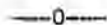


HISTORY AND PRESENT STATUS  
OF THE  
BREEDING COLONIES OF THE WHITE PELICAN



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
Harold L. Ickes, Secretary  
NATIONAL PARK SERVICE  
Horace M. Albright, Director



HISTORY AND PRESENT STATUS OF THE  
BREEDING COLONIES OF THE  
WHITE PELICAN (*Pelecanus erythrorhynchos*)  
IN THE UNITED STATES

By

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Contribution of Wild Life Division  
Occasional Paper No. 1



"A legacy of the opulent days when nature  
took thought of her winged children"

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## FOREWORD

The National Park Service has been confronted for many years with the problem of protecting a large nesting colony of white pelicans on Molly Island in Yellowstone Lake, and the other numerous birds which find temporary feeding grounds in the lakes of the National Parks. In spite of two scientific investigations of the economic status of the white pelican in Yellowstone made in 1922 and 1925, controversy has continued between fishermen and bird lovers as to the economic value of this bird. As a consequence a full study of the present status of the bird was undertaken by the Wild Life Division of the National Park Service. This investigation has brought to light many interesting facts pertinent to the care and conservation of the white pelican which it seems important should be made available to the public interested in this subject. Therefore I have ordered this report published in convenient form to make a permanent record.

With the exception of the Yellowstone, there has been complete protection of the white pelican in all National Parks. For more than two years no control of the nesting colony on Molly Island in Yellowstone has been allowed, and orders prohibiting landing on the island without a permit have been issued. The National Park Service recognizes the need for complete protection for the white pelican, and will see that it is given.

Horace M. Albright,  
Director.



## PREFACE

"Well did the Psalmist of old choose the Pelican as the symbol of the wilderness. 'Dead' seas and salty, the mighty evaporating pans of the desert, have here given rise to a race as weird, as majestic, as gracefully uncouth, as any that have ever adorned the pages of time. The White Pelican is an embodiment of an elder age, a legacy of the opulent days when Nature took thought of her winged children, and recked not of the reign of man, man the ruthless, man the envious, man the destroyer. For eons the great white birds have circled and soared over the desert wastes of interior western America. For generations uncounted they have fished in the salty waters of Lake Lahontan, of Lake Bonneville, and their successors; or they have foregathered ashore in snowy windrows to meditate, to digest, and to gladden withal rare man who, like his Creator, enjoys the simple bliss of the undisturbed wild. The Pelican and the wilderness stand together in their mute appeal. When the one is fully 'reclaimed,' the other must perish" (Dawson, 1923, pp. 1961-1962).

How could such an interesting creature go unenjoyed by man? It was just this fascination, so well expressed by Dawson, which one must feel who has seen these strange, immense white birds at life in their wilderness haunts, that led to the undertaking of the present work. What has been the fate of these birds since white man came to this country? What is their present status? What are the factors which have brought about the change in the status of the white pelicans? What will be the future of these birds with us? And is there any reason why their existence should be of interest to us? These questions seemed worth answering.

The last of these questions can be answered only by years of field and laboratory research. No claim is made herein to answer it by reference to literature. But a few of the facts which have been found are presented in the hope that judgment may be suspended until more adequate information is available.

The other questions have been met with a degree of success by recourse to published reports, personal interviews and correspondence, and excursions to most of the present breeding

grounds of the white pelican in the western United States. As I have stated, these things seemed worth knowing, if for no other reason, because one wishes to know what is happening to so strange and interesting a creature. There is another reason, however, which is that we tend to govern our actions in the future by our knowledge of the past. To be specific, it is necessary to know the present status of the white pelican, and the factors which have brought it about, in order to provide for its continued maintenance.

To Mr. George M. Wright, whose generous assistance has made the work possible; to the various members of the staff of the National Park Service, whose cooperation has greatly facilitated the project; to these members of the Museum of Vertebrate Zoology of the University of California, Drs. Joseph Grinnell, Tracy I. Storer, and E. Raymond Hall, for their kindly supervision and experienced guidance; to those who have given of their time and information by correspondence or verbal interview, and to many others who have assisted with this project, I wish to express my sincere gratitude.

All correspondence referred to within the text is filed in the office of the wild life research group of the United States National Park Service, 213 Hilgard Hall, Berkeley, California.

Ben H. Thompson

Berkeley, California  
November 9, 1932



## HISTORY AND PRESENT STATUS OF THE BREEDING COLONIES OF THE WHITE PELICAN IN THE UNITED STATES

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### VALUE OF THE WHITE PELICAN

In any attempt to estimate the value of the white pelican it must be admitted that at present the information necessary to arrive at a judgment of value is incomplete. This does not mean that we are entitled to hold that the bird has no value until the contrary has been proved. The statement is meant to apply equally to any point of view.

The economic value of the white pelican depends primarily upon its food habits. The fact that the bird lives on fish has brought it into disrepute, and at times has caused the annihilation of breeding colonies as well as wide persecution on feeding grounds. The attempt is made here to present some of the facts which have been discovered, to the end that actions governing the welfare of the white pelican may be guided by the known facts until further investigation shall clarify the issue beyond doubt. No sweeping generalization is sought. If it is held that the pelican eats only one type of fish, there are always instances to the contrary. But if there is any value in assembling the results of pelican food investigations, carried on at different times and places, that is sufficient reason for presenting them here.

In 1831 it was recorded (Swainson and Richardson, 1831, p. 472) that white pelicans "devour great quantities of carp and other fish." Arthur H. Howell (1932, p. 84) says: "The White Pelican has been found to feed largely upon carp, suckers, and similar fishes of small value for human consumption."

Several investigations of the food of the pelicans at Pyramid Lake have been carried out. "At Pyramid Lake a crusade has been inaugurated against the pelicans by the fisherman, whose cause is justified in their own eyes by the voracity of the big birds, and the number of fish consumed by them. . . . This complaint of injury done the fishing interests is not, it must be

said, without some foundation. The number of pounds of fish consumed in a day by the combined numbers of a large colony of pelicans, especially when feeding young, must amount to something fabulous. As a rule, however, and from the nature of the mode of fishing practiced by the white pelican, fish of value, as the trout, are but little exposed to their attacks; the species they are able to obtain consists chiefly of the smaller fry found in shallow water, and of little or no table value whatever, their principal, if not their only, importance being as food for better kinds. As this small fry fairly swarms in all the western lakes, there is no danger at present, at least, that the fishing interests will be injured in this indirect manner, as indeed is plainly evidenced at Pyramid Lake, where, despite the number of the pelicans, trout exist in enormous numbers" (Henshaw, 1879, p. 329).

Evermann (1923, p. 45) substantiated these remarks of Henshaw's by his own observations. "Although I made careful search for examples of trout, let it be said to the credit of the pelicans I did not find one. There were plenty of suckers and chubs but not a single trout. The species in order of abundance were Ques-wee, Red Sucker, Lake Chub, and Lake Minnow." Evermann estimated that a pelican would consume four pounds of fish per day; 10,000 pelicans at the lake for 200 days would consume 8,000,000 pounds or 4,000 tons of fish each season. His comment was that while these fish may be inferior from our standards of taste, they were nevertheless eaten by the Indians, and that 4,000 tons of such food was a heavy price to pay annually in order to maintain the pelican colony at Anaho Island.

E. Raymond Hall (1925, pp. 147-160) made extensive investigations of the food of the pelicans at Pyramid Lake and found that the pelicans do not feed upon the trout but upon the less desirable species. The Lake Minnow (Leucidius pectinifer), Carp (Cyprinus carpio) and Lake Chub (Siphateles obesus) were the principal species consumed by the pelicans.

Coues (1874, p. 587) collected a female pelican on the Red River near Pembina in North Dakota. "In the stomach were found about fifty crawfish (Astacus)."

At Malheur Lake, George Willett (1919, p. 198) said that "The remains of a rainbow trout found in the colony was the only real food-fish noted."

Mr. David H. Madsen reports that for many years he has observed the fish brought into the pelican colonies in Great Salt Lake, and that only on a few occasions has he seen the remains of a trout or other game fish. During the trip to Bird Island this summer we saw quantities of chub and minnows but no trout. A similar observation was made by Goodwin (1904, p. 128) at Utah Lake the only year the pelicans nested there. "Upon examination I found chub, carp, catfish, suckers, an occasional bass. More than one-half of the fish seen were chub. . ."

An entirely different circumstance exists at Yellowstone Lake where there is practically nothing for the pelicans to eat but trout, and here the trout form 98-100 per cent of their diet (Ward, MS).

Another observer (Ferry, 1910, pp. 190-191) lists still different items of food. At Quill Lakes when the young pelicans were disturbed "they disgorged the contents of their pouches, usually a mass of salamanders (Necturus maculatus) though occasionally a 'jock fish' (one of them was about a foot long) and some brook sticklebacks (Eucolia inconstans)."

The records just presented are not numerous, and there are doubtless others. However, they are the records of actual observations and studies which are worth far more than the usual prejudiced inference that every fish-eating bird is living on nothing but trout and other game fish. The fact must be faced, by all means, that in many cases, such as at rearing ponds or in special areas such as Yellowstone Lake, the pelican may take a heavy toll of game fish. There are numerous accounts of the depredations of pelicans and other fish-eating birds in these valuable areas. Unfortunately, however, one such incident serves to condemn the pelican as a pest everywhere. But is it not just as incorrect to classify the pelican in this unscientific, prejudiced manner as it is to go to the other extreme of saying that the pelican never consumes game fish? The point is that where actual investigations have been made, in the majority of cases the pelican has been found to feed principally upon fish of little or no human value. The cases which have been presented to uphold this statement are not extraordinary or unusual. They are cases where game fish and nongame fish are found in the same region, and should be considered a fair test.

There are undoubtedly two sides to the question. All the facts are not known. But those that are known point to the conclusion that the pelican is not the harmful factor that it is generally assumed to be. In the face of these facts, would not the logical course be to withhold a judgment of condemnation until further facts reveal the truth?

A great impression is usually made upon interested persons by computing the enormous quantity of fish which a breeding colony of pelicans will consume in a single season. But quantity is a relative measurement, and, whenever such figures are given, they are invariably given without reference to the total amount of fish present in a lake or stream and without consideration of the fractional portion of the whole amount which the pelican consumption represents. In such cases the argument is meaningless. Let the point be illustrated by a hypothetical case. A man owns property covered with a dense coniferous forest on which there is good forest reproduction. He notices that squirrels consume a great percentage of the seeds in the cones. He deduces therefrom that the squirrels are ruining his forest. He fails to note that there is good timber reproduction in his particular stand. Now, while it may be true that squirrels do prohibit forest reproduction in some cases, the man's deduction concerning his own stand is incorrect because reproduction there is good. The obvious explanation, of course, is that far more seeds are produced than could possibly grow in his forest. Consequently, it makes no difference whether the squirrels consume a large percentage of the seeds so long as there are plenty left for the reproduction of the forest. In other words, the quantity of seeds consumed by squirrels means nothing unless that quantity is so large as to curtail reproduction, and this is a matter which can only be ascertained in each individual instance by investigation of the facts of the case.

Turning, now, to pelicans and fish, we note an analogous situation at Pyramid Lake. Let it be assumed that the pelicans consume 4,000 tons of fish each season. This fact has little significance unless the supply of fish in the lake is being held below the productive capacity of the lake. It has not been proved that the fish which the pelicans of Pyramid consume are decreasing. To the contrary, it has been proved that the pelicans and fish have both been there for ages, and the fish still abound in incredible numbers. Is it not fallacious

reasoning, also, to hold the pelican responsible for the loss of that which we do not use, or even attempt to use? In other words, we do not eat these inferior fishes and the Indians have never eaten more than a small portion of them. Of what consequence is it, then, whether some of the remaining fishes are consumed by pelicans or by each other? We do not know that removal of a portion of the adult fishes does not increase the percentage of survival of the young. In fact, we do know that the mortality of the young is greater in a congested faunal community than in one where there is room for expansion. Whether a fish loses out in the game of fish competition or is caught by a fish-eating bird can make little difference in our ledger of economic values. To say that the pelicans consume 4,000 tons of fish annually at Pyramid Lake sounds bad, but actually it means nothing unless the fish supply is being depleted by the predacious pelicans. The point is so simple that it hardly seems worth making, except that the charge which necessitates it is constantly being made. Moreover, the fish which are consumed, in this case, are inferior as human food.

If the matter rested here, there would still be good reason to withhold judgment against the pelican, but there is the possibility of even a stronger factor in favor of the pelican -- perhaps the pelican is consuming large numbers of "trash" fish which prey upon game fish.

The subject receives consideration by J. A. Munro (1927, pp. 107-108) in his conclusions from his studies of the food habits of the double-crested cormorants on Lake Manitoba. The case appears to be analogous to that of the pelican. Munro found that crayfish formed twenty-five percent of the food of the cormorants at Lake Manitoba. He goes on to say: "In their food habits Cormorants show no preference for any particular species of fishes; the percentage of the various species consumed being dependent upon relative abundance. The bird's swallowing capacity is the only factor governing the size of the fish consumed. Within this limit fish of all sizes are taken indiscriminately. Of the seven species of fishes eaten only two, the Pickerel and Pike, are important commercially. It is estimated that these two species combined comprise one-third of the fish taken or 25 percent of the Cormorant's entire food." He estimates that the 2,100 adult and young cormorants on the lake consume 788 cwt. of pike and pickerel annually at the lake, and comments

that "it must be admitted that the toll of food-fishes taken by Cormorants is a heavy one." But he goes on to state: "In studying the relations of the Cormorant to fishing interests, consideration must be given the probable effects, produced by the birds' destruction of such piscivorous fishes as the Ling and Sauger, both enemies of the valuable food fishes, and also the destruction of Mullet and Suckers to which spawn eating habits are ascribed. No doubt under native conditions a balance between the various species is maintained partly through the work of fish-eating birds and partly by the piscivorous habits of the fishes themselves. In Lake Manitoba an exceedingly complex relationship between birds, fishes, crustaceae, insects and plants has been permanently disrupted by man's activity and whether a condition more suitable to man's requirement could be established by further interference, such as the control of Cormorants or the destruction of less valuable fishes is a matter of doubt. A dominant instinct in humanity is to destroy whatever creature is suspected of interference with man's complete enjoyment of the fruits of the earth. Such rough and ready methods may be desirable and expedient in some cases, but in this instance the cure is believed to lie elsewhere."

It is not within the province of this paper to go into the relationships of fish, but the subject is inextricably bound up with the subject of the value of the pelican, as well as other fish-eating birds. There is need of further research to determine whether the fish-eating birds act as a control upon the non-commercial, nongame fishes, and, as such, are an indirect benefit to the more desirable species. If such should prove to be the case, we might be faced with the seeming paradox that in order to have more game fishes, there must be more fish-eating birds.

In an attempt to evaluate the white pelican, then, it must be admitted that at present our information is far from complete, but that what information is available points to the conclusion that the pelican is not the destructive pest it is assumed to be, but, on the contrary, may be exceedingly valuable to man's interests.

A long chapter could be written upon other values of the white pelican, such as its aesthetic value, but this would merely open up a controversial subject upon which there is little tolerance evinced from either side. In all such controversies



the term sentimentalist is bandied about with great alacrity. The only difference seems to be that one man likes fish and another likes pelicans, and, consequently, if the term applies at all, it applies equally to both -- or to neither, of which the latter view is probably the more reasonable.

## BREEDING COLONIES IN THE UNITED STATES

To facilitate reference, the data presented herewith follow an alphabetical order of States and breeding colonies within each State.

### California

Buena Vista Lake, Kern County.---Buena Vista Lake was at one time the home of nesting waterfowl but the lake bed is now dry and the area under cultivation.

William Shore Baily (1914, pp. 51-55), who spent several years in the southern Sierra Nevada and San Joaquin Valley during the early part of the century, gives the following account of Buena Vista Lake as it was "some few years" prior to 1914.

