LONG LAKE NATIONAL WILDLIFE REFUGE
Moffit, North Dakota

ANNUAL NARRATIVE REPORT
Calendar Year 1979

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

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LONG LAKE NATIONAL WILDLIFE REFUGE

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1. GENERAL

A. Introduction

Long Lake National Wildlife Refuge was established in 1932 primarily to reduce migratory bird losses to botulism. The 22,310 acre refuge occupies part of the glacial Cannonball River Valley in Burleigh and Kidder counties in south-central North Dakota. The lake varies from three-eighths of a mile to two miles in width and is about sixteen miles long. Approximately 16,000 surface acres of water is divided into three pools by dikes. Water levels in the shallow alkali lake basins are entirely dependent upon surface run-off and Long Lake Creek. Surrounding the lake basin is native prairie, cultivated fields, shelterbelts of trees and gentle hills and ravines. The upland habitat is utilized by nesting waterfowl and numerous other birds and mammals indigenous to North Dakota. Migratory waterfowl and Sandhill Cranes stop by the thousands in the fall to rest and feed. Occasionally, the endangered Whooping Crane stops during its migration, making Long Lake an important refuge in the Central Flyway.

B. Climatic and Habitat Conditions

Weather conditions were anything but normal in 1979. The winter of 1978-79 began on the harsh side with the months of October, November, and December averaging four degrees below normal temperature. Precipitation during the same period was slightly above normal (1.88 inches). A continuous snow cover was present between November 13 and April 10 for a total of 149 days. Deep snow and cold temperatures were particularly hard on pheasant for the second year in a row. In 1979, January, February and March were unusually wet (3.16 inches). This moisture added to the snow depth which peaked at 25 inches on the ground on March 1st. The first five months of 1979 all had temperatures three degrees lower than the average.

The prolonged winter and late, cold spring were the most significant factors facing resident and migrating wildlife. By the first week of April, deer appeared to be very weak; and even after several weeks, when snows had melted and green shoots were up, they remained in their winter groups.

Spring was late and the ground stayed wet because of the slow even melt of accumulated snow. Farmers were late getting into their fields and potholes and lakes were filled to capacity. May and June turned out to be dry (2.75 inches), while July was extremely wet (5.09 inches). Yields of wheat, oats, and corn were hurt in some areas due to dryness in June. Summer moisture patterns were sporatic from dry to wet to dry. In September, October, November and December, moisture fell 2.14 inches short of the average (3.13 inches) with .99 inches of precipitation falling. Temperatures during this same period ranged from normal to warmer than normal.

The fall and winter of 1979-80 has been very mild by North Dakota standards. The refuge has been completely free of snow cover except for two brief flurries in December. This is good news for resident wildlife, especially pheasant. Favorable weather conditions this fall greatly enhanced the ability of trappers to harvest furbearing animals that are detrimental to ground and water nesting birds. A prolonged shortage of moisture, however, could mean trouble for replenishing potholes with needed water this coming spring. This year 14.51 inches of precipitation fell compared to the average of 15.88 inches.

The following table summarizes this year's weather:

Month	High Temp.	Date Occurred	Low Temp.	Date Occurred	Prec.
Jan.	29	18	-34	1, 5	.29
Feb.	35	26	-38	5, 6	1.84
March.	47	17	-19	10	1.03
April.	72	18	-4	5	1.49
May	85	16, 17, 28, 29	21	3	1.32
June	98	14	36	1, 8	1.43
July	95	8	46	17	5.09
Aug.	93	31	36	24	1.30
Sept.	96	17	28	21	.41
Oct.	77	1	9	13	.19
Nov.	68	17	-4	23	.01
Dec.	57	5	-20	16	.38
				Total	14.51

When weather conditions change on the prairie, it can be sudden and dramatic. This double rainbow made a perfect arc as a spring storm passed nearby. 79-1-PTS

Spring run-off surpassed that of 1978, but it posed less of a threat to refuge improvements. The accumulation of snow between November 1978 and April 1979 amounted to 4,55 inches of water or 1.86 inches above average precipitation. Long Lake Creek began flowing April 11 and peaked in unit I at 1718.83 feet.

Long Lake is divided into three management units by dikes. Spring run-off from Long Lake Creek and the surrounding watershed is the main source of water for these units. The management plans call for filling Unit I and II first and keeping Unit III dry, as possible.

In an effort to keep Unit III dry, water was forced out of the lake through "A" dike spillway (19,566 acre feet). Despite this effort, 12,507 acre feet moved from Unit II into Unit III. The watershed in Unit III provided another 44,120 acre feet of water, making it wet for a number of years to come. It's obvious that the dikes built to prevent water from entering Unit III do not work in wet years.

What surprised me, is that Unit III's watershed has been greater than Long Lake Creek's total spring flow two years in a row. This problem of water control is the key to botulism problems on Long Lake, and a number of ideas are currently being considered (note wetland report under Habitat management).

Water levels dropped slowly in May and June and held steady or showed small increases in July due to heavy rains. A steady drop continued into fall with the evaporation rate of 2.8 feet per year showing its effect.

The following water level data was recorded this year:

Unit	Approved Water Levels	Jan. 1, 78 Levels	Year High	Year Low	Dec. 31, 78 Levels
I	1716.00	1714.54	1718.44	1714.54	1714.74
II	1716.50	1713.23	1717.39	1712.93	1712.95
III	dry	1711.00	1714.50	1711.00	1713.16

C. Land Acquisition

All land acquistion in North Dakota by the U.S. Fish and Wildlife Service ceased in 1979. In recent years, the refuge has not actively pursued lands; even though a small number of round-out purchases should be made.

D. System Status

Long Lake Refuge is part of the Arrowwood National Wildlife Refuge Complex. Administration, objectives and funding are merged with those of the complex.

The main objective of the refuge is to minimize botulism losses through water management. Recent water flow studies have presented new possibilities for water manipulation. These studies will continue and, hopefully, improvements in the present water control plan can be made.

Bicentennial Land Heritage Program funds were made available to Long Lake to construct a new residence and office-shop building in 1978-1979.

A minimum of three full-time employees are normally stationed at Long Lake in recent years. The refuge operated with only two for ten months in 1979. This shortage of personnel affected many refuge responsibilities and activities at a time when the work load had increased. We were fortunate to have a YACC secretary and two good summer students to take up some of the slack.

II. CONSTRUCTION AND MAINTENANCE

A. Construction

The Bicentennial Land Heritage Program made it possible to construct a new headquarters complex at Long Lake. The new site is located one-half mile north of the present site on the north side of the lake.

In 1978 the site was selected, a well was drilled, electric service lines were buried and footings for a 200-foot radio tower were put in place.

