

SAND LAKE NATIONAL WILDLIFE REFUGE

NARRATIVE REPORT

SEPTEMBER 1, 1955 TO DECEMBER 31, 1955

PERSONNEL

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# Sand Lake National Wildlife Refuge

September 1, 1955 to December 31, 1955

## I. GENERAL

### A. Weather Conditions

A summary of weather data for the period September through December for the years 1953, 1954, 1955 is given in Table No. 1 as recorded at the official weather station at refuge headquarters.

TABLE NO. 1

### Sand Lake Weather Data

Month	'53	'54	'55 :	'53	'54	'55 :	'53	'54	'55
Sept.	.28	2.72	.55 :	91	87	95 :	29	30	27
Oct.	.50	.81	T :	85	73	81 :	19	24	20
Nov.	.20	.10	.07 :	70	62	62 :	12	7	-16
Dec.	.30	.20	.10 :	43	39	36 :	-11	1	-31
Totals &									
Extremes	1.28	3.83	.72 :	91	87	95 :	-11	1	-31

The dry fall period was a continuation of the dry summer period. As the table indicates it has been much dryer than the two years previous. At present the outlook for spring moisture is normal.

Our first killing frosts came on September 9, 10 and 11 stopping growth of corn, flowers and late garden plantings. This cold snap was followed by unseasonably warm weather with high temperatures the balance of the month, topped by 95° on September 15. Only .55 of an inch of rain fell during September furnishing good corn picking conditions. Winds up to 80 MPH during the latter part of the month eroded dried out, fall plowed lands in this area.

No measurable amount of moisture was recorded in October. This dry condition provided for little or no green fall browse that contributes so much to goose feed.

With the turning of the calendar to November, winter cold

also came our way. The first week in November the temperature skidded to lows of 17, 12 and 2 degrees marking the first freezeup of the lake.

It was then the weather prognosticators really went to work forecasting the worst winter since the turn of the century. As is usual some warm windy days opened the lake again until the 12th when it froze over to stay. This compares to a final freezeup of November 28 last year. The balance of November remained cold going below zero repeatedly, accompanied by 2" of snow with high winds until we had little snow on the level.

The cold continued throughout December with some relief the last week, when it thawed 3 days in a row. As of this writing very little snow remains on the level, and only a few drifts, marred by accumulated dirt.

In summary the month of September was warm and dry. October remained dry and traditionally chilly. November was unusually cold with a small amount of snow. December continued cold with very little snow.

The forecast of our worst winter in some time seemed to be correct as November showed much cold and some snow. As December continued cold we all began to agree. Then as the last week in December warmed and nearly all the snow disappeared, the "worst-winter" prognosis was squelched.

#### B. Water Conditions

At the start of this period virtually all outlying water holes were dry. However, the lake level held up well. Some shallow areas were reduced to mud flats - a very desirable situation, but the lake level actually remained near normal.

The first freezeup in early November saw the lake one foot below authorized level. When the lake opened up again and the winds had shifted the water around the final freezeup was recorded 3 inches below spillway level, or 1270.76.

At the close of the period the ice measures 23 inches over areas where water depth is sufficient.

#### C. Fires

No fires were reported on the refuge this period.

There was one instance, however, that is a shining example of what some hunters are capable of. One morning while Elmer Pedell was patrolling he noticed smoke coming from a road ditch in an area popular to fence line goose shooters. Upon investigation he found four Aberdeen hunters had developed a chilly



(25 degrees) and had lighted the prairie grass; they were feeding the fire with shell boxes and cartridges. Mr. Podoll was awe-stricken and proceeded to put out the fire, with the assistance of the parlor hunters. The area was dry as tinder and when the hunters shamefully stated they had everything under control, Mr. Podoll unhappily hurried to get some water and saturate the charred remains.

Manager Dill was informed of this misdemeanor and personally informed the <sup>arsenal</sup> about the facts concerning fires of this nature. Hunters can be a strange lot.

## II. WILDLIFE

### A. Migratory Birds

#### 1. Waterfowl

a. Whistling Swans were first noted on October 9th. A pair with three young seen on the above date seemed content, and did not mind our flying low over them for a second look. By October 14th numbers had increased to 18. An aerial census on October 21st revealed 32 swans using the area around the 4-mile grade. The age ratio of these showed 24 adults and 8 young. Swans reached a peak of 79 on October 27. The cold spell on November 2nd forced a movement southward leaving 36 on November 3rd. No record of swans was made after the Nov. 5-6 storm.

The overall ratio of adults to young birds observed was less than one cygnet per pair of adults. This however is not conclusive in that some of the birds considered as adults were probably of non-breeding age. Of the family groups positively identified the ratio was about 2 young per pair. This is about the average age ratio reported at Sand Lake in previous years. Peak numbers present this year dropped off about 25 % from the record high of 105 in 1954.

b. Geese. The resident flock of approximately 300 Canadas including pinioned and free flyers, were the only geese present at the beginning of the period.

The fall migration started on September 15th with the appearance of 150 whitefronts. On September 23rd an aerial census revealed whitefronts had reached their peak at 600. Numbers of whitefronts fluctuated some; however, the numbers recorded on successive counts during the fall showed a slow decrease throughout the month of October to 200 on November 2nd. The weather change on November 2nd was the deciding factor in sending our remaining goose concentrations southward this fall. This species showed up in the bag in rather surprising numbers when compared to the numbers present. This would indicate a steady passing of whitefronts rather than a sharp buildup and decline.

Blues and snows arrived during the week of September 20th. On September 23rd an aerial census revealed approximately 100 blues and snows in the north end of the refuge. A slow buildup to the 1st of October showed slightly more than 200 using the refuge. A big movement was noted during the 1st week of October bringing them to their peak at 9,000 on October 8th. This peak was far below the peak of 35,000 past fall. However, it does compare in some degree with peak numbers and goose use in other drought years such as 1952. Successive counts made throughout

the fall showed total numbers stabilized at approximately 7,000 until the cold snap November 2nd. The remaining 2,000 moved on with the second cold snap November 5-6.

From observations made at feeding sites it was estimated that blues comprised 10 - 15 percent of the population. This is a typical figure for fall populations of blues and snows.

Common Canadas appeared the first week of October. Aerial census data showed small increases to 2,000 by October 15th, representing the peak for this species. A slow drop in numbers during the remainder of October left approximately 1,000 using the refuge when the first November cold front hit. This species is not an important fall migrant at Sand Lake. Figures from previous years indicate that no great concentrations of this species have been recorded at Sand Lake. They represent a very small percentage of the hunters' bag.

The Richardson's migration was first evidenced by the arrival of 200 on September 25th. A buildup the latter part of September brought numbers up to 2,400 by October 1st. An impressive wave the first week in October raised the count to the 13,000 peak level on October 8th. A rather rapid decline to 7,000 was evidenced by October 21. The population held steady for approximately 10 days then took another drop the latter part of the month.

The increase in peak numbers was welcomed in view of the steadily declining Richardson's population over the past five years. (See news article attached.) The status of the Richardson's goose at Sand Lake is reported separately.

Goose numbers (all species) reached a peak of 24,000 on October 8th. The peak had been reached and a downward trend was underway when the hunting season opened October 16th. Drought conditions coupled with the late opening date shortened the season considerably for hunters in this area. A discussion of hunting and hunter kill information is given under Section VI - D.

#### C. Ducks

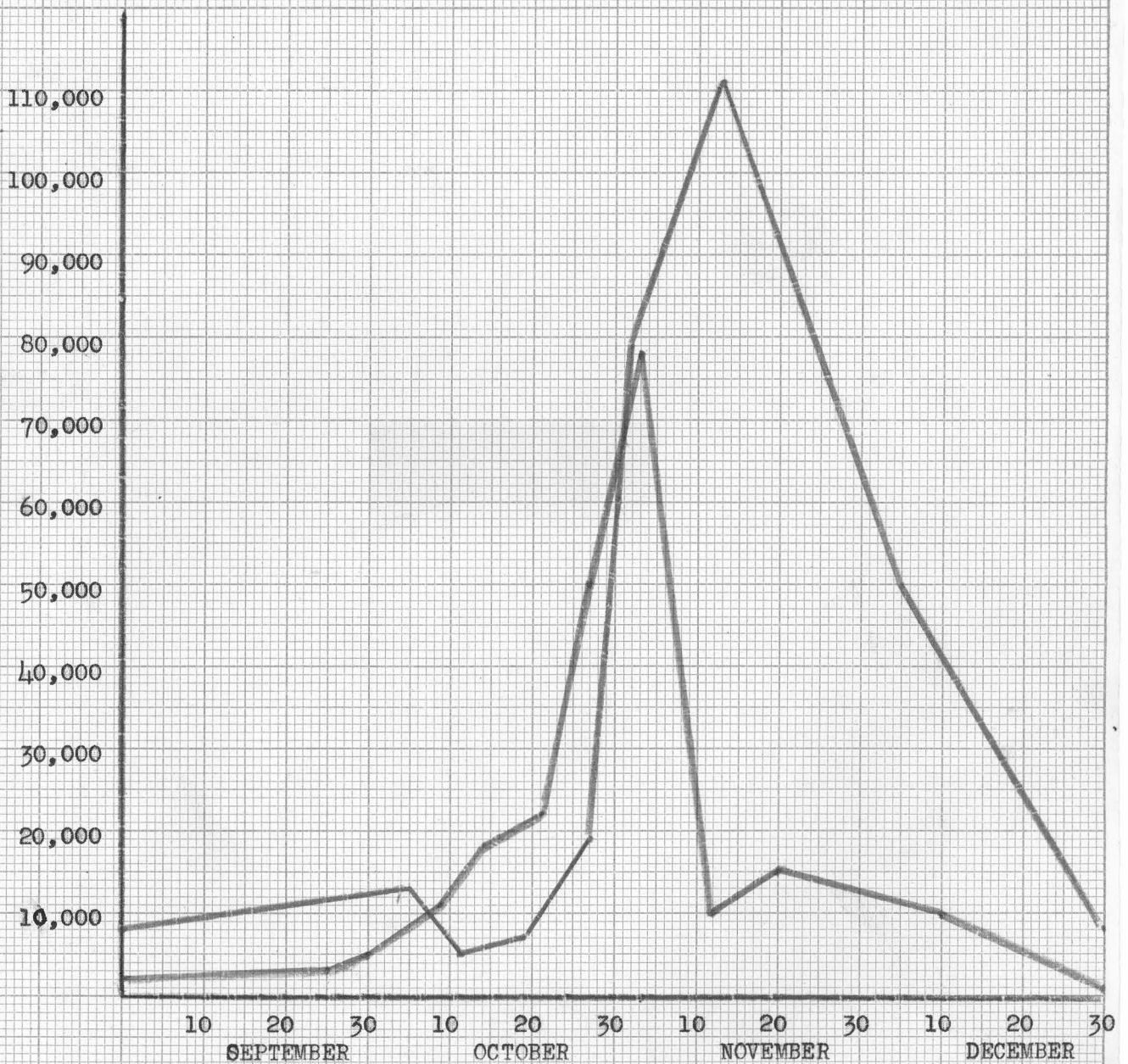
At the beginning of the period the refuge duck population, which comprised mainly summer residents, was static. A very small migration of pintails during late August had moved on leaving only the summer residents plus a few hundred migrant mallards. Mallards increased to 2,500 by mid-September.