"In the winter and spring when the Kern River is bank high, the lake has a circumference of about 40 miles, but in the summer when its waters are drawn off for irrigation purposes it is considerably smaller, but still remains a very considerable body of water, and a noted resort for wild fowl of all kinds.

"At the time of which I write over 100,000 ducks were shipped from here to the San Francisco and Los Angeles markets annually. . . . I had noticed flock after flock of White Pelicans (Pelecanus erythrorhynchus) flying down the lake. A colony of about one thousand of these fine birds have their home on the lake. . . . They breed regularly on the island in the lake, but before doing so, they migrate to the lagoons of Mexico and Central America, where mating takes place. For a month or six weeks in the spring, not one is to be found upon the lake."

A few months later, Baily (1914, p. 299) writes again of the lake. His observation must have been made some time in the spring, although he gives no date. "Our way for the first few miles led along the edge of the lake. Away on the open water, White Pelicans (Pelecanus erythrorhynchus) now returned from the Mexican lagoons, were going about in pairs, very evidently intent on the business of nesting."

C. B. Linton (1908, p. 196) visited Buena Vista Lake from May 20 to June 16, 1907, and gave the following account of the pelican colonies: "Two large colonies were visited; one of about 250 nests, on a small sandy island in the river mouth; the other of perhaps 500 nests, on the lake shore. The nests of the latter colony were mostly well constructed of tules and marsh grass covering about 2 acres. The nests on the island were merely holes scooped in the sand."

These figures of Linton's would probably justify an estimate of 1500 adult pelicans in the two colonies, which, it will be noted, is somewhat larger than Baily's estimate.

Buena Vista Lake was again visited on June 8, 1912, by Messrs. Chester Lamb and A. Brazier Howell (1913, p. 116). No mention is made of the shore colony, which leads one to believe that it did not exist at the time of their visit. Also, the total population of white pelicans resident at Buena Vista Lake seems to have decreased. This note taken from the account of their visit gives a brief summary of the pelican colony in 1912: "We found the lake to be exceedingly shallow at this time and one could wade in it almost anywhere in from six inches to two feet of water, though there were a few deeper places. The bottom is of adobe and it is the particular delight of the large carp that infest the lake, to lie in the shallows with their backs sticking out and wallow violently in the ooze. Pelican Island, however, is formed of fine gravel and bits of broken shell.

"We estimated that there were six hundred occupied nests about equally divided between the Pelicans and Cormorants. The former had apparently preempted the middle and higher part of the island, while the latter were nesting closer to the water." . . .

"In some cases eggs had not yet been deposited, and many nests held three eggs -- the greatest number found in any nest; but by far the larger proportion held two eggs. The loss in eggs must have been very great as there were a hundred or so scattered promiscuously around the ground. They were in all stages of incubation. We saw no young at this date, though in examining eggs we could frequently hear the young birds peep." (Lamb and Howell, 1913, p. 117.)

The following year, 1913, Buena Vista Lake was very low, and there is indication that the pelican colony did not fare too well.

"During the early part of September, Deputy Tipton Mathews of Wasco, California, visited Buena Vista Lake, in southwestern Kern County. At that time, ducks were dying very rapidly. Deputy Mathews, in walking from the shallower portions of the lake along a slough in the northeastern side, counted over 1,500 dead ducks in less than one mile. In some places the dead almost touched one another. On October 9 the writer visited this spot. Few birds were then dying there, but the great mass of carcasses was simply appalling. . . . Ducks constituted the main portion of the remains; still, many cormorants, pelicans, etc., were represented" (Clarke, 1913, p. 226).

The next picture of Buena Vista Lake shows it in its final stages. Chester Lamb (1922, p. 184) presents it in one brief paragraph: "A short trip to Buena Vista Lake, Kern County, was made on June 11, 1922, in company with Mr. Luther Little. What impressed us most was the irregular occurrence of some of the breeding birds, comparing different years. For several years the water of the lake has been very low, but now, the copious rains of last winter have made it higher than for many previous years. Last season, large numbers of White Pelicans (Pelecanus erythrorhynchos) were present all summer, but did not nest; the water was not high enough to form their nesting island and it seems that these birds must have an island or they will not nest. This year, although their island was formed, there were but few Pelicans around and those were not nesting. The reason may have been that this year there are only a few fish left of the myriads that were there formerly."

This appears to be the last account of the pelicans at Buena Vista Lake, for the water of the Kern River has been so extensively utilized for irrigation that the lake bed, except for a small reservoir, has been practically dry for several years. In March, 1932, Mr. Pemberton reported that Buena Vista Lake was dry in spite of the heavy rains.

Clear Lake, Modoc County.--There seems to be almost no data relative to Clear Lake as a nesting site for pelicans, yet it supported in 1932 perhaps the largest white pelican colony in the United States.

The lake originally (Voorhees, MS, 1912, p. 69) covered about 10,000 acres, with an additional 5,000 acres of marsh lands. "The easterly and northeasterly shores were bordered by extensive marshes, which were under water during the Spring of each year, and largely dried out during the Summer and Fall, so that several thousand acres of marsh lands were available for grazing and for cutting hay. Jesse D. Carr, a prominent cattle owner, acquired possession of nearly all of the marginal lands during the 70's and 80's, and established a cattle ranch on the northerly shore of the lake. It was necessary to buy out Mr. Carr before the waters could be raised by the Reclamation Service.

"The main source of supply for Clear Lake is Willow Creek. This stream discharges several thousand-second feet at times during the winter and spring floods, and dwindles to about 10 second-feet or less in the dry season.

"The outlet of Willow Creek is on the northeasterly corner of the marsh lands surrounding the lake, and, by a system of dikes, Mr. Carr has arranged so that Willow Creek could, at will be turned over the marshes into Clear Lake, or diverted into a channel leading to an outlet through Lost River."

These conditions are presented because they seem to indicate that no pelicans could have nested there at the time of which Voorhees speaks.

In 1910 a dam across Lost River was completed, which would raise the water level of the lake eighteen feet and increase the lake area to about 25,000 acres. Whether pelicans had nested at the lake previous to this reclamation development is a matter of speculation, but it is probable that they did not nest there during utilization of the swamps in the "70's and 80's." From these facts and those recorded later, it seems fairly certain that the forming of the reservoir was followed by the establishment of a pelican colony.

In the spring of 1918, George Willett (1919, p. 197) visited Clear Lake and published this note: "White Pelican. From four hundred to five hundred pairs noted on islands at Clear Lake April 10. At this date about one hundred and fifty nests were noted, many of which contained one or two eggs each."

H. M. Worcester, Reservation Protector for the Tule Lake Wild Life Refuge, in a letter dated July 19, 1932, stated that 5000 young white pelicans hatched this season on Bird Island in the Clear Lake Refuge. Judging by the ratios of adults to young in other colonies, it is evident that the Clear Lake colony must have numbered at least several thousand adult birds this year. It was reported to me verbally by Marion Barnes, Game Warden, Klamath Falls, that there has been a great concentration of pelicans at Klamath Lake the last few years, numbering in the thousands, and that he was certain that they nested no nearer than Clear Lake.

It seems possible that Clear Lake has become the nesting site of the pelicans which used to nest on Lower Klamath Lake, which lake has been practically dry since 1919.

Clear Lake is a wild life refuge, and the nesting waterfowl are receiving constant protection under the able administration of the Bureau of Biological Survey. There is every reason to believe, therefore, that the future of the pelican colony at Clear Lake is assured.

Eagle Lake, Lassen County.—On July 4, 1877, H. W. Henshaw (1879, pp. 329-330) visited the pelican colony in Eagle Lake. "As might be presumed, all the pairs of a colony do not begin laying at the same time; in fact there is much irregularity in this respect, and as a consequence there results a corresponding difference in the time of appearance of the young. This was clearly shown in the case of a community of from 500 to 1,000 pairs that had established themselves on a sandy island in Eagle Lake (Cal.), and which I visited July 4. At this date the young were present in all stages of growth, from the chick just breaking the shell to the youngster fully grown, but still unable to fly. A rough estimate placed this number at considerably over 1,000, and a more incongruous assemblage was never witnessed."

Perhaps an estimate of 1,500 adults would represent the Eagle Lake colony as Henshaw saw it. The large number of young would seem to indicate that the colony had not been disturbed that year, which makes his record the more valuable.

There is no evidence of change in the colony during the next few years, for Charles H. Townsend (1887, pp. 192-193), who



visited it June 28, 1884, says: "This Pelican was found only at Eagle Lake, where it resorts to breed in great numbers in summer. There are two islands lying in this beautiful sheet of water, and I observed that the Pelicans had taken almost exclusive possession of one of them, the other being similarly occupied by equally large numbers of shags."

In 1902, Grinnell (1902, p. 16) speaks of the pelican as "breeding abundantly at lakes east of the Sierras (Eagle Lake)". In June, 1905, Sheldon (1907, p. 186) visited Eagle Lake, and made the following comments: "A large colony was said to be nesting at the northeast end of the lake. As we had no means of getting to the island where they bred, we failed to visit the birds. Stockmen told us that on one occasion they had killed the nestlings with clubs on account of their becoming so numerous. Many birds were seen by us in the Lake."

In the summer of 1914, Milton S. Ray (1915, p. 74) visited Eagle Lake and spoke of "the vast ground colonies of American White Pelicans." Again Ray (1921, pp. 192-193) visited the colony, May 27, 1921, and wrote: "The California Gulls, however, were just beginning to lay, while in the great rookery of the American White Pelicans we were surprised to find that every set of eggs (and there were scores) had been destroyed by some undetermined agency."

The next few years of the colony are reported by Grinnell, Dixon and Linsdale (1930, pp. 158-159) and the story is so characteristic of most of the white pelican colonies that it is given herewith.

"On June 21, 1921, a colony of pelicans was visited, whose nesting ground on an island in Eagle Lake had recently been broken up. Two hundred and fifty-three birds were counted about the island and it was known that at least fifty others were at the same time fishing on the lake. There were four dead birds that had met death within two or three weeks, and holes in their bones indicated that they had been shot on the breeding ground. Over 100 nests were examined, but not one whole egg or live young bird was found. Apparently, after the pelicans had been frightened from the island by the shots the gulls proceeded to peck holes in all the eggs (fig. 121). People who lived near the lake were effectively unfriendly toward the pelicans because, in

their opinion, the birds destroyed too many fishes. Many shells of pelicans' eggs were found about a nest of black-billed magpies on the lake shore one-fourth of a mile away (Dixon, MS).

"Again, in 1928, a colony of white pelicans had occupied early in the season an island newly exposed by the lowering water. Young, by hearsay numbering 'more than a thousand,' were killed there prior to June 17 by persons 'from Susanville,' who resented the presence of competing 'fishermen.'

"A visit was made, June 13, 1929, to the large island in Eagle Lake where pelicans were nesting. Adults numbering close to 200 were sitting in groups on different parts of the island or swimming in the lake close by. Two small groups of nests were seen at places where there were large blocks of broken lava and clumps of a large white loco weed nearly one meter high. Some of the nests contained eggs, part of these clean and apparently newly laid and part soiled, possibly infertile. Only a few of the eggs had holes in their sides as if they had been eaten by some animal; gulls were likely responsible.

"The young on the island were estimated to number close to 100, of ages from many just hatched to some covered with white down and from one-fourth to one-third grown. An equal number of dead young was seen. Not one that was examined showed evidence of having been killed by violence or even of having been eaten into after death. Seemingly, the high rate of mortality here was due to some other cause than being preyed upon by other animals, possibly exposure, desertion, or trampling. Whatever the cause of death it seemed to affect all ages of the young.

"Mr. S. A. Webb, of Spalding's, who also visited the island on June 13, said that he had been there late the previous summer (1928) and had seen a much larger number of young than were present in 1929. He thought that many of these young had matured. That visit had been made after the slaughter in early June of young pelicans by persons. The pile of skeletons which had been left by these persons was examined. Surely there were not many hundreds of individuals represented there. These facts were taken to indicate that the 1928 season could be counted a successful one for the pelicans and that a smaller brood would be reared in 1929, provided there would be no serious molestation of the colony."

The last of the pelican colony at Eagle Lake is told by Mr. C. O. Fisher, Deputy, in a letter dated July 25, 1932.

"I would say that on the 17th of July the day I was on the lake in a boat with motor from 5 a.m. to about 11 a.m. that as near as I could count there were about 350 white pelicans on the lake. I landed at what used to be Pelican Island and looked it over for nests, eggs, and signs of nests. I found that there had probably been about 150 nests which looked like they had been destroyed by predatory animals. Pelican Island, as it was called where the colony nested, is now a part of the mainland, for the drawing off of the water of Eagle Lake for irrigation has caused the lake level to drop some 25 feet.

"I saw no evidence of young birds at Eagle Lake and would believe that the nests or the young had been destroyed."

Professor S. T. Harding, of the Irrigation Department, University of California, Berkeley, says that it is planned to continue draining the lake to reduce its evaporation area. The lake is to be lowered considerably, and its area confined to the relatively small deeper portion where there are no islands.

The white pelican colony at Eagle Lake is gone.

Elsinore Lake, Riverside County.—Not much appears to have been recorded of the Elsinore pelican colony.

In 1902, the following note (Nordhoff, 1902, p. 213) appeared: "These birds have hitherto been one of the commoner residents of Elsinore Lake, but this year (1902) there has been but one flock of five."

In a letter dated April 5, 1932, John McB. Robertson gave this very interesting information: "I have delayed answering your letter of March 25, in regard to White Pelicans, until I could go out to Elsinore and see if the use of this lake for speed boat races had caused them to leave. I drove out there this afternoon and found a group of Pelicans resting on the south end of the lake. While I was there two flocks came down from a great height and joined those on the water and I estimated about 250 birds present. I could not tell if the additions were newcomers or only birds that had been up for exercise. My notes

give two other observations of White Pelicans at Lake Elsinore: February 10, 1918, about 25 seen; and April 30, 1922, several hundred. I do not believe that they nest there as there are no islands in the lake."

The deduction from this information would be that it is improbable that pelicans will ever nest again on Elsinore Lake so long as it remains in its present condition.

Goose Lake, Modoc County.—Henshaw (1879, p. 329) mentions the white pelican in immense numbers at Goose Lake. "From their great extent, and in many instances complete isolation, as well as their containing an abundance of fish, the lakes of Nevada, California, and Oregon are especially favored by this bird, and on certain of them, as Pyramid, Eagle, and Goose Lakes, the pelicans are found in summer in immense numbers." Supposedly, the colony must not have continued long after this report, for there appears to be no other reference to it.

In 1913, Clarke (1913, p. 217) said, "Goose Lake is entirely dry."

During the last few years, the water of the lake has been receding due to its use for irrigation, the marshy areas around the lake have been cultivated, and in 1931 the lake bed was totally dry. In August 1932, several residents of the town of Lakeview were interviewed but none of them could recall ever having seen white pelicans nesting on Goose Lake.

Kern Lake, Kern County.—The story of Kern Lake is short.

In August, 1875, H. W. Henshaw (1876, p. 275) visited the lake for the Wheeler Survey. He wrote: "The most conspicuous of all the feathered tribe that we found assembled at Kern Lake were the White Pelicans, noticeable both from their great size and the extreme whiteness of their plumage. This was in August, and the birds had probably remained here all summer, breeding somewhere about the lake. During the hours of mid-day they appeared to give up fishing entirely, and, betaking themselves to some dry spot along the lake, they dozed away the unoccupied hours, standing motionless in long rows, with their heads drawn on their breasts, and appearing lost to all around them."

This gives nothing specific except that the pelicans were there in long rows. There may have been a few hundred nesting there, but probably not more; otherwise, more specific mention of numbers would doubtless have been made.

The next account (Chapman, 1908, p. 371) is the final one: "White Pelicans nested on Kern Lake until it was drained in 1904."

Sacramento River, Sacramento County.--A definite record of a white pelican colony nesting on an island in the Sacramento River is given by George Neale (1916, pp. 161-162).

