

ARROWWOOD NATIONAL WILDLIFE REFUGE

PINGREE, ND

NARRATIVE 1978

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I. GENERAL

A. Introduction

Located on the James River in east-central North Dakota, Arrowwood National Wildlife Refuge provides a mixture of shallow lakes and ponds, native prairie, grasslands, tame grasslands, cultivated fields, and wooded ravines. The refuge's primary purpose is to serve migratory birds during the nesting and migratory seasons. Resident wildlife also benefit from management of the refuge's varied resources. Established in 1935, the refuge contains 15,934 acres and serves as headquarters for the Arrowwood Refuge Complex. The complex is composed of the Valley City WMD, Arrowwood WMD, Slade WMD, Slade NWR, Long Lake NWR, Chase Lake NWR, and 15 easement and fee-owned refuges. The complex serves Fish and Wildlife Service lands in 12 counties of east-central North Dakota.

B. Climatic and Habitat Conditions

Precipitation & Temperature Information *

<u>Month</u>	<u>Rec'd</u>	<u>Normal</u>	<u>Snowfall</u>	<u>Max. Temp</u>	<u>Min. Temp</u>	<u>Mean Temp</u>
January	.55	.40	5	27	-28	-10.1
February	.04	.34	1.5	37	-28	10.2
March	.12	.62		63	-22	24.6
April	1.12	1.48		70	19	40.3
May	2.08	2.50		85	31	56.8
June	4.06	3.46		87	38	63.7
July	1.71	2.78		95	43	64.3
August	.76	2.56		98	32	66.4
September	1.65	1.87		106	36	60.4
October	0	1.23		80	19	
November	.93	.53	7.1	75	-21	21.1
December	.62	.43	6.5	37	-25	9.6
	<u>13.64</u>	<u>18.20</u>	<u>15.6</u>	Ave. Yearly Temp 37.0		

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

Good runoff conditions brought water levels on the refuge back to normal. This was a significant improvement over 1977 levels. The improved water conditions coupled with winter kills in all refuge lakes, increased pond weed production dramatically. Marshes which dried up last year attained a good water level through the summer. On the DePuy Marsh unit high water levels yielded heavy response of emergent vegetation and a corresponding drop in the degree of open water. Arrowwood Lake produced extensive

beds of sago pondweed in 1978. The beds were nearly continuous over the entire five-mile length of the lake. Eradication of rough fish brought about by two successive years of winter kill contributed to the recovery. About 4,000 canvasbacks utilized the sago beds during migration.

Besides the refuge's large lakes, the numerous potholes also recovered. A lack of significant moisture during the summer caused the more temporary wetlands to dry up. Good snow accumulations and spring rains could restore the wetlands to full capacity. There were fish kills on both Arrowwood and Jim lakes. The abundance of carrion on the shores was more than enough for the predators and scavengers.

Overall habitat conditions on the refuge were good. Waterfowl populations were about normal. Observations on one DNC plot showed heavy nesting use. Food plots were extensively utilized by migrating geese. On the uplands both predator and prey species were in good numbers. With our continuing prescribed burning program and, hopefully, more moisture, habitat conditions will be even better in the ensuing years.

C. Land Acquisition

Nothing to report.

D. System Status

1. Objectives

Overall refuge objectives remain unchanged from the past few years. There is a need to change and update them and we understand directives for this will be coming out to all refuges sometime in 1979. We will withhold submitting changes until that time.

2. Funding

The funding picture for the Arrowwood Complex improved considerably in FY 1978. Manpower, administrative and overhead costs were adequately covered and we still had enough left over to replace equipment on a timely basis and replenish supplies and materials. The O&M funding picture compared to FY 1977 is shown below:

	FY Cost Codes				
	1210	1220	1240	1340*	Total
1977	198,000	5,000	10,000	3,000	\$216,000
1978	253,700	5,000	10,000	2,000	270,000

* The 1340 funds are for Valley City WMD and represents salary costs for our biological technician when he helps the hatchery during spawning operations.

BLHP funding in the amount of \$165,000 including engineering, was also provided in FY 1978. The money was used for the following facilities and equipment.

<u>Item</u>	<u>Cost</u>	<u>Status</u>
Truck-tractor	\$ 41,123	To be delivered 2-79
LoBoy Trailer	9,004	Delivered FY 78
House for Long Lake NWR	53,916	To be constructed in 79
Farm Tractor, Long Lake	21,265	Delivered in FY 78
Disc	3,552	Delivered in FY 78
4X4 Pickup	6,277	Overdue
Seed for DNC	15,000	Delivered & seeded
4X2 Pickup	4,414	Delivered
Misc. Culverts, resources, stove, refrigerator	3,100	Delivered

Considerably more work needs to be done under the BLHP program. FY 1979 funds appear to be short of what scheduled projects are now estimated to cost and FY 80 and 81 funds are much in doubt because of announced budget cuts. It appears the BLHP program will have enabled us to update much of our equipment and some facilities but will be phased out just as we were getting involved with much needed facilities rehab and replacement.

II. CONSTRUCTION & MAINTENANCE

A. Construction

Construction work began on a waterfowl impoundment adjacent the county road on the south end of Arrowwood Lake Unit. The shallow impoundment will be about 14 acres in size and have several earthen islands when completed. The dike is approximately one-half mile long, five feet high and ten feet wide. About seventy-five percent of the project was completed before freeze-up.

B. Maintenance

Heavy snow during the winter of 1978 raised havoc with refuge fences. Most sections of boundary fence and interior fence received some damage which necessitated considerable time for repair. Another major maintenance project was the work done on the main entrance road, tour route, and picnic ground road. These roads were graded

up and about 350 cubic yards of gravel was spread in problem areas. Considerably more of this work needs to be done on the tour route. Most work was on the entrance road north of the headquarters where 250 cubic yards was spread to reduce the mud problem that occurred every time it rained.



YCC enrollees from the camp sponsored by Northern Prairie Wildlife Research Center assisted the refuge with routine maintenance projects.

C. Wildfire

No wildfire occurred on Arrowwood Refuge this year. Several occurred on other portions of the complex and are written up in the narratives for these respective areas.

III HABITAT MANAGEMENT

A. Croplands

The following table summarizes the crops planted on the refuge in 1978. The refuge share was left standing for use by wildlife except five acres of wheat harvested from F-2 for baiting and feeding purposes.

