

ARROWWOOD NATIONAL WILDLIFE REFUGE
Pingree, North Dakota

ANNUAL NARRATIVE REPORT
Calendar Year 1977

NATIONAL WILDLIFE REFUGE SYSTEM
Fish and Wildlife Service
U.S. DEPARTMENT OF THE INTERIOR

Comments

RESOURCE MANAGEMENT ROUTING SLIP

☒ Beaty
☐ Kvernmo
☐ Wills
☐ Brown

☒ Sontag
☒ Fowler
☒ McCrea
☒ Potts

☐ Nelson
☐ Quinter
☐ Bender
☐ Stieglitz

☒ Young
☒ Frickie
☒ Baldacchino
☒ Omand

☒ Adams
☒ Carlsen
☐ Forester

☐ Operations

☐ Planning

From:

Date:

Personnel

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2. James W. Matthews, Complex Manager, GS-12, Transferred 6/9/77
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Review and Approvals

<u>John R. Foster</u>	<u>James W. Matthews</u>	<u>4/13/78</u>
Submitted by	Date	Area Office
		Date

<u>Arrowwood NWR</u>	<u>Jerald J. Wilson</u>	<u>6/9/78</u>
Refuge	Regional Office	Date

Arrowwood
Complex Office

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I. GENERAL

A. Introduction

Arrowwood Refuge continues to serve as headquarters for the Arrowwood Complex. The year was highlighted by abundant late-season precipitation which set the stage for recovery from a prolonged and severe drought. 1977 was a year of change. There was a dramatic change in personnel with turnover occurring in four of the five refuge manager positions on the complex. A change occurred in our funding picture as the first dollars of the Bicentennial Land Heritage Program became available and the years of planning and scraping to get by were rewarded with arrival of sorely needed replacement equipment and rehabilitated facilities.

B. Climatic and Habitat Conditions

Precipitation and Temperature Information *

Month	Rec'd	Normal	Snow	Max. Temp	Min. Temp	Mean Temp
January	.75	.40		33	-33	- 4.7
February	.63	.34	16	48	-21	19.6
March	.71	.62	7.5	61	- 5	31.9
April	.40	1.48	.7	90	14	49.1
May	3.74	2.50		88	26	63.9
June	1.70	3.46		94	45	65.9
July	5.68	2.78		95	44	70.1
August	2.47	2.56		85	41	61.7
September	4.14	1.87		80	35	55.7
October	1.08	1.23	2	77	16	46.4
November	1.61	.53	8	67	-18	25.0
December	.92	.43	11	36	-33	4.9
	23.83	18.20	45.2			

*Weather records are from official weather service station located at Arrowwood headquarters.

Last year it was reported that the 10.62" precipitation for 1976 was the least amount recorded since records were started at the refuge in 1940. This year almost the reverse occurred as 1977 went down as the second wettest year on record.

The drought continued through the first half of the year. Precipitation amounts were generally near normal but not sufficient to recharge soil moisture. Above normal precipitation fell during the second half of the year and by freeze-up, soil moisture conditions were good and some

potholes were showing small accumulations of water. Heavy snows fell in November and December and filled low spots and piled up in huge drifts behind shelter belts and other obstacles. With any luck at all there should be good runoff in 1978 and the prairie will once again be wet and productive.

A severe ice storm hit the area on December 16 causing widespread damage to power lines and coating the general area with ice. Power was off for nearly a week at the refuge and for over a week in some places. The storm raised havoc with wildlife. Pheasants appeared hard hit with considerable loss suspected. Deer were forced to yard-up early and are causing considerable depredation problems in some areas of the complex and have been subjected to a stress situation much earlier in the winter than normal.

Water levels on the refuge were about as bad as they could get short of drying up completely. Through September water levels on refuge lakes receded leaving exposed mud flats between the water line and spillways. DePuy Marsh dried up completely as did most of the 90 or so scattered small impoundments. Slight recovery occurred on Arrowwood Lake before freeze-up.

As expected, Arrowwood Lake experienced a fish kill in early 1977 but, surprisingly, not a complete one. The Lake reportedly froze to the bottom last winter but some fish must have survived in undiscovered holes and spring areas because carp were abundant by late summer. Winter kill is expected again this year and should hit Jim Lake as well as Arrowwood.

Upland habitat improved through the year. The abundant rains of late summer kept vegetation lush and green and aided recovery from the drought.

We are optimistically looking forward to good habitat conditions next spring.

C. Land Acquisition

Nothing to report.

D. System Status

I. Objectives

There still exists a need to update objectives of the complex. Current objectives are fragmented and do not

adequately show what we should be striving for. Additional direction is needed to bring about needed change.

2. Funding

Fiscal year 1977 showed an improvement in funding for the complex over past years. Our total budget of \$212,000 included an \$8,000 add-on from the Bicentennial Land Heritage Program and was a considerable improvement over the \$186,000 the complex received in FY 76.

