SAND LAKE NATIONAL WILDLIFE REFUGE

NARRATIVE REPORT

SEPTEMBER 1, 1954 to DECEMBER 31, 1954

PERSONNEL

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C O N T E N T S

I. GENERAL

A. Weather Conditions 1
B. Water Conditions 2
C. Fires 2

II. WILDLIFE

A. Migratory Birds 2
B. Upland Game Birds 8
C. Big Game Animals 9
D. Fur Bearers and Other Mammals 9
E. Predaceous Birds 10
F. Fish 11

III. REFUGE DEVELOPMENT

A. Physical Development 12
B. Plantings 13
* C. Weed Control 13

IV. ECONOMIC USE OF REFUGE

A. Grazing 20
B. Haying 20
C. Fur Harvest 20

V. FIELD INVESTIGATIONS

A. Age Ratios and Composition of Snow-Blue Flocks 21
* B. Goose Browse Preference 23
* C. Status of the Captive Goose Flock 24
D. Ross' Geese 26
E. Status of the Richardson's Goose 27
F. Grazing 28
G. Waterfowl Trapping and Banding 29

VI. PUBLIC RELATIONS

* A. Public and Recreational Use 30
B. Refuge Visitors 30
C. Refuge Participation 31
D. Hunting 32
E. Fishing 34
F. Violations 34

VII. OTHER ITEMS

A. Easement Refuges 35
B. Items of Interest 36
C. Photographs

* Special Reports

Sand Lake National Wildlife Refuge 34

September 1, 1954 to December 31, 1954

I. GENERAL

A. Weather Conditions

A summary of data recorded at the official weather station located at refuge headquarters is given in Table No. 1.

TABLE NO. 1

Sand Lake Weather Data

Month	Precipitation '52	'53	'54	Max. Temp. '52	'53	'54	Min. Temp. '52	'53	'54
Sept.	.18	.28	2.72	95	91	87	31	29	30
Oct.	T	.50	.81	77	85	73	8	19	24
Nov.	1.21	.20	.10	70	70	62	-3	12	7
Dec.	.06	.30	.20	40	43	39	-6	-11	1
Totals & Extremes	1.45	1.28	3.83	95	91	87	-6	-11	1

The highlight of this fall's weather was the 2.72 inches of rainfall in September, bringing the total rainfall for the period to more than twice as much as in either of the two previous years. This early fall moisture promoted an abundance of food and cover for wildlife in the area.

Temperatures averaged just a little below normal but the departure was hardly noticed. Our first real frost of the season came October 6 with a low of 24 degrees. We experienced a low of 30degrees on September 22 that threatened the late-maturing corn crop, but little damage was noted.

Little snow is on the ground at this writing and again this year we feel the winter will be short. This comes as a surprise after experiencing a cold snap the 1st of November when the temperature dipped to less than 10 degrees. The lake was frozen over completely except for a few deep holes the remaining water-

fowl kept open. When this happened all hands agreed "winter is here", only to see the coming of an Indian Summer within a few days and the lake opened up again. It remained open until the general freezeup came Nov. 26, with a low of 2 degrees being recorded.

No below zero readings were noted in December although 5 degrees or less was quite common. At the present time the ice on the lake averages one foot in thickness. What snow we have had is reduced to a point where more gound is showing than is covered.

The weather in general for the period has been average; snow and cold weather have caused no hardship to man or wildlife.

B. Water Conditions

The pools remained at authorized levels until Oct. 29 when we started pulling stop logs. This was done to lower the levels and permit access to the workings of the Columbia Dam for installation of radial gates for improved water control. The logs remained out until Nov. 27 when they were all replaced at Columbia Dam and Mud Lake Dike to allow getaway of downstream water prior to commencement of the installation job. The lake froze over at 1271.60 after having dropped approximately 5 inches. At the end of the period the ice is approximately one foot thick and the remaining mallards have 4 holes open.

C. Fires

No uncontrolled fires were reported on the refuge this period.

II. WILDLIFE

A. Migratory Birds

1. Waterfowl

a. Swans. Whistling Swans were seen for the first time just north of the Mud Lake Dike on October 5, the earliest that swans have ever been reported here in the fall. The two birds were the pure white plumage of adults, and were not accompanied by any young.

Swans were not observed again until October 19, when 10 were seen, and by the time an aerial count was made October 26, there were 76 using the refuge. The peak number, 103, was recorded on November 2. Swans were heard 'talking' to one another on the refuge on November 19, but none were seen nor heard after that date.

The peak swan population exceeds all previous fall migrations by more than 25%. However, the young-adult ratio was not as favorable as it has been in the past. Of 11 family groups recorded, most (9) included only one cygnet, and two pairs were accompanied by two young. In the past three years swan families recorded included on the average slightly more than 2 young. There appeared also to be more pairs without young this year than in the past. This indicates that the population of whistling swans that pass through Sand Lake in the fall experienced a poor nesting season.

b. Geese. The resident flock of approximately 130 Common Canada's were all the geese that were present at the beginning of the period.

The first migrating geese appeared on the scene September 24 - 2 snows, 2 blues, 12 Richardson's and 23 white-fronted geese. At that time approximately 1,000 white-fronts were reported in the Souris country.

Geese continued to drift in slowly, and the population had increased to only 500 at the start of the waterfowl hunting season on October 1. Most of these were white-fronted geese. However, quite a number of geese moved onto the refuge during the opening weekend, possibly reflecting hunting pressures on non-refuge areas in this part of North and South Dakota. An aerial count on October 5 revealed 4,500 geese on the refuge, and indicated that geese were arriving from the north at about the usual rate.

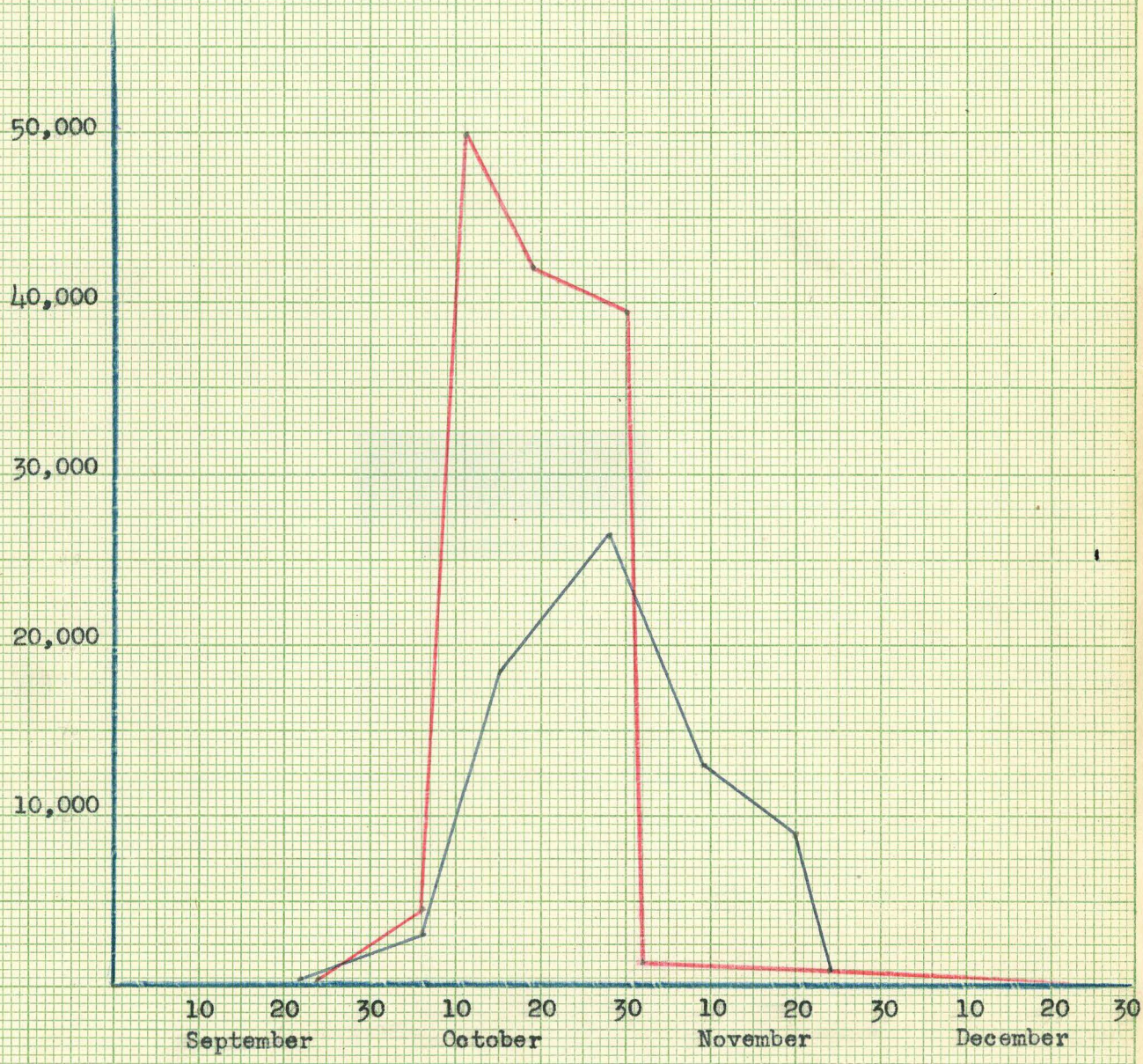
The peak population of white-fronts, 2,000, was reached during that first week in October, the same number as last year.

Then, on October 7, the first large scale migration of geese into and through the area began, and continued through October 9. During these three days white fronts began moving to the warmer southland, but snows and blues supplemented their numbers many times over. During the census flight on October 11, 50,000 geese were counted, 44,000 of them snow-blues, 1,000 white fronts, and 5,000 Canada types, predominantly the smaller Richardson's. The above figure for snows and blues turned out to be the peak population for this species, and the peak goose population, all species included, was also recorded on that date.

White-fronts continued their leisurely movement southward, and a flight through the area on October 13 was noted. Apparently some snow-blues had drifted southward, for an aerial count on October 19 revealed that the snow-blue population had declined to 32,000. At this same time, 9,500 Richardson's geese were counted, the peak for that particular species.

Another detectable movement of white geese was noted

FALL GOOSE POPULATIONS



on October 25. Residents in Columbia and Aberdeen reported many geese moving overhead during that night, and refuge personnel recorded observations to that effect. On October 26, Leo Kirsch at the Lake Andes Refuge took note of snow - and blue geese moving through that area.

A count of 40,000 geese was made on October 26, and most of these remained until October 30, when a cold wave that froze up most of the lake descended from the north accompanied by blowing snow. By this time, the feed supply on the refuge was almost exhausted. A count on November 2 found only 1,200 geese remaining on the area.

The weather warmed, and the lake opened up again during the first week in November, but geese numbers continued to decline.

During most of December, there were approximately 175 Common Canada geese using Sand Lake, and a few snows, blues, and Richardson's that were believed to be cripples.