Construction of the new buildings began in the spring of 1979. Ground work on the refuge house was to begin in 1978, but numerous problems delayed work until May 1979.

On May 15, BEK Telephone Co. buried a mile long telephone cable to the headquarters site. The cable was placed 36-42 inches underground by means of a "hook" attached to the bulldozer. This was a very efficient and quick method with minimal disturbance to the ground surface.

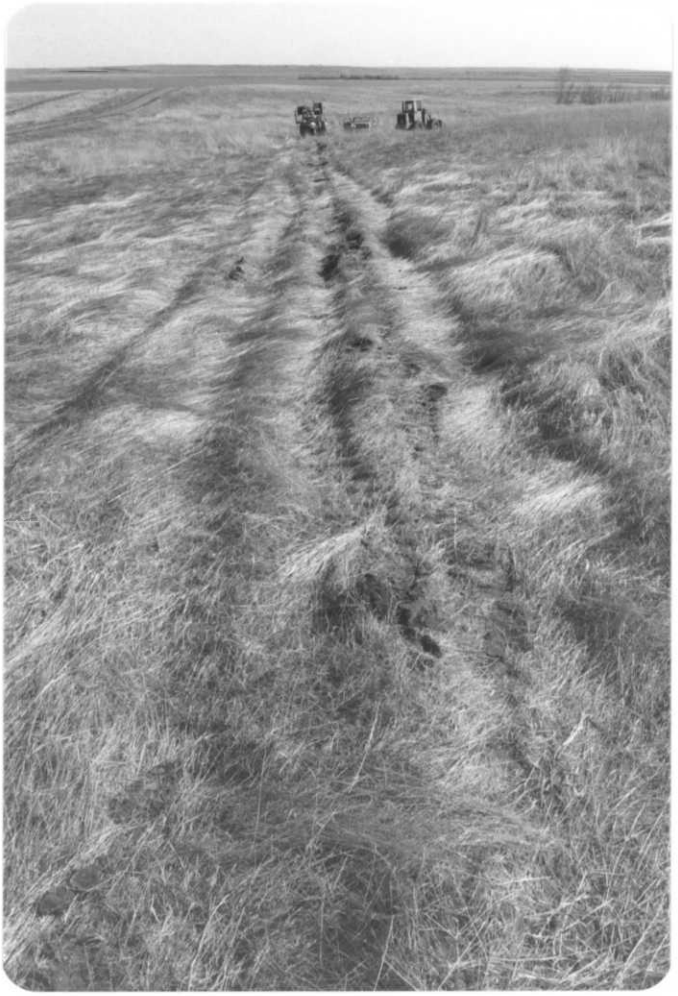
New headquarters site on the north shore of Long Lake prior to development. Old headquarters site is seen as a clump of trees on the south side of lake. 78-1-PTS

A similiar telephone cable was buried on August 2 to service the old headquarters area. We didn't think this was necessary but they insisted.

The contract to build a three bedroom house was let to Mid West Homes of Minot, N. D. Two homes were under this contract; the other being built at Uper Souris NWR. Construction time was six months starting October 1, 1978, with the possibility of shutting work down due to weather conditions. The house under contract is a pre-built modular structure that was built in South Dakota. During the winter, the two house sections were shipped to Minot where interior finishing work was completed.

Work at the refuge house site began on May 29. By June 8, foundation walls for the house and garage were in place, and the basement plumbing was roughed in ready for pouring the floor.

Work ceased until July 29, when dirt had to be moved from the foundation area so that the house, now in one piece, could be moved in. Another long pause and then, on August 15 the house was moved and set on the foundation. In the process, three floor joists and some underground plumbing was busted up.



BEK Telephone Co. installs underground line to new headquarters site. Considering alternatives, this method of burying cable (bulldozer with underground hook) seems most acceptable from a disturbance standpoint.

79-4-PTS

In the meantime, the garage built at Upper Souris was rejected by engineering. The contractor, having problems all along meeting government specs, decided to slow down activities (not exactly a ball of fire to this point). The garage thing was resolved, and on September 9, garage construction proceeded. As time moved on, the concrete people arrived September 27 to pour the basement and garage floors. An inspection on the morning of September 28 at about 10:00am revealed the cement crew of five were still feeling the effects of an all night party. Three cement trucks were on hand with only one truck unloaded at 10:30am. All trucks were loaded between 6-7am that morning in Bismarck. Two trucks were rejected for use and were dumped on a dike in an effort to keep the truck drivers and cement crew separated. A second attempt by a tired and sober crew to pour cement at 3:00pm that same day proved to be ill-fated also. The cement was poured alright, but it failed hardness tests and was set on top of the steel reinforcement mesh. The cement crew used two different cement companies, and lawsuits may develop.

The new residence was placed on its foundation August 15, 1979. The modular house was moved in one piece from Minot, N. D. 79-6-PTS

The west end of the new residence was unfinished. A one stall garage was later added on the site. 79-6-PTS

The house contractor gave the cement crew a third shot at it on January 6 and hopefully, this one will take. Incidently, while tearing up the concrete basement floor, some plumbing was worked out also, but the floor supports were done correctly this time. The brick fireplace in the living room was taken out and replaced by one meeting contract specifications. There had been so much incompetence on the part of the contractor, that his business partnership dissolved in December. His partner now has the house contract, so we are very hopeful that things will go better now (they can't get much worse). Unfortunately, the word is out to the trade unions, and the project is as popular as bubonic plague. The contractor may have to pay in advance for work to proceed. Since the contract was not completed on schedule, a penalty assessment of $50.00 a day is is affect since October 26. There won't be much profit when it's all said and done. With a little luck, the manager will move into the new house in the spring of 1980.

The garage was constructed on September 9. Temperatures were not warm enough to seal the roof shingles so many had to be tacked down. 79-7-PTS

Lakeside view of new residence showing basement door entrance and newly constructed garage. 79-7-PTS

The entrance road into the headquarters site was formed and shaped from the existing clay soil. Prior to the delivery of the refuge house, a contractor hauled in 310 cubic yards of gravel. Refuge equipment was used to smooth out a one-foot layer over the road surface.

Work on the refuge communication equipment continued on July 18, with the construction of a 280ft. aluminum tower supported by six guide wires. The antenna was bent during shipping, so it was not mounted until September 12, when a replacement was installed. The new facility will not be in service until mid-summer 1980.

