

BRANCH OF WILDLIFE REFUGES

NARRATIVE REPORT

ROUTING SLIP

DATE Sept. 25, 1952

Mr. Salyer _____

Mr. DuMont _____

Mr. Krummes _____

Miss Baum _____

Section of Operations:

Mr. Ball _____

Dr. Morley _____

Mr. Regan _____

Section of Habitat Improvement:

~~Mr. Griffith~~ WJG

Mr. Kubichek _____

~~Dr. Eburn~~ WJB

Mr. Stiles WJB

Section of Land Management:

Mr. Ackerknecht _____

~~Mr. Davis~~ adp

Stenographers:

REFUGE Mud Lake National Wildlife Refuge

PERIOD May - August 1952

MUD LAKE NATIONAL WILDLIFE REFUGE
Holt, Minnesota

NARRATIVE REPORT

May - August, 1952

PERSONNEL

Robley W. Hunt	Refuge Manager
Lloyd H. Mangus	Assistant Refuge Manager
Oliver T. Davidson	Refuge Maint. Foreman
Irven O. Rostad	Refuge Maint. Man
Melvin R. Johnson	Refuge Clerk
Gerald A. Vogelsang	Student Assistant

An average of 7 T.A. laborers were employed per day during the period.

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NARRATIVE REPORT

I. GENERAL

A. Weather Conditions

Following is a tabulation of comparisons between the periods of 1951 and 1952:

Month	<u>Snowfall</u>		<u>Rainfall</u>		<u>Max. Temp.</u>		<u>Min. Temp.</u>	
	<u>1951</u>	<u>1952</u>	<u>1951</u>	<u>1952</u>	<u>1951</u>	<u>1952</u>	<u>1951</u>	<u>1952</u>
May	None		2.39	.70	83	- 86	25	25
June	None		1.49	2.83	84	91	34	36
July	None		2.27	5.71	93	88	38	42
Aug.	None		5.68	2.41	90	93	43	42
Total	None		11.83	11.65	90	93	25	25

The month of May did nothing to disturb the unusually light spring run-off record for the previous period. Very light precipitation and mild weather aided the draw-down of our biggest pool, Mud Lake. Light scattered rains during the month of June aided by relatively higher temperatures than 1951 brought about drought conditions originally instigated by light snowfalls during the winter and little precipitation during the spring months.

An above-average amount of rainfall during July saved most of the crops in this locality from being a complete loss. Lower average temperatures for July also aided considerably in restoring life to parched farmlands.

B. Water Conditions

This period was notable for lack of run-off troubles - due to minimum snowfall, early spring break-up, and very little rain during the month of May. July rains saved crops in the nick of time, and the following month of August again turned dry.

The draw-down program resulted in continuing Mud River pool as a dried marsh, Webster pool drawn down to the level of Mud Lake, Northwest pool as a dried marsh (this area completely dried also for major dike repairs), and Mud Lake pool was to be lowered 10 inches.

Lack of usual rainfall during this period further dropped the pools, and at this time pool levels are as follows:

<u>Pool</u>	<u>Approved Level</u>	<u>Present Level</u>
Mud Lake	1141.0	1.38' low
Green Stump	1140.0	1.00' low
Madsen	1140.0	.50' low
Headquarters	1141.5	2.50' low
South	1141.2	1.00' low
East	1143.0	Normal
CCC	1143.0	Normal
Mud River	1143.0	Dry
Webster	1144.0	4.38' low
Northwest	1141.5	Dry

Fall rains should restore levels to satisfactory conditions for winter carry-over. While pool levels appear low (on paper), and the two dry pools have an ominous echo, we should hasten to add that the marsh areas right now are 100% improved as waterfowl areas. Even the totally dry areas now have the appearance of excellent waterfowl habitat - heavy bulrush and cat-tail growths where formerly nothing but open, barren, expanses of water existed.

C. Fires

Early May rains, and the new season's growth of vegetation put an end to the high fire hazard which existed in April, and which resulted in several serious fires within the refuge.

At this writing, we are again entering a season of high hazard - through lack of rain and early threat of frosts which will dry the vegetation to a point of easy combustion.

Low water levels in ditches, dried potholes, and peat burn-outs reduce the effects of natural fire lines, and we may have some difficulties in maintaining effective suppression and control.

II. WILDLIFE

A. Migratory Birds

1. Population and Behavior

a. Ducks

Waterfowl populations on the Mud Lake marshes have shown considerable inconsistency this summer - with some good to excellent gains for some species and medium to severe decreases shown for other species. ✓

In general, the over-all resident population as shown on paper, is down some 25%-30% from a year ago this date. The spring migration was good through this area, the number of mated birds remaining on the Refuge was high, and conditions appeared perfect for an exceptionally good hatch. Such was not the case for several species however as brood sizes were generally small, nest predation apparently somewhat severe in certain instances, and brood mortality also high in many cases. This decrease is offset by at least 5,000 birds made up primarily by the diving ducks. Broods of scaup, canvasback, and ruddy were observed many times but did not show up on the survey. Additional transects are planned for future waterfowl census work and this inadequacy will be corrected. Estimations of populations of the above species are shown on N-R 1. ✓

Two brood counts were made. The first was completed during June 25th - 27th to catch early broods while the second was timed to coincide with the period when the bulk of the broods were out which occurred July 15th-18th. Both census periods were set with some difficulty due to the wide variations between the start of incubation periods of various species and even within a species. For example, the July census was run at the most opportune time to get the most mallard broods but at the same time, several of the very early nesting mallards had broods of advanced class III young - in fact, a few such broods were beginning to take to the air. At the same time, many, many, broods of Class I and Class II were being observed. Similar circumstances surrounded many of the other species.

Based upon number of young produced, mallards did well this summer. Some 3,000 more young were produced this year than last. Nesting commenced very early this ✓

spring, evidence points to the second week in April for a few hardy individuals, and continued on into July for very late nesters and re-nesters. Broods of Class I ducklings were observed the middle of August but should be well enough advanced to make the fall migration providing they get a break from the weather.

Black ducks, present in only very limited numbers as a rule, offered no exception this year although their numbers were up slightly. Five hundred and twenty birds were figured from the census as compared with four hundred last year.

Gadwall numbers dropped ²²~~37~~% this year. This decrease was anticipated as a result of observations made during the spring migration and subsequent observations made during the nesting and incubation periods. Four thousand and thirty ducklings were produced this summer. WBS

Baldpates increased in very good numbers this summer. This too, was anticipated following spring migration and nesting behavior observations. The 5,495 young produced was a 109% increase over last summer's production. Apparently this increase has also been consistent in surrounding nesting areas outside the refuge. Great numbers of baldpates are present in the flocks of birds moving into the refuge from the outside areas as they do each year at this time.

Pintails also showed a marked increase this summer as 2,600 young were produced as compared to a mere 160 last summer. Adult birds were much in evidence also as the moulting period concentrated the flightless birds.

Green-winged teal numbers have been steadily increasing at Mud Lake the past few years. They also fared well this summer, showing an increase of 144% in the number of young produced.

Blue-winged teal production is the darkest spot in the overall waterfowl production picture for the refuge this summer. Blue-winged teal have either been competing with or leading mallards in young produced the past few seasons. However, their numbers dropped over 108% from the 22,495 produced last summer. A ready explanation is not available in the light of the tremendous numbers of mated birds pres-

54%

spring, evidence points to the second week in April for a few hardy individuals, and continued on into July for very late nesters and re-nesters. Broods of Class I ducklings were observed the middle of August but should be well enough advanced to make the fall migration providing they get a break from the weather.

Black ducks, present in only very limited numbers as a rule, offered no exception this year although their numbers were up slightly. Five hundred and twenty birds were figured from the census as compared with four hundred last year.

Gadwall numbers dropped 26.9% this year. This decrease was anticipated as a result of observations made during the spring migration and subsequent observations made during the nesting and incubation periods. Four thousand and five hundred thirty ducklings were produced this summer.

Baldpates increased in very good numbers this summer. This too, was anticipated following spring migration and nesting behavior observations. The 5,495 young produced was a 52.3% increase over last summer's production. Apparently this increase has also been consistent in surrounding nesting areas outside the refuge. Great numbers of baldpates are present in the flocks of birds moving into the refuge from the outside areas as they do each year at this time.

Pintails also showed a marked increase this summer as 2,600 young were produced as compared to a mere 160 last summer. Adult birds were much in evidence also as the moulting period concentrated the flightless birds.

Green-winged teal numbers have been steadily increasing at Mud Lake the past few years. They also fared well this summer, showing an increase of 59% in the number of young produced.

Blue-winged teal production is the darkest spot in the overall waterfowl production picture for the refuge this summer. Blue-winged teal have either been competing with or leading mallards in young produced the past few seasons. However, their numbers dropped over 52% from the 22,495 produced last summer. A ready explanation is not available in the light of the tremendous numbers of mated birds present on selected territories

ent on selected territories well into the nesting season. The gradual disappearance of paired birds from known nesting territories was observed but actual permanent movements were never noted nor was the cause of such disappearances ascertained.

