

thought process and to record the terms by which I seek to make a color name clear to my own apprehension. Accepting Ridgway's arrangement and spacing of colors as a practical fixity, and referring all colors to the thirty-six-hue base, I designate the three diminishing tints of each local base as tint, half-tint, and quarter-tint, respectively; and the shades as shade, double-shade and triple-shade, respectively. This is not accurate in either case if we base our comparison upon percentages of black or white, but it is practically correct if we appeal to the eye and that is what we are after. In like manner referring back to the normative hues all successive changes affected by additions of neutral gray, I speak of gray (32%), double-gray (58%), triple-gray (77%), quadruple-gray (90%), and quintuple-gray (95.5%)—the last two, of course, rarely required. In this way, the blue of a Valley Quail's breast designated in the text of Ridgway as Light Payne's Gray, is thought of as the double-gray half-tint of Spectrum Blue; and the buffy of its lower breast, known as Light Buff, is related in thought to the Cadmium Yellow base by saying that it is the gray quarter-tint of that hue. It is thus clearly differentiated from "Cartridge Buff" or "Tilleul Buff", which are as truly light-buffies, but which differ very materially in quality from the arbitrarily named Light Buff.

In *analyzing* a color, that is, in seeking to arrive at its proper designation, the reverse of this process is of the utmost importance. One first decides upon its basal or distinctive element, then estimates the relative admixture of gray, then turns expectantly to the appropriate column to determine the tint or shade. As a novice I should never by any possibility have guessed that a Valley Quail's breast is light Payne's Gray (indeed, I suspect I shall die in ignorance of the difference connoted by the *names* Payne's Gray and Puritan Gray), but I did guess first off, within one point, that it was a double-gray quarter-tint of Spectrum Blue. A brief experience leads me to the belief that this logical process will always be followed, in practical disregard of arbitrary names. For this provision of a logical method of color inference, we are immeasurably indebted to our foremost living ornithologist, Robert Ridgway.

PRELIMINARY REPORT UPON THE DISEASE OCCURRING AMONG
THE DUCKS OF THE SOUTHERN SAN JOAQUIN
VALLEY DURING THE FALL OF 1913

By FRANK C. CLARKE

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WITH ELEVEN PHOTOGRAPHS AND ONE DIAGRAM BY THE AUTHOR

ABOUT the month of August, 1909, a fatal epidemic broke out among the water birds, especially among the ducks, of the vicinity of Soleta Lake, which lake, now dry, was situated about thirty-five miles southeast of Tulare Lake. This epidemic, gradually spreading, raged throughout the hot part of the season till the cool weather of the fall, when it ceased. At this time Soleta Lake was quite stagnant, becoming more so until it finally dried up some two or three years later. There were reports of a fatal disease among the water birds the year before, but little attention was paid to them.

During the following year, that is, 1910, the same disease, apparently, broke out not only on the above mentioned waters but also on Buena Vista, Goose and Tulare lakes. Thousands of birds died. Members of the State Fish and Game Commission made several expeditions into the regions thus affected, but were unable to ascertain the cause of the malady. The year following this, the disease again appeared, and an attempt to determine the cause of the mystery was made but not completed. The year 1912 was not an off year for the disease, nor has the present season been an exception. On the other hand, the present season has been almost a record year for a high death list.

Whatever has been the causative factor of the malady, it does not seem to have been one which rendered the birds affected by the disease dangerous for human consumption, because many thousands of sick birds have doubtless been distributed through the markets of San Francisco, Los Angeles and other places. The writer has been told by reliable parties that, ever since the disease was first known, market-hunters (some of whom are not noted for the highest principles of integrity and morals) have reaped a two-fold harvest in their business by selling sick birds. These were easily obtained and being fat, sold well. It is said that



Fig. 66. BED OF TULARE LAKE, ON SOUTH SIDE; MANY MILES OF THIS SORT OF GROUND WERE COVERED BEFORE ANY OPEN WATER WAS REACHED; PHOTOGRAPH TAKEN SEPTEMBER 30, 1913.

the market hunter would pick up a string of sick ducks, hang them out, get off several yards and fire shot into the birds to kill them, and thus allay any suspicion as to the nature of their condition and capture. Certainly the market hunter of wild game should have no more right to sell diseased birds than the stock man has to sell diseased beef or mutton.