The new office-shop building is being constructed by Scherr Construction Co. of Valley City, N. D. Work began on September 11 and has proceeded steadily through the end of December. Few problems have been encountered and much of the work has been completed. The structure has been totally enclosed so temporary heating will allow interior work to be done during the remainder of the winter. Mild fall and winter weather have made it possible for the contractor to be ahead of schedule. The new office provides for a reception area, two offices, toilet, storage room and a crew area with lockers. The 36x40ft. two-stall shop has a floor hoist, floor drains and a electrically heated concrete floor.

Construction of new headquarters entrance road on August 13. Contractor hauled material. Refuge personnel shaped road. 79-6-PTS

Foundation work began September 11 for the new office-shop building. New refuge housing can be seen in the upper right hand corner of picture. 79-6-PTS

It was decided to move the six-stall vehicle storage building to the new headquarters site. A new concrete foundation was prepared by refuge personnel, and on September 24, the building was moved twelve miles around the lake to the new site.

Refuge personnel prepared the foundation for the moving of the six-stall vehicle storage building.
79-6-80

The vehicle storage building was moved September 24 to the new headquarters site. Power Company personnel assisted in moving the metal building along the twelve mile route.
79-6-PTS

The plumber working on the office building was contracted to install water lines and a frost free hydrant. A cement contractor poured a cement floor and a three-foot apron in front of the building. An underground power line was installed from the office-shop building to the six-stall garage. All that remains to complete this building is the wiring, a paint job and a gravel entrance road.

A major project that refuge personnel took on this fall was the construction of the office sewer systems. Since the soil has poor drainage capabilities, a seepage pit system is being used. All plumbing materials, septic tanks and concrete block

for seepage pits were purchased locally from the lowest biders. One problem that developed was that our backhoe could not dig deep enough so the office contractor assisted. The house contractor had not extended his sewer pipe five feet from under the foundation so hook-up has not been possible. The work on the house sytem still includes linking five feet of sewer pipe to the house and back-filling the seepage pit with sand. Both the septic tank and sewer pipes are in place all the way to the seepage pit for the office sytem. Many hours of refuge personnel time has been spent inspecting various contractors' work and completing force account construction projects this past year.

Photo taken in front of house showing office-shop building to right and vehicle storage building to the left. 79-7-PTS

New headquarters site on Long Lake NWR before construction on November 3, 1978. 78-9-PTS

New headquarters site on November 8, 1979 with construction in progress on the office-shop, residence and vehicle storage building. 79-7-PTS

B. Maintenance

Maintenance on existing headquarters buildings has been held to a minimum because of new headquarters construction. In the spring, both the office and house basement areas were pumped to keep from flooding. In April, the well pump failed when a automatic sump pump malfuctioned. A back-up pump motor was used until a burned out switch could be replaced. Spring flooding was greater this year than last, however, damage to dikes, roads and structures was minimal. Spillways on "C" and "B" dikes required several truck loads of gravel, and six boards from "B" dike structure were replaced. An access road at the extreme east end of the refuge washed out at a culvert. Normal maintenance of vehicles and equipment was performed as needed.

Planned maintenance of refuge earthen dams was postponed again this year due to lack of time and equipment. Botulism activities this year required twenty-five days of pick-up work plus many other days of equipment maintenance and logistic support.

Portions of the refuge's fence were maintained by grazing cooperators. Three wind mills required repair in grazing Units G-3, G-4 and G-20.

C. Wildfire

There were no wildfires on the refuge this year.

III. HABITAT MANAGEMENT

A. Croplands

The refuge has about 824 acres available for cultivation. In recent years, an effort has been made to reduce farming acreage in favor of nesting and winter habitat. Refuge upland sites are basically narrow strips of land between the lake bottom and neighboring private fields and pastures. The lake and private areas provide little habitat during the five winter months. During the fall, migratory waterfowl seldom utilize refuge food patches with thousands of acres of grain stubble nearby. Resident wildlife find food, but their survival is limited by lack of winter habitat. Both farming and grazing practices are being changed with wildlife diversity in mind.

During the year, twenty acres of trees were planted in units A-5 and A-11. Units A-1 and A-13 were not farmed this summer and are scheduled for tree and DNC planting in 1980.

Also this year, 476 acres were planted to crops by eight farming cooperators and refuge personnel. The refuge share of the 403 acres planted by cooperators was 113 acres of corn and small grains. Unusually dry conditions in May and June reduced the small grain yields to about 20-25 bushels an acre. Corn production ranged from poor to nothing at all. The seventy-three acres the refuge planted had the same success.

Refuge fields tend to stay wet in the spring due to soil and low-land conditions. When a late spring delays planting activities, we may be better off planting sunflowers instead of corn. There has been increased interest in sunflower planting by local farmers over the past two years.

The following information is a breakdown of farming activity in 1979:

Unit	Acres not Farmed	Acres Planted to Trees	Acres Farmed by Refuge	Acres Farmed by Cooperators: Refuge Share	Acres Farmed by Cooperators: Cooperators Share	Acres in DNC*
A-1	48.8					7.5
A-2				11.7	32.2	27.1
A-3				8.3	18.9	15.9
A-4				13.9	25.1	15.6
A-5		10.0		16.0	43.0	24.0
A-6			17.1			76.9
A-7			18.0			
A-10				12.1	25.0	6.8
A-11		10.0	38.0			
A-12				29.4	104.8	22.2
A-13	24.3					41.4
A-14				11.5	20.0	6.8
A-15				10.3	21.0	10.0
Totals	73.1	20.0	73.1	113.2	290.1	254.2

*DNC-dense nesting cover, mixture of sweet clover, alfalfa and two wheat grasses.

B. Grassland

Two small areas of leafy spurge were hand sprayed with 2-4-D in units G-4a and G-4c. The spurge has been controlled from spreading for a number of years now but has not been eliminated.

One farming cooperator removed hay from unit A-2 to make it attractive for Sandhill Crane use. Twenty-eight tons of tame grass hay were removed from the forty-eight acre site for a refuge revenue of $112.68.

Of the 6,000 acres of upland on Long Lake, about 5,000 acres are set up in twenty-seven grazing units. Four years ago the grazing program was changed to give the refuge better management flexibility. The new system placed each grazing unit into a four-year cycle. During the first year, the grazing unit is rested. The following three years, a permit is issued to graze for two month intervals which vary from May-June, July-August and September-October. The permit allows so many animal unit months (AUMs) per

unit based on acreage and other management objectives. When the three-year permit has ended, the unit can be re-evaluated for future management.

The refuge grazing program was modified in one way this year. It was decided to eliminate the two-month grazing period of July-August in future agreements in native prairie units. The first two-month period of May-June will also terminate June 10th instead of June 30th. By making this change, native warm season plants will be encouraged and invading cold season tame grasses will be discouraged. Another benefit of this system would be undisturbed habitat for late nesting waterfowl.

