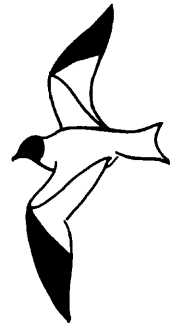


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NESTING POPULATIONS OF CALIFORNIA AND RING-BILLED GULLS IN CALIFORNIA: RECENT SURVEYS AND HISTORICAL STATUS

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ABSTRACT: Statewide surveys from 1994 to 1997 revealed 33,125 to 39,678 breeding pairs of California Gulls and at least 9611 to 12,660 pairs of Ring-billed Gulls in California. Gulls nested at 12 inland sites and in San Francisco Bay. The Mono Lake colony was by far the largest of the California Gull, holding 70% to 80% of the state population, followed by San Francisco Bay with 11% to 14%. Butte Valley Wildlife Area, Clear Lake National Wildlife Refuge, and Honey Lake Wildlife Area were the only other sites that held over 1000 pairs of California Gulls. In most years, Butte Valley, Clear Lake, Big Sage Reservoir, and Honey Lake together held over 98% of the state's breeding Ring-billed Gulls; Goose Lake held 9% in 1997. Much of the historical record of gull colonies consists of estimates too rough for assessment of population trends. Nevertheless, California Gulls, at least, have increased substantially in recent decades, driven largely by trends at Mono Lake and San Francisco Bay (first colonized in 1980). Irregular occupancy of some locations reflects the changing suitability of nesting sites with fluctuating water levels. In 1994, low water at six sites allowed coyotes access to nesting colonies, and resulting predation appeared to reduce nesting success greatly at three sites. Nesting islands secure from predators and human disturbance are nesting gulls' greatest need.

Conover (1983) compiled data suggesting that breeding populations of Ring-billed (*Larus delawarensis*) and California (*Larus californicus*) gulls have increased greatly in the West in recent decades. Detailed assessments of population status and trends of these species in individual western states, however, have been published only for Washington (Conover et al. 1979), Nevada (Yochem et al. 1991), and Utah (Paul et al. 1990). As part of a broad inventory of nongame aquatic birds at Great Basin lakes, Winkler (1982) estimated numbers of these gulls at various colonies in northern California, but his surveys did not cover all historical breeding sites and were conducted late in the breeding season during the extreme drought year of 1977. Currently,

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the California Gull is listed as a species of special concern in California (Remsen 1978, Calif. Dept. Fish & Game, unpubl., 1992), and the Ring-billed Gull is under consideration for this designation (L. Comrack pers. comm.).

To determine the current status of breeding California and Ring-billed gulls in California, from 1994 to 1997 we surveyed all sites where they have nested in recent decades. Here we report the distribution, abundance, habitat associations, and nesting phenology of gulls at these colonies, present the historical record, and evaluate data quality and population trends of these species in California. Finally, we assess threats to these colonies and make recommendations for their protection.

STUDY AREA AND METHODS

Statewide Surveys

We surveyed gull colonies statewide from 1994 to 1997, focusing our efforts on the Modoc Plateau and Great Basin in northeastern California, where most historical colonies have been located. This region, though arid, has numerous large wetlands at moderately high elevations in plateaus, large valleys, or basins receiving drainage from nearby mountains. Colonies at Mono Lake in the Great Basin, at San Francisco Bay on the coast, and at the Salton Sea in the Colorado Desert of southern California were surveyed as part of other studies, as described below. We supplemented the statewide surveys with data from opportunistic surveys or other studies from 1998 to 2000. Prior to our field surveys, we searched the literature and contacted biologists and field ornithologists active in California to determine which sites had supported gull colonies since the 1970s. Shuford also scouted for other gull colonies during shorebird surveys by airplane, airboat, and on foot in northeastern California in late April to early May in 1994 and 1995 and during statewide surveys on foot, by kayak, and by plane for various colonial waterbirds from mid-May to mid-July, 1997 to 1999 (Shuford 1998, Shuford et al. 1999; PRBO unpubl. data).

Our surveys spanned one very dry year and three very wet years. The survey period began at the end of a drought that began in 1986–87 and ended in 1994–95, interrupted only by above-normal precipitation in 1992–93. Precipitation (1 July–30 June) in the Great Basin in California averaged 31.8, 93.6, 69.8, and 79.7 cm in 1993–94, 1994–95, 1995–96, and 1996–97, respectively; the long-term average ($n = 103$ years) for this region is 54.0 cm (Western Regional Climate Center; <http://www.wrcc.dri.edu/divisional.html>). Water levels at most colonies in northeastern California fluctuated greatly over the survey period.

To capture peak nesting numbers, we selected a primary survey period of early to mid-May for San Francisco Bay and mid- to late May for northeastern California, representing the late incubation to very early hatching period of both species (PRBO and SFBBO unpubl. data). Shuford and colleagues counted all gull nests or breeding adults at various colonies in northeastern California primarily from 11 to 29 May, 1994 to 2000. A few early-season surveys (27 April–3 May) served mainly to confirm the lack of nesting at a few sites occupied irregularly. Shuford also counted nesting gulls at Goose Lake in mid-June 1999 and 2000; gull nesting at Goose Lake in these years was

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much later than at other sites in the region. Dates of nest counts at Mono Lake in all other years, 1983 to 1993, ranged from 18 May to 2 June, except in 1983 when they spanned 29 May to 16 June (PRBO unpubl. data, J. R. Jehl, Jr., in litt.). Shuford and others conducted aerial photographic surveys of nesting gulls at the otherwise inaccessible Sheepy Lake pelican and cormorant colony at Lower Klamath National Wildlife Refuge (NWR) on 23 May 1994, 12 May 1997, and 13 May 1999. Gulls may have nested at this site in other years of our surveys, but a lack of counts at this small colony has little effect on statewide totals. Similarly, we were unaware until 1995 that in 1994 a few gulls bred at Shasta Valley Wildlife Area (WA), Siskiyou County; no gulls bred at this location in subsequent years (M. McVey pers. comm.).

From 3 May to 19 June (mostly 8–20 May), 1994 to 2000, Ryan, V. L. Layne, D. Bell, and colleagues surveyed California Gull colonies in San Francisco Bay within Santa Clara, Alameda, San Francisco, and Contra Costa counties. Nest counts there from 1980 to 1993 were between 4 May and 21 June (mostly 4–30 May; SFBBO unpubl. data). Molina (2000) counted California Gull nests at a newly formed colony at Obsidian Butte, Sault Sea, Imperial County, between 15 May and 6 June, 1997 to 1999.

Observers made most counts by walking through colonies and marking each nest individually (on the rim or on an adjacent rock or weed) with a dab of spray paint to avoid over- or undercounting. For those colonies, we estimated the number of nesting pairs equaled the number of nests counted. At South San Francisco Bay we did not mark nests; the colonies' occupying narrow dikes minimized over- or undercounting. An exception was at the Alameda Naval Air Station (NAS), where colony size was estimated from outside the colony (L. Collins pers. comm.).

At Clear Lake, most years we used the spray-paint method to count one or two gull colonies not inhabited by other colonial waterbirds. Otherwise, observers minimized disturbance to multi-species colonies by counting all adult gulls from a small motorboat cruising slowing by the colonies about 60 m offshore. We estimated the number of nests on these islands as 0.71 of the number of adults counted for the Ring-billed and 0.72 for the California, the ratios at Clear Lake in 1994 at colonies where we could count both nests and adults. Though these ratios may vary by site and year, we applied them at Sheepy Lake to counts of adults obtained from aerial photographs in 1997 and at Goose Lake to counts of adults from the ground in 1999 and 2000, when the association of gulls with nesting Caspian Terns (*Sterna caspia*) precluded nest counts. We made all counts in the morning at the same stage of the nesting cycle. At Lake Shastina in 1994, R. Ekstrom (in litt.) counted nesting gulls from shore by looking out to the small nesting island off Milkhouse Island; in other years, observers counted nests using the spray-paint method.

For northeastern California, we characterized nesting phenology by the first observations of chicks and, to a lesser degree, by the proportion of nests with chicks at the time of our surveys. Survey dates and the extent of coverage were most suitable for this purpose in 1994, 1995, and 1997. We estimated the approximate dates of first egg laying by backdating based on the range of mean incubation periods from various studies reported by Ryder (1993; 25–26 days) for the Ring-billed Gull and Winkler (1996; 24–

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27 days) for the California. In San Francisco Bay in 1998 and 1999, biologists aged eggs by the egg flotation method of Hays and LeCroy (1971) and thereby estimated egg laying dates $\pm 1-2$ days.

Historical Data

We obtained other population estimates from the published literature when possible, including the seasonal reports of *North American Birds* (NAB) and its predecessors, and unpublished sources, including long-term studies at Mono Lake (PRBO; J. R. Jehl, Jr., in litt.) and San Francisco Bay (SFBBO), the notebooks on file with the regional editors of the Middle Pacific Coast Region of NAB (cited MPCR notebooks), the files and annual narrative reports of various state and federal wildlife refuges, and biologists' field notes. We report dates of surveys, methods used, and the numbers of nests or pairs when these data are available. Otherwise, we report numbers of nesting adults, as there is no reliable way to convert raw counts or estimates of adults to nesting pairs. We also searched for historical data from the records of egg sets housed at the California Academy of Sciences (CAS), Museum of Natural History of Los Angeles County (LACM), Museum of Vertebrate Zoology (MVZ), San Bernardino County Museum (SBCM), San Diego Natural History Museum (SDNHM), Santa Barbara Museum of Natural History (SBMNH), and the Western Foundation of Vertebrate Zoology (WVZ).