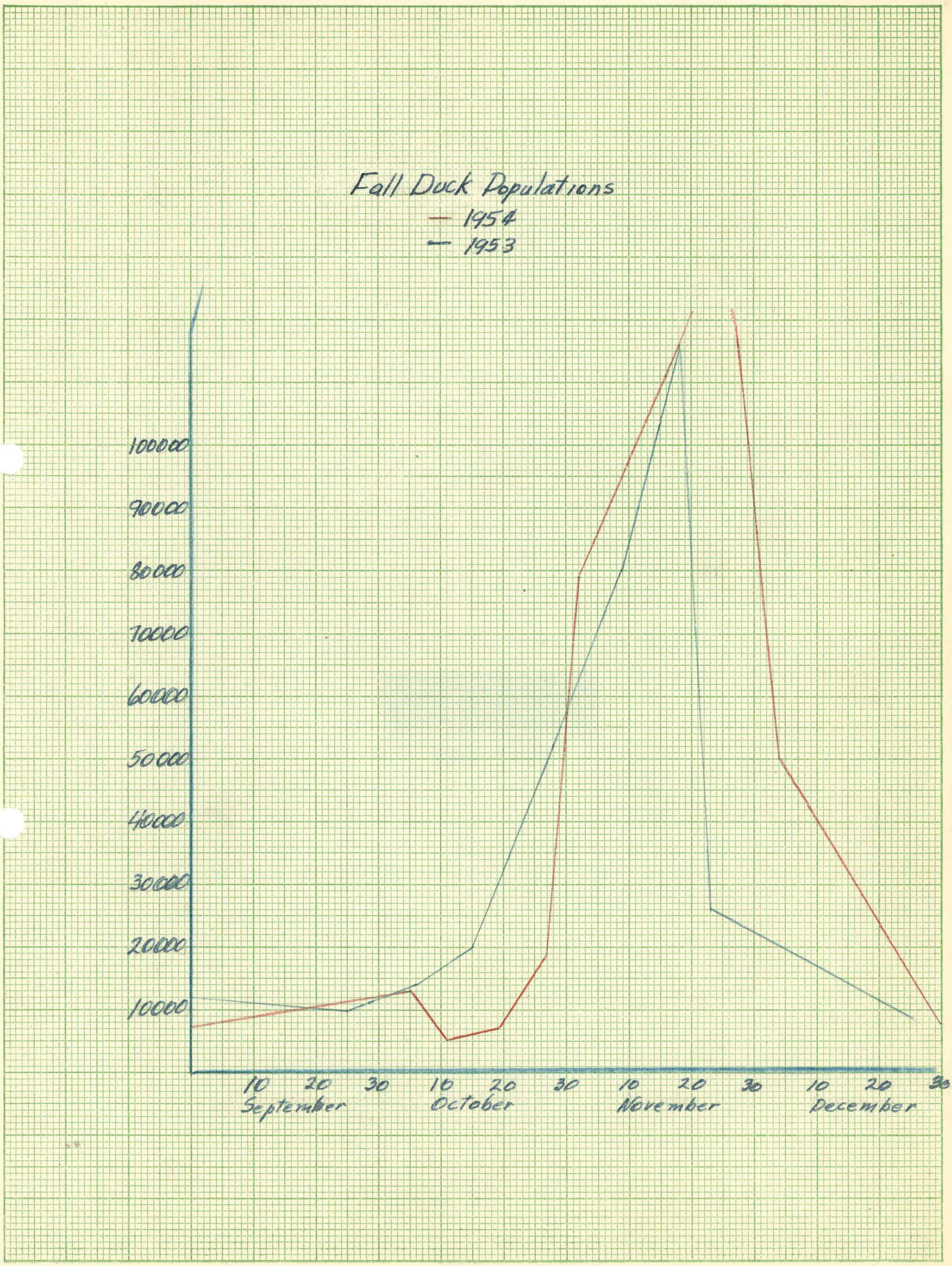
The peak for Canada (Richardson's) geese was considerably less that for previous year's populations, and s howed a decrease from 1953 of almost 50%. Whether or not this represents a decrease in the Richardson's goose sub-population that uses Sand Lake is a question, but one ~~when~~ the evidence viewed in the light of our data, seems to point strongly in that direction. The current status of the Richarason's goose should be carefully considered by those who are in a position to view this middle-continental population along the whole flyway. A special report has been submitted by us, and an analysis of the Sand Lake flock from our viewpoint is given in Section V.of this report.

The topsnow-blue population of 44,000 recorded this year approaches the high in 1951 of 57,000 of this species. Data on young-adult ratios and composition of snow-blue flocks appears in Section V.

Of very particular note were two Ross' geese that were caught in the net trap on October 23 and 25 in the Silo Bay area while trapping snow geese. This is a rare observation for South Dakota. As far as can be ascertained, there has been only one other observation of this species in South Dakota. The birds have been kept in the hospital pen. A more complete report is found in Section V. of this report.

Table 2 and Figures 1 & 2 summarizes the migration.

c. Ducks. At the start of the period there were approximately 7,200 ducks using the refuge, mallards predominating,


Fall Duck Populations
— 1954
— 1953
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
10 20 30 10 20 30 10 20 30 10 20 30
September
October
November
December

with pintails, gadwalls, and blue-winged teals next in abundance in that order. Usually at this time there are three times this number using the refuge, but the decrease in production in the Dakotas is believed to partially explain the reduced refuge use.

Duck numbers did not increase noticeably during September. Many blue-winged teals moved southward on about September 15, although migrants of this species were present well into October.

Early in October most gadwalls and pintails moved out, but were replaced by mallards. Redheads began to increase in early October as did canvasbacks.

An aerial count on October 5 revealed 13,000 ducks on the refuge, mostly mallards, but only 5,000 were seen on October 11.

Redheads and canvasbacks continued to increase during the first half of October, but there never were the number of these two species present this year as there have been in the past.

During the remainder of the month, mallards built up very slowly, (see Figure 2). A movement of green-winged teals was recorded during the last week of October. An aerial count on October 26 found only 19,000 ducks on the refuge, mallards and green-winged teals.

Then came a cold snap, on October 30, and mallards moved into the area. On November 2, 79,000 mallards were seen, and it was evident that the green-winged teals had moved out.

Duck numbers continued to build up, and anaerial count on November 16 revealed 111,000 mallards using the area. This was the last aerial count made during the fall, and is the only concrete figure we have to consider as the peak population. However, observations of ducks feeding out on November 22 indicated that there probably had been a continued buildup during the days after the aerial count and that there were considerably more present then had been recorded on November 16. This large population of mallards remained until the general freezeup on November 28.

Throughout December there was a steady decline, but there were still at least 8,000 mallards and a few redheads using an open water hole at the south end of the refuge.

There was no flight of scaup through the area this fall, and fall diver populations were in general quite a bit smaller than last year.

Other items of note include observatins of a

bufflehead as early as October 5, 10 wood ducks early in September, and 20 common mergansers on November 25.

d. Coot. There were about 900 coots using the refuge when the period began, and their numbers built up to a peak of 4,000 during the second week in October. Many had disappeared by October 12, and the last of this species were seen early in the last week of October.

e. Water and marsh birds. Pied-billed grebes were seen in steadily declining numbers until October 24. Western grebes were also present until October 24. There had been an estimated 500 present early in September.

Approximately 2,400 white pelicans were using Sand Lake at the beginning of the period, and that represented the peak population for the period. Pelicans were seen on October 27, just 7 of them, but never again thereafter.

Double-crested cormorants were also present until the end of October. Two-thousand were present at the start of the period, representing the peak population for this species.

Great-blue herons were seen throughout the marsh until October 27. One was seen south of the refuge as late as November 13.

American bitterns and black-crowned night herons were present until mid-October. One small heron, believed to be a least bittern was seen during the aerial count on October 11.

f. Shorebirds, gulls, and terns. Avocets, willets, and marbled godwits were seen occasionally during September. However, as a whole, very few shorebirds were seen during the migration period at Sand Lake. Water levels were quite high, and and there were few exposed mud flats and it is believed that few birds in the group found the area attractive.

Herring gulls and ring-billed gulls were present.

Thousands of Franklin's gulls were present during September, with a movement of them through the area on September 30. It was estimated that there were at least 100,000 using Sand Lake on that date.

2. Food and Cover

Waterfowl foods were fairly abundant at the start of the period, despite the dry summer. Approximately 9,800 bushels of corn, 5,800 bushels of barley, 640 bushels of wheat, and 2,000 bushels of cultivated millet were left out in the field for water-

fowl, a total of about 18,200 bushels of feed.

Ducks, principally mallards and pintails, began feeding on barley, millet, and wheat during the latter part of August. Mallards began feeding extensively in corn by October.

During the earlier parts of October, snow and blue geese could be found feeding in mowed barley and millet fields. Millet in the new Landis Slough farm unit north of Site # 3, and in the Silo Bay area was completely cleaned in a few days. During the second half of October, the birds could be found feeding almost exclusively in cornfields.

Then, near the end of October, food began to run short. Geese moved back in some of the cornfields in favored feeding areas and gleaned standing corn right up next to shelterbelts.

When the geese moved out at the end of October, practically all the food was exhausted on the refuge. Corn remained in 2 cornfields in the Harseth area, and at both ends of the strip of corn in the Weismantel farm unit just south of Site # 2.

Aquatic foods were plentiful, although few divers were in the area to take advantage of them. Pondweeds, particularly sago, were abundant throughout the lake, in all its smaller bays, and much of the larger water areas. Coots apparently made the most use of this as their food source.

3. Botulism

None noted.

4. Lead Poisoning

Again this year, evidence of lead poisoning among our late December mallards was noted. Approximately 8,000 mallards and about 10 redheads were using an open water hole near the south end of the refuge at the end of December, and an unknown number were suffering more or less from lead picked up during their flight from the north. Fifty-one dead mallards were picked up along one side of the hole, and most of them had perished directly or indirectly as a result of lead poisoning. It was estimated that there were 250 dead birds around that area. About 400 mallards and a few of the redheads would not or could not flush from the open water hole.

Foxes, raccoons, and snowy owls were seen frequenting the area, and no doubt some of these birds were picked up by these hungry predators, when they strayed from the protection of the open water.

B. Upland Game Birds

1. Population and behavior.

a. The ring-necked pheasant population is this vicinity was somewhat greater this fall and winter than during 1953. There were at least as many as in 1949, generally considered the last "good" pheasant year. An aerial count or ground count will be made as the basis for an estimate when snow cover permits.

The hunting season extended from October 23 to November 14, in this county with a daily limit of 3 male birds. Hunting was good, although it was necessary for hunters to work for their limit after the opening weekend.

This winter so far has been open, and the weather generally mild without blizzards and heavy snow, and the birds were still widely dispersed at the end of the period. There has not yet been any winter mortality to speak of but a few birds have been killed along roads by cars and trucks. Still, this mortality can be considered negligible.

b. European partridge. "Huns" have been seen occasionally during the period. One covey of 11 birds was noted quite frequently in the headquarters area, and another of 15 was seen just north of Site # 2. That is the extent of our observations of partridge on the refuge during the period. The population did not increase on the refuge or in this area during the last year.

c. Grouse. Three pinnated grouse, and one sharptail were seen on the refuge during December. The observation of a sharptail is the first for a number of years at Sand Lake.

2. Food and Cover.

There was not so much in the way of cultivated foods for upland game since the high waterfowl population was here, but the winter has been a mild and open one permitting the birds to range widely and utilize all food resources. Weed seeds were plentiful, and shrubs in shelterbelt plantings will provide much additional food.

Cover so far has been more than adequate, and is always plentiful except in winters of extremely heavy snows. Phragmites and other emergent marsh vegetation is used most extensively, and there are numerous weed patches and tree groves on the refuge.

3. Disease.

None noted.

C. Big Game Animals

1. Population and behavior:

White-tailed deer is the only big game animal we are concerned with at Sand Lake. The population prior to the hunting season was estimated to be at least 450 animals. On the basis of counts of hunters and their success, it was estimated that 245 deer were taken during the three-day deer hunting season December 11-13. Thus, it is estimated that more than 200 of the refuge deer population remain.

Most of the deer hunting in this area was concentrated in the refuge; little hunting was done on areas in the immediate vicinity of the refuge. Therefore, it is quite possible that some deer were deployed out into the area, particularly west of the refuge.

2. Food and cover:

There is not the food available to deer on the refuge that there has been in the past. Corn appears to be preferred by deer on the refuge, but after inroads by the fall waterfowl populations, little was left. Of course, neither are there so many deer, and browse in tree groves and shelterbelts is fairly plentiful.

Cover was no problem during the fall.

3. Disease.

Two large bucks were found dead down along the marsh, but the cause of death was not ascertained. They were dead before the deer hunting season started however.

D. Fur Animals, Predators, Rodents, Other Animals

The raccoon population has remained at a high level despite the removal of 375 animals last fall and early winter. It was estimated that there were at least 800 animals present prior to trapping. In the south half of the refuge, where the trappers concentrated last winter, there were fewer coons, according to the trappers. By January 1, 380 coons had been removed by two trapper and their helpers.

In the winter, most of the coons are found denned up in the dense emergent vegetation throughout the marsh, sometimes 10 or more animals in the nest. The den or nest istelf consists of dense phragmites and cattail that have been bent down with snow and wind, and often covered with snow.

The coons spend most of the wintertime asleep in these

dens, but during warm days they roam about to some extent.

Mink were fairly abundant, and the population was estimated to be at least 100 animals.

Striped skunks were seen occasionally, and it is known that some spotted skunks (Spilogale) were present.

Red foxes were seen quite frequently, and were most abundant around open water holes where crippled and lead poisoned ducks were congregated.

There were approximately 45 beavers, in 6 known colonies, but as yet they have not caused us any real difficulty.

The muskrat population is definitely increasing, and next fall provision may be made to affect their removal. We did not make a house count of the whole refuge, but a count was made of the refuge south of a line extending east and west intersecting the Service Building at Refuge Headquarters. Sixty-one houses were counted in this area. There was also an increase in the population in the Mud Lake area and along the Houghton Drain. The area north of Mud Lake still has only a sparse rat population.

Water levels have been fairly high, for the last few winters, and there have been no floods, possibly two factors helping them to increase.

White-tailed jackrabbits and cottontails were quite abundant.

Fox squirrels roam many of the tree groves and shelterbelts.