"Lone Tree Island, about three miles northwest of the city of Sacramento, was formerly the site of a white pelican rookery. The accompanying photographs showing some of the birds and some of the nests were taken June 28, 1910."

Mr. Neale's photograph shows a group of pelicans which appears to be about two hundred in number. The colony may have been somewhere between two and three hundred birds.

No other pelican nesting records for the Sacramento River proper have come to light, but it is probable that white pelicans at one time nested at various places throughout the Sacramento and San Joaquin Valleys. Heermann (1859, p. 72) stated that "some few pair breed in Sacramento Valley." Henshaw (1876, p. 275) says: "They are present upon all the inland waters of any size in California, and less often and in fewer number are found upon the coast." Newberry (1857, p. 109) stated: "The white pelican is rarely or never seen at San Francisco, at Astoria, or at any other place on the coast where the brown are so abundant; but as one leaves the coast, penetrating the interior, on all the large rivers and inland lakes he will be sure to find it, though never in great numbers. It seems to occupy the inland lakes and rivers quite across the continent. ." The southern San Joaquin Valley, of course, had several well known pelican colonies about Buena Vista, Tulare, and Kern Lakes.

Salton Sea, Imperial County.--The history of the white pelicans of Salton Sea begins with Grinnell's account of his visit to Echo Island on April 19, 1908. There were no young hatched on the island at this date, although one set of the eggs collected was far advanced in incubation. Grinnell (1908, p.

188) says: "There were 980 occupied nests, besides many others in process of construction. At the very minimum there were 2000 pelicans here assembled."

In 1911, there are two more references (Van Rossem, 1911, p. 130 and p. 134) to the pelicans of Salton Sea. "White Pelican. Seen almost every day at Brawley in large flocks, and at Salton Sea. As early as January 8, they had begun to pair and by the thirteenth couples formed the majority." Van Rossem, in speaking of the birds found at Mecca, March 18 to 31, 1911, says: "White Pelican. But one or two seen. Probably most had gone to their island, about thirty miles out, to breed." It thus appears that the pelicans wintered in the Salton Sea region to some extent.

Dawson (1923, pp. 1962-1963) mentions "a company of about 300 pelicans who daily resorted to the western end of the Salton Sea, then, in 1913, near Mecca. Although the Farallon Cormorants were nesting feverishly, February 1st, the Pelicans alternately loafed and fished in idyllic indolence and in utter disregard of the claims of posterity."

Aside from the mere mentioning of Salton Sea as a nesting site for white pelicans there seems to be no other account of note until May 20, 1927, when J. R. Pemberton (1927, pp. 253-254) visited the colony and gave the following account: "We soon got into boats and made our way a couple of leagues to a small sand island where the White Pelicans (Pelecanus erythrorhynchos) were nesting. There proved to be by actual count 350 occupied nests each containing from one to four eggs. Incubation had not progressed very far, even in the sets of three and four. On two other nearby islands were two additional colonies; the 50 occupied nests in each brought the total number of breeding pelicans to 450 pairs. It is likely, judging from the relatively large number of nests containing only a single egg each, that many pairs of the birds had not yet laid; and I believe it safe to say that there are at least 500 pairs of breeding pelicans this year on Salton Sea."

Through the kind assistance of Dr. Loye Holmes Miller, Mr. George Willett, and Mr. A. J. Van Rossem, it has been possible to get some idea of the recent status of Salton Sea as a pelican colony. Pelican Island is now a peninsula and the birds no



longer nest there. Summer recreation near the island colonies has resulted in most of the pelicans leaving. There were about 50 pairs of pelicans nesting at Salton Sea in 1928, 1930, and 1932, and "a small number" in 1929, according to the correspondence from these sources.

Salton Sea, then, can hardly be counted as a pelican breeding colony of any importance. A portion of Salton Sea is a Federal reservation.

Tulare Lake, Kings County.--Grinnell (1926, p. 38), in discussing Gruber's (1884) article on the water birds of the Farallon Islands, gives the first record of the white pelican nesting at Tulare Lake. "Incidentally, he includes Tulare Lake as among the breeding places of the pelicans, doubtless the true White Pelican in this case." Gruber's observations were made some time prior to 1884. Unfortunately there is no specific data given for the Tulare colony other than this mention of it.

E. A. Goldman (1908, p. 201) visited the lake in the summer of 1907. "White Pelican. Large, loose flocks were seen daily while along the north and west shores of Tulare Lake, June 18-24 and July 6-8. A man who was gathering drifting lumber reported finding a nest containing eggs, on a small island near the west shore, about June 25."

The next report of the Tulare Lake colony is given by Dawson (1923, pp. 1968-1969). "According to local rumor, a shifting colony of Pelicans has maintained itself on Tulare Lake for a great many years. As we were skirting the western shore of the lake on May 14, 1912, we saw many birds, and a young man who herded cattle hard by told us minutely of the location of a colony of White Pelicans breeding on a tiny island some 18 miles away. He claimed to have visited the place on the 1st day of May, at which time most of the nests to the number of 'thousands' were occupied. Goldman had heard similar rumors in 1907."

Just how much weight should be attached to this report of "thousands" is a question, for the following year, 1913, Frank C. Clarke (1913, pp. 216-217) gives a very graphic picture of the conditions at Tulare Lake which certainly do not seem conducive to the maintenance of a large pelican colony. Excerpts are given herewith: "Tulare Lake, situated in the southern portion of

Kings County, on the western side of the southern San Joaquin Valley, is not the large body of water that one would expect to find from looking at the ordinary traveler's map of California. At present the lake is lower than for the past seven years, and at the present rate of evaporation it will most probably be entirely dry in another year, unless the coming winter proves a wet one. Prior to 1906 this lake had almost completely dried up, and nearly all of the bottom lands were farmed. It was during this period that the lake bed was dyked off on the section lines . . .

"The winters of 1905-6 and 1906-7 were years of heavy rainfall, and the lake, together with the adjoining sloughs, filled to a mark higher than for many years. The sloughs connecting this Lake with Buena Vista and the San Joaquin River are now very low or dried up. Goose Lake is entirely dry, and Buena Vista Lake, situated in the southwestern part of Kern County, is also very low.

"Following the intermittent recession of the waters of Tulare Lake during each of the past two or three years, the land, as soon as dry enough to work, has been planted with Kafir corn, grain, squash, etc. Thus at the present time these crops extend to within two or three miles of the water line. But between planted areas and the water there is no vegetation at all. The lake is merely a body of shallow stagnant water far away from any vegetation, plant or tree, and consequently there are no breeding places for ducks or any kind of birds whatsoever. . . . The water is decidedly brackish, is translucent or almost opaque in places, and is of a greenish yellow color. Its heavy content of alkali gives it a very soapy, almost slimy feeling, and over large areas there is a heavy covering of a yellowish-brown mass of fermenting organic debris. The fish -- carp, perch, bass and catfish -- of which the lake had a great abundance at one time, all died prior to the summer just past, the water becoming too stagnant for their existence.

"In view of all these conditions, one can readily see that Tulare Lake does not now present the most favorable conditions for the existence of ducks or any other kind of water birds."

Clarke mentions seeing a "few" white pelicans at Tulare Lake at this time.

The history of the pelican colony at Tulare Lake can, however, be fairly well deduced from the foregoing account. The lake evidently had islands, and great numbers of fish in shallow waters. These are ideal conditions for a white pelican colony. Large flocks of pelicans were seen at the lake at various times, and the local residents reported finding a nesting ground on an island where there were thousands of pelican eggs. This seems sufficient grounds for believing that a large white pelican colony did exist at Tulare Lake until the lake was dried up by diversion of its water supply for irrigation purposes. The lake has been alternately marshy and dry, depending upon the seasonal flood waters, for several years.

Tule Lake, Modoc County.—There are few references to the white pelican colony at Tule Lake, but they give a fairly good synopsis of the fate of the colony.

In the summer of 1895, Finley (1907, pp. 36-37) and Bohlman visited the lake. "The birds were so plentiful about Tule Lake that we were anxious to find where they were nesting." They found a small colony of nesting pelicans in company with Farallon Cormorants. "This was the only colony of pelicans we found after cruising for two weeks on Tule Lake, although we had seen a flock of several hundred birds that fished about the Lake and roosted together at night on one of the sandbars. They were very likely last year's birds and being immature, had not yet begun to nest."

Whatever the reason might have been for the small size of the pelican colony at Tule Lake in 1895, a possible inference from Mr. Finley's account is that several hundred young may have been raised there the previous season. That a large colony was present four years later is evident from Vernon Bailey's comment (1902, pp. 63-64) after he visited the lake early in July of 1899. . . . The pelicans and cormorants deserted their nests and young at the first alarm, but with apparent reason. The pelicans had been entirely driven from the peninsula where thousands had been in the habit of breeding and were feeding their young on a few little rocky islands in the lake, while under one group of trees where the cormorants nested, nearly a hundred almost full grown young were lying where some vandals had shot them from the nests."

The reason for the Tule Lake colony being disturbed may be

in part explained by conditions prevailing over most of the Western breeding grounds at this time. To quote further from Bailey (1902, p. 64): "This glimpse of the corner of one lake in the breeding season could be almost duplicated in a hundred other lakes of the region. In the past four years many thousand grebe skins have been shipped from this one lake, and the skin and plume hunting business has spread over the Great Basin country. A few years ago market hunters visited these lakes when the young ducks were nearly full grown and the old ducks moulting and unable to fly, loading their wagons with them for the market. While the game laws have put a stop to the open wholesale slaughter of ducks out of season most of the other birds, just as worthy of protection, are left unguarded. The white pelicans have been driven from many of their breeding grounds."

The plume hunting business was finally stopped by the efforts of the National Association of Audubon Societies, and by the arousal of public interest generally, but another factor, far more disastrous from the point of view of the nesting waterfowl, has crept in and destroyed many of the old nesting haunts. This is the reclamation of swamp and lake areas for agriculture. Tule Lake has been largely turned into farms and much of the water supply utilized. The present area of the lake is but a small fraction of its former extent, and it is not probable that white pelicans have nested there for several years.

Mr. H. M. Worcester, in a letter dated August 31, 1932, stated that aside from Clear Lake, no pelicans worth mentioning nest anywhere else in the district and that none nest at Tule Lake.

Summary.--While it is impossible to give a comparison of the white pelicans nesting in California originally and at present in terms of census numbers, some facts are evident from the data presented:

1. Of the 10 colonies discussed, 8 were vacant in 1932.
2. One colony, Salton Sea, may have had 50 pairs breeding in 1932.
3. One colony, Clear Lake, showed an enormous increase.

In other words, where there were ten colonies in, let us say, 1900, there were two in 1932, and only one of these remaining two

is of any consequence. As has been stated, it is possible that the Clear Lake colony was largely the result of the destruction of Lower Klamath Lake on the Oregon-California boundary and the construction of the Clear Lake reservoir. Though this circumstance may represent an increase for California, it does not represent an increase in the total number of white pelicans in the United States.

Perhaps the most significant aspect of the situation is not to be found in numbers but in the fact that all but one of the California white pelican breeding grounds have been destroyed. Where the birds were formerly scattered in many colonies, today they are all in one colony. Obviously, the hazard to their safety is thus greatly increased. The mere matter of the size of the Clear Lake colony can hardly be considered sufficient safeguard.

California, with the exception of Clear Lake, can no longer be considered as a nesting ground of the white pelican.

#### Colorado

A few records of the white pelican in Colorado indicate that it may have bred there sparingly in the past, and was common in migration formerly, although it is now rarely seen.

W. W. Cooke (1897, p. 52) said: "Formerly not uncommon in migration and some remained to breed; now rare in migration and no late record of its breeding. Passes across Colorado late in April and early in May."

In the summers of 1905 and 1906, a few pelicans were seen on different lakes, but it was not known whether they were breeding (Felger, 1909, p. 279).

W. L. Slater (1912, p. 29) gave the following account: "The Pelican was formerly not uncommon on migration, while a few are said to have bred in Colorado. Of late years, no doubt owing to the increase of population, it has been less often seen, nor have I met with any undoubted account of its nesting within the State."

#### Florida

While it is definitely known that the white pelican does not

now nest in Florida, there is some indication that it may have, at least on a few occasions, in the past.

Thomas Nuttall (1834, p. 473) wrote: "They are very rarely seen along the coast of the Atlantic, but stragglers have been killed in the Delaware, and they are known to breed in Florida."

From an unsigned article in the Oologist (vol. 4, 1887, pp. 101-2), said to have been taken from Maynard's "Birds of Eastern North America", this excerpt has been taken: "The late Captain Dummitt informed me, that upon one occasion, the White Pelicans bred in considerable numbers on a small island, in the lagoon just south of Mosquito Inlet, but this is unusual and they have never repeated it, the species generally migrating northward in April to nest on the inland waters of the northwest."

S. C. Clarke (1871, p. 252) gives another record for Florida in 1871. "In East Florida, the Brown Pelican, P. fuscus, a smaller bird, is most numerous; you will see twenty of these to one of the white species. They both breed in that region, and lay their eggs on the sand bars and lonely islands."

A few years prior to 1905 Herbert Knightley Job (1905, p. 46) visited the Cape Sable region in search of nesting white pelicans. "These lakes are the resorts of large numbers of the American White Pelicans, that usually breed in the far North. Yet I was not without hope that possibly we might find them nesting in this Southern wilderness." The quest was unsuccessful, however, and only two nonbreeding birds were found.

## Idaho

I know of no pelicans nesting in Idaho at present.

W. E. McGee informed me, August 2, 1932, that a small colony of white pelicans had nested at the Minidoka Federal Wild Life Refuge, Cassia County, in the past, but that he was not aware that pelicans had nested there for several years. McGee estimates, however, that in the summer of 1932, 1500 white pelicans were on the Snake River between the mouth of the Weiser River and American Falls. Since there appears to be a large number of nonbreeding birds present throughout the summer range of the pelican, this aggregation on the Snake River does not necessarily indicate that a nesting colony was in the region.



## Louisiana

There is some indication that the white pelican has nested sporadically along the Gulf Coast. Audubon (1838, pp. 89-90) says: "How strange it is, Reader, that birds of this species should be found breeding in the Fur Countries, at about the same period when they are to be found on the waters of the inland bays of the Mexican Gulf! On the 2d of April 1837, I met with these birds in abundance at the south-west entrance or mouth of the Mississippi, and afterwards saw them in the course of the same season, in almost every inlet, bay, or river, as I advanced toward Texas, where I found some of them in the Bay of Galveston, on the 1st of May. Nay, while on the island of Grande Terre, I was assured by Mr. Andry, a sugar planter, who has resided there for some years, that he had observed White Pelicans along the shores every month of the year. . . . My friend John Bachman, in a note to me says that 'this bird is now more rare on our coast than it was thirty years ago; for I have heard it stated that it formerly bred on the sand banks of our Bird Islands. I saw a flock on the Bird Banks off Bull's Island, on the 1st day of July 1814, when I procured two full-plumaged old birds, and was under the impression they had laid eggs on one of those banks, but the latter had the day previous to my visit been overflowed by a spring tide, accompanied with heavy wind.'"

Nearly a hundred years after Audubon's comments, accounts in similar vein appear. "White Pelican (Pelecanus erythrorhynchos), winter visitor, arriving here about October and departing about April, breeding in the north. A few breeders remain during the summer." (Hopkins, 1928, p. 277). Bailey (1927, p. 90) says: "There are a few records of white pelicans nesting along the Gulf coast. . . ."

Summary.--Louisiana, according to ornithological record, was never an important breeding ground of the white pelican, although there is evidence that a few breeding colonies have been located there from time to time.

## Minnesota

Thomas S. Roberts (1932, pp. 162-163) gives a full account of the nesting of white pelicans in Minnesota.