Shovellers were present in far greater numbers during the spring and early summer months than in previous years, and stayed on to produce a very good hatch. Circumstances in other years, for the spoon-bill, were similar to those mentioned for blue-winged teal above for this year, wherein they remained well into the nesting season but did not produce the anticipated number of young. This year 1,485 young were produced for an increase of 295%.

Total production shown on the tables for wood ducks is probably in excess of the actual population present on the refuge. The reason for the relatively high figure shown is due to the type of habitat covered in the census in relation to the total amount on the refuge. Considering the projection factor again in relation to the total habitat utilized by wood ducks, it would be necessary to decrease the 1,113 figure for young produced this year approximately 50% in order to arrive at an acceptable figure. This is done on N-R 1 on adjusted totals.

The five species of divers nesting on the refuge (redheads, scaup, ringnecks, canvasbacks, and ruddy ducks) all showed up in decreased numbers for this summer. While this is partially due to the lowered pools resulting from the draw-down program - which in turn altered the census routes and gave inadequate coverage of diving duck habitat, there is nonetheless a decrease in all diving ducks species. This was indicated during subsequent surveys over diving-duck habitat but impossible to include in the July count. As previously mentioned, an estimated 5,000 divers could be included in the overall waterfowl population at Mud Lake for this period.

As previously indicated on a special report, coot populations are at a new low on the refuge. Young produced figures show a tremendous drop of 1212% over last year's figures. Very few adult coot were present on the refuge either during the spring migration or the nesting period immediately following.

92+%

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Shovellers were present in far greater numbers during the spring and early summer months than in previous years, and stayed on to produce a very good hatch. Circumstances in other years, for the spoonbill, were similar to those mentioned for blue-winged teal above for this year, wherein they remained well into the nesting season but did not produce the anticipated number of young. This year 1,485 young were produced for an increase of 74.7%.

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As previously indicated on a special report, coot populations are at a new low on the refuge. Young produced figures show a tremendous drop of 92.4% over last year's figures. Very few adult coot were present on the refuge either during the spring migration or the nesting period immediately following.

well into the nesting season. The gradual disappearance of paired birds from known nesting territories was observed but actual permanent movements were never noted nor was the cause of such disappearances ascertained.

Shovelers were present in far greater numbers during the spring and early summer months than in previous years, and stayed on to produce a very good hatch. Circumstances in other years, for the spoonbills, were similar to those mentioned for blue-winged teal above for this year, wherein they remained well into the nesting season but did not produce the anticipated number of young. This year 1,485 young were produced for an increase of 4.2%.

Total production shown on the tables for wood ducks is probably in excess of the actual population present on the refuge. The reason for the relatively high figure shown is due to the type of habitat covered in the census in relation to the total amount on the refuge. Considering the projection factor again in relation to the total habitat utilized by wood ducks, it would be necessary to decrease the 1,113 figure for young produced this year approximately 50% in order to arrive at an acceptable figure. This is done on N-R 1 on adjusted totals.

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As previously indicated on a population are at a new low on the refuge. The census showed a tremendous drop in the number of ducks. Very few adult birds were seen on the refuge either during the spring or summer nesting period immediately following.



b. Geese

Both the newly-formed goose pen flock of ninety some birds and the "transferred-gosling" flock produced broods of goslings. Three broods were brought off in the goose pen for the first evidence of reproduction from that source. While some production is a certainty from the free flock transferred as goslings from the Seney Refuge in 1948, 1949, and 1950; the extent of this production is not known. Seven nesting territories were definitely established with another four or five "probables". The previously mentioned major drawdown of Mud Lake Pool was first noticeable about the time the goslings were hatching out and it is our opinion that the goose broods were moved by the adults from the shallower nesting areas into the more inaccessible areas of more stable water depths. One flock of 24 birds has been observed on several occasions leaving the refuge during morning and evening feeding flights. Undoubtedly a goodly share of these birds are young of the year. Several birds are carrying bands which would indicate them as adults (by our records). In addition, another four geese (apparently a family group) have been observed in another part of the refuge.

Ten flyers have been reported from the State Thief Lake Refuge located 3 miles from our north boundary. Numerous observations from that area cause us to believe that 10 of the goslings of last season and immatures this season have possibly taken up residence there.

We were able to corral 75 of the pinioned birds in the goose pen and feather-clip them to prevent their flying off with the fall migrants such as happened last year to a few of the supposedly captive birds. Five goslings were also trapped and banded during the operation.

c. Water and Marsh Birds

A nesting colony of double-crested cormorants was located this summer for the first time. It had been reported in other narratives that we were sure a nesting colony of cormorants was present on the refuge but this had not been verified by the location of as much as a single cormorant nest. The colony of some 150 nests was located in the upper reaches of Mud Lake Pool and was located during the aerial brood count.

The great blue heron population decreased slightly from last year's population figures.

Holboell's grebes were especially abundant this past period. Many family groups were observed following the completion of incubation.

Pied-billed grebe numbers dropped even lower than the 3,000 recorded for last summer.

The draw-down program drew in thousands of shore-birds. Greater and lesser yellow legs, sanderlings, sandpipers, and turnstones, were in abundance on the exposed mud flats. One new record was picked up during this period. The unusual observation of a golden plover was made on August 20, 1952.

TABLE I

June Brood Survey - 25, 26, 27th.
Actual Observations on Strip 13.95 mi. x 2 Chains

Species	CLASS I		CLASS II		CLASS III		TOTAL	
	No. Broods	No. Ducklings	No. Broods	No. Ducklings	No. Broods	No. Ducklings	No. Broods	No. Ducklings
Mallard	5	37	5	35	7	49	17	121
Black Duck	-	-	-	$\frac{1}{2}$	-	-	-	-
Gadwall	2	18	1	9	-	-	3	27
Baldpate	-	-	1	9	-	-	1	9
Pintail	1	4	-	-	1	8	2	12
Green-W. Teal	1	9	-	-	-	-	1	9
Blue-W. Teal	8	75	5	46	-	-	13	121
Shoveller	-	-	-	-	-	-	-	-
Wood Duck	-	-	-	-	-	-	-	-
Redhead	-	-	-	-	-	-	-	-
Ring-neck Duck	-	-	-	-	-	-	-	-
Canvas-Back	-	-	-	-	-	-	-	-
Scaup	-	-	-	-	-	-	-	-
Ruddy	-	-	-	-	-	-	-	-
Sub Total	17	143	12	99	8	57	37	299
Unidentified	1	9	-	-	-	-	1	9
TOTAL	18	152	12	99	8	57	38	308
Coot	2	13	2	10	-	-	4	23

TABLE II

Actual Observations On Strip Census - Waterfowl Count July 15, 17, 18, 1952
13.95 Miles Shoreline Covered - Two Chain Wide Strip

Species	Unk. Sex	Bar. Hens	Males	Brood Hens	Total Adults	CLASS I		CLASS II		CLASS III		CLASS IV	
						No. Broods	No. Dklg.	No. Broods	No. Dklg.	No. Broods	No. Dklg.	No. Broods	No. Dklg.
(MARSH AREA)													
Mallard	7	20	17	23	67	2	21	6	40	14	118	23	186
Black Duck	2	-	-	-	2	-	-	-	-	-	-	-	-
Gadwall	1	2	3	9	15	3	13	6	48	-	-	9	61
Baldpate	-	1	3	10	14	2	12	5	36	3	26	10	74
Pintail	9	5	1	-	15	-	-	-	-	-	-	-	-
Green-W. Teal	1	-	-	1	2	-	-	-	-	-	-	-	-
Blue-W. Teal	29	9	12	20	69	6	36	8	69	6	40	20	145
Shoveller	-	7	-	-	7	-	-	-	-	-	-	-	-
Wood Duck	-	-	6	-	6	-	-	-	-	-	-	-	-
Redhead	-	-	1	1	2	-	-	1	11	-	-	1	11
Ringnecked Duck	-	1	-	4	5	2	23	1	4	1	8	4	35
Canvas-Back	-	-	-	-	-	-	-	-	-	-	-	-	-
Scaup	-	1	1	-	2	-	-	-	-	-	-	-	-
Ruddy Duck	-	1	1	1	3	-	-	1	4	-	-	1	4
Unidentified ducks	13	-	-	2	15	-	-	2	13	-	-	2	13
Coot	-	-	-	3	3	-	-	1	5	2	10	3	15
Pied-Billed Grebe	3	-	-	1	4	-	-	-	-	1	3	1	3
Holboell's Grebe	-	-	1	1	2	-	-	1	2	-	-	1	2
Hooded Merganser	-	1	-	-	1	-	-	-	-	-	-	-	-
(DITCH AREAS) 19.2 Miles Ditch Covered - Average Width 16.5 ft.													
Mallard	-	3	2	3	8	-	-	2	10	1	7	3	17
Blue-Wing Teal	5	-	-	3	8	1	8	-	-	2	14	3	22
Gadwall	-	-	-	2	2	-	-	-	-	2	7	2	7
Shoveller	-	-	-	2	2	1	5	1	4	-	-	2	9
Coot	-	-	-	1	1	-	-	-	-	1	5	1	5
Hooded Merg.	-	4	-	-	4	-	-	-	-	-	-	-	-