<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	134	44	90		32	58
F-2	75	20	36	19 sunflowers	15	40
F-3	30	10	10	10 sunflowers	10	10
F-4	22	11	11			11
F-5	96	28	68		21.5	46.5
F-6	26		26		10	16
F-7	83		71	12 sunflowers	37	46
F-8	69		55	14 corn	22	47

Refuge crops were well used by wildlife. Migrating geese were especially fond of the winter wheat. They fed on wheat and browse constantly until the fields appeared black. They also used the harvested wheat stubble fields, gleaning grain and green browse. Standing small grain received poor use. Corn and sunflowers provided food for resident species, especially sharptailed grouse, ring-necked pheasants, Hungarian partridge and deer. Crop production was generally good. Early spring moisture and adequate rains during the growing season made the difference. Weeds were a problem in some fields notably wild oats in small grains.

DNC Plantings

Arrowwood Refuge has nearly 3,000 acres of dense nesting cover scattered throughout the refuge. The cover plantings have been made over several years beginning in the early 1970's. Following substantial summer and fall rains in 1977 the DNC went into the winter in good shape. Heavy ice and snow cover during the winter flattened the rest in all but the most protected areas.

The value to early nesting waterfowl was substantially reduced as a result. Adequate moisture in 1978 made for ideal growing conditions and excellent recovery of cover was made.

Plantings of DNC were made on portions of seven units this year. The mixture consisted of three pounds of tall wheatgrass, five pounds of intermediate wheatgrass, one-half pound of sweet clover and two pounds of Ranger alfalfa. All rates are expressed as pure live seed. Seeding was done under cooperative farming agreements. This is a three-year agreement where the permittee breaks out the field and summer fallows it the first year, plants small grain and takes 100 percent share the second year and plants DNC with a small grain nurse crop and takes 100 percent of the small grain that year. The DNC seed is furnished by the refuge. Areas planted in 1978 are summarized below.

<u>Unit</u>	<u>Acres</u>
D-6	67
D-9	29
D-10	48
D-16	25
D-16a	43
D-13	20
D-13a	54

B. Grasslands

1. Grazing

Eight of the refuge's 30 grazing units received grazing treatment.

The fee was \$4.18 per animal unit month. Other grazing information is summarized below.

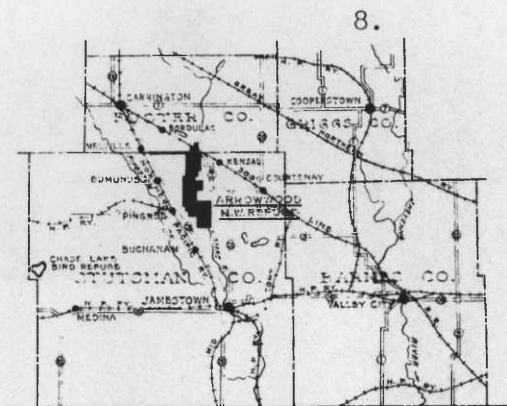
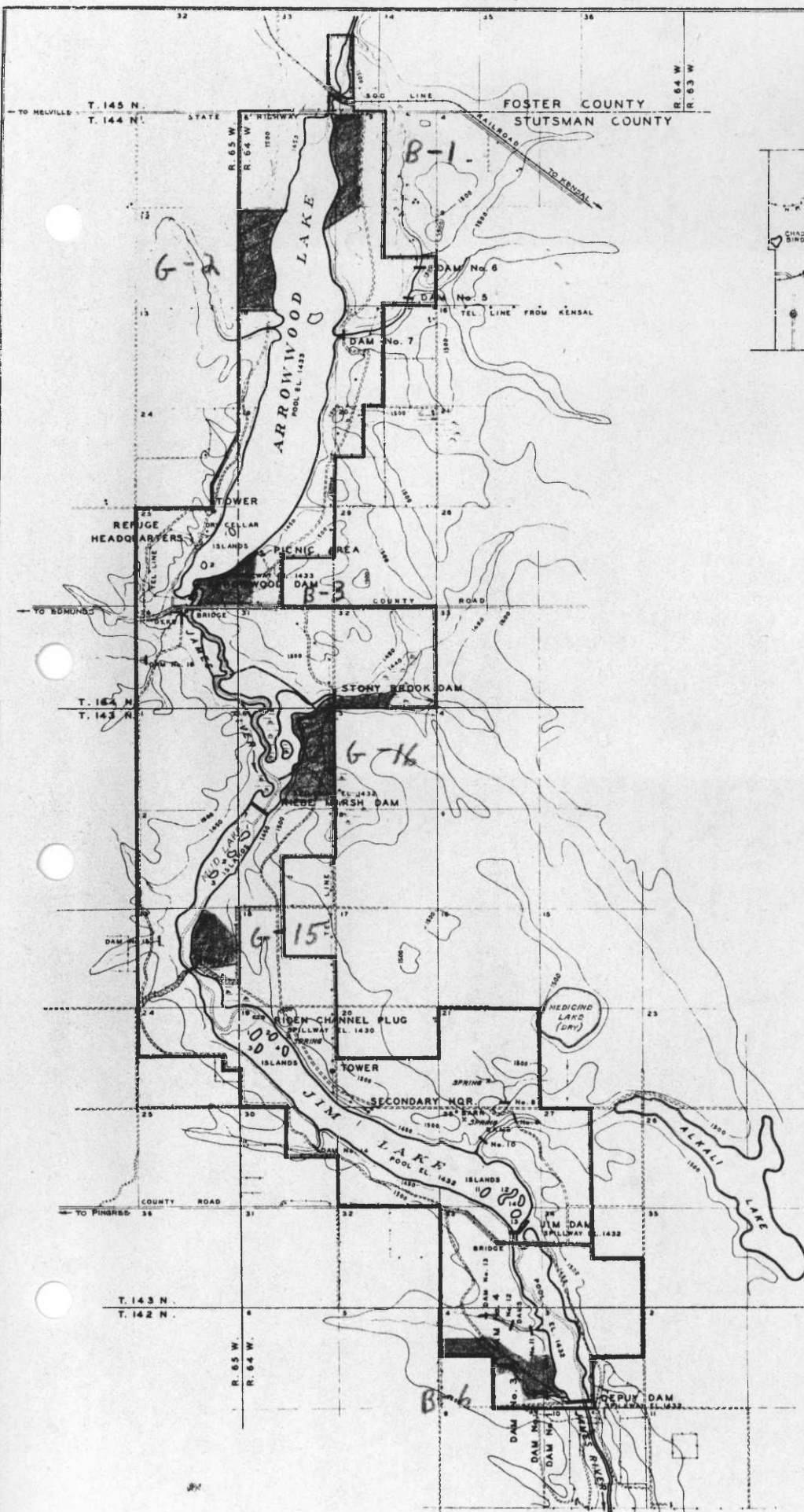
<u>Grazing Unit</u>	<u>Acres</u>	<u>Period Grazed</u>	<u>AUM's Allowed</u>	<u>AUM's Used</u>	<u>Receipts</u>
G-1	170	5/5-6/2	170	146.53	\$ 612.50
G-4	157	4/2-6/7	150	169.78	709.68
G-5	144	4/23-6/26	160	157.50	658.35
G-6	192	5/1-6/30	192	166.94	697.81
G-8	220	4/2-5/26	150	146.16	610.95
G-18	322	4/29-6/30	220	221.12	924.28
G-19	360	5/1-6/30	360	111.00	463.98
G-22	242	4/2-6/30	250	226.64	947.35
G-25	326	4/29-6/30	250	233.45	975.82
Totals			1902	1579.12	6,600.72