We continue to be frustrated in our attempts to track costs for specific projects and for the various segments of the complex. We have been told that the current reporting system does not lend itself to this kind of breakdown and have not had much encouragement that the situation will change.

II. CONSTRUCTION & MAINTENANCE

A. Construction

The shop building was completed early in the year and is a most welcomed addition to our facilities. Toilet facilities were installed under force account. The building has been most adequate for all our needs with no problems encountered. This was a BLHP project.



Our first BLHP Project - A New Shop. The new tractor is also a BLHP acquisition.

B. Maintenance

There was the normal amount of posting, fence repair, road grading and routine facility maintenance during the year.

The spring in the Grasshopper hills area was rehabilitated by digging it out, installing a 30" perforated concrete culvert on end to serve as a collecting site and placing several dump truck loads of pea gravel around the culvert to encourage flow. A plastic pipe was installed to carry the water away from the spring site where it can be used by wildlife and livestock.



The Old . . . The New. The old Kensal to Edmunds road bridge was replaced this year by the county. The new bridge is a welcome replacement.

C. Wildfire

Nothing to report.

III. HABITAT MANAGEMENT

A. Croplands1. Permanent Croplands

The following table summarizes the crops planted on the refuge. All the refuge share was left standing for use by wildlife.

<u>Unit</u>	<u>Acres</u>	<u>Summer Fallow</u>	<u>Wheat</u>	<u>Other</u>	<u>Refuge Share</u>	<u>Permittee Share</u>
F-1	109	33	76*		25	51
F-2	63		43*	20 sunflowers	16	47
F-3	30		20	10 corn	10	20
F-4	22	11	11		0	10
F-5	140	28	79	33 alfalfa	22	57
F-6	36		26	10 alfalfa	20	6
F-7	102	10	52*	20 alfalfa } 20 corn }	20	52
F-8	81	12	45*	12 alfalfa) 12 corn) 25 alfalfa 42 corn	17	40
	<u>583</u>	<u>94</u>	<u>352</u>			

* Includes fields with sweetclover seeded with wheat in preparation for green manure plow down.

2. DNC Plantings

No DNC seeding was attempted this year because of drought situation and because funding was looking short and this seemed to be a place where we could save money by holding off on buying seed.

B. Grasslands1. Grazing

The following units were grazed in 1977.

<u>Grazing Unit</u>	<u>Period Grazed</u>	<u>AUM's Allowed</u>	<u>AUM's Used</u>
G-3	4/21-5/24	112	113
G-5	5/6-6/29	270	106
G-9	7/1-9/2	160	161
G-12	5/3-8/31	265	252
G-18	4/27-6/30	225	222
G-21	5/1-6/8	200	264
G-25	5/2-6/30	240	232
		<u>1470</u>	<u>1350</u>

The refuge grazing program continued to be operated under a rotational system. Some problems developed this year because impoundments dried up and cattle had to be placed in alternate pastures. Additional fencing, scheduled under BLHP, is required before all grazing units can be utilized.

The grazing fee this year was \$3.50/AUM with a cow being 1 AUM, yearlings .75 AUM and sucking calves .25 AUM. Grazing fees amounted to \$4729.36.

2. Prescribed Burning

No burning was accomplished in 1977. Drought conditions caused the Governor to declare a moratorium on burning which was not lifted in time to accomplish our planned burning.

C. Wetlands

Nothing could be done this year in the way of water management. There was virtually no run-off and water levels continued to recede through the summer. Most of the 90 small impoundments scattered throughout the refuge went dry. In 1976 it was reported that Arrowwood Lake at elevation 1434.30 was the lowest it had been since being dry in the 1930's. This year it went down an additional .91 ft. reaching elevation 1433.39 in August. At that level water was barely two feet deep in the deepest parts.

Jim Lake water level dropped below the outlet structure and receded to where there was several hundred feet of exposed mud flats between the water and the structure. No gauge readings were possible under these circumstances.

DePuy Marsh dried up completely and had considerable emergent vegetation emerge from the vast exposed mud flats.

The following table gives the average elevation during the months readings were taken on the three lakes where we have gauges.

Spillway Elevation:	1436.66	1436.00	1436.38
<u>Month</u>	<u>Arrowwood</u>	<u>Jim</u>	<u>DePuy</u>
January	1434.25	1433.10	1433.34
February	1434.25	1433.10	1433.34
March	1434.25	1433.10	1433.34
April	1434.25	No readings- Water	
May	1434.08	too low	

<u>Month</u>	<u>Arrowwood</u>	<u>Jim</u>	<u>DePuy</u>
June	1433.92	No readings	- Water
July	1433.62	too low	"
August	1433.39	"	Dry
September	1433.49	"	"
October	1433.53	"	"
November	1433.53	"	"
December	1433.53	"	"

As expected Arrowwood Lake had a winter-kill of fish and we expect another this winter. Jim Lake did not winter-kill last year but it seems highly probable it will this year.