TABLE III

Projected Populations On Strip Census - Waterfowl Count July 15, 17, 18, 1952
13.95 Miles Shoreline Covered - Two Chain Wide Strip

Species	Total Adults	No. Ducklings	No. Broods	Av. Brood Size All Classes	Total Adults & Young
<u>Marsh Area</u>					
Mallard	4,980	13,810	1,710	8.07	18,790
Black Duck	148	520	74	7.03	668
Gadwall	1,124	4,530	669	6.79	5,654
Baldpate	1,080	5,495	740	7.43	6,575
Pintail	1,124	2,600	371	7.00	3,724
Green-W. Teal	148	520	74	7.04	668
Blue-W. Teal	5,125	10,775	1,486	7.25	15,900
Shoveller	520	1,485	298	4.99	2,005
Wood Duck	445	1,113	223	5.00	1,558
Redhead	148	816	74	11.02	964
Ringnecked Duck	371	2,600	298	8.74	2,971
Canvas-Back	-	-	-	-	-
Scaup	148	520	74	5.20	668
Ruddy	223	297	74	4.01	520
Unidentified Ducks	1,124	965	147	6.56	2,089
	16,708	46,046	6,312	7.30	62,754
Coot	223	1,113	223	5.00	1,336
Pied-Billed Grebe	297	222	74	3.00	519
Holboell's Grebe	148	148	74	2.08	296
Hooded Merganser	75	223	55	4.06	298
	743	1,706	371		2,449
<u>Ditch Area - 19.2 Miles Ditch Covered - Average Width 16.5 feet.</u>					
Mallard	9	20	4		29
Blue-W. Teal	9	26	4		35
Gadwall	2	8	2		10
Shoveller	2	10	2		12
	22	64	12		86
Coot	1	6	1		7
Hooded Merganser	5	14	2		19
	6	20	3		26
<u>Ducks Only:</u>					
Marsh Area	16,708	46,046	6,312		62,754
Ditch Area	22	64	12		86
GRAND TOTAL	16,730	46,110	6,324		62,840

2. Food and Cover

Food and cover are in sufficient abundance to adequately handle all resident birds and expected waterfowl during the migration. In addition, an abundance of food will be available as a result of aerial and hand seeding of exposed mud flats resulting from the draw-down as mentioned under Water Conditions. Millet seedings took very nicely and stands have been utilized to a considerable extent up to this time. Maximum use of millet and smartweed is expected following the first frost which will make the greater percentage of the fruiting bodies more readily available to the birds.

Ditch 11, the only area on the Refuge with which we've had any success with wild rice, is supporting a fairly good stand this year. Actually, the small amount of rice grown here is not of too great a factor in the over all waterfowl food production of the marshes but given time and further successful growing years, it may prove of considerable value.

3. Botulism

The Mud Lake Refuge experienced it's first marked loss of birds from sickness during the period. Sick and dead birds were observed during the last week of July while carrying out the aerial waterfowl and brood survey. Symptoms of sick birds varied somewhat from the characteristic symptoms of botulism and it was felt that at least part of the losses were due to something other than botulism. Algae samples were collected in an attempt to identify species of algae that might be toxin producing and consequently, causing algael poisoning in the birds. Sick birds were also collected for the other half of the analysis. Among the twenty-seven species of algae identified were two toxin producers Polycapitis aeruginosa and Anabena circinalis which were found in abundance and could very well be the cause of the trouble. Positive word of this should be forthcoming upon the completion of analysis of the sick birds collected.

Sanitation measures of burying dead birds and cleaning up infected shorelines, along with the picking up of sick birds for flushing-out purposes has been the extent of our control measures to date. The degree of infection seemed to be lessening to a considerable degree by the 25th of August and practically wiped out by the 29th. Further checks are being made to observe any outbreaks that may re-occur. Some 2,000 birds have been handled

to date, either dead or sick, and there has no doubt been another 500 that have gone undetected in inaccessible reaches of the upper Mud Lake Pool.

4. Lead Poisoning and other Diseases

No instance of lead poisoning has been encountered during the period.

B. Upland Game Birds

1. Population and Behavior

As can best be determined, both sharptails and ruffed grouse had about an average year. A few broods of both species have been observed but with no startling departures from average brood size. Some increase for both species is known, however, as a result of the increased survival due primarily to the relatively mild weather experienced last winter. Observations to date indicate about 500-600 birds are present for each species.

Ringnecked pheasants are still few and far between. Only one cock bird has been seen on refuge lands the past several periods. The severe and lengthy winters plus a relative scarcity of cultivated crops in the locality will continue to prevent this bird from being present in appreciable numbers. The Minn. State Conservation Dept. continues to release pheasants throughout this general area with little or no success.

Prairie chicken is another of the low-population species of upland game birds on the refuge. They, however, appeared to make a very slight comeback this year. One brood of three young was observed on the heavily overgrown mud flats of Northwest Pool during the running of waterfowl nesting transects. A few additional adults have been observed now and then in proximity to our west and north boundaries.

Hungarian Partridge, while present in only limited numbers (25-30) have shown slight gains. Observations have been made on flushed birds along County Road "E" and the Secondary road in addition to the normal range of these birds in the far Northeast corner of the Refuge.

2. Food and Cover

Food and cover conditions for ruffed grouse is more than adequate at the present time. Limiting factors

enter into the picture during the long, severe winter months when normally available foods are not so readily attainable under thick blankets of crusted snow. Cover in the few hardwood areas is adequate for those areas only while other areas supporting ruffed grouse at other times of the year are lacking somewhat in either food or cover requirements.

Sharptail grouse are faring somewhat better with the recovery and cultivation of old farm lands. As the Soil and Moisture program gains momentum and additional areas are recovered and put to cultivated crops, more optimum conditions will prevail for all species of upland game birds found on the Refuge.

3. Disease

No evidence of disease in upland game birds has been noted during the period.

C. Big Game Animals

1. Population and Behavior

a. Moose

The Refuge moose herd of 54 animals as of the February big game aerial census has fared very well during the period. Many observations of single and twin calves have been recorded. Based upon past figures of herd composition we can expect an increase of at least from 16-20 calves to the herd up to the first day of the deer season. As has been mentioned in earlier reports, a deer season on the Refuge usually results in the loss, directly or indirectly, of approximately the year's increment of young to the moose herd. The direct loss of moose due to the guns of trigger-happy or wilfully violating deer hunters is significant but only about 25% as damaging as the infringement and disturbance created by swarms of deer hunters upon wilderness areas occupied by moose. A program of education and publicity concerning this problem obviously will prove of benefit in the far future but will do little to correct the situation in the immediate future. The presence of a plane and several wardens did nothing to prevent the illegal shooting of four moose last year but may have prevented the shooting of many more.

Food conditions are more than adequate for the moose herd. All types of willow, balsam poplar, and

aspen are in abundance.

b. White-tailed Deer

The deer herd survived the relatively mild winter in excellent condition for bearing fawns this spring. Using last February's count of 847 animals, we can figure our deer herd to be made up of approximately 1100 animals at this time.

In spite of our recommendations to the contrary, based upon exhaustive winter browse surveys, winter weights, tagging returns, and the loss of moose, about 17,000 acres of the Refuge will again be open to deer hunting this fall.

Using the results of past winter browse transects as a basis of amount of browse taken and considering the amount of additional browse produced each year, it is very evident that the deer herd will have an abundance of browse for years to come.

One of the significant factors that should be considered when dealing with the Mud Lake deer herd is that it supplies the majority of deer hunting within a several mile radius outside Refuge boundaries - operating as an excellent, but one of the few, examples of the original theory or conception of a wildlife Refuge wherein harvestable surpluses move from within the sanctuary to be harvested outside the boundaries.

2. Disease

No evidence of disease has been observed in our big-game populations.

D. Fur Animals, Predators, Rodents, and Other Mammals.

A. Muskrats

It is too early in the season to give population figures for muskrats. This information will be forwarded at a later date following completion of the aerial and ground muskrat house counts.

In general, it can be stated that the 'rat population appears to be similar to that of a year ago this period.