"The Pelican was formerly a fairly common summer resident throughout Minnesota, breeding in large colonies at a number of places from Heron Lake, Jackson County, northward. The last of these breeding-places, as far as known, was in Grant County, a few miles west of Herman, and was located on a strip of low ground along the Mustinka River. This was in 1878. It was a colony of considerable size and attracted so much attention that the settlers came from far and wide, and so disturbed the birds that they did not return the next year. Rumors of this nesting having reached Minneapolis, Mr. Franklin Benner and the writer visited Grant County in June, 1879, hoping to find the birds again at the former location, but they were not there. Mr. Jasper N. Sanford, of Elbow Lake, Grant County, upon whom we called, had eggs in his possession, collected by him during a visit to the colony in 1878 and confirmed the account of the nesting. As stated above, there have been various reports of Pelicans nesting since that time at Pelican Lake, Grant County, up to about 1895; at Lake Shetek, Murray County, in 1899; in the vicinity of Leech Lake in 1902; and at Heron Lake in 1914. But these reports were more or less in the nature of rumors and, as no actual nests were found, were probably based on the presence of nonbreeding birds, spending the summer on various lakes. There is, however, one record that seems to indicate that at least one pair nested in the State as late as 1904. Albert Lano, in the Auk (39: 105, 1922), states that on August 15, 1904, while he was living at Aitkin, Minnesota, a hunter brought him two young Pelicans that had been shot on the shore of Sandy Lake, about forty miles north of Aitkin. They were not more than one-fourth grown, which seemed to indicate that they had been hatched and reared not far from the point of capture, as they were still unable to fly."

Summary.--The breeding of the white pelican, once common in large colonies throughout the State, was practically at an end by 1878 when the last colony of any note was driven away by visitors.

#### Montana

Big Lake, Stillwater County.

Lake Bowdoin, Phillips County.

There appear to be very few records of the nesting of white pelicans in Montana. The two colonies listed (Saunders, 1921,

p. 31) here give no indication of what the conditions affecting this species may have been in the past.

Speaking of the white pelican, Saunders says it "breeds in at least two localities in the prairie region of the State, and occurs in summer or migrations in many other places. Found breeding at Lake Bowdoin, young and eggs being seen on July 4, 1903 (Willett, 1907, p. 106). This colony is evidently still in existence, for I saw a number of birds of this species on this lake, from the train, on June 22, 1915. A colony of eight pairs breeds on an island in Big Lake, Stillwater County, observed there in 1918 (Thomas, MS)."

An apparently sporadic case is listed by E. S. Cameron (1907, p. 247). "Rare. Mr. Dan Bowman is positive that a pair of pelicans nested on a small wooded island in the Powder River near the mouth of Locate Creek in the summer of 1884."

Mr. B. R. Lugar, Custodian, Idle Wild Gun Club, on Lower Redrock Lake, Beaverhead County, informed us June 11, 1932, that each summer in July and August, "thousands" of white pelicans came to the lakes but that he knew of no place where they nested. Another gun club custodian in the region concurred in this statement, and added that he had killed many of the birds because he thought they ate the grayling which came up the river to spawn. June 18, 1932, I saw 23 pelicans at the Redrock lakes. The pelicans were not nesting at Redrock, and no one in the vicinity knew of their ever having done so.

In a letter dated October 29, 1931, Mr. Robert H. Hill, State Game Warden, reported that a considerable number of pelicans nest at Lake Bowdoin. Ellsworth Lumley (1932, p. 371) writes: "The White Pelicans nesting at Lake Bowdoin, near Malta, were more plentiful this year than in several previous years. Also quite a few nested at Lake Helena, near Helena."

Montana never has been an important breeding ground of the white pelican since its nesting in the State has been recorded. The Big Lake and Lake Bowdoin colonies were small, but the latter appears to be growing.

## Nevada

Pyramid Lake, Washoe County.---Anaho Island in Pyramid Lake has long been the breeding ground of pelicans. A species of fish, the Quee-wee (Chasmistes cuius), found only in Pyramid Lake, indicates that the lake has remained in a condition suitable to fish for a long period of time. Doubtless, such uniformity of habitat would have been conducive to the maintenance of the pelican colony as well. At any rate, Hall (1925, p. 148) says: "Pyramid Lake is known to have been a breeding place of the White Pelican (Pelecanus erythrorhynchos) from the time the first white man settled in the region until the present. According to Indian lore, the birds were there for countless years preceding the advent of white men."

Fremont discovered the lake January 10, 1844. Of course there were no pelicans there at that time of year, and they are not mentioned in his account.

The first actual account of the pelican colony begins with Ridgway's (1874) "thousands" of pelicans seen on the lake in August 1867. Apparently, the peace of the colony was disturbed shortly after Ridgway's visit, for Henshaw (1879, p. 329) gives the following account: "At Pyramid Lake a crusade has been inaugurated against the pelicans by the fishermen, whose cause is justified in their own eyes by the voracity of the big birds, and the number of fish consumed by them. In a single day, as I was informed, over 700 eggs belonging to one colony were destroyed." The effects of such treatment were clearly evident in the conditions which Russell (1885, p. 63) found. "During our visit to Anaho Island in August, 1882, there were two large pelican 'rookeries', in each of which there were 600 or 800 young birds." This indicates a much smaller nesting colony than any succeeding census shows.

In July, 1903, Chapman (1908, p. 378) observed the Anaho colonies. "Anaho is too big to be seen at a glance, however, and during the day when we completely covered it, eight distinct colonies of Pelicans were found, containing in all 4000 young Pelicans and one hundred and eighty-nine eggs. The young ranged in age from those just hatching to others which were beginning to acquire their wing feathers. Generally speaking, all the young of one colony were approximately the same age; suggesting that

the various groups formed quite distinctive villages, and conducted their affairs wholly independent of one another."

The loss in eggs and young in a pelican colony is so variable that it is hard to say how many adults were there at the time of which Chapman speaks. There were probably several thousand adults.

On June 19, 1917, and again on June 3, 1921, B. W. Evermann (1923, p. 18) inspected the island. On the latter visit, he made a definite count of nests. "I inspected a total of 13 breeding colonies. Listing these colonies, starting with those highest up, the number of nests in each was, respectively: 150, 200, 150, 150, 100, 25, 150, 800, 150, 200, 150, 150, and 6. The total number of occupied nests was 2,381.

"All of these were on the north side of the island. The southeast, south and southwest parts were not visited. In 1917 there were several considerable colonies on these parts, and it is quite probable a good many were there in 1921. An estimate of 1800 nests seems reasonable. This would give a total of 4181. It is believed that an estimate of 5000 pairs of breeding birds for the entire island is a conservative one.

"It is believed the number breeding on Anaho Island in 1921 was considerably fewer than in 1917. In my recent visit I noted several areas that were occupied in 1917, but now without any birds at all; and some areas now occupied had more birds the earlier date. The decrease has probably been 20 to 30 percent."

In the summer of 1924, Hall spent three months at Pyramid Lake studying the relations of fish and fish-eating birds, principally, the pelicans. During this time he made an actual census of the colony (Hall, 1925, p. 149). "On June 5 and 6, 4534 nests containing 816 young and 6234 eggs, or a total of 7050 eggs and young, were counted in the 13 colonies, and some eggs were known to have been taken from the colonies before this date."

Later in the month a census of the adults was taken (Hall, 1925, p. 150). "From actual counts of 8500 adults made on the island between 12 a.m. and 4 p.m., June 21 and again June 22, and the estimate of 1400 at other places away from the island, based on the average of actual counts previously made at these various

other places at the same time of day, the total number of adult pelicans present in the Pyramid Lake region was placed at 10,000. This is, therefore, the largest colony of White Pelicans known to be in existence today."

During a part of June and July, 1927, Dr. Owen J. Gromme (1930, p. 272) of the Public Museum of Milwaukee, encamped on Anaho Island. Exact censuses of the colonies are not given, but the conditions presented seem to be somewhat different from those presented for the colony previously. There has been a shifting of the colonies and the older nesting sites over the whole of the higher portions of the island have been deserted, and only the low lying sites along the east side are in use (Gromme, 1930, p. 277). "There were thirteen occupied colonies ranging in size from about one dozen nests to over one hundred." It is of interest, here, that Gromme found thirteen colonies as did Evermann in 1921 and Hall in 1924, although the total number of birds in the colony seems to have decreased, and several of the old nesting sites are entirely vacant. Whether this indicates that there has been a decrease in all, or various ones, of the thirteen groups of pelicans, or whether it is merely a coincidence, is a question. But later information indicates that there has been a decided decrease in the colony as a whole.

Mr. Charles F. Cooper, U. S. Biological Survey warden for the Anaho Island Wild Life Reservation, says that in 1931 there were 7 colonies of the pelicans on Anaho and about 7,000 adult birds.

On May 10, 1932, Mr. Francis L. Chamberlain and I visited the island and made a census of the nests and adults. This date was evidently too early, for we found only 667 occupied nests, and about 2500 adults. Later in the season, June 9, 1932, Mr. Cooper counted the nests and adults. There were 2994 occupied nests, about 300 young pelicans, and about 6,000 adults, counted and estimated.

The reason for this marked decrease is not known. In fact, the colony is receiving better protection than it did previously, for it is now a Federal preserve and has had permanent warden service since 1931. It is perhaps possible that a portion of the colony has moved to Bird Island in Great Salt Lake, Utah, but this hardly seems probable in view of the fact that Pyramid Lake is an old, established breeding ground.



There is one factor which may ultimately destroy the white pelican colony on Anaho Island, and even Pyramid Lake itself; that is the diversion of the water of the Truckee River for irrigation and power. As early as 1908 Chapman (1908, p. 379) spoke of the lowering of the lake level, and the process has continued till the present. Should the island become connected with the mainland, or the water become too salty (Pyramid Lake has no outlet) to maintain fish, or the spawning grounds be destroyed, the pelicans would have to leave. While these effects do not appear to be imminent, they are inevitable with continued lowering of the lake.

Walker Lake, Mineral County.---In a letter of December 30, 1931, Major E. A. Goldman quotes mention of a "large colony" of pelicans at Walker Lake, Nevada, in 1931. Other than this, I have no information relative to the Walker Lake colony.

Washoe Lake, Washoe County.---One record (Hanford, 1903, p. 50) implies that white pelicans may have nested at one time on Washoe Lake. "About 50 pelicans were observed at the lake last year and the number had increased to 100 this year. Three eggs were found a foot under water in June, but no nests have been found for a number of years." Hanford made his observations at Washoe Lake during the months of May and June, 1901 and 1902.

Chapman (1908, p. 371) mentions "Pelican settlements on islands in" Washoe Lake, Nevada.

In 1931 the lake bed was dry. In 1932, it was covered with a shallow sheet of muddy water. There was no sign of nesting pelicans, and according to local report, it was not known when they nested there.

Summary.---The facts presented above indicate that the white pelican population of Nevada has decreased since the bird was first recorded. But the colonies of the State have done less shifting, probably because of the few nesting sites available. One colony, namely at Washoe Lake, has disappeared because of the early settlement of the Washoe Lake valley. The Pyramid Lake colony is the only one of note, and, so far as I know, the only colony of pelicans within the State for many years.

## North Dakota

It is probable that before the coming of white man, white pelicans nested at various places throughout the State, although the actual records pertain to but a few specific localities. In 1874, Coues (1874, p. 587) gives this account: "The large number of Pelicans I observed, however, in Northern Dakota, at various times in the summer, leads me to presume that they nest in that region, especially about the Lake River, a short expansive affluent of the Mouse River, more like a great prairie slough than an ordinary river. In May, 1873, I took a female on the Red River, near Pembina. . . ." In referring back to this record of Coues, Norman A. Wood (1923, p. 15) says: "The species was only once again observed, near Mouse River early in September."

Chase Lake, Kidder County.--Chase Lake is a small alkaline lake near Pettibone, North Dakota. According to Walter W. Bennett (1926, p. 66), who visited the lake June 24, 1924, it is "about two miles long and nearly round. The actual area of the Chase Lake Reservation, according to Dr. A. K. Fisher, Acting Chief of the Bureau of Biological Survey at Washington, was 2,839 acres. Nestled among hills and without an outlet, its waters had become so strongly alkaline that white salts were piled up six inches deep in some places along its shores. No rushes grew in the water, nor were there any trees in sight -- nothing but bare prairie and lake."

To go back a few years, Bennett (1926, p. 68) presents a letter from the former warden of the reservation which fairly well summarized the growth and maintenance of the pelican colony since 1905.

"Our genial guide, Mr. H. H. McCumber, under date of March 20, 1925, writes a most interesting history of this lake and its remarkable island:

"'When I came here in 1905 there were probably five hundred pelicans that nested on the island as well as a good many gulls, avocets and terns, also some Canada Geese, cormorants and several species of ducks.

"'The pelicans were not considered as of any value whatever, and in an economical sense I do not think that they are. However,

we do not want to see any bird now living, or rather any species of birds, exterminated as the Passenger Pigeons and some others were. The settlers did not consider the pelicans of any value and they made a practice of going there on Sundays and seeing how many they could kill by shooting them on the wing with rifles and generally wagered small bets on their shots which they considered great sport.

"I saw that in a very short time they would be wiped out so I began in 1907 to take the matter up with the Biological Survey at Washington to see if we could not make a bird refuge out of the lake which consists of five or six sections of land. The Island which serves as a safe nesting place for the birds contains only about forty acres and is at least a quarter of a mile from any shore so it is perfectly protected from coyotes, skunks and other nest robbers who would do great damage if the nests were on the main land. Finally, after investigating and after the number of pelicans had been reduced to about fifty birds, President Roosevelt set it aside as a bird refuge in August, 1908. I was in charge from that date until 1918 when I went to Sully Hill Park, near Devils Lake, which is a big game park under Government supervision.

"While the Chase Lake refuge is a great thing for the protection of the birds mentioned above, yet we think its greatest value is in the protection it gives to wild ducks and geese in the fall. When they are shot out in all the rest of the lakes they have found safety by going to this refuge and they certainly do go there by the thousands. I have seen hundreds of acres covered on this lake when the other ponds were practically stripped owing to excessive hunting so that otherwise I think our birds would move on south at such times if they did not have this refuge to go to and know they were safe.

"During the last season there were between 2500 and 3000 pelicans on the refuge so it will be always possible to have them if the refuge is kept up and properly protected. I will also say that this is the only place in the State where the pelicans nest and there are few such colonies in the United States, so it behooves us to take care of these reservations if we do not want the birds totally exterminated."

Continuing with his own observations of June 24, 1924,

Bennett (1926, p. 70) says: "Mr. T. Gilbert Pearson, president of the National Association of Audubon Societies, in a letter dated April 14, 1926, states that he visited the Chase Lake Bird Reservation in the summer of 1916. Evidently the numbers of pelicans had not increased greatly for he says, 'Of course I distinctly recall the small colony of White Pelicans breeding there at the time, and I think there were a few cormorants. There were also a few ducks and I remember seeing one Canada Goose with her young.'

"As we came to know this preserve it was evident some of the birds of McCumber and Pearson were not there. The nesting cormorants had gone and there were no Canada Geese to be seen with their young. Yet as we scanned the landscape there were plenty of birds left for our observation and, particularly, the pelicans had increased from the fifty birds of 1908 to at least 2500."

In a letter of September 6, 1932, Mr. Burnie Maurek, Commissioner of the State of North Dakota Game and Fish Department, gives this recent information on the Chase Lake colony: "Your inquiry in regard to the American White Pelican at Chase Lake in North Dakota received, and I wish to state that there are between two and three thousand pelicans still nesting on the island in Chase Lake. My observations for years have been that there is not very much fluctuation as to increase or decrease in these birds."

Devils Lake, Benson County.--The following unsigned article appearing in The Young Oologist (1884, vol. 1, p. 73) gives perhaps the first indication of the status of the Devils Lake colony: "Our collector at Minneapolis, from whom we expected to receive a large number of White Pelican eggs, writes us that he has been unable to procure any. He says that Devil's Lake, Dakota, where the birds are usually very plentiful, is this year deserted by them. Last season eggs were easily obtainable, one man getting over a barrel of them. The Pelicans were certainly a beautiful feature of the lake. When there last summer I saw a large flock of them, perhaps several thousand. As the steamer neared them the engineer blew the whistle and they all flew. The sky was white with them for a space the length of four hundred feet or more at a height of perhaps seventy-five feet. Where the birds have gone is a mystery."