Great interest has naturally been aroused regarding this condition, as thousands upon thousands of our finest game birds, representing a large sum in dollars and cents to the people of the state, have perished from the unknown cause.

No systematic investigation was made on this subject until the present season when the State Fish and Game Commission, working in co-operation with the University of California, detailed a research assistant from this latter institution to make as thorough an investigation of this destructive disease as means at his disposal should permit. The present article is only a preliminary report, which is intended to answer some of the many questions which have been put to the Fish and Game Commission regarding the subject.

The investigation was begun on September 19, 1913. The first work consisted of a general survey of the situation, and the collection of a large number

of sick birds, which were carefully examined. Later, experimental work was carried on at Tulare Lake, the results of which will be described toward the close of this paper.

The State Fish and Game Commission, besides directly financing this investigation, gave every possible assistance toward the furtherance of the work. Deputy Fish and Game Commissioners Tipton Mathews and E. W. Smalley, both under orders, were in the field continuously for over three weeks, gathering material and transporting the necessary equipment from place to place. The machine of Mr. Mathews greatly facilitated the undertaking. The preliminary examination of ducks and other birds was made in the laboratory of Dr. Frank Griffiths of Hanford, who kindly furnished headquarters for this work. Professor J. G. Davidson, of the Hanford Union High School, deserves mention for the valuable analyses which he made of water, gases, and blood.

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 travelers' 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

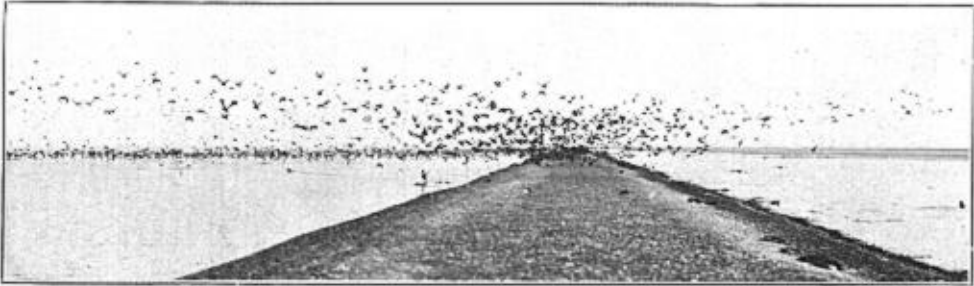


Fig. 67. DUCKS RISING FROM A LEVEE IN TULARE LAKE, OCTOBER 3, 1913;
NOTE DEAD BIRDS IN FOREGROUND

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, and this was the origin of the levees of which I shall speak later on.

These levees, in the central portions of the lake region, were built only a few feet high. At present they are over a large area submerged, while around the borders of the lake they gradually rise out of the water and thus afford resting places for water birds. As soon as dry enough these levees are used as roads for travel, since most of them are from 20 to 40 feet wide, and are dry long before the land between them.

The winters of 1905-6 and 1906-7 were years of heavy rain fall, 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. Gocse Lake is entirely dry, and Buena Vista Lake, situated in the southwestern part of Kern County, is also very low. As our investigations were carried on mainly at Tulare Lake, we shall confine our discussion principally to that region.

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 Kaffir corn, grain, squash, etc. Thus at the present time these crops extend to within two or three miles of the water line. But between the 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 (see fig. 66). The bottom is a soft black mud containing large amounts of disintegrating organic matter. This mud is the abode of considerable insect and worm life, and consequently furnishes a certain amount of food for water birds.

Due to the processes of fermentation which go on in the bottom mud of the lake, a great deal of gas is generated, principally marsh gas; but I do not believe that this gas is responsible at all for the epidemic, as has been suggested by some. 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 yel-