Abundant food and cover is present and 'rats are making good use of this.

b. Mink

Live-trapping operations carried out by a Graduate Student have shown indications that the mink population may be on an increase this year. In addition to these trapping activities, many observations have been made and recorded which also indicate an increase in mink.

c. Weasel

Weasel, like mink, are more numerous than last year. Several have been caught in live traps used in mink trapping as compared to practically a complete absence of weasel during last season's mink trapping activities.

d. Beaver

Fresh cuttings, new dams, and other beaver sign around old lodges and in new territories show the beaver population to be in good order following the removal of 39 animals this spring from around control structures and other points where they were obstructing water management.

e. Raccoon

Twenty-six raccoon have been trapped during the period by Mr. Priedert while operating his mink traps. Observations of 'coons and their sign indicate a slowly but steadily rising population. While not predators of serious consequence as yet they may become so if their numbers are permitted to rise unchecked. A few are taken by share-trappers each fall but the relatively poor price of the pelts are not sufficient inducement to the trappers to trap them heavily.

f. Skunk

The skunk population has been reduced considerably the past two years by constant control measures. Few skunks were to be seen during the first part of the period although many animals are still present as indicated by observations made following the appearance of the young of the year. Mr. Priedert has also trapped 23 skunk during the course of his mink trapping.

g. Fox

As reported in our January-April NR the fox population is increasing. This is not an alarming situation by any means, in fact, for the present it should prove of considerable value from the standpoint of a buffering agent against our rapidly rising rabbit population.

h. Coyote

Four coyote have been observed during the period and sign has been observed occasionally to indicate their continued presence. The slight increase in the dozen or so animals on the Refuge is welcomed, like the fox, as a rabbit control factor.

i. Bobcat

Very little is known about the bobcat population at this time. Normal habitat of this animal is not readily accessible during the summer months. Colder weather and a blanket of snow will afford an opportunity to more accurately determine bobcat numbers. This information will be contained within the report for the next period. At any rate, there wouldn't be more than two dozen cats.

j. Badger

Badger numbers, low in the past, offer no exception this year. Occasional burrows offer the only evidence of the presence of this animal.

k. Bear

The bear population in the immediate vicinity has increased over last year. Possible refuge population would not exceed two or three. One 500 pound bear was killed on the Refuge after destroying a number of bee hives.

E. Predacious Birds, Including Crows, Ravens, and Magpies

a. Horned Owls

Great Horned Owls have made slight gains again following the bringing-off of the young of theyear. An estimated 50-55 horned owls are present in widely scattered areas of the Refuge. This number is not dangerous from a predation standpoint and should aid

other predators in maintaining a healthy balance on the rabbit population.

b. Eagles

No eagle observations have been made during the period. Normally, this period will produce an observation or two on Golden eagles. The more significant notes on both American and Golden eagles are made during the spring and fall migrations.

c. Ravens and Magpies

Normally both ravens and magpies disappear during the spring and are not seen again until the fall migration as they return from the north. However, one very large raven was observed on the 20th of August in one of the more remote regions of the Refuge, adding a bit of evidence to our opinion that a limited number of ravens remain the spruce-tamarack bog region around Whiskey Lake for nesting purposes.

No magpies have been seen during the period.

d. Hawks

Both marsh and red-tailed hawks were present during the period in substantial numbers. Marsh hawks were present some 125 strong while red-tails showed an increase to some 150 resident birds.

Other hawk summer residents include, in limited numbers, red-shouldered, broad winged, rough legs, and sparrow hawks.

F. Fish

Public fishing is not, and could not, be permitted on the Refuge. First, the location of the pools and Refuge trails would not permit public fishing without ruining the area as a wildlife sanctuary. Secondly, the very shallow waters are not too suited for game fish, and finally, the Refuge water system of inlet and outlet ditches drastically reduce the number of fish that must re-populate refuge waters each spring following the near-solid freeze each winter.

As a result of the above, not too much is known of the population percentage composition. Known to be present, as a result of observing the spring-run, are northern pike, suckers, sheephead, and bullheads, in addition to an abundance of various species of minnows - predominately sickle-backs.

III. REFUGE MAINTENANCE AND DEVELOPMENT

A. Physical Development

Madsen Pool (622-C-1)

Completed fourth ring dike, and added additional fill to sections of other three ring dikes (where the previous soft materials had sloughed) - total of 13,575 yds. of dirt moved utilizing both the Northwest and Link-Belt draglines.

Northwest Pool (622-C-1)

Completed entire job of dike repair (after utilizing three shifts of dragline crews, and the D-6 bulldozer. This job was stretched out over a three year period due to lack of money during the very limited times when pool bottoms were sufficiently dry to walk the draglines and use the bulldozer - the entire dike section was repaired with the additional handicap of working on mats. A total of 28,400 yards were moved during this period - the complete job required a total of 37,723 yards.

A total of nine acres of dike slope was seeded to a mixture of Reed Canary, fall rye, sweet clover, alsike clover, red clover, and timothy.

Headquarters Pool (622-C-1)

This job was set up for completion of a new open spillway, and a dike re-building job, and re-surfacing job for the entire length of over three miles.

The open spillway was completed and involved removal of 250 cubic yards of dirt, placing 60 yards of riprap, and placing of 86 yards of pit-run gravel.

Dike work has just commenced and to-date but 2,650 yards have been moved - the dragline work on this dike will be especially tricky as the $1\frac{1}{2}$ yard Northwest must be used, and must be walked on mats the entire distance - at this time it is sinking so that the soft mud and water is very near above the top track pads - it may be embarrassing if the operator fails to correctly determine the margin between the edge of the mats, and the beginning of the marsh bottom.

About 2500 lineal feet of heavy fill must be placed, while the remainder will be raised only a foot or two, and then an application of pit-run gravel for the entire dike surface - plus an application of gravel to both sides of the dike section where now exposed to heavy wave action.

Mud River 712-R: Narrow Dike (622-C-1)

This job will be similar to that accomplished on Northwest - working the dragline on mats, on the dried pool bottom - filling the old borrow pit, and restoring lost dike sections to the upstream side.

At present the job is about $\frac{2}{3}$ completed and 6,300 yards have been placed.

Webster Pool (622-C-1).

200 yards of pit-run gravel were hauled and bulldozed into place on the upstream side. It is believed that this dike is now in condition to withstand heavy wave action - we think.

East Pool Control (622-C-1)

This structure was built in CCC days without use of piling - it has leaked at intervals for the past several years, but developed a bad break this spring. It was repaired by driving 18 lineal feet of Wakefield beneath the concrete box, and pouring a new cap and walls - a coffer dam was also required - 2 yards of concrete were poured.

Secondary Control (622-C-1)

This control was in the same condition as the East Pool control with the addition of collapse of the old metal culvert. It was repaired by installing a new culvert, driving 18' of piling, pouring $2\frac{1}{2}$ yards of concrete, and new cap.

Soil and Moisture (712-R)

An allotment of \$1500.00 was granted for accomplishing such work as willow brush control, quack grass control, renovation of farm lands in the vicinity of the goose pen, fertilizing, and other related work.

Field work was not commenced by refuge personnel until August - the following accomplishments to-date are listed:

<u>Type of Work</u>	<u>Area Worked</u>	<u>Work Accomplished by:</u>	
		<u>Refuge</u>	<u>Permittee SCS</u>
Mowing of willow brush	15.5 ac.	X	
Plowing under willow brush	18.3	X	
Rolling plowed willow areas**	15.0	X	
Quack control	63.0(2)		X
	15.0(3)	X	
	70.0(2)		X
Plowing formerly cultivated areas	70.0		X
Soil Capability survey	1240.0		X
Total (excluding surveys)	181.0		

Numbers in parenthesis indicate number of separate cultivating operations on the tract.

The above indicated acreages are close but detailed mapping jobs have not as yet been completed. The areas will be mapped upon completion of all operations for the season.

We are at present exceeding our original goal of 60 acres (for quack and willow control) by more than three times, and expect that an additional 60 acres may be put into cultivation before freeze-up.

** The term "rolling" refers to use of an 8-ton concrete roller - this is a necessary operation following the first rough brush-breaking - if the field is not rolled it is impossible to operate a wheel tractor due to the very rough condition, brush, peat humps, peat burn-outs, etc.

Re-wiring of Headquarters site

A complete re-check and repair of existing wiring in seven of the 16 refuge buildings plus a complete new distribution (overhead) system was demanded by REA in order to continue electrical service from that concern.

The actual skilled labor required is of course accomplishing the greater part of this work, altho occasional refuge help is used, and more will be used in such work as extensions to the fur house and apartments.

As of August 31st the following has been accomplished: complete overhead wiring, installation of poles, guys, grounds, etc.

Completed re-wiring in Clerk's dwelling, Service building, equipment shed, fur house, and barn.

Installation of new furnaces in Quarters 3 and 4.

This job consists of removing old furnaces, and installing new convertible coal-wood-oil units. The work will also consist of installing a number of new ducts in quarters No. 3, and several in quarters No. 4 - all work, with exception of hooking up the automatic controls, will be accomplished by refuge personnel. To date one furnace has been purchased, and we will get at it pending completion of additional dike repairs.

Miscellaneous Repairs, Maintenance, Job accomplishments, etc.