Pelicans are not now reported from Devils Lake, but Wood (1923, p. 15) says: "In 1920 an old resident told me that many years ago a few nested at Pelican Bay, Devils Lake. Five were seen July 15, 1920, at Minnewaukan Bay. On May 10, 1921, six came into Creel Bay and on July 19, forty were observed on a small island in Minnewaukan Bay. Residents of the central part of the State record that a few breed there."

Long Lake, Burleigh County.--Mr. Maurek, in the letter previously mentioned, says: "I also wish to report that there have been some pelicans nesting on the west end of Long Lake in Burleigh County, about a hundred all told."

Summary.--Of the two recorded white pelican colonies of any note, one was destroyed in 1883. The other had a population of 500 in 1905, which, due to protection, has increased to 2500-3000. The Chase and Long Lake colonies are apparently the only ones in the State today, and, of these, the former is the only one of any size.

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.

## Oregon

Klamath Lakes, Klamath County.--In 1886 Merrill (1888, p. 141), in speaking of Klamath Lake (probably Upper Klamath), noted that the white pelican was "common on the lake, a part of which is called Pelican Bay, from the abundance of these birds which breed on certain islands."

Lower Klamath Lake was intensively explored in 1895 by Finley (1907, p. 37) and Bohlman. They present a description of the lake as it was originally.

"When we crossed over to Lower Klamath Lake, we found it very different from the south end of Tule Lake, where we had fairly good places to camp. Extending for several miles out from the main shore was a seemingly endless area of floating tule islands, between which flowed a network of channels. These islands furnished good homes for the great flocks of pelicans

that return each spring to live about these lakes and rivers that teem with fish. The tules had grown up for generations. The heavy growth of each year shoots up through the dead stalks of the preceding season till it forms a fairly good floating foundation. On the top of this the pelicans had perched and trodden down the tules till they formed a surface often strong enough to support a man. But it was like walking on the crust of the snow, for you never knew just when it would break through. However, these treacherous islands were the only camping places we had during the two weeks we cruised the lower Klamath.

"We rowed on among these islands and found the pelican colonies scattered along for about two miles. There were eight or ten big rookeries, each containing from four to six hundred birds. Besides, there were about fifteen others that had all the way from fifty to two hundred birds. The birds nested a few feet apart on these dry beds, each laying from one to three eggs."

Although it is difficult to arrive at any definite figures for the pelican colony at this time, an estimate of from 6000 to 8000 birds seems reasonable.

The picture just presented was probably the last before adverse factors began to decimate the colony, for a few years later the plume hunters arrived, and most of the colonies affected never fully recovered (Finley and Bohlman, 1905, pp. 341-342). "For awhile the White Pelicans were also shot for their plumage. In 1901 fifty skins were shipped to New York, and brought one dollar each. A little later a consignment of five hundred skins was sent, but, not being paid for, the further shipment of these skins stopped, as far as we could discover." This is not so much, to be sure, but in 1915 (Finley, 1915, pp. 489-490) the rest of the plume-hunting story is told. "From the Cormorant colony, we cruised around to some of the White Pelican camps. Here rows of hundreds of great white birds . . . were solemnly awaiting our arrival. . . . For many years the White Pelican disappeared rapidly. Many hunters shot these birds wantonly, and others killed them for their quills, which at one time were fashionable, and in this way thousands of the big birds paid penalty to the milliners' trade. They would have been exterminated here in the Klamath country, perhaps, had it not been for Audubon and Government protection."



Another chain of influence was at work in the meantime. Chapman (1908, p. 379) visited Lower Klamath Lake in June and July of 1907 and found the colonies only slightly smaller than in previous years. But aside from that fact, he records (Chapman, 1908, p. 380) that "The Government Reclamation Service has condemned this lake, not because its waters are required, but because they are useless or, from a strictly utilitarian view, worse than useless. When the project, now being developed, is completed, they will have disappeared down the Klamath River and 260,000 acres of tillable land will have taken their place. The reed islands will strand in the mud, the tules will wither and alfalfa flourish in their place, the birds, like other indigenes, will find that the Government Land Office does not recognize a claim to ownership based only on priority of occupation, and, with their relatives of Pyramid Lake, they must search for a new country." All of this came true, except that the alfalfa did not flourish.

In 1919 Finley (1919, pp. 412-414), who has followed the telescoping events of the Lower Klamath Lake colonies perhaps more closely than anyone else, gives the final view.

"The greatest blow at the conservation of wild birds on the Pacific Coast is the almost certain destruction of our two large Federal wild-bird reservations, Lower Klamath and Malheur Lakes. The destruction of Klamath Lake Reservation has been accomplished by the drying up of the water, caused by cutting off the flow of water from Klamath River. The Reclamation Service has done this by building a dyke across the river.

"Lower Klamath Lake was a stretch of about 15 miles of open water, surrounded on all sides by miles of tule marsh. Untold thousands of Ducks, Geese, Pelicans, Terns, Herons, and other birds made this place one of the greatest wild-fowl museums in the United States. Because of this, President Roosevelt, at the request of the National Association of Audubon Societies, made it a national bird-reservation on August 8, 1908. It was a great living monument to his memory, but now looks like a desert waste. To complete the devastation, fires were started months ago in the vast tule marsh. Not only the surface, but below the surface into the tule roots and the peat, the fires are burning continually.

"What has been gained by the drying up of Lower Klamath Lake? The idea of the Reclamation Service was to bring irrigation water from some other place and use the land for agriculture. Examination of the soil shows that it is so filled with alkali that little or nothing can be grown, even with a great amount of irrigation.

"Formerly, Lower Klamath Lake subirrigated a part of the surrounding country, providing a large amount of wild hay land. These sections have now reverted to a desert. The great bird colonies were of inestimably more value to the Pacific Coast and to the whole country than the wild alkali flats. Every person and every organization in the country should protest to Franklin K. Lane, Secretary of the Interior, to open up the dykes and restore Lower Klamath Lake. If this could be done, the fires now burning in the tule marsh could be extinguished. The bird multitudes would likely return next spring to their ancestral homes. If this is not done, Klamath Lake Reservation is gone forever.

"The protection of our wild birds is not only a National, but an international question, in which we are bound by treaty with Canada. The real factor in preserving wild fowl is saving their breeding-places from destruction. Here is the destruction of wild fowl on an enormous scale by a department of the Federal Government. The public as a whole, has a right to know whether the destruction of this federal wild-bird reservation which is a great natural asset to the country, can ever be recompensed for by the effort to cultivate alkali flats of what was once Lower Klamath Lake."

Malheur Lake, Harney County.--There is slight evidence in the following quotation (Shufeldt, 1892, pp. 401-402) that White Pelicans nested in the Malheur Lake region during the tertiary epoch, but the suggestion is given here for what it is worth,

"There is in the Cope Collection the distal end of the right ulna of a Pelican, a perfect specimen. It belonged to a bird very slightly larger than Pelecanus fuscus, and I have carefully compared it with the corresponding part in that specimen and find it to agree almost exactly in its characters. (No. 18, 483 Coll. U. S. National Museum.) As P. erythrorhynchos is now abundant on Silver Lake, I have no doubt that its ances-

tors, as the same species, existed in the ancient avifauna of the tertiary epoch of that region."

Silver Lake is a small alkaline lake a few miles northwest of Malheur Lake.

Captain Charles Bendire (1875, pp. 165-166) first explored the great bird rookeries of Malheur Lake, and accounts from his letters were compiled by T. M. Brewer.

"April 16 and April 28, visits were made to Lake Malheur. The following extracts are from letters dated April 18 and 29: 'I have just returned this evening from my first cruise in Malheur Lake, which has been sailed over for the first time. As an egg hunting expedition it has proved a perfect success. I obtained about a hundred eggs of the white pelican on one of the islands in the lake, the only one they use, apparently. I had no idea that these birds nested so early, as on the first of the month the lake was completely covered with ice, and I found snow on this very island on the 16th, when I took the eggs. . . . The eggs were all fresh when taken, none had been laid more than four days, which would make the 12th of April their first deposition.

"I returned from my second trip to Malheur Lake yesterday morning (28th)." Referring to the pelicans, Bendire continues: "They appear very sensitive about having their nesting places disturbed. On my second visit I found they had all left the island on which I took my first eggs, and had buried in the sands the few we had left. They occupy an island now about half a mile from the first one, and when I visited it there must have been on it more than a thousand eggs. Many of the nests contained three and four eggs each, all evidently laid by the same bird. The majority of the nests, however, contained only two, and I believe that many do not lay more than two eggs at a sitting. . . . West of the island where they breed, is their favorite fishing ground. Here is a large spring coming right out from the hills, having a gravelly bed. It is the only place on the lake where the water is sweet and palatable. The shore here swarms with a species of sucker about eighteen inches long, and red on the sides. I camped a night there, and this kept the birds away in the daytime. At sundown they began to collect, first by tens, then by fifties, and in a short while there was a string of them one hundred and fifty yards long, at least, and from four to six deep.' . . .

"May 27th the lake was again visited: 'The pelicans are thicker than ever. I could have gathered a wagon load of their eggs on the island where I first found them, April 16. Quite a number of the eggs were quite fresh'" (Bendire, 1875, p. 167). It should be noted here that after Bendire's first visit, the first island was deserted; on the second visit, the pelicans had taken up abode on another island which was then covered with "more than a thousand eggs"; and that on the third visit, the first island was also covered with "a wagon load of their eggs," so that the two islands must have been occupied on May 27, the date of his third visit. This gives some idea of the size of the colony, which must have numbered somewhere in the thousands.

The following year Bendire (1876, pp. 146-147) speaks of the white pelicans breeding "in large numbers on several of the small islands in the eastern part of Malheur Lake." And George R. Bacon (1877, p. 44) says: "They nest in large groups, the nests being side by side and covering acres."

On August 18, 1908, Malheur Lake Reservation was established.

For the next few years, not much specific information about the Malheur pelican colony is available, except reports which indicate that the pelicans were there, as the following excerpts show. Finley (1908, p. 291) was at the lake during May and June of 1908. "The most populous colony we found was one composed of thousands of White Pelicans and Ring-billed and California Gulls nesting together." Alex Walker (1917, p. 133) reports; "On June 1, 1913, a large flock was seen in flight a few miles east of Silver Lake." And in the same year, 1917 Finley states in Birds of America that: "The largest colonies of White Pelicans in the United States are found on Malheur Lake, Klamath Lake, and Clear Lake reservations in southern Oregon and northern California." However, at this time the colony was by no means as large as when Bendire first saw it, for George Willett (1919, p. 197), who visited Malheur Lake in 1918, reported about 400 pairs of nesting pelicans.

At least one of the reasons for the decline was that Malheur Lake, like Lower Klamath Lake, just discussed in the previous account, was being affected by a diminishing water supply and the encroachment of grazing and farming upon its marsh lands. In 1920, Dr. A. G. Prill (1922, pp. 32-33) visited the pelican

colony and estimated about 250 breeding birds. Again, in 1921, he (Prill, 1922, p. 126) visited the colony and estimated about the same number of pelicans.

The fate of the colony during the next few years was well predicted by William L. Finley (1919, pp. 413-414). "The case of Malheur Lake Reservation is somewhat the same as Lower Klamath except that this is not a project of the Reclamation Service. Malheur Lake Reservation is in the lowest part of Harney Valley. The diversion of the waters for irrigation purposes is rapidly drying it. Inside of three years more, this will be accomplished and the greatest Federal bird-reservation in the country will pass out of existence. An effort was made at the last session of the Oregon legislature to straighten out the Malheur Lake matter and secure its permanency as a bird-reserve, but this failed. The fight is against the prevalent commercialism that will destroy everything of beauty in the hope of turning it into money. . . . Malheur's millions of birds, including Ducks, Geese, Grebes, Pelicans, Egrets, and Gulls will soon be driven away forever unless the unexpected happens."

Needless to say, the unexpected did not happen.

During the last few years, Malheur Lake has been nearly dry, and in 1931 it was dry. In a letter of October 24, 1931, Mr. Stanley Jewett, Leader, Predatory Animal and Rodent Control, U. S. Bureau of Biological Survey, stated that: "There has not been a single pelican nesting at Malheur Lake during the past two, or possibly three years. This year, there has not been a drop of water in the bed of Malheur Lake although the tule swamp and adjacent hay ranches at the mouth of the Blitzen River have held enough water to support a limited amount of waterfowl."

On August 4, 1932, I visited the lake and saw about 20 white pelicans. The islands where they have nested in years past are no longer surrounded by water; consequently Mr. George Benson, Warden of the Reservation, thinks no pelicans nested this year either.

An effort is being made to restore at least a part of the Reservation to its former condition by buying adjacent farm lands, which were once marsh area, and by procuring more water for the area.

Warner Valley Lakes, Lake County.—Warner Valley is a level, narrow defile in the mountains of southeastern Oregon, where, during seasons of heavy rainfall, water collects in a chain of shallow basins stretching along the valley floor for perhaps forty miles. Before any of the water was utilized for irrigation, this was probably a magnificent breeding ground for waterfowl, with the marsh remaining fairly constant year after year. White pelicans undoubtedly nested here in large numbers. But of late years, much of this water has been diverted, and the marshes have suffered a varied existence ranging from seasons of abundant water to periods of absolute drought.

Dr. A. G. Prill (1922, p. 134) visited the valley from May 20 to June 20, 1922, and found only 25 pairs nesting on two islands in Hart and Crump lakes, the two major lakes of the chain. In 1923, Prill (1924, p. 25) visited the valley again and recorded very different conditions. "In 1922 the entire valley was well covered with water, from its most southern to its northern point, but during 1923, fully 50% of this area was dry and bare. Many small ponds and large areas of marshes were entirely devoid of water. . . . The American white pelican had increased from a few hundred birds to more than a thousand, which were counted in one flock on Crump Lake." Again, in June, 1923, Prill (1925, pp. 36-37) saw the lakes, but reported only two pelican nests.

On August 4 and 5, 1932, I visited the valley and found about 200 pelicans at Hart and Crump lakes, but they were not nesting. It was reported by inhabitants of the region that the lakes had been entirely dry in 1931, and that while there was some water in them this year, it was so shallow around the island where the pelicans nested that coyotes had crossed over and driven the birds from their nests. It was also reported that pelicans had nested in the valley by thousands in the past, and that during dry seasons the few pelicans returning would resort to the narrows between Hart and Crump lakes where minnows were to be found in the potholes which did not go dry.

Doctor Prill, under date of September 8, 1932, writes in detail of the present status of the lakes in Warner Valley. He reports that there is a movement under way to make a Migratory Bird Refuge of Hart and Crump lakes. He states further, however,



that the water supply comes from Deep Creek and Twenty Mile Creek, which are at present outside of the proposed refuge, and urges that if the refuge is to be effective, the water supply must also be procured. Certainly, judging from the fate of Malheur and Lower Klamath lakes, Doctor Prill's suggestion is most timely.

Summary.—The history of the white pelican breeding grounds in Oregon has been almost identical with that of California. Beginning with recorded thousands of birds in the various colonies, they have diminished until it is doubtful whether any pelicans nested successfully in Oregon in 1932. Oregon and California, once forming perhaps the greatest breeding ground of the white pelican in this country, have today practically limited this species to one colony at Clear Lake.

#### South Dakota

It is recorded that the white pelicans nested at one time in South Dakota. W. J. Hoffman (1875, p. 175) reports finding quite a number of pelican skulls in various Indian tents, and was informed that the species was regularly seen. Whether the pelicans nested in the vicinity of the Grand River Indian Agency, where Hoffman made his observations, he does not state. But Chapman (1914, p. 184) says that the white pelican formerly nested in South Dakota.

