

## ROUTING SLIP

## DIVISION OF WILDLIFE REFUGES

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## REMARKS

Medicine Lake Quarterly  
August - October 1940Return to: Coak

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE  
Medicine Lake National Wildlife Refuge  
Medicine Lake, Montana

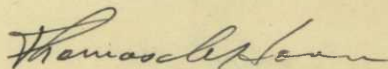
Jan. 16, 1941

Regional Director  
Fish and Wildlife Service  
630 American Bank Building  
Portland, Oregon

Dear Sir:

Transmitted herewith is our August-October  
quarterly report, which brings this office up to  
date on all reports.

Very truly yours,



Thomas C. Horn  
Refuge Manager

TCH:ef





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UNITED STATES DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

MEDICINE LAKE NATIONAL WILDLIFE REFUGE

QUARTERLY NARRATIVE REPORT

AUGUST, SEPTEMBER and OCTOBER, 1940



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## I. GENERAL

### A. Weather Conditions

Weather conditions thru this period were excellent for the operation of equipment and for the accomplishment of physical improvements.

	Rainfall	Max. Temp.	Min. Temp.
August	.19	101	35
September	.16	100	28
October	<u>1.43</u>	<u>80</u>	<u>21</u>
Totals	1.78	Extremes 101	21

### B. Water Conditions

Water in all units lowered considerably due to evaporation. In units 10 and 11 this caused a high concentration of alkali in the water and on most of the pot holes in #10 unit a heavy salt ring was precipitated. Levels of water on October 31 and of approximately the same time last year are compared in the following tabulation. The fact that the Homestead unit is kept full from Medicine Lake should be borne in mind.

	Oct. 1940	Oct. 1939
Homestead	1937.04	1937.30
Medicine Lake	1940.70	1941.40
Unit #10	1942.90	1944.20
Unit #11	1950.50	1951.84
Unit #12	1951.60	1953.18

The low stage of the last three units can be attributed to the fact that they received no runoff this spring.

### C. Fires

During a lightning storm on the afternoon of August 14, a small fire started on the south side of Medicine Lake. Floyd Martini, who lives near where the fire started, telephoned in a report on it and a CCC crew was immediately dispatched to the scene. Forty-five minutes work by the sixteen man crew with wet sacks and back-pack pumps were sufficient to extinguish the fire.

Approximately 22.5 acres of grazing land were burned over.

## II. WILDLIFE

### A. Waterbirds

This year's southward migration has been characterized by a steady light flight. No heavy flights occurred thru the period covered by this report.

Except for the following species most birds appeared at approximately the same time as last year. Those shown below arrived earlier than usual.

✓ Slate-colored Junco	Sept. 23
✓ Sandhill Cranes	Oct. 6
✓ Buffleheads	Oct. 8

✓ Cormorants and blue-wing teal were still on the refuge on October 15, which is late for them.

The fact that an unusually heavy flight of gadwalls used the refuge this year was borne out by the predominance of this species in hunters' bags.

✓ Franklin's gulls began to concentrate here about Sept. 1.



Their peak population of an estimated 3000 this year was only about 40% of the previous year's peak. There were no summer resident Franklin gulls here this year, while last year approximately 2000 birds summered here.

reported nesting in May-July report.

The same peculiar behavior of California and ringbill gulls as last year, with an addition of pelicans this fall, was observed.

Thru the months of September these birds could be observed circling to great heights in thermal updrafts. After reaching the peak of their flight, flocks of the birds would set their wings and dive toward the lake in a nearly vertical flight with terrific speed. The sound of their wings rushing thru the air was audible at a distance greater than the birds could be seen.

#### Food and Cover

The sago pondweed patches in the west end of Medicine Lake and in front of headquarters developed into excellent feed patches for waterfowl. The dense growth of rank sago produced a tremendous crop of seed, larger than the Bear River Refuge seed. At the close of this report period no plants were visible in front of headquarters, all having been eaten off by tipplers, divers and coots, and what had been a dense growth earlier in the season, west of the state highway #16 was only a ragged patch with windrows of loose stems and leaves around the shore.

In unit #12 widgeon grass, (*ruppia maritima*), Mares tail (*hippuris vulgaris*), arrowhead (*sagittaria cuneata*), smartweed (*polygonum* spp.), and sago pondweed (*potamogeton pectinatus*), seed from Bear River Refuge, made their appearance.

This year was the first year the first four species have been in evidence in unit 12 and the first year on the refuge for the widegreen grass and mare's tail. The sago pondweed in unit #12, grown from the Bear River seed is a much more delicate plant than the native species. Leaves and stems are shorter and finer and the seeds are smaller.