Cattle grazing May 1-June 10 (41 days) will be crowd-grazed somewhat to get the same AUM use as before. The September-October grazing period would remain the same with sixty-one days of use.

There are some problems with this change. When spring comes late, some pastures are too wet for total use. The first growth of vegetation will not properly support cattle on May 1st without supplemental feed. Some ranchers are not interested in moving cattle long distances for short grazing periods. These added complications will be worked out in a way that is beneficial to the refuge.

The amount of grazing on Long Lake has been reduced in recent years because of the new system. Five of the fifteen permits issued this year actually reflect adjustments from the 1978 grazing season. It is expected that ten to twelve permits a year would be closer to the average.

The following table portrays changes in the grazing program over a six year period:

Year	Number of Units Grazed	Number of Acres Grazed	AUMs Available	AUMs Used	Cost per AUM	Refuge Revenue
1974	27	4,908	2,454	2,231	$2.81	$6,269.11
1975	27	4,928	2,464	2,240	$2.60	$5,825.69
1976	19	4,130	2,065	1,897	$2.80	$5,312.87
1977	21	4,004	2,215	1,991	$3.50	$6,968.50
1978	9	1,995	1,035	930	$4.18	$3,887.40
1979	15	2,732	1,427	1,080	$5.18	$5,597.04

Permittees were allowed to graze 1,427 AUMs on 2,732 acres. This averages about two acres per animal. In some units, additional cattle were grazed for less than two months to reach the AUMs available. Twelve units totaling 2,196 acres were not opened to grazing this year.

Cattlemen paid $5.18 per AUM in 1979, which is below grazing fees on private lands. The service's policy is not to increase the rate more than $1.00/AUM per year and is based on the USDA grazing report out of West Fargo.

In May of 1978, a twenty-two acre controlled burn was conducted on a native and tame grass area near headquarters. The purpose of the burn was to reduce the influence of smooth brome grass and buck brush (common snowberry) on the area. It was noted in 1977 that large patches of brome grass were thick with dead vegetation and lacked other plant species. Four separate clumps of buck brush were present, and they appeared to be expanding through root stalk reproduction.

Area burned in May 1978. The site is dominated by smooth brome grass and several large clumps of buck brush. Picture taken prior to burn. 78-C53-PTS

When the burning began on May 17, well developed buck brush leaves and grass blades were consumed or destroyed by the fire. Recovery by both species was very slow that summer. The grass blades returned, but very few seed heads developed. Occasionally, a forb or other plant could be seen among the pure stands of brome. Woody stems of buck brush were destroyed during the fire so new shoots appeard at the ground surface. With the loss of the folilage canopy, other vegetation successfully competed with the newly sprouted buck brush.

The net result of the fire that first summer was low vegetative vigor, thickness and height over the entire burn area. The site had been so dominated by the two species that an immediate alternative vegetative response was not possible.

In 1979, the burn area came alive with vegetative growth. Smooth brome appeared more vigorous than before with one difference. Other plants appeared in the ground cover that were not seen in 1977 or 1978. General observations indicate that the buck brush was definitely set back and plant diversity had improved.

Picture of 1978 burn area in July 1979. Smooth brome still dominates area. However, other plant species are successfully competing for space. Two buck brush clumps seen in the 1978 photo have disappeared in the understory. 79-5-PTS

It's important to note, also, that additional burns or other controls will be necessary to maintain pressure on smooth brome to reduce its influence in the area.

C. Wetlands

Water conditions were good this year with ample spring run-off and heavy July rains. About eighty pot-holes and dams on refuge property remained wet into late summer. Conditions could be better, though, since we have a back log of repair work on some of our im-poundments.

Ironically, during wet years Long Lake is faced with the problem of having too much water. This has been true through the years because no useful outlet exists in the lake. Consequently, a long history of botulism has been associated with the area.

It was because of botulism losses that Long Lake became a refuge in 1932. Historically, water entered the lake by way of Long Lake Creek and the surrounding watershed. Creek waters flowed through marshes toward the northeast end of the lake where elevations were lower. If lake levels were high enough, some water would eventually flow out the northwest corner of the lake. It was decided in the late 30's to prevent water from flowing to the northeast end of the lake. Dikes were constructed forming three pools in the lake. Water from Long Lake Creek was held in the northwest corner of the lake (unit I) by the first dike. When the capacity was reached here, water was forced out of the lake to the northwest, and at the same time into the second pool (unit II) to the northeast. A last resort was to place water from unit II into unit III which was a dead end. This system over the years has worked well during dry or normal moisture years. Water entering unit III, if any, usually evaporates by the end of summer causing few botulism problems. However, when a wet year comes along, water accumulated in unit III fails to evaporate in one season. This situation often leads to major waterfowl losses as it did in 1978 and 1979.

There may be alternate solution to water management on Long Lake. Water flow studies the last two years indicate unit III has a larger watershed than previously thought. In fact, unit III receives more water than both units I and II do from Long Lake Creek. This means the problem is not

creek run-off but unit III's own watershed. The solution lies in draining unit III through units II and I and out of the lake reservoirs.

The key would be the construction of a structure to release water from the lake to the northwest. Studies are now planned to determine the feasibility of this approach. It appears that a major amount of water can be moved by gravity flow with a structure at "A" dike.

Botulism losses the last two years have demonstrated the need to change water management on Long Lake. We really don't have much to lose considering the fact that in wet years botulism occurs anyway under the present system. At the same time, other negative aspects of present management include extensive and continuous bank erosion in units I and II, the maintenance of two large lakes in a near sterile condition, and damage to improvements such as roads, dikes and structure through wave and ice action.

If indeed water can be controlled on Long Lake, entirely new management opportunities would be possible.

D. Forestlands

Severe winters have demonstrated a need for additional winter habitat on Long Lake. The refuge presently has sixty acres of trees in eight shelterbelts scattered over the refuge. This past spring, two ten-acre sites were planted in farming units A-11 and A-7. The Soil Conservation Service was contracted to plant the 49,600 trees on June 8th and 9th. Species planted included Northwest Poplar, common Choke Cherry, Bay Berry, Green Ash, Lilac, Russian Olive, Siberian Elm, River Willow, Caragana, Ponderosa Pine, Red Cedar and Sand Cherry. Trees and shrubs were planted in rows and spaced according to each species' needs. It will be necessary to cultivate the plantings for a number of years until they are established.

Because the SCS service was at the end of the planting season, the refuge was able to pick up 5,000 additional trees at no cost. These were planted by refuge personnel in existing shelterbelts. Some of these plantings will be transplanted to the new headquarters site following construction work in the summer of 1980.