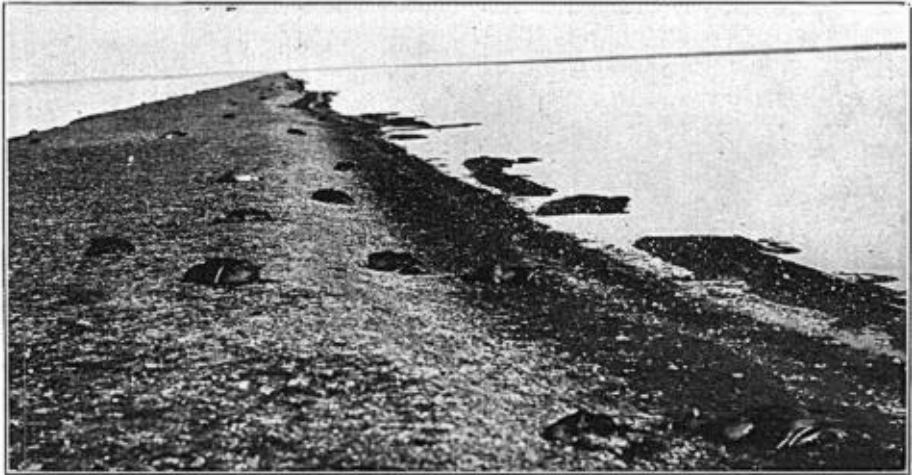


Fig. 68. DEAD DUCKS (SPOONBILL, SPRIG AND TEAL) ON LEVEE NUMBER III IN TULARE LAKE, OCTOBER 2, 1913

lowish-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.

The more common species of birds observed in the immediate vicinity of the waters of Tulare Lake from September 19 to October 7, 1913, were as follows:

Ducks:

1. Spoonbill or Shoveller (*Spatula clypeata*).
2. Pintail or Sprig (*Daifila acuta*).
3. Cinnamon Teal (*Querquedula cyanoptera*).
4. Green-winged Teal (*Nettion carolinense*).

Farallon Cormorant (*Phalacrocorax auritus albociliatus*), few.

White Pelican (*Pelecanus erythrorhynchos*), few.

Sandhill Crane (*Grus mexicana*), few.

Mudhen or Coot (*Fulica americana*), few.

Northern Phalarope (*Lobipes lobatus*).

Black-necked Stilt (*Himantopus mexicanus*), many at first, but became scarcer.

Avocet (*Recurvirostra americana*), few.

Killdeer (*Oxyechus vociferus*), few.

Sandpiper, several species.

Turkey Vulture (*Cathartes aura septentrionalis*), few.

The food supply for water birds around Lake Tulare was not the best. The cranes, pelicans, and cormorants had nearly all emigrated from this lake as there were no more fish for them to feed upon, the fish having, as previously stated, died some months before. But the ducks and smaller water birds were getting a fairly



Fig. 69. BLACK-NECKED STILTS ON THE WING AT
TULARE LAKE, SEPTEMBER 19, 1913

abundant food supply from the insects and worms in the lake. Several stomachs of well ducks showed that these birds had been feeding on aquatic insects and small worms. However, the ducks in this locality feed principally at night, in regions quite remote from the lake, and return to the lake for safety during the day. About dark these birds leave the lake and often fly long distances to cultivated fields where they feed on grain or alfalfa. When through feeding they return to the lake for the day. Their arrival may be during the night, but generally about daybreak or a little before. In making these flights large flocks are sometimes seen, but most frequently the flocks are small and broken.

Narrowing our discussion now to ducks only, we should first note the source from which these birds come. Most of them are not native to this state. They have come here from the north—from British America and Alaska. Some years

ago ducks bred in considerable numbers in the San Joaquin Valley. In 1907, for instance, Goldman (*CONDOR*, x, pp. 200-205) found conditions favorable for the breeding of water birds, and ascertained the nesting of seven species of ducks. But since the lakes and sloughs have undergone such marked changes, and since the former feeding and shelter grounds have been destroyed, there is no chance for them, and so we now find very few breeding in this part of the state.

It is impossible to give even approximate numbers of the ducks in the Tulare Lake region. Besides the dead there were many thousands of live birds on the lake at the time of our investigation. The accompanying photographs (figs. 67, 70) will give an idea of the numbers of birds which come together on the old levees during the day time. The writer feels safe in estimating that there were at least a quarter of a million ducks on the lake at the time of the investigation.

