

STATUS OF THE WHITE PELICAN IN THE UNITED STATES AND CANADA THROUGH 1964

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In 1931–1932 a comprehensive survey of the breeding colonies of White Pelican (*Pelecanus erythrorhynchos*) was made by Thompson (1933). More than three decades later it seemed desirable to make another inquiry as to the status of the species to ascertain whether this large, conspicuous, and somewhat controversial bird, having both esthetic appeal and economic value, is maintaining itself in sizable numbers or is becoming a "threatened species." We decided to assess the continental breeding population for each of two successive seasons, 1963 and 1964. Unlike the earlier survey in which Thompson was able to visit personally several of the breeding colonies, we have had to take inventory almost entirely by means of letters sent to ornithologists and refuge managers at or near the known colonies. The one exception was that we were able to visit the Gunnison Island colony in Great Salt Lake on 9 July 1964. We should like to express our thanks to all those who helped in this survey, most of whom were governmental officials in the United States or Canada. We particularly wish to thank the personnel at the Patuxent Wildlife Research Center of the U.S. Fish and Wildlife Service for furnishing a list of refuge managers to whom we could direct inquiries.

The information solicited for each colony or aggregation of small colonies pertained to the number of adults present during June and July for each of the two years, as well as the number of nests and the number of young. In presenting the information thus gathered, we have followed essentially the sequence employed by Thompson in arranging the colonies alphabetically by states in the United States, followed by those in the provinces of Canada. By recapitulating briefly the situation as Thompson found it and then presenting the recent data, a basis of comparison is afforded for each colony as well as for each state and province. When available, pertinent data are included for the intervening years so as to signify trends and gain further insight as to factors affecting the welfare of the species. Although we have made inquiry about all colonies past or present known to us, we doubtless have missed some. A few of our contacts failed to respond. In some instances we have information for one year but not the other. Despite these limitations we feel that the survey is fairly complete and that we have some basis for drawing conclusions regarding population trends for the 32 years between 1932 and 1964.

BREEDING COLONIES IN THE UNITED STATES

CALIFORNIA

Thompson (1933:8–23) presented the historical record for 10 colonies in California, only two of which were still in existence in 1932. One of these is now abandoned and the other drastically reduced. A few of the locations where pelicans formerly nested are now national wildlife refuges, and there may be a recovery in years to come at these potential areas.

Clear Lake National Wildlife Refuge. This site in Modoc County was one of the four largest colonies in 1932. Although Thompson gave no data for adults, he states that 5000 young were hatched that year. For 1952, Low (Aud. Field Notes, 6:292, 1952) gave the figure of 1380 nests in six colonies but noted that two colonies, located on a peninsula and containing 100 and 500 nests, had been destroyed by coyotes. From the remaining four came 2500 young. In 1963 the refuge manager reported 1060 adults, 430 nests, and 900 young. For 1964 there were 1860 adults,



Figure 1. Breeding colonies of White Pelicans in North America. Solid dots represent major colonies present during 1963–1964 survey. Four of the seven (Clear L., Calif.; Pyramid L., Nev.; Great Salt Lake, Utah; Chase L., N. Dak.) were also major colonies at time of Thompson's 1931–1932 survey. Half-solid dots (Dore, Johnston and Chase lakes, Canada) were considered major colonies by Thompson but have since declined. Three large colonies in Montana (Medicine L., Bowdoin R., Chas. M. Russell R.) have become established since the Thompson survey. Circles show locations of minor colonies in 1963–1964.

800 nests, and 609 young. Although more adults were present the second year, there were fewer young. While there has been a marked decline from 1932, the downtrend would seem to have slowed somewhat since 1952.

Salton Sea National Wildlife Refuge. This colony was of little significance at the time of Thompson's survey (1933:17), and with fluctuating lake levels and increased recreational use of the lake it is surprising that pelicans persisted in nesting there as long as they did. The last breeding was reported in 1956 and 1957. In 1956 about 100 pelicans nested on a small island near the south shore, but in June the adults deserted the nests and nestlings (Small, Aud. Field Notes, 10:410, 1956). In 1957 the refuge manager reported an estimated population of 30 adults. A few eggs were laid on the small sand island, but incubation did not take place and no young were reared. During June and July 1963 there were 225 non-nesting pelicans. The number increased to 650 by 20 October. There was no indication of nesting in 1963. No data are available for 1964.

Lower Klamath National Wildlife Refuge. Thompson (1933:35) combined his data for the Klamath Lakes and placed the information under Oregon. Former large colonies were then gone, mainly because of drainage. In the meantime a colony has become re-established at the Lower Klamath Lake. In 1952 Low (Aud. Field Notes, 6:292, 1952) reported approximately 1000 nests in five colonies that produced 1800 young. In 1963 there were 700 adults, an estimated 300 nests, and an estimated 600 young. In 1964 there were 1500 adults, 250 nests, and 400 young.

