SQUAW CREEK
NATIONAL WILDLIFE REFUGE

MOUND CITY, MISSOURI

ANNUAL NARRATIVE REPORT

Calendar Year 1980

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

Squaw Creek National Wildlife Refuge
Mound City, Missouri

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STAFF

Berlin A. Heck, Refuge Manager
GS-11, PFT

Shirley A. Zeliff, Refuge Assistant
GS-5, PFT

John A. Guthrie, Assistant Refuge Manager
GS-9, PFT, Transferred 10/31/80

George S. Crockett, Assistant Refuge Manager
GS-7, PFT, Transferred 6/13/80

William R. Hamilton, Engineering Equipment Operator
WG-9, PFT

Albert J. Yocum, Maintenance Worker
WG-7, PFT, Retired 6/13/80

Richard G. Martinez, Student Trainee (Engineering)
GS-2, PFT (Junior Fellowship Program)
6/1-8/23 and 12/22-31/80

John C. Robinson, Student Trainee (Biological Sciences)
GS-4, PFT (Cooperative Education Student)
11/16-12/31/80

REVIEW AND APPROVALS

Berlin A. Heck 2/4/81
Submitted By Date

Area Office 2/20/81
Area Office Date

Squaw Creek NWR, Missouri
Refuge

R. Wayne Hein 3/16/81
Regional Office Date

Betty and Junior Yocum at retirement party.
BAH

On June 14, 1980, after 29 years, 3 months and 14 days of federal service, A.J. (Junior) Yocum has retired. Junior did not particularly want to retire but his right leg, injured in a 1963 bulldozer accident, began causing too many problems, and resulted in his decision to apply for a medical retirement.

Junior served his whole career at Squaw Creek and he has made many friends with his personable nature and willingness to help. He was hired by Bruce Stollberg on November 9, 1953 as a GS-3 Clerk-typist. The pay was poor back then at $2,950 per year.

Junior worked his way up through several managers--Kenneth Krumm, Harold Burgess, Gerald Nugent and finally, Berlin Heck. He became a Biological Technician under Manager Krumm in 1961 and was promoted to GS-6 under Manager Burgess in 1967. In 1978 under Manager Heck Junior's position was changed from Biological Technician to Maintenance Worker WG-7.

It is difficult to arrange a party on a medical retirement because the retirement is uncertain until the date it is approved and that is the effective date. So there is no way of knowing ahead. However, on August 1 a party was held at Big Lake State Park restaurant. Junior was presented several pictures by friends and a scrapbook that chronicled his career and contained letters sent by friends, both old and new, plus pictures.

Junior will not be easy to replace.

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I. GENERAL

A. Introduction

Squaw Creek National Wildlife Refuge is a 6,887 acre waterfowl refuge located in northwest Missouri at the edge of the Missouri River floodplain. The nearest town is Mound City located five miles north of the refuge headquarters with a population of approximately 1,200.

The surrounding area is predominantly farmland with corn and soybeans being the primary crops. Only one industry is found near the refuge and it is a battery recycling plant.

The area was a WPA camp in the early 1930's and was made a refuge in 1935 by executive order of President Franklin Roosevelt. The large concentrations of waterfowl on the refuge each fall have stimulated the formation of hunting clubs around the perimeter, and now hunting related business provides the second greatest income to county residents.

B. Climatic and Habitat Conditions

The year began warm with open water everywhere but winter caught up before the end of January with below zero temperatures and six inches of snow on the ground.

February was unsettled with cold and warm weather alternating and this trend continued through March.

April began the long drought of 1980 that saw the refuge nearly dry by fall. The only reason that the refuge did not dry completely was that Squaw Creek maintained a fairly strong flow through the summer.

The summer months saw prolonged periods of hot weather that increased evaporation to the point where creek flow could not compensate.

August provided more rain on the refuge than any month between April and December. The weather table (Table 1) indicates a different situation but the station is located 25 miles from the refuge and they received rain that missed the refuge.

Table 1. 1980 Weather Rosecrans Memorial Airport, St. Joseph, Missouri

	Temperature			Normal	Precipitation	
	Maximum	Minimum	Average	Average	Month	Normal
January	58	-11	29.1	26.2	1.71	1.09
February	52	-10	25.2	31.5	1.03	1.03
March	72	- 7	37.8	40.0	2.91	2.40
April	91	30	53.9	54.2	0.85	3.21
May	91	33	64.5	64.8	2.83	4.65
June	105	51	76.3	73.9	2.45	6.50
July	107	56	82.7	78.2	2.08	3.82
August	103	54	78.1	76.5	3.69	4.06
September	95	35	67.8	67.8	3.70	3.83
October	89	22	53.1	57.6	3.32	2.47
November	82	16	43.1	42.3	0.11	1.24
December	68	- 2	31.0	30.7	3.01	1.35
Extremes	107	-11		Totals	27.69	35.65

Information for the above weather summary was obtained from the U.S. Weather Bureau for their station at Rosecrans Memorial Airport, St. Joseph, Missouri--about twenty-five miles southeast of Squaw Creek National Wildlife Refuge.

By the time rain finally fell in December, most of the waterfowl had either migrated from the refuge or migrated past the refuge without stopping.

In summary, it was a dry, hot summer and fall with no major freezes until December. The waterfowl remained to the north of here until late and when they did migrate, it was all the way to their wintering grounds on the Gulf Coast.

Over ninety percent of the farm fields were fall plowed, further encouraging the waterfowl to keep moving, due to lack of available food.

Refuge pools all had excellent growths of emergent vegetation such as water millet and smartweed, but the water was not available to flood them for the waterfowl migration.

C. Land Acquisition

Nothing to report.

D. System Status

1. Objectives

In 1210, Migratory Birds, the waterfowl objectives were not met. The waterfowl did not use the refuge as in past years. Perhaps the warm fall weather did not push the waterfowl south until late in the season and then they flew past. Or maybe it was the tremendous amount of fall plowing that covered their food supply. Or maybe the lack of water on the refuge encouraged them to disperse to other areas. The newly constructed Smithville and Truman Lakes to the south could have attracted many of the ducks.

There is no doubt that many of the waterfowl remained north of here until much later than normal, but why the birds never arrived here in large numbers nor remained long is open to speculation. Needless to say, the local hunters did a great amount of speculating but only a few were actually frothing at the mouth.

The Pintail Point dike (3,500 feet), Long Slough levee (325 feet) and Mallard Marsh tower dike (650 feet) were renovated by dragline to prepare them for riprap to be deposited in January and February when dikes are frozen.

New flow ditches were constructed in Snow Goose Pool and Mallard Marsh to accomodate the two new water control structures in Squaw Creek (1,650 feet).

The dike along old Squaw Creek berm was renovated and a flow ditch dug along the north side of the dike (5,000 feet). A three foot stoplog structure was installed to allow diversion of water to Eagle Pool or Pelican Pool.

In 1230, Wildlife Resources, propane scare guns were loaned to many farmers, primarily for waterfowl depredations on wheat, blackbird (cowbird) depredations on milo, coyote depredations on pigs, starlings in feedlots and beavers plugging pond spillway tubes. Fourteen additional propane guns were transferred from Horicon NWR on April 3 to augment the number already on hand.

In 1240, Interpretation and Recreation, all objectives were met.