The disease of the present year first appeared during the latter part of July and was at the height of its course from about the first to the middle of September. By the 10th of October it was decidedly on the decline. This is in general the course of the epidemics of former years. That is, the first appearance is dur-

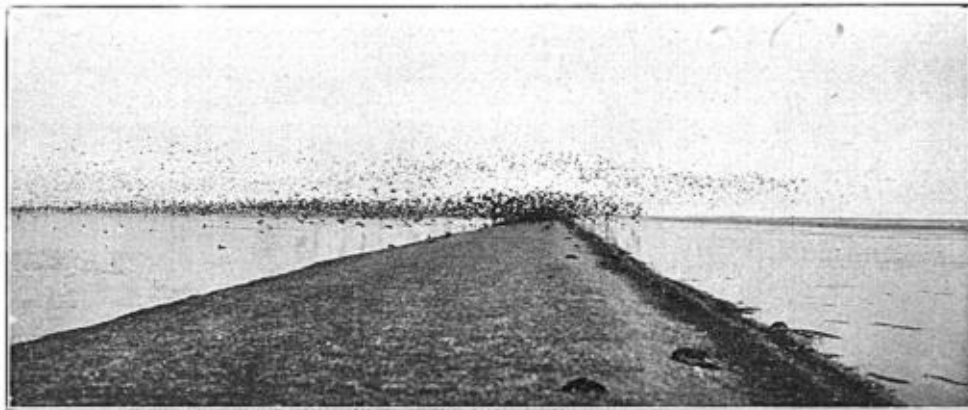


Fig. 70. CLOUDS OF DUCKS RISING FROM LEVEE IN TULARE LAKE; NOTE DEAD AND SICK DUCKS IN FOREGROUND, BOTH ON LAND AND WATER; PHOTOGRAPH TAKEN OCTOBER 3, 1913

ing the very hot summer weather, and the cessation is rather abrupt as the cool weather of the fall comes on.

Special pains were taken to count and estimate the number of dead birds on the lake. Our principal observations were taken on the north and west sides of the lake, where, it is claimed by some, there was less mortality than on the south side. However, it must be noted that the prevailing winds on the lake at this time of the year are from north to south; and therefore this factor may be responsible for the greater abundance of dead birds on the south side of the lake, because many carcasses are thus doubtless carried across the lake by the wind.

But because conditions on the north side of the lake were more favorable for our work, we selected that side for our purposes and consequently are able to give more data from this restricted locality than from elsewhere. The accompanying diagram and table are self-explanatory except that it should be noted that the levees, varying in width up to forty feet, are measured from the water line on one side of the levee to the water's edge on the other side. The counts

TABLE ENUMERATING DEAD BIRDS FOUND ON LEVEES I TO V INCLUSIVE, AS SHOWN IN ACCOMPANYING DIAGRAM (FIG. 72). NUMBER OF DEAD ARE SEEN TO HAVE BEEN STEADILY INCREASING DURING THE TIME OF THE INVESTIGATION

Date of count	Sept. 30	Oct. 1	Oct. 2	Oct. 3	Oct. 5	Totals
LEVEES	1	11	III	IV	V	642
Teal	52	79	377	134	...	571
Pintail	25	55	166	325	...	540
Spoonbill	32	25	201	282	...	46
Sandpipers	2	7	27	10	...	21
Stilts	3	15	3	...	...	17
Coots	2	...	9	6	...	11
Avocet	...	4	7	...	...	8
Cormorant	...	...	6	2	...	6
Gulls	2	1	1	2	...	3
Pelican	...	...	3	...	...	214
Unclassified	...	...	...	...	214	214
Totals	118	186	800	761	214	

Grand total..... 2079

Average number of ducks per mile on first four levees, 467; average of all kinds of birds, 497. Numbers within levees not counted.

LEVEES: No. I Three-fourths mile long..... 0 to 25 feet wide
 No. II One mile long..... 30 to 40 " "
 No. III " " " 10 to 30 " "
 No. IV " " " 10 to 25 " "
 No. V Half mile long..... 20 to 30 " "

(Width of levees measured from edge of water on one side to edge of water on the other side.)



Fig. 71. SICK AND DEAD DUCKS ON LEVEE AT TULARE LAKE, SEPTEMBER 21, 1913; THE SICK BIRDS ARE UNABLE TO FLY OR WALK; THEY REMAIN IN THIS PARALYTIC STATE FOR SEVERAL DAYS BEFORE DEATH

made included just those birds which remained on the levees after our approach. No birds were counted which were able to scramble into the water and swim off: only those which were dead or too sick to travel were enumerated. Two men generally conducted the count,—one to call off the names of the birds, the other to tabulate them.