Excellent usage was made of the domestic crops planted for waterfowl. All the barley fields were practically cleaned and at least 50% of the corn was consumed by ducks at the close of this report period. It was not uncommon to see three to eight thousand waterfowl in a 10 acre field at dusk. No supplementary feeding was carried on as thousands of bushels of grain were available to waterfowl south and west of the Homestead unit as a result of the July 14 hailstorm.

#### Disease

The start of the cleanup of the various refuge units was made on June 12th, when the WPA crew with the caterpillar and hay rake began operations on the Homestead unit. This unit was cleared of all shoreline debris and the cleanup outfit then moved to units 11 and Katys Lake. The entire shoreline, where necessary, was cleared before the start of the outbreak on July 8.

This year thru these preventative measures the number of afflicted birds was reduced from last year's total of 13,296 to 8,158. This year's duck sickness was thus only 61.5% of last year's.

Last year 11,636 birds died as compared to this year's loss of 7,196 birds, making this year's loss of birds 62% of last year's.

The difference in these percentages, i.e.,  $\frac{61.5}{52}$  and 52, indicates that this year's poisoning was more lethal than last year's, altho there is a considerable reduction in the number of birds afflicted.

This, probably, is due to the fact that with control methods started prior to the outbreak, most of the mildly lethal toxic spots of the previous year were eliminated this year reducing the number of birds affected by reducing the areas of infection. The extreme toxic spots, the locations of which are not known, were the sources of this year's infection and probably account for a higher death rate, in birds afflicted with botulism, which was 75% in 1939 and 78% in 1940.

The hailstorm that occurred on the Homestead unit was of some benefit to the unit from the standpoint of botulism control. The temperature of the water was reduced somewhat, which may or may not have had a beneficial effect.

The water area was swept completely clean of decaying vegetation by the high wind that accompanied the hail and the debris thus removed was deposited from 15 to 150 feet from the normal shoreline of the lake. The bullrush in the Homestead unit was cut to shreds by the hailstorm, wind drifted to shore and removed, prior to the set in of decay, with the caterpillar and hay rake.

On July 19th Dr. Quortrup, Mr. Lakin, and Mr. Hotchkiss arrived to conduct botulism habitat type studies on the area. Soil tests were made and water samples taken.



The following organisms were identified in the water samples:

Anabaena Sp.	Homestead unit	West & south sides	Very abundant
Diatoms	Unit #11		Abundant
Oscillatoria	Unit #11		Abundant
Cladophora	Katy's Lake		Abundant
	#10 Channels		Abundant
	Medicine Lake	West end	Abundant
	Homestead Unit		Abundant
Spirulina	Unit #11		Common
Enteromorpha	Unit #11		Common in 1 pool
Arthrospira	Unit #11		Rare

These findings were made from July 20th to the 23rd, inclusive.

On at least one of these days a slight breeze drifted Anabaena into surface mats on the Homestead unit. Samples of this were taken and proved to be toxic when administered intraperitoneally. The introduction of Type C botulism toxin into the Anabaena administered did not alter its toxicity which indicated that it was possible for birds to be poisoned from anabaena alone. This may be partly responsible for some of the deaths of waterfowl that are now attributed to botulism.

The only heavy concentrations of algae that were observed were Anabaena and Cladophora, the latter being particularly heavy in Unit #11. Anabaena formed dense mats in the Homestead unit.

On the afternoon of July 23 the west shoreline of the Homestead unit 100 yards north of the spillway was covered with small fish, probably shiners. The approximate 10,000 fish were spread along shore for about 100 yards, indicating that whatever caused their death was very localized. Orders were given to the field crew to clean them up but none were to be found the next morning, probably having been picked up by terns and gulls. A live garter snake found on the shore nearby, upon being properly handled, disgorged three of the small fish.

The succeeding map shows the breakdown into botulism units, of the entire refuge. This was done because, ecologically and geographically, each unit is vastly different.

The following table gives a fair description of water areas of the various units. This information is given in order that a better understanding of the tabulations showing hospital and field burial records might be better interpreted.

Unit	Shoreline		Vegetation			Water			
	Steep	Flat	Emergents	Aquatics	Alkalinity	Open	Potholes	Chann	Depth
#4	100%	No	60%		Low		40%	No	18"
Katys L.	30%	70%	10%		Moderate	Yes	No	No	24"
#12	100%	No	1%	80%	Low	Yes	No	Wide	48"
#11	60%	40%	No	No	High	Yes	No	5%	12"
Gaf. L.	70%	30%	No	No	High	Yes	No	No	48"
#10	90%	10%	No	No	Very High	Yes	50%	50%	20"
Mud. L.	100%	No	No	10%	Low	Yes	No	No	96"
Hemestead	40%	60%	20%	5%	Low	80%	Bays	No	24"