Table 2. Funds Status FY-1975-80

FY	1100	1200	1210	1220	1230	1240	1400	Total
1980			116,000			37,000		153,000****
1979	300		116,000		1,000	42,000		159,300***
1978	400		92,000	1,000	1,000	37,500		131,900**
1977	300		80,000	1,000	3,000	10,000	500	94,800
1976			102,000*	1,000	3,000	9,700	250	115,950
1975		79,000				10,000	350	89,350

*Includes $30,000 maintenance/rehabilitation add-on funds.
**Includes cyclical maintenance funds; $6,000 in 1210 and $10,000 in 1240.
Does not include $287,000 flood damage money, $56,000 rehabilitation money or $114,000 BLHP money.
***Includes cyclical maintenance funds; $16,000 in 1210 and $12,000 in 1240, revolving rehab, $10,000 in 1210.
Does not include $418,000 BLHP money.
****Includes cyclic maintenance funds; $15,000 in 1210 and $10,000 in 1240.
Does not include $850,000 BLHP money.

In cyclic maintenance the 1210 funds were scheduled for: repairing tracks and fixing oil leak on D-8 dozer ($1,600), boundary posting ($2,500), graveling roads ($2,300), cleaning ditches ($4,300), repairing dikes ($1,500) replacing dragline cables ($600), repairs to basement wall in Quarters #1 ($1,500), renovate driveway and parking area at Quarters #1 ($700).

The 1240 cyclic maintenance funds were scheduled for graveling roads ($8,500), repairing dike trail in Mallard Marsh ($500), and renovating the cab on the road grader ($1,000).

BLHP Projects were very confusing in their funding but there were definitely three projects funded this fiscal year: Squaw and Davis Creek Cleanout ($351,000), Rehab Water Control Structures ($26,000) and Dike Riprap ($372,000).

Two past years BLHP projects were finally contracted. The new headquarters (URS maxi design) was a negotiated contract with minority business (Leland Anderson Construction Company, Topeka, Kansas) and cost $335,917. The other project involved purchase of a flow easement south of the refuge ($75,000) and cost share for constructing a new bridge across Five Mile Lane Ditch south of the refuge ($100,000). This project was completed.

An unscheduled BLHP project was completed by Peter Construction Company, Skidmore, Missouri for $24,832. It involved removal of the old Squaw Creek water control structure, purchase and installation of two, three-foot tubes with screw gates and the clean-out of several hundred feet of Squaw Creek channel.

II. CONSTRUCTION AND MAINTENANCE

A. Construction

A temporary dike along the east side of Squaw Creek north of Cross Levee #2 was constructed to protect farm fields from possible flooding.

A flow ditch was constructed and a new water control structure was installed along old Squaw Creek berm to allow flow of water east to Eagle Pool.

Construction of the new headquarters building began July 11 by Anderson Construction Company (BLHP). The basement was poured and backfilled, but a crack in the basement was discovered October 9. A decision was made to allow them to pour a second wall outside the first for reinforcement. On November 3 the second wall was poured, giving one-foot thick basement walls on the north side.

Flow ditches were constructed in Snow Goose Pool and Mallard Marsh to facilitate movement of water into all refuge pools.

A three-foot tube was removed from the cross levee in Snow Goose Pool and the dike opened to allow flow of water to Eagle Pool and Pelican Pool. The north side of Eagle Pool was basically silted-in so a cross levee was no longer needed.

A fire lane (one-half mile) was constructed 1,400 feet north of Cross Levee #3 so the area between the fire lane and levee could be burned.

Removal of old Squaw Creek water control structure and installation of two, three-foot tubes with screw gates was completed by Peter Construction Company (BLHP).

B. Maintenance

Long Slough levee (325 feet), Pintail Point dike (3,500 feet) and Mallard Marsh tower dike (650 feet) were renovated in preparation for riprapping in FY-81.

Spoil along old Squaw Creek berm (3,900 feet) was leveled and the top graded to make an access road.

Cleanout of Davis and Squaw Creeks was begun by Elton Construction Company (BLHP) on August 11. However, on September 3 a temporary restraining order and summons were issued listing Director Greenwalt, Regional Director Willoughby, and Manager Heck as defendants and Holt County and Canon Drainage District as plaintiffs. Two contractors working on the ditch were stopped. The order stated that the defendants had not honored commitments to Holt County to pay $115,000 for damages to a downstream bridge that could result from cleaning the ditches. Also a commitment to Canon Drainage District to pay $60,000 for a perpetual flow easement below the refuge. On September 5 Regional and Area Office persons and Manager Heck met with U.S. Attorneys in Kansas City to determine strategy. The case was withdrawn to

federal court and the restraining order allowed to expire. On September 26 at a meeting at Holt County courthouse with plaintiff's lawyers, Regional Solicitor Whitham, Heck and others it was decided that one contractor would be allowed to finish his project of clearing the old water control structure from Squaw Creek and the other contractor would be allowed to clear brush from Davis Creek but not remove dirt as it would increase flow. No injunction was issued even though plaintiffs requested one. Finally, after several other legal hassles the money was disbursed and the problem was resolved on October 20.

A basement entryway was constructed for Quarters #1 and a new wood/propane furnace installed.

A shaft used to restrain the track tightening spring in the D-8 broke, necessitating repairs in excess of $1,500.

In completing insulation work on the shop which involved installation of new windows and sealing others, it was found that termites have "honeycombed" the inside of the structure. Options are presently being considered.

Refuge shop with new insulated door and window.
11/80 BAH

Davis Creek ditch prior to cleaning.
9/80 JAG

Clearing brush on Davis Creek ditch while awaiting settlement of conflicts with downstream landowners.
10/80 BAH

The motor that runs the sixteen inch pump began showing water in the oil. It was inspected and everything pointed to a cracked head (it has three). They were removed, magnafluxed and found to be good. They were reinstalled with new gaskets and the motor started again. Again water was found in the oil. The heads were magnafluxed again and a crack was found behind a valve. It was taken to another machine shop for welding and no crack could be found after cleaning and magnafluxing again. It will be reinstalled and torque on head bolts will be increased to try to solve this problem. Meanwhile, $1,830.87 which remained in a special allocation for purchasing fuel for pumping water was not used and impoundments were not as full as they could have been for fall migration.

Possibly serious defects with the new 35 foot roller gate structure were noted which included vibration when the gate was being raised, rollers on the sides were seized up, the gate was slightly bowed and the concrete pads that held the gate up were crumbling. These defects were called to attention of Denver Engineering Center who contacted Garney Construction (builders) who sent a representative out.

Meeting at the Squaw Creek roller gate. Represented are Armco Steel, Denver Engineering Center, Garney Construction and refuge staff. 9/80 JAG

Garney man said the structure was built to specs and problems would be between us and Armco Steel who fabricated the structure. We pushed harder and a meeting was held here July 7 with representatives from Denver Engineering Center, Garney Construction and Armco Steel. It was a finger pointing exercize with conflicting recommendations. As of the end of the year nothing has been done and it appears that the problems have been relegated to the station.

C. Wildfire

Three fires were classified as wildfires this year. The first one started off-refuge on October 7 when an abutting landowner was burning brush piles. The flames got into cattails at the south end of Bluff Pool and caused quite a stir among farmers whose corn and beans had not been harvested around the perimeter of the refuge. The fire burned itself out eventually after burning about one-third of Bluff Pool.

Burned area in the north central part of the refuge.
11/80 BAH

The second fire on November 7 got tremendous press coverage (mostly bad and erroneous) after it hit the wire services. It was of unknown origin but burned about 500 acres of cattail and brush thickets in the north central part of the refuge. The fire did more good than harm but the press did not want to hear that a "forest fire" is beneficial and the television and radio interviews gave an impression that the refuge may not be considering the best interests of wildlife.