Data Quality

Because the methods used to estimate nests, adults, or young varied widely, we categorized the accuracy and repeatability of each estimate as high (1), moderate (2), or unknown (3). 1: All counts taken near the late incubation period when the adult nesting population reaches its peak; individual nests counted in entire colony, or density of nests in a portion of a colony calculated then applied to the measured area occupied by the entire colony, or number of pairs estimated from counts of adults converted to nesting pairs from the ratio of adults to nests determined for a portion of the colony. We consider such data appropriate for population-trend assessment. 2: Counts taken on known date(s) in early to mid-nesting season and based on direct counts or estimates of adults or chicks, possibly from a distant vantage point. Such data should be viewed cautiously in assessment of population trends. 3: Date(s) and/or methods of surveys unavailable, or methods as in category 2 but estimate made late in the nesting season, or estimate made visually from fixed-wing aircraft. Such data should be used with great caution in interpreting population trends. The quality of estimates based on early- to mid-season aerial photographs varies with the clarity and size of images and contrast of adult gulls and nests with the background.

RESULTS AND DISCUSSION

Current Distribution, Abundance, and Habitat Associations

Except for the recently established colonies of California Gulls in San Francisco Bay (Jones 1986) and at the Salton Sea (Molina 2000), all known current breeding colonies of California and Ring-billed gulls in California are located in the northeastern part of the state in Siskiyou, Modoc, Lassen,

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Plumas, and Mono counties (Figure 1). For California Gulls, the westernmost and southernmost breeding sites in the species' entire range are at San Francisco Bay and the Salton Sea, respectively (Winkler 1996, this paper), whereas Ring-billed Gulls reach their southwestern limit at Honey Lake (AOU 1998).

In northeastern California, gulls nest mainly on islands and, rarely, on peninsulas at natural lakes, reservoirs, managed wetlands, and saline or alkaline lakes, primarily between 2700 and 5100 feet (823–1555 m) above sea level, at 6385 feet (1947 m) at Mono Lake. The substrate may be earth, rock, or, infrequently, broken-down tule mats. Gulls nest in the open or among rocks, tall weeds, or shrubs (Figures 2b, 3b, 4b, 5). California and Ring-billed gulls often nest together at these sites and/or with other colonial species, such as pelicans, cormorants, herons, egrets, and terns. Except at

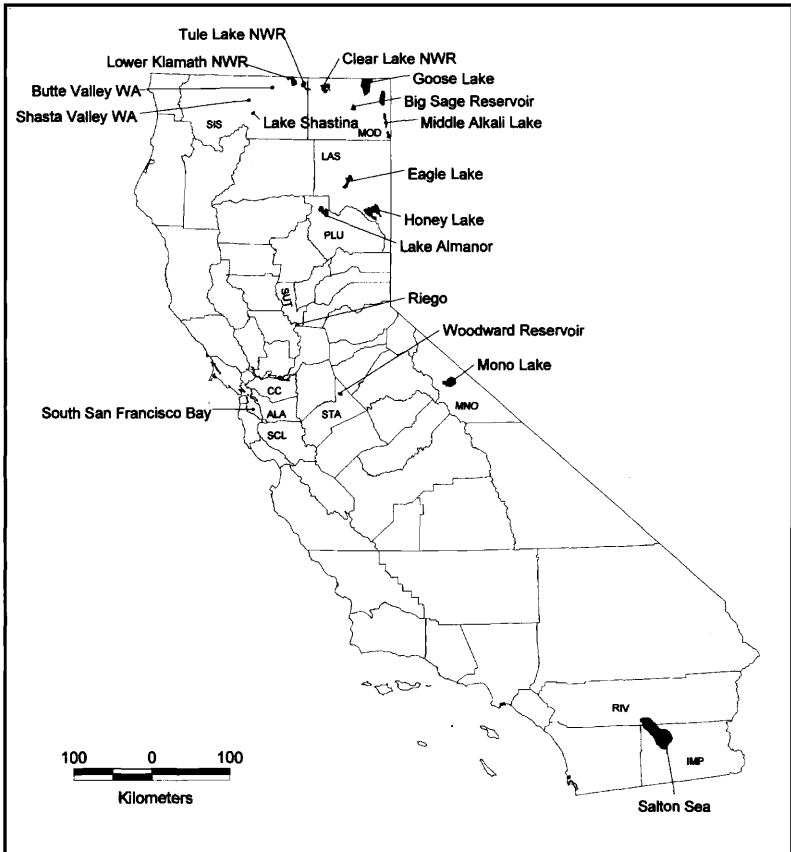


Figure 1. Locations of California and Ring-billed gull colonies in California. All colonies have been active since 1944 except for Riego, Sutter County, and Woodward Reservoir, Stanislaus County.

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Mono Lake, most large gull colonies are at or near extensive freshwater wetlands or irrigated fields (primarily alfalfa). In San Francisco Bay, California Gulls nest at sea level primarily on earthen islands and levees in salt ponds; the small colony at the Salton Sea, on a rocky and sandy island near shore, is 227 feet *below* sea level.

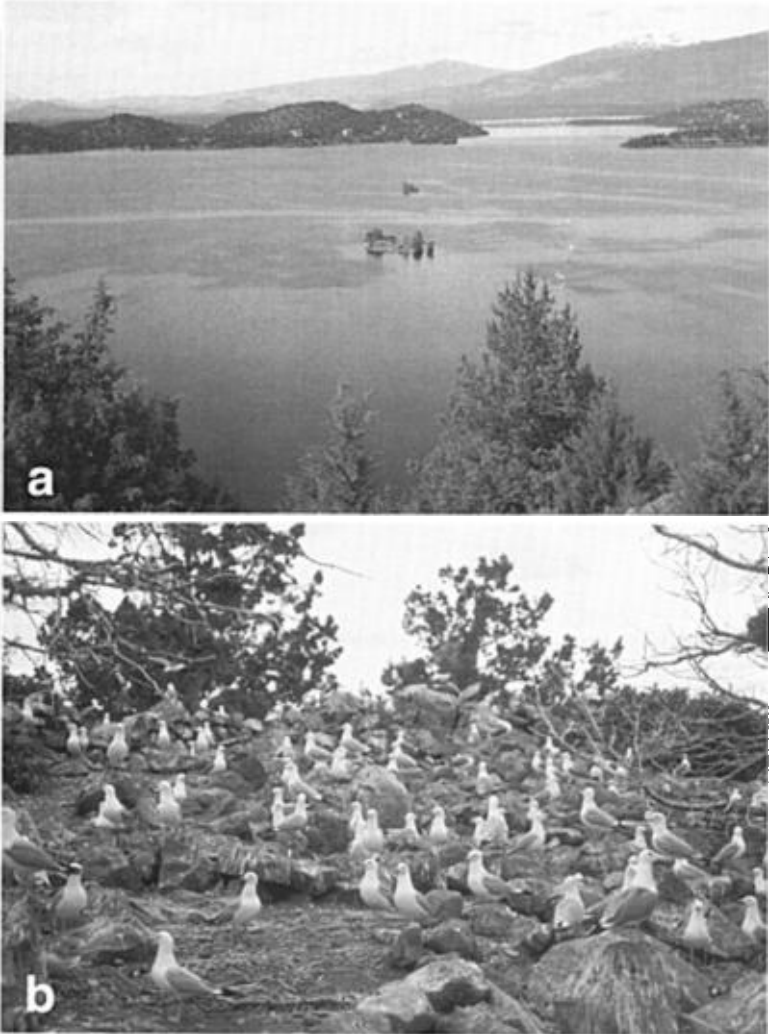


Figure 2. (a) View from landlocked Milkhouse Island of islet in central portion of Lake Shastina, Siskiyou County, where (b) Ring-billed and California gulls nest amid rocks and shrubs.

Photos by W. D. Shuford, 16 May 1995

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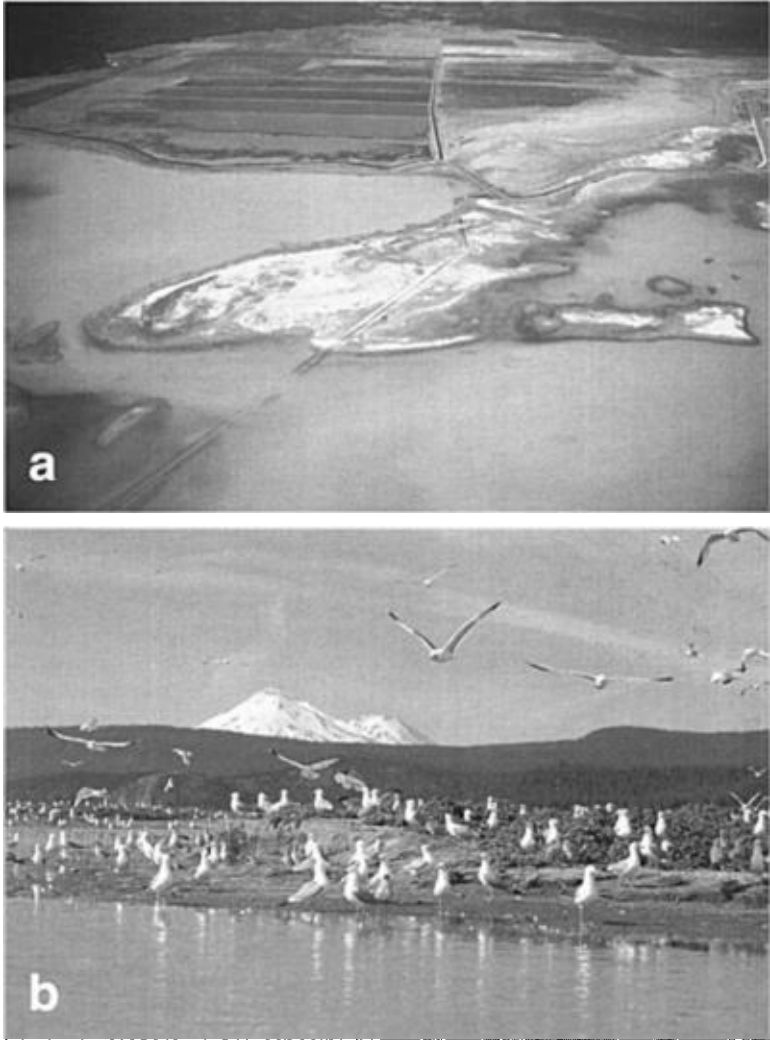


Figure 3. (a) Aerial view of Meiss Lake, Butte Valley Wildlife Area, Siskiyou County, where Ring-billed and California gulls attempted to nest during a prolonged drought despite the nesting islands' becoming peninsulas. (b) Ring-billed Gulls nesting amid weedy growth on an island in Meiss Lake, with Mt. Shasta looming in the background, five years later after water levels had risen.