8. Predaceous Birds

Swainson's hawks were seen occasionally during September and October during treks around the refuge. A movement of red-tailed hawks was noted on October 6. While traveling a five mile stretch through prairie farm land, three were seen. Sparrow hawks were present throughout September, and were quite common. American rough-legged hawks were seen from time to time during November and December, but not as frequently as the previous year.

The first golden eagle was seen on October 25 in the Silo Bay area. Other observations of these large birds were made during December, just north of the Mud Lake Dike on the west side, in the trees at Hansens Point (due east of Refuge Headquarters) and at the south end on the east side near one of the open water holes there. No more than one at a time were seen on any one day.

The first bald eagle adult was seen on November 16 at Hanson's Point, and on November 23 one bald eagle adult and one immature were seen in this same area. That is the sum total of observations of eagles at Sand Lake.

Horned owls were fairly common, and were heard around site # 2 in late December.

Snowy owls have been with us since November 21, and have been seen quite often. Some of them seem absurdly tame. One was alongside the road astride a dead rooster pheasant. This writer pulled up alongside the owl, within about 5 feet, and even when the pickup door was opened, the bird only stared unblinking. It was not until I began to step out of the vehicle that the bird flushed. The dead pheasant still warm, was brought in and examined. The only marks found on the bird were claw-like wounds around the base of the neck, and a severed jugular vein.

F. Fish.

No new species of fish have been discovered in Sand Lake, and Carp, black bullheads, bigmouth buffalo, white suckers and yellow perch are the most abundant species. Northern pike and a few crappies are present.

III. REFUGE DEVELOPMENT MAINTENANCE

A. Physical Development

1. Partial installation of radial gates at Columbia Dam.

2. Prepared 7.8 miles of refuge roads for graveling, mowed and raked off vegetation, bladed back and forth.

3. Built 1200 rods of fence for new grazing units; steel and wood posts, 4 strand barbed wire.

4. Repairs to west side of boundary fence; reset 30 wood posts, rebuilt a total of 164 rods.

5. Dug 97 breeding pair potholes to increase duck nesting, 5 yards x 5 yards x 10 yards; work done by dragline under contract. measurements wrong! not 5 yards long.

6. Interior of site # 3 repainted.

7. Minor repairs to Mud Lake Dike; fill in next to bridge and emergency spillway at the east end.

8. Minor repairs to Dakota Lake spillway.

9. Built bale feeder stack at Tewaukon, and hauled soft wheat to cabin site for winter feed.

10. Installed new pump for headquarters water system.

11. Built up low spots and curves and approaches on refuge roads with the cat.

12. Partially filled steel granary by hospital pen with mixed grain for captive geese. (250 bushels)

13. Placed 270 geese in hospital pen, including 2 Ross, snows, blues and Canadas.

14. Placed feeder on the ice for feeding geese.

15. Took 130 bushels of ear corn to Swan Lake Refuge and brought back 30 Canadian geese.

16. Got deer jaw samples and cleaned and aged them for a sample board.

17. Banded approximately 600 geese, snows, blues and Richardsons.

18. Trimmed all shrubs and trees around headquarters, mowed grass kept neat.

19. Refuge staff was indoctrined to be separate post for C.O.C.

20. Chevrolet pickup given valve job and tuneup.

21. Reo truck given valve job and minor tuneup.

22. Autocar snow plow put into operating condition.

23. Pontiac station wagon doors and window and woodwork given a general overhaul.

24. Rebuilt 5 picnic tables at Columbia Recreation area.

25. Two stock water dugouts dug under contract; 10 feet x 50 feet x 150 feet.

26. Replaced nearly all boundary markings at Dakota Lake, Tewaukon, and Maple River.

B. Plantings

Cultivated Crops. Small grains harvested on the refuge were reported in the previous report. For breakdown see NR 8.

Corn grown on the refuge was of average quality. 414 acres were left in the field and 37 acres were harvested and placed in the corn crib and elevator. Also 40 bushels of ear corn was left near the hospital pen for winter feed. Last year the yield averaged 30 bushels per acre but this year was closer to 24, giving us 9,843 bushels in the field for the birds and the rest was stored for feeding and transfer.

C. Weed Control

Quite extensive weed control activities were carried on at Sand Lake During the past year. Our control efforts were directed wholly at the four primary noxious species present: leafy spurge Euphorbia esula, perennial peppergrass (hoary cress or whitetop) Lepidium draba, perennial sow thistle Sonchus arvensis, and canada thistle Cirsium arvense, with the eventual aim of eliminating them if possible.

Isopropyl ester (46%) 2,4-D was used in all spray mixtures on all four species, and water was used as the diluent in all cases. In addition, Borascu was applied to some leafy spurge patches, and the area infested with hoary cress was burned prior to treatment.

Most of the sow thistle was sprayed by aircraft, but ground equipment was used to treat the other species. The ground equipment consisted of a power sprayer mounted on the back of a pick-up truck. Most of the weeds were in smaller patches and a boom was not practical, so 100 feet of hose and a hand nozzle was used to transfer the chemical to the infested area. For this reason the spray was not always evenly distributed over the infestation.

Leafy spurge. It has been found in the past the standard applications of 2,4-D to leafy spurge will kill only a small percentage of the plants. Therefore, summertime applications were made to prevent the formation of seeds, and weaken the stand in preparation for soil sterilization tactics in the fall.

The spurge treated wasin scattered patches of medium density totaling approximately 3 acres. Two treatments were made at standard application rates to 2½ acres of the weed. Each time the patches were sprayed the plants were fully leafed but floral development ranged from zero to full flowering. Each gallon of the chemical, 2,4-D, was mixed with 20 gallons of water, and applied at the rate of 1.5 pounds of acid equivalent per acre. (Standard rate)

The initial applications were made on May 25 and June 4, and second applications on August 12. The days were clear and sunny, with the wind no more than a gentle breeze.

The results for both of these applications were about the same. The plants showed e fects the same day, becoming wilted by evening. After 10 days the tops of the plants had become brown, and lifeless, but most of the roots were still alive. Regrowth was evident in about two weeks. The stands were thinned somewhat following the two applications, and it was estimated that the kill amounted to 15 to 20 percent. Apparently young plants were destroyed, but older establishedplants with better developed root system continued to thrive.

Because our experience in the past had been that standard applications of 2,4-D would do no more than prevent the spread of this weed species, Borascu and very heavy applications of 2,4-D were made to all patches of leafy spurge in the south half of the refuge. The Borascu was applied to all of the patches around site # 2, including three patches in the Olson and Weismantel farm units, at the rate of 20 pounds per square rod, on October 7. On November 17, 2,4-D was applied to all remaining spurge spots, at a rate of 30 pounds of acid equivalent per acre. Since Borascu is a soil sterilant, and such heavy applications of 2,4-D are supposed to act as such, the results and success of these later treatments will not be known until the 1955 growing season.

The following is a summary of the cost of a single treatment of 2,4-D to one acre:

	At 1.5lbs	at 30 lbs
Acres	5	1
Labor	$10.45	4.40
Chemical	5.50	29.35
Vehicle, sprayer operation	1.00	.50
	16.95	34.25
Cost per acre	$3.39	34.25

Cost of applying Borascu to 20 spuare rods:

Labor	$ 1.10
Chemical	10,00
Operation	.20
	11.30
Cost per square rod	$ .56

Perrennial peppergrass. Perennial peppergrass has been a perennial thorn in the side of Sand Lake personnel for quite some time. The weed did not seem to "respond favorably" to treatments of 2,4-D in the past. This year, however, the pest appears to have finally met its match.

The peppergrass was located around site # 2 in dense patches within a heavy growth of kochia. Other small scattered patches totaling about one-half acre, of scattered density were located near the west end of the Mud Lake dam. It covered a total of eight acres in all, with a total of 5½ acres of peppergrass.

On May 5-6, about 20 acres of grass, kochia and sweetclover infested with dense patches of hoary cress were burned over, removing the heavy over topping species in preparation for spraying the area with 2,4-D. It became evident later on that in addition to removing the vegetation that prevented the spray from penetrating the peppergrass, the burning set back the growth of the weed to some extent.

By June 4, the peppergrass in the burned area had grown to a height of 6-7", and the stems of many of the plants were still growing upward and producing new leaves. Some of the plants were producing flower buds. It was on this date that 2,4-D was applied with ground equipment at a rate of approximately 2.0 pounds of acid equivalent per acre. About 6 acres of the pest plant were covered.

On July 7, an application of 2,4-D at about the smae rate was made to .25 acre of the weed that had been missed during the initialspraying.

The first treatment resulted in almost 100% kill. The plants had become wilted the day following the application, and by June 10 (7days after the application) the leaves were somewhat curled and the plants twisted. There followed a period of two weeks when no futher change was noted. But, but July 7 all the plants were dried and brown. No regrowth was noted thereafter.

Similar results were obtained on the hoary cress treated July 7.

By August, the patches had become enveloped in overtopping vegetation, and examining them for regrowth was difficult. However, none (regrowth, that is) had occurred in any of the patches that could be relocated at that time.

The cost of applying 2,4-D at approximately 2.0 pounds of acid equivalent per acre to 6 acres was as follows:

Labor	$9.00
Chemical	6.72
Sprayer, vehicle operation	1.00
Cost per acre	$2.78

Sow Thistle. A total of 483 acres of perennial sow thistle was sprayed with 2,4-D ester by a locally rented aircraft. The stands varied from scattered density to very dense.

The first application was made on June 29 to 50 acres along the marsh edge in the south one-half of the refuge. All of these patches were very dense. Leaves and stems were fully developed but floral development had not progressed past the bud stage, and buds had not yet formed on many individual plants. The chemical was applied at a rate of 1.5 pounds of acid equivalent per acre, diluted with water, 1 gallon chemical to 1.23 gallon of water.

It was found that no key to the locations of patches of sow thistle could be found that would help the pilot locate the pest plant, and the tremendous amount of time and manpower necessary to locate and mark or flag each plot precluded those possibilities, so spraying was not resumed until July 20.

At that time, the plants began to blossom, and locations of patches were marked by the yellow color of the flowering plants. On that date 207 acres of sow thistle were sprayed, 160 acres of the pest at a rate of 1.5 lbs of acid equivalent per acre and 47 acres at 2.2 lbs of acid equivalent per acre.

The last aerial spraying was done on August 3, when 186 acres were sprayed, with the chemical applied at 1.5 lbs of acid equivalent per acre.

Second applications were planned on some of the earlier sprayed areas. However, the areas sprayed in late June and middle July showed no regrowth at this time, and so the spraying was deferred until September. Then, when September appeared, some late flowering plants had appeared, but goldenrod had blossomed out and obscured the sow thistle, so spraying from the air could not be done efficiently.

Samples of different sprayed areas were taken following the spray applications. No matter what the application rate, nor the date applied the plants showed effects within 24 hours after being sprayed. They had taken on a droopy, wilted appearance. Within two weeks the leaves had become brown at the edges, the upper part of the stem had become twisted and distorted, the flower heads turned downward, and the plants had become paler green - a sort of yellowish green color. The plants still contained milky juice, and the roots appeared healthy.

The areas sprayed on all three dates showed about the same results later in the summer regardless of the rate of application. A month after spraying, the tops of most of the plants had turned brown, the stems were hollow, and they appeared to be dead. Some of the small hair roots had become decomposed, although the rootstocks still contained milky juice and appeared to be living.

At the end of October, further checks were made to determine mortality. The tops of almost all plants were brown and dead, and some of the plants were easily pulled from the soil. Upon examination of the roots system of these plants it was found that the tap root of the plant was no longer connected to other underground rootstocks, and contained no milky juice. There were also practically no hair roots attached to the tap root.

Other plants, also with their tops brown and dead were found to pull from the ground with difficulty, and it was found to have a root system that was still alive. The plant was still connected to underground rootstock, many still had smaller root hairs, and they contained at least some milky juice. Those plants that pulled easily from the ground then were considered dead.

Using this criterion it was found at the end of October that 60 percent of the plants sprayed were dead, with variations in kill from 54 to 67 percent in different areas. The highest kill 67% was found where the 2,4D had been applied at a rate of 2.2 pounds per acre, but is questionable whether that is a significantly higher kill.

No regrowth or new growth was found where the weeds were growing in dense patches where there was a mat of vegetation above the surface of the soil, but regrowth believed to be seeds that germinated was found in cultivated fields.

The areas sprayed on June 29, before the plants had flowered, never did show any blossoms, and so no new seeds were formed. The plants sprayed later after flowers had formed to mark the area for the spray pilot did produce seeds, but their viability was not known.