Of course it was impossible to estimate the number of dead birds on the lake from the numbers on the levees alone, because, in the first place, more birds died on the levees than elsewhere, the sick and well both making an effort to attain these resting places during the day; and, secondly, the strong north winds blew the carcasses of those dying on the water southward against the levees. In nearly every case there were more dead birds on the north and west sides of the levees

than on the south and east sides. Further, it was out of the question to count all the birds on any of the sections between the levees, as part of this territory was in heavy mud or under water. But taking into account the ducks on these areas and those on the levees, the approximated average for all the territory affected was about one to the acre at the very least. Then figuring 25,000 acres as the total area of this affected territory, we have a total result of 25,000 dead ducks, besides many other birds.

As stated above, ducks on the lake usually prefer to locate for the day on the old levees where these are very nearly submerged. Where great numbers of birds visited these levees, the latter soon became very filthy. Circumstances favored such conditions. The ground was a soft, black mud, full of

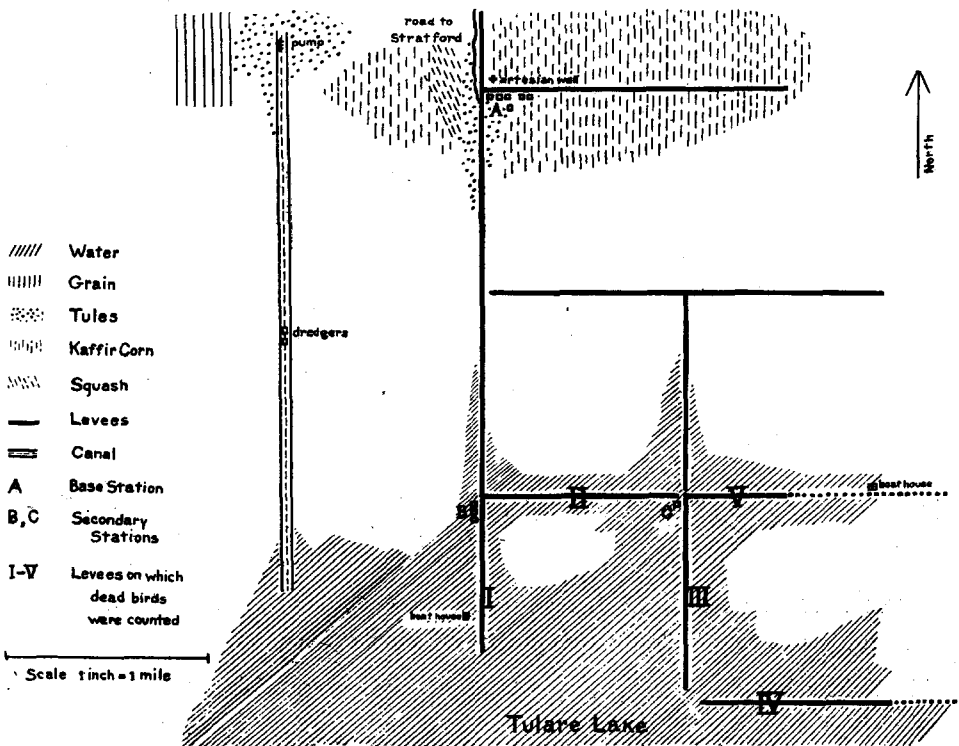


Fig. 72. DIAGRAM SHOWING NATURE OF COUNTRY WHERE EXPERIMENTS WERE CARRIED OUT, AND OBSERVATIONS MADE, ON DUCK DISEASE AT LAKE TULARE, SEPTEMBER 19 TO OCTOBER 7, 1913, BY THE STATE FISH AND GAME COMMISSION

decaying organic matter, consequently when visited by thousands of birds, sick and well, all paddling together, these levees became very foul. Sick birds, too weak to travel, were often found stuck in this mud, or even half buried in it.