As part of a research study on aquatic weed growth done by personnel from North Dakota State University, it has been determined that all the lakes on the refuge contain an abundance of necessary nutrients for optimum pondweed growth. Water levels were found to be a negligible factor except in DePuy marsh where good smartweed growth can be stimulated by draw down. Fish activity, notably carp, seems to be the largest prohibitive factor in pond weed growth. On Jim Lake, the lake bottom is shale material and too active to produce good pond weed growth.

Sago pondweed growth was again good in Arrowwood Lake, but the hoped for buildup of canvasbacks did not occur. Only 650 were tallied this fall compared to over 7,000 in 1976.

D. Forestlands

Nothing to report.

E. Other Habitat

Nothing to report.

F. Wilderness and Special Areas

Nothing to report.

G. Easements for Waterfowl Management

Nothing to report.

IV. WILDLIFE

A. Endangered and/or Threatened Species1. Greater Prairie Chicken

The last reports of this species on Arrowwood Refuge occurred in 1974 and 1975.

2. Prairie Falcon

No observations were recorded.

B. Migratory Birds1. Waterfowla. Ducks

Spring arrived early this year. Canada geese and mallards started arriving the second week of March. Whistling swans, pintails, green-winged teal and other early migrants arrived shortly after. By the end of March all species normally migrating through the area, except blue-winged teal and ruddy ducks had been recorded.

Duck-use days are summarized with other waterfowl use on the table on page 12. While overall use figures are not significantly different from previous years totals, species composition was markedly different. For example, mallards reached a fall peak of 26,000 in 1976 and could only muster a fall peak of 1,000 in 1977. Shovelers found the shallow lakes to their liking and peaked at 3,000 in 1977 compared to about 300 the previous year. The wide difference in numbers of canvasbacks has been brought out previously.

The annual breeding pair count was conducted on May 23 with 832 pairs tallied, the lowest number since 1968. Pair count information for the past 10 years is summarized below.

Breeding Pairs
1968-1977

<u>Year</u>	<u>Pairs</u>
1968	552
1969	1116
1970	1186
1971	1447
1972	973
1973	941
1974	1494

Breeding Pairs (cont.)

1968-1977

<u>Year</u>	<u>Pairs</u>
1975	1070
1976	901
1977	<u>832</u>
Ten-year ave.	1051

The pair count this year represents a 21% drop in the 10-year average. Production also fell way off from the past few years as summarized in the following table.

Arrowwood Refuge Duck Production 1968-1977

<u>Year</u>	<u>Ducks Produced</u>
1968	2305
1969	5801
1970	3985
1971	4999
1972	3165
1973	2982
1974	4771
1975	4264
1976	4717
1977	2376

A combination of fewer pairs and lower productivity rate combined to give the poor production.

The following table gives the estimated 1977 production by species.

1977 Duck Production

<u>Species</u>	<u>Pairs</u>	<u>Production Rate</u>	<u>No. of Broods</u>	<u>Brood Size</u>	<u>Total Production</u>
Mallard	234	.4	94	6	564
Gadwall	126	.4	50	6	300
Widgeon	7	.4	3	6	18
Pintail	30	.4	12	6	72
Blue-winged teal	116	.4	46	7	322
Shoveler	40	.4	16	6	96
Green-winged teal	2	.4	1	7	7
Wood duck	109	From nest box check			<u>547*</u>
					1926
Redhead	11	.4	4	6	24
Canvasback	5	.4	2	5	10
Ruddy	229	.4	92	4	368
Scaup	20	.4	8	6	48
Merganser	3	From nest box check			<u>0</u>
					<u>450</u>
					<u>2376</u>

The production rate is computed using procedures outlined in Wildlife Inventory Plan.

* Number of hatched eggs - actual survival not known.

Waterfowl-Use Days 1954-1977

<u>Year</u>	<u>Swan</u>	<u>Geese</u>	<u>Ducks</u>	<u>Coots</u>	<u>Total</u>
1954	630	49,231	1,684,214	210,810	1,755,885
1955	0	15,255	1,029,209	106,720	1,151,184
1956	217	32,790	1,634,294	71,568	1,738,869
1957	592	47,283	1,387,743	37,730	1,473,348
1958	4,648	76,432	1,341,622	131,950	1,554,652
1959	6,622	122,695	865,695	146,370	1,141,382
1960	10,748	61,320	973,089	141,790	1,186,947
1961	5,712	130,606	1,029,286	55,965	1,221,569
1962	5,114	181,483	871,298	75,075	1,132,970
1963	6,084	218,876	923,452	44,627	1,193,041
1964	4,333	114,975	239,402	20,020	378,730
1965	3,619	101,388	493,612	82,558	681,177
1966	847	214,935	858,530	67,179	1,141,491
1967	1,610	262,178	1,188,010	147,350	1,599,148
1968	2,583	216,363	1,511,976	220,934	1,951,856
1969	5,565	167,300	1,963,766	233,994	2,370,025
1970	17,206	376,285	2,414,719	948,269	3,756,479
1971	4,767	373,723	2,068,466	588,239	3,035,195
1972	25,596	380,365	1,774,279	1,382,258	3,562,598
1973	16,052	618,872	1,686,520	615,935	2,937,379
1974	7,685	880,970	1,602,136	320,060	2,810,851
1975	9,750	214,265	1,258,165	220,675	1,702,855
1976	18,475	547,355	1,837,870	306,350	2,710,050
1977	9,450	654,000	1,280,250	168,000	2,111,790

b. Geese

The first flock of 15 giant Canadas returned to the refuge the second week of March. Small Canadas and blues and snows followed in late March when the peak goose population of 500 occurred.