In evaluating the refuge grazing program, we determined that the rest-rotation system previously set up was not accomplishing what we wanted and made some modifications. Mid-summer and fall grazing was discontinued in favor of spring grazing. This was done to create optimum growing conditions for the warm-season natives and to put pressure on the cool-season species, notably Kentucky bluegrass (Poa pratensis), quack grass (Agropyron repens), and smooth brome (Bromus inermis).

These species are all serious invaders at Arrowwood. Grazing permits in effect for 1978 were all multi-year permits for up to five years. Two permits expired at the end of the 1978 grazing season and the remainder will terminate after the 1979 season. New permits will be written to allow us to terminate grazing by June 15 to put maximum pressure on cool-season invaders and encourage warm-season natives.

2. Prescribed Burning

We resumed prescribed burning on Arrowwood in 1978 following several years of no burning. Location of burns are shown on Map 1. Arrowwood Refuge has some upland areas that are classic examples of what can happen with overprotection and inadequate or untimely management treatments. Native uplands have deteriorated in areas previously invaded by introduced species such as Kentucky bluegrass, quack grass and smooth brome. Buckbrush (Symphoricarpos occidentalis) has greatly expanded its percentage of composition in the native community. We feel that an intensive burning program is the only way to return these areas back to some semblance of true native prairie. We intend to intensify the burning management program in years to come, not only on the areas identified as burning units in our present land use plan, but also on the areas identified as grazing units.



LOCATION MAP

SCALE 0 5 10 20 30 40 MILES

FIFTH PRINCIPAL MERIDIAN

LEGEND

- BOUNDARY LINES
- FENCE LINES
- PRIMARY ROADS
- SECONDARY ROADS
- TRAILS
- CANALS & DITCHES

CONTOUR INTERVAL - VARIED
DATUM IS MEAN SEA LEVEL



UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

GENERAL MAP ARROWWOOD NATIONAL WILDLIFE REFUGE FOSTER & STUTSMAN COUNTIES NORTH DAKOTA

SCALE 0 10 20 30 MILES

WASHINGTON, D. C., JULY 1936
REVISED MINN. OCT. 1963



September 9, 1978. Typical refuge habitat following prescribed burning. Dark areas are buckbrush patches where the woody vegetation was killed back. Resprouting occurred but obviously did not reach the height of the brush before the burn. A small unburned area of buckbrush can be seen left center of the photo. Note forbs in foreground and clump of big bluestem in background.



Some reports indicate spring burning is detrimental to wild rose (*rosa* spp.). We noted improved vigor following a burn as this late summer photo indicates.

To evaluate the burning program, photo points were established to record pictorially the changes that took place. With the help of Range Ecologist Blake Smith, we set up and recorded information on two frequency transects. This was done to better quantify the vegetative changes that occur. More such transects, modified to also show percent of composition, will be set up in 1979. Information on the various burns conducted in 1978 is given on succeeding pages.

Burn No. G2-78

Area Description: Grazing Unit G-2

Date: May 10, 1978

Time Start: 1:00 P.M.

Finish: 4:00 P.M.

Size of burn area: 193 acres

Humidity: 34%

Wind: 25 MPH S to SW

Temperatures: Max. 82°

Remarks:

This unit was grazed in 1977 and as a result did not have a great deal of litter except in the extensive patches of buck brush. Because of reduced litter the burn was spotty. Good burns occurred in areas of moderately thick clumps of buck brush where Kentucky bluegrass formed heavy layers of litter. The buck brush was in early leaf stage and the burn was a little early in the season, however, later burning would not have been as successful because of insufficient litter and increasing new growth. The burn had a moderate impact. In areas where the fire was hot enough the woody stems of buck brush were killed. Suckers developed several weeks after the burn and other vegetation exhibited improved vigor. We intend to burn the unit again in 1979 after bluegrass has headed out and buck brush is near full leaf.

Burn No. B3-78

Area Description: Burn Unit B-3

Date: May 17, 1978

Time Start: 10:30 A.M.

Finish: 1:00 P.M.

Size of burn area: 175 acres

Humidity: 55%

Wind: S to SE 20-25 MPH

Temperatures: Max. 70°

This area had not been burned since 1971. It had much litter and was badly invaded by buckbrush and introduced species. The unit was burned at a time when the Kentucky bluegrass was at full head and buckbrush was about 75 percent of full leaf stage. The burn had maximum impact. Woody stems of brush were burned off or killed forcing the plants to sucker and utilize substantial root reserves.

Photo point pictures below illustrate the response by natives to this burn. We plan on burning this unit again in 1979 and annually as often as there is sufficient litter to assure a hot fire. This treatment will continue until the buckbrush is set back substantially and range site conditions improve.



Photo of B-3 looked like this in early May prior to the controlled burn. Note extensive invasion by buckbrush and matted condition of grasses.