The other colonies. Buena Vista Lake in Kern County continues to be ephemeral, and although pelicans occasionally are reported there (see Small, Aud. Field Notes, 13:399, 1959) no nesting occurs. The same situation exists at Goose Lake, 30 miles to the northwest. Conditions, as Thompson reported them, apparently have not changed at Eagle Lake, Lassen County; Elsinore Lake, Riverside County; Goose Lake, Modoc County; Kern Lake, Kern County; or Tulare Lake, Kings County. All these former colonies are still abandoned. The refuge manager at the Sacramento National Wildlife Refuge reported that there were 50 adults on the refuge during July 1963 and 180 in June 1964, but that no White Pelicans have ever nested there. Thompson (1933: 22) reported that a small colony once existed at Tule Lake, Modoc County, but at the time of his study the lake was but a fraction of its former extent and was abandoned by the pelicans. In the meantime there has been habitat improvement, and 630 adult pelicans were counted on the Tule Lake National Wildlife Refuge during the summer of 1963. There was no indication that they were nesting. In 1964 there were 220 adults.

At the relatively new Modoc National Wildlife Refuge, a few pelicans occur regularly during June and July. In 1963 the numbers fluctuated between 15 and 30. During the first half of June 1964 there was an average of 42 on the refuge. Pelicans may eventually utilize the Tule Lake and Modoc refuges for nesting.

COLORADO

Thompson (1933:23) did not unearth any evidence of pelicans nesting in Colorado, but there were some vague references to their once having bred there. Very recently a colony has become established at Riverside Reservoir. This colony, near Masters, Colorado, was discovered during the breeding season of 1962 (Ryder and Grieb, 1963) when from 200 to 250 adults with 60 young were seen on an island in the reservoir. Ryder reports that in May 1963 there were an estimated 200 adults with 55 nests from which 44 fledglings were produced. For 1964 there were 110 adults, with 50 nests and 35 young.

FLORIDA

Thompson (1933:23) reviewed sparse evidence that the White Pelican may once have nested in this state, but the species did not do so in 1932 and had not for many years. We have not turned up any nesting records either, but it may be worth noting that some large flocks have occurred there. May (1936) reported a flock seen in the Everglades in 1934 that was estimated to number 1000. The refuge manager of the South Florida National Wildlife Refuges reported 5000 White Peli-

cans observed in Tampa Bay on 15 July 1956. For our 1963–1964 survey the estimated number of White Pelicans on the west coast of Florida from Cedar Key to Cape Sable was 50 adults each year.

IDAHO

Thompson (1933:24) stated that there were no nesting colonies in Idaho in 1932 but that one had formerly existed at the Minidoka Wildlife Refuge in Cassia County. Also large numbers of nonbreeding pelicans occurred on the Snake River. There is no record of nesting in Idaho since 1932, but pelicans have been reported at certain refuges, one being the Minidoka National Wildlife Refuge where there were 115 on 2 June 1963. The number increased to 400 by 20 July 1963. For 1964 there were 40 on 1 June, and by 11 June they had increased to approximately 200. It is assumed that the usual increase during the month of June is due to nonbreeders moving into the area for feeding and then remaining until the fall migration.

On the Deer Flat National Wildlife Refuge in an area along the Snake River between Walters Ferry, Idaho, and Brownlee Reservoir, Oregon, there were no pelicans on 3 June 1963, but by 29 July 1963 there were about 55 adults. The 13 June 1964 census showed 60 adult pelicans on the refuge.

MINNESOTA

We have nothing to add to Thompson's statement (1933:25–26) following his historical résumé that the breeding of the White Pelican, once common in large colonies throughout the state, was virtually at an end by 1878 when the last colony of any note was driven away by visitors.

MONTANA

Thompson (1933:26) commented that Montana never has been an important breeding ground. There were two small colonies at Big Lake and Lake Bowdoin, but the latter appeared to be growing. There have been some significant changes since 1932.

Bowdoin National Wildlife Refuge. This has come to be one of the large breeding areas for White Pelicans in the United States, with nesting apparently continuous since 1932. Nest counts on Pelican Island for the first few years after Thompson's summary are as follows: 1932, 50 nests; 1933, 6 nests; 1934, 40 nests; 1935, 116 nests. On 8 June 1935 there were also 70 nests and 150 young on Woody Island and a total of 800 adults on both Pelican and Woody islands (Weydemeyer and Marsh, 1936). Subsequently there was a population increase, and by 1949 there were 3500 young produced (Gammell, Aud. Field Notes, 3:243, 1949). During the first part of May 1950 an estimated 3500 adults were on the refuge (Gammell, Aud. Field Notes, 4:247, 1950). During 1953 the islands at the Bowdoin Refuge reached their saturation point, and White Pelicans nested on a peninsula (Gammell, Aud. Field Notes, 7:314, 1953). In 1962 there were an estimated 7500 adults nesting on three islands and a small portion of the shoreline (Nero, Aud. Field Notes, 16:487, 1962). Nero (*loc. cit.*) also reported for 1962 an estimated 900 nonbreeding adults on the Fort Peck Dam Reservoir, which is located about 70 miles southeast of Bowdoin Refuge. For 1963 at Bowdoin there were 5500 adult pelicans, an estimated 2200 nests, and an estimated 3200 young produced. In 1964 there were 5750 adults, 3683 nests, and 5957 young.

Charles M. Russell National Wildlife Range. This site near Lewistown, Montana, is apparently a new breeding area, for the refuge manager reported that there were 1550 adults on the refuge that produced 200 young during the 1963 breeding season. For 1964 there were 415 adults, but flooding destroyed all the nests.