About 25-30 Canadas took up residence for the summer. At least six pairs attempted nesting but only two broods came off and five birds were produced to flight stage. We lost a few of these birds to hunting but when they departed in November we still could count around 30.

Migrant geese started arriving about September 20, and we had 500 snows and blues and 650 small Canadas by the end of the month. In October snows and blues peaked at over 14,200 and small Canadas at 2,500. Numbers dropped off some, but on November 8 we estimated a peak of 20,000 snows and blues and 2,000 Canadas moving through in front of and during a storm. By the time the storm broke only a few scattered flocks were left and they quickly departed.

c. Swans

Whistling swans put in a brief appearance in the spring with a peak of 80 recorded April 6. About 20 showed up in mid-September, built to over 200 in October, and peaked at 300 in early November.

2. Marsh and Water Birds

Information on this group is on file as quarterly reports. The information is generally estimated with no time spent gathering specific data. A hail storm in September killed a large number of pelicans on Chase Lake NWR and also claimed some birds on Jamestown Reservoir and Pipestem Reservoir south of Arrowwood Refuge. See the narrative on Chase Lake at the end of this report for more information.

3. Shorebirds, Gulls, Terns & Allied Species

Comments made above regarding marsh and water birds applies to this section also. Nothing of significance to report.

4. Raptors

Nesting raptors included a pair of red-tails and a pair of ferruginous hawks. Both nesting attempts were successful and young fledged from both nests.

Hawk migrations were observed on several days during the fall. On September 20, a light phase Harlans hawk was observed. An additional number of buteos, estimated at 30, were also seen in about an hour on this same date.

Eagles showed periodically during spring and fall migration periods, with 1-2 bald eagles being observed from time to time and up to 3 golden eagles observed in November.

5. Other Migratory Birds

Nothing to report.

C. Mammals and Non-Migratory Birds

1. Game Mammals

- a. White-tailed deer - The refuge's deer herd continued to grow reaching an all time high near the end of the year. On December 12, we made an aerial survey of the refuge and counted 568 deer. The count was made under excellent conditions with an overcast sky and good snow cover. Even so it is felt some deer were missed and the actual count could have been over 600. This compares to a count of 349 deer on the refuge in February of 1977.

The high count in December, no doubt, reflects some recruitment from outside the refuge as deer were beginning to bunch up and move to heavy cover because of the snow. We suspect additional recruitment has occurred since the count.

We attempted to classify the deer and feel we did a reasonable job except on the bigger groups where we could only get a total count and count bucks. Data collected was as follows:

<u>Does</u>	<u>Fawns</u>	<u>Bucks</u>	<u>Unclassified</u>
149	197	31	191

Doe-fawn ratio 100/130

Obviously the herd was in good shape and reproducing at a high rate. The hunting season harvest accounted for approximately 55 deer being removed from the refuge plus an additional estimate of 15 taken immediately adjacent the refuge. Unfortunately, most of the deer harvested were bucks which did little to hold the reproductive potential of the herd down. More information on this is presented under the section on hunting.

- b. Red Fox - Fox numbers plummeted this year following a high population reported last year. We estimate 25 to 30 using the refuge compared to 100-150 estimated last year. We counted 14 foxes while making the aerial survey for deer.

2. Other Mammals

- a. Coyotes - A pair or more of coyotes have used the hilly terrain along Arrowwood Lake in past years and continued to do so this year. During the aerial survey for deer we spotted six coyotes, five of them on the Arrowwood unit and one just off the west side of Mud Lake unit. It will be interesting to see if they rapidly increase numbers now that fox numbers are depressed.
- b. Mink - These mammals were reported at an all-time high last year when it was theorized the drought pushed many onto the refuge. Refuge trappers took 52 mink that year. This year the population was down. Observations of mink and mink tracks were infrequent and trappers caught only three.
- c. Muskrat - The muskrat population was extremely low. Foresburg pond and perhaps National Guard pond, two spring-filled impoundments, held a rat or two but low water and lots of ice appeared to have eliminated most of the ones reported last year on the Jim River below Arrowwood Lake.
- d. Beaver - The only active house seen this year was on Arrowwood Lake. Some activity was noted on the James River in the Mud Lake unit but these animals apparently moved out as water levels receded.
- e. Other Mammals - Numbers of raccoon and skunk were about normal. The prairie dog town along the tour route continues to hold steady. Counts revealed at least 16 present.