The last fire started November 21 at the paper incinerator across the road from the headquarters (better known as the dump). Behind 20-30 mph winds the fire burned into a pile of wood and was threatening to spread into an inaccessible area when the fire department arrived and extinguished it.

III. HABITAT MANAGEMENT

A. Croplands

Approximately 822 acres of refuge land is under cultivation. At the beginning of the year there were five cooperative farmers but Charles Scarbrough retired and his acreage was assigned to Gene Maley who already farmed on the refuge so the total number is now four. Reassigning acreage is not easy and causes a lot of resentment but it was done fairly and strictly in accordance with policy so it went as smoothly as possible.

The objective of the refuge farming program is to support 1,000,000 waterfowl use days annually which figures to about four percent of waterfowl food needs during spring and fall migrations based on approximately 25,000,000 use days per year. The almost exclusive users of cultivated crops are geese--ducks tend to remain in marsh areas.

Crops are corn, soybeans and wheat. The rationale in each crop type is: wheat is the preferred food of geese when they first arrive in the fall. Providing wheat on the refuge satisfies this need for a while and helps decrease off-refuge depredations on emerging wheat.

Benefits of corn are obvious and geese and a few mallards prefer it when the weather begins to cool. The refuge corn offering could hardly be considered a deterrent to off-refuge use by waterfowl, but nearly

all off-refuge corn has been harvested by the time geese arrive so there is usually no problem unless the farmer plans to turn cows or hogs into his field to glean the waste grain.

Soybeans are usually planted in the wetter fields or when a wet spring prevents planting corn until too late or when cutworms wipe out the corn crop. They benefit waterfowl to some degree, although slight, but they do provide a good rotation crop to break the life cycle of corn pests such as rootworm, cutworm, etc.; and pheasants and deer like soybeans.

Refuge fields are very productive with corn averaging 90-100 bu./acre, soybeans 40-50 bu./acre, and wheat averaging 20-25 bu./acre.

This year saw the introduction of a crop rotation type farming program designed to reduce the need for petrochemical nitrogen fertilizer and increase the humus content of the soil. It meant dividing each farmer's fields into thirds with corn on one-third, soybeans on one-third and wheat on one-third. Each field would cycle in three years with a different crop each year. In mid-winter the farmer will interseed the wheat with biennial sweet clover at a rate of 15 lbs. per acre. The wheat is refuge share and is harvested in the late summer, leaving the sweet clover.

Sweet clover in harvested wheat.
9/80 JAG

Refuge cooperative farmers loading wheat for aerial seeding in soybean fields. 8/80 JAG

This rotation is going to be refined and modified to more closely correlate the cost of planting rates for various crops to a 60-40 percent share. But at present, the objective is to determine the amount of nitrogen "fixed" in the soil by the sweet clover and reduce the application rates of chemical fertilizer by this amount the spring following sweet clover.

B. Grasslands

In past years it has been impossible to interest anyone in this area in planting hay on the refuge. Most farmers are cash croppers who do not bother with cattle and have little interest in hay.

This year we found a cooperator who put in 47 acres of alfalfa which will provide more green browse area for geese. He also mowed approximately ten acres of reed canary grass.

Another cooperator mowed roadsides for hay and mowed a ten acre area in the center of the refuge for hay, but it was a very poor quality so he was not charged for it. He refused to mow it if charged so the refuge benefitted by not having to mow it.

This could be called the year of the fire here. Over 300 acres of uplands were burned during the spring, primarily to retard the growth of woody vegetation. Some of the blazes were questionable as to whether they were controlled or wild, but the refuge habitat has improved greatly. Over 1,000 acres of cattails were also burned but it will be discussed under "Wetlands".

Late April burn of newly seeded prairie grass across the road from refuge headquarters. 4/80 GSC

The late spring burns were concentrated on higher ground such as the cordgrass prairie area in the center of the refuge and the reed canary grass area at the north end, with the objectives being to retard the growth of willows and dogwood and to improve the grassland composition.

All burned areas have responded quite well with almost total kill of woody vegetation and denser growth of the herbaceous species. A study is scheduled for 1981 to determine the effects of fire on plant species composition in the prairie area.

C. Wetlands

The extended drought almost left us with nothing to report under this category. This was the first year I know that produced no flood in the creeks. The year began normally with excellent flow in the creeks and plenty of rain. Drawdown of Eagle Pool began on schedule and everything was normal except for the very obvious lack of rainfall. Pelican Pool was held full and by May, Squaw Creek was diverted into Pelican Pool to maintain the level, even though it was much earlier than planned. The drought continued and the extremely hot weather during the summer months resulted in abnormal evaporation and by October only four pools had water; Mallard Marsh, Snow Goose Pool, Pelican Pool and Long Slough.

To provide more water, Davis Creek was diverted into Eagle Pool August 1 for the first time in several years and the flow put some water into the north end of the pool. Also, for the first time in several years, pumping was initiated and succeeded in flooding Long Slough.

Emergent vegetation (water millet, smartweed and chufa) growths were excellent, but there was insufficient water to flood the major pools.

Dead dogwood south of Cross Levee #2 in the burned cordgrass priaire area (late April burn). 4/80 BAH

April burn of willow-cottonwood area at the north end of Mallard Marsh. 4/80 GSC

Waterfowl habitat in the pools was increased by one-third as a result of the influence of a technical bulletin (No. 112) from the Wisconsin Department of Natural Resources entitled "Control and Management of Cattails in Southeastern Wisconsin Wetlands", which came to the refuge. It indicated that cattails are most vulnerable there (and therefore, here) in about mid-July. So, in early July, we began mowing and burning cattails as the pools were dry anyway. The past years growths carried the flames through the green parts and killed the growth. Some areas were burned again two weeks after the first burn when the fire killed growth from the present year dried out enough to burn. And by then, new shoots were up six to twelve inches, providing a double kill. Shoots that came up after the second burn were eaten back by waterfowl and snow geese rooted up a great amount of the rootstocks in areas that could be flooded.

Smartweed at east side of Eagle Pool. This area was cattails last year. Note dead willows (upper left) resulting from late-July burn (looking west from headquarters bridge tower). 9/80 BAH

Water millet growth at west side of Eagle Pool (looking northeast from Pintail Point tower). 9/80 BAH

Vegetation at north end of Eagle Pool after two July burns and temporary flooding. 7/80 BAH

Same area as above but just prior to arrival of waterfowl. 9/80 BAH

Mowing cattails at east side of Eagle Pool in mid-July (view looking west from headquarters tower). 7/80 JAG

Vegetation after burning mowed area at east side of Eagle Pool. Early August (view looking west from headquarters bridge tower). 8/80 JAG

Another benefit is that fire kills willows and there were many fairly large ones invading many areas that deterred geese from using them. The next few years should see great improvement in the marsh areas here as the cattails and woody vegetation are slowly eliminated with the use of fire. This method of control is the fastest and cheapest known and will be pursued in the future.

Dead willows resulting from mid-July burn of cattails. View looking west from south end of Eagle Pool. 8/80 JAG

D. Forestlands

Nothing to report.

E. Other Habitats

Nothing to report.

F. Wilderness and Special Areas

The 100 acre Loess Hills Research Natural Area (G8 aeolian land form) and the 250 acre Bluejoint-Sloughgrass Prairie Research Natural Area (K-73 northern cordgrass prairie) are the only areas included in this category. The cordgrass prairie was burned in late April to enhance vegetation composition.