Post-burn view of the same site. This photo taken in September shows many forbs. A good clone of big bluestem is evident. Buckbrush is still evident but hopefully weakened.

Burn No. G16-78

Area Description: Grazing Unit G-16

Date: May 17, 1978

Time Start: 1:00 P.M.

Finish: 4:00 P.M.

Size of burn area: 215 acres

Humidity: 47 percent

Wind: 10-20 MPH

Temperatures: Max. 74°

Objectives of this burn were similar to those of B-3. The burn produced excellent results with complete coverage and maximum impact on brush and introduced cool-season species. Recommendation for future treatments are the same as B-3. This burn stimulated a nice patch of switchgrass (Panicum virgatum) along the south portion of the unit.



This photo is a control area on G-16.
The photo was taken in September 1978
and shows the choking out of natives
by the invasion of buckbrush and
Kentucky bluegrass.



G-16 treated with a prescription burn in May 1978. This general view shows the improved condition of the rangeland. Note the big bluestem adjacent the road and in scattered clones on the slopes in the background. The control area shown in the previous photo is off the right side of this photo about 20 feet from the road.

Burn No. B6-78

Area Description: Burn Unit B-6

Date: 5-18-78

Time Start: 11:15 A.M.

Finish: 7:00 P.M.

Size of area burned: 200 acres

Humidity: 50 percent

Wind: SE 20 MPH

Temperatures: Max. 72°

The objectives for this burn were similar to those mentioned previously. The burn took longer than anticipated because of slow going on the backfires. We used trails for breaks but had not worked the areas so dead litter layed across these trails. This forced us to go slowly and watch closely to make sure the fires did not get across the breaks. At 7:00 p.m. a shower dowsed the fire. We burned the small remaining area about a week later. Results were similar to other burns with buckbrush being set back and noticeable increases in natives, particularly big bluestem.

Burn No: BI-78

Area Description: Burn Unit B-1

Date: May 23, 1978

Time Start: 11:00 A.M.

Finish: 4:00 P.M.

Size of area burned: 174 acres

Humidity: 59 percent

Wind: SW 7 MPH

Temperatures: Max. 76°

This unit has only minor problems with buckbrush but is being invaded by introduced species. The hilly area bordering Arrowwood Lake favors warm-season species, while on top cool-season natives such as Western wheatgrass (Agropyron smithii) and needle grasses (Stipa spp.) prevail. Also in this unit are a couple of patches of dense nesting cover. This was considered a maintenance burn. Response was excellent with dramatic increases in forbs noted, especially leadplant (Amorpha canescens). Big bluestem showed up in some of the shallow draws and alfalfa showed tremendous improvement in vigor on the DNC plots. Our current thinking is that this unit should be burned at 3-year intervals.

Burn No. G15-78

Area Description: Grazing Unit G-15

Date: May 23, 1978

Time Start: 2:00 P.M.

Finish: 4:30 P.M.

Size of area burned: 140 acres

Humidity: 50 percent

Wind: South 10-15 MPH

Temperatures: Max. 82°

This unit has a bad buckbrush problem. It was last burned in June 1971 and has been in non-use since then. The burn was very hot and went through nearly all the brush. A large hill occupied the central portion of this unit and around much of this hill the burn stimulated big bluestem. Results from this burn were very impressive when the area was viewed in August. There was a dramatic increase in forbs as well as native grasses. Buckbrush was burned off but had suckered and new growth was present. Several more spring burns on an annual basis will be required to set it back to a more acceptable level.

C. Wetlands

Refuge water levels were excellent this year. Spring runoff and rains brought lake and small impoundment levels to near normal conditions. Last year the Arrowwood Lake level dropped to 1433.39 in August, a record low, whereas this year in August the level was 1434.66.

The levels on all the lakes reached spillway elevation. DePuy Marsh was dewatered briefly during mid-summer and reflooded in late August with water released from Jim Lake. The following are average elevations for each month.

Spillway Elevation:	1436.66	1436.00	1436.38
<u>Month</u>	<u>Arrowwood</u>	<u>Jim</u>	<u>DePuy</u>
January	1433.53	--	--
February	1433.53	--	--
March	1436.52	1435.82	1434.40
April	1436.81	1436.03	1436.46
May	1436.68	1436.11	1436.95
June	1436.58	1435.97	1434.94
July	1436.50	1435.97	1434.17
August	1436.46	1435.92	1434.68
September	1436.44	1435.84	1434.88
October	1436.33	1435.70	1434.42
November	1436.33	1435.70	1434.42
December	1436.33	1435.70	1434.42

The winter-kill of fish on Arrowwood was excellent and consequently pondweed production was very high. On Mud Lake the north end yielded excellent pondweed production. Jim Lake experienced a good winter-kill of fish but because of the lake's limnology pondweed production was limited to the upper end and a few shallow areas.

D. Forestlands

Nothing to report.

E. Other Habitat

Nothing to report.

F. Wilderness and Special Areas - Nothing to report

G. Easements for Waterfowl Production

Nothing to report.

IV. WILDLIFE

A. Endangered and/or Threatened Species1. Prairie Falcon

One observation was made in late December on the east side of Jim Lake.

2. Bald Eagle

A single migrant was observed in December in the Mud Lake Unit.

B. Migratory Birds1. Waterfowl

- a. Ducks - The refuge lakes and sloughs were free of ice by March 25. By the first week in April most duck species had arrived. Mallards and pintails seemed to build up the fastest and by the beginning of May, the entire duck migration peak had been reached. By the end of May the refuge held only the resident breeding population. The fall buildup of ducks was about normal with 3,000 present in September and 10 to 15 thousand most of October. A moderate buildup of 4,000 cans occurred in October and these birds made considerable use of the sago beds.

Pair and brood counts were conducted this year using established methods. The pair count was conducted from May 23 to June 2. A total of 618 breeding pairs was observed. This figure is down from last year's 832. One reason for this may have been the inability to run some of the water transects which were clogged with sago. Also, there was more pair habitat which caused a dispersal.



Pondweed on Arrowwood Lake.

Arrowwood Breeding Pairs and Duck Production

<u>Year</u>	<u>1968-1978 Pairs</u>	<u>Production</u>
1968	552	2,305
1969	1116	5,801
1970	1186	3,985
1971	1447	4,999
1972	973	3,165
1973	941	2,982
1974	1494	4,771
1975	1070	4,264
1976	901	4,717
1977	832	2,376
1978	618	3,776

Brood counts were conducted from July 10 to July 17. Again, clogged water ways impeded the count. The following table gives the 1978 duck production figures for the past eleven years.