In 1911, Alex Walker (1911, p. 190) gives a list of birds from Douglas County whose nests he had either found or was positive that they nested there. He includes the white pelican.

There seems to be no certain proof that pelicans nest in the State at present, but Roberts (1932, p. 163) reports that: "Throughout every summer a few Pelicans are present on the larger lakes in eastern South Dakota. Mr. Peterson, of Pipestone, on June 28, 1930, found 100 at Lake Poinsett, Hamlin County, South Dakota, only about 30 miles west of the Minnesota line, and on August 3, following, it was estimated that the number had increased to 1,000. It is not known where these pelicans nest, but undoubtedly this is the source of the small flocks that appear in late summer on the lakes of southwestern Minnesota. They may come from the Chase Lake colony in North Dakota."

## Texas

Little Bird Island in Laguna de la Madre, about thirty miles south of Corpus Christi.—The white pelican colony south of Corpus Christi seems to be a temporary occurrence, largely due to the nature of the nesting site. As Alvin R. Cahn (1922, p. 169) explains: "The Laguna Madre is a long, very narrow strip of water that is almost cut off from the Gulf of Mexico by the equally long sandy ridge of Padre Island, which extends from opposite Corpus Christi southward, paralleling the coast, to Point Isabel near the mouth of the Rio Grande, a distance of about one hundred miles. Padre Island acts as a protective barrier to this section of the coast of Texas, receiving the brunt of the attack of the waters of the Gulf of Mexico. Yet even this protection is insufficient when the furious storms characteristic of the region sweep shoreward. At such times the waters, whipped into mountainous waves by a terrific gale, rise in their fury, completely overwhelm Padre Island, and rush madly on the coast, which then may be submerged beneath twenty or more feet of turbulent water. When this occurs (the last big storm was in September, 1919), the Bird Islands which rise above the water a scant two or three feet at the highest point, sink completely from sight, to reappear again days after the storm is over. Such storms play havoc with the fauna of the islands, and, when they occur during the breeding period of the thousands of birds nesting upon them, a terrific loss of life results."

The story of this colony begins with T. Gilbert Pearson's (1921, p. 515) account. "It may not be known generally that of the numerous White Pelicans resorting to the coast of the Gulf of Mexico in winter a few remain when the great flocks move northward in spring. On June 12 and 13, 1918, I found about 70 among the Brown Pelicans at Timbalier Pass, Louisiana. So far as I am aware there has been no published record of their breeding in these southern waters. I was, therefore, greatly surprised on May 23, 1920, to discover a colony of nesting White Pelicans on Little Bird Island in Laguna de la Madre. Fifty adults were seen, eighteen young and fourteen eggs were counted."

The remaining few years of the colony may be treated briefly because the causes of its success or failure were probably due to storms and too many visitors. Cahn (1922, p. 173) visited the island May 26 to June 2, 1921, and found no white pelicans

nesting there, although about fifty adults were seen. Mr. J. J. Carroll (1930, pp. 202-204) made annual trips to the island from 1926 to 1931. In 1926, there were none breeding, although Mr. Carroll remarks that he had known for twenty years that they occasionally nested there. In 1927, there were from 75 to 100 adults, five occupied nests, and several nests just made. In 1928, there were from 150 to 200 occupied nests of the white pelican, all of which were deserted and eggs cold, while at the same time the brown pelicans nesting on the same island were undisturbed. This was unaccountable. In 1929, there were several hundred nests of the white pelican, and on June 9, when the colony was visited, all seemed well. There is no reason to suppose that the colony was not successful. In 1930 (Carroll, 1930, p. 304) there were at least 5,000 adult birds and four major colonies of nests.

Strangely, in 1931 there was not a single nesting white pelican at the Bird Islands. In a letter of April 1, 1932, Mr. Carroll says: "I have no explanation to offer with reference to the disappearance of the White Pelican last summer, unless it is because of these birds being constantly plagued by visitors. Unfortunately the State of Texas does not protect either the white or brown pelican. The professional fishermen have an idea that these birds consume a great amount of edible fish and I am inclined to think they sometimes destroy pelicans at nesting time, which of course is a very simple matter. This is speculation on my part."

It has been impossible to learn, so far, whether any white pelicans nested below Corpus Christi in 1932, but it hardly seems probable that any number could have nested there without being noticed.

#### Utah

Great Salt Lake.--A wealth of adventure is included in Stansbury's first accounts of the pelicans nesting on Gunnison and Bird islands in Great Salt Lake. It is to be regretted that his whole account can not be included here, but the portions which pertain to the welfare and size of the colonies are given herewith (Stansbury, 1852, p. 179).

Under date of May 8, 1850, Gunnison Island, he writes:

"The whole neck and shores on both of the little bays were occupied by immense flocks of pelicans and gulls, disturbed now for the first time, probably, by the intrusion of man. They literally darkened the air as they rose upon the wing, and, hovering over our heads, caused the surrounding rocks to re-echo with their discordant screams. The ground was thickly strewn with their nests, of which there must have been some thousands. Numerous young, unfledged pelicans, were found in the nests on the ground, and hundreds half-grown, huddled together in groups near the water, while the old ones retired to a long line of sand-beach on the southern side of the bay, where they stood drawn up, like Prussian soldiers, in ranks three or four deep, for hours together, apparently without motion."

On May 20, 1850, the party visited Bird Island (Stansbury, 1852, p. 188). "Before we passed around the point of Antelope Island, we stopped for a few moments at the little islet near it, where the number of gulls and pelicans was, if possible, greater than we had seen on Gunnison's Island. The whole islet was covered with eggs, chiefly those of gulls, and with innumerable young birds, just hatched. . . ."

From May 30 to June 1, 1850, the party encamped at Gunnison Island, during which time there was a hail storm (Stansbury, 1852, p. 195). "We found that the hail had killed a large number of the young pelicans, as, upon the approach of the gust, they had been deserted by their parents, who had betaken themselves to the protection of the neighboring rocks, leaving their tender offspring to 'bide the peltings of the pitiless storm.' So much for the ancient fable of their feeding their young from their own veins!"

The knowledge of the whereabouts of the pelicans in Great Salt Lake soon worked to their destruction. By 1875, the two colonies had been nearly obliterated, as attested by several accounts. "It formerly bred in immense numbers about Great Salt Lake, where it has decreased in abundance of late" (Coues, 1874, p. 586). "In Stansbury's report of Great Salt Lake, mention is made of large numbers of these birds being seen in the lake, they breeding in the islands thereof. In July, but few were seen, and we are informed they no longer breed there. These birds were seen at Utah Lake late in July sparingly, and in September on the sloughs of the Sevier" (Henshaw, 1875, p. 485). And again,

Henshaw (1879, p. 329), in speaking of the abuse of pelicans on their breeding grounds, says: "Under such circumstances they may occasionally be so closely approached as to be killed with clubs. No creature however so dull as not to profit by the lessons that experience teaches, and the treatment the pelican usually receives at the hands of man is of such kind that in him they soon learn to recognize an enemy to be feared and shunned on all occasions. Such is the case at Great Salt Lake where the former great abundance of the pelican is attested by all the early explorers, but where now the bird is known only as a casual visitant." This destruction of the birds was due to the fact that they eat fish.

Apparently, after the colonies had been so decimated, no one took the trouble to go after the few remaining birds; consequently they began to increase again. By 1884, the following unsigned notice appeared in The Young Oologist (vol. 1, p. 73): "F. E. L. writes that during a recent trip on Great Salt Lake he collected eggs of the White Pelican and the California Gull."

In a letter to Edward J. Court (1908, p. 293), A. O. Treganza includes an excerpt from his notes of May 8, 1906, in which he mentions the nesting of white pelicans in company with Treganza herons and California gulls on Hat (Bird) Island. And later (Court, 1908, p. 295) he mentions the nesting of white pelicans on Gunnison Island. No specific figures are given, however.

On May 15, 1915, R. H. Palmer (1916, p. 117) visited Bird Island and estimated 2,000 nesting pelicans.

Alfred M. Bailey (1927, p. 91) speaks of having visited the colony (no date given). But from his description the recent usual number is thought to have been nesting there at the time. The pelicans of Bird and Gunnison islands must travel long distances for their daily fishing. Most of them resort to Utah Lake, which is between seventy-five and one hundred miles from their nesting grounds. They are also to be found scattered through the Great Salt Lake region in many places, wherever fish are procurable. Apparently the old competition still arouses the same reaction, for Bailey says (1927, p. 92): "These birds, also, have been accused of being destroyers of game fishes, and on one occasion a party of men raided Hat Island, killing all the

birds possible. Fortunately, many of the young were large enough to escape to the water, so the colony was not destroyed."

Bird Island was again visited in 1926 by R. M. Barnes (1926, p. 142), who, while giving no specific figures, reported that "the island is the nesting place for thousands of gulls and pelicans."

From this maze of recent reports it is rather difficult to arrive at any estimate of the numbers and welfare of the birds on these two islands, except that they seem to have enjoyed a minimum of disturbances of any sort and may have remained around the 2,000 mark ascribed by Palmer in 1915.

On May 15, 1932, Mr. David H. Madsen generously arranged for a trip for a party of five to Bird Island. That day we counted over 4,000 adult white pelicans at Bird Island, and about 1,500 occupied pelican nests. Mr. Madsen, who has been familiar with the pelicans of Great Salt Lake for many years and has visited the islands on previous occasions, says that never more than half of the adults are at the nesting ground during the middle of the day. The other half are scattered throughout the region, but are found mostly at Utah Lake. In verification of this, it was reported to me a few days later by a local resident at Utah Lake, that between 3,000 and 4,000 white pelicans had been seen daily at the lake this season. Mr. Madsen, therefore, estimates that approximately 8,000 adults were in the Bird Island colony in 1932. He further states that as long as he has been familiar with the birds of the region, there has been a colony of white pelicans annually on Gunnison. We were unable to visit Gunnison Island this year, but Mr. Madsen feels sure that the pelicans are there again as usual, for he has seen them flying in flocks toward that island. His estimate for the Great Salt Lake region for 1932 is approximately 10,000 white pelicans.

The cause of this extraordinary increase is unknown. A possible suggestion is that with the drying up of the nesting places of many of the outlying colonies throughout the West, the removal of the large colony from below Corpus Christi, and the decrease of the Pyramid Lake colony, there may have been a resultant concentration at Great Salt Lake.

Utah Lake, Utah County.--White pelicans have nested on an



island in Utah Lake only once since observations in the region have been recorded (Goodwin, 1904, p. 126). "Equipped with glass, gun, and camera a party of four of us laboriously made our way toward this island one June morning, for reports had come that hundreds of pelicans (Pelecanus erythrorhynchos) were nesting there for the first time in the history of the island. From time immemorial these strange, solemn birds had foraged on Utah Lake -- where a few years ago many hundreds of them were killed for the small bounty offered by the State -- but never before had they nested here."

Mr. Goodwin (1904, p. 128) counted about 200 young on the island. Apparently the colony numbered only a few hundred adults.

In a letter of March 31, 1932, Mr. David H. Madsen says: "You will also discover that the question of isolation has an important effect upon the nesting habits of these birds. Only once during my lifetime, have pelicans nested on the island in Utah Lake. This island only appears above the surface during very low water. The lake is alive with many varieties of warm water fish all of which are easily accessible to the birds. At the time they nested there, there were no motor boats on the lake and it was an eight-mile row to the island. Consequently they felt secure. During the past several years, though the island is much larger, due to the low water, and food is still abundant the birds have not returned to nest. This is doubtless due to the fact that there are now scores of motor boats on the lake, and the island is visited almost daily. The birds choose to remain in their isolation on the islands in Great Salt Lake, where they are not disturbed more than once or twice a year, and fly between seventy-five and one hundred miles to Utah Lake daily to capture fish to feed their young."

Summary.--The island colonies in Great Salt Lake are the only permanent ones recorded in Utah. These two colonies numbering thousands of individuals, virtually destroyed by 1875, have gradually come back until, with the increase of 1932, they may have reached or even exceeded their original numbers.

#### Wyoming

There seems to be but one permanent nesting colony of the

white pelican in Wyoming, and that is the one at Molly Island in Yellowstone Lake. Pelicans have been reported nesting at one or two other places in the State, but these sites were apparently only temporarily occupied (Knight, 1902, p. 30.) "Resident, rare; migratory, common. In late spring this species usually visits the large ponds and subalpine lakes and breeds in a few localities. Dr. Grinnell in a private letter to me states that he found several fledglings on the Medicine Bow River about the year 1881; he also reports them from the Yellowstone Lake, 1875. Bond reports them from Cheyenne; Dr. Jesurun from Douglas. Several have been killed at Hutton's Lake, Albany County, and I have seen large flocks about these lakes several times in late spring."

Molly Island, Yellowstone Lake, Yellowstone National Park.-- In 1875, G. B. Grinnell (1876, p. 89) found the white pelicans "very abundant on the Yellowstone Lake, but shy and difficult of approach." From time to time in the earlier annual reports of the superintendents of the park mention is made of the pelican, but no specific data is given concerning the colony.

In 1917, Milton P. Skinner (1917, p. 180) who had visited the colony each season since 1898, reported that "all through May the number steadily increases until there are about seven hundred birds." As in all white pelican colonies there is seasonal variation in the numbers of adults and young and Mr. Skinner (1917, p. 181) gives a specific instance of this. "Possibly only one bird in a brood reaches maturity, for I have often noted a great discrepancy between the numbers of eggs laid and the young birds maturing. One season I counted over five hundred eggs, yet there were only one hundred and seventy young to be found in mid-August. What became of the others I could not tell, but I have never found any dead pelicans of any age except those killed on the mainland by coyotes, and a few young birds killed by exposure to the sun. Perhaps the gulls have developed an inordinate appetite for pelican eggs." Similar observations have been recorded by many other investigators. It was, therefore, with considerable interest that in the summer of 1932 I saw California Gulls (Larus californicus) break pelican eggs in the colonies at Pyramid Lake, Great Salt Lake, and Molly Island.

C. C. Adams (1925, p. 383) says that during the investigations of the relation of white pelicans to the trout in Yellow-

stone Lake in 1922 the pelican colony numbered between 500 and 600 adults and about 200 young.

For several years the pelican colony in Yellowstone Lake has been under observation and study because the pelicans there are one of the hosts in the life cycle of the fish parasite (Dibothrium cordiceps). In 1924, and from time to time thereafter, a portion of the eggs of the colony were collected as a control measure. The upset of the colony during the breeding season resulting from these investigations, the collection of specimens of both young and adults for scientific investigation, plus the disturbing influence of the visitors who sought out the colony, appeared to be detrimental to its welfare. Therefore, in the fall and winter of 1931, the history of the colony over a number of years was ascertained by the park administration, and it was decided that not only should the colony receive absolute protection, but, in order to secure this, no one should be permitted to visit it except under written permission from the administration. This ruling was put into effect immediately, and the following season, the summer of 1932, the colony was visited only by official parties for the purpose of observation and census. The colony was found to number about 300 adults, and about 100 young, in the latter part of July.

## BREEDING COLONIES IN CANADA

The subject of this paper does not include the nesting grounds of the white pelican in Canada. Inasmuch as the breeding grounds of the white pelican are distributed over North America regardless of international boundaries, any history of the subject would be incomplete without presenting at least some indication of the status of this bird in Canada. It has been impossible to procure all the data necessary to give the complete picture of the breeding grounds there, but enough information has been accumulated to give some idea of the trend of conditions affecting the pelican breeding colonies.

### Alberta

As one glances at a map of Alberta he realizes that there are "numberless" lakes as Chapman (1908, p. 371) comments. "In many of the numberless lakes of Manitoba, Saskatchewan, and Alberta, invariably upon islands, white pelicans nest; a colony containing anywhere from a dozen to several thousand birds." Many of these lakes are, however, in the more settled portions of the province, which makes it problematical whether numerous unreported colonies remain other than the few listed below, but there may be others.