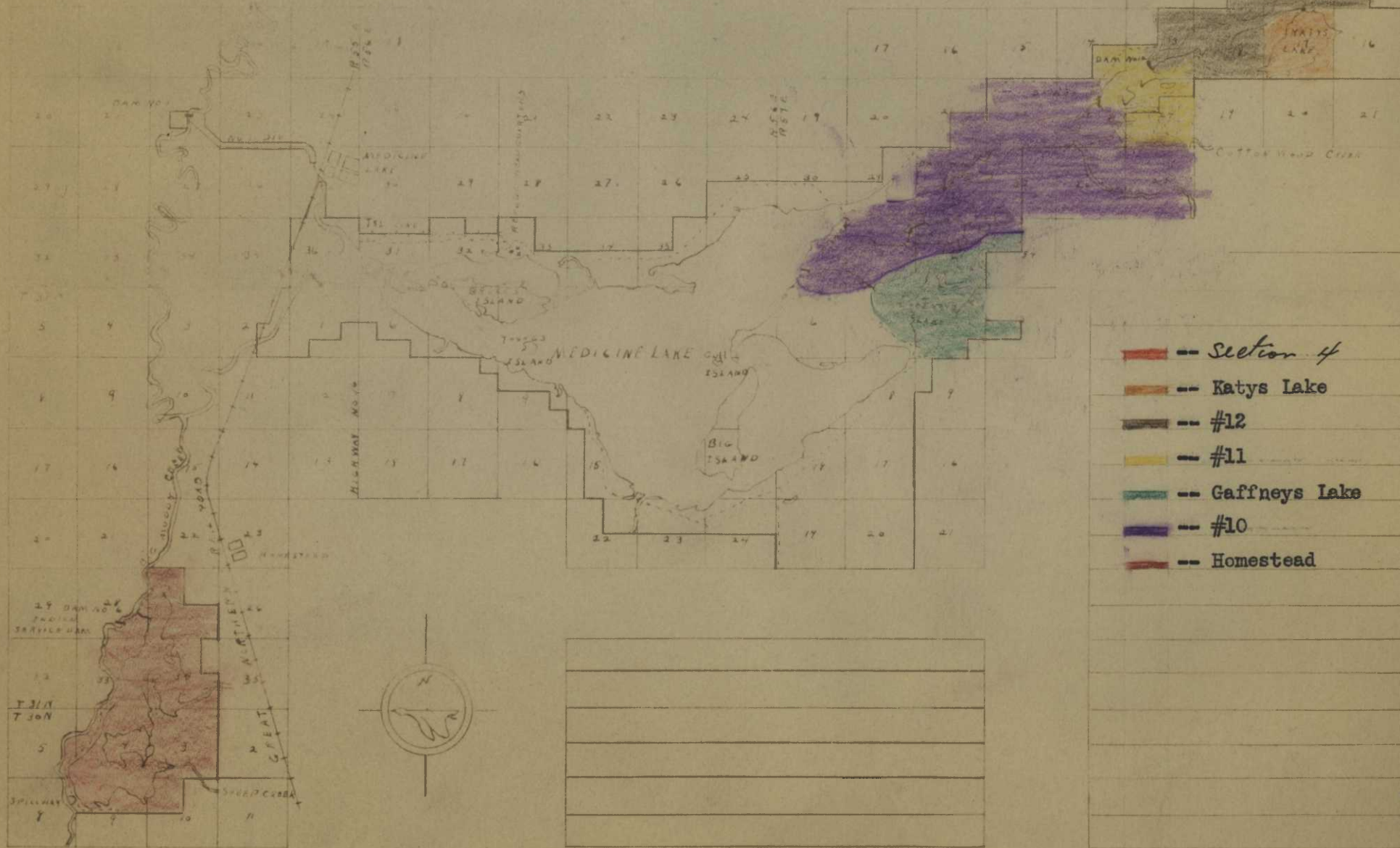
When the botulism outbreak occurred on July 8, 345 birds were picked up on the Hemestead unit. Pickups for the next day were only 193 birds and more nearly indicates the number of daily victims at the start.

On the succeeding graph a daily record is shown of this season's pickups, temperatures and a comparison with last year's pickups. The term pickups, used in this report, is meant to cover total birds picked up, either dead or alive, and respectively, hospitalized or buried. The lines on the succeeding graph are identified as follows:

**Black:—** Total pickups for 1940. In comparing 1940 botulism with 1939 botulism the black line should be compared with the blue line.

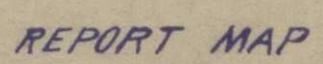


# MEDICINE LAKE MIGRATORY WATERFOWL REFUGE REPORT MAP





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Blue:--Total pickups for 1939. This line was included in the graph for comparison with 1940 only.

Green:--Total pickups for the Homestead unit. The difference between this line and the black line indicates the proportion of ducksickness on the balance of the refuge.

Red:--Average daily temperature. This may be compared to 1939 by referring to the August-October 1939 narrative report.