Repaired six miles of telephone line (Refuge to Holt)

Removed 4 miles of telephone line - (Narrow dike "Y" to Secondary).

Re-set all marking posts along County Road "E" - 11 miles, both sides, posts 1/8 mile apart.

Tore down and salvaged usable materials from old steel shed, and old shed at Secondary.

65 miles blading refuge trails, and dike tops.

Hauled 5 yards aggregate for use in pouring footings for piers - new machine shed.

Unloaded 45 tons coal from box car - loaded on refuge trucks, hauled and delivered to refuge bins or refuge storage.

Bladed around goose pen three times.

80 miles refuge trails, dikes, mowed (80 miles of single swaths).

Trip to Tamarac for tree planter - returned planter next day.

Building Maintenance

Manager's Residence

Exterior paint job completed on all but one end - will complete shortly.

New asphalt tiling laid in vestibule.

New linoleum wainscoating in bathroom.

Cleaned sewers - main and tanks - twice.

Apartments

The apartments are located in one end of the warehouse and are occupied by graduate student Fred Prievert, and Student Assistant Gerald Vogelsang.

Exterior paint job on entire building.

New shelter for ice-box located outside building, and utilized by all occupants - also painted.

Masonite sheeting installed in north side.

Interior of both apartments painted (including floors).

Fur Shed

Exterior paint job (aluminum) on entire building.

Floor painted.

Roof repaired - new tarpaper laid on one section.

Clerk's residence

New concrete landing and steps in rear.

New screening for ten screens on front porch.

Ass't. Manger's Residence

Concrete floor poured for front porch.

New concrete landing and steps for front porch.

New concrete landing for back door.

Cement blocks salvaged from former Secondary residence, and re-laid for walks around house in new location.

30 yds. black dirt "topping" hauled and spread for new lawn area around house.

Same area seeded to lawn grass mixture after preparation (leveling, dragging, etc.).

Bunkhouse (Occupied by Maintenance Man)

Sanded and varnished floor in fronttroom.

Replaced window panes.

Equipment Shed

Painted exterior entirely.

Painted interior of building in space used for shop and storage (four stalls - work benches, tool racks, etc.).

Painted concrete door guards.

Constructed new doors and bins for parts, etc.

Service Building

Painted entire exterior, including storm windows.

Made roof repairs, and repairs on cornice.

Painted flag pole.

Painted all screens.

Replaced rod cylinder in deep well.

Barn

Painted exterior.

Replaced 2 broken panes.

Chicken Coop

Painted exterior.

Replaced 5 broken panes.

Oil Shed

Painted exterior.

Grounds

Mowed 2.5 acres of kept lawn weekly.

Mowed additional 2 acres by Farmall power mower.

Used grass scythe around all buildings in unkept areas followed by application of oil to kill of grass (fire hazard checked closely).

Two applications 2-4-D to control weed growth around buildings.

Two applications of oil to control weed growth in courts and driveways.

Trimmed around recognition signs.

Cleaned grounds and courts regularly.

Removed old deteriorated signs, and posts.

Set up pump for Boy Scouts - old Secondary site.

Removed old sidewalk and transferred to Hqs. site.

Installed new gate at Boy Scout camp site.

Goose Pen

Cut post tops - braced where needed, re-set posts, re-tamped posts, re-stapled fencing around 145 acre goose pen.

Hauled 88 yards pit-run gravel on bad sections goose pen road.

Plowed up additional 5 acres in cultivated area.

Cultivated 15 acres four times for quack control - this area to be fertilized and planted to alfalfa.

Cleaned up around well, pools, hoppers, and granary.

Salvaged old culvert and installed in goose pen road.

Equipment Repair and Maintenance

Int. Pickup - Cleaned, repainted completely, simonized.

Int. Dump, I-18197 - Installed new front wheel cylinders, hydraulic brake kit, new oil seal in hydraulic hoist, new brake linings all wheels and repaired hoist with new case, bushings, grease seal. New rear wheel cylinders (complete). Washed, cleaned and completely repainted and simonized. Adjusted brakes.

Int. Dump, I-18196 - New wheel cylinders, all wheels, hydraulic gbrake kit installed. Replaced oil seal in hoist, new brake linings and one bearing in rear wheel. Bled and adjusted brakes. Cleaned, and completely painted with two coats paint. Simonized. Installed new speedometer cable and re-adjusted brakes.

New Jeep

Motor tune-up, installed new shackle bolt and 1 new zerk fitting.

Oshkosh Dump

Repaired air line to brakes.

Reo stake-Dump

Washed, cleaned, and painted completely. Simonized.

GMC Dump

Checked front wheel bearings, repaired dump box and power hoist.

Ford Pickup

Adjusted brakes, cleaned carburetor, installed "flasher" stop lights, new rings, new rod bearings, new muffler, new valve job, new set gaskets. 1 new bearings in transmission, rear axle cage, ring gear and axle bearings. Replaced broken wheel rim. New spark plugs. Repaired siren mounting and re-installed.

Old Jeep

Removed and repaired gas tank; spindle bearings; installed new front spring; repaired steering sector; new shaft. Cleaned starter twice; repaired clutch. Four cone & bearings (front end).

Cat D-6

Removed radiator guards and cleaned radiator twice. Repaired fuel transfer pump.

Mower

Installed new bar, two new sickles; much welding; straightened cutter bar.

Link-Belt Dragline

Installed two thrust bearings, complete engine overhaul, repaired drive chain, much welding.

Brush breaker plow

Repaired coulter on brush plow.

Northwest Dragline

Cleaned and complete paint job, rebuilt teeth on bucket, new drag chain, replaced 350' 7/8 inch cable, much welding work.

Brush Cutter

Assembling upon arrival from factory.
Repaired universal joint.

Maintainer

Transmission overhaul.

Cletrac

New track and new sprockets, new crankshaft, pulley and fan belt pulley, new roller installed.

Farmall

Repaired hitch.

B. Plantings

With the aid of the Service plane and seeding equipment, plus considerable hand seeding it was possible to step up the habitat improvement accomplishments.

Favorable planting sites were of course produced by the draw-down program, altho we would have had an opportunity to make more use of the plane had water levels been dropped lower - exposing additional mud-flat planting sites.

A total of 276 acres were seeded to wild millet, smartweed, bulrush and wild celery. Of this total, 37 acres were hand planted, and 239 acres by plane.

Exposed flats in Northwest pool were sufficiently dry for use of equipment, and about 15 acres were plowed and seeded to millet and smartweed.

All hand seeded areas were raked following seeding.

Besides the above mentioned seedings, the dense growths of bulrush which had volunteered in 2 and 3 year draw-down areas, were used as a source for digging and transplanting clumps of root stock.

A total of 4,660 clumps (totalling 107,000 tubers or shoots) were removed from heavy stands (above) and transplanted along dike sections needing wave protection, and food and cover for waterfowl.

To date survival has been excellent with the bulrush clumps, perhaps 70% with the millet, less than 50% with the smartweed, less than 50% with celery, and no definite statements can be made as yet concerning the Sc. paludosus, or SC. americanus - off-hand it doesn't look too good for this season, but may make a showing next year.

Large numbers of waterfowl are already attracted to the flats and shorelines, and have been taking the millet, smartweed, and bulrush seed - earlier in the season considerable use was made of the young green shoots of the millet - by waterfowl and muskrat.

Trees and Shrubs

A total of 4,750 shrub and tree plantings was accomplished by use of the Tamarac tree planter, and by means of seedlings obtained from the Minnesota Conservation Dept.

Stock consisted of a great variety, including honeysuckle, plum, white pine, jack pine, cottonwood, Buffalo brush, bush and sand cherries.

A close check on survival will not be attempted until the growing season is over - at this time it looks like we will be lucky to get more than 50%, due mainly to extreme dry soil conditions when planted, and for the following several weeks.

Upland Herbaceous Plants

The entire north dike slope of the newly completed Northwest dike was seeded to a mixture of reed canary, fall rye, sweet clover, alsike clover, red clover, and timothy. Nine acres were seeded.

Cultivated Crops

Grain crop seeding was again quite limited during the spring. We have interested several farmers in attempting fall plowing with the hopes that a considerably larger area might be planted to grains in the vicinity of the goose pen. At this time about 100 acres have been worked up, and it is expected that an additional 60 acres may be prepared for spring seeding.

Refuge grain farming has been pretty well confined to developing a field inside the goose pen. To date

about 15 acres have been controlled for quack throughout the summer - it will be fertilized, planted to fall rye this year, and a part of it to alfalfa next spring. The field will be enlarged to about 30 acres when complete.

C. Collections

1. Seeds and Propagules

To date 1600 pounds (approximate) of sweet clover seed has been collected. The total yield this year may not exceed 5,000 lbs. Other grains such as barley and oats will be coming in shortly.

We also expect to harvest several hundred pounds of Sc. validus from the Mud River draw-down area.

Under this category should also be included the 107,000 Sc. validus tubers - which were collected and immediately planted in barren sites on this area.