Medicine Lake National Wildlife Refuge. This is another colony site established since Thompson's survey. It is located in the northeastern corner of Montana. In 1949 there were

500 young produced on the refuge (Gammell, Aud. Field Notes, 3:243, 1949). For 1963 there were 3500 adults at the peak during July, and 1140 nests contained 2300 eggs. From these about 1000 young were raised to flight stage. For 1964 there were estimated to be 3500 adults, 1300 nests, and 1000 young.

Red Rock Lakes National Wildlife Refuge. In 1963 there were 550 adults present during June and July but no nesting. For 1964 there were 210 adults but again no nesting.

NEVADA

The Anaho Island colony at Pyramid Lake has long been one of the largest colonies, but Thompson (1933:28-31) showed that the numbers had decreased. Colonies at Walker and Washoe lakes disappeared long ago. Numbers apparently increased at Pyramid Lake for a few years after 1932 but lately have been falling again. From Bond (1940) and Marshall and Giles (1953) we have the following data: 9 June 1932, 2994 nests and 300 young; 21 June 1940, 100 nests and 3000 young; June, 1942, 1761 nests and 1553 young; 26 May 1944, 4238 nests and 5417 young; 3 July 1950, 4160 young; 15 May 1951, 5650 nests and on 6 July the same year 3742 young. The adult population during 1951 was estimated at 11,300 on the basis of two birds per nest. According to Scott (Aud. Field Notes, 15:484, 1961) the population had been declining over the past 10 years. In 1961 there were 3000 young produced. In 1963 the refuge manager reported that in May there were approximately 6000 adults, 1000 nests, and 2500 young produced. The comment was made that in 1963 the population was reduced considerably from previous years perhaps because of low water and low fish populations in the Carson and Truckee river drainages. For 1964 there were 7000 adults, 1608 nests, 1514 young, and still 945 eggs when the census was taken, but the date was not specified.

Stillwater National Wildlife Refuge. The refuge manager reported 1900 nonbreeding pelicans there during 1963 and 600 during 1964.

NORTH DAKOTA

Thompson (1933:32-35) summed up the situation for this state with the statement: "In North Dakota, then, as in the western states, there has been the destruction of scattered pelican breeding colonies and a concentration at one protected site, with some indication of increase since 1905." The site referred to is Chase Lake, Kidder County.

Arrowwood and Chase Lake National Wildlife Refuges. The Arrowwood National Wildlife Refuge is not a nesting area but is one of the feeding areas for the White Pelican population that nests at the nearby Chase Lake National Wildlife Refuge. The history of pelicans at Chase Lake is detailed by Thompson (1933). It had a population of 500 in 1905, had not increased much by 1916 but numbered from 2500 to 3000 by 1924 and so continued until 1932. The situation since then is as follows, the data being furnished by the refuge manager except as otherwise noted: 1937, 65 young (Gammell, Aud. Field Notes, 1:183, 1947); 1941, 300 adults; 1942, 45 adults and 25 young; 1943, 275 adults and 25 young; 1944, 1100 adults, 750 nests, and 1000 young; 1945, 1200 adults and 900 young; 1946, 1250 adults, 500 nests, and 950 young; 1947, 1075 adults, 400 nests, and 925 young; 1948, 1100 adults, 1100 young; 1949, 3000 adults, 1100 young; 1950, 1300 young; 1951, 1400 young; 1952, 1400 young (Gammell, Aud. Field Notes, 7:314, 1953); 1953, 1200 young (Gammell, *loc. cit.*); 1954, 6000 adults; 1955, no figures available but still nesting since 100 young banded; 1956, 1200-1500 young (Nero, Aud. Field Notes, 10:391, 1956); 1957, 1500 young (Nero, Aud. Field Notes, 11:413, 1957); 1958, no figures submitted except 100 young banded; 1959, 3500 nests; 1960, 500 nests; 1961, 4000 nests; 1962, no data except 664 young banded. For the year of our survey in 1963 there were an estimated 8000

adults based on a figure furnished of 4000 nests. The number of young was not given. For 1964 there were again 8000 adults; the number of nests was not reported, but there were 3000 young.

Des Lacs National Wildlife Refuge. While not known to breed there, many nonbreeding pelicans frequent the refuge during the summer. According to Gammell (Aud. Field Notes, 4:282, 1950) in 1950 there were between 3000 and 4000. The refuge manager reported that in 1963 the peak number was 130 birds. This was below the average summer population, probably as a result of lack of food because of drought during recent years. In 1964 there were 90 adults on the refuge in June.

Devils Lake and Sullys Hill Preserve. Thompson (1933:34) reviewed early records of nesting at this site, but it was abandoned about 1920. A re-establishment occurred, for the refuge manager at Sullys Hill National Game Preserve reported that pelicans nested on Devils Lake during the summers of 1956, 1957, and possibly also 1958. In 1956 about 350 pelicans were seen and 10 nests found containing 12 eggs and 6 young. No data were given for 1957. Since then, with drought conditions prevailing, the fish in the lake have been largely eliminated and the island nesting site has become a peninsula. There was no nesting here or anywhere in the north-eastern quarter of the state in 1963, but 100 adults frequented the lake in 1964.