The cost of the aerial spraying of sow thistle was as follows:

Acres 483		
Labor		$ 13.75
Chemical 232 gal. @ 3.26		756.32
Aircraft Rental @ 1.00/acre		483.00
		1253.07

In addition to the aerial spraying of sow thistle, approximately 15 acres more were sprayed using ground equipment. These areas were small patches, along roads and road ditches, or near trees that could not be reached with the aircraft.

On June 18, two acres of sow thistle were sprayed with 2,4-D applied 2.0 (approximate) pounds of acid equivalent per acre. The basal leaves of the plants were well formed, and formed a very dense stand but the seems that were to bear the flowers had not yet appeared.

Nor did they ever appear, except along the fringe of the area sprayed. The estimated hill was 75%

On July 7, budding sow thistle, and on August 13, sow thistle that was flowering and seeding was sprayed with 2,4-D at a rate of 1.5 pounds of acid equivalent per acre. The patches varied from scattered to medium density. Leaves were fully developed, of course, at these times.

The results of the August sprayings were not checked, and those of July 7 only cursorily. The latter was checked on July 17, and most of the leaves were browned, from the edges inward about half way, and the bud bearing stems had paled, and become twisted and distorted. No regrowth was apparent then, and only widely scattered flowers were seen in the area in late August.

Canada thistle. Canada thistle was found in medium to very dense patches in the north half of the refuge. An application of 2,4-D was made to 2.6 acres on July 7, applied at a rate of approximately 2.0 pounds of acid equivalent per acre. At this time the leaves were fully formed, and buds were just beginning to open on some of the plants.

The tops of all of these plants were killed -about 95%- except for some on the edge of the infestation but scattered regrowth was noted on about 2.0 acres of the infestation. A second application of 2,4-D was made on August 17, applied at 1.5 pounds of acid equivalent per acre. On August 12,13, 16, 17 and additional 6.6 acres of Canada thistle, some of which was seeding, was sprayed with 2,4-D applied at a rate of 1.5 pounds of acid equivalent per acre. The results of these late sparyings were not checked.

The costs of ground applications of 2,4-D to sow thistle and Canada thistle acre combined because the work was much the same for both species.

Cost to spray 20.9 acres	$ 65.79
Cost per acre	2.99

IV. ECONOMIC USE OF THE REFUGE

A. Grazing

Nine permits were issued for grazing from July 15 to November 15 at the rate of $1.00 per head per month. One permit was issued for land at Tewukon Refuge. This brought receipts of $834.60 compared to 3 permits and $475.00 last year.

In years previous to 1954, the Economic use plan called for 630 acres of grazing land on the refuge and was all used. Proposals for revisions were made in 1954 and 1,342 acres were put into grazing use; an increase of 712 acres. This increase is a portion of 2,727 acres approved for grazing in the near future. Nearly all of the fencing is completed; 1200 rods were built, and it is hoped the total acreage will be in use this coming season. Some minor changes will be made, according to water levels, haying use, location of gates and roads, access to stock dams etc., but it is felt that we will have nearly 3400 acres of grazing land when the complete revision is made. This acreage will be divided into 23 units in all, whereas 8 units were used in 1954 and 3 in previous years.

Details of the workings of the grazing plan can be found in Section V., Field Investigations.

B. Haying

Haying permits were issued to 13 permittees covering 900 acres on Sand Lake Refuge and 3 permits on Tewaukon Refuge. A total of 636.33 tons of hay were put up bringing receipts of $954.53 on both refuges.

C. Fur Harvest

Two trapping permits were in force furing the period, one to a full time trapper and his helper for the taking of surplus mink, weasel, raccoon, skunk, badger, red fox, and beaver. The other was issued to a part-timetrapper for the purpose of removing raccoons.

By the end of the period 340 raccoons had been taken. (at the time of this writing - Jan 20 - a total of 460 raccoons had been removed.) The coons were found in dense stands of phragmites. On one day 23 were taken. The furs have been bringing the trappers $3.50 each, the same price as last year. This should put a dent in the population!

Mink trapping was much better this year, and 29 had been taken by December 31.

In addition, one weasel, five redfoxes, and six skunk were

removed. Six beaver were also trapped, one of them measuring 73".

V. FIELD INVESTIGATION OR APPLIED RESEARCH

A. Age Ratios and Composition of Snow-Blue Flocks

Counts were made of snow and blue geese on the refuge during the fall migration to determine the ratio of young to adults, and the proportion of snows and blues in the concentrations.

Two counts were made on consecutive days at two concentration points, one of geese that had been feeding for several days just north of Site # 2, and another of birds that had been feeding just north of Site # 3.

It was found that the flocks included 32 percent young. Based on the assumption that a young-adult ratio of 1-1 is average, the snow and blue geese had a poor nesting season this year. This agrees generally with Cooch's studies in the far north.

Snow-blue flocks were made up 20% blues, and 80% snow geese. This compares closely with the percentage composition during the past few years.

It has been noted that concentrations of snows and blues use certain areas for fairly long periods - usually until the feed is exhausted in these areas, and it is thought very probably that more than one subpopulation passes through Sand Lake. So the thought occurred to us that perhaps these subpopulations remain together on the refuge as a unit, and possibly are represented by the various large concentrations. If this were so, then differences in population structure between the different concentrations could be detected by these counts. The data, therefore, were kept separate.

Differences were noted, but the magnitude of the differences and other questions concerning flock behavior leave some doubt as to the significance of the data.

The data are, however, herein recorded in Table II.

TABLE NO. II

Summary of Counts of Snow-blue Geese

October 21, 1954 North of Site # 2	Yng Sno	Ad Sno	Yng Blu	Ad Blu	Total
Geese Counted - - - - - - -	371	657	63	170	1261
% Young - - - - - - - - - -	36%		27%		
Young/Adult - - - - - - - -	.57:1		.37:1		
% Young - All Geese - - -		34%			
Young/Adult - All Geese -		.52:1			
October 22, 1954 North of Site # 3					
Geese Counted - - - - - - -	90	243	20	67	420
% Young - - - - - - - - - -	27%		23%		
Young/Adult - - - - - - - -	.37:1		.3:1		
%Young - All Geese- - - -		26%			
Young/Adult - All Geese -		.35:1			

B. Goose Browse Preference

Observations of fields where goose flocks were found feeding formed the only basis for our studies of goose browse preference.

Snow-blue and particularly Richardson's geese were found browsing frequently on alfalfa, and appeared to prefer it to other browse. They were never seen in any other fields where only hay was grown. Large concentrations of snows and blues fed in millet fields, and no doubt utilized leafy parts of millet. Because of the dry weather much of the millet did not sprout until late summer rains fell, and there was quite a bit of millet browse in these fields, as well as grain. After the fields had been cleaned, no green shoots could be found, much of it trampled but much of it eaten as browse also.

The geese, snow-blues and Richardson's also fed much in barley fields during the earlier part of October, and no doubt utilized barley stubble and sprouted waste grain. The same holds true for wheat stubble, particularly at Hanson's point (near Silo Bay) where wheat had been left in a swath, and much of it had sprouted.

Common Canada geese usually fed in small grain stubble fields, and were not infrequently seen browsing on mowed hayland where brome, wheatgrasses, and sweet clover predominated.

C. Status of the Captive Goose Flock

In the January - April 1954 Narrative a summary of the Captive goose flock project is given. Briefly 26 young "honkers" were trapped at Sand Lake in Oct. 1952; these were pinioned. In Oct. 1953, 21 young Canadas were trapped and held.

During the summer of 1954, five of the geese trapped in Oct. 1953 escaped. The other 16 were pinioned in Nov. 1954. These Canadas have lived in the hospital pen since Oct. 1953.

We failed to catch any large Canadas in the fall of 1954, so 30 young birds were transferred to Sand Lake from Swan Lake. These had already been pinioned at Swan Lake shortly after they were trapped.

Hence, at the date of this writing we have 67 pinioned geese left from the original captures - 21 in the display pen (south) and 46 in the hospital pen. However, there are 10 "foreigners" that are staying with the 21 in the display pen giving us a grand total of 78 large Canadas. It is likely that five of these 10 are the escapees from the hospital pen last summer.

Two of these "extra" birds are a pair that wound up there last October. The smaller (female) limped into the pool wing-tipped by a hunter, and there they stayed. The other three may be wild birds (males?) that have certain interests in some of our unattached pinioned geese.

A total of six pairs of Canada geese are thought to be present in the display pen. We hope there are more come spring.

The behavior of the group of 31 geese in the display pen is of interest. In the first place, all have learned to fly. The reader will recall that some were twice pinioned! Surprisingly enough, they fly very well (if with a peculiar look) but always have returned to the pen.

During most of December a flock of 175 large Canadas visited the display pen daily to feed. Presumably, this is our refuge nesting population. We feared that our penned geese would depart with them. But when they left in January, our penned birds stayed on and have wintered in good shape on the 'outside'. The picture section shows how food and water is provided.

It seems that, here again, is an example of tradition as it relates to the behavior of Canada geese. Thus, we consider it important to completely confine the young geese, slated for release in the pen, for two years.

We are told by a man who has had a captive flock (i.e. his family) since 1870 that if the young are pinioned while still in

the downy stage, they never learn to fly. Once on the wing, however, they nearly always will learn to fly again even if pinioned.

Our captive geese are fed mixed grain including barley, hard wheat, oats and a very little corn. A bale of alfalfa is thrown in every four or five days and is relished by them.

After observing the floating nesting-mounds, constructed last winter, during the summer and fall, we finally decided they offer too much wind resistence. They have all been brought in and will be reconstructed and put out again this spring.

D. Ross Geese.

Two Ross's geese were caught in the cannon net trap this fall while trapping snow-blue and Richardson's geese in the Silo Bay area. One was caught on October 25 and the other two days later. Both were found to be immature females. The geese were placed in the hospital pen alive. (Full winged)

This is a rare record for South Dakota, and a new one for Sand Lake. Numerous records exist for the bird from central Montana south to Arizona and New Mexico, but only rarely has the species been reported east of the foothills of the Rockies. W. J. Breckenridge, in correspondence states, "Bent has 2 records, one for Winnepeg, September 20, 1902, the other from Louisiana, February 2, 1910, while Oberholser, in the BIRDS OF LOUISIANA, reported another Louisiana record in 1916. The 1936 AOU Check-list simply includes North Dakota as having a casual record. Mr. Graham Gooch in the September, 1954 issue of the CONDOR, page 307 has an interesting article which refers to a record in the AUK, 1908, page 450 of a specimen at Portage, Manitoba in September, 1902. He further reported in this article a Cree Indian shooting a Ross's Goose on James Bay in October, 1953 and that the same Indian had shot two others there in 1939. He also reported two adult female Ross's Geese captured and banded on Southampton Island in the summer 1953. This is the sum total of all of what I can find of eastern records on Ross's Geese."

Dr. Breckenridge also reports that two banded Ross's Geese were shot in northern Minnesota during the 1953 hunting season, and the bands sent to Washington.

Measurements were taken, and the birds were weighed after having been kept in the pen for 40 days. The following are those weights and measurements:

January 3, 1955 Sand Lake	No. 1	No. 2
Upper mandible	1-9/16 in.	1-5/8 in.
Wing	13-3/4 in.	13-3/4 in.
Tarsus	2-3/8 in.	2-3/4 in.
Total length	22.0 in.	21.0 in.
Weight	3.5 lbs.	3.75 lbs.

Trapped October 25 and 27, 1954

E. Status of the Richardson's Goose

It is evident from the data contained in the attached chart and table that the number of Richardson's geese stopping at Sand Lake has declined in the past five years. It is also evident that there has been a disproportionate kill at Sand Lake in 1953 and 1954

It is likely that a major portion of the world's population of this species passes through Sand Lake. Therefore, the heavy hunting pressure throughout the southern part of the flyway, which is reflected by our banding data, probably means that this species is being over-harvested.

An interesting report of a flight of small Canadas was received by letter from Rev. Ruben R. Strutz. While traveling U. S. 10 near Hysham, Montana on October 7, 1954 he reported seeing " several thousand" small Canadas which he called Hutchins. However he was merely passing through on his way to his home at Billings and did not stop to verify the identification of the entire flock. He said these geese were feeding in wheat fields and watering in the nearby Yellowstone River.

John Van den Akker writes me from Salt Plains that they are "way down" on small Canadas this year; he gave no exact figure. Graham Cooch writes that the 1954 breeding season in the Arctic could well be completely written off for many species. We have corresponded with others reported to have seen flights of Richardson's, but there is no good evidence to show that any large numbers of Richardson's geese passed up Sand Lake This fall.

To the north of us our banding data is meager. We are told by Peter Ward that large numbers of Richardson's geese are shot near the Delta Marsh. We know also that Devil's Lake, N. D. is a favorite hunting spot for this species. Goose hunting at this point was reported very poor last fall.