3. Resident Birds

- a. Pinnated Grouse - No sightings in 1977.
- b. Sharp-tailed Grouse - Dance ground counts were taken between April 7 and April 13. A total of 185 males were counted; an increase over previous years. Only one new ground was located this year.

A summary of sharp-tailed grouse dance ground activity is presented in the following table.

Ground Number	Year											
	66	67	68	69	70	71	72	73	74	75	76	77
1	12	9	9	9	7	14	8	10	15	22	19	12
2	14	10	15	10	5	8	5	0	5	2	12	14
3	5	0	0	3	3	0	10	14	12	11	12	0
4	8	12	11	5	7	7	8	16	10	10	8	12
5	5	12	10	14	17	17	18	16	18	22	15	22
6	7	7	7	0	0	0	9	17	12	12	11	8
7	18	17	18	25	22	19	13	0	7	10	13	19
8	0	7	0	0	0	0	0	0	0	0	0	0
9	20	16	14	5	11	18	22	18	14	19	15	18
10	5	12	17	12	12	11	10	16	9	11	13	11
11	17	15	12	11	11	9	11	17	13	0	0	0
12	3	5	5	0	0	0	0	0	0	0	20	13
13					12	13	8	11	12	12	3	0
14(52)						4	8	6	0	0	0	0
15(59)						6	13	9	4	0	0	0
16							2	0	0	0	0	0
62											9	14
63											12	16
53											8	10
51											8	8
New Ground Off-Refuge - No Number												8
Totals:	114	116	118	96	107	126	155	150	131	131	178	185

The gradual increase in birds is attributed to increased cover brought on by our DNC program.

During the fall months, flocks of up to 50 sharptails were common throughout the refuge. As the snow began to pile up the birds began to concentrate feeding activities in an unharvested sunflower field immediately west of headquarters. On our Christmas bird count, we tallied about 300 grouse in this field.

- c. Ring-necked Pheasant - Numbers of this favorite game bird had been increasing slowly, aided by several mild winters. This past spring the North Dakota Game & Fish Department supplemented the existing population with a stocking of 250 females and 75 males. Many broods were observed as summer progressed and by fall we estimated 500 birds on the refuge.



Pheasants being released on the Mud Lake Unit of Arrowwood Refuge.

The first winter storm in mid-November dealt the pheasants a severe blow and may have knocked the population in half. Snow drifted over the buckbrush and cattail cover in depths ranging from 2 to 5 feet. Where the cover was thickest, so was the snow and many pheasants were presumed suffocated by the blanket of snow.

The severe ice storm in December no doubt claimed additional birds and subsequent storms have also taken their toll. Pheasants have once again been reduced to a remnant population with numbers down to perhaps 50.

- d. Hungarian Partridge - We went into the fall with a good population of partridge and they seem to be coping with the winter situation very well.

The fall population was again estimated at 200 birds. Mortality has reduced numbers but the high reproductive potential of Huns gives them the capability of recovering come next spring.

4. Other Animal Life

We previously mentioned that Arrowwood Lake winter-killed last winter. This was only a partial kill, but eliminated many carp, northern pike and other fish. Some carp and perhaps other species survived the winter-kill.

We anticipate winter-kill will occur again this winter and probably hit Jim Lake as well as Arrowwood.

V. INTERPRETATION & RECREATION

A. Information and Interpretation

1. On-Refuge

About 4,000 people visited the refuge and drove the 5-mile tour route.

Interpretive talks were given to Cub Scouts from Pingree, the Boy Scout troop from Carrington and a bus load of students from Carrington.

2. Off-Refuge

News releases were made regarding hunting on the refuge and other activities permitted on the refuge.

B. Recreation

1. Wildlife Oriented

- a. Deer Hunting - Rifle hunting was permitted on the refuge for the nine-and-half-day firearms season which opened at noon on Friday, November 11 and closed Sunday, November 20. A new method of regulating hunters was tried this year. For the first $2\frac{1}{2}$ days only those 100 hunters with a special permit for the refuge could hunt and only antlered bucks could be taken. After that hunting was permitted by any one holding a valid permit for the general zone in which

Arrowwood is located. Either sex could be taken depending on what the individual's permit called for.

We were a little apprehensive as to how the season would work out, particularly when the refuge became open to everybody with a permit for the general area. For the last few years only 125 permits had been issued for the entire season. Fears were expressed that we would be overrun by people and that all the does would be shot off.

Opening day saw the refuge roads lined with cars and precisely at noon most of the 100 permit hunters started marching in. About 20 bucks were killed opening day. During the next two days an additional 20 bucks were taken. Hunting pressure dropped off markedly during this time.

The next day was a Monday and marked the beginning of the unrestricted portion of the season. About 75 hunters showed up. Most hunted for a couple of hours without getting a shot and left. Thereafter hunting pressure remained low throughout the rest of the season. During the last seven days of the season, we were aware of only eight deer being taken including three adult does, two bucks and three male fawns. A summary of the deer harvest for the past three years is presented in the following table.