Beaverhills Lake.--Mr. J. A. Munro in a letter of November 6, 1931, says that a breeding colony of white pelicans is reported from Beaverhills Lake, Alberta.

Buffalo Lake.--Macoun (1909, p. 72) states that they are breeding on Buffalo Lake, Alberta.

Lac la Biche.--Mr. E. A. Goldman, in a letter of December 30, 1931, reported the pelicans as "breeding commonly" in 1919 at Lac la Biche.

In 1922, F. M. Farley (1922, p. 73) gave a short descriptive account of the lake. "Lac la Biche is about 150 miles northeast of Edmonton, and is a beautiful lake on the south side of which the Hudson's Bay Company has maintained a post for many years. The lake is about twenty miles by ten miles in extent and has several fair-sized islands which have been the breeding grounds for such birds as the white pelican, double-crested cormorant and

great blue heron, likely for ages, but within recent years the natives claim their numbers are not as great as previously. . . . The lake is noted for its large whitefish, many of them weighing over twelve pounds, and a large industry is carried on with the breeds, who net the fish and sell to the companies, who ship them in refrigerator cars to the large cities of the East."

This last sentence would lead one to suspect that the pelican colony might not be flourishing as much now, even, as it was in 1919 when Farley saw it. But since there is no recent information at hand, the exact status of the colony at present cannot be given.

Miquelon Lake.--It is Farley again who tells of the events connected with the disappearance of the Miquelon Lake colony (1919, pp. 38-39). In 1908, he visited an island in the furthest North Miquelon Lake, about 18 miles north of Camrose, and found about 500 adult pelicans and hundreds of eggs which had never hatched and were then desiccated. On May 29, 1909, he again went to the island and found about the same number of pelicans and the usual quota of eggs scattered promiscuously about the island. This was perhaps attributable, he suggests, to the exertions of the birds themselves in leaving the nests. In July, 1910, he visited the island for a third time and found about 500 adults as before, besides 19 young. As before, hundreds of eggs were scattered about the island. The following two or three years the colony was there as usual, but due to settlement of the shores of the lake, with the consequent disturbance of the island colony, the birds left and have never returned. The lake was made a Government sanctuary but it was too late.

P. A. Taverner (1919, p. 264) says that "at the height of their nesting from 300 to 500 nests were to be seen on an island of not three acres extent." And Farley (1919, p. 39) wrote: "A halfbreed told me that many years ago the pelicans nested on all the islands in these lakes, and that they were as plentiful as geese in the fall."

Pelican River.--Edward A. Preble (1908, p. 275) lists a colony at the rapids in Pelican River near its junction with the Athabaska. No estimate of the size of the colony is given, but the reference indicates that it was not large.

Lake Ste. Anne.—"J. Alden Loring reported seeing a number of these pelicans on Lake Ste. Anne, Alberta, in August, 1895; he also noted several on an island in the same lake, May 26, 1896" (Preble, 1908, p. 275).

"In all probability may be expected in the Edmonton district as Wm. Spreadborough records them breeding on Lake Ste. Anne, northwest of Edmonton, 1898" (Soper, 1918, p. 130).

Macoun (1909, p. 72) says that there were only a few breeding birds on the lake at this time. It is problematical whether the pelicans nest there now, especially in view of the fact that no later records appear.

Summary.--Of the six breeding sites listed here, insufficient data for four of them prohibits any definite conclusions relative to their present status and trend of course. Of the remaining two, the Lac la Biche colony showed a decrease and the Miquelon Lake colony completely disappeared.

#### British Columbia

British Columbia is outside the main breeding range of the white pelican. A few localities, however, have been listed where it breeds. Brooks and Swarth (1925, p. 31) reported that a breeding colony had been found at Sucker Lake, 1899. Kermode (1904, p. 12), referring to the period prior to 1898, reported that it was "said to breed in the Chilootin country." Munro (1930, p. 65) wrote: "There is said to be a breeding colony at Anahim Lake, which is approximately one hundred miles southwest of Quesnel. This colony was reported in 1922 by a former game warden who patrolled the district." Mr. T. T. McCabe, who has just returned from Anahim Lake, says that a flock of 26 adults was on the lake in June, 1932, but that Mr. Bowser, who has been there for many years, reports that no young have been on the lake for eleven years. Apparently there has been none since the breeding colony in 1922. Mr. McCabe has kindly furnished me with three other records of a few breeding birds. Two or three pairs with young were seen at Puntzi Lake in 1931. There are a few breeding pairs at Pelican Lake, close to Anahim Lake, each year, and a few at Swan Lake also. It is possible that numbers of white pelicans breed in the Eutsuk Lake region. Mr. McCabe says that he has heard reports to this effect, but is unable to substantiate them at present.



The following observation from Samuel N. Rhoads (1893, p.31) indicates that as early as 1892 there had been a decrease in the white pelicans of British Columbia. "Occasional as far north as Stewart's Lake and Peace River, British Columbia, according to Mr. G. Hamilton, an ex-Factor of Fort James. I was told by the McKenly Bros. that 'white pelicans' were formerly numerous 'in the migrations' at La Hache, Williams and Quesnel lakes. . . . From accounts, its distribution in British Columbia, once general is yearly becoming restricted to the southern districts. . . ."

#### Mackenzie

Great Slave Lake.---Although Great Slave Lake is many times referred to as the northmost breeding site of the white pelican, I have been able to find only one reference to the specific locality (Preble, 1908, p. 275). "Merritt Cary was informed that several pairs breed annually on a small rocky islet, one of the Desmarias group, in Great Slave Lake." Several sources refer to its being common north to Big Island, but these do not state specifically that there is a breeding colony at Big Island.

Smith Rapids, near Fort Smith.---"The Smith Rapids colony occupy the most northern breeding station of this species in North America (excepting the small colony on Great Slave Lake), and have evidently occupied this site from time immemorial, as Alexander MacKenzie refers to the 'Pelican' as one of the portages passed in these Rapids when he descended the river in 1789. . . . Frank Russell collected young birds and eggs at the Smith Rapids breeding ground, July 3, 1893. He reported many scores of young birds in different stages of development" (Preble, 1908, p. 275).

When Preble's party was in the region in 1901 they also saw white pelicans daily during June at the Rapids and made the statement (1908, p. 275) that "A large number nest on the islands at Smith Rapids."

In 1907, Seton (1908, p. 69) made an expedition to Great Slave Lake and reported concerning the pelicans: "The north most colony is that on Great Slave River at Mountain Rapids, 150 miles south of Fort Resolution. Here, about 80 pairs breed each year: on June 22 the young were beginning to hatch." This is further up the river than Smith Rapids. Whether it was a totally separate colony or only a temporary shifting of the Smith Rapids

colony, I cannot say, as there is no later reference to the Mountain Rapids group.

In the summer of 1921, M. Y. Williams (1922, p. 62) saw six white pelicans at Smith Rapids from June 1 to 5 -- not a very large colony, to be sure. He mentions no others. H. W. Fairbairn (1931, p. 160), who visited the region in 1929, indicates that the colony is small but apparently permanent. "Twelve of these great birds were seen on the rapids at Fort Smith in late June. They were very wary and sunned themselves on the rocks fully half a mile from shore. This northern colony seems to be holding its own at present, although its numbers have been often depleted in the past."

#### Manitoba

Shoal Lake.--The disappearance of the Shoal Lake white pelican colony is summarized by P. A. Taverner (1919, p. 141). "Said by the Ward brothers to have been a very common breeder on the islands during high water, and Raine speaks of an 'island white with them' in 1894. Seton tells of seeing a flock of thirty-five and finding a score of deserted nests, 'the eggs strewn about, in some cases evidently sucked, I suppose by herring gulls.' We are told that their eggs used to be regularly gathered by Indians and others. In one case a boatload were boiled and fed to the hens. At present only a few small flocks appear in the spring, and occasional summer visitors. Young reports thirty on May 6, which were all we saw."

In the same paper Taverner (1919, p. 138) tells of the lowering of the lake level, the drying of the surrounding marshes and the encroachment of hay fields, the alkalinity of the lake, and the disappearance of the vast numbers of birds which were at one time there.

Macoun (1909, p. 72) found a breeding colony of pelicans on an island in Shoal Lake on June 18, 1894, and Raine's (1895, pp. 3-6) account indicates at least several hundred pelicans; there may have been many more. The passing of the Shoal Lake colony was therefore of importance in the history of this species. It probably occurred shortly after Chapman's (1908, p. 373) visit in 1901, for he found only 27 nests on the island, and Seton a few years later said that "they formerly bred on Shoal Lake in

Manitoba, but the settling of the country has caused them to move farther north" (Macoun, 1909, p. 71).

Lake Winnipeg.--C. C. Nutting (1893, pp. 254-255) explored the lower Saskatchewan River during July and August of 1891. He reported the white pelican, "Common on and near Lake Winnipeg and Cross Lake. Not seen at Chemawawin. Above Grand Rapids was a favorite resting place of these birds, a flock of about thirty being seen almost daily standing on the rocks in the middle of the river. There are said to be extensive breeding places of this pelican on Lake Winnipeg, one of the islands in the lake being called 'Pelican Island.'"

E. A. Preble (1902, p. 82) saw several white pelicans near Bull Head Point, Lake Winnipeg, June 16, 1900, but he does not mention any others.

On July 9 and 13, 1918, an expedition from the University of Manitoba (O'Donoghue and Gowanlock, 1919, pp. 1-6) visited Pelican Island in Lake Winnipeg for the express purpose of studying the nesting colony of white pelicans, but they found none nesting there. "White Pelican (Pelecanus erythrorhynchos) were not noted, although excreta and two humeri were found. However, the species was regularly observed fishing in Swampy Bay, five miles from Pelican Island, so it probably is a frequent visitor here also."

The brief evidence presented here seems to indicate that Lake Winnipeg, once the nesting place of large numbers of white pelicans, is no longer their breeding ground.

Lake Winnipegosis.--Lake Winnipegosis has been listed as a breeding site of the white pelican for many years. E. T. Seton (1886, p. 148) referred to the species as "Common in Red River Valley, breeding about the large lakes. 'Breeding on Lake Winnipegosis'"; and Whiteaves (1904, p. 71) says that the species is represented in the Museum of the Geological Survey "by a series of its eggs, from a small island at the western end of Lake Winnipegosis, collected by Mr. J. G. Tyrrell in 1889. . . ." Macoun (1909, p. 71) reported finding them on Lake Winnipegosis, where they were breeding in numbers, and also on Lake Manitoba. Bent (1922, p. 284) visited the lake in 1913. "The first breeding colonies of white pelicans that I found were in Lake Win-

nipegosis, Manitoba, where they were nesting on small islands with double-crested cormorants, ring-billed gulls, and common terns. The largest of these was examined on June 19, 1913." This island contained 46 white pelican nests and about 100 of the adult birds.

Summary.—Many early accounts speak of the white pelican as an abundant summer resident in the prairie country of Manitoba and the Northwest Territories, and other accounts speak of the breeding colonies as ranging all the way from a few birds to thousands; whereas, in 1932, there was not positive confirmation of even the one colony in Manitoba referred to by Pearson (1932, p. 240). Unfortunately this information is too meager to draw specific conclusions. In general, it is known that white pelicans have nested on Manitoba, Shoal, Winnipeg, and Winnipegosis lakes, that they are probably gone from the first three, and, according to our present knowledge, their status at the last named is doubtful.

Inasmuch as Macoun as early as 1909 said that pelicans were "found on all the large lakes throughout northern Manitoba and Saskatchewan" and stated that they were there in even greater numbers than at the well-known breeding sites of the central part of the provinces, it seems plausible that there may be a number of unrecorded colonies where the birds, driven from the more settled portions, may have gone.

#### Saskatchewan

Saskatchewan contains more breeding colonies of the white pelican than any other province in Canada. It occupies much of the great central prairie region where innumerable waterfowl of many species have nested for centuries. And, for the white pelican, it still presents the most favorable conditions of any region within its breeding range.

Big Stick Lake.—Bent (1922, pp. 283-284) found a large flock of adults on an island in the lake, June 14, 1906, and July 18 Bishop and Dwight found a small breeding colony containing 14 occupied nests. In 1907, Chapman (1908, pp. 384-385) visited the colony. "In southern Saskatchewan, whither I had gone for wild geese and grebes, I learned that the white pelicans which pass through the region to more northern existing resorts, had this

year remained to nest in large numbers. An unusually late spring and an abnormal supply of fish supplied by damming a stream which flowed into the lake, were evidently the incentives which had induced the birds to remain south of their regular nesting limit.

"At least 3,000 birds settled on a small mud-bar in Big Stick Lake. A few pairs of pelicans had been known to nest here before, but there was no record of such a snowy gathering as made the bar conspicuously white at a distance of two miles." On June 10, the young were just appearing.

In a letter of March 29, 1932, Dr. F. Bradshaw, Director, Provincial Museum, Normal School, Regina, writes that "Big Stick Lake according to my information is no longer a breeding ground of the pelican owing to a water diversion scheme having reduced the water level and forming peninsulas of what formerly were islands. It was here, I believe, where Chapman found a colony of 3,000 pelicans in 1907."

Dore Lake.--"White Pelican.--Common summer visitant; breeds in large colonies at Johnstone, Quill and Dore lakes and northward" (Mitchell, 1924, p. 104).

Dr. Bradshaw writes: "The latest report I have regarding Dore Lake is that there are about 500 pelicans on Big Rock Island and about 150 on Little Rock Island and that they are increasing in numbers."

Johnstone Lake.--Mitchell's account, as just given, mentions the colony at Johnstone Lake as "large" in 1924.

Bradshaw (1931, p. 6) visited the colony in 1930 and gave the interesting account from which the following excerpts are taken: "For some reason or other pelicans appear to have abandoned the island during 1930 and established their colony on what is known as McRae's Point. . . . It was near the tip of the point where from 2,500 to 3,000 adult pelican were observed on June 21, 1930. . . . This being the height of the breeding season one would expect to find as many, if not more, young birds as there were adult birds, but much to our surprise there were not more than 300 young and the unhatched eggs would not total more than 200. Why they should have nested on the point in

preference to the island is not known. Possibly some predatory animals may have wintered on the island and failed to leave before it was too late to reach the mainland over the ice. McRae's Point during high lake levels is entirely covered by water, and there is every indication that when the pelican first established their home on the point that portion of it on which they were nesting was surrounded by water, and it was not until incubation was well advanced that it became part of the mainland, otherwise it is very doubtful if the pelican would have selected such a site considering their natural preference for isolation."

In his letter of March 29, 1932, Dr. Bradshaw states: "I visited the lake twice in 1931. No pelican were nesting at all on the point, but I am credibly informed by persons who visited the island that there were as many, if not more than last year. With my field glasses I could see a large stretch of pelicans from the mainland, and am quite sure my informant's estimate is well within the mark." Johnstone Lake is a bird sanctuary.

Lavalee Lake.--In Prince Albert National Park lies Lavallee Lake. The Canadian Department of the Interior (Williams, 1930, p. 20) reports that hundreds of pelicans and cormorants nest on two islands in the lake.

Manito Lake.--In June, 1921, J. A. Munro (1929, pp. 100-102) visited Manito Lake. "This is one of the so-called 'soda lakes' and so far as observed no fish, molluscs, crustaceans, or vascular plants inhabit its waters." There are several islands. At island number one, Munro says that "At one time, according to report, a large colony of pelicans was located here but because of persecution -- the human summer colony on the mainland objected to the smell -- were driven off several years previous to my visit." On islands three and four, Munro found nesting colonies of white pelicans estimated at 300 pairs of breeding birds. It is not known where the birds from this colony went for their daily catch of fish.

In a letter of November 29, 1929, Dr. Bradshaw reported about 300 breeding birds in the colony, and in a letter of March 29, 1932, he commented that Manito Lake, due to the last few years of drought, is no longer a breeding ground of the pelicans. "Probably a few wet seasons will again convert these areas into suitable breeding grounds and induce the pelican to resume their tenancy."



Manito Lake is a bird sanctuary.