Long Lake National Wildlife Refuge. Thompson (1933:34) cites a report of about 100 pelicans nesting at Long Lake in 1932. Apparently they do not nest there at present, but nonbreeding adults do occur. Gammell (Aud. Field Notes, 3:234, 1949) found 230 adults there during the summer of 1949, while for 1950 there were 500 nonbreeding adults. However, on 28 April 1951 only 50 adults were sighted (Gammell, Aud. Field Notes, 5:262, 1951). According to our survey the number at the refuge during June and July 1963 varied from 40 to 120, for an average of 100. For 1964 they varied from 14 to 400, with again an average of 100.

Slade National Wildlife Refuge. During the summer of 1963 there were about 30 pelicans on the refuge. For 1964 there were only about 5 present, but at Northwest Slough about one mile west of the refuge there were about 100 pelicans for a total of 105. They do not nest in this area.

Lower Souris National Wildlife Refuge. Pelicans do not seem to nest here, but there is a fairly large number of nonbreeders reported as follows: 1958, an aerial count on 18 August showed 3780; 1959, about 300 nonbreeding birds with an August influx that raised the number to about 4000; 1960, 300 in early summer, August peak, 4000; 1961, 3000 estimated; 1962, a summer resident flock of 500, numbers increasing to 1500 in migration. For the years of our survey, on 22 April 1963 the aerial census revealed 250 pelicans, but the number built up to about 500 in June and July. For 1964 the number varied from none to 300, depending upon water discharge from the control structures. A flow of water appears to concentrate fish below the dam; consequently the pelicans flock there. It was thought that perhaps 150 represented the normal summer population in the refuge. There is no evidence of nesting to date.

Snake Creek National Wildlife Refuge. According to Gammell (Aud. Field Notes, 9:338, 1955) White Pelicans began to utilize the Garrison Dam and surrounding area late in the 1954 season. On 15 June 1962 there were 200 nonbreeding pelicans on the refuge (Nero, Aud. Field Notes, 16:487, 1962). For 1963 there were, according to the refuge manager, about 200 pelicans. During June 1964 the numbers fluctuated between 100 and 200. There is no evidence of their having nested there yet. The pelicans range from Garrison Reservoir to the refuge and southeasterly to possibly Turtle or even Chase lakes.

Tewaukon National Wildlife Refuge. Pelicans occur here in summer but have never nested. In 1963 it was estimated that there were 175 birds; in June 1964 there were 39.

Upper Souris National Wildlife Refuge. This is another nonbreeding area, but many pelicans are attracted for food and remain all summer. In 1951 there were 1600 (Gammell, Aud. Field Notes, 5:262, 1951). On 1 May 1955 there were 2000 which was double the number found during the summer of 1954 (Gammell, Aud. Field Notes, 9:338, 1955). During the summer of 1956 there were 1800 pelicans (Gammell, Aud. Field Notes, 10:391, 1956). In response to our request for information, it was revealed that in 1963 there were about 1500 adults, a total 500 less than 1962 and 1500 less than in 1960. In June 1964 only about 900 occurred. Hence there has been a gradual reduction without much change in the environment.

OREGON

Upper Klamath National Wildlife Refuge. As is the case for the Lower Klamath in California, pelicans have become re-established at Upper Klamath, where, in 1963, there were about 500 adults with 80 nests. From these came an estimated 150 young. For 1964 there were 360 adults, 200 nests, and 100 young.

Malheur National Wildlife Refuge. According to Thompson (1933:38) tremendous colonies once existed here, but the lake dried up. Water conditions fluctuate greatly from year to year, thus affecting the pelicans. Great concentrations of as many as 30,000 pelicans occur in migration. According to Scott (Aud. Field Notes, 12:431, 1958) in 1958 pelicans nested at Harney Lake, next to Malheur Lake, but only two of 230 nests remained after a storm caused waves to wash over the two narrow islands where they were nesting. In 1959 some nested for the first time in many years. However, low water and predators resulted in the destruction of all the nests. No nesting was reported for 1960, according to Scott (Aud. Field Notes, 14:467, 1960). The refuge manager reported no nesting for 1963 or 1964, but in 1963 there were 170 pelicans present and during 1964 there were only 155 pelicans on the refuge.

SOUTH DAKOTA

Thompson (1933:43) reviewed inconclusive evidence of pelicans nesting in the state in earlier times. He said that there was no certain proof of their doing so in 1932, but noted that they occurred on the larger lakes in eastern South Dakota. Since then, several nesting colonies have been reported.

Lacreek National Wildlife Refuge. Pelicans began nesting here in 1938, with a gradual increase in numbers through the years. In 1947 there were 22 nests (Henry, Aud. Field Notes, 1:183, 1947). According to Gammell (Aud. Field Notes, 5:262 and 295, 1951) previous to 1950 only a few dozen young were raised on the refuge. There was a large increase in 1951, but all the 114 young as well as 14 adults were killed in a hailstorm and flood. During the nesting season of 1955 there were 250 adults present (Gammell, Aud. Field Notes, 9:383, 1955); in 1956 (Gammell, Aud. Field Notes, 10:391, 1956) there were again 250; and in 1957 (Gammell, Aud. Field Notes, 11:413, 1957) still 250. The number increased from 500 in 1958 to 800 in 1959 (Krause, Aud. Field Notes 13:437, 1959). For our survey the following was learned. On 12 April 1963 a count revealed 750 adults on the refuge. They remained the entire nesting season. An estimated 275 nests, from which came 450 young, were located on one island. This was the highest production figure on record for the island up to that time, but the following year was even better. In June 1964 there were 800 adults, 641 nests, 175 eggs still not hatched at the time of the census, and 759 young.