Photos by W. D. Shuford, (a) 23 May 1994 and (b) 24 June 1999

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Figure 4. (a) View from bluff along Highway 395 of southeastern portion of Goose Lake, Modoc County, where small changes in lake level can rapidly expose or inundate potential nesting islands. (b) Ring-billed Gull colony on a low-lying grassy island isolated after a post-drought rise in the level of Goose Lake.

Photos by W. D. Shuford, 18-19 May 1997

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Figure 5. California Gulls nesting in the grass in the open and under shrubs on a small islet in Middle Alkali Lake, Surprise Valley, Modoc County, with the Warner Mountains in the distance.

Photos by W. D. Shuford, 17 May 1994

California Gull. From 1994 to 1997, the number of pairs of California Gulls nesting in the state ranged from about 33,125 to 39,678 (Table 1). In these years, the Mono Lake colony constituted 70% to 80% of the statewide total, colonies farther north 9% to 16%, and the San Francisco Bay colonies 11% to 14%. Of other sites occupied as recently as the early 1990s, only Tule Lake NWR and Lake Almanor remained unoccupied throughout the four years of our surveys.

Ring-billed Gull. From 1994 to 1997, at least 9611 to 12,660 pairs of Ring-billed Gulls nested annually at five to seven sites in northeastern California (Table 1). Of other sites occupied since the 1970s, only Tule Lake NWR remained unoccupied throughout our surveys. Despite their smaller statewide breeding population, Ring-billed Gulls outnumbered California Gulls where they overlapped in Siskiyou, Modoc, and Lassen counties by a ratio of about 1.9 to 3.2:1, a pattern Winkler (1982) also found.

Phenology

In all years, we saw at least a few small chicks during our nest counts, indicating we had timed our counts well with respect to peak nesting numbers. Patterns varied somewhat by species, region, and year.

California Gull. In northeastern California, we recorded the first California Gull chicks from 16 to 20 May, with no consistent pattern of variation by colony or year. Backdating, the earliest California Gull eggs were laid at least

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Table 1 Numbers of Nesting Pairs of Ring-billed and California Gulls in California, 1994–1997^a

Site	Ring-billed						California ^b			
	1994	1995	1996	1997	1994	1995	1996	1997		
Lake Shastina ^c	~15	73	~50	221	~300	151	~103	123		
Shasta Valley WA	~15	0	0	0	0	0	0	0		
Butte Valley WA ^d	3190	3158	4087	3475	327 ^e	1803	1873	2145		
Lower Klamath NWR/	178	—	—	79	312	52	87	104		
Clear Lake NWR ^e	2868	2942	3747	3680	1175	1769	1488	1355		
Goose Lake	0	0	0	1117	0	0	0	73		
Big Sage Reservoir	3007	2052	— ^h	1586	76	11	— ^h	28		
Middle Alkali Lake	0	0	0	0	71	0	0	0		
Eagle Lake	0	132	0	0	0	201	0	0		
Honey Lake WA ⁱ	1931	1961	1727	2502	1247	1317	1510	1913		
Mono Lake	0	0	0	0	31,670	24,927	23,750	24,957		
Salton Sea	0	0	0	0	0	0	2	22		
San Francisco Bay	0	0	0	0	4500	4357	4312	5076		
Totals	11,204	10,318	(9,611) ^y	12,660	39,678	34,588	33,125	35,796		

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^aData from direct nest counts or other methods meeting category 1 quality standards (see Methods), —, No survey made; 0, survey taken but no nesting gulls found.

^bWe found no nesting gulls at Lake Almanor, where they previously bred at least sporadically, or at Tule Lake in 1994 and 1997, and it is unlikely that they nested there in 1995 and 1996.

^cIn 1994, counts taken from shore by spotting scope; in 1996, count of total nests made on island but apportioned to species by ratio found in 1995.

^dObservers (K. Novick in litt.) counted 2298 and 2956 pairs of California and 3484 and 2525 pairs of Ring-billed gulls nesting at Meiss Lake in 1998 and 1999, respectively.

^eCount low as many nests already destroyed by coyotes when colony censused on 11 May (J. King in litt.).

^fAerial photographs taken in 1994 and 1997 of the pelican and cormorant colony at Sheepy Lake showed about 178 and 79 pairs of Ring-billed Gulls and 43 and 8 pairs of California Gulls, respectively. In 1999, high water saturated the island and no gulls nested. This small colony has been active since at least the early 1990s (L. A. Moreno-Matiella pers. comm.) hence the gull numbers we attribute to Lower Klamath probably were slightly underestimated in 1995 and 1996. In 2000 J. Beckstrand (in litt.) estimated 48 pairs of the Ring-billed and 6 of the California at Unit 6A.

^gBiologists erected an electric fence across a peninsula to Bird Island in late May 1994 to prevent access by coyotes. J. Beckstrand (in litt.) found 1345, 1245, and 432 pairs of the California and 3922, 1957, and 1739 pairs of the Ring-billed nesting in 1998, 1999, and 2000, respectively.

^hNo surveys made, but gulls were thought to be nesting.

ⁱOn 17 and 18 May 2000 B. Tatman (pers. comm.) counted 1794 nests of California and 1964 nests of Ring-billed gulls at Honey Lake WA; all were at Hartson Reservoir except 544 of the Ring-billed on islands in Unit 5A.

^jThe total for the Ring-billed in 1996 is probably low by at least 1500 to 2000 pairs because Big Sage Reservoir was not surveyed.

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by 19-22 April in 1996 and 1997 but probably several days earlier based on the large numbers of early-season chicks in those years. On 16 May 1997, 22.2% of 1858 California Gull nests checked at Honey Lake had small chicks, implying the earliest nesting; no chicks were seen at any other colonies surveyed from 14 to 19 May 1997. On 17 May 1995, of 47 territorial gulls an island in Clear Lake had only 7 nests with eggs, implying the latest nesting.

Estimated mean dates of egg laying in San Francisco Bay in 1998 and 1999 ranged from 26 April (range 18 April–2 May, SD 2.67, $n = 121$, colony surveyed 3 May) at Knapp to 8 May (range 5–14 May, SD 2.39, $n = 100$, colony surveyed 14 May) at Moffett, both in 1998.

Ring-billed Gull. We saw the first Ring-billed Gull chicks from 16 to 20 May, in all instances at Honey Lake. Backdating implies the earliest eggs were laid about 20–21 April in 1994 and 1997. Nesting was somewhat advanced at Honey Lake in 1997, when on 16 May 3.1% of 2479 Ring-billed Gull nests checked had small chicks; no chicks were seen at any other colonies surveyed from 14 to 19 May 1997. In 1999, incubating adults and a lack of chicks at Goose Lake on 20 June indicated a very late initiation of nesting.

History of Breeding Colonies

Lake Shastina. It is unclear when islands became available or when gulls began nesting at this reservoir, which though created in 1928 took a long time to seal and hold water (DWR 1988, R. Ekstrom pers. comm.). Our counts of a mixed colony of Ring-billed and California gulls nesting among rocks and shrubs on a small island off landlocked Milkhouse Island (Table 1, Figure 2) appear to be the only population estimates for this site.

Shasta Valley WA. The only known evidence of gull nesting was in 1994 when low water at Steamboat Lake exposed two small dredge-spoil islands that later in the season became a peninsula. The attempts by a few Ring-billed Gulls to nest there apparently were disrupted by terrestrial predators (B. Smith pers. comm., Table 1).

Butte Valley WA. Historically, Meiss Lake covered about 4050 ha, but diking in the 1940s greatly reduced the size of the wetlands (K. Novick pers. comm.). The islands where gulls nest have been available since before the dikes; smaller islands created in managed wetlands since the establishment of the refuge in 1981 have not been used. Gulls have nested at Meiss Lake since at least 1970, when a 27 May survey of only one of the lake's islands revealed 1244 nesting gulls (species not distinguished; K. Novick in litt.). Aerial surveys of Meiss Lake from 1 to 5 June 1981 and 29 May to 1 June 1984 yielded estimates of about 1000 and 700 nesting gulls, respectively (B. E. Deuel in litt.). On 7 May 1988, observers estimated 600 to 1000 adult gulls on three of the four islands with nesting gulls that they checked; they did not estimate the proportions of the two species, but Ring-billeds were more numerous than Californias (K. Novick in litt.). In 1988, a landbridge formed, leaving the colony vulnerable to predation; in 1992, the lake dried up, and gulls did not nest successfully.

The first accurate nest counts at Meiss Lake on 7 May 1993 yielded 520 pairs of California and 450 pairs of Ring-billed gulls nesting on four low-lying

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islands (K. Novick in litt.). The early-season counts in both 1988 and 1993 may have underestimated the nesting population in those years. In 1994, both species initiated nesting on two peninsulas in the lake (Table 1, Figure 3a). Signs of coyote (*Canis latrans*) predation starting in May and the lake's drying by early July made it unlikely that gulls raised any young in 1994 (K. Novick pers. comm.). From 1995 to 1999, gulls nested on up to seven small islands in Meiss Lake, three or four in the central portion and one to three in the south portion of the lake (K. Novick in litt., Figure 3b). During this period, the nesting Ring-billed Gull population ranged from about 2525 to 4087 pairs with no trend (Table 1, K. Novick in litt.). By contrast, California Gull numbers increased steadily from about 327 pairs in 1994 to 2956 in 1999 (Table 1, K. Novick in litt.), although this trend is exaggerated by the artificially low count in 1994.