Year	<u>Adults</u>		<u>Fawns</u>		Total
	Bucks	Does	Bucks	Does	
1975	25	17	3	8	53
1976	21	12	5	5	43
1977	42	3	3	0	48

From this information it is readily apparent the over-harvest of deer some people had expressed concern about did not occur. On the contrary, the harvest of antlers deer was inadequate and steps will have to be taken to increase harvest of does in order to control our expanding herd.

- b. Fox Hunting - There was some interest in fox hunting this year but deep snow limited how far a person was willing to walk and coupled with the reduced population, kept harvest near zero.

- c. Upland Bird Hunting - A special late-season was authorized again for Arrowwood with hunters permitted to hunt pheasants, sharp-tailed grouse and Hungarian partridge. The season opened Monday, November 21, and extended to December 11 for sharp-tails and "Huns" and December 18 for pheasants. The opening of the season followed by one day the closing of deer season. It also followed a severe blizzard, which was suspected of substantially reducing the pheasant population.

Hunter interest was high prior to the opening and considerable time was spent answering calls and inquiries. The snow storm smothered interest as well as the birds and on opening day only three hunters (all refuge employees) tried wallowing through the hip deep drifts of snow. Hunting pressure remained low through the entire season and the kill of birds was roughly estimated at 50 pheasants and 25 sharp-tails.

As reported earlier, there was an excellent population of sharp-tails, however, they were extremely wary at this time of year and it was difficult to get close enough for a shot.

- d. Trapping - Limited trapping was permitted this year. Because of some problems and complaints that occurred last season, the refuge was divided into seven trapping units and one trapper was assigned to each unit. Trapping was permitted to start when the statewide season opened October 22 and continued until the various seasons closed except all traps had to be sprung or pulled during the deer season. For the most part, trapping was limited to the early part of the season as most trappers gave up after snow made travel and keeping traps operational impossible tasks.

The short season and low population of red fox kept the take down. A summary of the take follows.

<u>Species</u>	<u>1977 Harvest</u>	<u>1976 Harvest</u>
Fox	22	53
Skunk	44	28
Raccoon	15	44
Mink	3	52
Badger	<u>1</u>	<u>2</u>
	85	179

Prices remained high with fox bringing over \$50 and raccoons between \$30-35.

2. Non-Wildlife Oriented

- a. Picnicking - The picnic area on Arrowwood Lake continued to receive moderate use by local people. This is the only non-wildlife activity on the refuge.

C. Enforcement

Periodic patrols in and around the refuge were carried out during the waterfowl season and intensive patrolling occurred during the deer season. Two apprehensions were made, one for shooting a swan and the other for entering the refuge to retrieve a downed bird. Both defendants forfeited collateral amounting to \$100 and \$25 respectively.

OTHER ITEMS

A. Field Investigations

I. Wood Duck Study

This was ninth year wood duck nesting success was monitored. This is being done to keep track of the progress the wood duck has made since originally released in 1968.

All wood duck nest boxes were checked in July. The following summarizes the data.