Sand Lake National Wildlife Refuge. Pelicans began using this refuge in the late 1930's. Some figures for the colony are reported in the literature. Henry (Aud. Field Notes, 2:209, 1948) reported that in 1948 there were 1000 pelicans, a total 50 per cent less than in the previous year. Furthermore, in 1948 there was a 70 per cent decrease in the number of nests because high water caused flooding. Gammell (Aud. Field Notes, 4:247, 1950) reported 700 adults on the refuge on 30 April 1950. In 1956 there were 200 young produced. A mid-August count revealed 800 adults (Gammell, Aud. Field Notes, 10:391, 1956). In 1957 there were 250 young produced (Gammell, Aud. Field Notes, 11:413, 1957).

As pertains to our survey, the refuge manager reports that for 1963 there was an estimated population of 500 White Pelicans, which had increased through migration to 2000 on 9 September. No information was contributed on nesting that year. For 1964 there were 800 adults, and 250 young were produced.

Waubay National Wildlife Refuge. Pelicans do not nest within the refuge per se but do so in an island in South Waubay Lake outside the boundaries. On 28 April 1951, during the spring migration, 950 adults were found on the refuge (Gammell, Aud. Field Notes, 5:262, 1951). In response to our request the refuge manager wrote that during the summer of 1963 about 200 pelicans occasionally frequented the refuge, presumably coming from the nesting colony on South Waubay Lake. On 8 May 1963 there were about 500 adults at the colony and an estimated 250

nests, most of which contained two eggs. For 1964, when the colony was visited on 15 June, the adults were estimated to number 300, there were 38 nests, and 53 young, most only a few days old.

TEXAS

The southernmost nesting site of the species is at Bird Islands, just off the coast in the Laguna Madre Bay south of Corpus Christi, Texas. But as pointed out by Thompson (1933:44), the nesting of White Pelicans in the area has been subject to frequent disturbance from violent storms. He found not a single nesting White Pelican at the Bird Islands in 1931 and doubted that any nested in 1932. Some later information reveals that not only do White Pelicans still utilize the Bird Islands but that sizable populations occur.

South Bird Island, Laguna Madre, near Corpus Christi. In 1959 there were 420 pairs nesting (Webster, Aud. Field Notes, 13:441, 1959). The number had increased to 530 pairs in 1960 (Webster, Aud. Field Notes, 14:461, 1960). Audubon Warden Louis Rawalt reported (through Henry Hildebrand) that there were 1750 adults in the colony in 1964, with 500 nests from which about 450 young were produced. Hildebrand further commented that probably less than a dozen White Pelicans nest in areas other than South Bird Island in coastal Texas and that the colony in the Laguna Madre de Tamaulipas in México is no longer extant. Pelicans have apparently not nested there since 1960 or 1961.

Aransas National Wildlife Refuge. Refuge managers reported that there was just one small island in the immediate vicinity of the refuge on which pelicans nest. There were 30 nests in 1963, with from 45 to 50 young raised. No nesting took place in 1964.

UTAH

At the time of Thompson's survey the Utah Lake site had long been abandoned and still is. For the Great Salt Lake colonies he found the Hat or Bird Island colony flourishing and reported that pelicans were probably nesting at Gunnison Island. It was the same year that Behle (1935) studied the Great Salt Lake colonies and later summarized their entire history (1958). Although the Bear River Migratory Bird Refuge is used extensively as a feeding area, pelicans are not known to nest there.

Hat Island, Great Salt Lake. Pelicans no longer nest at Hat Island. They were last reported to do so in 1943 (Behle, 1958:83).

Gunnison Island, Great Salt Lake. This colony has continued, but the numbers are below their former peak. For the breeding season of 1963 the adult population was estimated by Bob Davison to be about 4500 adults, with 2500 nests and about 1000 young produced. On our visit of 9 July 1964 it was too late to make a nest count. There were 897 young and an estimated 3000 adults.

WYOMING

Molly Island, Yellowstone National Park. This is the only permanent colony in the state. Thompson reported 300 adults and 100 young in July 1932. In 1962 there were about 600 adults, 298 incubating birds being counted on 6-7 June, and originally 300 nests. But 80 nests were flooded by rising water. There was a 77 per cent mortality from eggs to young able to fly. Only 117 young had been raised by late August (Schaller, 1964:6). For 1963 there were again about 600 adults and 300 nests. About the same number nested in 1964, but the nests and young were fewer, probably due to an adverse effect of high water.

BREEDING COLONIES IN CANADA

While Thompson's study, as his title indicates, emphasized pelicans in the United States, he presented some information on the colonies in Canada, although he did not procure enough data to give a complete picture for the northern breeding grounds.

ALBERTA

Thompson notes several former colonies at Lac la Biche, Miquelon Lake, Pelican River, Lake Ste. Ann, and two probably extant at Beaverhills and Buffalo lakes. No information is available for the latter. According to Robert Lister there are only three colonies known in recent years in the province, but he pointed out that the northern half contains many lakes, some so inaccessible that little is known of their avifauna.