Blue-winged teal, gadwall and shovellers showed some increases by the middle of September to 800, 600 and 300 respectively. On September 25th an aerial census showed a decline in all species. By October 1st the migration was on. A total of

FIGURE II  
FALL DUCK POPULATIONS  
(All Species)  
SAND LAKE REFUGE

— 1955

— 1954





11,000 ducks, including 8,000 mallards, were noted on this date.

Duck numbers increased steadily during the month of October. On November 1st approximately 78,000 ducks were using the refuge, of these 75,000 were mallards. Shovellers, green-wings, gadwalls and pintails comprised the major portion of the other 3,000. The November 2nd cold front rapidly dispersed the ducks, leaving about 10,000 in small open-water holes on the lake. Some movement was noted again on November 20th resulting in a slight increase in numbers as the weather moderated. A steady decrease in ducks was noted throughout December. At the close of the period only one open water hole remained with about 500 mallards using it.

Mallards consistently make up the bulk of the fall migrants at Sand Lake. A wide variance is noted between years; however, the reduced number of mallards this fall is believed to be a direct result of the drought conditions prevalent throughout the area. As previously reported, this section of the country experienced a tremendous loss of nesting birds as a result of the drought conditions in the spring. This condition was somewhat alleviated by early summer rains. But late summer and fall again presented extremely dry conditions.

#### D. Coots

At the beginning of the period only the 350 summer resident coots were using the refuge. Coot activity during the year 1955 was noticeably reduced from other years. Considering the very dry conditions as adversely affecting other waterfowl species this spring, leaves some doubt as to the reason for a reduction in coot numbers. No appreciable refuge coot-nesting habit was affected by the drought, yet they showed the same 60% reduction in nesting birds as exhibited by other species of waterfowl. We can offer no reasonable explanation for this phenomenon.

Fall populations showed evidence of a movement into the area on September 18th. A rapid increase brought peak numbers of 1200 on October 1st. This number was present on the area until a sharp decline on October 12th left approximately 50 remaining. No records of coot were made after October 22nd. In previous years the coot population use has been eight to nine times as great.

#### E. Other Water and Marsh Birds

White pelicans were abundant during the first part of the period. The peak of approximately 2,000 was noted on September 6th. This number, while considerably larger than the fall of 1953, has not returned to the impressive numbers present in 1952. Fishing was good on bullheads and perch as evidenced by the rather "full in the face" look worn by most individuals observed.

Double crested cormorants also had good pickings on the

refuge. Numbers increased to 1,800 by September 2nd. As with the pelicans, this represents some increase over the low of 1953 but does not approach the remarkable fall of 1952.

Western Grebes while having a successful nesting season did not buildup appreciably during the fall. The pattern of migration got back to normal this year with most all of the individuals going south about mid-October. Last fall many remained into November, a rather odd happening at this latitude.

Pied-billed and eared grebes were noted occasionally up to mid-October.

#### F. Gulls, Terns and Shorebirds

One hundred thousand Franklin's gulls were estimated in the vicinity of the refuge on October 3rd. A trail of these insect pickers followed behind neighboring fall plowing operations like a cloud of bees. While no serious effects of locusts were recorded the gulls had a plentiful supply to work on. It was rather comical to see some gulls so stuffed they could hardly take wing, with kicking feet still emerging from their mouths. Herring and Ring-billed gulls were seen frequently during the first half of the period.

No large concentration of Dowitchers was noted this fall. In 1954 large numbers of dowitchers were recorded during October. Greater and Lesser yellowlegs were both seen in small numbers until mid-October. Wilson snipe were seen occasionally during October. A movement of Avocets was noted on an aerial count of the refuge September 30th.

#### 2. Food and Cover

Food and cover were abundant for fall populations of waterfowl this year. The amount of cultivated crops left in the field for waterfowl use is dependant on several factors. The numbers of waterfowl using the refuge during the fall migration period varies considerable from year to year. In order to furnish an adequate food supply our crop management is based on average fall populations. Winter food requirements of deer and pheasants are also taken into consideration when determining the amount and location of food to be left in the field. Waste from grain left untouched by fall waterfowl populations is negligible in view of the large numbers of spring migrants. (i.e. upwards of 500,000 blues and snaws.) Despite smaller numbers of waterfowl using the refuge this fall, the major portions of crops left in the field were cleaned up.

An abundant crop of sage pondweed was available throughout the migration period. Extreme dry weather limited the green

browse to the marsh margins and a few ~~sprouted~~ rye fields. This probably had an effect on the close use of millet and barley fields where some small shoots of green plants were to be found along with the grain.

In general small grains were used ahead of the corn, <sup>This</sup> is the usual pattern. During the first half of October geese moved about freely using all parts of the refuge and some privately owned fields for a radius of 15 miles. After the opening of the season on October 16th the goose use was restricted to refuge lands in a pattern similar to other years. Ducks made use of aquatics until the latter part of October, when peak numbers occurred. Then a shift to refuge corn fields and adjacent stubble fields was noted.

### 3. Botulism

None noted

### 4. Lead poisoning

No evidence of lead poisoning was noted. Some scattered carcasses found along the marsh edge were believed to be cripples slanted back into the refuge to die as the result of fence-line hunting. In most cases only parts of the remains were left intact.

## B. Upland Game Birds

### 1. Populations and behavior

a. Ring-necked pheasants showed up in large numbers on the refuge this fall. The population has been increasing steadily since the bad winters of 1949 and 1950. The population, while not in proportion to concentrations prior to the "big blizzard," is showing significant increases each year. A 3 week open season in this section of the state this year did not adversely effect the population in the vicinity of the refuge. A ratio of 2.3 hens per rooster was noted from Christmas Bird Count data. An unusually cold November and December has kept pheasant activity to a minimum. The lack of snow has made all forms of food readily available, and no serious winter losses have been incurred.

b. European partridge are conspicuous by their absence. Only one record of this species using the refuge early in October makes their prospects for recovery look even poorer. This represents a further loss in this diminishing species that is rapidly becoming scarce in this area.

c. Grouse. The only records of sharp-tail and pinnated grouse were made during late December. It appears, from records

of previous years, that the refuge serves mainly as a wintering grounds for small populations of grouse in this area. The abundance of cover afforded by our shelterbelts and marsh vegetation would undoubtedly be an attraction. The wide variety of natural and cultivated foods available could sustain sizeable populations of grouse.

## 2. Food and Cover

Upland game food, both natural and cultivated, was abundant during the period. The relatively open winter to date has allowed maximum use of natural foods. Upland food requirements are taken into consideration when crop divisions are made. Cover for upland birds is no problem during normal winters. Dense marsh vegetation adjacent to feeding sites is adequate for cover unless prolonged storms and snow drift it under.

## 3. Disease. None noted.

## C. Big Game Animals

### 1. Populations and Behavior

The white-tailed deer is the only big game animal numerous enough to be mentioned at Sand Lake. An occasional record of a mule deer is made during the course of a year, but none are known to be permanent residents on the refuge. The population of 200 estimated during this period is based on an estimated rate of reproduction applied to last winters census figures. Our annual census of the big game population is usually done in February or as soon as sufficient snow cover permits counting from a plane.

No open season was set for this section of the state this fall. Information received from farmers, and our observations on the refuge indicate a fast recovering herd. It may be advisable to recommend a refuge hunt the fall of 1956 if the state game commission doesn't see fit to open this section of the state. On areas of this size and nature a deer population in excess of 400 animals makes serious inroads on shelterbelts and crops if not controlled.