Wood Duck 1977

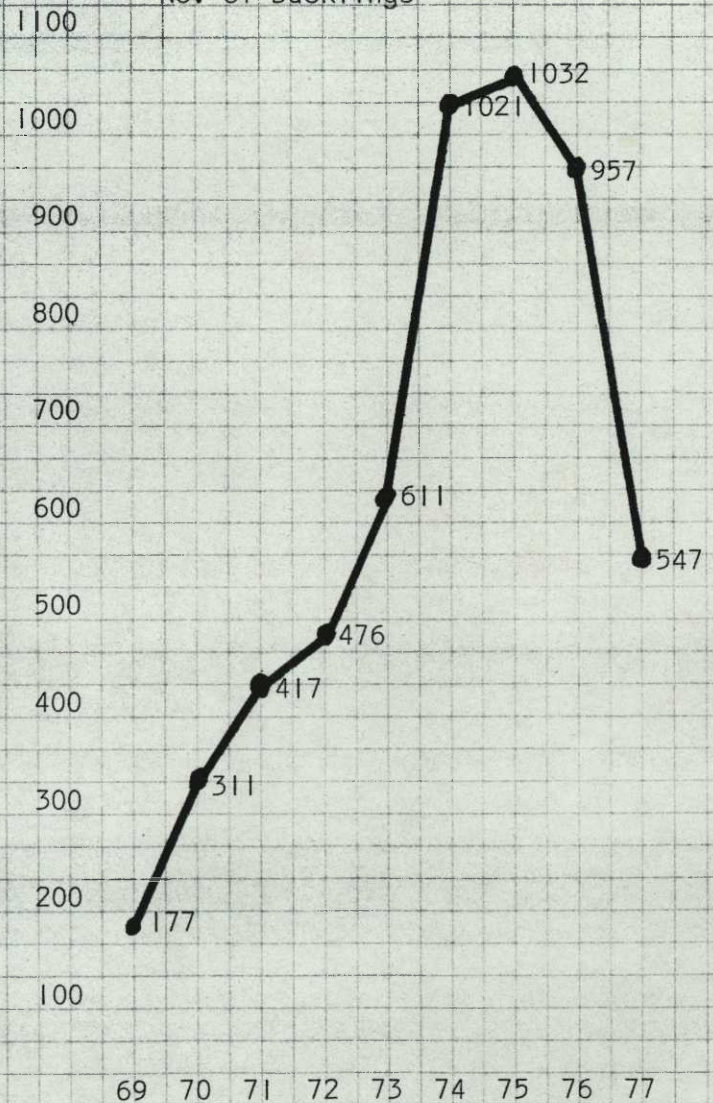
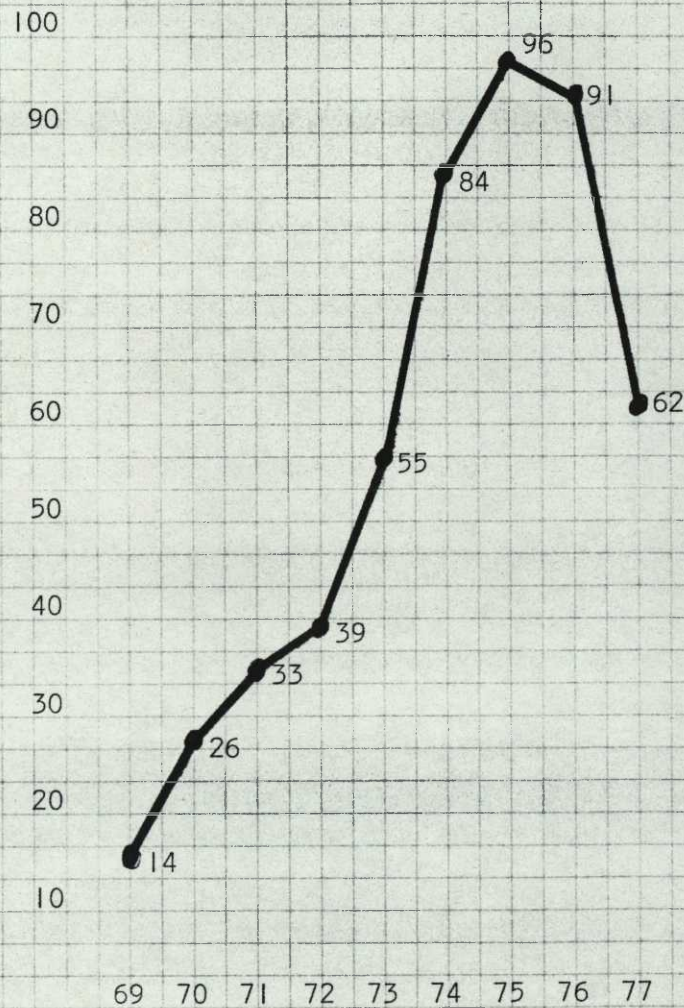
Number of Nests	82	
Successful Nests	62	
Unsuccessful Nests	20	
Percent Successful	75.6	
Number of Eggs Laid	766	
Number of Eggs Hatched	547	% hatched 72
Infertile Eggs	149	% infertile 19
Dead Embryos	69	% dead emb. 9
Houses Out	315	
Houses Available	306	
Percent Use by Wood Ducks	27	
Average Clutch Size All Nests	9.3	
Average Clutch Size All Hatched Nests	8.8	

As evidenced on the following graph, 1977 was the second year that production of wood ducks has declined. Drought conditions probably had the greatest negative influence on production. The receding shorelines in the bigger lakes and the dry condition of the small impoundments did much to discourage nesting.

9-Year Summary of Wood Duck Production

Successful Nests

No. of Ducklings



Until this fall about 200 wood ducks have been banded each year. We tried again, but the extreme low level of the lake appeared to discourage use of the net site and we were unable to get many ducks on the bait and virtually no wood ducks appeared.

B. Cooperative Programs

The refuge continues to operate a weather service station as it has since 1940.

C. Items of Interest

There were numerous personnel changes during 1977. Refuge Manager Jim Matthews had served at Arrowwood long and faithfully since 1971. Jim assumed the responsibilities of the Bicentennial Land Heritage Program Coordinator in the area office in Bismarck. The position was filled by John Foster, who transferred in from Bowdoin Refuge in Montana.

Over at Valley City WMD, Dave Goeke departed for the warmer climes of Savannah Refuge and was replaced by Lloyd Jones from J. Clark Salyer Refuge.

Bob Wright left Long Lake Refuge after serving nearly eight years and became assistant manager at Sand Lake. Peter Smith transferred into that position from Upper Mississippi Refuge.

Just before the year ended Refuge Manager Trainee Richard Gilbert decided he did not want to face another North Dakota winter and was lured away by promises of warmer weather at Havasu Refuge in southern California. We understand it hardly ever freezes down there. No replacement had been made by the end of the year.