To the south of us, most of the kill (based on band returns) is near the Salt Plains area in Oklahoma, and in the following Texas Counties along the coast: Refugio, Patricio, Aransas, Victoria, Jackson, Brazoria, Matagorda and Aleberg; or from Galveston south to Baffin Bay.

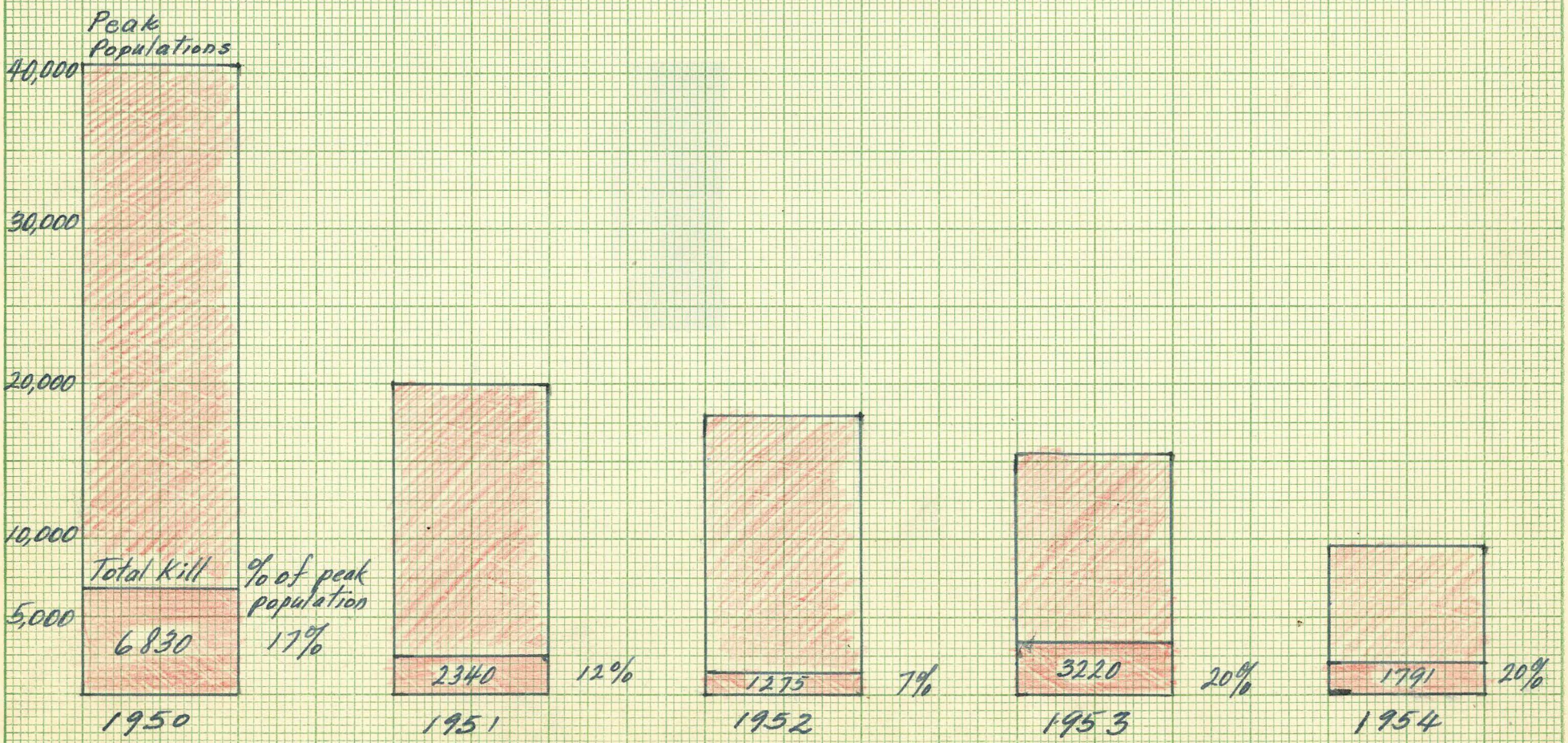
Because of conditions beyond our control, only a small number of Richardson's geese were trapped in 1953. This year 190-odd were banded along with 300-odd snows and blues.

The drop in the refuge kill for 1952 (percentage-wise) is attributed to the fact that, being a drouth year, hunting was poor at Sand Lake. According to the 1952 band returns the over-all flyway kill was about the same proportionately as in 1951

RICHARDSON'S GEESE

FALL PEAK POPULATIONS AND KILL

SANDLAKE REFUGE '50-'54



Richardson's Goose Bandings

Sand Lake National Wildlife Refuge

1951

Total Number Banded	485
Direct Returns	66
Percent of Total	14

Summary of Direct Returns by States

South Dakota (at station)*	20	- 30.3%
South Dakota	3	- 4.5%
Nebraska	7	- 10.5%
Kansas	5	- 7.6%
Iowa	2	- 3.3%
Oklahoma	6	- 9.0%
Louisianna	1	- 1.5%
Texas	22	- 33.3%
Total	66	100%

1952

Total Number Banded	203
Direct Returns	33
Percent of Total	16

Summary of Direct Returns by States

South Dakota (at station)*	12	36.3%
South Dakota	3	9.1%
Oklahoma	7	21.8%
Mississippi	1	3.0%
Texas	10	30.3%
Total	33	100%

* All geese were banded in about a weekstime both years.

F. Grazing

It had become increasingly evident to Sand Lake personnel through various studies that certain areas along the marsh edge and the adjacent upland had deteriorated to a point whereby these refuge lands were not being used by waterfowl. The marsh-front vegetation had grown up to a point where there was an unbroken line of emergents paralleling the shoreline; certain adjacent uplands were composed of a very heavy, rank growth; and areas were not used by waterfowl. It was thought that by opening up the marsh frontage, and cleaning up the heavy growth on the upland, that these areas could be made more attractive. Grazing was selected as the management tool to do the job.

Certain of these areas were made up of considerable acreages of lowland, semi-marsh type, and these were recommended for an early opening so that the livestock would be encouraged to feed on the semi-aquatic vegetation before it became too rank. These areas are being fenced off from adjacent upland pasture where the regular July 16 opening is in force. These recommendations were approved, and incorporated into our Economic Use Plan, and 2700 acres of grazing land were added to our pattern of land use.

The conversion of these areas to grazing units has been set up on a long-~~turn~~ term basis. Permits were issued covering four of these units during the past summer, and studies will be made on these areas during the 1955 breeding season to determine waterfowl use.

G. Waterfowl Trapping and Banding

Work on goose banding was resumed this fall as time and available personnel permitted. One of the improved net traps was operated on Hanson's Point (Sile Bay) supplemented by one of the older standard net traps. The following geese were banded:

Richardson's	177
Blues	44
Snows	172
Total	393

Most of these geese were taken in the improved net trap and the details are being reported separately.

Another important facet of the program was that of trapping crippled geese. The effectiveness of the improved net trap, and the ease and simplicity with which this can be done, is shown by the fact that the refuge manager working with his two smallest youngsters (age 8 and 12) caught 160 geese over one week end. These were from a group of about 200 "crips".

A total of 270 cripples were taken of which 112 were released as free flyers three weeks later. The others will be held over until spring and the flyers banded out at that time. The rest are distributed to parks and zoos.

VI. PUBLIC RELATIONS

A. Public and Recreational Use

Fishing, waterfowl and deer hunting, and people of all ages who visited the area to see the birdlife and learn about our operation accounted for 22,716 visitor use days throughout the year. The following is a breakdown of the number of man-days:

	Visitor Days
Hunting	16,816
Fishing	1,600
Miscellaneous	4,300
Total	22,716

B. Refuge Visitors

Don Drange	Hunting lodge guide	9/28/54
R. G. Scott	Aberdeen, S. D.	10/3/54
H. H. Morgan	Iowa Game agent	10/3/54
H. V. Padinos	Redfield, S. D.	10/7/54
V. T. Culp	Aberdeen, S. D.	10/12/54
C. A. Zeitner	Clearwater, Fla.	10/12/54
Carl Muth	Hosmer, S. D.	10/12/54
H. C. Aman	Hosmer, S. D.	10/12/54
John Potts	Sterling, Ill.	10/15/54
Reuben Nelson	Aberdeen, S. D.	10/15/54
Mr. & Mrs. Miller	Britton, S. D.	1018 /54
Maj. M. S. Gichald	USMC San Francisco, Cal.	10/19/54
Wright, Van Dyke, Johnson	Regional Engineers	10/26/54
Dan Janzen	Regional Office	10/27/54
Nelius Nelson	Kensal N. Dak.	10/29/54
John Farley	S. Dak. Game Dept	11/2/54
Rod Brevig	N. D. Game Agt.	11/14/54
Harry Jensen	N. D. Game Agt.	11/14/54
George Arthur	P.R., Ill.	11/14/54
Jim Lockhart	P.R., Ill.	11/14/54
A. J. Bjerken	Wool Growers, N. D.	11/22/54
Carl Strutz	Wool Growers, N. D.	11/22/54
E. Littner	Watertown, S. D.	11/23/54
Frank Bramble	Watertown, S. D.	11/23/54
Leo Kirsch	Lake Andes, S. D.	11/23/54
L. A. Perteson	MRB, Montana	12/13/54
Karl Kuilman	S. Dak. Game Tech.	12/13/54
Les Burner	S. Dak. Game Tech.	12/13/54
Paul North	Aberdeen, S. Dak.	12/14/54
Art Jamieson	Minneapolis, Minn.	12/54
Forrest Carpenter	Minneapolis, Minn.	11/54

Frequent Visitors:
L. C. Richardson, E. Sutton, J. Stoudt, E. Daly, R. Pence.

C. Refuge Participation

The following programs were presented by Mr. Dill or Mr. Sutherland:

Downtown Quarterbacks, Aberdeen, S. D., Brief takl - Dill.
Brown Co. Weed Control, Aberdeen, S. D., Report of Weed Control on the Refuge - Dill.
P. T .A. Barnard, S. D., Refuge film shown by Sutherland.
Downtown Quarterbacks, Aberdeen, S. D., Brief talk on goose hunting and wildlife ingeneral on the refuge - Sutherland.
Rotary Club, Aberdeen, S. D., Refuge film shown - Dill.
J. C.'s, Aberdeen, S. D., Refugo film shown - Dill.
Radio K.S.D.N., Aberdeen, S. D., Discussion of deer hunting regulations and special conditions on refuge - Dill.
Lake Region Improvement Club, Rutland, N. D., Refuge representation and plans for club - Dill and Sutherland, Talk by Carpenter.

D. Hunting

1. Waterfowl Hunting. The waterfowl season for South Dakota began on October1, and continued for 60 days. The goose hunting season this year, lasted for 30 days - the month of October - for at the end of that month the bulk of the geese moved southward.

Twenty-five miles of fenceline that were not controlled by any club or private group, and where no fee was charged were hunted by the "one gallus" hunter. Daily counts during routine patrols by refuge personnel, visiting GMA's and the state warden revealed an average of 16 hunters along each of these miles per day. Some days, there were as many as 80 or more hunters concentrated along some particular mile of boundary where the geese were moving out, or showed some signs of doing so. From these data it was estimated that there were 12, 150 hunter-days of sport expended around the boundary during the goose hunting period.

Private and commercial hunting clubs kept books in which they recorded the number of hunters and the kill. However, this year, many of these operators were not so conscientious in keeping records on the number of hunters, and so it was necessary to use the data in the books as the basis for an estimate that club hunting furnished at least 4,100 additional hunter-days. Therefore, a total of 16,250 hunter-days were expended in the pursuit of geese within one-half mile of the refuge boundary.

During routine patrols, 1,898 hunters who were checked on these free-access areas bagged a total of 317 geese, for a success of .17 geese per hunter day. The estimated success for those hunting on club areas where the hunting was controlled was estimated to be about .7 geese per hunter day.

According to the record books kept by clubs, 2,993 geese were bagged on these areas, According to our hunter-check data, 2065 geese were bagged by those hunting on free-access areas, for a total bag of 5,058 geese. The species composition of the number of geese bagged is found in Table No. III.

According to club record books, 413 geese were shot on these areas but were unretrieved because they fell inside the refuge. This represents 14% of the total kill on these areas. Assuming these same figures (which has remained more or less constant for the past four years) applies equally well to public hunting along the fenceline, an estimated 365 geese were not retrieved by fenceline shooters on the free-access areas. Thus, the total crippling loss was estimated to be 772 geese.