### 2. Food and Cover

Food and cover are abundant on the refuge during the summer months. The winter food supply is the limiting factor as the herd reaches the point of overbrowsing shelterbelts and tree plantings. Some corn is left standing along shelterbelts margins to balance out the winter food supply. This amount must be in accord with the degree of browsing to be tolerated so as not to concentrate deer from the surrounding area at any one location. As previously mentioned a thinning of the population



may be necessary in 1956 if the present rate of increase continues.

3. Disease. None noted.

D. Fur Bearers and Other Animals

1. Raccoon numbers appear to have been effectively controlled the past two winters. A serious problem existed from an overpopulation the past few years. Concerted efforts by share trappers has resulted in the removal of nearly 800 "coon", the past two winters. This fall a mopping up operation began to show the desired results.

To the end of the period less than 200 "coon" have been taken, with little prospect of finding any more. Inclement weather during November and early December kept trappers and "coons" home by the fire. A few weeks of warmer weather allowed almost a complete coverage of the area by the end of the period. Future operations will be aimed at keeping raccoon numbers down.

2. Mink are still fairly abundant despite good numbers being harvested each year. The population was estimated at 100 this fall. Twenty-four have been removed by share trappers to the end of the period.

3. Striped skunks are present but not numerous for an area of this size. Trappers kill skunks if contacted. However, no special efforts are made to reduce their numbers. Approximately 35 skunks have been destroyed this fall. This is about the average number removed while trapping raccoons.

4. Red foxes are seen quite frequently throughout the year both on and adjacent to the refuge. An open season and a \$7.50 bounty has receded the number of foxes. The refuge population varies some as to season of the year. Winter months bring more foxes into the heavy cover on the refuge. Trappers have been successful in removing yearly increases from the refuge. A rather heavy pressure is brought to bear from local hunters in view of the substantial bounty. The net result is a fairly stable fox population. Fourteen foxes have been removed from the refuge during the period.

5. Beaver numbers have been maintained at a safe level. Approximately 35 beavers were using the refuge at the beginning of the period. To date, through limited harvesting operations, no problem has arisen from beaver damage. Five beavers have been removed during the period.

6. Muskrat numbers have been increasing slowly to the point where a limited harvest was recommended this year. A house count

made in November showed the population to be approximately 1500. The removal quota was aimed at topping off the population to reduce losses normally incurred through predation and freezeout. Inclement weather has kept trappers from completing the recommended harvest quota thus far. A total of 83 muskrats have been taken to the end of the period.

7. White-tailed jackrabbits and cottontails are quite abundant. Plantings in shelterbelts have reached the stage where rabbit damage is not significant. Mass rabbit hunts in the area adjacent to the refuge allows room for expansion of refuge populations. As many as 300 jacks are removed in a day by community hunts sponsored as fund raising activities. Jacks are presently bringing 60¢ apiece in this area.

8. Box Squirrels are tolerated around most building sites and in shelterbelts. Oddly enough there is an open season on them but no demand for their succulent little carcasses. Local people class squirrels eaters with monsters. We know better.

9. Rats and mice are being successfully controlled at building and grain storage sites with warfarin. Some new bait boxes constructed from down spout pipe, as directed by the Predator and Rodent Control Branch, have proven very effective in keeping the bait intact. No problems have arisen from damages incurred by these species.

#### E. Predaceous Birds

Roughlegged hawks and Horned owls are common winter residents. No significant amount of predation was noted. An occasional Snowy owl, Cooper's hawk, golden eagle and prairie falcon were noted during the fall period. These species usually appear in December and drift on through the area by the end of the period. No problems exist from the small numbers ordinarily present.

#### F. Fish

Fish populations at Sand Lake have been static for some time. Game fish are stunted and overpopulated. Rough fish are too numerous for a proper balance in the population. A listing of species and relative abundance are given on R.R. 6 enclosed with this report.

### III. REFUGE DEVELOPMENT MAINTENANCE

Most important work in this category during the period was the completion of the two water structures - one in the Mud Lake unit at Sand Lake, and the other in the White Lake unit at Tewaukon. From the standpoint of marsh management for waterfowl, these are the two most significant happenings on both areas since their establishment. They will permit manipulation of water levels which, in turn will allow marsh development and improvement that has been sorely needed for years.

The details of the work have been reported separately. Both jobs progressed satisfactorily except that Engineer Dick Johnston was required to "sit on" the contractor at Tewaukon to get the job done on time and up to snuff. Our thanks to Dick and the Branch of Engineering for a swell job.

With the assignment of Leo Hirsch to Washington for training, two of the Sand Lake personnel went to Lake Andes and moved all the equipment and property to Sand Lake. Routine administrative duties for Lake Andes were subsequently assumed by Sand Lake personnel.

The bank slopes opposite the rip-rap job completed this summer were harrowed down and seeded with broms, alfalfa and other soil binders. This was just north of the Columbia Recreation area.

Approximately one-half mile of refuge trail was built with the elevating grader (under contract) which represented a continuation of the trail from Hanson's Point to the east end of Silo Bay. This was later graded. The washout opposite the Hereth Ranch was repaired and 3/10 of a mile of new trail finished off. We now can travel from the Weismantel sub-headquarters to State No. 10 entirely on refuge trails as a result of this work.

*Constructed*  
Contracted (for account) 6 miles of fence on four grazing units near the north end of the refuge. This four wire fence consisted of three steel posts alternated with one wooden post (treated). The entire 48 miles of boundary fence was gone over and repaired where needed. In connection with this work, 37 refuge signs were replaced.

Set up a banding shack at Hanson's Point and set two nets. Baited and repaired banding equipment.

Dug 4,000 lineal feet of level ditch with the ends tied into Mud Lake which permitted burning off the islands formed in the middle for goose use in the spring. The work was done with a dragline by contract.

Trip to Lemmon, S. Dak. after surplus Reclamation Service

equipment and building. Salvaged one 21 by 56 foot quonset hut and hauled back three truck loads of miscellaneous equipment together with this building. Prepared complete sketches for re-assembling the building.

The usual run of maintenance on buildings: bathroom set installed at quarters No. 3, tile in utility room quarters No. 1, remodeled the lab to make more office space at headquarters plus renovation of all heating systems during fire-prevention week in October.

A major overhaul was performed on 1953 Chevrolet pickup; the 2-ton Bee was cleaned up and painted and a new rack made for hauling rock. Regular winter maintenance and overhaul was done on all equipment.

### B. Plantings

1. Aquatic and Marsh - None.
2. Trees and Shrubs - None.
3. Upland and Herbaceous

A mixture of broom grass, alfalfa and rye seeded at 22 lbs. per acre on 14.5 acres. Seeding was done on approximately one-half acre of bank, sloped and rip-rapped at the toe to stabilize the upper portion of the slope. A borrow pit area, approximately 14 acres, was dressed with black dirt and seeded for use as part of a pasture unit. This pasture unit will be drilled with a 50-50 mixture of alfalfa and native and tame grasses this spring.

4. Cultivated Crops - None.

### C. Collections None.

### D. Receipt of Seed and Nursery Stock

Alfalfa and broom grass seed were received during the period as a result of our agricultural rotation plan and a cooperative agreement with the Soil Conservation Service for harvesting of native and tame grasses. A total of 1,565 pounds of alfalfa seed has been cleaned and delivered by permittees as part of the government share of the alfalfa seed harvest. Broom grass seed, 6,680 pounds as refuge share, was harvested by the S.C.S. district, cleaned and delivered to refuge headquarters. Seed is to be used in reseeding areas on the refuge and for shipment to other refuges as requested.

### E. Weed Control

Weed control operations reached an all time high at Sand

Lake during 1955. Previously weed control work has been limited by methods available for applying chemicals and sufficient funds to do a complete job. This spring our new Ford 116 tractor equipped with half-tracks and a Sherman transmission was put into use with a 210 gallon tank trailer and Hanson broad-jet sprayer. This type sprayer operates on pressures from 0 - 150 pounds, developed from a pump mounted on the PTO shaft, and effectively covers a 45 foot swath. With this sprayer and half-track equipment most inaccessible marsh areas can be reached. Prior to the receipt of this equipment, only areas readily accessible with a Jeep truck could be treated. A second sprayer of this same design was rented from a neighbor at 10¢ per acre. The refuge owned John Deere A used with the rented sprayer handled the high ground work, thus freeing the Ford rig to work in the marsh, to speed up operations.

Using this equipment an average of 18 gallons of liquid per acre was applied, increasing the penetration of the chemical into heavy vegetation. This proved to be much more effective penetration than accomplished through aerial work where 1 - 2 gallons to liquid per acre is a maximum. Disadvantages of this equipment are that 35-40 acres per day is maximum for coverage, while working in heavy vegetation. Time required to travel to and from a water supply plus loading time takes up a considerable portion of the day. Even being able to stop in the marsh and pump the tank full is time consuming when spraying in some of the remote fields.

Perennial Sowthistle (Sonchus arvensis) and Canada Thistle (Cirsium arvense)

The first application to these species consisted of .83 lbs. per acre of 2,4-D ester on 1368 acres during June and July. The Hanson broad jet sprayer was used in applying the chemical with a liquid medium of water at 18 gallons of solution per acre. Canada thistle is grouped in this operation although only 10 acres of the total represents Canada thistle. Sow thistle is the major noxious weed as will be noted from acreage figures.