On a sadder note, Biological Aid Harold Kollman died when he was stricken by a heart attack. His easy-going manner and dedication to work have been missed by all.

D. Safety

Safety meetings were held periodically throughout the year. No lost-time accidents occurred.

CHASE LAKE NWR

This 4,500-acre refuge is located in west-central Stutsman County about 10 miles east of Medina. The refuge was designated a wilderness area in April of 1975.

The major activity at Chase Lake has been an on-going study of white pelicans conducted by students from Michigan Tech, Houghton Lake, Michigan.

Three master theses have been completed since studies began in 1972. The last one, completed in 1977, concerned the food habits and sexing-aging criteria of pelicans using the refuge. A significant finding of this last study was that the primary food supply of pelicans during the study period was tiger salamanders.

The Chase Lake Refuge pelican flock is one of the largest in North America. Population and production figures from 1972-1977 are presented below.

Pelican Population

	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>
Number of Nests	4,827	3,911	4,062	4,220	4,755	4,619
Number of Eggs	7,334	7,941	No egg count	-----		
Young Produced	1,500	1,800	1,200	2,500	2,425	2,494
Breeding Population*	9,654	7,822	8,124	8,440	9,510	9,238

* This figure arrived at by doubling the number of nests -- figuring two adults per nest.

The production figures are considered liberal since mortality from the date of the chick census until fledging was not determined. On September 8, 1977, a severe hail storm struck Chase Lake killing 142 chicks. This was almost six percent of the 1977 chick population. Band returns also reflect a high post-fledging mortality after birds leave the nesting area.

The hail storm also claimed other species including 14 sandhill cranes, 17 shovelers, 12 blue-winged teal, 10 barn swallows and lesser numbers of seven other species.

It was fortunate the storm was relatively late in the year. Had it occurred before most pelicans had fledged, mortality would have been much higher.

Production of two or three broods of geese was noted by the student working on pelicans. More specific information was not obtained.

Sharp-tailed grouse dance ground counts were made by personnel from the Woodworth Station. Three grounds with a total of 26 males were found. Location of grounds and distribution of birds was as follows:

T141 - R69 Sec. 22, NW $\frac{1}{4}$	9 males
T141 - R69 Sec. 17, NW $\frac{1}{4}$	1 male
T140 - R69 Sec. 32, NE $\frac{1}{4}$	16 males

Chase Lake supports a large population of white-tailed deer and during most winters the population swells as deer from the surrounding area move into the refuge.

This year the early storms deposited up to two feet of snow on the refuge and the ice storm in December put a crust on the surface of the snow. This combination of climatic factors made it extremely difficult for the deer to get around and find adequate food. Many of the deer moved several miles west of the refuge to wind swept farm land where the snow was not as deep and hay stacks provided a food supply.

Depredation complaints started pouring into the State Fish and Game Office not only at Chase Lake but many other places. The Governor issued a proclamation authorizing a special deer season to reduce deer numbers in specific problem areas. This special season created an even greater furor as sportsmen objected to this method of attempting to ease the problem. As the picture now stands, sportsmans groups and other interested parties were given the opportunity to try to move the deer from the problem areas and initiate a supplemental feeding program. No hunting has been permitted and it appears doubtful there will be any.

In early January refuge staff assisted the Woodworth Sportsman's club and local farmers in a feed-the-deer project. The refuge grader was driven over 50 miles to the area west of Chase Lake. Three trails were opened up to provide access to a Waterfowl Production Area and two areas immediately adjacent Chase Lake. The refuge supplied about 200 bushels of barley while the Sportsman club supplied an even larger amount of grain and screenings.

The following day about 12 stacks of hay were moved into the areas, most of them donated by local farmers.

On the third day a large number of people gathered to observe and participate in the deer drive. About 15 snowmobiles were used to drive the deer out of the farmsteads and into the vicinity of the supplemental feed. The drive worked exceptionally well with most of the drivers taking it slow and allowing the deer to move at a fast walk. At one farm over 80 deer were flushed from the hay-stacks. A total of approximately 150 deer were moved from the problem areas. Once at the feeding sites the deer were left.



Typical North Dakota deer habitat. With food buried under snow and ice, deer moved in on haystacks.



A typical problem area. 60-80 deer were using haystacks like this. The boards and other material stacked against the hay provided some protection but couldn't solve the problem.

Within a few days deer were beginning to move back to the farms. The snowmobilers moved about 40 deer away from the farms the second time. The process was repeated a few more times with fewer deer each time. By the time the last drive was attempted the deer left the farm sites immediately upon hearing the snowmobiles start up.

The big concern now is whether the food supply will hold out to spring. The trails have long since been drifted in and reopening them will be nearly impossible.

We can only hope the food supply is adequate. A lot of people contributed time, equipment, money and feed to save this herd of deer and reduce a very serious depredation problem. We bought the deer some time and hopefully it will be enough time to see them through these hard times.