Referring to this graph it is found that this year's outbreak began two days earlier than in 1939 and reached its peak nine days later than in 1939.

This year's secondary peak preceded the actual peak by six days while in 1939 the secondary peak succeeded the actual peak by fifteen days.

#### Correlation of Temperature and Pickups

To realize the full significance of this paragraph, page six of the August-October 1939 report should be referred to. In this report indications pointed to a pickup peak between nine and eleven days after a temperature peak. This year's study of this phase of the malady indicates further that this is true. The following tabulation correlates this fact.

<u>Temperature Peak</u>		<u>Pickup Peak</u>	
<u>Date</u>	<u>Peak Temperature</u>	<u>Date</u>	<u>Pickup</u>
July 9	77°	July 17	505 Eight days later
July 13	72°	July 23	665 Ten days later
July 18	78°	July 29	675 Eleven days later
July 21	77°	July 31	270 Ten days later
July 31	76°	Aug. 12	200 Twelve days later
Aug. 9	85°	Aug. 19	180 Ten days later
Aug. 13	82°	Aug. 23	140 Ten days later

This information, as last year's, is not sufficient basis on which to base conclusions, but a finger of suspicion can now be pointed to the

relationship with some definition.

Pickup operations were carried on as usual with all areas being patrolled thru the height of the outbreak and sufficient crews to keep the shoreline clean after the outbreak had subsided some.

Thru this season all birds possible were identified before in-  
terment into the hospital or burial. The succeeding graph was made  
from information thus tabulated.

Several facts became obvious in an analysis of the graph. The  
following table clearly indicates that the species pickup peaks are not  
related to the total refuge pickups peaks.

<u>Species</u>	<u>Date of Peak Pickups</u>
Total refuge	July 29
Mallard	July 29
Pintail	July 28
Shovellers	Aug. 2
Bluswing Teal	July 29
Greenwing Teal	July 29
Coot	July 15

The average course of the line thru graph is a fair indication  
of refuge population thru the outbreak this year, i.e. pintails predomi-  
nated with bluswing teal, mallards, coots shovellers and greenwing teal  
in numbers respective to their order.



Pr. II - Land - man's and ever is in a field



HOSPITAL RECORD

SPECIES	#4	Estys L.	#12	#11	Gaf. L.	#10	Med. L.	Hmstd.	Total	Recoverd	Died	% Recov	% of Total Hosp.
Western Grebe				1					1	1		100	.158
Eared Grebe								5	5	1	4	20	.86
Pied B. Grebe								3	3	1	2	33	.82
California Gull								1	1		1	0	.17
Ringbill Gull			1	1				3	5	1	4	20	.86
Franklin's Gull								2	2	1	1	50	.352
Terns								12	12	5	7	42	2.15
Pelican								2	2	0	2	0	.352
Mallard	2	2	12	23	1		3	227	274	141	131	52	16.00
Black Duck				1				2	3	1	2	33	.18
Godwall		1	1				2		4	1	3	25	.18
Baldpate		3	2	3		1	12	34	59	52	27	51	3.86
Greenwing Teal	1	3	5	30			7	108	154	66	88	43	9.25
Bluewing Teal	1	5	4	27	1		4	228	270	77	193	28	16.2
Shoveller		2	3	14			3	57	91	53	58	34	5.5
Pintail	7	13	16	76	2	2	1	672	789	435	352	55	47.2
Red Head				2			2	4	10	2	3	20	.65
Canvasback	1					1	2	1	3	3	2	60	.55
Scup								5	5	5	0	100	.35
Bufflehead				1					1	0	1	0	.06
Ruddy								7	7	6	1	85	.42
Blue Heron					1			1	2	1	1	50	.352
Black-crowned N Heron								13	13	9	4	69	2.2
Virginia Rail		1						1	2	0	2	0	.34
Sora Rail								9	9	1	8	12.5	.155
Coot			2	7			2	93	104	25	79	25	18.184
Phalarope								36	36	15	23	36	6.3
Avocet	1	4	3	13	2		31		54	9	45	17	9.4
Sandpipers		4	3	14	2	3	2	40	63	7	61	10	11.7
Dowitcher			3	3				46	52	12	40	23	9.0
Sanderling								1	1	1	0	100	.176
Marbled Godwit			1				6	31	38	15	23	39	6.6
Yellowlegs		1	3	4				76	84	17	67	20	14.6
Willet				2				20	22	13	9	59	3.9
Curlew							1		1	1	0	100	.176
Hawk		1					1	1	3	1	2	33	.62
Blackbird								2	2	0	2	0	.352
Unidentified		4	22	3				10	19	0	19	0	5.3
Total Ducks Hosp.	12	31	43	179	11	4	40	1359	1672	802	866	870	
Total Other Birds Hospitalized	1	17	19	52	3	3	43	439	579	156	423	423	

1798 2251 758

1293 (died)

Waterfowl



### Hospital Record Analysis (Preceding Tabulation)

This tabulation shows a total of 1672 waterfowl and 579 other birds interned in the hospital. Of the total of 2251 a 38% recovery was realized with 958 birds having been released. (7.5% of total)

In waterfowl alone the recovery rate was 48% and in birds other than waterfowl the recovery rate was 27%. Comparative figures from last year's report are 52% and 22% respectively.