From it all, we estimate that a total of 5,058 geese were

TABLE NO. III

HUNTING PRESSURE AND TOTAL ESTIMATED GOOSE KILL

	HUNTER DAYS	GOOSE PER HUNTER DAYS	GEESE IN HUNTER BAGS	UNRETRIEVED % OF TOTAL KILL	UNRETRIEVED GEESE	TOTAL KILL
Public Hunting along refuge boundary	12,150	.17	2,065	14	365	2,430
Private and Commercial Hunting Clubs	4,100	.70est	2,993	14	413	3,406
TOTALS 1954	16,250	.	5,058		778	5,836
Comparable data 1953	14,042	.28	4,183*		700	4,883*
Comparable data 1952	15,284		1,512		197	1,709
Comparable data 1950	12,566		5,400		1,106	6,450
Comparable data 1950	18,020		6,590		2,399	8,989

* Figure represents estimate of minimum kill of 2 clubs that did not report.

5 yr Ave = 15,232

5 yr Ave = 5,573

76,162

Ave Success .36

8299

TABLE NO. IV.

SPECIES COMPOSITION OF GEESE KILLED - 1954

SAND LAKE REFUGE

		C. Canada	Richardson's	White-front	Snow	Blue	Totals
Public Hunting	No.	5	86	3	147	15	256
	%	2	34	1	57	6	100
Club Hunting	No.	64	966	137	1026	316	2509
	%	3	38	6	41	12	100
All Geese	No.	69	1052	140	1173	331	2765
	%	2.5	38	5	42	12	99.5

bagged by hunters hunting within one-half mile of the refuge boundary. The total kill - geese bagged plus cripples - was estimated to be 5,836 geese. Table IV summarizes these data for the past five years.

It is of note that one large concentration of snow geese remained for many days in the refuge adjacent to the State Public Shooting Grounds just south of the Hecla Grade, and the area was used by many hunters.

2. Deer Hunting. The refuge was opened to deer hunting during the ~~state~~ East River season December 11-13. The entire refuge was opened except for small protective areas around refuge building sites, and all state laws applied. No vehicles were permitted within the refuge boundary. The hours of the hunt were restricted by state law to 8:00 AM to 4:00 PM.

Aerial counts of vehicles parked around the refuge boundary on December 11 and December 12 were used to obtain an estimate of the hunting pressure. On December 11, 142 cars and trucks were counted between 9:00 and 10:00 AM when it was believed that most of the hunters had arrived on the scene and none (or very few) had filled and left. The next day, the count had to be delayed until 10:30 AM because fog had enveloped the area, but 61 cars were seen. Checks by personnel on the ground showed that the aerial counts were virtually 100% complete.

In the meantime, personnel on the ground obtained a sample of 115 cars to find out the number of hunters per car. The average was found to be 2.6. From this it was estimated that there were 370 deer hunters on the refuge on the opening day, and 161 on the second day. This system could be applied wherever a hunt is contained within an area of good deer cover surrounded by more or less open country.

Hunter checks revealed success on thefirst day of the hunt to be 51 percent, and from this it was estimated that 190 deer were bagged that day. On December 12, the second day of the season, success had dropped to 27 percent, with the kill estimated to be 45 animals. On the last day, there were 35 hunters out, and they killed only four deer. The total bag then was 239 deer.

Two dead bucks that had been crippled and lost were found after the season, but there are probably a few more that have not been located. Thus, the estimated total kill was 245 animals. It is estimated that 200 deer survived the hunt.

Thirty percent of the deer bagged were fawns; of the adults taken, 53 percent were does indicating no selective hunting for bucks. Many deer hunters were heard to say that they would take

(or had taken) the first deer they saw, regardless of age or sex.

According to a survey of license plates of hunters cars, 48 percent were from Brown County, 12 percent from neighboring Marshall County, and the rest from various parts of the state. Two non-residents from Minnesota were checked.

Very few of the hunters in this immediate vicinity hunted outside the refuge.

E. Fishing. Fishermen during the period were congregated at the Hecla Recreation area in the James River channel. Northern Pike was the most sought after species, although yellow perch were also caught.

Northern pike fishing usually gets good during September and October. Apparently the fish move into the deeper waters in the river channel at that time. Many were caught, most of them weighing around 3 to 3½ pounds. The largest one reportedly weighed 9 pounds 3 ounces, weighed in Hecla.

F. Vioaltions. Apprehensions made by Sutherland and Richardson.

Ignatius Hartung	Sand Lake	Late Shooting	$25.00	&Costs
Robert E. Ward	" "	Hunting in Refuge	$25.00	& Costs
Pete Harrenga	" "	Hunting in Refuge	$25.00	& Costs
Don J. Ziegler	" "	Refuge Trespass	$25.00	& Costs
E. E. Mehaffey	" "	Late Shooting	$25.00	& Costs
Paul Hartung	" "	Late Shooting	$25.00	& Costs

VII. OTHER ITEMS

A. Easement Refuges.

Waterfowl populations at Dakota Lake were checked each time an aerial count was made at Sand Lake. At the beginning of the period 18 pelicans, 9 great blue herons, 3 cormorants, and about 20 mallards were all that were seen using the area.

On September 29, a movement of shorebirds was noted at Dakota Lake. Four-hundred-twenty dowitchers, 110 greater yellowlegs, and a "few" lesser yellowlegs were seen in the slough just west of Ludden along the highway. Three-hundred geese (unidentified) were seen flying south over the area.

On October 11, there were 550 snow-blues, and 150 Canada type geese were using Dakota Lake. This was the peak number of snow geese seen on the area.

Eight-hundred Richardson's geese were seen on October 27, the peak for those species for thsi refuge. They were observed just south of the Great Northern railroad bridge that bisects the area.

Twelve-hundred mallards were the most seen at Dakota Lake; the date was November 16.

There were enough geese using the area during October to provide quite a bit of shooting around the boundary, but no data was accumulated to measure hunting pressure or kill.

Water levels were near the top of the concrete spillway on the west end throughout the period.

The boundary at Dakota Lake was re-posted to clarify the boundary, and damaged signs were replaced.

At Tewaukon Refuge on September 24, 6 white-fronted geese had arrived from the north. As the migration continued, the goose population continued to grow until the total peakof approximately 2000 was reached about the third week in October. This figure includes snow-blues and big Canada geese.

The most ducks, 4500 mallards, were observed by Rod Brevig, GMA, on November 14. No doubt more ducks than these used the area, but a count was not made a t the time of the big movement through there.

All boundary signs that had been damaged were replaced, and some new signs were added to mark clearly the boundary area.

Water levels in White Lake and Cloud's Lake were quite low, al-

though the water level in Lake Tewaukon itself was about 6" below the spillway, about normal for this time of the year.

At Maple River Refuge all signs that had been shot or knocked down were replaced, and a few new signs were placed so that there could be no misunderstanding about where the refuge boundary was.

B. Items of Interest

Maintenance Man-Equipment - Elmer Podoll was recently awarded $150.00 for his suggestion to improve a flushing bar. This bar is attached to a tractor during mowing and serves to scare birds away from destruction by the mower.

Maintenance Man-General - Albert(Fritz) Krege recently received an "Outstanding Achievement Award" for his fine work on the refuge.

Sand Lake Refuge has its "beauties" too. A local Snow Queen Contest had Manager Dill's daughter Donna and Maintenance Man Podoll's daughter Marlene as contestants. Marlene was sponsored by the refuge and Donna by the local American Legion Post. They were not chosen queen but were the best in our books!

SPEBSQSA - Largely at the instigation of the refuge manager and his assistant plus some good singing support by Maintenance man Krege, a chapter of the Society for the Preservation and Encouragement of Barbershop Quartet Singing in America has been chartered at Columbia.

It comprises a 25-voice male chorus and two quartets. Refuge Managers Dill and Sutherland are the tenor and bass in one of these and these gents are also President and Secretary of the Chapter. (Easy to see who hooks who for the work!) The refuge quartet is aptly named the "Four Old Crows".

Most recent outing for the Crows was a 15 minute appearance on Radio Station KSDN's March of Dimes program which netted a total of $3,081.00. The "live-talent" portion of the show ran 2 hours with an additional 2 hours transcribed.

In October, Don Gray (Lower Souris) brought his "Americanadians" out of the north; and this famous quartet (two Canadians and two Americans) joined the "Crows", the "Flying Songsters", the "Springs Four", the "Four Nubbins", and the "Atomic Bums" in putting on a parade of quartets at Aberdeen that was a tremendous success! The show was backed by the Columbia chapter chorus "Twoneriers" and the neighboring Wessington Springs chapter chorus. Refuge Clerk Ted Wahl got into the act by making up a beautiful set of highly appropriate stage props.

About 1200 people attended with a gross of approximately $900.00; $200.00 was donated by the Columbia group to the Junior American Legion Baseball program.

C. Photographs.

All photographs used were taken by Dill and Sutherland.

Credits: Portions of V, VI, VII and editing - Herbert H. Dill;
II, E of III, C of IV, V, D and E of VI, portions of VII - Dale E. Sutherland;
I, III, IV, VI, and VII - Theodore O. Wahl

Submitted by Herbert H. Dill
Herbert H. Dill

February 4, 1955

Approved by: _____
Regional Office

80 - SDL - 651

Two Ross' geese were captured in the net trap during October (See Sec. 5). In these pictures the much smaller Ross is compared to an adult lesser snow.

80 - SDL -

Cloacal examination indicated that both Ross' geese were two-year-old females. Note the grayish stripe up the back of the neck.

SD-SOL-[illegible]

During hunting season 270 crippled geese were picked up and placed in the hospital pen at headquarters. After confinement for three weeks, 112 were released as free flyers. In the background below are part of our flock of captive Canadas. Overflow from the hospital pool maintains a spot of open water in the display pool which they utilize.

SD-SOL-[illegible]

SD-SDL-

A feeder was placed on the ice in the display pool for the captive flock of honkers. Baled alfalfa was also made available, and open water was provided from the artesian-well overflow which is located inside the hospital enclosure.

SD-SDL-

A small flow of water is maintained at the Mud Lake dam to prevent ice damage.

SD-SDL-

Standing corn that was picked clean by geese in October. They reach up under the husks to strip the ear clean to a heigth of over 32 inches from the ground!

SD-SDL-

As this is being written in January, about 8,000 mallards are still present on the refuge. The picture was taken near the south end of the area.

3-1750
Form NR-1
(Rev. March 1953)

WATERFOWL

REFUGE SAND LAKE MONTHS OF Septmeber TO December, 1954

(1) Species	(2) Weeks of reporting period: ending Sept 14	11th 2	18th 3	25th 4	Oct. 2nd 5	9th 6	16th 7	23rd 8	30th 9	Nov. 6th 10
Swans:										
Whistling						(10-5) 2		10	76	103
Trumpeter										
Geese:					Totals →	26,500	50,000	42,000		
Canada	122	130	130	130	150	500~~0~~	500	500	800	100plus
~~Cackling~~ Richardson	-	-	-	(9-24)12	350	5,000	4,500	9,500	8,300	200
Brant	-	-	-	-	-	-	-	-	-	-
White-fronted	-	-	-	(9-24)50	2,000	2,000	1,000	P	P	P
Snow	-	-	-	(9-24)20	80	17,000	35,200	24,300	25,400	200
Blue	-	-	-	(9-24) 2	20	3,000	8,800	7,700	5,600	200
Other - Ross's	See text	-	-	-	-	-	-	-	-	-
Ducks:										
Mallard	2,500	2,500	2,500	2,500	10,500	10,500	5,000	6,000	15,000	79,000
Black	100	100	100	100	200	200	P	P	P	P
Gadwall	1,200	1,200	1,200	1,200	P	P	-	-	-	-
Baldpate	450	450	450	450	200	200	-	-	-	-
Pintail	1,750	1,750	1,750	1,750	500	500	P	P	P	P
Green-winged teal	20	20	20	20	200	200	P	1,000	4,000	P
Blue-winged teal	900	900	900	250	300	300	-	-	-	-
Cinnamon teal	-	-	-	-	-	-	-	-	-	-
Shoveler	20	20	20	20	P	P	-	-	-	-
Wood	10	10	10	10	-	-	-	-	-	-
Redhead	250	250	250	250	800	800	700	P	P	-
Ring-necked	-	-	-	-	-	-	-	-	-	-
Canvasback	50	50	50	50 plus	700	700	300	P	P	-
Scaup	P	P	P	-	-	-	-	-	-	-
Goldeneye	-	-	-	-	-	-	-	-	-	-
Bufflehead	-	-	-	-	-	-	-	-	-	-
Ruddy	P	P	P	-	-	-	-	-	-	-
Other										
Coot:	900	900	900	1,000	2,500	4,000	2,500	P		

- Present, but in unknown numbers.