2. Specimens

A total of 28 plants have been collected, and pressed for the refuge plant herbarium.

A total of 45 seed specimens have been added to the refuge collection.

Six samples of algae have been collected and frozen for a future check by an algae expert.

Twelve specimens of waterfowl have been collected, frozen, and now awaiting autopsy by a State pathologist - this in connection with our recent Botulism, or algae poisoning outbreak.

D. Receipts of Seed and Nursery Stock

None

IV. ECONOMIC USE OF REFUGE

A. Grazing

A total of 575 animal use months are now covered by permit. Grazing demands continue low due to the isolation of the area, and due to the heavy brush, extensive marshes, and abundant insect pest populations.

B. Haying

The extended dry season in May and June resulted in a heavy demand for haying privileges. Many areas formerly untouched have been cut for hay, and it now appears that the sale of wild hay will exceed any previous year.

Individuals from far distant locations called daily in their search for hay stumpage.

A total of 18 permits have been issued to date.

C. Fur Harvest

Nothing this period.

D. Timber Removal

None this period.

E. Other Uses

A total of 78 hives are on the refuge - under permit to Mr. George Franzen. This is an "off" year for sweet clover, altho there are always a few scattered patches of volunteer sweet, and alsike clover, and these, along with other flowering plants, are sufficient for placement of some hives.

V. FIELD INVESTIGATION OR APPLIED RESEARCH

A. Progress Report

Draw-down Study

Considerable effort has been expended on checking results of our "draw-down" program. A number of quadrat checks have been completed, and more will be attempted at the end of the growing season. The objectives in this study are to determine the response of volunteer vegetation at various levels - dominant species, extent of the seasons, growth, effect of one, two and three year draw-downs, etc.

Botulism-Algae Poisoning Study

This being the first occurrence of comparatively heavy bird losses on Mud Lake we are going to some effort to determine (if possible) why the loss occurred, why confined to a definite restricted area, possible controls for the future, etc.

Samples of algae, and dead birds will be examined by specialists, soil samples will be taken and analyzed, possible changes in handling the water supply will be considered, etc.

Mink Study

Mr. Fred Prievert, graduate student from the U. of Minn. is continuing his second year on this field problem, and it now appears as if he will obtain some very valuable and usable information when the study is completed. A total of 30 mink have been live-trapped, ear-tagged, weighed, sexed, and released. Other data collected has been toward the ends of aging, parasitology, skin measurements, weights, etc., of steel-trapped animals.

Small Mammal Study

In connection with the mink study, Mr. Prievert is also handling a large number of other mammals, and is collecting similar data on them. To date a total of 180 muskrats, 6 weasel, 48 raccoon, 3 Franklin ground squirrel, 9 beaver, and 2 woodchuck, have been trapped, and given the same treatment. A large number of skunk have also been trapped, but as yet Mr. Prievert has not developed sufficient scientific interest to attempt ear-

tagging, or further handling - other than to take immediate "control" measures - on the spot - on occasions his methods have resulted in eventual control at the cost of temporary expulsion from refuge social functions.

Waterfowl Banding

Waterfowl banding to-date has been unsuccessful but it is expected that a fairly large number of birds may be banded during September and October.

Soil Capability Survey

Two sections (1280 acres) were mapped and analyzed by SCS personnel - this a prerequisite to the Soil and Moisture program.

Aircraft Spraying of Willows

An experimental spraying of willow was attempted by Mr. Glahn during the early summer. A relatively small area was covered. To date it appears as if the 2-4-D at a standard mix will kill the willow when in early leaf, and when not exceeding 10 feet in height. The species of willow that attain tree size, however, apparently are simply set back in growth - we will not know definite results until another growing season.

The purpose in attempting such control was an effort to kill off willow from some of the islands, and spoil banks, with the idea of creating more attractive nesting sites - maybe they are just as attractive with the willow.

Shore-bird Inventory

The "draw-down" program resulted in extensive mud flats - the subsequent "dry" spell (which is still on) greatly increased the mud flat area, and we had a vastly increased population of shore-birds of large variety.

Student Assistant Vogelsang accomplished a "census" by utilizing the same method, with some alterations, as we have been using on waterfowl. His report is not yet completed, but it is obvious that any kind of a count would confirm general observations - that the draw-down was most effective in attracting and holding an abundance of shore birds.

Small bird Inventory

Student Assistant Vogelsang also made a census of the mated pairs of small birds on the immediate Headquarters site. We believe that his count will come up with some kind of a record for numbers and variety in a restricted area - from ruffed grouse, crows, waterfowl, on through hundreds of cliff swallows, blackbirds, etc.

Waterfowl Census - Plane Count vs. Count by Observer From Dikes.

Mr. Glahn accomplished a census of mated birds by plane. Checks were run on some of the marshes the same evening by our old method of sampling from dikes - we believe we can now put some little degree of reliance on the old method - the two different methods came up with figures so close it might almost appear as if someone juggled the notes.

Soil Tests

Soil tests covering acidity, needs for nitrogen, phosphorous and potash have been completed for the goose pen cultivated area. Additional tests will be accomplished on other potential farm areas.

Willow-Aspen Leaf Disease

Several samples of willow and aspen leaves have been forwarded to U. of Minn., Pathology Dept. in an effort to determine the cause of a "disease" which is apparently not fatal, but does result in withered, dried foliage.

VI. PUBLIC RELATIONS

A. Recreational Use

A total of 73 Boy Scouts had an overnite "Camporee" at the abandoned Secondary site. Beyond this type of use we have no recreational facilities to offer.

B. Refuge Visitors

See sheet following.

C. Refuge Participation

May 23 - M. Johnson and I. Rostad showed refuge movie & gave talk to Stephen Rod & Gun Club. 72 in attendance.

May 30 - R. Hunt showed refuge movie and gave talk to 96 Boy Scouts, and 40 visitors at Old Mill State Park.

June 11- R. Hunt showed refuge movies and gave talk on refuge operations to Eastern Marshall County Sportsmen Club at Gatzke, Minn. Sixty were in attendance.

June 15- R. Hunt acted in charge of local Scout Troop over nite of June 15, and all next day. Merit badge instructions and field trip during day.

June 19- M. Johnson showed refuge movie and gave talk to Thief Lake Farmers Union group, 63 in att.

June 20- M. Johnson showed refuge movie and gave talk to Ringbo Farmers Union group, 30 in attend.

July 7 - I. Rostad showed refuge movie and gave talk to Steiner Community Club at Steiner, Minn., 75 in attendance.

July 8 - M. Johnson showed refuge movie and gave talk to Farmers Training group at Thief River Falls, Minn., 73 in attendance.

July 21- M. Johnson showed reufge movie and gave talk to Oslo Rod & Gun Club, Oslo, Minn., 39 in attendance.

MUD LAKE REFUGE VISITORS

Date	Name and Address	Title and/or Business	Purpose of Visit	Time Spent
5/3/52	C. Alexander Bemidji	USGMA	Waterfowl check	8 hours
5/4/52	Ornithology Class (20)	Bemidji State College	Bird Study	6 hours
5/6/52	J Haroldson & Partner	State Cons. Dept.	Delivering trees	2 hours
5/20/52	J. Liemandt, TRFalls	State Warden	Law enforcement	2 hours
5/22/52	R. Glahn, Lower Souris	Pilot-Biologist	Spraying willow	5 hours
5/27/52	Field Exec., Grand Fks	Boy Scout Office	Camping-activities	2 hours
5/27/52	K. Peterson, TLRefuge	Supt. TL Refuge	Equipment loan	1 hour
5/30/52	Dr. Morley, C. Rollings	Central Office	Soil & Moisture	5 hours
	Mr. Davis	Regional Office	program	
6/9-10/52	R. Glahn, Souris Ref.	Pilot-Biologist	Seeding w/plane	20 hours
6/17-9/16	G. Vogelaang, Wisc.	Student Ass't., U of Wis	Employment	3 mos.
6/24---	F. Priewert, Minn.	Grad Student, U of Minn	Mink study	4 mos.
6/25/52	J. Liemandt, TRFalls	State Warden	Law Enforcement	2 hours
7/25/52	R. Glahn, L. Souris	Pilot-Biologist	Brood count	6 hours
7/9/52	R. Farms, TRFalls	PR Biologist	Waterfowl pop.	2 hours
7/14/52	Rural School Teachers	(28) TRFalls	Bird & refuge study	2 hours
8/17/52	Dr. Marshall, Drs. Mr	J. of Minn.	Marsh ecology, refuge	1 1/2 days
	& Mrs. Buell & Class		operations, botulism	
			study	
8/18/52	Ten wildlife mgmt students.	U. of Minn.	Study of above	1 1/2 days
8/19/52	K. Peterson TL Refuge	Supt.	Geese for exhibit	2 hours
8/24/52	Gatzke Woodmen Club	(60) Gatzke, Minn.	See refuge(conducted)	4 hours
8/26/52	R. Wright, R.O., Mpls.	Engineer	Engr. inspection	8 hours
8/26/52	F. C. Gillett, R.O.	Mpls., Refuge Supvr.	Quarters appraisal	6 hours
?	D. Lawrence, TRFalls	SCS	Info re muskrat proc.	2 hrs.
8/28/52	J. Bue, F. Lee, R.	PR Biologists, St. Paul,	Waterfowl banding	2 hours
	Farms, J. Zoraheck	Brainerd, TRFalls	Refuge operations	
8/30/52	Mr. Finseth, Duluth	Duluth Bird Club, Pres.	Bird study	5 hours
MX ?	Mr. Grimes, TRFalls	SCS	Soil capability sur-	2 days
			vey	
Period	Permittees, visitors,			
	sightseers	Vicinity, 400	Ad infinitum	1/2 hr. each

D. Hunting

None during this period.