Treatment of the birds in the hospital consisted of an intra-peritoneal injection of sterile glucose with an oral injection of potassium permanganate and magnesium sulphate solution. No reason can be given for the difference in this year's recovery rate and that of last year unless, by keeping the shoreline clean from early in the season, spots of mild toxicity were eliminated and the birds treated were victims of poisoning which was pickup where the toxin was highly virulent.

The difference in the total numbers of birds afflicted this and last year somewhat bears out this belief.

Space in this report will not be taken to give a comparison by species of the percentage of recovery since this comparison can be made by referring to last year's report, page 10. The fact that during both years, pintails showed the highest recovery rate is a tribute to their vitality.

### Field Burial Record Analysis (succeeding tabulation)

Probably the most significant comparison that can be made here is the difference in percentages of the total number of birds, both waterfowl and other birds, buried in the various betulism units this



FIELD BURIALS

SPECIES	#4	Katys Lake	Hmstd	#12	#11	Cal. L.	#10	Med. L.	Total Species Buried	% of Total Bur. of Waterfowl
Western Grebe							2	2	4	.2
Bared Grebe			18						18	1.4
Pied B. Grebe			4	1	1				6	.5
Californian Gull			2	1	3	4			10	.8
Ringbill Gull			2		1	1		3	7	.5
Franklin's Gull			1						1	.1
Terns		1	94	2	3				100	7.6
Pelican			5						5	.5
Mallard	5	15	474	16	90	3		45	648	14.2
Black Duck										
Gadwall		22 5	43		2 6	2 15	2	22	22 74	22 1.6
Baldpate		13	36		8	2		37	96	2.1
Greenwing Teal	2	18	281	4	86	1		45	437	9.5
Bluewing Teal	15	14	692	25	239	3		23	1044	22.9
Shoveller		6	104	3	42	4		40	199	4.4
Pintail	21	46	1464	50	278	18	1	85	1963	43.00
Red Head			5		2				7	X
Canvasback		3	30		2			4	39	1.0
Scamp	1		11		1				13	.2
Bufflehead										
Ruddy		1	31		9			2	43	1.0
Bittern			7						7	.5
Blue Heron										
Black C.H. Heron			21						21	1.7
Virginia Rail										
Sora Rail			2		2				4	.3
Coot	1	1	509	12	35			57	598	45.40
Phalarope			12						12	.9
Avocet	2	10	73	13	9	11		8	124	9.7
Dowitcher			25						25	2.0
Sandpipers	1	7	41	4	31			8	92	6.9
Sanderling										
Marbled Godwit			13		1			62	79	5.9
Yellow Legs			130	2	21				153	10.2
Willet		1	24		3			1	28	3.1
Killdeer		2	24		22 2				28	2.1
Hawk			3		1				6	.5
Blackbird					3				3	.2
Canada Goose								3	3	
Waterfowl burials	42	121	3174	98	763	46	3	316	4573 ✓	
% of total " by units	1.0	2.70	68.52	2.22	16.4	1.06	.07	6.98		
Other bird burials	4	22	1915	33	115	16	2	122	1534 /	
% of total " by units	.34	1.65	76.2	2.86	3.65	1.20	.15	8.95	5907 ✓	

1293

5907

7290



year and last. The following table gives this information.

	% of Total Birds Buried 1940	% of Total Birds Buried 1939
Unit #4	1.	.422
Katys Lake	2.7	5.03
Unit #12	2.22	10.2
Unit #11	16.4	17.1
Gaffneys Lake	1.06	.38
Unit #10	.08	10.6
Medicine Lake	6.98	.27
Homestead	69.52	56.0

It will be noted that all units except Gaffneys Lake, Medicine Lake, and Homestead showed decreases in percentages. The increase in percentage of Gaffneys Lake is only slight, while that in the Homestead unit is 13.56%, with the Homestead unit producing 71% of our ducksickness. Including this 13.56% increase in the percentage of refuge totals duck sickness in the Homestead unit, this year/<sup>it</sup> caused only 90% of what it did last year.

The decrease in the percentage of birds afflicted in #10 Unit, more than 10%, which brings the birds buried in/<sup>that</sup> ~~the Homestead~~ unit down to 5 is accounted for by the complete absence of aquatic growth. Extreme alkalinity and high turbidity completely eliminated all aquatic and emergent growth in this unit.