In the future, additional refuge farming sites will be selected for tree planting. The tree habitat will compliment the refuge without changing its overall character.

Summer students Marsha Thompson and Carole DuRand plant trees as Alvin Hottman operates tractor. A total of 5,000 trees and shrubs were planted by refuge personnel using old mothballed equipment. 79-5-PTS

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 Species

There were no sightings of Whooping Cranes this year on or near the refuge. During the spring, Bald Eagles were observed on four occasions. On March 21, a bird was seen

feeding on a deer carcass south of headquarters. On March 22 and April 12, single birds were seen resting in shelterbelts near unit I. Four Bald Eagles were observed on April 15 sitting on the ice near waterfowl concentrations in unit I.

Golden Eagles were seen on eight different days with six of these sightings in the spring. On April 13 and November 9, four birds were seen together near unit I.

All eagle activity near Long Lake occurs during migration periods. Once in a while, birds are seen during the winter months. These are probably strays coming from the Missouri River bottoms sixteen miles to the west of the refuge.

B. Migratory Birds

1. Waterfowl

Spring was late in 1979 and the first waterfowl were not observed until April 4, when a pair of Mallards showed up. Most observation before April 12 were of birds overhead because of extensive ice on the lake. By April 20, the refuge was holding 15,000 waterfowl with all species represented. This list would include White-fronted, Snow, Blue and Canada Geese, Swans, Coot, Mallard, Gadwall, Pintail, Green and Blue Wing Teal, Widgeon, Shoveler, Red Head, Ring-necked, Canvasback, Scaup, Bufflehead, Ruddy, American, Red Breasted and Hooded Mergansers and Common Goldeneye. Even one Wood Duck appeared which is unusual for Long Lake. Most peak populations occurred the first week of May. By the third week of May, only local breeding ducks remained in the area.

Water conditions were very good this year. Pair count surveys revealed that refuge wetland basins were 86% wet. The refuge waterfowl population was about 23,000 birds during the nesting period. It was estimated that 18,000 ducks were produced with Blue Wing Teal (6,300), Pintail (3,800) and Shoveler (2,800) leading the list. Production figures would have to be adjusted for botulism losses. During botulism clean-up operations, it was not uncommon to find groups of dead ducklings.

Goose populations peaked at 450 birds this spring with 9,700 use days recorded. These figures represent light

use possibly due to the late spring. The biggest surprise was the lack of any resident geese from May through September. Back in 1972, 248 geese were released on Long Lake to establish a breeding population. That first fall, the geese were exceptionally vulnerable to hunters and at least sixty birds were harvested. In 1973, fewer than 100 geese returned to the lake and these did not all stay. Between 1974 and 1978, a nucleous of thirty geese attempted nesting on the lake with little success. This past summer was the first time that geese did not use the refuge at all. Remnants of the Long Lake goose flock appear to be using suitable habitat east of the refuge and have combined with released birds near Slade NWR. Twelve goose nesting structures on the lake were maintained in hopes of attracting some use.

Botulism takes its toll again this year at Long Lake. This particular bird died during the night on the site of clean-up operations. 78-11-PTS

For the second year in a row, botulism has struck Long Lake in water management unit III. These recent outbreaks represent the first major botulism problems since the early 1940's when 135,000 birds were lost over a three-year period. The disease problem has always been directly related to the amount of water present in the unit. Eight out of ten years, the unit is dry by the middle of August. In 1978 and 1979, the unit received more water (58,300 and 52,100 acre feet respectively)

than evaporation (2.8 feet/year) could handle. As a result, botulism developed in late July both years.

On July 20, fifty dead birds were found on twenty miles of shoreline. Nearly all the dead birds were in good shape indicating the disease had just begun. Many of the birds were found around emergent vegetation where Franklin gulls and Black-crowned Night Herons were nesting. It's interesting to note that gulls represented 10% of the dead birds in the initial stages of the outbreak. In the final analysis, they only represented one-hundredth of one-percent of all the dead birds.

There is a good chance that the outbreak started in the nesting colony. However, two other locations developed into hot spots shortly after the outbreak and both of these areas were bad in 1978. (Note map).

The botulism problem spanned sixty days between July 20 and September 17. Between July 23 and August 3, waterfowl were picked up on eight occasions totaling 1,700 birds. Five hundred thirteen birds were collected on July 30 for highest one day total. Each succeeding two-week period saw a reduction in waterfowl losses, 6/8-17/8 1,211 birds, 20/8-31/8 714 birds, 3/9-17/9 188 birds.

Waterfowl populations during the outbreak ranged from 20,000 to 48,000 birds.

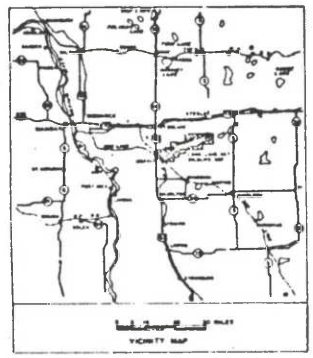
The new refuge airboat was received on July 20 from Airboat Engineering in West Palm Beach, Florida. The 180hp Lycoming powered craft was used for botulism clean-up work. 79-5-PTS

LONG LAKE NATIONAL WILDLIFE REFUGE

BURLEIGH AND KIDDER COUNTIES, NORTH DAKOTA

UNITED STATES
DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE



LONG LAKE

UNIT ONE

UNIT TWO

Areas affected mildly with botulism

Areas of concentrated die- off

COMPILED IN THE BRANCH OF ENGINEERING
FROM AERIAL PHOTOGRAPHS AND SURVEYS
BY THE B.L.M. & B.S.F.&W.

MINNEAPOLIS, MINNESOTA

MARCH, 1961 REV. OCTOBER 1971

FIFTH PRINCIPAL MERIDIAN

Scale

TOWNSHIP DIAGRAM

MEAN DECLINATION 1960

The refuge was able to use airboats from Devils Lake WMD, J. Clark Salyer and Upper Souris NWRs at various times during the outbreak. Long Lake acquired its new airboat on July 20, just in time for botulism activities. Sixty-nine man days were used in direct clean-up operations with another twenty man days in support services.

The refuge was fortunate to get a YACC crew from Nekoma N. D. for five weeks. Two camper trailers were used to house the five workers at refuge headquarters. The crew provided the manpower for botulism clean-up operations at Long Lake and other sites in the wetland management district

During the botulism outbreak, YACC personnel from Nekoma N. D. assisted the refuge in clean-up operations for five weeks. From left to right Kathy Braaten, Dave Duciaume, Elaine Fritz, Mide Hall and Brad Sigfusson

79-P-PTS

A total of 3,550 waterfowl and 405 other birds were picked up this year. Estimated losses were placed at 4,500 waterfowl and 900 other birds.