<u>1978 Duck Production</u>					
<u>Species</u>	<u>Pairs</u>	<u>Prod. Rate</u>	<u>No. of Broods</u>	<u>Brood Size</u>	<u>Total Production</u>
Mallard	122	.85	103.7	6	622
Gadwall	124	.85	105.4	6	632
Widgeon	12	.85	10.2	6	61
Pintail	42	.85	35.7	6	214
BWT	152	.85	129.2	7	904
GWT	16	.85	5.1	7	36
Shoveler	48	.85	40.8	6	245
Wood duck *	91	From nest box checks			595**
		Dabbler total			3,309
Redhead	57	.85	48.5	6	291
Canvasback	10	.85	8.5	5	43
Ruddy	27	.85	23.0	4	92
Scaup	8	.85	6.8	6	41
		Diver total			467
		Total ducks			3,776

Productivity rate of .85 was computed using procedures outlined in wildlife inventory plan.

* Total count not pairs

** Number of eggs hatched - actual survival not known.

Peak fall population of about 33,000 was reached on September 29. By the end of October only 3,500 ducks remained on the refuge. Waterfowl-use days are summarized on the following page.

Waterfowl-Use Days 1954-1978

<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
1978	6,750	614,700	941,900	678,300	2,241,660

b. Geese

During spring the first Giant Canada geese were observed March 30. Small Canadas and snow and blue geese numbered several hundred in early April. About 20 Canada geese resided for the summer. Three Canada broods were observed from the air. Two of these successful broods were hatched from islands in Arrowwood Lake. September 15 saw 1,000 snows and blues and 500 small Canadas. By October 16, snows and blues had peaked at 14,350 and small Canadas at 8,670. Use-days for geese were similar to last year and are shown on the Waterfowl-Use Day Table.

c. Swans

Over 100 whistling swans were seen on the refuge in mid-April. The fall brought a peak population of 600 swans in mid-October.

2. Other Water Birds

A good number of double crested cormorants were observed along Mud Lake. The cormorants, which may nest in Chase Lake NWR, feed on Arrowwood from spring through fall. A peak number of 100 was observed in August. No sightings were made after September 30. White pelicans from Chase Lake NWR also utilized the refuge from spring through the fall. The peak number observed was a flock of 478 on Arrowwood Lake. By October 15 no pelicans were recorded.

American bitterns, black-crowned night herons and pied-billed grebes were common throughout spring, summer and fall. Numbers of great blue heron were put at about 25, perhaps a decrease over previous years. Western grebes were first seen on April 20. Several hundred were recorded on Arrowwood and Jim Lakes. Sandhill cranes were seen flying over the refuge several times during the last week of April, but no ground observations were made.

3. Shorebirds, Gulls and Terns

California, ring-billed and Franklins gulls were numerous on the refuge. Untold thousands were observed at the lower end of Jim Lake on April 21 where they were feeding on winter killed fish. Hundreds of common and black terns were also recorded. Shorebirds observed included golden plover, Wilson's phalarope, greater yellowlegs, willet, avocet, killdeer, marbled godwit and the common snipe.

4. Doves

Mourning doves were very common throughout the refuge. No population censuses were taken.

5. Raptors

Two red-tailed hawk nests were observed as well as one successful Ferruginous hawk nest. Swainson's hawk and marsh hawk were common but no nests were observed.

6. Owls

Great horned owls remained common on the refuge with one nest recorded along Jim Lake. Large numbers of short-eared owls were observed passing through the refuge in the spring, with some certainly nesting. An unusual observation of Barred owls was made on December 19 during the Christmas bird count. This is the first record of this owl on the refuge.

C. Mammals and Non-Migrating Birds

1. Game Mammals

- a. White-tailed deer - The number of deer on the refuge in early 1978 was at an all time high with an actual count in February yielding 558. The large number of deer was due in part to recruitment from surrounding areas during the unusually hard winter. The bottomlands along the lake offered good cover and deer from adjacent wind-swept lands moved into the refuge during the winter. The herd appeared to be healthy based on observations of deer taken during the hunt. The late fall and winter population appeared to be low, but no actual count was made. Deer were ranging fairly well as the year closed and the build-up of a year ago was not expected.
- b. Red Fox - The trap harvest was double that of last year, an indication that the refuge supported a good population this year. We estimate over 150 fox used the refuge including those fox dispersing through the refuge.

2. Other Mammals

- a. Coyotes - One coyote was shot off the western boundary of the Arrowwood Lake Unit and four were trapped along Mud Lake. In addition, several observations were recorded along Jim Lake and three spotted in the Mud Lake unit after trapping ceased. It is possible that numbers are increasing with a maximum figure for the refuge at about ten.
- b. Prairie Dogs - The refuge's small prairie dog town continues to hold its own. The dog town was established in 1971 when prairie dogs were released at the site. About twenty animals were present in the town.



One of our alert prairie dogs.

- c. Mink - Signs of mink were infrequent but thirteen were trapped this year whereas only three were trapped the preceding year. Improved water conditions have helped mink numbers increase.

- d. Muskrat, Beavers and Other Furbearers - Muskrats were observed on Foresburg and National Guard Ponds. Numbers are extremely low. Two beaver lodges remain on Arrowwood Lake, one on Mud Lake and a new lodge was recorded on Jim Lake. Numbers of raccoon and skunk were high based on trapping figures. There was almost a four fold increase in the number of raccoon caught by trappers.

3. Resident Birds

- a. Pinnated Grouse - No observations were made this year. The last sighting was made in 1975.
- b. Sharp-tailed Grouse - Counts of sharp-tailed grouse on their dance grounds were made between April 11 and April 26. A total of 98 males were counted, a considerable decrease from previous years. The decrease in grouse numbers can probably be attributed to the severe winter. Food supplies may not have been sufficient to carry the birds through the last months of winter. The following table summarizes the number of grouse on the dance grounds.