Beaverhills Lake. In 1959 this colony contained from 180 to 200 adults and 81 nests. During the 1960 breeding season there were only 14 pairs of adults and 6 young produced. It was deserted in 1961 and 1962 but was thought to have been re-established in 1963.

Lake Newell. This colony of about 20 adults located near Brooks produced only 5 young during 1963.

Frog Lake. A colony is said to exist at this locality in the northern part of the province near the Saskatchewan border, but no information on population size or nesting activities could be obtained.

BRITISH COLUMBIA

Thompson (1933:54) commented that British Columbia is outside the main breeding range of the White Pelican. But the species has bred at a few localities such as Sucker, Anahim, Puntzi, Pelican and Swan lakes. Because of the remoteness of the locations, there is little recent information on these sites.

Stum Lake. This locality was not mentioned by Thompson but has been the site of a pelican colony since at least 1953, when Ian McT. Cowan noted approximately 140 nests. In 1959 Lawson G. Sugden counted 70 live young, 9 dead young, and 59 eggs on two islands and estimated 100 to 150 adults in the immediate area. In 1963 two colonies had 150 and 130 adults, but there is no information regarding nests or young and no data at all for 1964.

MACKENZIE

Thompson (1933:55) summarized a few early records of colonies at Great Slave Lake and Smith Rapids near Fort Smith. We discovered no evidence of any pelicans breeding in the province in either 1963 or 1964.

MANITOBA

According to the historical evidence amassed by Thompson (1933:56-58) the White Pelican was once an abundant summer resident in the prairie country of Manitoba and the Northwest Territories at such places as Shoal Lake, Lake Winnipeg, and Lake Winnipegosis. But in 1932 there was no positive confirmation of any colonies. However, in recent times it has nested in several regions and continues to do so.

Grand Rapids Region. The population in this whole region is estimated by J. Donald to be between 500 and 800 adults. The main nesting area is on Kawinaw Lake, with secondary nesting areas at Lake Winnipegosis and the Saskatchewan River.

Moose, Talbot, Cedar and Cormorant Lakes. J. C. Reader reported about 100 nesting on the east arm of Moose Lake, about 200 on Talbot Lake, 300 on Cedar Lake, and about 50 at Cormorant Lake during the last week in May 1963, for a total of 650. He states that pelicans start nesting as soon as the ice is gone or about 15 May. The total number of nests was estimated at 300 and the young at 400. Moose and Talbot lakes are the farthest points north that the White Pelican is known to nest.

East Shoal Lake. A former colony at West Shoal Lake has been abandoned, but a colony at East Shoal Lake visited 1 July 1962 by Harold Hosford contained 600 adults. In early June 1963 the colony was thriving with 600 adults, but excessive rains subsequently raised the lake

level at least two feet and flooded the nesting site. During June 1964 Hosford found two colonies. One had 212 nests on 1 June, 7 of which had newly hatched young. The adults were estimated to number 500. On 27 June there were only 22 young, the excessive mortality probably being due to Herring Gulls. At the second colony on 6 June there were 74 nests and an estimated 150 adults. On 27 June there were 70 young.

Dog Lake. Another colony was reported in the Dog Lake region near the southern portion of Lake Manitoba. No information was obtained about size or nesting activities for this site.

Lake Winnipeg. This former large nesting area was no longer in existence at the time of Thompson's survey (1933:57). But it has been re-established, as indicated by a report of 1517 adults on the lake in 1964 with some 500 nesting on Martin's Island, giving rise to 700 young.

In addition to these nesting sites, pelicans occur in abundance at two other areas, but there is no evidence of nesting. E. W. Boggs reported about 400 pelicans around Clandeboye Dam on Lake Manitoba throughout July and August 1963, but only 10 were seen there on 3 May 1964 by Bill Carmichael. In 1963 Boggs saw about 100 at the mouth of Long Creek. At Netley Marsh during June 1963, H. Schindler estimated 200 pelicans but found no nests and doubts that nesting ever occurred there. In migration in May, pelicans feed along the course of the Red Deer River. On 4 June 1964 a flock of 105 was seen 80 miles south of The Pas. About the same number was estimated to have occurred there the preceding year.

ONTARIO

No information on White Pelicans in Ontario was presented by Thompson in his report. The loan of a manuscript by W. Dan Mansell, biologist of the Ontario Department of Lands and Forests, reveals that the White Pelican does nest in Ontario at one site, at least, and the birds have upon occasion reached large numbers.

Dream Island, Lake of the Woods. Breeding of the species was definitely established for the province when J. L. Baillie found 16 eggs on Dream Island in the Lake of the Woods, which is located 38.5 miles south of the town of Kenora. Seemingly the species subsequently disappeared from the region until about 1958. On 4 September 1960 a breeding colony was discovered at two small islands (West Island 3.1 acres and East Island 1.4 acres) located about one-quarter mile south of Dream Island. At this time there were about 50 adults and 8 young near the islands. The colony was included in the "Massacre Island Wilderness Area" in 1961 to afford protection for the birds, and subsequent studies by the Department of Lands and Forests revealed that in 1961 there were 403 nests and approximately 800 breeding pairs. However, in 1964 there were only 160 nests and about 320 breeding pairs. Sixty-eight young were banded on 16 June 1964. On 26 July 1964 the number of young swimming in the lake near the islands totaled 61.