The following is a list of species involved with botulism and their estimated losses in 1979:

Ducks	Estimated Loss
1. Pintail	1,300
2. Blue-winged Teal	900
3. Gadwall	750
4. Green-winged Teal	600
5. Shoveler	400
6. Widgeon	300
7. Mallard	240
8. Ruddy	10
9. Black Duck	1
	4,501

Other Birds	Estimated Loss
1. Sand Pipers	425
2. Lesser Yellow legs	100
3. Coot	70
4. Franklin Gulls	60
5. Eared Grebes	55
6. Phalarope	50
7. Greater Yellow legs	40
8. Western Grebe	30
9. Avocet	15
10. Pied-billed Grebe	15
11. Sandhill Crane	13
12. Marbled Godwit	9
13. Ring-billed Gull	5
14. Herring Gull	5
15. Common Tern	3
16. White Pelican	2
17. Bonapartes Gull	1
18. Red-wing black Bird	1
19. Killdeer	1
	900

It's probable that not all birds died of type C botulism. The Sandhill Cranes may have died from gun shot wounds inflicted during the September 7-11 hunting season. The two pelicans appeared to have died much earlier than the July outbreak.

During clean-up operations, 507 sick ducks plus other birds were placed in holding pens with fresh water and food provided. About 50% of the ducks survived while only 5% of the other birds pulled through. It may help in future years to separate the ducks from the other birds.

After two years of observation, a person can almost tell which ducks will survive based on their physical characteristics. A list of progressive stages the birds go through would look something like this.

1. Duck is unable to fly but is capable of swimming long distances under water, very difficult to catch. Birds in this stage can be confuse with molting ducks.

2. Duck becomes less vigorous, tires easily and is unable to dive under water for any length of time, easy to catch.

3. Duck puddles around in water, wings are drooped, eye lids react abnormally, bill slightly open for labored breathing.

4. Duck has lost functional use of its feet, neck is weak, bird may not be able to hold head up, many cases eyes are near shut unless bird is startled. If bird has not reached shore, it probably will drown at this stage.

5. Duck moves only when handled (usually eyes, maybe neck, sometimes feet). It is difficult to note breathing movements.

6. Death usually occurs within twelve hours of stage five.

We have found that if a bird can be given fresh water in the early part of stage four, its chances are good for survival. It is necessary to hand dunk these birds in fresh water several times a day so they will drink. It usually would take forty-eight hours for a bird to show definite improvement. In four to five days a bird would be strong enough to start feeding. As birds gained strength they eventually would fly out of the uncovered pen.

Another observation in 1978 and 1979 deals with the percent of sick birds to dead birds collected each day. We found as the portion of dead birds increases compared to sick birds the closer you are to controlling and ending the outbreak.

Botulism activities ended September 17, twelve days before the waterfowl season began. Facts contributing to the control of botulism this year include: cool temperatures, cooling rains, and clean-up operations beginning at the onset of the problem.

The following data compares the 1978 and 1979 botulism outbreaks on Long Lake.

Year	Estimated Date of Outbreak	Date Clean-up began and ended	Largest one day pick-up	Estimated Waterfowl losses	Coot losses
1978	July 15	Aug. 4-Sept. 20 48 days	Aug. 11 1,900 birds	16,000	1,200
1979	July 15	July 23-Sept. 17 57 days	July 30 513 birds	4,500	50

Year	Other Bird losses	Sick Ducks pick-up	Sick Ducks Recovered	Waterfowl Population of lake
1978	1,500	2,200	1,000	40,000-70,000 birds
1979	900	507	251	20,000-48,000 birds

Year	Man days spent in clean-up	Man days spent in support services	Calander days of actual pick-up	Average air temp. during period	Rain fall during period
1978	153	46	30	68.3°	3.96 in.
1979	69	20	20	67.5°	3.81 in.

Fall goose populations peaked the third week of October with 5,400 birds. Hunting was good near the refuge boundaries with 347,000 goose use days recorded during the hunting season. Fall duck populations were fair with 3,2000,000 use days. Peak populations were observed the second week of October when 58,000 ducks were on the lake.

There seems to be less interest in duck hunting around the refuge area this year. It could be that botulism reports and gas prices have affected the hunters.

2. Marsh and Water Birds

Marsh and water bird populations fluctuate greatly with water elevations, particularly in unit III. Three years ago, the unit was essentially dry. In 1978, 10,000 acres were wet providing attractive nesting and feeding areas in the dead vegetation and shallow waters. Some notable sightings in unit III in 1978 include ten White-faced

Ibis, eight Great Egrets, ten Cattle Egrets, and two Louisiana Herons. All but the Great Egrets nested in the unit. This may have been the first sighting and nesting observation of Louisiana Herons in North Dakota.

Island construction was started in February in unit II. There is a need for loafing and nesting sites in large open water areas on the refuge. This experimental project should be completed in 1980. 79-2-PTS

In 1979, unit III had 10,500 surface acres of water but lacked extensive emergent vegetation. The Louisiana Herons did not return and only half as many Cattle Egrets and White-faced Ibis showed up.

Botulism problems were discovered on July 20 in the Franklin Gull rookery area in section 35, T138N, R75W. The disease confined itself to gulls, terns and waterfowl in the rookery area. None of the various herons and egrets using the area were found dead during the entire outbreak. It was estimated that one-hundred Western, Eared and Pied-billed Grebes were lost. As many as five-hundred Pelicans were seen on the refuge at one time during the summer months. These birds move from one lake to another in search of food but do not nest on the refuge.

There were one-hundred Lesser Sandhill Cranes on unit III the second and third weeks of July which was unusual. Fall migrants were first noted on August 25 and peaked on October 20 with 9,000 birds. Thirteen Cranes were picked up by botulism crews after the Crane hunting season began September 7-11. Fall Crane populations together with waterfowl make the refuge a busy place at dawn and dusk.

Whooping Cranes were not seen on or near Long Lake this year.

3. Shorebirds, Gulls, Terns and Allied Species

Ring-billed Gulls, some of the first migrants of spring, feed on minnows as water begins to flow from unit I to unit II. What a sight after a long cold winter. 79-2-PTS

This group of birds experienced significant losses during the botulism outbreak in unit III. The puddle ducks and shallow water feeding birds are always hit the hardest on the refuge. A nesting colony of 600 Franklin Gulls and 200 Forester Terns was identified as the probable site for the botulism outbreak this year. In that concentrated nesting area were found dead young and unhatched eggs floating in the water. A large proportion

of dead birds were picked up in the rookery area or on shorelines where prevailing winds had moved the birds from the rookery. The rookery was not the only site of the probable "spontaneous" outbreak but may have been the first.