Ground Number	Year												
	66	67	68	69	70	71	72	73	74	75	76	77	78
1	12	9	9	9	7	14	8	10	15	22	19	12	0
2	14	10	15	10	5	8	5	0	5	2	12	14	0
3	5	0	0	3	3	0	10	14	12	11	12	0	9
4	8	12	11	5	7	7	8	16	10	10	8	12	5
5	5	12	10	14	17	17	18	16	18	22	15	22	7
6	7	7	7	0	0	0	9	17	12	12	11	8	8
7	18	17	18	25	22	19	13	0	7	10	13	19	7
8	0	7	0	0	0	0	0	0	0	0	0	0	0
9	20	16	14	5	11	18	22	18	14	19	15	18	10
10	5	12	17	12	12	11	10	16	9	11	13	11	2
11	17	15	12	11	11	9	11	17	13	0	0	0	0
12	3	5	5	0	0	0	0	0	0	0	20	13	6
13					12	13	8	11	12	12	3	0	8
14(52)						4	8	6	0	0	0	0	0
15(59)						6	13	9	4	0	0	0	4
16							2	0	0	0	0	0	0
62											9	14	14
63											12	16	0
53											8	10	5
51											8	8	8
New Ground Off-Refuge - No Number												8	0
17													9
Totals:	114	116	118	96	107	126	155	150	131	131	178	185	102

One new dance ground was discovered adjacent to the eastern boundary of the Arrowwood Lake unit. Production was good, however, and the fall population was again high. Flocks of 100 and more were observed on one occasion.

- c. Ring-necked Pheasants - The pheasant population was decimated by the severe winter. There was some production and a few were taken by hunters this fall. This species cannot cope with the region's weather as well as native species of upland birds.
- d. Hungarian Partridge - Partridge numbers appear to be stable as in previous years. They appear to make good use of refuge's agricultural crop lands and adjoining edge habitats.

V. INTERPRETATION AND RECREATION

A. Information and Interpretation

I. On-Refuge

From 2,000-2,500 visits were recorded each month for the self-guided tour route during the summer months. A number of groups including the National Wildlife Federation students from Jamestown College and scout troops from nearby towns were given guided tours. The refuge also played host to a wagon train commemorating days long gone by. Arrowwood Refuge provided a scenic backdrop to these modern-day pioneers.

In addition, the picnic area on the east side of Arrowwood Lake received heavy use.



This wagon train utilized about fifteen miles of refuge trails in their search for a little touch of yesteryear.

B. Recreation

I. Wildlife Oriented

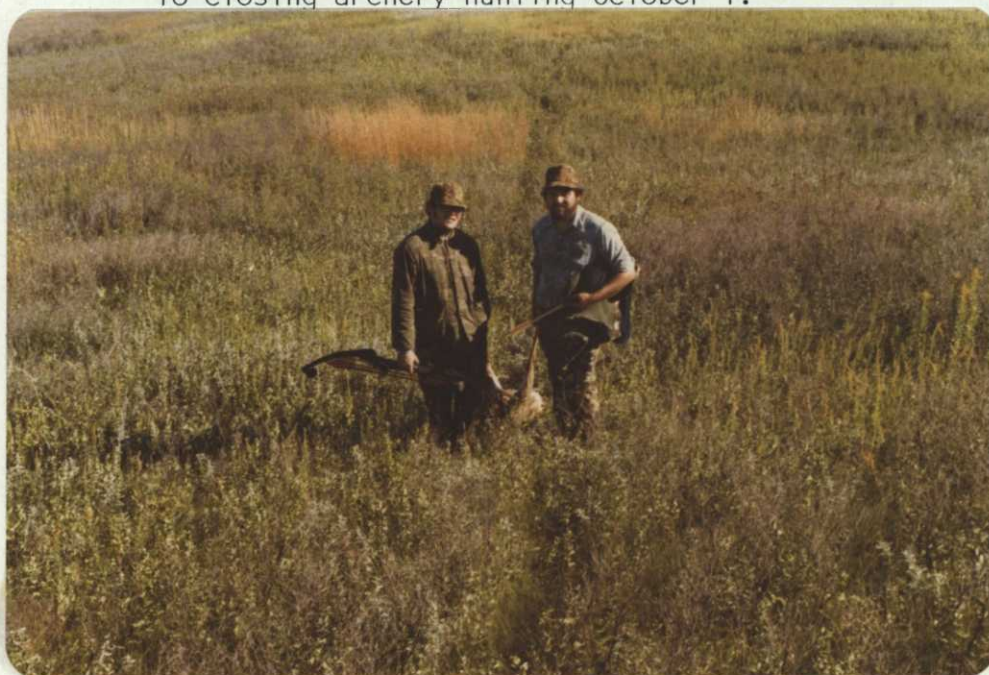
- a. Deer Hunting - Rifle hunting opened at noon on Friday, November 7, and closed Sunday, November 26. The initial $2\frac{1}{2}$ days were open only to 122 hunters holding permits for 89 bucks and 33 does. After that period the refuge was open to anyone with a permit for the zone in which Arrowwood is located.

Surprisingly, the turnout on opening day was light and hunters seemed to congregate in a few areas exerting hunting pressure primarily on the Mud Lake unit. Snow, winds, and near zero temperatures appeared to discourage many. About 21 deer were killed opening day. The remainder of the special permit period yielded a known kill of eight deer. On the ensuing days hunting dropped off considerably and on some days no hunters entered the refuge. The total number

of deer known killed was 36, down from previous years. (See the deer harvest table below). Certainly this low harvest was due to a poor hunting turn out. Further, those that did hunt did not work many of the choice deer areas such as the wooded draws along the lakes.

<u>Year</u>	<u>Adults</u>		<u>Fawns</u>		<u>Total</u>
	<u>Bucks</u>	<u>Does</u>	<u>Bucks</u>	<u>Does</u>	
1975	25	17	3	8	53
1976	21	12	5	5	43
1977	42	3	3	0	48
1978	22	11	2	1	36

The refuge was also open during the statewide archery deer season which ran from September 1 to November 12 and resumed November 27 until December 31. We estimate 20 deer were taken by bow hunters, a substantial increase from the normal 4 or 5 we get most years. We experimented with allowing bow hunting during the waterfowl season. Problems were minimal but some goose hunters complained so we will probably go back to closing archery hunting October 1.



A successful bow hunter.