G. Easements for Waterfowl Management

Nothing to report.

IV. WILDLIFE

A. Endangered and/or Threatened Species

Peregrines are occasionally observed on the refuge during migration periods. This year there were five known sightings, four by refuge staff.

Bald eagles are common on the refuge during fall and early winter when they concentrate on refuge impoundments to feast on the dead ducks and geese resulting from disease, hunting mortality, lead poisoning and other causes.

The fall buildup of bald eagles this year was not as great as in past years probably due to the lack of waterfowl (their food source) and the mild, open winter. The peak was 170 compared to 300+ in past years. The greatest number for the year was 189 on January 5, but this was carryover from the previous year.

The central part of the refuge harbors the last known stable population of western massasauga rattlesnakes in Missouri. This small inoffensive reptile is classified as rare on Missouri's list. The term "inoffensive" is used because only one record of snakebite is known in the 46 year history of the refuge and the victim was a collector who tried to pin a snake's head with a pencil. They are strictly protected here.

Western massasauga temporarily detained while crossing plowed ground. 5/80 BAH

B. Migratory Birds

1. Waterfowl

Waterfowl production on the refuge was normal this year with an estimated 30 mallards, 40 blue-winged teal, 80 wood ducks, and abnormally, 15 green-winged teal. All production was to flight stage. The green-winged teal brood was a rare occurrence, the first record for many years.

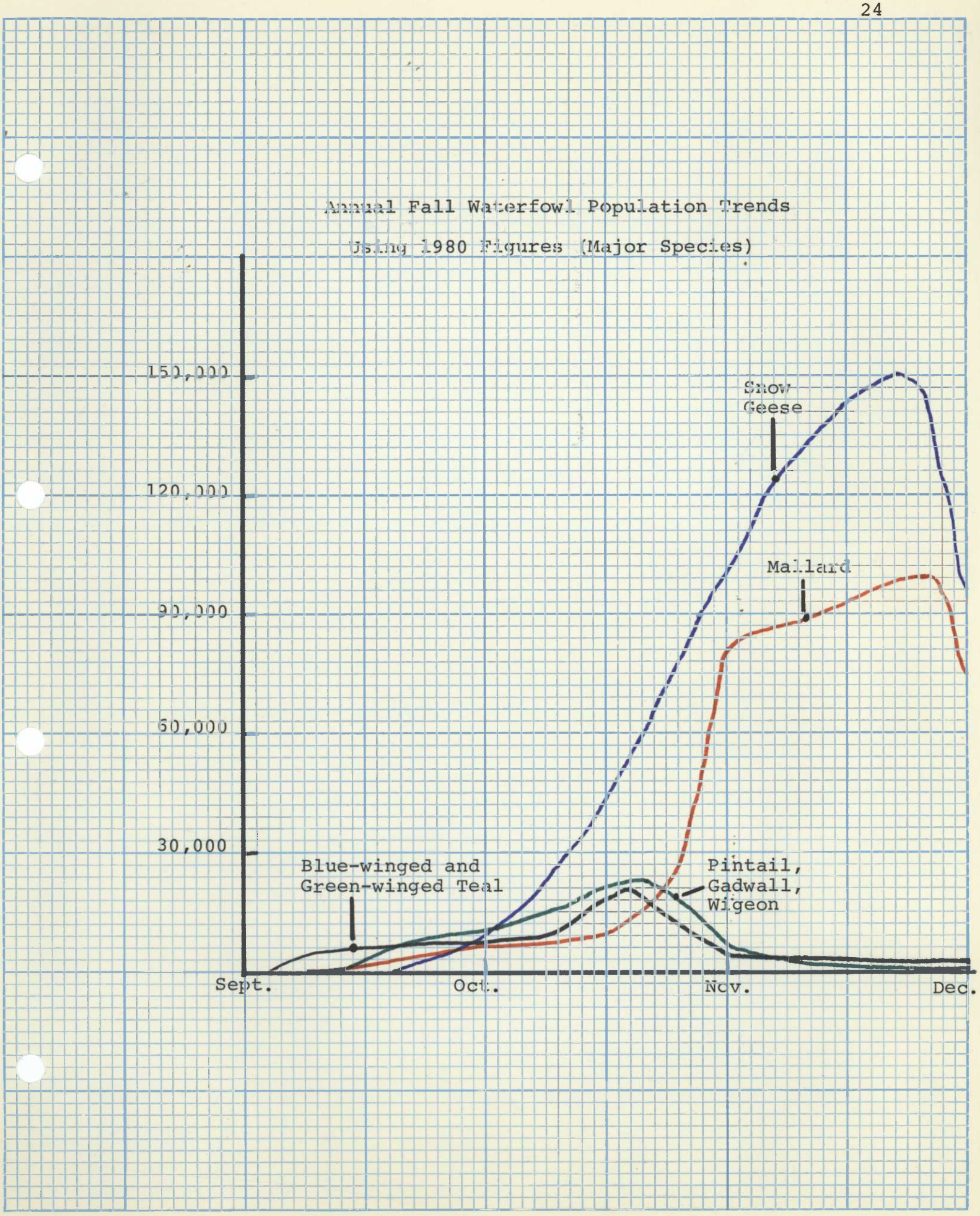
As in the past few years the spring migration mostly bypassed the refuge with no large buildup of waterfowl. The spring migration began about the second week of March with the usual great diversity of species. Goose numbers peaked at 11,000 on March 12 and duck numbers peaked at 87,000 on March 26, mostly being mallards.

The migration tapered off and was basically finished by the third week of May. The fall migration began the second week of August with a slight increase of mallards and a few wigeon. By August 20 there were other species beginning to migrate in, but mallards remained the predominant duck species, even more so than blue-winged teal.

The mallard population peaked at only 150,000 on November 19, much lower than the usual 250,000 to 300,000 peak. Most of the other duck species peaked around October 22, all being much lower than in previous years. The following table indicates peak populations of various species:

Species	Peak Number	Date
White-front	400	10/31
Blue/snow	150,000	11/26
Canada	8,200	11/19
Mallard	97,000	11/19
Gadwall	8,000	10/22
Pintail	11,500	10/15
Green-winged teal	10,000	10/20
Blue-winged teal	12,000	10/15
Wigeon	3,000	10/22

After two seasons of mandatory steel shot for waterfowl hunting (some areas and guages) the state conservation commissioners abolished the regulation in a surprise vote that even shocked the Department of Conservation people. The sad part of the whole thing is that a steel/lead shot effectiveness study had just been completed at Schell-Osage WMA and the data was scheduled to be presented to the commissioners the next day by the state waterfowl biologist. Incidentally, the data showed that steel was as good as lead. The rationale used by the commissioners was that they had to be receptive to the wishes of the waterfowl hunters and not always side with the Department of Conservation. So waterfowl were once again hunted with lead, merchants who stocked steel are in danger of taking a financial loss and the whole situation has deteriorated to a point where it is worse than when steel shot was first introduced.


Annual Fall Waterfowl Population Trends
Using 1980 Figures (Major Species)
150,000
120,000
90,000
60,000
30,000
Snow Geese
Mallard
Blue-winged and Green-winged Teal
Pintail, Gadwall, Wigeon
Sept.
Oct.
Nov.
Dec.

One of the rumors circulating this year to explain the low numbers of waterfowl was that we forced them to migrate early as revenge for abolishment of steel shot regulations.

Actually, the waterfowl never showed up this year maybe because of the warm weather during the fall encouraging them to remain north until late. Even had they migrated on schedule there was little grain in harvested fields because nearly all had been fall-plowed.