In late summer, Franklin Gulls gathered on the lake to roost for the evening. As the evening sun set, flocks of gulls skim across the prairie landscape returning from feeding areas. About 5,500 birds congregated this year in mid-September.

The American Avocet is one of the more popular and visible species of this group on the refuge. Bird watchers are always impressed with the Avocets and upland Sandpipers.

4. Raptors

Marsh hawk populations showed a marked increase this year with 5,150 use days. An increase in spring eagle observations was noted with fifty-five use days for Bald Eagles and forty-nine use days for Golden Eagles. Most eagle observations occur about the time lake ice is breaking up. Dead fish are abundant then, and waterfowl populations are changing daily.

Sightings were made of Burrowing Owls near the north entrance gate several times. These owls are somewhat rare in the area and even more so on the refuge, considering the habitat.

A group of thirty Short-eared Owls were seen sitting in the marsh near the refuge bridge on April 12. Snowy Owls were seen as late as March 8. There were no sightings of Peregine Falcons this year.

5. Other Migratory Birds

Two Mourning Dove surveys were conducted this year. In addition to the Kidder County route, a new survey was started in Burleigh County near Driscoll, N. D.

C. Mammals and Non-Migratory Birds and Others

1. White-tailed Deer

Despite the long harsh winter of 78-79, the deer population appeared to remain stable. It was necessary to feed the deer from January through March at two refuge locations. A mixture of wheat, oats and barley was used

for this purpose to supplement their diets. Forty deer consumed about seventy bushels during the period.

In February, three deer were found dead. I suspect coyotes over-powered them in their weakened condition. Even after spring arrived and green vegetation began to appear, deer appeared weak and remained in larger groups another three weeks. High water in the spring forces many deer out of the marshes and into the surrounding farming areas. This off-refuge migration tends to reverse itself in the fall when fields are harvested and hunting activities begin.

The refuge habitat attracts additional deer from surrounding farm lands during the fall and winter months. Food plots and feeding stations are provided near winter cover areas as these needs develop.

Local people are seen viewing deer on the refuge during the fall evenings. Deer hunters like to drive by the refuge closed area and hunt the boundaries.

There were about one-hundred fifty deer on the refuge in December 1979.

2. Moose

A cow moose was seen on November 18 six miles north of the refuge near the road to Driscoll. This is probably the same moose that was seen last year on the refuge. It evidently lives south of Bismarck in the Missouri River bottoms, but it tends to wander in the fall and winter months.

A refuge trapper reported moose tracks and droppings in a shelterbelt near G-6. The moose apparently stayed in that area for a number of days about the first week of November.

3. Other Mammals

Because the last two years have been good moisture years, we have seen an increase in muskrat and mink populations. Three years ago muskrat observations were rare, but now populations probably range from four to six-hundred.

A dramatic increase in skunks was noticed this fall based on tracks, sightings and trapping reports. Spring flooding should push them back to upland sites this spring.

Badger and raccoon populations appear to be stable. Cottontail rabbits around the headquarters were drastically reduced by a Great Horned Owl during the winter months.

The coyote population remains around ten animals with constant movement on and off the refuge. Coyotes may be spending less time in the headquarters area because a number of fox were seen in the area this fall.

Trapping was good this fall with mild temperatures and little snowfall through December. Trappers reported the following harvest figures: two fox, seven raccoons, four mink twenty-five skunks, five weasels, eight jack rabbits, six cottontail rabbits, one porcupine and one badger. The skunks, weasels, rabbits and porcupine were undoubtly discarded or used for bait. It is known that at least nine fox and three coyotes were taken adjacent to the refuge.

Our trapping program is aimed at reducing skunk, mink, raccoon and fox populations to enhance waterfowl nesting success. A number of problems have prevented a good harvest the last few years. In 1977-78, deep snows discouraged trapping activity despite good fur prices. The refuge trapping season opens too late (conflicts with resting migrating waterfowl) to harvest skunk and raccoon properly. Also, many trappers are only interested in trapping fox and coyote.

There is some thought to having a spring trapping or hunting season for raccoon. Opening the trapping season earlier on the refuge may be a possibility in certain locations. Another alternative would be for refuge personnel to trap surplus animals.

Muskrat trapping was not allowed this year in hopes of establishing a viable population in all suitable habitat.

A porcupine was accidently trapped in a shelterbelt area on unit A-12. They are rare on the prairie but have been seen on the refuge in previous years.

4 Resident Birds

Pheasant survived the winter and spring of 1979 better than in the previous year. About eighty birds made up the breeding population in the spring. A peak population of four-hundred birds occurred in late September.

Sharp-tailed Grouse tend to use the refuge more for food and shelter during the winter months. A flock of seventy birds has been using the headquarters shelterbelt and deer feeding stations since early January. Refuge populations probably range from three to five-hundred birds.

Hungarian Partridge are found on the refuge and in the surrounding farming areas. Their population appears spotty, probably no more than sixty are found on refuge upland sites.

5. Other Animal Life

Refuge impoundments are not the best habitat for fisheries. The shallow lakes are supporting bullheads and minnows at the present time. Game fish that enter the lake from Long Lake Creek usually "winter kill" in recent years. Fishermen were observed catching bullheads near the creek bridge and "A" dike during the summer months.

This was the first year that bats were noticed around the headquarters site. One or two were seen on several occasions in the fall.

Salamanders are fairly common on the headquarters lawn during early fall evenings. Four individuals have taken up residence in the underground well house.

The lake has a prolific minnow population that attracts summer populations of Cormorants, Western Grebes and Pelicans.

V. INTERPRETATION AND RECREATION

A. Information and Interpretation

The refuge does not have any developed interpretive or informational sites. A short nature trail and lookout point are a possibility at the new headquarters site in the future.

2 Off-Refuge

Television station KFYR, Bismarck, did a news report on the botulism outbreak for the second year in a row. A news release was issued to local papers and post offices regarding refuge trapping permits.

A number of slide programs were presented including; the Lewis and Clark Wildlife Association Bismarck, N. D. and two church groups in Bismarck and New Salem N. D. Programs involved botulism problems at Long Lake and general conservation principals concerning all natural resourses. About ninety people attended the presentations.

The largest number of contacts were made during the SCS seventh grade conservation tours. Twenty-minute programs on wildlife were presented to 690 students in Burleigh, Kidder, Emmons and Morton counties.