Lower Klamath NWR. Before 1900, Lower Klamath Lake consisted of about 22,267 ha of marsh and 12,146 ha of open water (Akins 1970). Currently, Lower Klamath NWR has 8907 ha of wetlands; 4858 to 6478 ha are seasonally flooded and 2024 to 3644 ha are permanently flooded marshes (USBR 1998). In 1905, Finley (1907) explored Lower Klamath Lake by rowboat, describing floating tule "islands" stretching for miles separated by a network of narrow channels. He and his companion, H. T. Bohlman, found "at least 500 pairs" of California and Ring-billed gulls nesting on the broken-down tules. They ascribed the nesting sites to Lower Klamath Lake, Oregon, but given the vast area of the lake and the difficulty of travel they could have missed other sites.

Since 1952, biologists at the Klamath Basin National Wildlife Refuges have estimated numbers of breeding gulls at Lower Klamath NWR, California (Table 2). From the 1950s to the 1970s, up to 2500 pairs each of the California and Ring-billed gulls nested. The refuge estimated 700 Ring-billed Gull nests in 1976, but subsequently very few appear to have nested at Lower Klamath. When thousands of California Gulls were nesting there in the 1980s, M. Robbins (pers. comm.) noted only one or two Ring-billed Gull nests, in 1981 and 1983.

Spraying of oil on gull eggs by biologists in the 1950s, to reduce gull predation on waterfowl eggs and young (J. Hainline pers. comm.), did not appear to have any major effect on gull populations on the refuge. Probably beginning in the 1950s or 1960s, and increasing from the 1970s to early 1980s, refuge personnel built islands in diked ponds to attract nesting Canada Geese (*Branta canadensis*; J. Beckstrand in litt.). Gull colonies expanded to occupy islands as they became available and first concentrated in Unit 4 of the refuge (early 1960s), then units 3 and 4 (mid-1960s), finally units 4 and 6 (late 1970s onward). The gulls' apparent increase from the late 1970s to the mid-1980s, peaking at 3000–5000 pairs of the California in 1985, prompted removal of most of the islands to reduce the perceived problem of gull predation on waterfowl nests and young (J. Hainline, D. Mauser pers. comm.). Draining of ponds in Unit 4 for maintenance in late April 1986 forced thousands of gulls to abandon nesting islands by 1 June, and they produced no young (R. Ekstrom, M. Robbins in litt.). In 1987 and 1988, numbers of gulls declined (refuge's annual reports). In 1989, after removal of islands in Unit 4C displaced over 2000 nesting gulls, biologists found only a

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Table 2 Numbers of Nests (and Young) of California and Ring-billed Gulls at Lower Klamath National Wildlife Refuge, 1952–1991

Year	California	Ring-billed	Unidentified
1952 ^a	1820 (3600)	2400 (5500)	
1953 ^a	930 (1580)	46 (80)	
1954 ^a	? (3025)	? (1810)	
1955 ^a	1533 (2759)	746 (1720)	
1957 ^a	1220 (1220)	900 (900)	
1958 ^a	800 (1000)	500 (600)	
1961 ^a	? (500)	? (400)	
1963 ^a			900 (2000)
1964 ^a	2500	400	
1965 ^a			1514 (2000)
1966 ^a			2000 (2500)
1967 ^a		2500 (2000)	
1968 ^a	1300 (1500)	800 (1000)	
1969 ^a	900 (1300)	600 (850)	
1970 ^a	548 (700)	950 (1200)	
1971 ^a	1550 (620)	700 (350)	
1972 ^a	1670 (508)	685 (322)	
1972 ^{a,b}			? (3000)
1973 ^a	? (600)	? (580)	
1976 ^a	210 (400)	700 (955)	
1977 ^c			present
1980 ^d	4000 adults		
1985 ^e	3000–5000		~2000 adults
1986 ^{a,f}	1000's (0)		
1990 ^a			~100
1991 ^a			~100

^aData quality category 3, from refuge's annual narrative reports.

^bFrom *Am. Birds* 26:884.

^cGulls nested successfully on islands in a dry lakebed (E. O'Neill *vide* D. W. Winkler in litt.).

^dA visit on 1 June produced a rough estimate of 2000 pairs (data quality category 2; Conover 1983, S. A. Laymon pers. comm.).

^eBased on visits from mid-June through mid-July (data quality category 2; R. Ekstrom in litt. and annual narrative reports).

^fFrom R. Ekstrom (in litt.).

few gull nests on the entire refuge. Since then the few breeding gulls have nested in Unit 6A or in Sheepy Lake (Table 1; J. Beckstrand pers. comm., Shuford pers. obs.). Sheepy Lake has been occupied by nesting gulls since at least the early 1990s (L. A. Moreno-Matiella pers. comm.), but its remoteness may have masked earlier occupation.

From 1994 to 2000, numbers of nesting pairs of California Gulls ranged from about 6 to 269 in Unit 6A of Lower Klamath NWR, where they bred on up to 8 small rocky islets (Table 1). During that period, Ring-billed Gulls

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nested in Unit 6A only in 2000, but in 1994 and 1997, at least, small numbers nested with even fewer California Gulls on a tule-mat island at Sheepy Lake (Table 1).

Tule Lake NWR. Before 1900, Tule Lake fluctuated in size from about 22,267 to 44,534 ha (Akins 1970) but today consists only of 5263 ha of return-flow permanent sumps (USBR 1998). The first reported visits to the colony, in 1931 (Moffitt 1942) and on 16 May 1940 (WFVZ), produced no population estimates. In at least the 1950s and 1960s, gulls bred irregularly, mostly in the upper sump, on flattened mats of tules sheared off by ice (E. J. O'Neill pers. comm.). Up to about 400 pairs each of both species nested there in at least six years from 1952 to 1964, though the data, from the refuge's annual report, are of low quality (category 3; see above). Since 1964, gulls are known to have nested at Tule Lake only in 1990, when L. A. Moreno (pers. comm.) found 35 adult and 11 young Ring-billed on a small rocky island in the lower sump on 19 July. Shuford found no nesting activity during our 1994–1997 and 1999 surveys.

Conover's (1983) report of 1980 California and 11,818 Ring-billed gulls breeding at Tule Lake in 1976 is in error. Those figures are the sum of "peak population" estimates, *not* numbers derived from nest counts, for Clear Lake and Lower Klamath refuges combined; no nesting data were available for Tule Lake in 1976 (refuge's annual reports, J. Beckstrand in litt.).

Clear Lake NWR. Before its outflow was dammed in 1910, Clear Lake consisted of a west lobe of about 4048 ha of shallow open water and an east lobe of about 2024 ha of marshlands (Akins 1970). The dam created a reservoir of open water, which today covers about 9623 ha (USBR 1998). Willett (1919) visited the "usual breeding grounds on islands" in Clear Lake on 10 April 1918, prior to nest initiation, and estimated about 2000 gulls present, about 90% California and 10% Ring-billed. On 11 and 12 July 1933, H. M. Worcester (in Lincoln 1933) found California Gulls close to fledging on an island in Clear Lake from which the water had receded three miles.

Estimates for Clear Lake from 1952 to 1989 come from the Klamath Basin refuges' annual reports, those from 1990 to 1993 from the refuges' reports or L. A. Moreno-Matiella (in litt.), who was studying nesting American White Pelicans (*Pelecanus erythrorhynchos*) (Table 3). From the 1950s through at least the 1970s up to about 850 pairs of California Gulls nested at Clear Lake, and from the 1950s through the mid-1960s up to about 550 pairs of Ring-billed Gulls nested there, though the estimates are rough (quality category 3; see above). Subsequently, numbers of Ring-billed Gulls appeared to increase sharply, as population estimates from 1968 to at least 1972 ranged from about 1150 to 2100 pairs. Data from the mid-1970s through the early 1990s did not distinguish between the two species, but numbers of gulls as a whole appeared to increase. Most estimates during this period ranged from about 2500 to 5000 nesting pairs. Our more precise estimates (category 1) from 1994 to 2000 ranged from 1739 to 3922 pairs of Ring-billed Gulls and 432 to 1769 pairs of California Gulls (Table 1).

The location of waterbird colonies at Clear Lake varies annually as the availability of islands varies with changing lake levels (L. A. Moreno-Matiella pers. comm., Shuford pers. obs.). Nesting sites are (1) a large rocky island in

Table 3 Numbers of Nests (and Young) of California and Ring-billed Gulls at Clear Lake National Wildlife Refuge, 1952–1993

Year	California	Ring-billed	Unidentified
1952 ^a	500 (950)	554 (1200)	
1953 ^a	475 (900)	450 (950)	
1954 ^a	685 (1850)	565 (1730)	
1955 ^a	423 (994)	527 (1325)	
1956 ^a	200 (210)	250 (260)	
1957 ^a	“above 1956 levels”	“below 1956 levels”	
1961 ^a	? (70)	? (30)	
1963 ^a			600 (1750)
1964 ^a	500 (600)	432 (500)	
1965 ^a	100 (300)	470 (1500)	
1966 ^a	250 (500)	500 (1000)	
1967 ^a	500 (500)	140 (300)	
1968 ^a	350 (500)	1885 (2300)	
1969 ^a	150 (200)	2000 (2500)	
1970 ^a	868 (950)	1165 (1800)	
1971 ^a	878 (500)	2134 (1000)	
1972 ^a	400 (460)	1690 (1200)	
1973 ^a	? (520)	? (1080)	
1977 ^b	“lower than 1976”	“lower than 1976”	
1985 ^a			? (4300)
1986 ^{a,c}			nearly 8000
1987 ^{a,c}			3000
1988 ^{a,c}			nearly 4500
1989 ^{a,c}			5000
1990 ^{d,e}			5000
1991 ^{e,f}			4000+
1992 ^{e,g}			2500 (2000+)
1993 ^{e,h}			3400

^aData quality category 3, from refuge’s annual narrative reports.