First Application:

Acres sprayed	1368
Rate of application	.83 lbs per acre
Total acid used (2,4-D ester)	330 gal (1132 lbs.)
Cost of acid	\$930.74
Labor cost (WAZ 283.60, Regular 156.42)	440.02
Operation Cost	87.50
Sprayer days	38
Acres per day	40
Sprayer rental (330 acres @ 10¢)	33.00
Total cost of application	1491.26
Cost per acre	\$1.09



The second application to these species was curtailed for two reasons. (1) The lack of funds available and (2) A change in land use practices lessening the need for a second application.

Land to be put under grazing use this next spring was bypassed on the second treatment because of control results obtained from pasturing perennial weed patches. The first application succeeded in killing the seed stalks in time to prevent the maturing of viable seed. Spring use by livestock should greatly reduce the growth of new plants and eventually kill out or control the patches in grazing units.

#### Second Application:

Acres sprayed	300
Rate of application	.75 lbs. per acre
Total acid used (2,4-D) ester	60 gal. (240 lbs.)
Acid cost	\$216.00
Labor cost (regular 60 hrs @ 1.58)	\$94.80
Operation costs	\$15.00
Liquid per acre (water)	18 gal.
Sprayer days	7.5
Acres per day	40
Total cost of application	\$325.80
Cost per acre	\$1.08

#### Totals for Treatment of Sow and Canada Thistles

Acres sprayed	1668
Total acid used	1372 lbs.
Total cost	\$1817.06
Av. cost per acre	\$1.08

#### Results:

First applications succeeded in killing 100% of parent plants covered. Some skipping was noted, estimated at less than 1%. The parent seed stalks treated did not produce viable seed this year. Stalks were easily pulled up and showed signs of brown discoloration and general dryness from 1 to 2 inches along the underground rootstalk.

The second application was aimed at the winter rosettes, to further reduce the food reserves of the rhizomes and prevent budding in the spring. Patches examined proved the application to be effective in that rosettes were withered and showed no signs of living tissue for a short distance along the rootstalk. It took from 10 days to 2 weeks for any significant changes to show at either application.

changes

Prognosis:

This of course is still a matter of conjecture as we have no way of determining how much the rootstalk has been weakened. It will of course, be the beginning of the end if follow up treatment is made at the proper time and concentration. From information available to us it seems that from 2 to 3 years of concentrated effort will reduce these species to the non-problematical stage.

Perennial pepper grass (Lepidium draba) This is the most persistent and difficult of perennial weeds to contro l. One application was given to an 11 acre patch as described below. This area was then plowed, disced and seeded to a mixture of crested wheat grass and kentucky blue grass. Subsequent observations during the year showed no sign of this plant reappearing. A small area around the buildings at site # 3 was given a second application in the fall at 30 lbs per acre. This area was so small that no cost figures were worked up regarding the treatment.

First Application:

Acres sprayed	11
Rate of application	1.35 lbs per acre
Total acid used	4.5 gals (14.85 lbs.)
Cost of acid	\$10.08
Cost of Labor (Reg 7 hrs @1.90)	\$13.30
*Operation Costs	\$1.75
Liquid per acre (water)	18 gal.
Spraying time	7 hours
Total cost of application	\$25.13
Cost per acre	\$2.28

\*This work was the first done with the new equipment and necessarily required some time in adjusting and testing, hence the increased time and labor costs.

Results:

This has been discussed somewhat in the preceding paragraph. The only information available to degree of kill was made from the small patches around the building site where the second application was made. After the first treatment a rather rapid change took place in withering of the top portions of the plant. This indicates an over dose of acid was applied, and resulted in burning off the plant with little or no damage to the root system. As previously mentioned this pertains to the small patches. Too much acid was applied in trying to effect a light treatment over a small area. The majority of the acreage treated, or the plowed portion, showed a good penetration of the root system and no re-appearance of new plants to the date of plowing. The second

treatment on the small patches was intended as a soil sterilant. Information as to the effectiveness of this treatment in sterilizing these areas will be apparent in the spring at the time regrowth normally occurs.

#### Prognosis:

The majority of this species occurring in the plowed land will be treated subsequently with recommended concentrations. No treatment of this nature is 100% effective on this species and must be followed up for at least two more years before definite results can be expected.

#### Leafy spurge (Euphorbia esula)

Previous control work on this species has managed to keep it within reasonable limits. Applications, as experiments in the fall of 1954, using both borax and 2,4-D ester have shown that the latter is the more effective soil sterilant, where applied at 30 pounds per acre. The advantages of using this chemical are found in its simplicity of application and the penetration achieved in soaking down the areas with a considerable amount of liquid as the vehicle. First application data given below reflects the fact that cost figures are not significant when dealing with small scattered patches. Time involved in traveling and locating isolated plants necessarily increases the labor costs over the actual cost of spraying. The first application was applied with the Hanson broad jet apparatus using a 30 foot hose and hand nozzle attachment. This first treatment was made the first week in June.

#### First Application

Acres sprayed	2
Rate of application	.75 lbs. per acre
Acid used (2,4-D ester)	.8 gal (2.66 lbs.)
Cost of acid	\$2.50
Cost of labor (WAB 12 hrs @ 1.25)	\$15.00
Cost of Operation	\$3.00
Liquid per acre (water)	50 gal
Total cost of application	\$20.50
Cost per acre	\$10.25

The second application was made late in September. The treatment was 30 lbs. of 2,4-D ester per acre, applied with a small hand operated pressure sprayer and a back pack pump. Labor costs were again excessive in that a great deal of time was expended in seeking out all isolated plants and small patches. Two regular personnel receiving a higher hourly wage were required to do this work.



## Second Application

Acres sprayed	2
Rate of application per acre	30 lbs.
Acid used (2,4-D ester)	15 gal (60 lbs.)
Cost of acid	\$54.00
Cost of labor (Reg 2 1/4 hrs @ 1.90 2 1/4 hrs @ 1.58)	\$83.52
Operation Cost	0 (hand sprayed)
Liquid per acre (water)	100 gal.
Total cost of application	\$137.52
Cost per acre	\$68.76

## Results:

A rather rapid disintegration of spurge plants after the initial spraying indicated that too much acid was applied to individual areas even though the rate was established at .75 pounds per acre. As mentioned this first treatment was done with the broad jet unit equipped with a hand nozzle. Evidently the size of each area was over estimated resulting in the acid being concentrated on individual plants rather than evenly dispersed over the calculated area. This of course is a waste of time and acid. The second treatment was therefore accomplished with the hand sprayers and was designed to saturate the soil with the acid water mixture to effect sterilization. Results of this are not fully evaluated because the tops of the plants disintegrated rapidly from this heavy treatment without such apparent effect on the roots. In the spring when the plants begin to grow a sufficient quantity of acid should be present in the immediate area of the root to prevent its normal function. This was the case with sample plots sprayed with this concentration in the fall of 1954. On these samples only one living plant was observed during 1955.

## Prognosis

We may be overly optimistic in assuming we have put an end to these spurge patches by attempting to sterilize the ground. We know however that the percent of regrowth is small enough to considerably reduce this species in amount with each successive treatment of this nature. Eventually these areas can be eliminated. A further problem exists in locating new infestations and treating them promptly before they reach the costly stage. A relatively new chemical, D-B granular, used as a sterilant for small patches should prove effective in treating any small infestations. A single treatment of this compound is supposed to be sufficient for eradication.

## Summary of Control Activities

Total acreage covered - 1683  
Total costs incurred - \$2000.21

These cost figures do not represent expenses incurred in purchase of equipment, technical assistance and vehicle operation other than spraying equipment.

We believe this expenditure of funds for noxious weed control during 1955 has been justified in lessening the possibility of more severe infestations on refuge croplands and by improving our public relations in the community. When the refuge control activities were made known, a greatly improved attitude and increased interest was noted among permittees and officials of Brown County. Better cooperation of permittees with respect to weed control has already made itself apparent through requests for information concerning purchase of equipment and methods of application. This program cannot however, be justified unless it is followed up by similar funds and efforts to further reduce noxious weeds. Costs for subsequent treatments will diminish according to intensity and thoroughness required.

#### IV. ECONOMIC USE OF THE REFUGE

##### A. Grazing

Grazing use has increased considerably during the year 1955 as provided for in the revised grazing use plan. This past year sixteen permits were in force covering 1863.53 animal use months. This represents an increase of 11,000 animal use months over grazing use prior to the development of the revised plan. The present plan, first put into force in 1954, did not show the proportions of the program until this past year. The period of use was July 16 to November 16 on thirteen of the sixteen permits. Three permits were issued for units to open on May 1 with continuous use to November 15. These early opening dates were set in order to evaluate the effects of grazing use during the different periods of the season. Some small deviations were necessary in the length of the grazing season due to the dry, cold weather conditions during November. Operators found it essential to remove livestock from pastures when watering facilities dried up or froze over.

Four new units were fenced during the period permitting limited use. At the present rate of development another two years will complete the proposed units which will provide approximately 3000 animal use months.

A field examination of grazing units, was made in December to determine the degree of use and evaluate pasture conditions. A range technician for the Soil Conservation Service assisted refuge personnel in making this inspection. Information obtained from this inspection and suggestions made by the S.C.S. will be incorporated into the final plans to be developed for the 1956 grazing season.