E. Fishing

None on Mud Lake.

F. Violations

None to our knowledge, altho we are hearing reports that there is activity in the vicinity - we expect to commence regular patrols within the next week or two.

VII. OTHER ITEMS

A. Items of Interest

The colored moving picture film taken on Mud Lake continues to prove of value in spreading the "word" - if the film itself isn't an outstanding job, it does give us a good opportunity to get into the assemblages and explain refuge work, refuge problems, etc.

We are now building up a library of 35 m/m transparencies which should serve the same purpose as the movie, but will cover a wider variety of activities - in our opinion, however, it is hard to beat the action of moving animals, moving equipment, broods trailing behind the mother, etc. - it still has an interest that cannot be beaten by "stills".

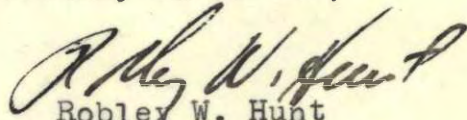
B. Pictures

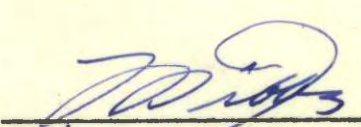
Appendix

Section II and NR forms prepared by Mr. Mangus.
Pictures taken by Mr. Mangus.

Date Submitted: Sept. 18, 1952

Respectfully submitted,


Robley W. Hunt
Refuge Manager

Approved: 

Title: Acting Regional Director

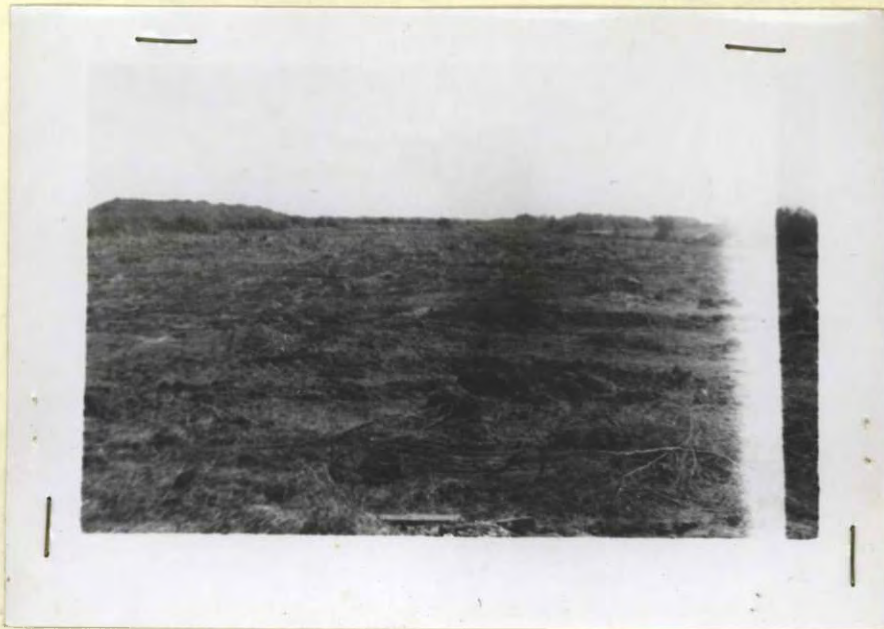
SEP 23 1952



Newly completed dike on Northwest Pool - we do not expect to have further erosion problems with this dike.



Section of newly completed "ring dike" before sloping and dressing - Madsen Pool.



Newly plowed area adjacent to goose pen - attempting to "open" up as much as possible - for attracting and holding geese.



Baled hay - put up by permittee. A large demand for hay this year due to prolonged dry spell.

WATERFOWL

Refuge Mud LakeMonths of Mayto August194 52

(1) Species	(2) First Seen		(3) Peak Concentration		(4) Last Seen		(5) Young Produced		(6) Total
Common Name	Number	Date	Number	Date	Number	Date	Broods Seen	Estimated Total	Estimated for Period
I. <u>Swans:</u>									
Whistling swan	Summer Resident		80	5/1	4	5/15	-	-	100
II. <u>Geese:</u>									
Canada goose	Summer Resident		80	5/1	"	"	4	25	* 45
Cackling goose									
Brant									
White-fronted goose									
Snow goose					75	5/12			1,000
Blue goose					75	5/12			1,000
III. <u>Ducks:</u>									
Mallard	Summer Resident		Not Peaked yet		Still Present			13,384	18,800
Black duck	"	"	"	"	"	"		520	670
Gadwall	"	"	"	"	"	"		4,540	5,650
Baldpate	"	"	"	"	"	"		5,495	6,575
Pintail	"	"	"	"	"	"		2,600	3,725
Green-winged teal	"	"	"	"	"	"		520	670
Blue-winged teal	"	"	"	"	"	"		10,805	15,900
Cinnamon teal	"	"	"	"	"	"			
Shoveller	"	"	"	"	"	"		1,485	2,015
Wood duck	"	"	"	"	"	"		540	800
Redhead	"	"	"	"	"	"		1,815	965
Ring-necked duck	"	"	"	"	"	"		2,600	2,970
Canvas-back	"	"	"	"	"	"		500	785
Scaup	"	"	"	"	"	"		1,200	1,600
Golden-eye	-	-	-	-	2	5/15	-	-	10
Buffle-head	-	-	-	-	40	5/15	-	-	80
Ruddy duck	Summer Resident		Not Peaked Yet		Still Present			300	520
IV. <u>Coots:</u>	"	"	"	"	"	"		1,120	1,500

* Does Not include pinioned flock.

3-1750

(July 1946)

(over)

Form NR-1

SUMMARIES

Total Production:

Geese 25

Ducks 46,770

Coots 1120

Total waterfowl usage during period 65,380

Peak waterfowl numbers --

Areas used by concentrations CCC Pool, Madsen Pool, Green Stump & South Pools

Principal nesting areas this season Drained NW & Mud River Pools, all grassland areas bordering water areas.

Reported by L. H. Mangus

INSTRUCTIONS

- (1) Species: In addition to the birds listed on form, other species occurring on refuge during the reporting period should be added in appropriate spaces. Special attention should be given to those species of local and National significance.
- (2) First Seen: The first refuge record for the species during the season concerned in the reporting period, and the number seen. This column does not apply to resident species.
- (3) Peak Concentration: The greatest number of the species present in a limited interval of time.
- (4) Last Seen: The last refuge record for the species during the season concerned in the reporting period.
- (5) Young Produced: Estimated number of young produced based on observations and actual counts on representative breeding areas. Brood counts should be made on two or more areas aggregating 10% of the breeding habitat. Estimates having no basis in fact should be omitted.
- (6) Total: Estimated total number of the species using the refuge during the period. This figure may or may not be more than that used for peak concentrations, depending upon the nature of the migrational movement.

Note: Only columns applicable to the reporting period should be used. It is desirable that the Summaries receive careful attention since these data are necessarily based on an analysis of the rest of the form.

WATERFOWL

Refuge Mud LakeMonths of Mayto August19452

(1) Species	(2) First Seen		(3) Peak Concentration		(4) Last Seen		(5) Young Produced		(6) Total
Common Name	Number	Date	Number	Date	Number	Date	Broods Seen	Estimated Total	Estimated for Period
I. <u>Swans:</u>									
Whistling swan	Summer Resident		80	5/1	4	5/15	-	-	100
II. <u>Geese:</u>									
Canada goose	Summer Resident		80	5/1	4	5/15	4	25	* 45
Cackling goose									
Brant									
White-fronted goose									
Snow goose -----					75	5/12			1,000
Blue goose					75	5/12			1,000
III. <u>Ducks:</u>									
Mallard	Summer Resident		Not Peaked yet		Still Present			13,840	18,800
Black duck	"	"	"	"	"	"		520	670
Gadwall	"	"	"	"	"	"		4,530	5,650
Baldpate	"	"	"	"	"	"		5,495	6,575
Pintail	"	"	"	"	"	"		2,600	3,725
Green-winged teal	"	"	"	"	"	"		520	670
Blue-winged teal	"	"	"	"	"	"		10,775	15,900
Cinnamon teal	"	"	"	"	"	"			
Shoveller	"	"	"	"	"	"		1,485	2,015
Wood duck	"	"	"	"	"	"		540	800
Redhead	"	"	"	"	"	"		1,815	965
Ring-necked duck	"	"	"	"	"	"		2,600	2,970
Canvas-back	"	"	"	"	"	"		500	785
Scaup	"	"	"	"	"	"		1,200	1,600
Golden-eye	-	-	-	-	2	5/15	-	-	10
Buffle-head	-	-	-	-	40	5/15	-	-	80
Ruddy duck	Summer Resident		Not Peaked Yet		Still Present			300	520
IV. <u>Coots:</u>	"	"	"	"	"	"		1,113	1,500

* Does Not include pinioned flock.