In last year's report (last full paragraph, page 7) an attempt was made to determine the movement of adult birds between botulism units by comparing the percentage of mature birds, (able to fly) with the percentage of juvenile birds, (unable to fly) that were poisoned on a given unit.



Last year these percentages were extremely close, which indicated little if any movement of mature birds between the botulism units. This same data was compiled again this season and is shown on the following graph. While variations were greater in 1940 than in 1939, the conclusion that little movement of mature birds occurred is still borne out.

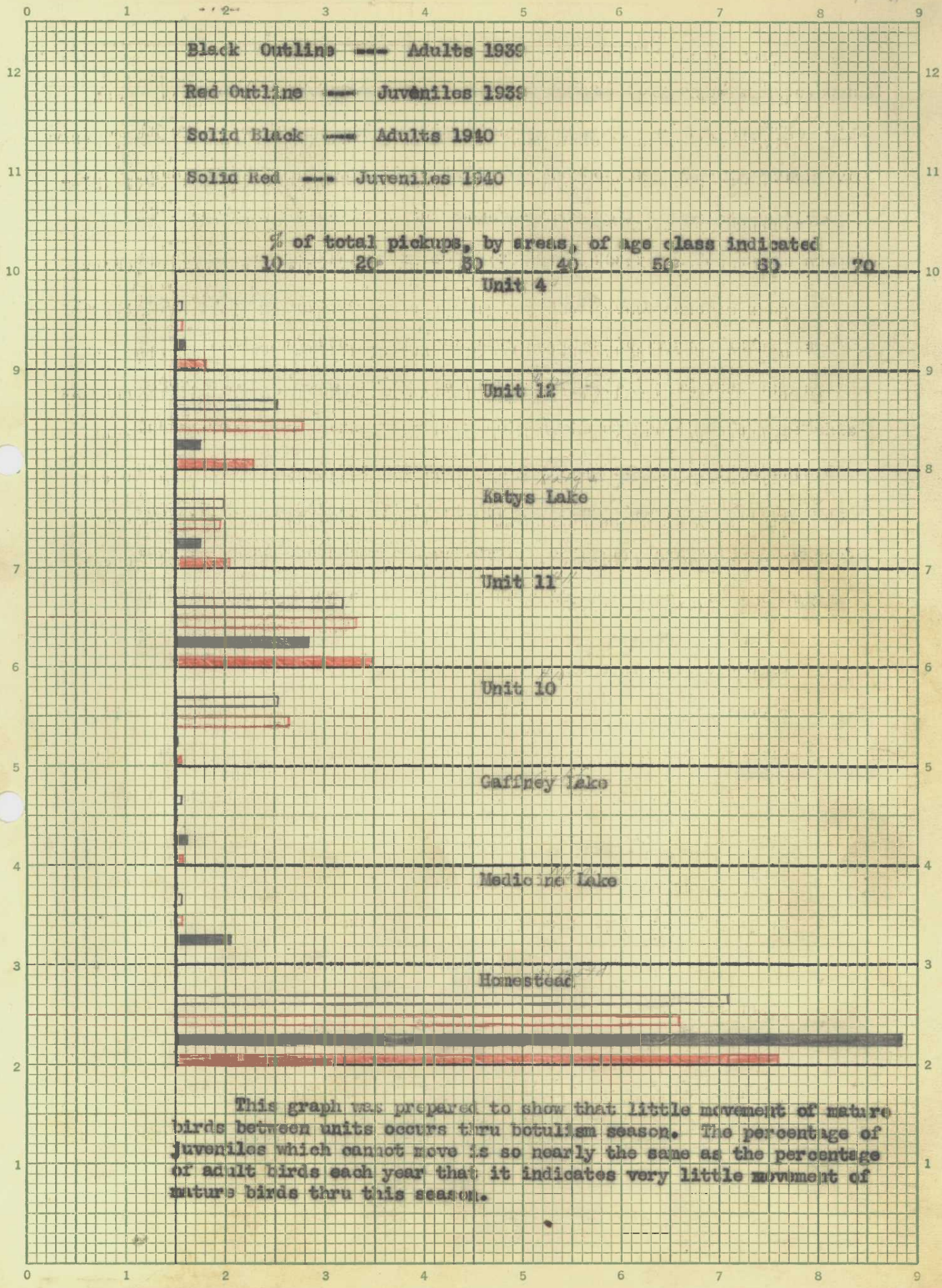
A slight outbreak of botulism occurred in the very west end of Medicine Lake, west of the highway, about September 10th. This was after ducksickness had ceased on all the other units and was probably caused by the decaying around shore of blankets of *peromogaster pectinatus* torn loose by feeding migrant coots and pintails. This outbreak was the cause of the death of three of the Canada geese we had raised here on the refuge.