##### B. Haying

Haying permits were issued to eleven permittees harvesting 516 tons of wild hay. In accordance with the economic use plan developed in 1954, hay lands are being converted to pasture as funds become available for fencing and watering facilities. The 50% decrease in hay harvested this year as a result of the change in land use. Drought conditions prevailing during the early spring did not seriously affect the hay crop. Haying was completed in record time under ideal conditions for curing and storage. Receipts from hay harvested during 1955 totaled \$774.30.

##### C. Cultivated Crops

A total of <sup>2,871</sup>~~2,871~~ acres of cultivated crops were planted on the refuge during 1955. Cultivated crop acreages have increased steadily since the development of the refuge. A program of reclaiming non-use areas suitable for agricultural purposes as the

need arises, and funds become available, has increased the productive capacity of the refuge by 1089 acres since 1950.

The governments share of cultivated crops was <sup>856</sup>~~1000~~ acres in 1955. This represents a larger proportion in acreage than is accounted for under the crop division system because crops such as alfalfa are divided on the basis of  $1\frac{1}{4}$  acres of grain for one acre of hay. The refuge does not utilize alfalfa hence the share is taken in grain. Food requirements of game populations accounted for <sup>637</sup>~~200~~ acres of the government share left in the field. The remainder of the crops were harvested and delivered to the refuge elevator. A complete listing of crops and amounts is given on NR - 8 included at the end of this report.

#### D. Other Uses

One permit was issued for the keeping of 150 bee hives at 15¢ per hive per year.

#### E. Fur Harvest

An aerial census of muskrat houses and beaver lodges was made on November 3. Information pertaining to furbearers was evaluated and recommendations subsequently approved by the regional office. Below is a table showing the recommendations and removals to date.

<u>Species</u>	<u>Est. Population</u>	<u>Recommended Harvest</u>	<u>Removals</u>
Mink	100	65	24
Muskrat	1500	500	83
Beaver	35	15	5
Weasel	100	Unlimited	0
Skunk	400	"	35
Raccoon	600	"	186
Badger	100	"	5
Red Fox	50	"	14

The refuge was divided into two units, with the provision that each permittee may have one helper to assist him if desired. A division of 50-50 on muskrat and mink was recommended and approved. Due to costs incurred and the low demand for other species a trapper take all division was recommended.

Inclement weather hampered further removal work until after the end of the period. The government share to date has been 12 mink and 40 muskrats, the remainder to be divided at the end of the season.

## V. FIELD INVESTIGATIONS

### A. Banding

Banding during the period was limited to a special effort to band Richardson's geese. A great deal of difficulty was experienced, during the period of greatest Richardson's use, in getting the net trap to operate properly. By the time we found the trouble to be faulty ammunition the period for best trapping success had passed. Richardson's comprised 152 of the 176 geese banded during the period. In addition to these geese banded we were able to replenish our captive flock with 15 immature common Canadas. Attempts made during the latter part of the period proved successful in returning twelve adult common Canadas to the captive flock. These had previously been pinioned but regained the power of flight. No ducks were banded this period.

### B. Captive Goose Flock (status report)

The history of the present captive goose flock dates back to October, 1952 when 26 young common Canadas were captured with the cannon net trap at Sand Lake, pinioned and put in the hospital pen. These geese were kept in the hospital pen until the end of March, 1953 when they were released into the display pool pen at refuge headquarters. In November of 1953 an attempt was made to herd these 26 yearling geese into the smaller hospital pen. At this time it was discovered that these birds had regained the power of flight. Later in 1953, 23 common Canadas were captured with the net trap and placed in the hospital pen. Twenty-one of these captured proved to be of the original 26 placed in the pen in 1952. The remaining five of the original stock plus two other common Canadas remained in the vicinity of the hospital pen during the winter of 1953-54.

On February 26, 1954 the 23 geese picked up late in 1953 were returned to the display pool pen. At this time 32 additional common Canadas, picked up during the winter of 1954, were kept in the hospital pen after being pinioned. The 7 flyers that had remained outside the pen during the winter of 1954 rejoined the 23 that were released from the hospital pen in February 1954. On April 22, 1954, 13 of the 32 common Canadas being held in the hospital pen were transferred to the Tamarac Refuge. During the fall of 1954 30 young common Canadas were received from Swan Lake Refuge. These were placed in the hospital pen and not pinioned until the spring of 1955. During the winter of 1955 one of these birds died. The 23 pinioned, plus 7 free flying birds were present in the display pool pen during the winter of '55.

During the winter of 1955 snowdrifts accumulated adjacent to the fence in the display pool allowing the 23 pinioned birds to walk back and forth over it. In this group of pinioned birds held in the display pool were eight known pairs. None of these



had successfully nested in the pen. On April 6, 1955 the remaining 29 birds (received from Swan Lake) along with 15 other common Canadas captured the fall of 1954 were pinioned and placed in the north portion of the display pool pen. This then placed 23 pinioned birds in the south portion of the display pool pen, 44 in the north portion in the spring of 1955. During the summer of 1955 some of these birds escaped from both pens either by regaining the ability to fly or through some breaks noted in the fence.

During October 1955, 15 young common Canadas were trapped at Sand Lake, pinioned and placed in the south portion of the display pool. This then would place our total flock of pinioned common Canada geese at 82 individuals. However, when we herded the geese from the display pool pen into the hospital pen in December 1955, we had a count of 47. On January 6, 1956 12 geese were picked up with the cannon net trap set up in the display pool pen. These 12 birds were free flyers at the time. Upon examination of these birds it was noted that 5 were banded and pinioned in January 1953, 2 were banded and pinioned April 6, 1955, the remaining 5 were not marked. At this writing there are 16 free flying geese frequenting the area around the display pool pen. Attempts to capture these have been unsuccessful to date.

We have been waiting until the remaining free flyers are captured to make a check of all geese and band numbers in the hospital pen to determine their origins. We have now in the hospital pen 59 pinioned common Canadas. When these are added to the 16 free flyers frequenting the display pool pen we arrive at a total flock of 75. This indicates a loss of 7 birds since the present flock was established in 1952. A summary of the status of our captive goose flock will be included in subsequent narratives.

## VI. PUBLIC RELATIONS

### A. Public and Recreational Uses

The Sand Lake and Hecla recreation areas were used slightly during the period. The Sand Lake recreation area is closed during the waterfowl season limiting its use to the month of September. The Hecla area was used moderately for short periods during the period by fishermen. No other recreational uses were noted within the boundary, during the period however, the hunter days of recreation the fence line shooting provided is to be considered. This subject is fully discussed under hunting. The following is a breakdown of estimated use by the public during the year 1955.

	Visitor Days
Hunting*	8,299
Fishing	1,500
Miscellaneous	4,500
Total	<u>14,299</u>

\*This includes the information available from fence line and adjacent hunting clubs only. No figure is estimated for public hunting use other than the organized clubs in the immediate area.

### B. Refuge Visitors

9/25 E. L. Becker - Region Pilot - Minneapolis, Minn.  
 9/29 C. L. Cadieux - Game Agent - Sioux City, Ia.  
 9/29 E. T. Maltby - Game Agent - Des Moines, Ia.  
 10/18 J. E. Shaeffer - Sportsman - Parker, S. Dak.  
 10/18 Tom Such - Brown Cty. Sportsmen Club - Aberdeen, S. Dak.  
 10/26 Geo. K. Seth - Sportsman - Clarion, Ia.  
 10/26 Cliff Fluver - Sportsman - Clarion, Ia.  
 11/1 Gilbert Ziemann - S. Dak. Publicity - Pierre, S. Dak.  
 11/1 Duke Lanster - S. Dak. Game Agent - Pierre, S. Dak.  
 12/8 Smith & Davidson - Mud Lake Refuge - Bolt, Minn.  
 10/31 - 11/1 Olet Lund - Regional Office, Inspection - Mpls, Minn.

### C. Refuge Participation

10/5 Lutheran Brotherhood Group, Hecla, S. D. - Howard Woon gave talk and showed refuge film to 30 in attendance.  
 10/19 Cosmopolitan Club, Aberdeen, S.D. - Herb Dill gave talk to 30 members present.  
 10/20 Montrose, S. Dak. Sportsmens Club - Herb Dill gave talk about refuges and showed the refuge film to 700 attending.  
 10/25 Presbyterian Church Discussion Group, Britton, S.D. - Howard Woon gave talk on the refuge and showed colored slides to 35 present.  
 11/17 Brown County Farmers Union, Aberdeen, S.D. - Howard Woon showed the refuge film and gave talk to 30 attending.  
 11/30 Jamestown, N. Dak. Lions Club - Herb Dill gave talk and showed

the refuge film to 75 attending.

Manager Dill had frequent meetings with Brown County Sportsmens Club officials concerning goose hunting and public hunting on the refuge.

#### D. Waterfowl Hunting:

Duck season opened as usual on October 1 and continued for the 75 day period through December 14. This represented an increase of 15 days over 60 day seasons allowed the past few years. The actual days of hunting were substantially increased in some sections of the state where duck concentrations are found through mid-December. The longer season did not affect the hunting in the Sand Lake area as duck populations are dispersed soon after the refuge lakes freeze over in November. While not an excellent duck hunting area, agricultural lands around the refuge provide some hunting opportunities.