- b. Fox Hunting - With the price of fox pelts fetching as much as \$95, there was an increase in fox hunting over last year. However, because fox hunting must be done on foot, the refuge does not receive the hunting pressure as do outlying areas where vehicular assistance is widely used.
- c. Upland Game Bird Hunting - There was some interest in our special late season bird hunt this year and many inquiries made concerning the hunting of sharptail grouse, ring-necked pheasant and Hungarian partridge. Nevertheless, the actual turnout was slight.
- d. Trapping - The refuge was again divided into seven trapping units as was done last year. Seven trappers were each assigned a specific unit. Trapping started October 21 and continued until snow cover made vehicle access to traps impossible. Trappers were required to close operations during the firearms deer season. Cessation of trapping occurred long before the various trapping seasons officially closed. The following table summarizes the trapping harvests over the last three years.

<u>Species</u>	<u>1978</u>	<u>1977</u>	<u>1976</u>
Fox	49	22	53
Skunk	50	44	28
Raccoon	61	15	44
Mink	13	3	52
Badger	1	1	2
Coyote	4	0	0

c. Enforcement

Routine patrols were conducted during the various hunting seasons. One apprehension was made for reckless driving in the recreation area. The driver was fined \$50. One hunter was apprehended shooting a redhead on the north end of the refuge and paid a \$35 fine, and one was apprehended and fined \$100 for molesting wildlife when he drove up beside a flock of geese on the refuge and frightened them off with a shotgun blast.

OTHER ITEMS

A. Field Investigations1. Wood Duck Study

This was the final year of a ten-year study on wood duck conducted by Hal Doty of the Northern Prairie Wildlife Research Center.

As the figures and graphs that follow show, wood ducks have been successfully established at Arrowwood Refuge. A paper will be published on this project in the future. We will continue to monitor the wood duck situation.

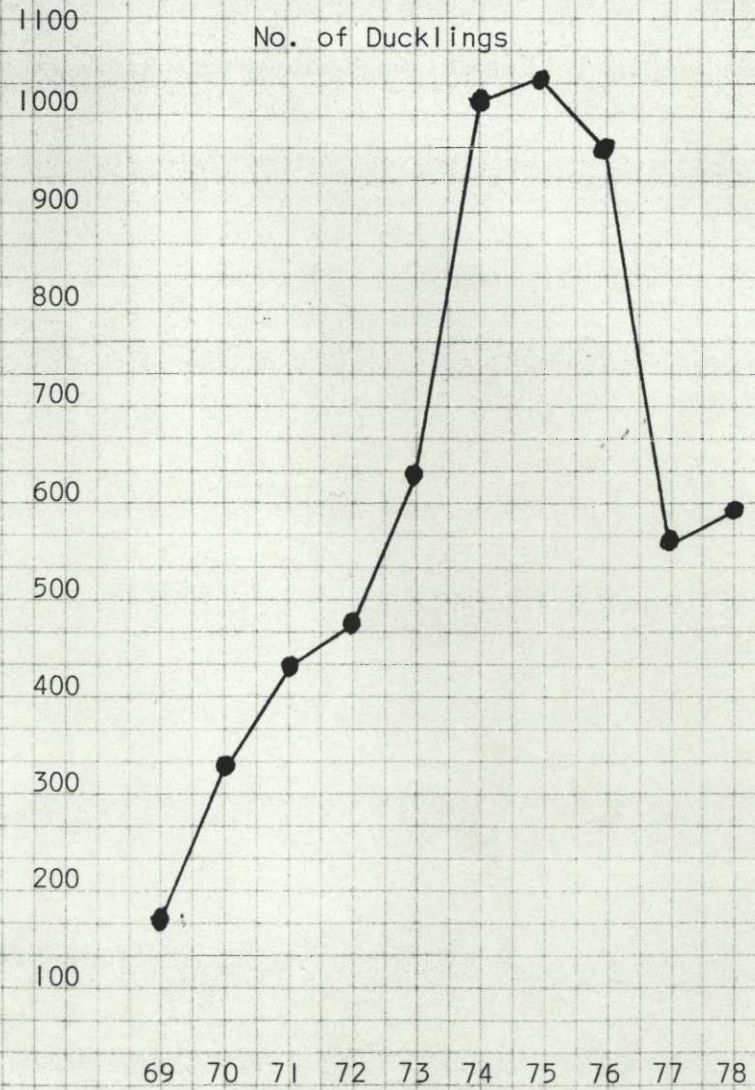
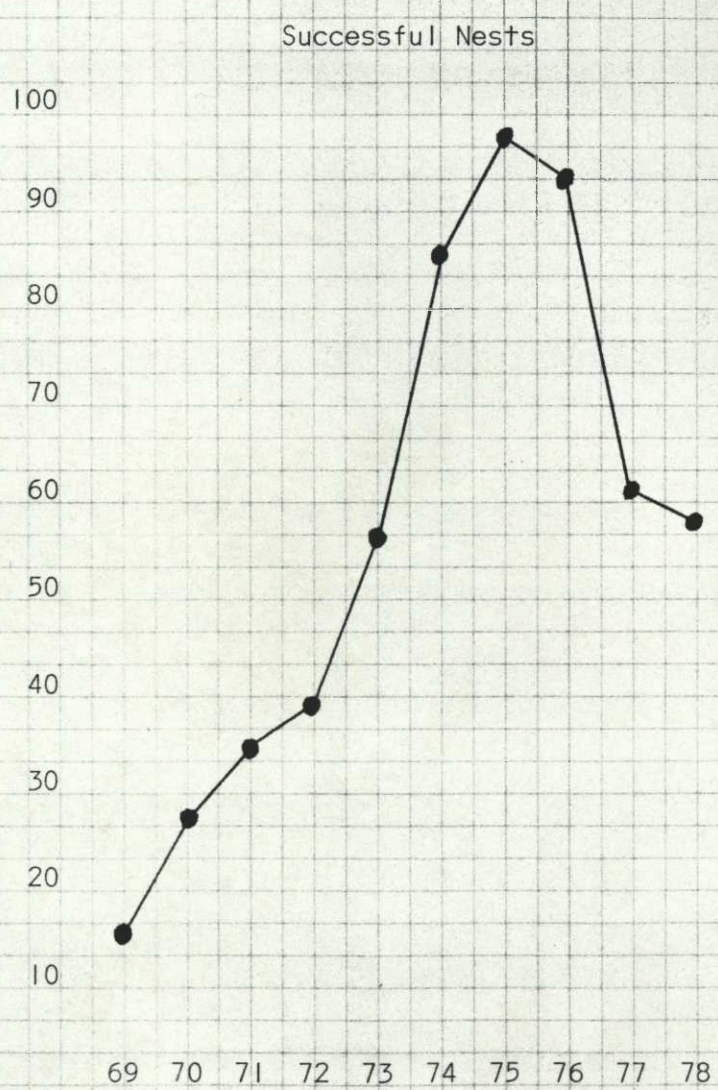
Wood Duck Study 1978