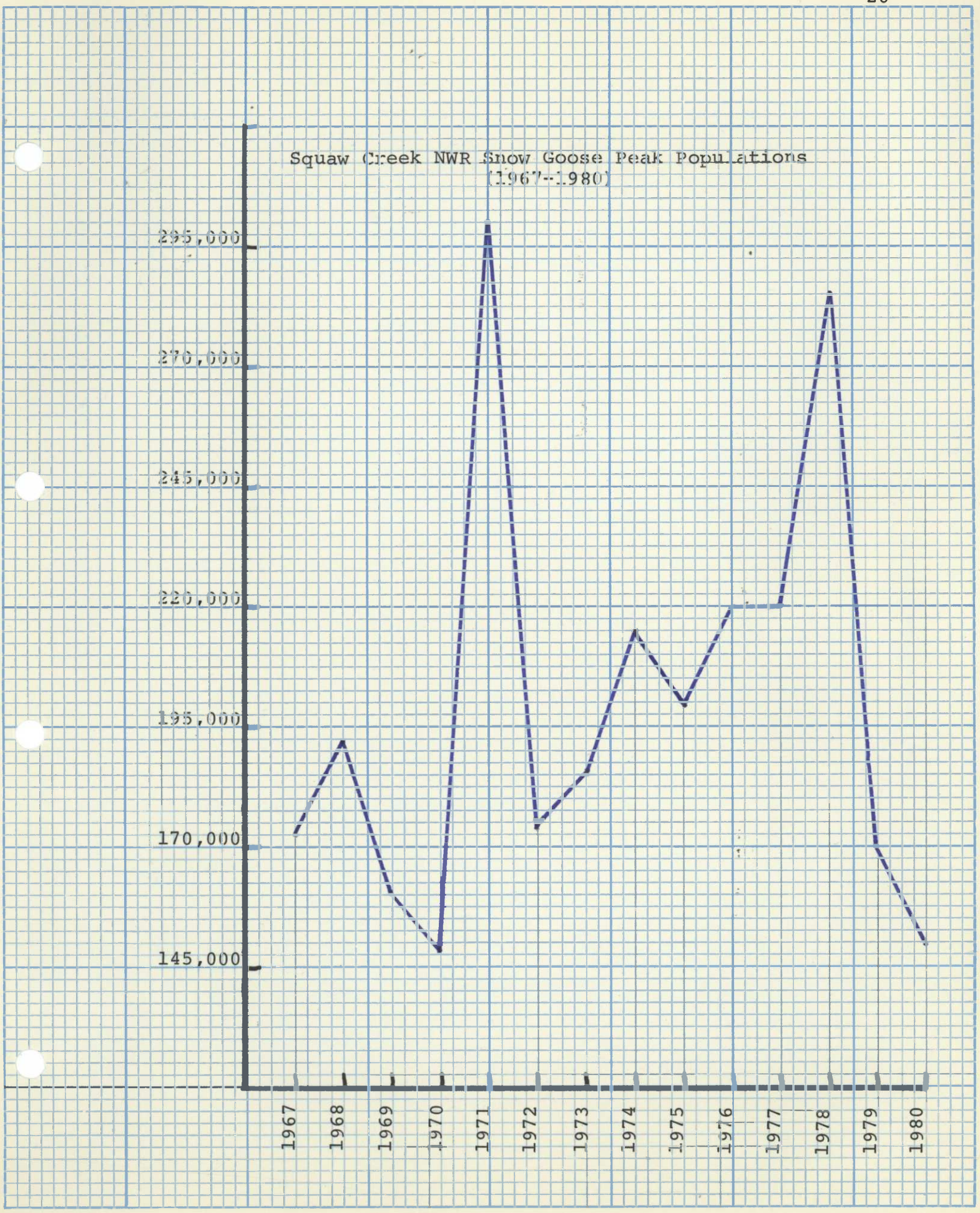
Avian cholera is a disease that we have come to expect as surely as the waterfowl migrate in. It is almost totally restricted to snow geese here, though some ducks and a few Canada geese have been found that were diagnosed as cholera victims.

The cholera outbreaks here are fairly predictable, based on weather patterns, even though the reason why a weather change triggers the disease outbreak is unknown. It has been noticed that the cholera problems usually occur in early December when a few warm days follow a period of hard freeze. As soon as the warm air moves in, a cholera outbreak occurs within 24 hours. Following is a summary of snow geese we collected that apparently died from avian cholera:

Date	Location	Number	Species
12/6/80	Snow Goose Pool	94	Snow Geese
12/8/80	Long Slough	8	Snow Geese
12/11/80	Long Slough	37	Snow Geese
12/13/80	Snow Goose Pool	22*	Snow Geese
12/16/80	RSR Ranch**	1,163	Snow Geese
" " " "	"	6	Canada Geese
" " " "	"	2	Ross' Geese
" " " "	"	31	Mallard
" " " "	"	2	Wigeon

*In January evidence of an estimated 75 additional snow geese was located in another part of Snow Goose Pool and nearly all apparently died from cholera.

**RSR Ranch is private land located about 18 miles north of the refuge. There was evidence of approximately 300 additional dead snow geese in the area.


Squaw Creek NWR Snow Goose Peak Populations
(1967-1980)
295,000
270,000
245,000
220,000
195,000
170,000
145,000
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980

Cholera is the most important disease affecting waterfowl at present. The only action that can be taken is to collect and burn carcasses,which does not apparently stop the disease. No management technique is known which can prevent it. Dispersal of birds has been considered but they disperse as large flocks and this could scatter the birds to die in other areas and possibly infect other environments.

No other disease was recorded.

Burning carcasses of cholera killed birds from RSR Ranch. 12/80 BAH

2. Marsh and Water Birds

The extremely hot summer with little precipitation reduced water levels in refuge pools, concentrating fish populations and providing an excellent food source for the wading birds.

There were large numbers of white pelicans using the refuge this fall with peak number being 1,500 on September 15. One group of sixty pelicans visited the refuge June 25 and then departed. Their mission was unknown as they should have been nesting. Three pelicans, apparently lost,

remained on the refuge from December 1 through December 24 and then disappeared. Four pelicans died this fall on the refuge; all were immatures. Two of the carcasses were sent to Madison Lab for analysis but no determination regarding cause of death could be made.

Yellow rails are rarely seen on the refuge but one observer watched several flush ahead of a slow fire in the central prairie in May.

There are no known heron rookeries in the area. Green herons nest on the refuge as well as sora, Virginia and yellow rails. American and least bitterns also nest here.

Great blue herons were observed all year. There were eleven on the refuge on December 10 and four on December 17, the last date one was observed.

3. Shorebirds, Gulls, Terns and Allied Species

Water levels were low during the summer but the habitat was not conducive to extensive shorebird use due to the rank growth of vegetation prior to the migration of shorebirds.

One nest of upland sandpiper was located and two young were raised to flight stage. These birds rarely nest here. The killdeer and spotted sandpiper are the only other birds in this category known to nest here recently.

More snipe than normal used the refuge this fall peaking at 80 on October 22. They preferred the areas where cattails had been burned and then flooded in the north part of Eagle Pool.

Killdeer were present most of the year, as usual. An unusual 20 were recorded on December 17 which is extremely late.

Golden plover were present in large numbers this fall with a peak of 500 birds observed October 15 in Pelican Pool.