The goose hunting season opened on October 16 and continued for the 60 day period through December 14. Goose hunting at Sand Lake is limited by the number of days a huntable population remains in the area. This period has varied between 20 and 30 days in the past. This year the later opening date restricted the hunting days to 15 at Sand Lake.

The system for collecting data pursuant to evaluating the hunting pressure and resultant kill was revised somewhat this year. A staggered tour of duty was adopted and a schedule posted on the bulletin board showing the dates and areas to be covered by each employee. The information collected was turned in at the office the following day and posted on a master sheet, providing a running account of hunting activities.

During the fifteen days of active hunting this year 200 man hours were spent patrolling 25.5 miles of fencing collecting the data given in tables A & B.

This distributed the work load formerly imposed on a few employees and increased the volume of information collected. The amount of information obtained under the present system, while complete in its extent, does not include a means of gathering data from outlying areas.

Private and commercial clubs also present a problem in that they do not report fully on their hunting activities. Books are provided by the state for their use in recording hunting information. These books are made available to us for our records. In many instances the books are noted to be incomplete when compared with our figures obtained on spot checks. As this is a very important phase of the hunting at Sand Lake we, have proposed several ways of better obtaining this information. The system



SAND LAKE REFUGE - 1955 FENCELINE KILL DATA

AREAS CHECKED	:	NUMBER OF HUNTERS	:	NUMBER OF CARS	:	COMMON CANADA	:	RICHARDSON	:	BLUE	:	SNOW	:	WHITEFRONT
Koch's Corner	.5	44		2										
Four Mile	.5	256		25				42				1		
Pfutzenreuter	2.3	1345		68		3		167		1		23		
Dennerts	1.0	48		0				11				1		
West Side	6.0	259		21				16						
South End	1.0	56		106		1		30				6		
Public Shooting	7.0	627		3		5		23		1		11		2
Nor. of Spurs	2.5	146		1				5				2		
East of Railroad	.7	118		21				23		2		5		
Tollefsons	2.25	391		2		3		49				17		1
Weismantel	1.75	628		5		5		39		3		12		2
TOTAL CHECKED	25.5	3918		(254)762		17		405		7		78		5
EST TO END OF SEASON				630		2		50		1		9		1
TOTALS				5,310		19		455		8		87		6
Total Geese - including crippling loss of 80 is 655														

TABLE NO. B

## HUNTING PRESSURE AND TOTAL ESTIMATED GOOSE KILL

	GOOSE PER	GOOSE IN	UNRETRIEVED %	UNRETRIEVED	TOTAL	
: HUNTER DAYS	: HUNTER DAYS	: HUNTER BAGS	: OF TOTAL KILL	: GOOSE	: KILL	
Public Hunting along refuge boundary	: 5,310	: .10	: 575	: 14	: 80	: 655
Private and Commercial Hunting Clubs	: 2,989	: .49	: 1477	: 14	: 207	: 1684
Totals 1955	: 8,299	:	: 2052	:	: 287	: 2339
Comparable Data						
1954	16,250		5058		778	5836
1953	14,042		4183		700	4883
1952	15,284		1512		197	1709
1951	12,566		5400		1106	6450
1950	18,020		6590		2399	8989

SPILLS COMPOSITION OF GASES KILLED - 1955

SAND LATE PERIOD

[illegible]

that seems the most practical would be for the refuge to distribute forms to the operators involved and make periodic checks to see that they are properly kept. This could include those places in the outlying areas where no information is available now. A system of this magnitude would entail considerable work, and it is doubtful if it could be carried out to the extent necessary, without additional personnel. The data from books kept by the private and commercial clubs this year is summarized in tables B and C.

Table C showing the breakdown of the kill by species and other tables included with this section are in accordance with previous reporting procedures. The number of hunter days on the fenceline was estimated at 630 for the last 10 days geese were present at Sand Lake. This figure is based on the average number of hunter days expended during previous periods when comparable numbers of geese were using the area. The success ratio of .10 was applied to this in arriving at the geese killed during this period. In determining the number of hunterdays from cars counted along the fenceline, several checks were made during this and past seasons showing the average number of hunters per car to be three. The 11% crippling loss was also determined from information gathered over a period of years.

#### 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. Small numbers of Northern pike were caught weighing 3 to 3½ lbs. Largest reportedly weighing 8 pounds, weighed in Hecla.

#### F. Violations

A. W. Smith, Ipswich, S. Dak. - Refuge Trespass - Fined \$25.00

## VII. OTHER ITEMS

### A. Basement Refuges (District 5, North Dakota)

Dakota Lake refuge was checked each time an aerial census of waterfowl was made at Sand Lake. Three counts made prior to the open waterfowl season in North Dakota showed only 75 mallards using the area. The duck and goose seasons were concurrent in North Dakota this year until November 30. The additional 15 <sup>days of duck hunting were optional in</sup> central flyway states. On October 9 the census showed 100 Richardson's geese on the refuge. With the South Dakota goose season closed until October 15 some residents in the Dakota Lake area felt they were cheated out of their hunting because the birds crossed over into South Dakota for protection. No waterfowl use was noted on Dakota Lake until October 27 when the aerial census showed 200 Richardson's geese and 150 mallards in the area around Ludden slough. The cold fronts moving through this part of the state early in November moved waterfowl populations southward.

Several trips were made to Dakota Lake during the waterfowl season to check posting and observe water levels. Two men spent one-half day in replacing broken and destroyed boundary markers.

Water levels remained near the spillway elevation until the latter part of August. Work was completed in September on the spillway alterations being done by the State Water Commission. The spillway level was lowered 8" to lessen damages incurred by adjacent land owners from flooding farm lands in the spring. This project has been under discussion for several years. The agreement reached was a result of cooperation between the Fish and Wildlife Service and the North Dakota State Water Commission. Funds financing the project were contributed by both agencies with the Water Commission doing the work.

Tewaukon. Water levels at this refuge were not as low as in other parts of the country, for the cloudburst back in July that, with hail, resulted in 100% crop losses, brought lake levels up to near normal. Lake Tewaukon was about a foot below spillway in October.

Waterfowl use of the refuge was about average for ducks, but fewer geese stayed. This was because green browse was brash and dry due to the almost complete lack of rain during the fall months.

Of most importance to this refuge was the completion of the structure for the White Lake unit which will permit re-activating this fine marsh. Plans call for staffing Tewaukon shortly after January 1, 1956, and there are myriad opportunities for developing this excellent area. This means that Tewaukon will lose its "orphan" status which it necessarily has enjoyed while under the

administration of Sand Lake, and will embark on its own as a full fledged refuge.

Frequent trips were made to Tewaukon by Sand Lake personnel to assist the Branch of Engineering with construction - mainly running levels and other surveying work. Much of this was done from a boat which was hauled up from Sand Lake as needed.

Another major item was checking the boundary posting and replacing shot up signs. Two man days were spent on this work.

Maple River. Water levels were the lowest at Maple River that we have seen. Only one small pond in the center of the marsh retained water this fall. Hence, waterfowl use was slight.

Three man days were spent in repairing a hole in the facing on the dam in the Maple River and one man day was spent checking boundary markers. Two cubic yards of concrete were required to repair the dam.

Lake Elsie. This refuge was visited once in September and two man days were spent in replacing shot-up and missing boundary markers.

Storm Lake. This refuge was visited once in September and all boundary markers checked and replaced where needed.

B. Photographs Photographs included with this report were taken by Manager Dill with the refuge camera.

Credits: Portions of III, VII and editing - H.H.Dill  
II, IV, V, portions of III, VI and VII - H.D.Woon  
I, portions of VI, and typing - T.O. Wahl  
NR forms and graphs by Wahl and Woon.

Submitted by:

Herbert H. Dill, Refuge Manager  
January 26, 1956

Approved by:  
Regional Office \_\_\_\_\_

W A T E R F O W L

REFUGE Sand Lake

MONTHS OF September TO December, 19 55

(1) Species	(2) Weeks of reporting period									
	9/3	9/10	9/17	9/24	10/1	10/8	10/15	10/22	10/29	11/5
	1	2	3	4	5	6	7	8	9	10
<b>Swans:</b>										
Whistling							5	13	32	79
Trumpeter										
<b>Geese:</b>										
Canada	200	200	200	200	200	1500	2000	1000	1000	400
Cackling										
Brant										
White-fronted			150	600	500	350	500	200	200	-
Snow	P	P	P	50	100	7650	6000	6000	6000	1200
Blue	P	P	P	50	100	1350	1000	1000	1000	400
Other Richardson	25	25	25	200	2350	13000	12000	7000	7000	1900
<b>Ducks:</b>										
Mallard	900	900	2500	1500	2600	8000	14000	20000	43000	75000
Black			P	P	P	P	P	P	P	P
Gadwall	300	300	600	400	500	700	550	200	1300	150
Baldpate	20	20	150	150	500	600	350	200	900	100
Pintail	350	350	250	150	P	150	400	300	1000	150
Green-winged teal	30	30	200	300	400	500	700	500	1400	500
Blue-winged teal	350	350	800	500	600	450	500	200	200	P
Cinnamon teal										
Shoveler	30	30	300	150	150	450	600	50	1700	P
Wood					P	P	P	P	P	-
Redhead	30	30	50	100	50	25	150	100	300	200
Ring-necked				50	P	P	P	P	P	P
Canvasback	50	50	50	50	50	25	250	100	200	200
Scaup	20	20	P	50	50	P	P	P	P	1000
Goldeneye										400
Bufflehead										200
Ruddy										P
Other										
<b>Coot:</b>	350	350	350	1000	1200	1100	1100	50	-	-