SASKATCHEWAN

Saskatchewan contained more breeding colonies of the White Pelican than any other province in Canada at the time of the Thompson survey (1933:58), even though in 1932 the colony at Big Stick Lake was gone as were some of the lesser colonies. In contrast those at Dore, Johnstone, and Quill lakes had increased. Considerable changes have occurred since then.

Last Mountain Lake. This area was not mentioned by Thompson, and no information is at hand indicating when a breeding colony was established. But the last successful nesting occurred in 1954, when there were 28 nests from which came 15 young. Shortage of water resulted in the nesting ground becoming connected with the mainland (Houston, 1962).

Quill Lakes. The several islands in these lakes were used as a bombing practice range during World War II, and the pelicans abandoned the area. The colony became re-established after the war, and as its size increased the Last Mountain Lake colony slowly decreased. During 1961, at the height of the drought, the water became very low and the area was once again deserted by the pelicans (Houston, 1962).

Crane (Crana) Lake. There were an estimated 200 young at this site on 23 June 1960, but

only 100 on 27 June 1961 (Houston, 1962). The decrease was thought to be due to shallow water and lack of protection. In correspondence Houston states that while some pelicans were seen at the lake during 1963, it had dried up by 1964.

Dore Lake. Houston (1962) found about 100 pelicans on the lake in 1956. The decline of this colony was attributed to the practice of the area's mink farmers of collecting pelican eggs for food for their mink. About 100 pelicans were reported for 1961. The last time pelicans were seen at the lake was in 1962. It has since dried up.

Redberry Lake. According to Houston (1962) there has been in past years an annual production of 150 to 200 birds per year. But the lake is now being used as a resort, and the pelican population is slowly decreasing. During 1963 Houston visited the colony. He found about 200 adults of which 175 were nesting, but reported the crop of young at an all-time low with only 52 young. In 1964 there were 600 adults and 200 young.

Suggi Lake. Houston reports that this lake had 466 pelican nests during the season of 1964.

Lavallee Lake. S. F. Kun, Superintendent of Prince Albert National Park, reported that there were an estimated 800 to 1000 White Pelicans nesting at three sites at this lake during the spring of 1964. Adults were also observed at many other lakes in the northern half of the park during the nesting season. It is significant that from observations since 1940-1941, it appears that the population has remained about the same.

Old Wives Lake. While no data are at hand for this colony, Houston, in one letter, commented that this was the largest breeding colony in Saskatchewan but that the colony was decreasing, presumably due to the feeding of pelicans at an artificial lake nearby formed by Thompson Dam in an area where insecticides had been heavily applied on fields. This was not reported as a nesting site by other observers in Saskatchewan.

SUMMARY

Thompson (1933:66) concluded that the White Pelican had been restricted in its breeding grounds by the encroachment of civilization until there were only four colonies of significance in the United States: Clear Lake, California; Pyramid Lake, Nevada; Great Salt Lake, Utah; and Chase Lake, North Dakota, plus three in Saskatchewan, Canada, at Dore, Johnstone, and Quill lakes. He noted that of these principal colonies only Great Salt Lake and Dore Lake were not governmental wild-life sanctuaries. His census indicated about 30,000 pelicans breeding at these seven large colonies. The majority of them were in the United States, including probably between 20,000 and 25,000 birds.

The results of our survey suggest a decline in these colonies since Thompson's study. Only four of his seven major colonies remain with any significant number of breeding pelicans. These are the four in the United States. Of the three in Canada, Dore Lake has supported only a small colony for the past few years. The water level in Quill Lake has dropped considerably, and pelicans seldom nest there. Johnstone Lake, as far as can be ascertained, has dried up. In comparison with Thompson's figure of 30,000 for his seven major colonies, there were in 1963 only 19,560 breeding pelicans and in 1964 about 19,860.

Because of the incompleteness of his data for Canadian colonies Thompson made no attempt to estimate a total continental breeding population. But he pointed out that such a figure, if available, would be considerably above the 30,000 figure for the seven largest colonies. Our figures show a total continental breeding population for 1963 of 36,200 pelicans, of which 33,870 were in the United States and 2330 in Canada. For 1964 the total number of breeding adults for North America was 40,067, of which 35,745 were in the United States and 4322 in Canada.

Thompson did not estimate the total breeding and nonbreeding population. Our data suggest that there was in 1963 a total breeding and nonbreeding adult popu-

lation of 44,220 White Pelicans—40,365 in the United States and 3855 in Canada. For 1964 the figures for a total population for the continent are 45,100, with 39,146 of these in the United States and 5964 in Canada.

These figures are of course, not precise. There are many variables. The estimates were made by many observers at different times of the day and season. For some of the smaller colonies data were available for one year and not the other. One big colony was reported only for 1964, and this largely accounts for the greater number of pelicans that year. Probably undiscovered and unreported colonies exist in northern Canada. Yet despite these factors of error, the results for the two years are fairly comparable and at least give some idea of the size of the continental population.

There has been considerable shifting of pelican breeding sites since Thompson's survey. As previously noted, his three large Canadian colonies are essentially gone. There were no really large breeding colonies reported in Canada during 1963–1964. The major breeding areas in the United States in 1963–1964 were found at Clear Lake, California, and the Upper Lake and Lower Lake in the Klamath Lake National Wildlife refuges in California and Oregon; Bowdoin and Medicine Lake National Wildlife refuges and the Charles M. Russell National Wildlife Range in Montana; Anaho Island National Wildlife Refuge, Nevada; Chase Lake National Wildlife Refuge, North Dakota; and Gunnison Island, Great Salt Lake, Utah.