4. Raptors

The bird of greatest interest in this category is the bald eagle. The peak number during spring migration occurred January 5 with 189 birds recorded (102 adult, 87 immature). The last spring record was seven birds on April 9. The fall migration began with the sighting of an immature bird on September 24, the earliest record in many years for the refuge (an adult was sighted off-refuge August 31). The fall peak occurred December 10 with 170 birds recorded (93 adult, 77 immature). This was well below the peak populations recorded in the past several years but it was likely due to the warm weather to the north and the lack of waterfowl upon which they prey.

Five peregrines were sighted this year and two prairie falcons. These birds rarely seem to stay long on the refuge; they just stop temporarily and then leave.

The winter red-tailed hawk population seemed to be stable with about 25 birds using the refuge in the fall and winter.

Golden eagles are rarely seen, but three individual birds, all immature, were sighted at different times on the refuge during the fall.

A Mississippi kite was observed on the refuge in June. It is listed as "accidental" on the bird list.

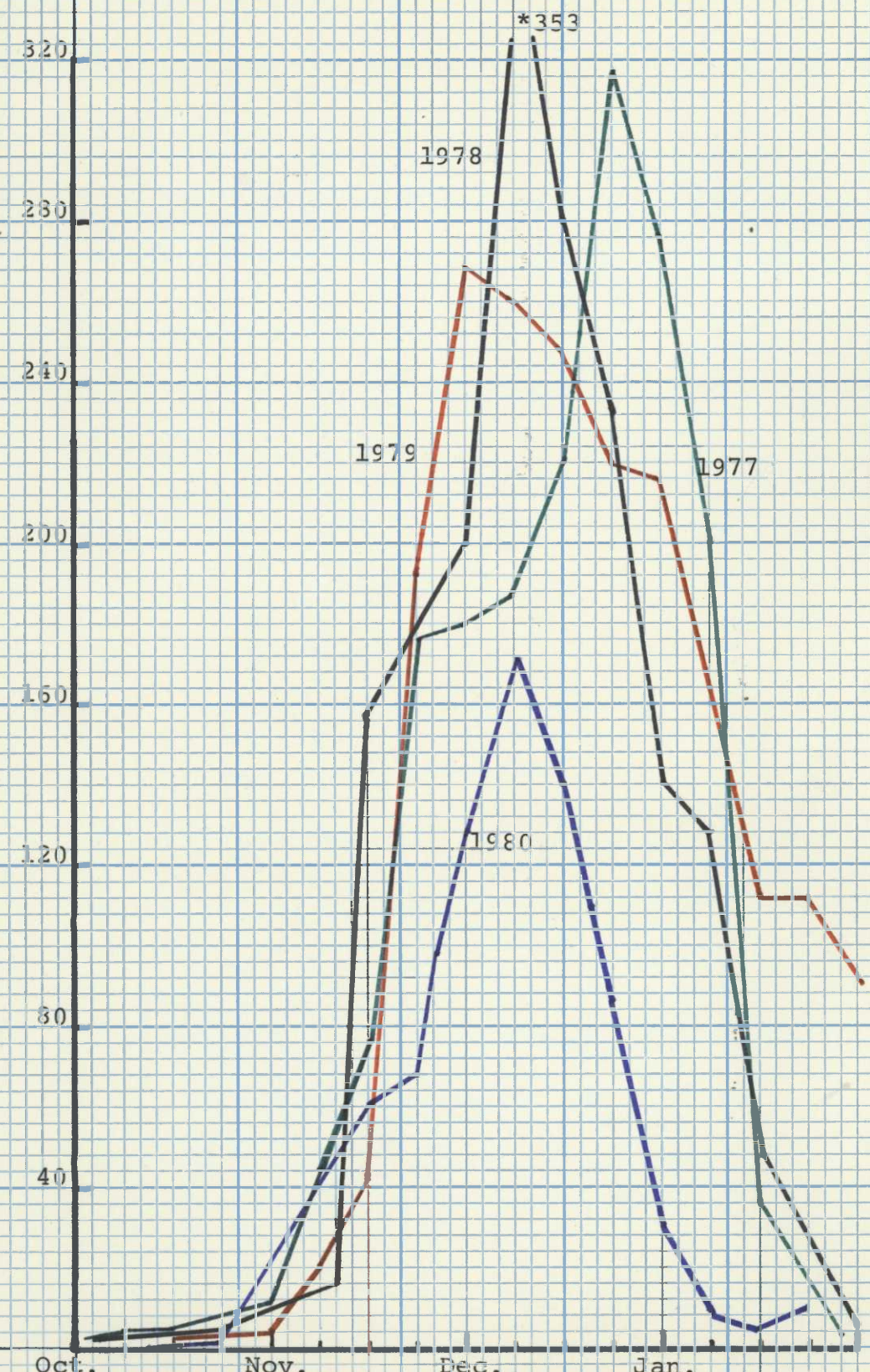
There are several species of owls that occur on the refuge, mostly in winter. There were eight long-eared owls sighted on the Christmas Bird Count. Short-eared owls are uncommon. Barred, screech and great horned owls occur here all year.

5. Other Migratory Birds

The refuge hosts a great variety of migratory birds, and seasonal occurrences can be found on the bird list in the back of the narrative.

One additional species, "great-tailed grackle" will be added to the list as they are now found on the refuge occasionally. There is a nesting population of these birds several miles to the west of the refuge.

Wintering Bald Eagle Populations on Squaw Creek NWR
(1977-1980)



*Represents highest refuge population.

The annual Christmas Count was held December 27 on the refuge and surrounding area. There were a total of 64 species recorded. Highlights were 196 pheasant (high), 25 red-headed woodpecker (high), five titmouse (low), 276 starling (low), one yellowthroat (high), 434 red-winged blackbird (low), 85 grackle (low), 23 purple finch (high), one savannah sparrow (high), five LeConte's sparrow (high). Also a great-tailed grackle and a white pelican were seen during the count period.

C. Mammals and Non-Migratory Birds and Other

1. Game Mammals

The winter population of white-tailed deer remains steady at an estimated 200 each year, based on aerial census over snow cover. Production is estimated at 100 fawns but predators, disease and especially road kills diminish the population by late fall.

A disease of white-tailed deer called "black-tongue" or "blue-tongue" apparently caused some mortality on the refuge this year. Three deer found dead exhibited the symptoms but no definite diagnosis was made. This disease caused numerous deer deaths throughout the state this summer.

The refuge herd is healthy, with abundant habitat and food. The deer prefer to use the north central prairie area and brush areas at the edge of crop fields to rest during daylight hours.

2. Other Mammals

Beaver were abundant this year in Squaw and Davis Creeks, but the creek cleanout was begun, displacing many to unknown areas.

Raccoon numbers have held steady despite intensive hunting and trapping pressure around the refuge. This is based on information obtained talking to coon hunters, trappers and fur buyers.

Electric fence rigged to discourage beavers from plugging tube off Davis Creek. It worked but could not compensate for rising and falling water.
9/80 JAG

Muskrats declined greatly due to the severe lack of water. Bluff Pool and Pelican Pool, the only ones with significant water, had several hundred houses.

Reports of mountain lion sightings still come to the refuge periodically. There are definitely one or more of these cats that wander through here each year.

3. Resident Birds

The warm dry spring provided excellent conditions for good hatches of quail, pheasant and turkey, with subsequent survival to flight (or run) stage.