Number of Nests	91
Successful Nests	58
Unsuccessful Nests	33
Percent Successful	63.7%
Number of Eggs Laid	915
Number of Eggs Hatched	595
Infertile Eggs	229
Dead Embryos	91
Houses Out	315
Houses Available	283
Percent Use by Wood Ducks	32.1%
Average Clutch Size All Nests	10.1
Average Clutch Size All Hatched Nests	12.3



Wood Duck Study 1978

10-Year Summary of Wood Duck Production



B. Cooperative Programs

Nothing to report.

C. Items of Interest

Personnel changes in 1978 were held to a minimum. John Sidle came on board at Arrowwood Refuge in April as our new refuge manager trainee. His previous wildlife experience was in Africa where he worked for 2½ years under the Peace Corp program.

Paul Van Ningen, wildlife student who had worked for us for three summers, was selected for a biological technician position at the National Fish Genetics Laboratory in Beulah, Wyoming. We were happy to see this hard working conscientious young man get a permanent position.

In last year's narrative we described the deer depredation problem that occurred in the vicinity of Chase Lake NWR and measures taken to reduce these problems. Through efforts of the Woodworth Wildlife club, an extensive feeding program was undertaken. The club coordinated the feeding of over 1,000 deer at eighteen sites in north-western Stutsman county. The club arranged for the food, raised money to acquire food, coordinated the breaking of trails into the feeding sites, dispensing the food, herding the deer away from haystacks and monitoring the situation and reacting when deer started returning to haystacks. In addition, the club initiated the statewide "Save the Deer" campaign by convincing the governor and the Wildlife Federation that this project was feasible and an available alternative to the late season deer hunt the governor had proclaimed. Before the winter was over the people of North Dakota would contribute over \$30,000 to the fund and provide feed to over 12,000 starving deer and antelope.

For their dedication and concern for the wildlife resources of North Dakota we nominated the club for the North Dakota Conservation organization-of-the-year award. At their annual meeting in January, 1979 the Wildlife Federation presented the Woodworth Club with this prestigious award. We are very proud of the work of this group and pleased that through a little effort on our part they received the recognition they justly deserved. In the Chase Lake area they certainly helped us out of a tight spot, and turned what could have been a disaster into a success. Their efforts went a long way toward smoothing over some of the problems sportsmen have been having with landowners.

Another horror story with a not-so-happy ending concerns this narrative report. After we had finished writing the rough draft we had it taken to the Valley City Wetland Office for typing. A draft was typed up and the whole thing -- original draft, photos and typed draft was packaged up and mailed back to us. The only problem was we never received it. Checks with post offices, the rural carrier and the dead-letter office brought no trace of the missing narrative. After about a month of waiting and anxiously hoping the mailman would finally deliver, we came to the realization we weren't going to see it again.

Our next concern was "What do we do now"? We didn't want to rewrite the entire narrative but our options were limited. From Valley City we received word they still had the typewriter ribbon that was used to type the narrative. We checked it out and determined that we could decipher the letters on the ribbon but it would not be an easy task. Lettering on the ribbon runs from the bottom up and from right to left. For example, the words Narrative Report would appear on the ribbon as:

t p e t r
r e v a a
o R i r N

It took us almost two days to complete the deciphering but that was considerably less time than would have been required to start from scratch again.

We learned a couple of lasting lessons -- 1. Never trust the U. S. Mail and, 2. Make a copy.

D. Safety

Safety Meetings were held on a monthly basis. No reported accidents occurred this year.

CHASE LAKE NWR

Chase Lake National Wildlife Refuge is an unmanned refuge located in west-central Stutsman county and administered by Arrowwood National Wildlife Refuge. Four thousand one hundred fifty-five of the refuge's 4,385 acres are included in the National Wilderness Preservation System. The refuge is one of two wilderness areas in the state. Chase Lake NWR hosts the largest nesting colony of white pelicans in North America. Population figures from 1972 to 1978 are presented below.

Pelican Population

	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>
Number of Nests	4,827	3,911	4,062	4,220	4,755	4,619	4,589
Number of Eggs	7,334	7,941	No egg count	-----	-----	-----	-----
Young Produced	1,500	1,800	1,200	2,500	2,425	2,494	2,420
Breeding Population*	9,654	7,822	8,124	8,440	9,510	9,238	9,178

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



The refuge was established in 1908. Pelican numbers steadily increased for a number of years and will probably continue to fluctuate. In 1917 the breeding population was only 175. Chase Lake Refuge remains a splendid example of what protection can do. In addition to the large number of pelicans nesting on the lake's two islands, thousands of ring-billed and California gulls nested on the islands again this year. The breeding population of double-crested cormorants was estimated at 916 birds. Common terns nested in good numbers on the islands. Avocets and a wide variety of other shorebirds nested on the exposed mud flats. During the fall migration one hundred twenty sandhill cranes were observed on the refuge. Several hundred migratory geese and swans were also recorded. Sharp-tailed grouse dancing ground counts in April revealed only a total of ten males on three separate dancing grounds in the northeast and southeast section of the refuge. The count, however, was incomplete and there are probably additional sharptails on the refuge.

The large snow accumulation last fall on the refuge which caused white-tailed deer to move away and depredate adjoining farmland did not recur this year. In addition, this year several bales of hay were placed on the refuge as a feed supplement. Rifle hunting was permitted this year with eight does and four bucks taken. Archery hunting was also permitted during September.

Public use of Chase Lake National Wildlife Refuge is necessarily restricted during the spring and summer months in order to ensure maximum protection of the breeding pelicans. A few tours, however, were conducted by refuge personnel for the Audubon Society and YCC environmental classes.