^bPeak population and production slightly lower in 1977 than in 1976 because of human intrusion in colonies.

^cOne to two, of several, mixed gull colonies on islands near the Clear Lake dam.

^dAn aerial survey on 20 June revealed 2000 gull nests on an island north of the Clear Lake peninsula (1630 young on 27 June ground survey) and 3000 nests on an island near the Clear Lake dam.

^eData quality category 2, from L. A. Moreno-Matiella (in litt.) and/or refuge’s annual narrative reports.

^fAbout 4000 gull nests on an island at the north end of the Clear Lake peninsula were later abandoned when a landbridge was exposed, allowing predator access. A count by foot on 30 June found 450 adult gulls on Bird Island and 270 adults on Rocky Island; the former was connected to shore in early June and produced no young, the latter held 265 young on 24 July.

^gSurveys by boat estimated 2000 gull nests on Rocky Island on 1 May and 500 nests on Bird Island on 10 June. Surveys by foot found 2000 young on Rocky Island on 13 July 1992. Exposed landbridges connected both islands to shore, and an electric fence was erected in late April or early May to protect various colonial waterbirds on Rocky Island.

^h1000 gull nests on Rocky Island, 1500 on the island north of the peninsula, 400 on Bird Island, and 500 on islands in the west lobe.

the east lobe of the lake that becomes several smaller islands at higher lake levels; (2) Bird Island, a sandy island near the east shore of the west lobe; (3) a large low-lying island of soil and small rocks at the north end of the lake in the channel connecting the two lobes; and (4) various small low-lying islands resembling (3) in the northeastern corner of the lake. In some recent drought years, when a dropping lake level connected islands to the mainland, biologists erected electric fences, preventing coyotes from entering and disrupting colonies, particularly those of the White Pelican (D. Mauser, L. A. Moreno-Matiella pers. comm.). In 1991, without such fences, gulls abandoned about 4000 nests after a landbridge formed.

Goose Lake. Since at least 1976 gulls have nested intermittently on low-lying islands, or a peninsula, near the southeast shore of Goose Lake. B. E. Deuel (in litt.) noted both California and Ring-billed gulls nesting there, 1–22 June 1976. D. W. Winkler (in Conover 1983) estimated 1205 California Gulls breeding at Goose Lake in 1977. Conover (1983) mistakenly reported that S. A. Laymon found 1200 California Gulls and <20 Ring-billed Gulls at Goose Lake in 1977; Laymon (pers. comm.) did not visit that area in 1977. From 1979 to 1985, B. E. Deuel (in litt.) visited Goose Lake in most years to survey or band waterfowl. On 15 June 1979 he estimated 800 California Gulls were nesting on a large island. In 1980, gulls were breeding at Goose Lake but were not counted, and during aerial surveys 1–5 June 1981 an estimated 400 gulls of unknown species were nesting there. In 1983, gulls again bred, but rising waters reduced the size of the nesting island. An aerial survey on 1 June 1984 detected a colony of about 400 gulls on a peninsula close to the inundated former nesting island; gulls were again nesting on the peninsula in 1985 but in much smaller numbers than when they nested on a nearby island. Shuford surveyed shorebirds at Goose Lake each year in late April from 1991 to 1995 and found no evidence of gull nesting; drought prevailed 1991–1994. The colony remained unoccupied in May 1996 (R. Ryno in litt.) but was reoccupied in 1997 (Table 1, Figure 4). A rising lake level in 1998 and 1999 reduced available nesting islands; Shuford's surveys on 20 June 1999 and 19 June 2000 revealed about 199 and 194 pairs of Ring-billed and 8 and 6 pairs of California gulls, respectively, nesting at the tip of a long peninsula.

Big Sage Reservoir. Big Sage Reservoir was completed in 1921 (DWR 1988); it now covers about 2133 ha (DWR 1988). B. E. Deuel (in litt.) first found gulls, mostly Ring-billed, nesting on islands here on 18 June 1976. During aerial surveys he found this colony active in 1980 and occupied by about 600 gulls 1–5 June 1981. From shore, on 2 July 1989, S. F. Bailey (pers. comm.) estimated >500 adult Ring-billed Gulls with young on an island in the middle of the reservoir; this colony cannot be censused completely from shore. In August 1992, the reservoir was completely dry, for the first time since 1935 (G. Dick pers. comm.), and it seems unlikely that gulls nested. But gulls had reoccupied the colony by 1994 (Table 1). Shuford visited the colony on 21 June 1999 and 20 June 2000 and found it dominated by Ring-billed Gulls in numbers similar to those in recent years but made no formal census. The reduced number of Ring-billed Gulls in 1997 could reflect a shift from Big Sage Reservoir to nearby Goose Lake, reoccupied that year for the first time in many years. In most years, the gulls

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nest only at the east end of Bird Island, the large island in the south-central portion of the reservoir, though in 1995 21% were on a small unnamed island to the northeast.

Middle Alkali Lake. Shuford discovered California Gulls nesting on a small scrub-covered island adjacent to landlocked Hansen Island on the east shore on 30 April 1993, during an aerial survey for shorebirds. On 4 May, by airboat, he found about 300 adults on the island, but as most had not laid determining the size of the population was not possible. On 17 May 1994, Shuford and C. Alexander found the island (Figure 5) connected to the lakeshore by a peninsula of saturated mud, crossed by numerous coyote trails. They counted 71 nests with eggs, 9 of which had recently been preyed on, some destroyed nests, and several dead adult gulls that had suffered predation. They estimated that prior to nest loss that about 100 nests had been initiated. The colony was unoccupied from 1995 to 1997.

Eagle Lake. Accounts of the birds of Eagle Lake from the late 1880s and early 1900s mentioned breeding by California Gulls but gave no population estimates (Ray 1915, 1921; Townsend in Grinnell et al. 1930). Ray and others collected at least five egg sets at Eagle Lake in 1914, when, as in recent decades, the gulls nested at Pelican Point (egg data slips MVZ, SDNHM, WFVZ). On 22 June 1921 Grinnell et al. (1930) found four California Gull nests on a small rocky island, and on 13 June 1929 they counted about 50 California Gulls along with two nests on an island where White Pelicans nested.

Gould (1974) reported that California and Ring-billed gulls were nonbreeding summer residents at Eagle Lake in 1970 and 1971. Lederer (1976) counted 13 California Gull nests at Eagle Lake in 1974, a year when rising water had isolated the nesting island (Pelican Point, *vide* Shaw 1998). From 1 to 5 June 1981, during aerial waterfowl surveys, B. E. Deuel (pers. comm.) estimated 150 gulls nesting. In 1990 J. Bogiatto (pers. comm.) estimated 1500 to 2000 California and 300 to 400 Ring-billed gulls nesting on Pelican Point; only the California fledged young. By 1991 drought lowered the lake's level and the island became a peninsula; that year and in 1992 gulls initiated nesting but abandoned their efforts midseason, apparently because of disruption by terrestrial predators. Nesting resumed in 1995 (201 nests of the California, 132 of the Ring-billed counted) when rising water made Pelican Point an island again (Table 1). No gulls nested there in 1996, 1997, or 1999, despite its remaining an island (Shaw 1998, Shuford pers. obs.), but did in 2000 (no population estimates made, J. Bogiatto pers. comm.).

Honey Lake WA. Ring-billed Gulls have nested since at least about 1920 at Hartson Reservoir (Moffitt 1942), a natural freshwater lake separated from the north shore of saline Honey Lake by sand dunes. From incomplete surveys (category 3) on 3 May 1940 and 14 May 1941, Moffitt estimated 150 and 75 Ring-billed Gull nests, respectively, and inferred that the population totaled "250 or more pairs." Johnston and Foster (1954) reported that when Hartson Reservoir was very low in 1950 about 750 gull nests were "counted on a small duck pond near the refuge headquarters." Although Ring-billed Gulls predominated, they suspected that California Gulls also were breeding. After 1950 the gulls again used the small islands in

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the reservoir. Nest counts (category 1) on 17 May 1953 revealed 717 pairs of the Ring-billed and 26 of the California on one island.

Various visitors from the mid-1950s to the mid-1980s estimated about 1500 to 4000 nesting gulls, the Ring-billed generally predominating (Table 4). In the extreme drought year of 1977, the numbers nesting were greatly reduced. On 23 June Winkler (1982, in litt.) found two nesting islands connected to the shoreline and dead adults and many destroyed eggs strewn about both colonies; on 19 July he found the colony abandoned. Such landbridging of natural islands during dry periods prompted refuge personnel to create additional islands in Hartson in the mid-1980s (K. Novick pers. comm.). Hartson Reservoir dried up in September 1990, and no gulls nested until 1993, after a very wet winter. Then high water reduced the number and size of the remaining islands, and most of the nesting gulls shifted to small islands in diked ponds north of Hartson (C. Holmes pers. comm.).

More accurate surveys (category 1) from 1993 to 2000 revealed 1727 to 2502 pairs of the Ring-billed and 1247 to 1913 of the California (Tables 1 and 2). The vast majority have nested on 9 to 18 small low-lying islands primarily near the north shore of Hartson Reservoir in the Dakin Unit (Figure 6b). In some years, up to 544 pairs of Ring-billed Gulls have nested on one to six small islands in diked ponds of the Dakin Unit north (units 6G and 6J) and east (Unit 5A) of Hartson Reservoir (Shuford pers. obs.). In 1994, about five pairs of Ring-billed Gulls nested in an isolated colony on a small island in a diked pond in Unit 15 of the Fleming Unit, the only known gull nesting at the refuge away from Hartson Reservoir or nearby ponds.