The minor breeding areas in the United States are found at Riverside Reservoir, Colorado, a newly established colony; Malheur National Wildlife Refuge, Oregon (when there is enough water); Lacreek and Sand Lake National Wildlife refuges and South Waubay Lake, South Dakota; South Bird Island and Aransas National Wildlife Refuge, Texas; and Molly Island, Yellowstone National Park, Wyoming. The minor breeding areas in Canada are found at Lake Newell and Frog Lake, Alberta; Stum Lake, British Columbia; Kawinaw Lake, Lake Winnipegosis, Saskatchewan River, Moose Lake, Talbot Lake, Cedar Lake, Cormorant Lake, Dog Lake, and East Shoal Lake, Manitoba; and Suggi Lake, Lavallee Lake, The Old Wives Lake, and Redberry Lake, Saskatchewan. Each of these areas has less than 1000 breeding adults present at any one time during the breeding season.

During the 32-year interval between surveys there seems to have been a general shift in the breeding pattern to the central part of the United States. The largest increase in breeding pelicans has occurred in Montana. The three breeding areas in South Dakota have been established since 1932, and the one in Colorado was established in 1962. The former large colony at Clear Lake in northern California seems to have been divided, and pelicans are found on three lakes in the same general area. The remainder of the western colonies have remained essentially in the same areas.

The major portion of the breeding colonies are found on National Wildlife Refuges in the central and western part of the United States, which is gratifying. The breeding colonies at Gunnison Island, Great Salt Lake, Utah; Riverside Reservoir, Colorado; and South Waubay Lake, South Dakota, are the only breeding areas that are not on National Wildlife Refuges. Of these, the Great Salt Lake colony is by far the largest. Indeed it is the only major breeding ground without refuge status. It has not been determined how many of the breeding colonies in Canada are found on wildlife sanctuaries.

DISCUSSION

In reviewing the data on the White Pelican colonies presented both by Thompson and in this report, several items bearing on breeding status are pertinent. One is that large numbers of adults seen during the time of breeding season do not seem to be nesting. There are frequently concentrations at nonbreeding areas as well as many loiterers at actual breeding colonies. For example, we have the report of 5000 pelicans on 15 July 1956 on Tampa Bay, Florida. This date seems too early for a postbreeding concentration of migrants. Furthermore, the location is distant from any breeding colonies. The large number of nonbreeders suggests either that it takes White Pelicans several years to reach breeding age, or that there are subtle psychological factors governing breeding.

An allied point is how few nests there are in relation to the number of adults reported at many breeding colonies. In one instance 500 adults were reported but only 80 nests. Hence the number of breeding pelicans is much less than the number of adults, and a better criterion of the number of nesting birds than adults present is an actual nest count. Of importance, too, is the great destruction of eggs from fluctuating water levels and mortality of the young from several factors such as rain, hail, and depredation of gulls. This mortality often ranges up to 50 or even 70 per cent. Also there is great fluctuation from year to year even in well-established colonies. All of these items highlight the precarious reproduction of the White Pelicans. Great changes could be wrought in a comparatively short time even with a total population in excess of 40,000.

In assessing the future of the White Pelican there are some favorable as well as unfavorable features. On the positive side the data show that the species is somewhat adaptable to habitat change and does re-establish some abandoned colonies when conditions become favorable. They occasionally move into new areas. Many ancestral nesting grounds are now embraced in wildlife refuges, and there seems to be a potential for additional nesting sites on several recently established refuges. The pelicans are more dispersed than formerly, with fewer large concentrated colonies. Their numbers are still fairly large, and there has been no drastic decline. We seem to be living in a more enlightened era with less prejudice toward the White Pelican because of its fish-eating propensities and more general appreciation of its esthetic and economic values.

Despite all these favorable factors, the White Pelican is, we feel, a threatened species, although not in the usual sense of that term of being faced with extinction like the California Condor and the Whooping Crane. There has been a long-range decline in numbers, and the species is not entirely protected. In some states and provinces there is full protection, while in others there is none. Some states reserve the right to control the pelican if deemed necessary. Some treat it as a game species. The most serious item in this connection, in the view of the writers, is that it is not protected by federal statute in the United States, nor is it included in the list of migratory birds protected by international convention between the United States and Canada and the United States and México. However, the biggest threat to the species seems to be continued habitat change, principally due to drought, which affects its food supply and removes the water barriers around breeding sites, thus allowing predation. Another big factor is human disturbance of nesting colonies.

Certain things can be done to protect the species and stop the drift toward a critical situation similar to what we have with other threatened species. A first step is to protect the large Gunnison Island colony in Great Salt Lake by making it into

a sanctuary of some kind. Perhaps other lesser breeding grounds could be included in wildlife refuges also. Another undertaking would be to work toward federal and international protection of the bird as a migratory species. Also protection could be extended by states. Probably the best approach is eternal vigilance toward further deterioration of wetlands that destroys the food and breeding sites of the species. The creation of new marshes, reservoirs, and wildlife refuges may provide sanctuaries for these exotic birds as well as other birds of marsh, shore, and water.

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