After cleaning the area of sick and dead waterfowl, potassium permanganate was dispersed thru the shoreline water by dragging the crystals in burlap sacks weighted with rocks. After this treatment botulism here completely disappeared and did not recur.

The following tabulation summarizes this year's botulism in comparison to botulism for the two previous years. Shortage of information for 1938 accounts for the shortage of comparative data for that year.

	<u>1938</u>	<u>1939</u>	<u>1940</u>
Afflicted birds	37,381	13,298	8,158 ✓
Hospitalized birds	4,003	3,797	2,251 ✓
% of afflicted birds hospitalized	11.9%	32.6%	20.3%
% of recovery of waterfowl		52% ✓	46% ✓
% of recovery of other birds		27% ✓	22% ✓





This graph was prepared to show that little movement of mature birds between units occurs thru botulism season. The percentage of juveniles which cannot move is so nearly the same as the percentage of adult birds each year that it indicates very little movement of mature birds thru this season.



With the experience of the past behind us and the disease having passed the milestone of another year in running its self out, it is our hope and belief that by continuing to keep the lake shore clean and treating potential toxic spots with potassium permanganate, the reduction in the number of birds afflicted next year will be reduced comparably to the reduction of the past two years.

#### B. Upland Game Birds

An excellent stand of cover now exists in the Sand Hills unit and this year's hatch of sharptail grouse is probably the heaviest on the refuge in many years. A flock of about 100 young, two-thirds grown sharptails were observed there. It is conservative to estimate that 250 sharptails were produced on the refuge this year. No competition existed between sharptails and other species.

One covey of young downy Hungarian partridges was observed on the refuge at the #12 cabin this year. Hungarians were plentiful on the refuge and the surrounding country this year. Two coveys of about 15 each lived around the residence and office all thru the fall months, feeding in the yard grass and resting on the sidewalks.

Chinese or ringneck pheasants were plentiful on the refuge this year and shared the abundant food around the headquarters buildings with the Hungarians, in a cooperative spirit.

An excellent crop of snowberries, as compared to last year's near crop failure, will provide an abundance of winter food for all three species.

#### D. Fur Bearers

Musk rats have increased to the point where they are a menace to aquatic and emergent growth. A heavy take, by share trappers, on this species is anticipated for this winter.

No predators were taken thru this period but trapping activity on weasels, skunks, and coyotes is planned for the winter months.

### III. DEVELOPMENT & MAINTENANCE

#### CCC

##### A. Physical Development

###### Truck Trails

Four miles of truck trail were broken and graded around the south side of the lake. Graveling will be done thru the winter months. Eighty square yards of Class A riprap were laid as rock crossings in coulees in the trail.

###### Fence

490 rods of interior, and 177 rods of boundary fence were constructed as indicated on the report map.

###### Indian Service Dam

A leak developed in this structure, the #6 gates were closed and all water above the Indian Service Dam let go. Upon excavation and investigation it was found that the cutoff walls in #4 were short and water had found its way around these out under the apron below the dam. A survey was made to determine necessary remedial measures, the holes plugged and the dam is now operatable but has not been permanently



repaired. It is planned that this work will be done after the spring runoff.

#### Channels

The #1 Overflow Spillway was nearly completed thru this period and used most of the Company strength.

A channel was cut through Bridgeman's point (see map attached) to make an island out of what was a peninsula.

A channel between Gaffneys Lake and Medicine Lake was cut to provide a drain for Gaffneys Lake. The structure for controlling the water will be built during warmer weather.

#### B. Plantings

8899 clusters of *Scirpus Acutus* were placed as shown on the map attached. This covered approximately 49½ acres.

#### C. Collections

The 8899 clusters of *Scirpus Acutus* shown as planted above were collected from the channel below #1 dam, where a healthy stand existed.

#### D. Distribution of Seed and Nursery Stock

##### Receipts

Seed was received as follows:

Transferred *Scirpus Paludosis*, 132 lbs. by freight from Bowdoin Refuge.

Purchased *Agropyron Cristatum*, 300 lbs., freight from Minot, N.D.