In May 1994, islands in Hartson Reservoir and Unit 6J were separated from the shoreline by only narrow shallow water or saturated mud; one formed a peninsula. On 15 May Shuford saw a coyote on the islands. B. Tatman (in litt.) found three islands that had had 631 nesting pairs abandoned on 7 June and 6 July and on 13 July counted 894 dead chicks on four islands that initially held 2398 nesting pairs.

Lake Almanor. This reservoir was created in 1913; today it covers 11,435 ha (DWR 1988). California Gulls were first reported nesting here in 1992, when a boat survey by H. Green (pers. comm.) revealed about 250 adults, many sitting on nests or courting or copulating, on a low-lying island along the east shore roughly 1–1.5 km south of the causeway at the north end of the reservoir. Distant views of the island via spotting scope from the causeway on 5 May 1993 revealed about 550 adult California Gulls, some of which were copulating, but views were inadequate to reveal nests (Shuford pers. obs.). The lake's level was rising at the time, and by late May the island was inundated (J. Evans pers. comm.), terminating any nesting attempt. Similarly, visits from late April to June, in 1995, 1996, 1997, 1999, and 2000 found the island tiny or submerged and yielded no evidence of gull nesting (Shuford, H. and P. Green pers. obs.). This island apparently is available for gull nesting under only a very narrow range of lake levels (H. Green pers. comm.).

Sacramento and San Joaquin Valleys. California Gulls formerly nested at a shifting station in the middle stretches of the Sacramento River (Dawson 1923, Grinnell and Miller 1944). Egg data slips (MVZ, SBCM, WFVZ) confirm the collection in the Sutter Basin, Sutter County, of at least six egg

Table 4 Numbers of Nesting California and Ring-billed Gulls at Honey Lake Wildlife Area, 1956–1990

Date	California	Ring-billed	Unidentified	Source
26 May, 2 Jun 1956 ^a	~500 adults	~2000 adults		W. M. Anderson <i>vide</i> MPCR notebooks
22–23 May 1963 ^b	~1025 nests	~1025 nests		Anderson (1965)
15–17 May 1964 ^c	present	~2000 adults		WFVZ collection
16 Jul 1976 ^d	40 young, 710 adults	700 young, 1800 adults		MPCR notebooks, R. Stallcup (pers. comm.)
11 Jun 1977 ^{a,e}		40 nests, 80 adults		S. A. Laymon (pers. comm.) <i>contra</i> Conover (1983)
23 Jun 1977 ^a	5 nests, 0 young, 15 adults	16 nests, 0 young, 100 adults		Winkler (1982, in litt.)
10 Jun 1979 ^a	4 adults	8000 adults		S. A. Laymon (pers. comm.)
17 May 1980 ^a			350 adults	D. A. Airola (pers. comm.)
15 Jun 1980 ^a	500 adults	3000 adults		S. A. Laymon (pers. comm.)
2 May 1981 ^c			600 adults	D. A. Airola (pers. comm.)
13 Jun 1981 ^a	500 adults	1000+ adults		S. A. Laymon (pers. comm.)
5 May 1984 ^a			2200+ adults	D. A. Airola (pers. comm.)
29 May 1984 ^{c,f}			1600 adults	B. E. Deuel (in litt.)
15–17 Jun 1985 ^a	80 nests	40 nests		S. A. Laymon (pers. comm.)
14 May 1990 ^g	1400 nests, 3012 adults	1928 nests, 3120 adults		J. R. Jehl, Jr., and C. Holmes (in litt.)

^aData quality category 2.^bHartson Reservoir filled nearly to capacity. Anderson counted 2050 gull nests on several islands and estimated that numbers of California and Ring-billed gulls were about equal.^cL. R. Howsley, R. Quigley, and K. E. Vorce collected at least 9 sets of Ring-billed Gull eggs from a colony of "1000 pairs" nesting on small islands in Hartson Reservoir; they also collected at least 2 sets of California Gull eggs from a small island with "only about 10 pairs."^dData quality category 3.^eConover (1983) reported that S. A. Laymon estimated 160 Ring-billed and 10 California gulls were breeding at Hartson in 1977. Laymon's field notes, however, mention an estimate of 40 nests and 80 adults of the Ring-billed and none of the California (S. A. Laymon pers. comm.).^fFrom aerial survey; gulls nesting on four islands.^gBased on direct nest counts on smaller islands and extrapolations from nest counts on transects across larger islands. (data quality category 1)

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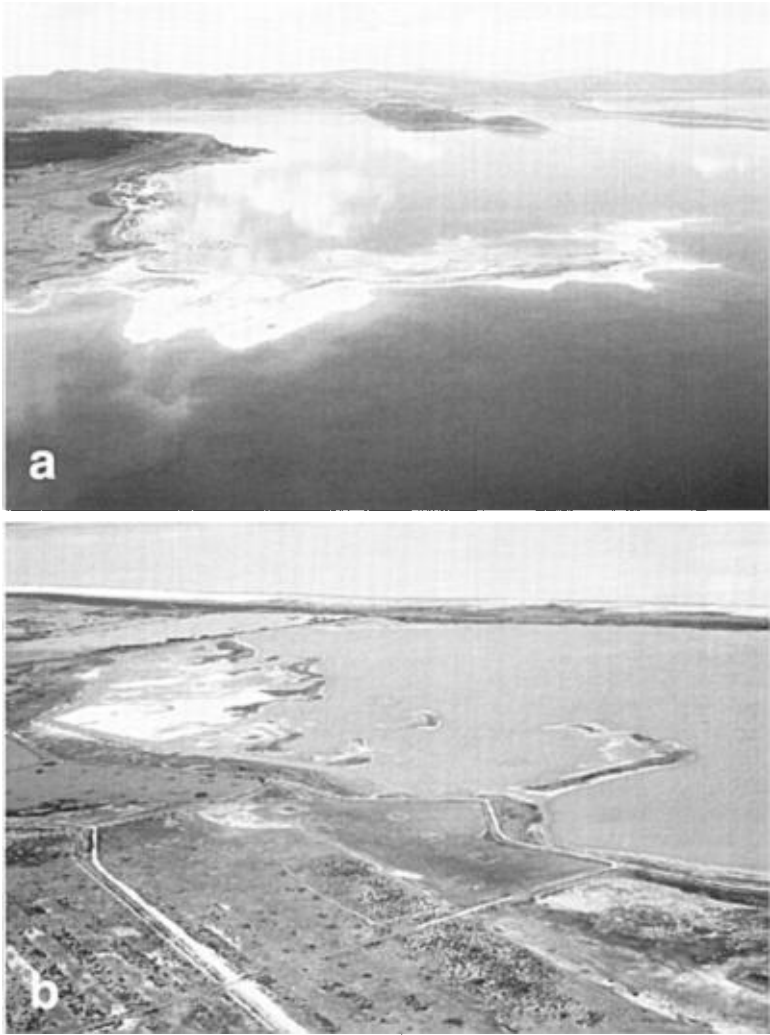


Figure 6. (a) Pelican Point was unoccupied by nesting gulls when connected to the shoreline south of Spaulding Tract, Eagle Lake, Lassen County, near the end of a prolonged drought. (b) Aerial view of Hartson Reservoir, Dakin Unit of Honey Lake WA, abutting the north shore of Honey Lake, Lassen County, in the background; low water levels during a prolonged drought gave coyotes access to the gulls' nesting islets on the north shore of Hartson and in adjoining ponds.

Photos by W. D. Shuford, (a) 23 May 1994 and (b) 24 May 1994

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sets from 21 to 24 May 1910 and 46 sets on 25 May 1911. On the former dates, C. S. Thompson found the colony about 7 miles from the Sacramento River. On the latter, H. A. Snow estimated about 200 pairs of gulls nesting near Riego within 2 miles of the Sacramento River. Both collectors indicated the colony was situated in overflow lands, where snow-melt waters that initially surrounded the nesting island had receded and left it high and dry at the time of their visits. Extensive construction of water-storage and flood-control structures later in the century has virtually eliminated such seasonal habitat in the Sacramento Valley.

On 14 June 1925, W. B. Sampson collected at least four sets of California Gull eggs from a small island in Woodward Reservoir south of Eugene, Stanislaus County, in the northern San Joaquin Valley (WFVZ egg data slips). Grinnell and Miller (1944) apparently were unaware of these data.

Mono Lake. Mono Lake is second only to Great Salt Lake in numbers of breeding California Gulls (Conover 1983, Paul et al. 1990, Winkler 1996). The extensive historical record on gull nesting at Mono Lake has already been presented and debated by Jehl et al. (1984, 1988) and Winkler and Shuford (1988). Regardless, it is clear that numbers of breeding gulls at Mono Lake have increased from the low thousands early in the century to tens of thousands in the 1970s to 1990s. Since 1983, the population has ranged from about 17,500 to 32,500 pairs with no clear trend (Figure 7). Storms at Mono Lake preceding the 1991, 1995, and 1998 breeding seasons appeared to delay initiation of nesting and prolong egg laying (PRBO unpubl. data), leading to underestimation of the breeding population. Such weather also likely reduced nesting attempts; in Wyoming many younger California Gulls may skip breeding in years of unusually harsh weather (Pugesek and Wood 1992, B. Pugesek pers. comm.). Before 1979 the vast majority of nesting gulls occupied volcanic Negit Island; they abandoned it that year when a dropping lake level exposed a landbridge, allowing coyotes to enter the colony (Winkler and Shuford 1988). Subsequently, most gulls have bred on two clusters of smaller islets—the Negit and Paoha islets (Figure 8). The former are composed primarily of volcanic rock, the latter of easily eroded lake-bottom sediments. From 1983 to 2000, 64% to 91% of the lake's nesting population has occupied the Negit Islets (Figure 7). Gull numbers increased on the Paoha Islets when their acreage increased during a period of declining lake level in the early to mid-1990s and on Negit Island during a period of recolonization in the mid-1980s to early 1990s. Since the late 1970s the lowered lake level periodically has enabled coyotes to reach some of the islands and cause the gulls to abandon their nests (Winkler and Shuford 1988, PRBO unpubl. data). Protection of the gull colonies was one of the factors in a water board's decision to restore Mono Lake by allowing the lake to rise from the 1994 level of 6374 feet (1943 m) above sea level to 6391 feet (1948 m), a process expected to take about 20 years (SWRCB 1994) but so far hastened by wet winters.