3-7150a
Cont. NR-1
(Rev. March 1953)

WATERFOWL
(Continuation Sheet)

REFUGE SAND LAKE MONTHS OF September TO December, 1954

(1) Species	(2) Weeks of reporting period: 13 / 11	20 / 12	27 / 13	Dec. 4 / 14	11 / 15	18 / 16	25 / 17	Jan. 1 / 18	(3) Estimated waterfowl days use	(4) Production: Broods seen	Estimated total
Swans:											
Whistling	P	P							2,600		
Trumpeter											
Geese:											
Canada	100	100	100	180	180	177	177	100	28,600		
~~Cackling~~ Richardson	400	400	300	P					168,000		
Brant											
White-fronted									27,000		
Snow											
Blue	600	600	300	P	P	P	P	P	878,500		
Other									1,102,100		
Ducks:											
Mallard	111,000	110,000+	110,000+	50,000+	40,000	20,000	12,000	8,000	Dabblers:		
Black									4,273,000		
Gadwall											
Baldpate											
Pintail											
Green-winged teal	P										
Blue-winged teal											
Cinnamon teal											
Shoveler											
Wood											
Redhead	P								Divers:		
Ring-necked									31,000		
Canvasback											
Scaup											
Goldeneye											
Bufflehead											
Ruddy											
Other											
Common Mergansers			(11/25)20								
Coot:									92,000		

(over)

	(5) Total Days Use	(6) Peak Number	(7) Total Production
Swans			
Geese		50,000	
Ducks		110,000	
Coots			

SUMMARY

Principal feeding areas _____

Principal nesting areas _____

Reported by _____

INSTRUCTIONS (See Secs. 7531 through 7534, Wildlife Refuges Field Manual)

(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) Weeks of Reporting Period: Estimated average refuge populations.

(3) Estimated Waterfowl Days Use: Average weekly populations x number of days present for each species.

(4) Production: 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.

(5) Total Days Use: A summary of data recorded under (3).

(6) Peak Number: Maximum number of waterfowl present on refuge during any census of reporting period.

(7) Total Production: A summary of data recorded under (4).

Interior Duplicating Section, Washington, D. C. 37944
1953

3-1751
Form NR-1A
(Nov. 1945)

MIGRATORY BIRDS
(other than waterfowl)

Refuge SAND LAKE Months of September to December 1954

(1) Species	(2) First Seen		(3) Peak Numbers		(4) Last Seen		(5) Production			(6) Total
Common Name	Number	Date	Number	Date	Number	Date	Number Colonies	Total # Nests	Total Young	Estimated Number
I. Water and Marsh Birds:										
Western grebe	Summer	Resident			4	10-24				
Pied-billed grebe	S "	"			2	10-24				
White pelican	"	"	2400	8-30	7	10-27				
Double-crested Cormorant	"	"	2000	8-30	10	10-27				
Great-blue heron	"	"	8	10-5	1	10-27				
Black-crowned Night heron	"	"				Mid Oct.				
American bittern	"	"				Mid Oct.				
Least bittern	1	10-11	1	10-11	1	10-11				
II. Shorebirds, Gulls and Terns:										
Herring gull	Summer	Resident — I doubt it!								
Ring-billed gull	Summer	Resident								
Franklins gull	"	"	100,000	9-30						
Avocet	"	"								
Spotted sandpiper	"	"								
Killdeer	"	"								
Dowitcher	"	"								
Greater yellowlegs	"	" — probably not resident!								

54

(over)

(1)	(2)		(3)		(4)		(5)			(6)
III. Doves and Pigeons:										
Mourning dove	Summer Resident									
White-winged dove										
IV. Predaceous Birds:										
Golden eagle	1	10-21	1	See text						
Duck hawk	-									
Horned owl	Resident									
Magpie	-									
Raven	-									
Crow	Summer Resident									
Bald eagle	1	11-16	2	11-23	2	11-23				
Rough-legged hawk	Resident									
Red-tailed hawk	"									
Snowy owl	1	11-11								

Reported by Dale E. Sutherland

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 Gruiiformes)
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

Refuge SAND LAKE Months of September to December, 1954

(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'v'd.	Estimated Total	Percentage	Hunting	For Re-stocking	For Research	Estimated number using Refuge	Pertinent information not specifically requested. List introductions here.
Ring Necked Pheasant	10,000 acres of upland, shelterbelts and marsh edge		Population greater than Fall of 1953 - See text.							
European Partridge	1,000 ideal 8,000 total		Population about equal to Fall of 1953 - See text.							
Pinnated Grouse	5,000 acres Field margins and grassland		See text.							
Sharptailed Grouse	5,000 acres field margins and grassland.		See text.							

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.

3-1753
Form NR-3
(June 1945)

BIG GAME

Refuge SAND LAKE Calendar Year 1954

(1) Species	(2) Density	(3) Young Produced	(4) Removals				(5) Losses			(6) Introductions		(7) Estimated Total Refuge Population		(8) Sex Ratio
Common Name	Cover types, total Acreage of Habitat	Number	Hunting	For Re-stocking	Sold	For Research	Predation	Disease	Winter Loss	Number	Source	At period of Greatest use	As of Dec. 31	
White-tailed Deer	Marsh, cropland, wooded upland 12,000 acres	150	2 5 0	-	-	-	0	Unk.	0	0		450	200	Unk.
	Winter big-game census yet to be made. Will be reported in Next Narrative Report.													

Remarks:

Reported by Dale E. Sutherland

INSTRUCTIONS

Form NR-3 - BIG GAME

(1) SPECIES: Use correct common name; i.e., Mule deer, black-tailed deer, white-tailed deer. It is unnecessary to indicate sub-species such as northern or Louisiana white-tailed deer.

(2) DENSITY: 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 total number of young produced on refuge.

(4) REMOVALS: Indicate total number in each category removed during the year.

(5) LOSSES: On the basis of known records or reliable estimates indicate total losses in each category during the year.

(6) INTRODUCTIONS: Indicate the number and refuge or agency from which stock was secured.

(7) TOTAL REFUGE POPULATION: Give the estimated population of <u>each species</u> on the refuge at period of its greatest abundance and also as of Dec. 31.

(8) SEX RATIO: Indicate the percentage of males and females of each species as determined from field observations or through removals.

116008

3-1755
Form NR-5
(April 1946)

DISEASE

Refuge SAND LAKE Year 194 54

Botulism

Period of outbreak None

Period of heaviest losses -

Losses:

	Actual Count	Estimated
(a) Waterfowl		
(b) Shorebirds		
(c) Other		

Number Hospitalized	No. Recovered	% Recovered
(a) Waterfowl		
(b) Shorebirds		
(c) Other		

Areas affected (location and approximate acreage) None

Water conditions (average depth of water in sickness areas, reflooding of exposed flats, etc.

Conditions of vegetation and invertebrate life

Remarks Steady flow of water throughout summer and fall months.

Lead Poisoning or other Disease

Kind of disease Lead poisoning

Species affected Mallard & Redhead

Number Affected

Species	Actual Count	Estimated
Mallard	200	500
Redhead	a few	

Number Recovered Unknown

Number lost 250

Source of infection Water areas north of refuge

Water conditions At authorized level - high

Food conditions

Remarks

Form NR-6

FISH

1617

Refuge SAND LAKE Year 1954

Species	Relative Abundance	Sport Fishing		Commercial Fishing		Restocking		Number removed for Restocking
		Man days Fishing	Number Taken	No. of Permits	Pounds Taken	Number Stocked	Area Stocked	
Carp	Abundant							
Bigmouth buffalo	Common							
White sucker	Common							
Black bullhead	Abundant	Many						
White crappie	Few	None						
Bluegill sunfish	Few	None						
Northern Pike	Common	Unknown						
Yellow perch	Abundant	Many						

REMARKS:

Form NR-7

PLANTINGS
(Marsh - Aquatic - Upland)

Refuge SAND LAKE Year 1954

Species	Location of Area Planted	Rate of Seeding or Planting	Amount Planted (Acres or Yards of Shoreline)	Amount & Nature of Propagules	Date of Planting	Survival	Cause of Loss	Remarks
Red Cedars	Shelter belt in Hq. area	SCS Standard	2.3	2000 young	May	60%	lack of moisture	doing well

TOTAL ACREAGE PLANTED:

Marsh and aquatic _____
Hedgerows, cover patches _____
Food strips, food patches _____
Forest plantings ~~one~~ miles 2.3

1618

3-1758
Form NR-8
(April 1946)

CULTIVATED CROPS

Refuge SAND LAKE Year 1954

Permittee (If farmed by refuge personnel, so indicate)	Permit No.	Unit or Location	Crops Grown	Avg. Yield per Acre	Permittee's Share		Government's Share or Return				
							Harvested		Unharvested		Compensatory Services, or Cash Revenue
					Acres	Bu. Harvested	Acres	Bu.	Acres	Bu.	
Bonzer, R.	20147	17-19-20-	Barley	20	37	740	7	140	39	780	
	20148	21-22-23	Corn	19	15	270	15	270	10	190	
			Oats	40	61	2440	2	80			
Dennert, S.	20149		Corn	25					40	1000	
	SL-32-52	3-4-6-7	Oats	40	32	1280					
			Wheat	10	93	930			22	220	
Dinger, G.	20150	11-12-13	Barley	32	34	1088	3	96	47	1574	
	SL-52-52		Corn	28	80	2240			40	1120	
			Rye	10	20	200					
Eichler, H.	20151	39-43	Corn	20					8	160	
	SL-37-52		Millet	15	14	100	14	100	23	600	
			Oats	35	70	2450	1	35			
			Wheat	9	16	144	4	36			
Herseth, R.	20152	35-36-37	Barley	20	15	300			15	300	
Continued	SL-40-52		Corn	20	28	560			47	940	

Summary of Crops Grown:	Crop	Acreage	Permittee's Share		Government's Share				Total Revenue
					Harvested		Unharvested		
			Acres	Bushels	Acres	Bu.	Acres	Bu.	$

Interior Duplicating Section, Wash.D.C.

Interior—Duplicating Section, Washington, D. C. 14268

DIRECTIONS FOR PREPARING FORM NR-8
CULTIVATED CROPS

Cultivated Crops Report Form NR-8 should be prepared on a calendar-year basis for all crops harvested or utilized during the calendar year and submitted with the December 31 refuge report.

Permittee - List each permittee separately. If lands of the refuge are farmed by refuge personnel or hired labor, this should be indicated in the Permittee column.

Permit No. - List the number of the Special Use Permit issued to the individual.

Use or location - The Unit No. or name specified in the Economic Use Plan should be listed in this column.

Crops Grown - A separate line of the form should be used for each crop grown by each permittee or by refuge personnel. This is important, since if each crop grown by each operator is not specifically enumerated, the report will be of no value for statistical purposes.

Average Yield per Acre - It is important that the average yield per acre of each crop grown by each operator should be shown.

Permittee's Share - Only the number of acres harvested or utilized by the permittee for his own benefit should be shown under the Acres column, and only the number of bushels of farm crops harvested by the permittee for himself should be shown under the Bushels Harvested column. It is requested that all crops harvested be reduced to bushels wherever possible, or, as in the case with the harvesting of seed such as that of sweet clover, alfalfa, bromegrass, etc., the total harvested crop in pounds may be shown. Timothy, alfalfa, or other hay harvested by the permittee should be shown on Form NR-10 and should not be shown in the Permittee's Share column.

Government's Share or Return - Harvested - Show the number of bushels harvested for the Government and the acreage from which this share is harvested, both for grain raised by refuge personnel and by permittees. Unharvested - show the exact number of acres of crops allowed to remain unharvested as food and cover for wildlife. An estimate of the number of bushels of grain that is available for the wildlife in such unharvested crops should be shown in the Bushels column.

Compensatory Services, or Cash Revenue - Show other services received by the Government in cooperative farming activities, the number of acres of food strips planted for wildlife, the amount of wildlife crops not otherwise reported that are planted by cooperators for the Service, or the cultivation of wildlife plantations. If the permit is on a fee basis, the total cash revenue received by the Service.