Turkeys have moved into the wooded hills east of the office and established a good population. A flock of 35 were using a soybean field south of the headquarters at the end of December. Phil Rice, Regional Supervisor for law enforcement,

Missouri Department of Conservation said very appropriately several years ago that "a South Missouri turkey sitting in an oak tree with a crop full of acorns is no more content than a Northwest Missouri turkey sitting in a cottonwood tree with a crop full of soybeans." This was said just after release of turkeys here when some biologists said there were insufficient oak trees in northwest Missouri to feed turkeys in winter.

Approximately 700 pheasants were present June 30. The mild winter and warm spring resulted in a great increase in pheasant numbers.

Quail increased in number again after the disasterous winter of 1978. There are still only three known coveys on the refuge, but there were none in 1979 that we could find.

4. Other Animal Life

Carp and bullheads are the primary fish species on the refuge. Their only value is as wildlife food.

Bullfrogs are common and are preyed on by the refuge manager. Snakes are common on the refuge, particularly ribbon, garter, and two water snakes (Graham's and diamond-backed). The western massasauga rattlesnake represents the only poisonous species occurring on the refuge. This species is included on Missouri's rare and endangered list and collecting has been halted. Killing is likewise prohibited as much as possible as this snake is not considered a threat to humans. But the contrary is surely true.

V. INTERPRETATION AND RECREATION

A. Information and Interpretation

1. On-Refuge

Nearly all the refuge outputs in this category result from slide/talk presentations to groups such as school classes, senior citizens' clubs, church groups and scouts. A total of 55 on-site programs (slide/talks and films) were presented

during the year. The programs are geared to the group in depth of coverage--for instance, the same program may be shown to both a fifth grade city group and a college biology class. But the narrative for each slide is completely different.

A "Prairie Day" was presented at the refuge on May 31 in cooperation with the Missouri Prairie Foundation. Approximately 45 persons attended to walk through prairie areas, have grasses and forbs identified and learn about management.

A "Young Trapper Training School" was presented October 4 and 5 in cooperation with the Missouri Department of Conservation. A total of 51 persons attended this training which involved setting various types of traps, care of traps, tools, sets, killing trapped animals, releasing non-target animals, skinning, fleshing and stretching pelts and marketing. It was extremely well received and very informative with members of the Missouri Trappers Association donating their time to help.

The refuge sponsored the third annual "Eagle Day" on December 13, in cooperation with the Missouri Department of Conservation. Eagle Day is set up to inform the public regarding eagles' habits and survival situation and to actually show them the birds on the refuge. An estimated 700 persons visited the refuge to see 90 eagles on a day that was made to order. A captive bird was brought up from Dickerson Park Zoo in Springfield and shown to the public along with an appeal to protect eagles. A film on eagles was shown and mounted specimens and leaflets were available. Spotting scopes and binoculars were available on the refuge so everyone could observe the eagles performing. The eagles performed admirably, flying, sitting, presenting talons and soaring.

Paul Price from Dickerson Park Zoo with captive eagle during "Eagle Day" presentation. 12/80 BAH

2. Off-Refuge

This category includes slide/talks off refuge, radio and television programs, published news releases, and participation in other off refuge functions.

In summary, 19 off refuge slide/talk programs were presented, 31 radio or/and television programs and 29 news releases were published.

The above data may be deceiving because the refuge has a regular news column "Squaw Creek Digest" which is published in several local papers. Also a weekly or less radio program at a local station.

A new display was developed for the bulletin board at the rest area on Interstate 29 just east of the refuge.

The annual "public meeting" was held March 5 to discuss refuge plans and programs. Area Office and refuge personnel presented the information for about 60 persons who attended. There were a few rather vociferous people but we were glad to have the opportunity to refute rumors and misconceptions regarding the refuge.

B. Recreation

1. Wildlife-Oriented

Nearly all use of the refuge is included in this category and it occurs primarily during the spring and fall migration periods. The auto tour route (eight miles) attracts nearly all visitors to observe, in order of popularity, waterfowl, deer, eagles, pelicans and pheasants.

The Loess Bluff Trail behind the headquarters is very popular as is the Pintail Point Trail in the center of the refuge.

The only consumptive forms of recreation are mushroom (morel) picking, fishing and berry picking. Each of these is very seasonal in nature with little use.