San Francisco Bay. San Francisco Bay supports the only coastal colonies of the California Gull (Winkler 1996), largely on abandoned levees, levee roads, and dredge-spoil islands in remote regions of the salt ponds, active and abandoned, at the bay's south end (Figure 9). Creation of the ponds began about 1860; by the 1930s about 12,145 ha of tidal marsh had been

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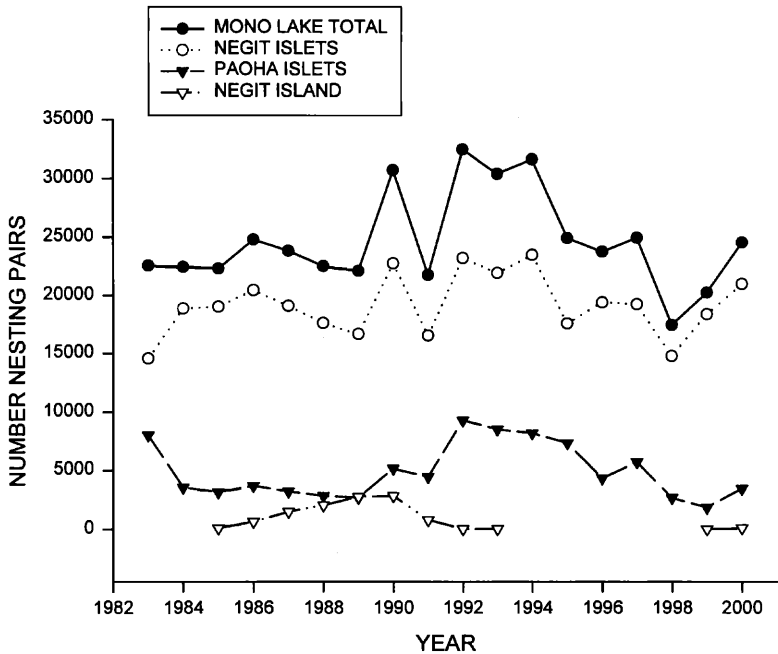


Figure 7. Trends in numbers of nesting pairs of California Gulls at Mono Lake, Mono County, California, 1983 to 2000. Totals presented for the entire lake and for three subsections: the Negit Islets, the Paoha Islets, and Negit Island.

converted into them. California Gulls were first discovered breeding in south San Francisco Bay in 1980 on a levee in Pond A6 at the Knapp property near Alviso, Santa Clara County (Jones 1986). The colony grew exponentially as birds expanded to an adjacent parallel levee in 1982 and to an adjacent road in 1986 (Table 5, Figure 10). Since 1983, California Gulls have colonized eight additional sites in San Francisco Bay, establishing the species' second largest breeding aggregation in the state. Six are in salt ponds in the south bay, two are in the central bay, one on an island in a wetland and on nearby breakwaters at the Alameda NAS, Alameda and San Francisco counties, the other on Brooks Island, Contra Costa County. The source of the bay's population is unknown, but it must be immigration, since local chick production alone cannot account for its rapid growth.

Nevertheless, California Gulls face some threats in south San Francisco Bay. Introduced Red Foxes (*Vulpes vulpes*) were first sighted at Pond A6 in 1991, subsequently near the colonies at Alviso Pond, Moffett, and Mowry 2. These colonies were partially or completely abandoned in the following sequence: Pond A6 (1991–1997), Alviso Pond (1991–1995), Mowry 2 (1995), and Moffett (1997). All of these colonies are either permanently attached to the mainland or become landbridged when waters recede early

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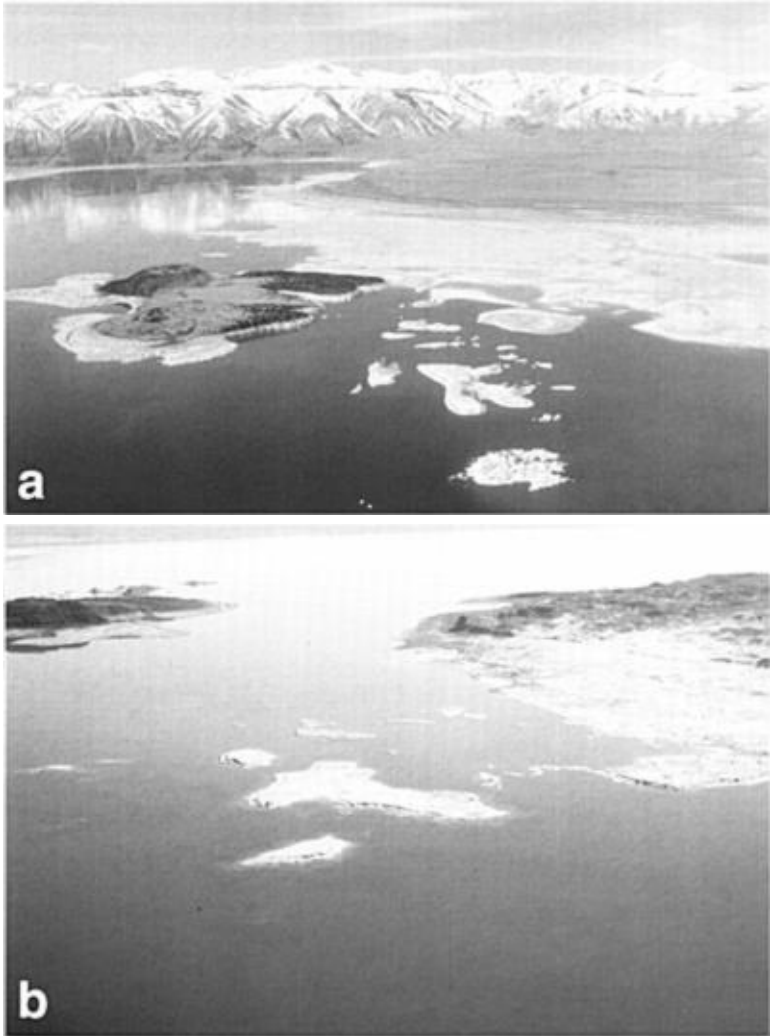


Figure 8. Aerial views of California Gull nesting islands at Mono Lake, Mono County. (a) The Negit Islets in right foreground flanked to left by the larger, darker Negit Island, shown here connected to the mainland by a landbridge at a lake elevation of about 6372 feet; the steep, snow-covered eastern escarpment of the Sierra Nevada is in the distance. (b) The Paoha Islets (center) off the western shoreline of Paoha Island, with Negit Island and the Negit Islets in the left background.

*Photos (a) courtesy Mono Lake Committee, circa 1982,
and (b) by W. D. Shuford, 24 May 1994*

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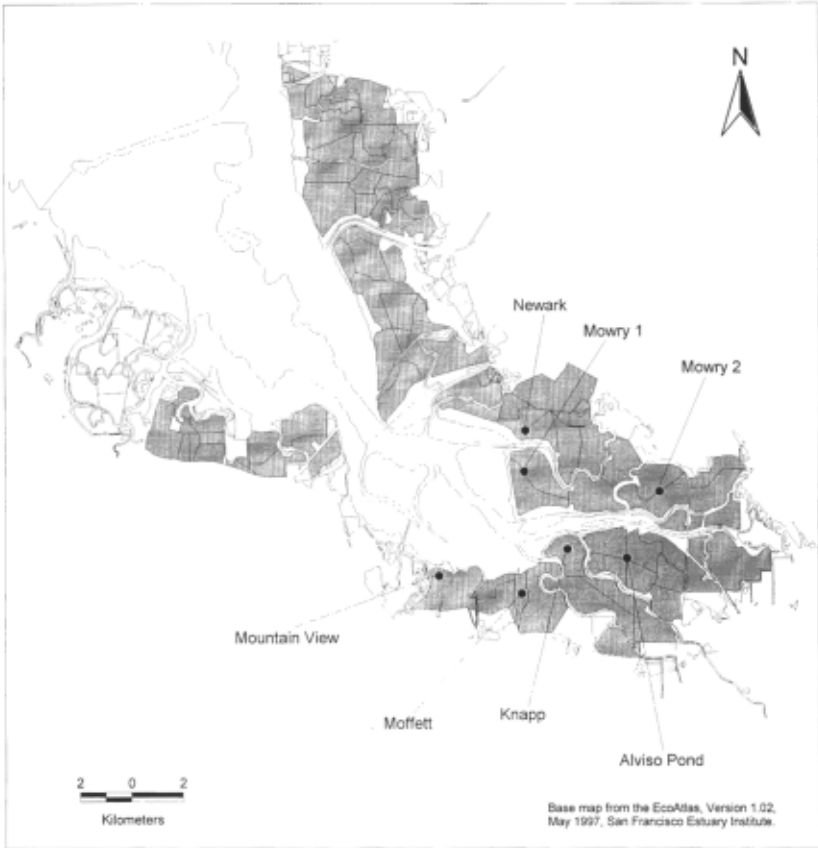


Figure 9. Location of California Gull colonies in south San Francisco Bay salt ponds (shaded); see Table 3 for data on colony sizes. The Alameda NAS and Brooks Island colonies in the central bay are not depicted.

in the nesting season. Additionally, the Don Edwards San Francisco Bay NWR purchased the Knapp property from Cargill Salt Division in 1989, and the pond remained an active salt evaporator until 1993. Since then the pond has not been actively managed and no water has been pumped into it.