3-1758
Form NR-8
(April 1946)

CULTIVATED CROPS

Refuge SAND LAKE Year 1954

Permittee (If farmed by refuge personnel, so indicate)	Permit No.	Unit or Location	Crops Grown	Avg. Yield per Acre	Permittee's Share		Government's Share or Return				Compensatory Services, or Cash Revenue
							Harvested		Unharvested		
					Acres	Bu. Harvested	Acres	Bu.	Acres	Bu.	
			Millet	10					20	200	
			Oats	35	72	2520	3	105			
			Wheat	11	60	660	12	132			
Lahman, F.	SL-45-52	25-80	Oats	30	13	390	7	210			
Mitchell, E.	SL-35-52	29-25	Millet	15					7	105	
Olson, C.	SL-38-52	44-70	Barley	20	6	120			13	260	
			Corn	25	6	130			19	475	
			Oats	35	18	630					
Pfutzenreuter, G.	20146	8-9-10	Barley	20	40	800			63	1260	
	SL-31-52		Corn	30	32	960			6	180	
			Oats	40	28	1120	2	79			
Richardson, H.	SL-36-52	41-42	Barley	25	11	275			19	475	
			Corn	25					30	750	
			Oats	25	27	675					
			Wheat	15	30	450					

Summary of Crops Grown:	Crop	Acreage	Permittee's Share		Government's Share				Total Revenue
					Harvested		Unharvested		
			Acres	Bushels	Acres	Bu.	Acres	Bu.	$

Interior Duplicating Section, Wash.D.C.

Interior—Duplicating Section, Washington, D. C. 34268

DIRECTIONS FOR PREPARING FORM NR-8
CULTIVATED CROPS

Cultivated Crops Report Form NR-8 should be prepared on a calendar-year basis for all crops harvested or utilized during the calendar year and submitted with the December 31 refuge report.

Permittee - List each permittee separately. If lands of the refuge are farmed by refuge personnel or hired labor, this should be indicated in the Permittee column.

Permit No. - List the number of the Special Use Permit issued to the individual.

Use or location - The Unit No. or name specified in the Economic Use Plan should be listed in this column.

Crops Grown - A separate line of the form should be used for each crop grown by each permittee or by refuge personnel. This is important, since if each crop grown by each operator is not specifically enumerated, the report will be of no value for statistical purposes.

Average Yield per Acre - It is important that the average yield per acre of each crop grown by each operator should be shown.

Permittee's Share - Only the number of acres harvested or utilized by the permittee for his own benefit should be shown under the Acres column, and only the number of bushels of farm crops harvested by the permittee for himself should be shown under the Bushels Harvested column. It is requested that all crops harvested be reduced to bushels wherever possible, or, as in the case with the harvesting of seed such as that of sweet clover, alfalfa, bromegrass, etc., the total harvested crop in pounds may be shown. Timothy, alfalfa, or other hay harvested by the permittee should be shown on Form NR-10 and should not be shown in the Permittee's Share column.

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3-1758
Form NR-8
(April 1946)

CULTIVATED CROPS

Refuge SAND LAKE Year 1954

Permittee (If farmed by refuge personnel, so indicate)	Permit No.	Unit or Location	Crops Grown	Avg. Yield per Acre	Permittee's Share		Government's Share or Return				
							Harvested		Unharvested		Compensatory Services, or Cash Revenue
					Acres	Bu. Harvested	Acres	Bu.	Acres	Bu.	
Scott, A.	SL-44-52	24-26-27	Barley	18			9	170	25	450	
			Corn	22					59	1298	
			Oats	30	87	2610					
Sieber, W.	SL-39-52	48	Barley	42	31	1302	9	380			
			Corn	19	15	280	15	280			
Spurr, C.	SL-48-52	30-31	Barley	20					28	560	
			Wheat	10	40	400					
Valentine, T.	SL-34-52	28	Corn	15					22	330	
			Oats	25	35	775					
Vitense, R.	20153	2-5-46	Barley	28	70	1960					
			Corn	25	4	100			46	1150	
			Oats	40	15	600					
Wells, H.	SL-43-52	1	Corn	30			7	210	18	540	
			Oats	35	33	1155					
			Wheat		16	22					

Summary of Crops Grown:	Crop	Acreage	Permittee's Share		Government's Share				Total Revenue
					Harvested		Unharvested		
			Acres	Bushels	Acres	Bu.	Acres	Bu.	$

Interior Duplicating Section, Wash.D.C.

Interior--Duplicating Section, Washington, D. C. 14268

DIRECTIONS FOR PREPARING FORM NR-8
CULTIVATED CROPS

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3-1758
Form NR-8
(April 1946)

CULTIVATED CROPS

Refuge SAND LAKE Year 1954

Permittee (If farmed by refuge personnel, so indicate)	Permit No.	Unit or Location	Crops Grown	Avg. Yield per Acre	Permittee's Share		Government's Share or Return				Compensatory Services, or Cash Revenue
							Harvested		Unharvested		
					Acres	Bu. Harvested	Acres	Bu.	Acres	Bu.	
Weismantel, E.	20154	5	Corn	25					17	410	
			Oats	45	14	625	4	180			
			Wheat	18	17	206					
Wilson, J.	20155	40	Barley	20					8	160	
			Corn	25					52	1300	
			Oats	45	128	5760	6	190			
			Wheat						28	420	
Refuge personnel		6-8-11	Millet	6					205	1230	

Summary of Crops Grown:

Crop	Acreage	Permittee's Share Acres	Permittee's Share Bushels	Government's Share Harvested Acres	Government's Share Harvested Bu.	Government's Share Unharvested Acres	Government's Share Unharvested Bu.
Barley	529	214	6585	28	775	257	5819
Corn	584	133	3310	37	760	414	9843
Millet	283	14	100	14	100	255	2135
Oats	658	633	23030	25	879		
Wheat	338	272	2812	16	168	50	640

Total Revenue $_____

Interior Duplicating Section, Wash.D.C.

Alfalfa - Harvested seed not divided at this time

Interior—Duplicating Section, Washington, D. C. 14268

DIRECTIONS FOR PREPARING FORM NR-8
CULTIVATED CROPS

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3-1758
Form NR-8
(April 1946)

CULTIVATED CROPS

Refuge LAKE TEWAUKON Year 1954

Permittee (If farmed by refuge personnel, so indicate)	Permit No.	Unit or Location	Crops Grown	Avg. Yield per Acre	Permittee's Share		Government's Share or Return				Compensatory Services, or Cash Revenue
							Harvested		Unharvested		
					Acres	Bu. Harvested	Acres	Bu.	Acres	Bu.	
Lee, O.	SL-48-52	C-1	Millet	20	22	440			11	220	
Skroch, T.	SL-49-52	C-3	Corn	20	31	620					
			Millet	10	8	80			19	190	
			Wheat	5	28	140			23	115	
Thornberg	SL-50-52	C-2	Oats	55	15	625			10	550	

Summary of Crops Grown:	Crop	Acreage	Permittee's Share Acres	Permittee's Share Bushels	Government's Share Harvested Acres	Government's Share Harvested Bu.	Government's Share Unharvested Acres	Government's Share Unharvested Bu.	Total Revenue $
	Corn	31	31	620					
	Millet	60	30	520			30	410	
Interior Duplicating Section, Wash.D.C.	Oats	25	15	625			10	550	
	Wheat	51	28	140			23	115	

47

Interior—Duplicating Section, Washington, D. C. 34268

DIRECTIONS FOR PREPARING FORM NR-8
CULTIVATED CROPS

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3-1570
NR-8a

REFUGE GRAIN REPORT

Refuge SAND LAKE

Months of October thru December 1954.

(1) VARIETY	(2) ON HAND BEGINNING OF PERIOD	(3) RECEIVED DURING PERIOD	(4) TOTAL	(5) GRAIN DISPOSED OF				(6) ON HAND END OF PERIOD	(7) PROPOSED USE		
				TRANS-FERRED	SEEDED	FED	TOTAL		SEED	FEED	SURP.
Alfalfa	309	2356	2665	1500			1500	1165	165		1000
Barley	1959	775	2734	80		24	104	2530		430	2100
Corn-Ear	388	620	1008	400		160	560	448		148	300
Corn-Shelled	481	140	621	298		35	328	293		150	143
Mixed Grain	664		664	250		122	272	292		292	
Oats	383	879	1262	420		43	463	799		100	700
Rye	20	18	38					38			38
Wheat	238	168	406	40		50	90	316		100	216

(8) Indicate shipping or collection points

(9) Grain is stored at Site # 2 Grain Elevator

(10) Remarks

NR-8a REFUGE GRAIN REPORT

This report should cover all grain on hand, received, or disposed of, during the period covered by this narrative report.

Report all grain in bushels. For the purpose of this report the following approximate weights of grain shall be considered equivalent to a bushel: Corn (shelled)--55 lbs., Corn (ear)--70 lbs., Wheat--60 lbs., Barley--50 lbs., Rye--55 lbs., Oats--30 lbs., Soy Beans--60 lbs., Millet--50 lbs., Cowpeas--60 lbs., and Mixed--50 lbs. In computing volume of granaries, multiply the cubic contents (cu. ft.) by 0.8 bushels.

(1) List each type of grain separately: Corn, wheat, proso millet, etc. Include only domestic grains; aquatic and other seeds will be listed on NR-9.

(3) Report all grain received during period from all sources, such as transfer, share-cropping, or harvest from food patches.

(4) A total of Columns 2 and 3.

(6) Column 4 less Column 5.

(7) This is a proposed breakdown by varieties of grain listed in Column 6.

(8) Nearest railroad station for shipping and receiving.

(9) Where stored on refuge: "Headquarters grainary", etc.

(10) Indicate here the source of grain shipped in, destination of grain transferred, data on condition of grain, unusual uses proposed.

3-1759
Form NR-9
(April 1946)

COLLECTIONS AND RECEIPTS OF PLANTING STOCK
(Seeds, rootstocks, trees, shrubs)

Refuge SAND LAKE Year 1954

Species	Collections				Receipts		Total Amounts on Hand	Amount Surplus
	Amount	Date or Period of Collection	Method	Unit Cost	Amount	Source		
Red Cedar					2000	SCS		

Interior Duplicating Section,
Washington 25, D.C. 84267

3-1760
Form NR-10
(April 1946)

HAYING AND GRAZING

Refuge ...ND LAKE Year 194/54

Permittee	Permit No.	Unit or Location	Actual Acreage Utilized	Animal Use Months	Tons of Hay Harvested	Period of Use From - To	Rate	Total Income	Remarks
Bruns, L. W.	21266	3	100		31.10	7/15/54 to 2/28/55	1.50	46.65	
Dinger, G.	24883	Near 12-13	40		18.75	" "	"	28.13	
Gerdes, H.	21265	3	100		118.96	" "	"	178.44	
Herseth, C.	20158	9	45		34.98	" "	"	52.48	
Herseth, R.	20159	13-14-15	95		18.96	" "	"	28.15	
Koch, H.	20160	1	100		27.59	" "	"	41.38	
Pearson, H.W.	21261	2	40		17.58	" "	"	26.37	
Salling, D.	20157	7	60		55.00	" "	"	82.50	
Scott, A.	21262	5-6	160		123.00	" "	"	184.50	
Stensland, E.	20156	16-18	100		49.50	" "	"	74.25	
Vitense, R.	21264	16	10		5.67	" "	"	8.51	
Wells, H.	21277	Hq.	50		42.00	" "	"	63.00	
			G R A Z I N G						
Crawford, G.	21271	1	160	120		7/16/54 to 11/15/54	1.00	120.00	
Dennert, S.	21278	4G	46	60		" "	"	60.00	
Gerdes, H.	24881	8Gb	300	54		9/1/54 to 11/15/54	"	54.00	
Mitchell, E.	21270	3	320	256		7/16/54 to 11/15/54	"	256.00	
	21280	12G	85	110		8/16/54 to 11/15/54	"	110.00	
Roettele, E.	21279	20G	26	20		10/6/54 to 11/15/54	"	20.00	
Scott, P.	21272	2	150	120		7/16/54 to 11/15/54	"	120.00	
Stensland, E.	24882	7Gb	255	26		10/28/54 to 11/15/54	"	26.60	

Totals:

Acreage grazed 1324 Animal use months 766 Total income Grazing 766.60

Acreage cut for hay 900 Tons of hay cut 566.63 Total income Haying 849.96

3-1760
Form NR-10
(April 1946)

HAYING AND GRAZING

Refuge Tewaukon Year 1954

Permittee	Permit No.	Unit or Location	Actual Acreage Utilized	Animal Use Months	Tons of Hay Harvested	Period of Use From - To	Rate	Total Income	Remarks
				HAYING					
Skroch, T.	21268	H - 3	15		6.3	7/15/54 to 2/28/55	1.50	9.48	
Thornberg, B.	21269	H - 2	15		42.8	" "	"	64.19	
Gelinské,	21267	H - 1	30		20.6	" "	"	30.90	
				GRAZING					
Skroch, T.	21273	G - 2	50	68		7/15/54 to 11/15/54	1.00	68.00	

Totals:

Acreage grazed 50 Animal use months 68 Total income Grazing 68.00

Acreage cut for hay 60 Tons of hay cut 69.7 Total income Haying 104.57