The first symptom of the disease, so far as could be learned, was the loss of the power of flight. Following this, the birds became unable to walk. But even after losing this function, they were able to swim and dive for several days, sometimes almost up to the point of death. Paddling in the water never seemed difficult, but attempts to dive often failed to take the birds beneath the surface of the water. These functions, of course, were dependent on the condition of the birds. On becoming very weak many of the sick birds took to the levees where they might

rest. Here they would remain in one spot, often stuck in the mud, until death occurred. A later symptom of the disease was the development of a whitish-green or yellowish diarrhoea.

During the later stages of the disease the sick birds were often found barely holding the head up or with the neck and head extended out upon the ground as if dead. While in this languid state, and under conditions of great heat and dryness, the eyes often became closed due to the formation and drying of matter in them, the birds being unable to clean themselves. At times flesh flies deposited their eggs or larvæ in the corners of the eyes, and this doubtless gave rise to the opinion on the part of some people that the birds were dying from "worms in the eyes". The mouths and throats of the sick birds were often dry and parched, due to cessation of drinking and feeding.

When a large flock of ducks on a levee was approached, most of the birds would fly off while the invaders were still several hundred yards or a quarter of a mile away. But in these flocks it was nearly always to be noted that some of the birds would lose distance and lag behind in the flight, and often times



Fig. 73. MAIN CAMP (A) FROM WHICH EXPERIMENTAL WORK WAS CARRIED ON; NOTE KAFFIR CORN FIELD IN BACKGROUND

would alight after a short journey, apparently weak or disinclined to follow. Other birds would make no attempt to go when the main flock arose. On closer approach, these individuals, if on the water, would swim off with fair rapidity; if on land, those able to travel would make an effort to get into the water and swim off. Many would attempt to fly and, after half swimming and half flying for a distance, would gain wing and fly perhaps a quarter of a mile, but more likely only a short distance, when they would slow down quickly and flutter onto the water. Others would not clear the water at all, but simply race along the top of the lake creating a big commotion, splashing the water violently, often quacking loudly as they made every possible effort of head, wings and legs to get out of the way. If the enemy got too close, many would try to dive. Sometimes they would remain down in the water several seconds, even twenty or thirty seconds, and then come up in another place several yards away. But the more seriously stricken birds would not be able to get much more than the head out of sight. Sick birds out upon the lake could nearly always be recognized even at a considerable distance because they sat lower in the water, being water-logged, and not

infrequently their tails drooped in the water. These birds, becoming too weak to hold the head up any longer, naturally died by drowning.

Some of the very sick birds would make no effort to move even when picked up, while others, though unable to walk or fly, would flap the wings, stretch the neck forward and quack violently. In a majority of cases where the sick birds could make no headway at all, they would open and close the mouths with a sort of hissing noise if a person came near. But as this was emitted at other times, it was plain that this was not a symptom of the disease. Temperatures of the sick birds were subnormal, ranging from 99 to 105 degrees Fahrenheit, while the normal temperature is 107 degrees Fahrenheit.

Postmortem examinations revealed less than one would naturally expect to find. There were no intestinal lesions or hemorrhages below the stomach. Most of the organs appeared nearly normal. However, the stomachs were contracted, with rigid folds of the mucous membrane and muscles, and usually showed evidences of one or more hemorrhages, though not always. In most cases this inner lining, with parts separated from the tissues underneath, would show patch-