* Does Not include pinioned flock.

SUMMARIES

Total Production:

Geese 25

Ducks 46,770

Coots 1120

Total waterfowl usage during period 65,380

Peak waterfowl numbers --

Areas used by concentrations CCC Pool, Madsen Pool, Green Stump & South Pools

Principal nesting areas this season Drained NW & Mud River Pools, all grassland areas bordering water areas.

Reported by L. H. Mangus

INSTRUCTIONS

- (1) Species: In addition to the birds listed on form, other species occurring on refuge during the reporting period should be added in appropriate spaces. Special attention should be given to those species of local and National significance.
- (2) First Seen: The first refuge record for the species during the season concerned in the reporting period, and the number seen. This column does not apply to resident species.
- (3) Peak Concentration: The greatest number of the species present in a limited interval of time.
- (4) Last Seen: The last refuge record for the species during the season concerned in the reporting period.
- (5) Young Produced: Estimated number of young produced based on observations and actual counts on representative breeding areas. Brood counts should be made on two or more areas aggregating 10% of the breeding habitat. Estimates having no basis in fact should be omitted.
- (6) Total: Estimated total number of the species using the refuge during the period. This figure may or may not be more than that used for peak concentrations, depending upon the nature of the migrational movement.

Note: Only columns applicable to the reporting period should be used. It is desirable that the Summaries receive careful attention since these data are necessarily based on an analysis of the rest of the form.

3-1751

Form NR-1A

(Nov. 1945)

MIGRATORY BIRDS

(other than waterfowl)

Refuge Mud LakeMonths of Mayto August19452

(1) Species Common Name	(2) First Seen		(3) Peak Numbers		(4) Last Seen		(5) Production			(6) Total Estimated
	Number	Date	Number	Date	Number	Date	Number Colonies	Total # Nests	Total Young	Number
I. Water and Marsh Birds:										
Great Blue Heron	Summer Resident		No	Peak	Still Present		1	-	-	350
Black Crowned Ngt. Heron	"	"	145	7/12	3	8/1	-	-	-	145
Horned Grebe	"	"	No	Peak	Still Present		-	-	-	125
Holboell's Grebe	"	"	300	8/3	"	"	-	-	148	450
Pied-billed Grebe	"	"	520	8/31	"	"	-	-	222	700
Hooded Merganser	"	"	420	8/31	"	"	-	-	245	400
D.C. Cormorant	"	"	325	8/31	"	"	1	-	-	375
Belted Kingfisher	"	"	No	Peak	"	"	-	-	-	50
American Bittern	"	"	265	8/28	"	"	-	-	-	420
II. Shorebirds, Gulls and Terns:										
Herring Gull	Summer Resident		No	Peak	Still Present		-	-	-	12
Ring-Billed Gull	"	"	"	"	"	"	-	-	-	3
Franklin Gull	"	"	11,000	8/23	"	"	2	-	6,000	11,000
Greater Yellowlegs	"	"	-	8/20	"	"	-	-	-	v. abund.
Lesser Yellowlegs	"	"	-	8/20	"	"	-	-	-	v. abund.
Sanderlings	"	"	-	8/22	"	"	-	-	-	v. abund.
*Sandpipers	"	"	-	8/22	"	"	-	-	-	v. abund.
Golden Plover	1	8/20	-	8/20	1	8/20	New Record	-	-	1
Ruddy Turnstones	Summer Resident		-	8/20	Still Present		-	-	-	35
Barn Swallow	"	"	-	8/9	50	8/17	-	-	-	abund.
Cliff Swallow	"	"	-	8/9	1,100	8/16	-	-	-	v. abund.
Tree Swallow	"	"	-	8/15	1,500	8/19	-	-	-	v. abund.
Bank Swallow	"	"	-	8/12	200	8/10	-	-	-	v. abund.

* 2 Spotted sandpiper nests located 1 brood (w/3) downy chicks recorded.

(1)	(2)	(3)	(4)	(5)	(6)
III. Doves and Pigeons:					
Mourning dove	Summer Resident	50	8/5	Still Present	75
White-winged dove					
IV. Predaceous Birds:					
Golden eagle					
Duck hawk					
Horned owl ----	Yr. 'Round Res.	50-60	7/15	Still present	50-60
Magpie	1	8/20	-	-	1
Raven	Summer Resident	6,000	8/28	Still present	6,000
Crow	"	"	"	"	"
Marsh Hawk	"	No Peak Yet	"	"	85
Rough-legged Hawk	"	No Peak Yet	"	"	15
Red-Tailed Hawk	"	45	8/30	"	45
Pigeon Hawk	"	"	"	"	10
Sparrow Hawk	"	"	"	"	20
Broad-winged Hawk	2	8/2	-	-	5
Reported by L. H. Mangus					

INSTRUCTIONS

- (1) Species: Use the correct names as found in the A.O.U. Checklist, 1931 Edition, and list group in A.O.U. order. Avoid general terms as "seagull", "tern", etc. In addition to the birds listed on form, other species occurring on refuge during the reporting period should be added in appropriate spaces. Special attention should be given to those species of local and National significance. Groups: I. Water and Marsh Birds (Gaviiformes to Ciconiiformes and Gruiformes) II. Shorebirds, Gulls and Terns (Charadriiformes) III. Doves and Pigeons (Columbiformes) IV. Predaceous Birds (Falconiformes, Strigiformes and predaceous Passeriformes)
- (2) First Seen: The first refuge record for the species for the season concerned.
- (3) Peak Numbers: The greatest number of the species present in a limited interval of time.
- (4) Last Seen: The last refuge record for the species during the season concerned.
- (5) Production: Estimated number of young produced based on observations and actual counts.
- (6) Total: Estimated total number of the species using the refuge during the period concerned.

3-1752
Form NR-2
(April 1946)

UPLAND GAME BIRDS

1613

Refuge Mud Lake

Months of May to August, 1942

(1) Species	(2) Density	(3) Young Produced	(4) Sex Ratio	(5) Removals	(6) Total	(7) Remarks
Common Name	Cover types, total acreage of habitat	Acres per Bird	Number broods obs'd. Estimated Total	Percentage	Hunting For Re- stocking For Research	Estimated number using Refuge Pertinent information not specifically requested. List introductions here.
Ruffed Grouse	Willow, Popple, Aspen, Hardwood groves, 5,000 a.		4		550-650	
Sharp-tailed Grouse	Brush - Meadow Upland 20,000 a.		2		500-600	
Prairie Chicken	Same as for sharptails		1		15-20	
Ring-Necked Pheas- ant	Same		0		2-4	
Hungarian Partridge	Same		0		35-40	

INSTRUCTIONS

Form NR-2 - UPLAND GAME BIRDS.*

- (1) SPECIES: Use correct common name.
- (2) DENSITY: Applies particularly to those species considered in removal programs (public hunts, etc.). Detailed data may be omitted for species occurring in limited numbers. Density to be expressed in acres per animal by cover types. This information is to be prefaced by a statement from the refuge manager as to the number of acres in each cover type found on the refuge; once submitted, this information need not be repeated except as significant changes occur in the area of cover types. Cover types should be detailed enough to furnish the desired information but not so much as to obscure the general picture. Examples: spruce swamp, upland hardwoods, reverting agriculture land, bottomland hardwoods, short grass prairie, etc. Standard type symbols listed in Wildlife Management Series No. 7 should be used where possible. Figures submitted should be based on actual observations and counts on representative sample areas. Survey method used and size of sample area or areas should be indicated under Remarks.
- (3) YOUNG PRODUCED: Estimated number of young produced, based upon observations and actual counts in representative breeding habitat.
- (4) SEX RATIO: This column applies primarily to wild turkey, pheasants, etc. Include data on other species if available.
- (5) REMOVALS: Indicate total number in each category removed during the report period.
- (6) TOTAL: Estimated total number using the refuge during the report period. This may include resident birds plus those migrating into the refuge during certain seasons.
- (7) REMARKS: Indicate method used to determine population and area covered in survey. Also include other pertinent information not specifically requested.

* Only columns applicable to the period covered should be used.