Salton Sea. Small (1994) reported a failed nesting attempt of a single pair of California Gulls at the south end of the Salton Sea, Imperial County, in July 1976, and two pairs laid eggs but failed to fledge young at the north end of the Salton Sea, Riverside County, in 1996 (*Field Notes* 50:996). In 1997, 22 pairs of California Gulls bred successfully on a small rocky and sandy islet off Obsidian Butte at the south end of the Salton Sea; this colony increased to 37 pairs in 1998 and 40 pairs in 1999 (Molina 2000).

Other sites. Gulls have been reported breeding at three other sites in the

Table 5 Numbers of Pairs of California Gulls Nesting in San Francisco Bay, 1980–2000^a

Year	Site										Total
	Knapp (Pond A6)	Newark	Alviso Pond	Mountain View	Mowry 1	Mowry 2	Moffett	Alameda NAS			
1980	12	—	—	—	—	—	—	—	—	—	12
1981	30	—	—	—	—	—	—	—	—	—	30
1982	206	—	—	—	—	—	—	—	—	—	206
1983	671	23	—	—	—	—	—	—	—	—	694
1984	808	22	21	—	—	—	—	—	—	—	851
1985	1113	277	187	—	—	—	—	—	—	—	1577
1986	1422	199	28	—	—	—	—	—	—	—	1649
1987	1657	11	46	—	—	—	—	—	—	—	1714
1988	2049	15	45	—	—	—	—	—	—	—	2109
1989	2121	0	217	—	—	—	—	—	—	—	2338
1990	2246	0	27	1	—	—	—	—	—	—	2274
1991	2588	0	0	—	—	—	—	—	—	—	2588
1992	2750	0	32	29	—	—	—	—	—	—	3259
1993	3423	—	90	39	—	—	—	—	—	—	3618
1994	3990	—	0	86	—	—	—	—	—	—	4500
1995	3618	—	2	4	—	—	—	—	6	—	4357
1996	3279	—	705	—	—	—	—	—	205	—	5076
1997	3128	—	878	22	—	—	—	—	50	—	4312
1998	3281	—	814	—	—	—	—	—	328	—	5076
1999	4690	—	1051	—	—	—	—	—	149	—	4551
2000	5741	—	993	—	—	—	—	—	127	—	6731
									1263	0	8168 ^b

^aExpressed as counts of active nests. Data of quality category 1, except at Alameda NAS where category 2 (see Methods). —, No survey made; 0, survey made but no nesting gulls found.

^bIncludes four nests at Brooks Island, Contra Costa County (S. Bobzien in litt.)

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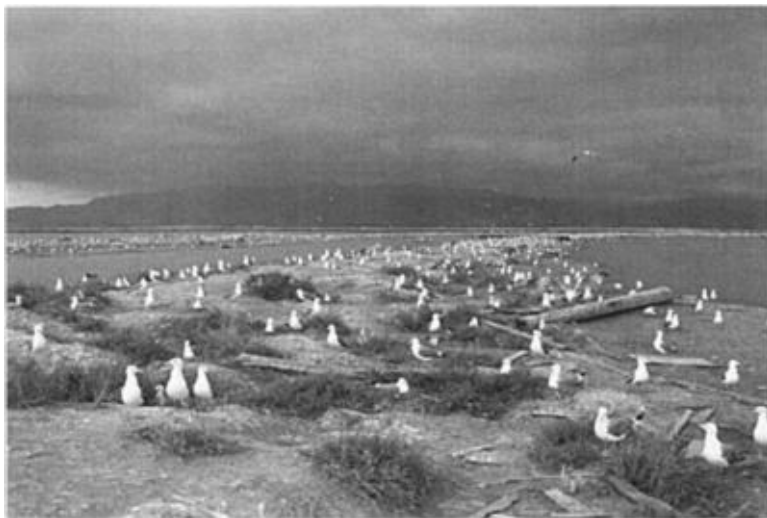


Figure 10. California Gulls nesting amid weeds and woody debris on abandoned levees in a salt pond at the Knapp property in south San Francisco Bay near Alviso, Santa Clara County.

Photo courtesy SFBBO archives, mid-1980s

interior of California, but information on these attempts is poorly documented or in error. Dawson's (1923) report of nesting at Lake Tahoe, El Dorado County, is unverified (Grinnell and Miller 1944). Cogswell's (1977) report of California Gulls breeding at Topaz Lake, and perpetuated from that source by Small (1994, A. Small pers. comm.), is erroneous (H. L. Cogswell pers. comm.). Finally, Small (1994) reported that Ring-billed Gulls have bred at Modoc NWR, Modoc County, on the basis of a refuge checklist only (A. Small in litt.), but refuge biologists know of no evidence that the species has ever bred there (R. L. Ryno pers. comm.).

Population Trends

Though Conover (1983) concluded that gulls have increased greatly in California and the rest of the West during the past century, the historical record is limited. We believe that Conover's (1983) comparisons to the early 1900s are inadvertently biased toward an increase because no author early in the century made a careful attempt to chronicle gull colonies, as Conover did for the recent period, and the number of persons likely to know of or report gull colonies has increased greatly since early in this century.

Even knowledge of the recent record is poor. For example, Conover (1983) reported only six gull colonies from the interior of California in the late 1970s to early 1980s, but we now know that 14 colonies in that area have been active, at least intermittently, since that time. Furthermore, the

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methods and dates of surveys are reported infrequently, or the estimates are rough, made incidentally to other activities. Exemplifying the latter are two independent estimates of nesting gulls at Honey Lake in 1981 that differ by a factor of 2.5 (Table 4). Similarly, Paul et al. (1990) commented "sporadic records and unequal effort make data [on populations of the California Gull at Great Salt Lake] difficult to interpret." Also, the year-to-year fluctuations in gull numbers and nesting sites caused by changing water levels devalue estimating regional populations for a given time period by summing data collected from various sites in different years with wide-ranging environmental conditions. Gilligan et al. (1994) and Conover et al. (1979) reported fluctuations at individual colonies and shifting among colonies in Oregon and Washington, Paul et al. (1990) at Great Salt Lake, the latter during a period when the overall population was stable. Consequently, we believe that apparent trends should be interpreted with the utmost caution and only when the usually limited data are compelling. Conover (1983) recognized many of the limitations of the data available but still expressed apparent population trends in terms of percentage increase over time, a practice we consider indefensible.

Despite these caveats, we draw some conclusions. The clearest well-documented example of a population increase is in San Francisco Bay, where California Gulls initiated nesting in 1980 and now total over 8000 pairs. At Mono Lake, California Gulls have increased greatly in this century, but it is uncertain whether the population was recovering from a decline in the 1800s, as at Pyramid Lake, Nevada (Yochem et al. 1991). At Honey Lake, numbers seem to have increased, but even when accurate counts have been taken the population has fluctuated greatly with climatic conditions. At Clear Lake nesting populations appeared to increase from the 1950s to the late 1960s, remained relatively stable until increasing again in the mid-1980s, then dropped from 1998 to 2000. Some of these increases may have resulted from birds shifting from nearby Tule Lake or Lower Klamath NWRs, particularly in the 1980s when the Lower Klamath population of thousands of gulls decreased to near extirpation. While estimates at Big Sage Reservoir and Butte Valley suggest increases, these may be artifacts of a limited earlier record followed by more accurate subsequent counts or, again, shifting of birds from nearby colonies. For other sites, the data are too few or colony occupancy too intermittent to warrant interpretation of population trends. On the whole, populations of California Gulls, at least, have increased substantially in California in recent decades, driven largely by trends at Mono Lake and San Francisco Bay. The record before 1950 is too scant for trends then to be estimated with confidence.

Paul et al. (1990) traced the history of California Gulls breeding at Great Salt Lake, where the population remained relatively stable from 1931 through the 1980s, then rose dramatically from 1989 to 1990 (D. Paul pers. comm.). In Nevada Yochem et al. (1991) concluded that California Gulls increased from several thousand birds in the 1870s (followed by a decrease through 1920s) to about 15,000 birds in the 1980s. These conclusions were based on an inference that a description of the Pyramid Lake colony in 1868 as "immense" and spread over "several acres" equaled a population of 4000-6000 birds and that this was the entire population in

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the region. Their rough estimates of 16,700 breeding gulls in 1985–1986 were followed by more accurate estimates of 10,700 in 1989–1990 (Yochem et al. 1991), suggesting gulls either shifted to other states or earlier estimates exaggerated the size of the population. Though these authors also reported rough estimates of 3000 pairs of California Gulls at Lahontan Reservoir 1983–1985, they omitted Alcorn's (1988) estimates of only 500 and >400 nests there in 1986 and 1987, respectively. We are skeptical that the Nevada population of California Gulls has increased greatly historically.

We remain uncertain whether the benefit to gulls of creation of islands in reservoirs, agricultural irrigation, and augmentation of the food supply on the wintering grounds has compensated for the loss of >90% of California's historic wetlands (Dahl 1990). Further research should concentrate on accurate population estimates via rangewide surveys and investigating gulls' responses to fluctuating environmental conditions.

Management Issues

The main threat to breeding gulls is the periodic scarcity of isolated nesting islands. This was particularly evident in 1994 when low water levels in northeastern California appeared responsible for a lack of suitable nesting islands at Goose Lake and Eagle Lake and for the formation of landbridges at Shasta Valley, Butte Valley, Clear Lake, Middle Alkali Lake, Honey Lake, and Mono Lake, allowing coyotes access to part or all of the colonies. Although periodic droughts are a natural phenomenon to which gulls are adapted, water diversions for human uses may exacerbate their effects. When possible, refuge managers and reservoir operators should maintain water levels that protect nesting islands for gulls. Despite the remoteness of many colonies, human disturbance is a potential threat. Seasonal closure of nesting islands has proved effective at Mono Lake (Shuford pers. obs.), but such restrictions or interpretive signing will likely be effective only where adequate personnel are available for enforcement or interpretation. In some instances such efforts might be counterproductive in drawing undue attention to nesting colonies. Protection of gull colonies will likely be most effective through comprehensive conservation plans that address the needs of all colonial waterbirds that nest together on islands.

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