Many Island Lake.--Mr. E. A. Goldman reports about 200 white pelicans nesting at Many Island Lake in 1920. J. A. Munro (1929, p. 72) listed the birds seen by him at the lake in 1922, but does not mention the pelican. And Dr. Bradshaw reports Many Island Lake, in 1931, under the same conditions as those affecting Manito Lake.

Quill Lake.--John F. Ferry (1910, p. 190) gives the status of the Quill Lake colony in the summer of 1909. He found many of the nests abandoned and the eggs broken by gulls. The young were mostly hatched, however. "The number of adult or young pelicans could not be told with certainty, but we estimated the number of young birds to be between 750 and 1,000. A photograph of a single group of young shows 250 birds. And this group could not have contained more than one-third of the total number of young. There must have been between 300 and 500 old birds." It seems from this account that only a portion of the adult pelicans were at the island when visited by Ferry, for such numbers of young would indicate a much larger colony than the 300 to 500 adults reported.

A large colony of white pelicans is mentioned from time to time in other references, indicating that the colony has been maintained. In Dr. Bradshaw's letter of November 29, 1929, he estimated 1,000 breeding pelicans at Quill Lakes. "Quill Lakes (Bird Sanctuary); there are, perhaps, eight or ten islands in these lakes where pelican breed." In his letter of March 29, 1932, he recounts: "I also visited one of the islands at Quill Lakes in 1931, situated about ten miles north of the village of Dafeo, west side of Big Quill Lake. There must have been at least 2,000 adult pelican and more than 1,000 young, some of which we banded. When I visited this island a few years ago, it was not more than a sandy strip, 300 yards long and 75 yards wide. On my recent visit, owing to drought, it was at least ten times this area." The Quill Lake colony, like the one at Johnstone Lake, has evidently grown considerably during the last few years.

Other Colonies.--Crane Lake, Long Lake, and Old Wives Lake are mentioned by Macoun (1909, p. 71) as places where he had found white pelicans breeding in numbers. Dr. Bradshaw's letter,

March 29, 1932, mentions several others. "Other correspondents mention Jackfish Lake, Turtle Lake, Big Island Lake (north of Turtleford), Cold Lake, and Pelican Lake as breeding grounds, but no information is given as to what extent these areas are occupied. These lakes are all situated in the settled portion of the province northwest of the city of Battleford." Mr. J. A. Munro, in a letter of November 6, 1931, says that a breeding colony is reported from Gull Lake. Mr. E. A. Goldman's letter of December 30, 1931, lists a colony of about 100 from Last Mountain Lake, and Dr. Bradshaw supplies the later information by saying: "There are still a few pelicans to be found on Last Mountain Lake each year. I am fairly familiar with this lake but know of no breeding colonies. In my opinion the fifty or sixty birds that frequent these waters are nonbreeding birds." Preble (1908, p. 275) says: "Richardson mentions the species as numerous on Isle a La Cross Lake, in flocks of 40 or 50, in June, 1848." Seton (1886, p. 148) writes: "At Qu' Appelle, 'Common, breeding at the lakes; have seen flocks of upwards of five hundred in the migrating season.'" In 1895, Arnold (1895, p. 169) visited a small lake at the foot of the Touchwood Hills where a small colony of pelicans nested, but when he found the lake, the island, due to drought, was connected with the mainland and the pelican colony was gone. Munro (1929, p. 129) says a small colony is reported to nest on a rocky island near the east shore of Redberry Lake. A colony of about 50 pairs of breeding pelicans was reported from Rush Lake by Raine (1892, p. 47), and Ward (1924, p. 136) mentions their breeding at Reed Lake, near Morse, south-central Saskatchewan.

Summary.—The colony at Big Stick Lake is gone, and some of the smaller colonies likewise. On the other hand, the colonies at Dore, Johnstone, and Quill lakes have increased. Dr. Bradshaw, in his letter of November 29, 1929, referring to the colonies just mentioned, concludes: "These colonies are located in the settled portion of the province and doubtless there are other small colonies in the settled area the present condition with which I am personally acquainted. In addition, I feel sure there are many colonies in the northern part of the province that have not yet been recorded. . . . I do not think there has been much change in the status of the pelican in Saskatchewan during the past twenty years."

## MIGRATION

The migration routes of the white pelican are, in general, well known. The route taken by the birds from specific colonies, however, is not known, and can only be settled by repeated banding. But the majority of records indicate that one main route of migration follows the valleys of the Missouri and Mississippi rivers to the wintering grounds in the Gulf of Mexico and south over Mexico to Guatemala. The other main route follows the Sierra Nevada of California to the Colorado River, where it is probably joined by a converging route from Idaho and Utah, and from thence south to the mouth of the Colorado River and the Gulf of California.

Many migration records have been gathered in an attempt to correlate such data with returns from the breeding and wintering grounds. This method, however, has not been successful because the records, while numerous, are too scattered, whereas at the breeding grounds observations are made year after year at the same place. For instance, along the main routes of travel it has been impossible to discover from records whether a decrease or increase in the number of migrants has been noted. But, in the regions outside of these main migration routes, where the white pelican is rarer, it has been possible to discern a diminution in numbers over a period of years, and to ascertain some of the factors affecting the birds in migration.

Inasmuch as the selection of certain data from a large body of records is apt to reflect merely the preconceived idea of the selector, it is to be understood that the facts presented here are some of those which tend to limit the numbers and distribution of the white pelican. To be sure, bird reservations have been established along migration routes which give protection to the birds while in these areas, but in a sense these are negative influences in that they only remove the more positive factors of limitation which are operative everywhere outside their restricted domain.

A few records may be given herewith. They need no further comment. Colorado (Lowe, 1917, p. 453), observations covering the years from 1888-1901: "This species formerly occurring quite plentifully on migration has been so persecuted on arrival that very few if any survived to continue their journeys to and from

their breeding grounds so that latterly it was less often seen." Florida, 1907 (Bowdish, 1909, p. 117): "A small flock of White Pelicans fed during the winter and early spring months in the northeast end of Gasparilla Sound. There were about 50, but they are decreasing from shooting for wings, feathers and for mounting. . . ." Indiana (Butler, 1897, p. 587): "Almost every year one or more are noted from some place in the State, yet few are the persons who ever saw one alive. . . . Mr. E. J. Chansler writes me of the occurrence of these birds in large numbers in Knox County in 1850. . . . Mr. T. H. Ball says years ago they were of regular occurrence at Cedar Lake, Lake County." Illinois (Clarke, 1871, pp. 252-253): "The White Pelican . . . was formerly not uncommon at the South end of Lake Michigan. I myself possessed a fine male which was killed within the present limits of the city of Chicago in 1840, by Dr. John T. Temple, then of that city, when we were shooting ducks together on the river. . . . At that time the white pelican was frequently seen on those waters, though like the swan, it has now disappeared before the march of settlements." Iowa (Anderson, 1907, p. 162): "Several specimens of the White Pelican are reported as killed every year, but the number seems to be decreasing in the State owing to the practice of hunters wantonly slaughtering any such rare or unusual bird which appears within gun-shot." Spurrell (1917, pp. 147-148) says: "The Pelican is a regular migrant, stopping on Wall lake to spend the night. It was common in early days, and large flocks are still seen in some years." Massachusetts (Proc. Bost. Soc. Nat. His., 1878, p. 26): Dr. J.B.S. Jackson remarked that a specimen of the pelican (P. erythrorhynchus) had been shot recently near Cohasset, Mass., and inquired how frequently it was found in the State. T. M. Brewer replied that this bird is now a rare visitor, although breeding farther north in great numbers. J. A. Allen remarked that the specimen referred to by Jackson was the third shot in the State within late years, but that the pelican was once a common bird here. New Mexico (Bailey, 1928, p. 83): "Formerly the White Pelican was much more common than at present. In the days of its abundance it was common along the eastern foothills of the Rocky Mountains during its migrations between its winter home near the Gulf of Mexico and its breeding grounds in California, Nevada, Utah, and the northern United States and Canada."

It would not give a true impression if the migration records presented here did not include some of those which show that

great numbers of white pelicans are still seen along their main migration routes. On October 4, 1931, at Crystal Lake, Dakota County, Nebraska, W. R. Felton (1932, p. 41) saw more than 2,000 pelicans in migration within about two hours. "After watching these birds for some time we drove to the ranch house of Elmer Ebel, who has lived on this edge of the lake for thirty-three years, and is a close observer of water-fowl, being a conservationist as well as a hunter. He stated that this migration is not uncommon, that in fact the pelicans are the first of the migrating birds to go south, and he has seen them in much greater numbers than on this occasion. The migration of these birds extends over a period of two weeks." And in a letter of October 13, 1932, Mr. David H. Madsen of Salt Lake, Utah, writes that in the early part of October he saw the greatest concentration of pelicans at Bear River Marsh that he has ever seen anywhere. "There must have been fifteen or twenty thousand."

It is evident from these records that the white pelican, though still abundant, "runs the gauntlet" in migration and has been so persecuted in some localities that it no longer frequents these places. Besides these factors, there are numerous records of numbers of the birds being killed by storms, severe cold, even lightning, telephone wires, predatory animals, parasites (of which they never seem to be free), and other natural checks. The white pelican is not protected by the convention between the United States and Great Britain for the protection of migratory birds. And, most significant for its welfare, the white pelican is generally disliked because of its fishing proclivities.

## SUMMARY

The white pelican, once breeding generally over the western half of North America, from southern Texas in the United States to Great Slave Lake in Mackenzie, has been restricted by the encroachment of civilization until it has four breeding colonies of significance in the United States (Clear Lake, California; Pyramid Lake, Nevada; Chase Lake, North Dakota; Great Salt Lake, Utah) and three breeding colonies of significance in Saskatchewan (Dore, Johnstone and Quill lakes) of which we have definite knowledge. All but two of these colonies (Dore Lake, Saskatchewan, and Great Salt Lake, Utah) are in government wild life sanctuaries. During the past few years there has been an increase at each of these colonies, except at Pyramid Lake where there has been a notable decrease. The censuses of the last two years indicate that there are about 30,000 white pelicans breeding at these seven large colonies. No attempt is made here to estimate the total number for the species because the returns from many of the colonies listed for Canada are too incomplete. The total number is undoubtedly considerably above the figure just given. In the United States, there are probably between 20,000 and 25,000 white pelicans breeding. Undoubtedly the majority of the pelicans breed in this country.

The greatest restrictive factor has been the draining, for agricultural purposes, of the lakes which constituted their breeding grounds. Actual destruction of the breeding colonies by acts of human violence has been an important limiting factor in the past but is a rare occurrence today. The shooting of pelicans in migration and in fishing areas continues widely, but is not a very important limiting factor. The influx of visitors has at times caused a colony to leave and never return. Egg collectors and plume hunters have done great damage in the past. Years of drought have augmented the removal of breeding grounds in many instances. For example, Buena Vista, Tulare, Goose and Tule lakes in California, Malheur and the Warner Valley lakes of Oregon, Manito and Many Island lakes in Saskatchewan, and others, might again become the breeding places of pelicans if a period of heavy rainfall extending over a number of years should ensue. Such an event, however, is in the realm of speculation. The fact is that these lakes are no longer suitable for pelican breeding grounds. It should be noted here that drought was not the only factor governing the disappearance of the pelican from these



lakes; in most of the cases cited, drought was only auxiliary; reclamation projects were the primary factors responsible for the change.

On the other hand, the Clear Lake Reservoir provides the only suitable breeding ground for the white pelican in California and Oregon at present. This is important, not only in the obvious sense that it has provided a breeding colony in a region where all the other colonies have disappeared, but in the sense that it clearly demonstrates in one case, at least, that the white pelican will take up residence elsewhere if its accustomed nesting site is destroyed. The fluctuating colony below Corpus Christi, Texas, the unusually large colony at Big Stick Lake, Saskatchewan, in 1907, and the unusual concentration at the four main breeding grounds in the United States during the last few years all point to the same conclusion. Unfortunately the compensating effect of the construction of reservoirs is greatly overshadowed by the many cases where irrigation projects have ruined important breeding grounds of the pelican. Even invaluable bird reservations, such as Malheur and Lower Klamath lakes, are not exempt from this danger, and Pyramid Lake is receding annually from the diversion of its water supply for irrigation and power.

When one considers the seven large colonies and the numerous smaller ones discussed previously, it becomes evident that the white pelican is in no immediate danger of extermination. Even if it could be proved that white pelicans at one time moved up and down the Atlantic Coast in great numbers and were found on all the inland waters of any size across the continent, which is not improbable, the remaining number, though comparatively few, may still be sufficient safeguard for the species. The following elements, however, are worth considering.

1. The white pelican is an unpopular fisherman. Man has the upper hand and frequently exercises it.

2. Protection of the white pelican is largely nominal except in a few refuges. Such a conspicuous bird is easy prey.

3. All the causes of mortality are intensified in these few large colonies. The losses of eggs and young are enormous at each colony, as has been frequently recorded. The nests are

shallow and the eggs are easily rolled out by the movements of the parent birds. The larger young in each nest usually kills the smaller by taking all the food and by pecking the weaker one continuously. If someone visits the island and causes the adults to remain away very long, the young perish from exposure to heat or cold or enemies; if the eggs are in the incubation stage, the entire colony may raise no young that year. When the parent birds are frightened from the nest, they may break the eggs with their feet and wings, or kill their young. The competition for food is intensified in the large colonies. The young birds when frightened collect in "pods", and injure themselves. Often the weaker ones are trampled to death. Where there is great concentration at a few lakes, the dangers from the encroachment of civilization are more serious from the possible utility of the lake for irrigation, commercial fishing, summer resorts, and other purposes. There are not many other colonies left or places where the disturbed ones may go. The adage about all the eggs in one basket could have no more specific application than to the present concentrated condition of the few large pelican breeding grounds in the United States.

For these reasons, I consider that the white pelican is in a more precarious condition than the number of birds would indicate. If the bird has any value, it should be protected in such a way that there is no possibility of its being exterminated. A bird reservation on which the water supply is not controlled is apt to be useless. The number of reservations with controlled water supply could be increased with great advantage not only to the white pelican but to the thousands of other waterfowl of great commercial and recreational value which nest within them.

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|-----------------------|--------------------|--------------------------|-----------------------------|
| 1. Buena Vista        | 16. Leech          | 31. Warner Valley        | 46. Butauk                  |
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| 3. Eagle              | 18. Sandy          | 33. Corpus Christi       | 48. Great Cleave            |
| 4. Mainore            | 19. Shetek         | 34. Great Salt           | 49. Smith Rapids and        |
| 5. Goose              | 20. Big            | 35. Utah                 | Mountain Rapids             |
| 6. Kern               | 21. Bowdoin        | 36. Medicine Bow River   | 50. Manitob                 |
| 7. Sacramento         | 22. Helena         | 37. Molly Island         | 51. Shoal Lake              |
| 8. Salton Sea         | 23. Pyramid        | 38. Beaverhills          | 52. Kinnipac                |
| 9. Tulare             | 24. Walker         | 39. Buffalo              | 53. Kinnipac                |
| 10. Tule              | 25. Washoe         | 40. Lac la Biche         | 54. Big Stick, Many Island  |
| 11. Colorado records  | 26. Chase          | 41. Miquelon             | 55. Lake                    |
| 12. Florida records   | 27. Devils         | 42. Pelican River        | 56. Johnston                |
| 13. Minisoka          | 28. Long           | 43. Ste. Anne            | 57. Lovell                  |
| 14. Louisiana records | 29. Klamath        | 44. Annam and Pelican    | 58. Kunito                  |
| 15. Heron             | 30. Malheur        | 45. Chilcotin and Puntzi | 59. Jull                    |
|                       |                    |                          | 60. 16 other lakes in Cook- |

Breeding Localities Referred to in the Text

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The Seven Large White Pelican Colonies in 1932

Comparison of the two maps indicates the concentration of breeding colonies which has resulted from the encroachment of civilisation.

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