National Wildlife Week provided an opportunity to visit local schools again this year. About 380 students received a thirty minute program on "Conserving Our Wildlife". Areas participating this year were Napoleon, Steele and Dawson Elementary schools.

B. Recreation

1. Wildlife Oriented

The refuge's biggest public use activity is fishing with 572 visits this year. Fishing has not been good in recent years because of winter kill problems. Bullheads accounted for ninety-nine percent of the catch with an occasional small Northern Pike being taken. There has been no ice fishing activity this season. However, Long Lake Creek, south of the refuge boundary, has been fished several times.

The refuge was open to deer hunting with bow and arrow for the first time. The entire refuge, including the deer gun closed area, was open 109 days during the state season. About thirty-five hunter visits were observed, but no deer were harvested. Next year we can expect more hunter visits as knowledge of the hunt grows.

The deer gun season attracted 360 hunter visits during the nine and a half day season. Hunters found the refuge easy for hiking but lacked snow cover for tracking and sighting deer. Marshes and shelterbelts provide the best hunting opportunities.

Deer movements in the refuge closed area are watched closely in early morning and evening by hunters. It's estimated that twenty to thirty deer were harvested this year.

There was considerable interest in trapping this year with fur prices being high. Four trappers were selected in a random drawing in October. About 165 trapper visits were made during the sixty-six day trapping season. Two trappers experienced theft of furs from their sets which were located close to public roads. Skunks were taken more frequently than anything else, although, raccoon and mink provided the most income for the trappers. The trapping program is presently being looked at to see how it can better serve the refuge's interests.

The refuge is not open to waterfowl hunting, but the surrounding area is hunted, particularly for geese. Goose hunting was good with an estimated 300-500 visits occurring during the season. Decoy hunting in fields is the most popular and productive but pass shooting occurs also.

Duck hunting has not been as popular around the refuge as previous years. Could be the cost of fuel has changed hunting patterns in the area.

Pheasant and grouse hunting occur southwest of the headquarters on railroad and private property adjacent to the refuge.

Public roads on the refuge are used by local residents to view deer in the fall. Most visitors are interested in bird watching during the summer months.

2. Non-Wildlife Oriented

The refuge has little non-wildlife oriented use. A small picnic area overlooking the lake probably has two-hundred visits a year.

On June 30, the community of Kintyre, which is southeast of Long Lake, held its 75th Jubilee celebration. Numerous people attended including a riding club from the Bismarck area. The riders made camp at the refuge picnic area on Friday evening and proceeded the next day on the last leg of their journey.

Local residents tend to travel to Bismarck for recreational activities.

C. Enforcement

In August, two individuals were heard firing several shots in the picnic area. As it turned out, they were testing a new hunting dog for gun shyness. Information was taken, but prosecution was dropped for lack of evidence.

Two individuals were ticketed for hunting on a National Wildlife Refuge. One paid the one-hundred dollar fine and, the other appeared in Federal Court, was found guilty and paid an eighty dollar fine.

A riding club from the Bismarck N. D. area passed through the refuge on its way to the Kintyre 75th Jubilee. 79-5-PTS

A Golden Eagle was shot near Driscoll, N. D. on October 21. The bird was found alive in a roadside ditch on a country road. No witnesses could be found, and the nearest landowners had seen or heard nothing. The eagle was taken to the Dakota Zoological Society for care but was found to be beyond help. The eagle was turned over to Special Agent Joel Scrafford for disposal.

VI. OTHER ITEMS

A. Field Investigations

A Canada goose release project that began in 1972 has ended this past summer. In 1972, 248 geese were released on the refuge in an effort to establish a nesting population. Through the years, the release birds have dwindled primarily because of hunting mortality. This was the first year since the release that no geese were present on the lake during the nesting and summer months. The twelve birds that appeared last year may have moved to other release sites where geese are nesting.

B. Cooperative Programs

Nothing to report.

C. Items of Interest

Alvin Hottman and Peter Smith both received Special Achievement Awards for their work during the 1978 botulism outbreak on Long Lake.

Tractor Operator Alvin Hottman receives his Special Achievement Award for outstanding work during the 1978 botulism outbreak. Complex Manager John Foster presents the award.

79-2-PTS

A Special Achievement Group Award was shared by many people including Alvin Hottman, Ronald Stromstad and Peter Smith for their assistance in the Valley City flood. For four days in April, Valley City National Fish Hatchery was threatened by the Sheyenne River. Many FWS personnel and local volunteers constructed dikes that successfully protected hatchery buildings and equipment.

In early July a White Pelican was observed acting strangely. The bird didn't mingle with the other pelicans and when flying would tilt its head to the right. We were unable to catch the bird so decided to watch its movements. One evening the pelican disappeared from site. A few days later it was found dead near Long Lake Creek.

This pelican became entangled in a ball of fishing line and probably died of starvation. The line is attached to a stick at the base of the right wing and loops over the bill.
79-4-ES

The bird was not sick, as we had suspected, but was snarled in nylon fishing line. A ball of line attached to a stick had somehow entangled the right wing and bill. Evidently, the pelican was unable to feed properly and eventually died of starvation.

Ron Stromstad and Peter Smith attended a four week Law Enforcement Training Course at FLETC, Brunswick, Georgia.

Alvin Hottman traveled to West Palm Beach, Florida, in July to pick up the refuge airboat.

The North Dakota State Water Commission was given permission to drill two test wells on "B" dike in August. The state is studying underground formations and the relationships of water movement through them.

On November 8, a Western Geophysical seismograph crew entered the refuge without a permit. Four sounding trucks traveled a half mile over native prairie to the lake's edge gathering data. The company's permit agent had failed to obtain a Special Use Permit for the crew. Damage to the refuge was minimal. The company was put on notice that further violations would result in seizure of equipment, fines and denial of permits to conduct seismic activities.

The refuge acquired a number of vehicles and other equipment the last two years. Two trucks and a snowmobile were purchased as replacement vehicles. A Ford tractor and Case off-set disk were bought to upgrade existing farm equipment.

Four wheeldrive Dodge pickup truck.

Chevrolet Luv pickup truck

This vehicle was traded to the Kulm WMD in 1979 for a Datsun pickup of the same size. The trade was made because a Datsun dealership was not located near Kulm, N. D.

Case wheel type off-set disk harrow.

Ford Tractor, model 7700
84 horse power.

Arctic Cat Snowmobile
model 79 Jag

D. Safety

During the Valley City flood protection work, Biological Technician Ron Stromstad aggravated an old back injury. Ron eventually required back surgery and was unable to work for a six-month period. While recuperating, Ron decided to go back to school for two years and complete his degree.

Safety meetings are held in conjunction with Arrowwood NWR staff meetings.