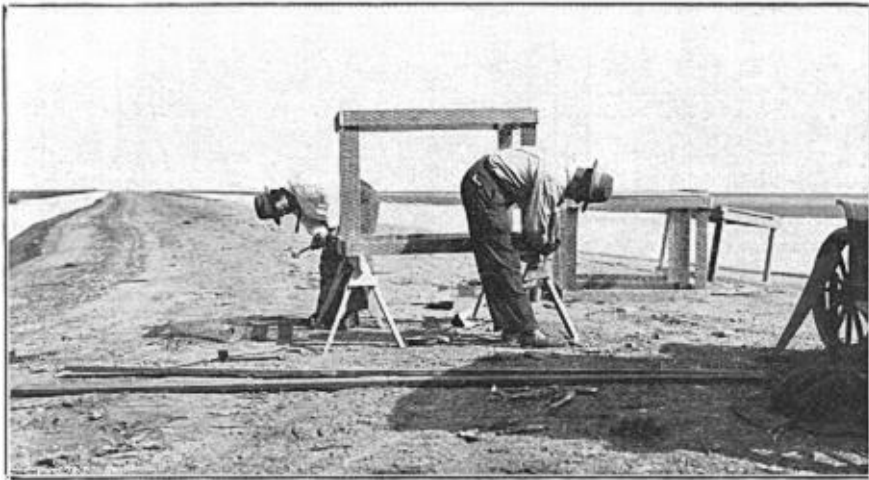


Fig. 74. DEPUTY GAME COMMISSIONERS MAKING CAGES FOR DUCKS TO BE KEPT UNDER EXPERIMENTATION; OCTOBER 24, 1913

es of a heavy necrotic growth and decomposition of the tissue. This was generally accompanied by a heavy viscid mucus at the anterior opening of the stomach.

As these and other minor symptoms indicated a slow poisoning of some kind, and as no disease-producing organisms could be located in the blood nor grown on agar, it was decided to carry on some experiments to determine if the water of Tulare Lake possessed the ingredients which were responsible for the malady.

Consequently a camp was temporarily established for this purpose on September 24 by deputy Fish and Game Commissioners Tipton Mathews and E. W. Smalley, on the north side of Tulare Lake. This camp was located near a small artesian well close to the southern border of a Kaffir corn field. It was just two miles from this camp to the edge of the lake. Three stations for carrying on experiments were established: one (A) at this camp, one (B) on the edge of the lake two miles directly south, and one (C) just one mile directly east of the second one (see fig. 72). Wire cages, four to six feet long, three feet wide and three

feet high, were constructed for holding the birds at these various places (see figs. 73, 74). The necessary food, shade and water were given according to the test to be performed. Operations were begun on September 25, 1913, and continued until the 8th of the following month.

Two dozen Spoonbill ducks were shipped down from the State Game Farm at Hayward, these birds being used as subjects and controls in the work. The following experiments and results were obtained.

(1) September 25 to October 7, 1913. Several dozen sick ducks were brought to station A, and put in cages containing fresh water and good food. Over ninety percent recovered completely.

(2) September 26, 1913. Three sick ducks were taken from the lake, placed in a cage on the edge of lake, and given good water and food. All three recovered completely.

(3) September 25, 1913. Two Spoonbill ducks from the State Game Farm

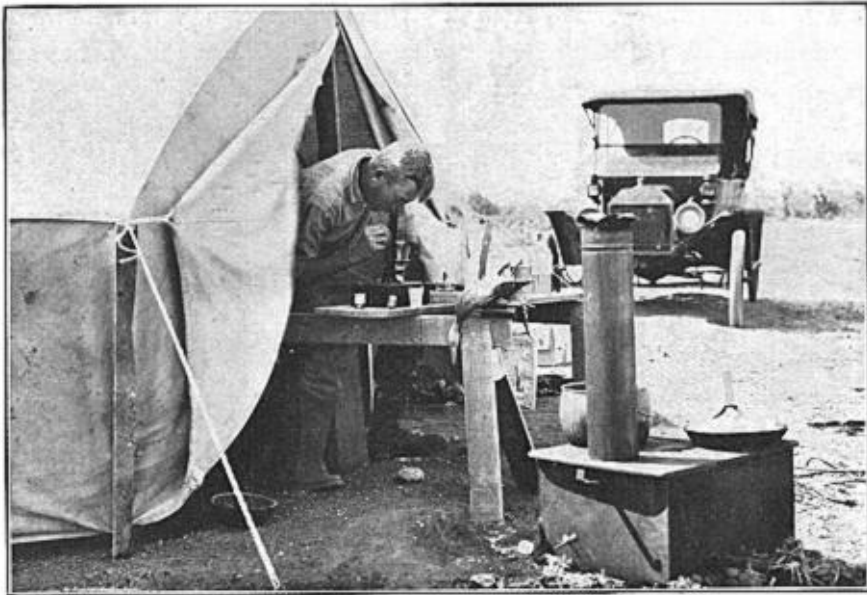


Fig. 75. THE WRITER OF THE PRESENT ARTICLE MAKING A MICROSCOPIC EXAMINATION OF THE BLOOD OF A SPRIG

were placed in a cage at station A, and given food, but unboiled lake water only to drink. Both died in less than four days with symptoms similar to those found dead on the lake. The experiment was repeated with like results.