WATERFOWL  
 (Continuation Sheet)

REFUGE Sand Lake Refuge

MONTHS OF September TO December, 1955

(1) Species	(2) Weeks of reporting period								(3) Estimated waterfowl days use	(4) Production : Broods: Estimated : seen : total	
	11/12	11/19	11/26	12/3	12/10	12/17	12/24	12/31			
Swans:											
Whistling	36								1,190		
Trumpeter											
Geese:											
Canada	200	200	400	400	400	100	100	100	61,600		
Cackling											
Brant											
White-fronted	-								17,500		
Snow	P	P	-						189,000		
Blue	P	P	-						54,300		
Other Richardson's	500	50	-						305,725		
Ducks:											
Mallard	8000	15000	15000	15000	10000	500	500	500	1,630,300		
Black	P	-							100		
Gadwall	100	-							35,700		
Baldpate	50	-							21,280		
Pintail	100	P	-						22,400		
Green-winged teal	200	-							33,320		
Blue-winged teal	P	-							27,650		
Cinnamon teal											
Shoveler	P	-							24,200		
Wood	-								100		
Redhead	100	-							7945		
Ring-necked	P	-							100		
Canvasback	100	-							6,225		
Scaup	500	-							11,480		
Goldeneye	P	-							2,800		
Bufflehead	P	-							1,400		
Ruddy									100		
Other											
Coot:									38,500		

(over)



	(5) Total Days Use	(6) Peak Number	(7) Total Production
Swans	1,190	79	
Geese	608,125	21,000	
Ducks	1,827,420	78,000	
Coots	38,500	1,200	

SUMMARY	
Principal feeding areas	Refuge grain fields
Principal nesting areas	-
Reported by <u>Howard D. Woon, Refuge Manager Ass't.</u>	

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).

3-1751

Form NR-1A  
(Nov. 1945)MIGRATORY BIRDS  
(other than waterfowl)Refuge Sand Lake Months of September to December 1955

(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. <u>Water and Marsh Birds:</u>										
Western Grebe	Summer	Resident	(Last period)		2	10/20				
Pied-billed Grebe	"	"			1	10/20				
White Pelican	"	"	2000	9/6/55	10	10/25				
Double-crested Cormorant	"	"	1800	9/2	10	10/25				
Great-Blue Heron	"	"	10	10/1	1	10/25				
Black-crowned Night Heron	"	"			Mid October					
American Bittern	"	"			Mid October					
II. <u>Shorebirds, Gulls and Terns:</u>										
Herring Gull	Summer	Resident	- 1 doubt it!							
Ring-billed Gull	"	"								
Franklin's Gull	"	"	100,000	10/3						
Avocet	"	"								
Spotted Sandpiper	"	"								
Killdeer	"	"								
Dowitcher	"	"								
Greater Yellowlegs	"	"								
			Prob. not resident!			55				

(over)

(1)	(2)	(3)	(4)	(5)	(6)
III. <u>Doves and Pigeons:</u> Mourning dove White-winged dove	Summer Resident				
IV. <u>Predaceous Birds:</u> Golden eagle Duck hawk Horned owl Magpie Raven Crow Bough-legged Hawk Snowy Owl Prairie Falcon Coopers Hawk	2  Resident  Summer Resident Resident 3 1 1 12/1 12/27 12/27				
Reported by.....				Howard D. Woon	

#### INSTRUCTIONS

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

UPLAND GAME BIRDS

Refuge Land Lake Months of September to December, 19455

(1) Species	(2) Density		(3) Young Produced		(4) Sex Ratio	(5) Removals			(6) Total	(7) Remarks
Common Name	Cover types, total acreage of habitat	Acres per Bird	Number broods obs'd.	Estimated Total	Percentage	Hunting	For Re- stocking	For Research	Estimated number using Refuge	Pertinent information not specifically requested. List introductions here.
Ring-necked Pheasant	10,000 acres of upland, shelter- belts and marsh edge		(See text)							
European Partridge	1,000 ideal 5,000 total		(Very few records made this year)							
Pinnated Grouse	5,000 acres field margins and grassland		(See text)							
Sharptailed Grouse	5,000 acres field margins and grasslands		(See text)							

3-1753  
Form NR-3  
(June 1945)

BIG GAME

Refuge Sand Lake

Calendar Year 1955

(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  (This information is an estimate until the big-game census is made. Report of this census will be made in the next narrative.)	200		NONE										

Remarks:

Reported by Howard D. Woon



3-1755  
Form NR-5  
(April 1946)

DISEASE

Refuge.....Sand Lake.....Year 194.....55

Botulism

Lead Poisoning or other Disease

Period of outbreak.....			Kind of disease.....		
Period of heaviest losses.....			Species affected.....		
Losses:			Number Affected		
	Actual Count	Estimated	Species	Actual Count	Estimated
(a) Waterfowl	.....	.....	.....	.....	.....
(b) Shorebirds	.....	.....	.....	.....	.....
(c) Other	.....	.....	.....	.....	.....
Number Hospitalized			Number Recovered.....		
(a) Waterfowl	No. Recovered	% Recovered	Number lost.....		
(b) Shorebirds	.....	.....	Source of infection.....		
(c) Other	.....	.....	Water conditions.....		
Areas affected (location and approximate acreage).....			Food conditions.....		
Water conditions (average depth of water in sickness areas, reflooding of exposed flats, etc.).....			Remarks.....		
Conditions of vegetation and invertebrate life.....			Remarks.....		
Remarks.....			Remarks.....		

Refuge Sand LakeYear 19455

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	None						
Niagara Buffalo	Common	None						
Black Bullhead	Abundant	Many						
White Sucker	Common	None						
White Crappie	Few	None						
Bluegill sunfish	Few	None						
Northern Pike	Common	Many						
Yellow perch	Abundant	Many						

REMARKS: See account of Sand Lake fishing in Text.

PLANTINGS  
(Marsh - Aquatic - Upland)

Refuge Sand Lake Year 1955

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 Cedar	Shelter belt 80S in hq. area standard		1.5 mile	1000 seedlings	June	Ok.	<sup>deficiency</sup> Moisture <del>lack</del> not determined.	
(These trees were planted in spaces that were left by those seedlings that succumbed from last years planting, to complete the shelterbelt pattern)								
50 lbs Brood grass 125 lbs Alfalfa 140 lbs Ryegrass	) Borrow pit ) and ) Bank slopes	22 lbs per acre of mixture	14 acres in borrow pit. 1/2 acre in bank slopes.		9/1/55	Unknown		

## TOTAL ACREAGE PLANTED:

Marsh and aquatic 1.5 miles  
 Hedgerows, cover patches of trees, 14.5 acres of grasses.  
 Food strips, food patches \_\_\_\_\_  
 Forest plantings \_\_\_\_\_

3-1758  
Form NR-8  
(Rev. Jan. 1956)

Fish and Wildlife Service Branch of Wildlife Refuges

CULTIVATED CROPS - HAYING - GRAZING

Refuge Sand Lake County Brown State South Dakota

Cultivated Crops Grown	Permittee's Share Harvested		Government's Share or Return				Total Acreage Planted	Green Manure, Cover and Water- fowl Browsing Crops Type and Kind	Total Acreage
	Acres	Bu./Tons	Harvested		Unharvested				
			Acres	Bu./Tons	Acres	Bu./Tons			
Barley	534	13,884	67	1,755	175	4,550	776	Alfalfa plowed under approximately 600 acres, final figure not available until April 30 following permittee interviews.	
Corn	479	10,538	68	1,665	334	7,348	881		
Soybean	46	1,212	6	160	123	3,321	175		
Oats	475	13,775	30	684	-	-	505		
Wheat	177	1,416	18	140	-	-	195		
Alfalfa (Hay)	536	Hayed acres, including second cutting					339		
Alfalfa (Seed)	106.5		35.5	Not delivered yet.					
								Fallow Ag. Land	

No. of Permittees: Agricultural Operations 17 Haying Operations 11 Grazing Operations 13

Hay - Improved (Specify Kind)	Tons Harvested	Acres	Cash Revenue	GRAZING	Number Animals	AUM'S	Cash Revenue	ACREAGE
				1. Cattle	24	1863.53	1863.53	2440
				2. Other				
				1. Total Refuge Acreage Under Cultivation				2871
Hay - Wild	516.2	957	774.30	2. Acreage Cultivated as Service Operation				20

CULTIVATED CROPS

Refuge \_\_\_\_\_ Year 195 5

Permittee (If farmed by refuge personnel, so indicate)	Permit No.	Unit or Loca- tion	Crops Grown	Avg. Yield per Acre	Permittee's Share		Government's Share or Return				Compensatory Services, or Cash Revenue
					Acres	Bu. Har- vested	Harvested		Unharvested		
							Acres	Bu.	Acres	Bu.	
Robert Deagon		17-20-21- 22-23	Oats		16		8	170			
			Corn		24					44	
			Barley		60					19 19	
			alfalfa		75		2.5	330			
Stanley Dinnert		3-4-6-7	Corn		65						
			Barley							42	
			Wheat		52.5		17.5	140			
Gordon Dinger		11-12-13	Barley		107					18	
			Oats		36						
			Corn							50	
			alfalfa				15	163			
Harvey Eickler		39-43	Corn		36					17	
			millet							40	
			Oats		55						
			Wheat		15						
			alfalfa		10						

Summary of Crops Grown:	Crop	Acreage	Permittee's Share		Government's Share				Total Revenue
			Acres	Bushels	Harvested		Unharvested		
					Acres	Bu.	Acres	Bu.	
									\$ _____
Interior Duplicating Section, Wash.D.C.									



