this disparity should be used if available from data on marked birds. Surveys should provide maximum coverage with the least possible disturbance. Observers should avoid disturbing plovers during the heat of the day, and early morning surveys or dusk seep watches may increase detection of plovers and their broods. Where possible, measure annual productivity as gauged by clutch-hatching rates, determined by gathering data on numbers of nests, nest loss dates and causes of loss, and the number and relative size of chicks. Where feasible, also determine population viability in terms of number of chicks fledged per male; color-banding of broods may be necessary to achieve this level of monitoring. It also would be valuable to monitor levels of environmental contaminants in areas of concern by collecting and testing salvaged eggs.

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