(4) September 26, 1913. Two Spoonbill ducks from the State Game Farm were placed in a cage at station A and given food, and boiled lake water only, the water being boiled for one hour. Both died in less than four days, with symptoms similar to those found on the lake. The experiment was repeated with like results.

(5) September 25, 1913. Four Spoonbill ducks from the State Game Farm were placed in a cage at station A and kept on good food and good water. These were kept as controls. All remained healthy.

(6) September 27, 1913. Two normal birds kept at station A were injected

intravenously with $\frac{3}{4}$ cc. of live blood from sick birds. No ill effects could be noted.

(7) September 25, 1913. Two Spoonbill ducks from the State Game Farm were placed in a cage at the edge of the lake. These were given good food and lake water. Both died in less than five days.

(8) September 25, 1913. Three Spoonbill ducks were placed in a cage at the edge of the lake. These were given good food and artesian water. They remained healthy.

(9) September 27, 1913. One normal duck (Spoonbill) was placed in a coop with the sick ducks at station A. It remained well throughout.

(10) September 27, 1913. One normal duck (Spoonbill) was placed in a coop with several dissected birds. On October 3 the bird got head in crack and strangled to death.

(11) Three birds were placed in a cage with good water containing chopped-



Fig. 76. REMAINS OF BIRDS, CHIEFLY DUCKS, ALONG SLOUGH AT NORTHEAST SIDE OF BUENA VISTA LAKE, KERN COUNTY, CALIFORNIA; COYOTES, COONS, ETC., HAD BEEN FEEDING ON THE DEAD AND DYING BIRDS HERE FOR TWO MONTHS OR MORE; PHOTOGRAPHED OCTOBER 9, 1913.

up parts of sick birds. Birds remained healthy.

(12) October 3, 1913. Three birds were confined in cage on lake. In cage, at water level, was set a platform, over which was placed a tight box, but containing entrance for birds. Artesian water and good food were provided. The experiment was to test effect on the birds of the gases which arose from the lake. This experiment was carried on only four days. Experiment not carried on long enough for definite results.

Thus, the examinations made and the experiments carried on tended to prove that the cause of the trouble lay in the lake water, either as a mineral or as an organic constituent.

At present, analyses of the water and gases of the lake are being made and experiments are being carried out to confirm or refute our conclusions regarding this duck disease. Some time will be required before all this data can be obtained.

CONDITIONS AT BUENA VISTA LAKE

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 on the northeastern side, counted over 1500 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. The ac-



Fig. 77. SICK DUCKS REMOVED FROM BUENA VISTA LAKE AND PLACED ON FRESH WATER SOON RECUPERATED. THESE BIRDS WERE ENCLOSED BY PERPENDICULAR BANKS AND WIRE FENCING, THE FLIGHT FEATHERS OF ONE WING BEING CLIPPED TO PREVENT THE BIRDS FROM FLYING AWAY AS SOON AS WELL; PHOTOGRAPH TAKEN OCTOBER 9, 1913.

companying photograph (fig. 76) does not nearly do justice to the situation. Ducks constituted the main portion of the remains; still, many cormorants, pelicans, etc., were represented. A number of sick birds were obtained and examined. Postmortem showed conditions similar to those of the Tulare Lake ducks. Samples of the water of Buena Vista are being analyzed.

It is hoped that by further experimentation the specific factor of the malady may be brought to light, and that it may prove expedient to effect means by which this great loss of birds may be greatly reduced, or even prevented.

FROM FIELD AND STUDY

Two Stragglers on the Oregon Coast.—*Plectrophenax nivalis nivalis*. Snow Bunting. On December 31, 1912, Mr. O. J. Murie collected one of these birds on the ocean beach at Netarts, Oregon. It was alone and no others were seen during ten days hunting in this vicinity.

Salpinctes obsoletus obsoletus. Rock Wren. On December 27, 1912, Mr. Murie collected a Rock Wren where it was running about over the drift-wood on the beach at Netarts. This is the first record, to my knowledge, of this wren occurring on the coast of Oregon, and the record in midwinter makes it doubly interesting.

Mr. Murie has kindly allowed me to publish these notes.—STANLEY G. JEWETT, *Portland, Oregon*.