CULTIVATED CROPS

Refuge \_\_\_\_\_ Year 195\_\_

Permittee (If farmed by refuge personnel, so indicate)	Permit No.	Unit or Loca- tion	Crops Grown	Avg. Yield per Acre	Permittee's Share		Government's Share or Return				Compensatory Services, or Cash Revenue
					Acres	Bu. Har- vested	Harvested		Unharvested		
							Acres	Bu.	Acres	Bu.	
Ralph Hurluth		35-36-37	Barley	<del>28</del>	121		14	300	11		
			Wheat		28						
			Corn		32				40		
			Millet		20				20		
			<del>Alfalfa</del>		<del>28</del>		<del>14</del>				
Fritz Lehman		25	Barley		4				4		
			Corn		13				14		
			Oats		9						
Edward Mitchell		28929	Barley		13.5		4.5	180			
			Oats		63.7		21.3	574			Oats traded for legumes
Alma Olson		44	Corn		10				10		
			Oats		18						
			Barley		5				13		
Earl Pfitzmaier		8-9-10	Barley		18.5				1.5		
			Corn		81				71		
			Oats		36						
			Millet		16.5		5.5	860			
			<del>Alfalfa</del>		<del>27</del>				13		

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

CULTIVATED CROPS

Refuge \_\_\_\_\_ Year 195\_\_

Permittee (If farmed by refuge personnel, so indicate)	Permit No.	Unit or Loca- tion	Crops Grown	Avg. Yield per Acre	Permittee's Share		Government's Share or Return				Compensatory Services, or Cash Revenue	
					Acres	Bu. Har- vested	Harvested		Unharvested			
							Acres	Bu.	Acres	Bu.		
Arnold Richardson		41-42	Barley		7					10		
			Corn		15					15		
			Millet		0					18		
			Oats		12							
			Wheat		28							
Alba Scott		24-26-27	Barley		109		3.75	100		17		
			Corn		138		17	480		11		
			Millet		4							
			Oats		40							
Walter Siler		48	Alfalfa		5		2					
			Barley				24	600				
			Wheat		22							
			Alfalfa		20		7					
Oy Sparr		30-31	Millet		5					25		
			Oats		20							
Robert Vitase		2-5-46	Barley		12							
			Oats		25							
			Barley		31		12	300		5		
			Corn		15		15	240				

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

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_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

CULTIVATED CROPS

Refuge SAND LAKE Year 1954

Permittee (If farmed by refuge personnel, so indicate)	Permit No.	Unit or Loca- tion	Crops Grown	Avg. Yield per Acre	Permittee's Share		Government's Share or Return				Compensatory Services, or Cash Revenue
					Acres	Bu. Har- vested	Harvested		Unharvested		
							Acres	Bu.	Acres	Bu.	
<del>Fritz Lehman</del>	<del>SL-45-52</del>	<del>25-60</del>	<del>Oats</del>	<del>30</del>	<del>15</del>	<del>390</del>	<del>7</del>	<del>210</del>			
<del>Harold Wells</del>		<del>1</del>	<del>Corn</del>	<del>0</del>			<del>30</del>	<del>600</del>			
<del>E</del>			<del>Wheat</del>	<del>22</del>							
			<del>Oats</del>	<del>31</del>							
			<del>Millot</del>	<del>0</del>					<del>20</del>		
			<del>Barley</del>	<del>45</del>							
Edwin Weismantle		45	Barley	61.5			8.5	275			
			Corn	20.5			6	145	1.5		
			Wheat	9							
John Wilson		40	Corn	29					60		
			Barley	0					36		
			Oats	113							

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

Interior Duplicating  
Section, Wash.D.C.

REFUGE GRAIN REPORT

Refuge Sand Lake

Months of Sept. thru Dec. 19455

(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.
Barley	2800	0	2800	50	-	-	50	2750	-	2750	-
Ear Corn	15	865	880	370	-	235	605	275	-	275	-
Shelled Corn	0	355	355	300	-	55	355	120	-	120	-
Millet	0	5615	5615	-	-	-	-	615	538	77	-
Oats	749	170	919	130	-	-	-	789	-	789	-
Eye	38	0	38	-	-	-	-	38	-	38	-
Wheat	305	0	305	80	-	-	80	225	-	225	-

(8) Indicate shipping or collection points.....

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

(10) Remarks 538 bushels of millet purchased for transfer to other refuge for seed.  
Grain transferred to Valentine, Waukey, Mud Lake, Crescent Lake Refuges.

COLLECTIONS AND RECEIPTS OF PLANTING STOCK  
(Seeds, rootstocks, trees, shrubs)Refuge Sand Lake Year 194 35

Species	Collections				Receipts		Total Amounts on Hand	Amount Surplus
	Amount	Date or Period or Collection	Method	Unit Cost	Amount	Source		
		NONE THIS PERIOD						



HAYING AND GRAZING

Refuge San. Lake Year 194 55

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
Robert Bonser	24215	22-0	160	33.2		9/25 - 11/11	1.00	33.20	
George Crawford	24212	1-0	160	128		7/16 - 11/15	"	128.00	
Stanley Dennert	24207	4-0	100	80		7/16 - 10/18	"	80.00	
Stanley Dennert	24219	5-0	100	58.7		7/7 - 11/6	"	58.71	
Neil Serdes	24203	8-0b	210	101.56		9/20 - 11/14	"	101.56	
Ralph Jones	24218	6-0	120	55.64		9/21 - 11/3	"	55.64	
Harold Koch	24217	210a	60	101.29		9/11 - 10/24	"	101.29	
Harold Koch	24201	210b	85				"		
Edward L. Mitchell	24210	3-0	320	255		7/16 - 11/15	"	255.00	
Edward L. Mitchell	24200	12-0	125	124		5/5 - 9/6	"	124.00	
Elmer Beetzels	24215	20-0	25	20		10/9 - 11/3	"	20.00	
Preston Scott	24211	2-0	150	120		7/16 - 11/15	"	120.00	
Cy Spurr	24209	14-0	280	256.33		8/1 - 10/31	"	256.33	
Ed Stensland	24206	7-0b	370	309.81		5/13 - 11/5	"	309.81	
Ode Tanby	24214	16-0	225	180		7/16 - 10/15	"	180.00	
Edwin Weismantel	24216	19-0	50	40		7/16 - 11/15	"	40.00	
BEE KEEPING									
Spencer Bradner	24205	Shelter belts		100	bee hives		.15	15.00	

Totals:							
Acreage grazed	2440.00	Animal use months	1863.53	Total income Grazing	1863.53		
				Total income bee keeping	15.00		
Acreage cut for hay		Tons of hay cut		Total income Haying			
				Totals	2652.83		

HAYING AND GRAZING

Refuge.....Sand Lake

Year 19455

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
L. W. Bruns	24704	3Ba	80		25.5	July - Nov.	1.50	38.25	
Neil Cordes	24705	3Bb	80		56.7	"	"	85.05	Needy
Clara Herseth	24709	9-B	45		28.3	"	"	42.45	
Ralph Herseth	24711	13-14-15	95		30.4	"	"	45.60	
Harold Koch	24714	1-B			19.5	"	"	29.25	
Eugene Pearson	24707	2-B	40		8.1	"	"	12.15	
Dean Pulfrey	24712	17-B	25		17.3	"	"	25.95	
Dennis Salling	24208	7-B	70		45.0	"	"	67.50	
Alba Scott	24710	5 & 6	160		124.4	"	"	186.60	
Ed Stensland	24213	7ga	80		33.5	"	"	50.25	
Harold Wells	24706	8q.			45.0	"	"	67.50	
<b>Easements</b>									
John L. Gelinski	24220	B-1			43.0	"	"	64.50	
T. T. Skroch	24702	B-3			2.5	"	"	3.75	
Bessie Thorberg	24703	B-2			37.0	"	"	55.50	

Totals:

Acreage grazed.....

Animal use months.....

Total income Grazing.....

Acreage cut for hay.....

Tons of hay cut.....516.2

Total income Haying.....774.30

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SD-SDL-740

Driving sheet piling for the new structure at Sand Lake Refuge. This structure was placed in the Mud Lake unit.



SD-SDL-741



SD-50L-742

Footings are poured and steel placed for walls and decking, Mad Lake structure.



SD-50L-743





SD-SDL-744

The newly-completed Mud Lake structure in October. Pictures show upstream (above) and downstream views. Riprap was added a few days later.



SD-SDL-745



SD.SDL-746

Work commenced on the structure for White Lake at Tewaukon Refuge in July. Here the footings are being poured.



SD.SDL-747



SD-SOL-749

The White Lake structure at Tewaukon was completed in December. These pictures do not show the riprap which was added a few days later.





50-50L-749

Salvaged cripples and captive "honkers" overwintering in the hospital enclosure. About 50 crips were picked up this year as compared to 300 last year when hunting was better.



Canada "honkers", Richardson's, Blues, Snows, and one Ross' goose in the hospital pen. The Ross was picked up in 1954. (See NR Sept.-Dec., 1954)

50-50L-750