#### IV. PUBLIC RELATIONS

The following visitors spent the indicated time on the refuge during this report period:

Neil Hotchkiss, Washington, D.C., Sept. 25-26, two days

E.C. Gavin, Soil Conservation Service, Culbertson, Mont. Sept. 25, 3 hours

Mr. Moore, " " " Billings, Mont., Oct. 11, 1 hour

Mr. Gustafson, Washington, D.C., Aug. 1, 4 hours

Paul Breager, Portland, Ore., Aug. 31-Sept. 1, 2 days

Tom Murray, Portland, Ore., Aug. 12, 1 day

Ken Roebber, Game Agent, Billings, Mont., Oct. 24-25, 2 days

Frank Bogut, State Game Warden, Oct. 31, 2 hours

C.W. Burt, Ass't. U.S. Attorney, Oct. 7, 1 day

H.C. Biering, State Land Department, Oct. 14, 1 day

Paul Leonhardy, " " " " " "

Robert H. Smith, Washington, D.C., Sept. 4-5, 1½ days

Dr. Quortrup, Bear River Refuge, July 19, 1 day

Mr. Lakin, Washington, D.C., July 19, 1 day

Mr. Neil Hotchkiss, Washington, D.C., July 19-24, 3 days

#### VII. FIELD INVESTIGATIONS

##### B. Bird Banding

A complete account of bird banding will be made at the close of these operations, as suggested in Division Memo #91.

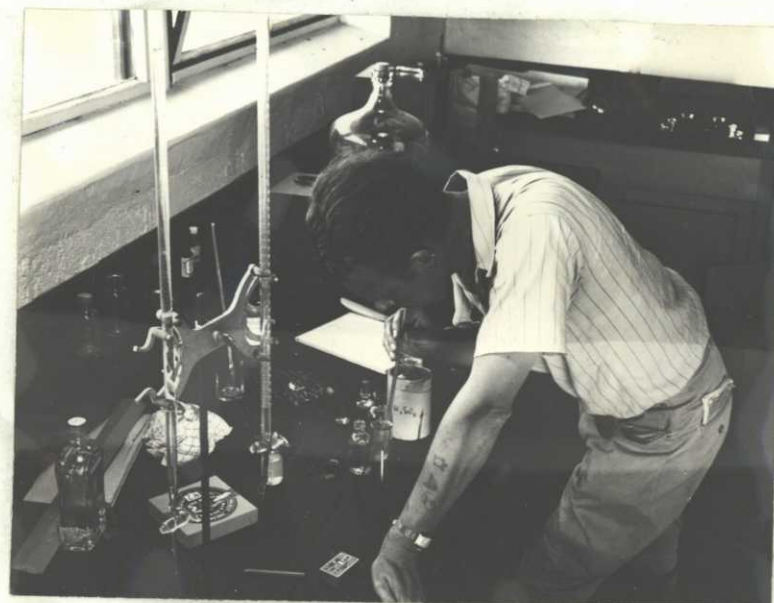




Grading road around the south side of  
the refuge.



Closeup of the crew in action.



Laboratory work on the study of botulism habitat type.





Potential or possible toxic condition of water is tested by the use of white mice.



Antitoxin, if successful in reviving the afflicted bird, indicates that toxin was the cause of the affliction.



An oral injection of potassium permanganate and magnesium sulphate, by Quortrup.



Hotchkiss dissecting a duck for examination.





Iakin taking a sample of marsh gas.



Quertrup looking over a probable toxic spot.

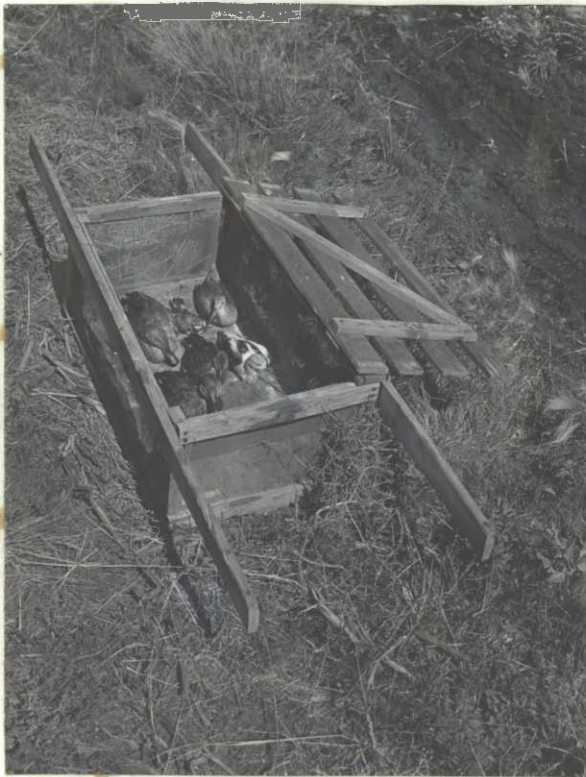


A variety of birds in a field pickup  
crew's carrier.



Leeches in a ducks nostrils.





A variety of birds in a field pickup  
crew's carrier.



Leeches in a ducks nostrils.



Botulism research crew. Hotchkiss,  
Lakin, and Quortrup.



Field pickup crew at work.





Excavating at #1 Structure preparatory  
to building overflow spillway.



Pouring cutoff wall on #1 overflow structure.

# MEDICINE LAKE MIGRATORY WATERFOWL REFUGE REPORT MAP