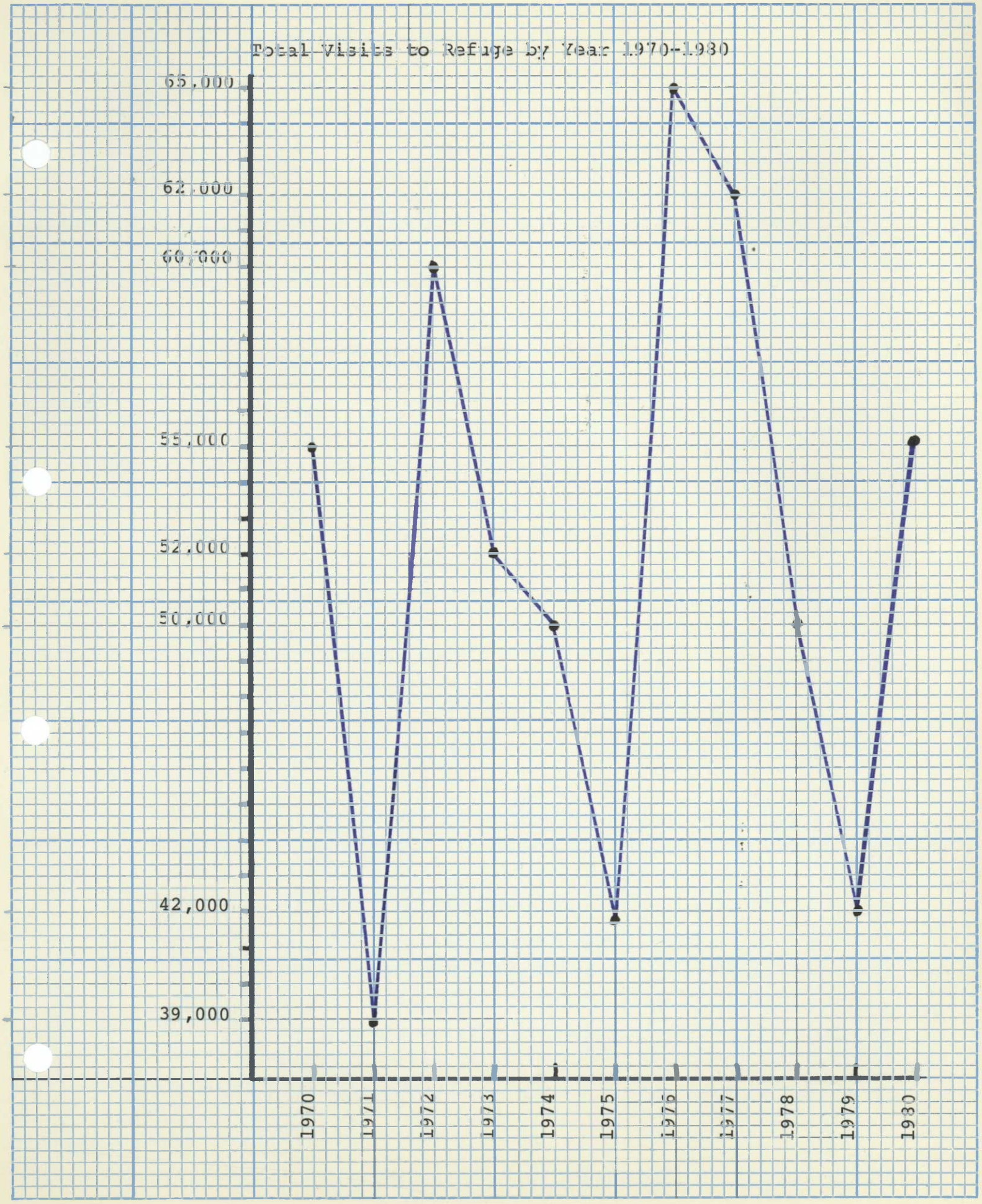
2. Non-Wildlife Oriented

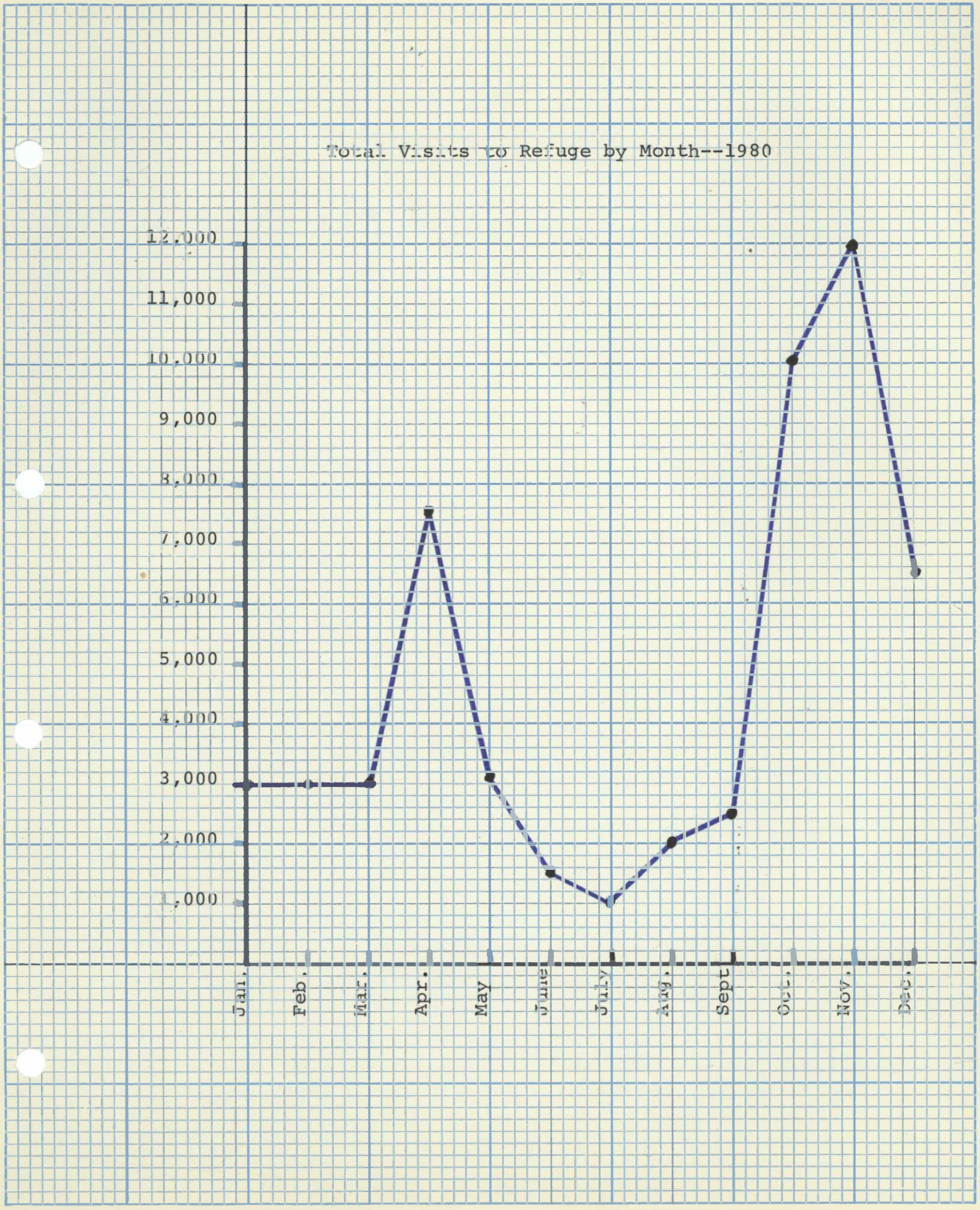
Very few persons visit the refuge who are not interested in wildlife. Only picnicking would be included in this category if eating is considered a form of recreation.

C. Enforcement

No record of cases was maintained at the refuge. Most were waterfowl hunting violations but there were some trespass violations that were prosecuted.

All possible cases are prosecuted through state court with the cooperation of the local conservation officer because it is easier and the money from fines is allotted to the local school systems in the county. And we have an excellent prosecutor and judge who really enjoy the refuge and are interested in protection of wildlife.


Total Visits to Refuge by Year 1970-1980
65,000
62,000
60,000
55,000
52,000
50,000
42,000
39,000
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980


Total Visits to Refuge by Month--1980
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
Jan.
Feb.
Mar.
Apr.
May
June
July
Aug.
Sept.
Oct.
Nov.
Dec.

VI. OTHER ITEMS

A. Field Investigations

University of Kansas Ph.D. candidate Richard Seigel is studying "The Life History of the Western Massasauga Sistrurus catenatus tergeminus" on the refuge for the field investigation part of his dissertation. He has received a grant from the Missouri Department of Conservation to assist him in this project. His data will be used to determine proper habitat management that will insure the survival of a viable population of these reptiles on the refuge. It would be a bland walk in the prairie if there were no danger of being bitten by a rattlesnake.

Northwest Missouri State University student Terry Miller is studying "Non-Hunting Waterfowl Mortality on Squaw Creek National Wildlife Refuge". This study will be the field investigation part of his Master's degree in Wildlife Management. This study involves setting up random transects and covering each one each week during the fall migration. He picks up dead birds and has carcasses necropsied to determine causes of death. Mr. Miller has received a grant from Missouri Department of Conservation to assist him in this project. It is not known exactly how this data will be applied to management of the refuge but it could have national application in the lead/steel shot controversy.

Cholera killed waterfowl (and others) retrieved from Snow Goose Pool. 12/80 BAH

The wood duck boxes were checked January 12-15, 1981 to determine 1980 usage. There are 33 boxes available on the refuge, 12 had screech owls present (9 grey phase--3 red phase), 22 had owl pellets and 22 had wasp or hornet nests present. Only one had evidence of wood duck use and 15 eggs hatched. This year a small piece of "no-pest strip" will be tacked to the inside top of each box to discourage wasp use.

B. Cooperative Programs

The refuge YCC program was lost this year due to the directive regarding the ratio of resident camps to non-resident camps. This one was non-resident, so it had to be closed to meet the quota.

The YACC program likewise finally died. At the beginning of the year two corpsmen were employed. They were dependable workers and did an excellent job. Both quit in early August, one to take a job and the other to enroll in college. Many things must be considered before more YACC members are employed. Most of the incredible quantity of YACC property left here after the original camp folded was transferred on March 4 to Sulphur, Oklahoma to a YACC warehouse which must be huge.

The refuge is participating in the Junior Fellowship Program which involves contacting high schools to locate minority graduates in the top ten percent of their class to work during vacation and semester breaks. We were able to locate a really outstanding participant from our own town--Rocky Martinez. He has completed numerous jobs that are fairly complex such as installing refuge radios in two vehicles, managing the water purification system and repairing various motors.

The refuge is participating in the Cooperative Education Program and Student Trainee John Robinson from Iowa State University entered on duty November 24 under this program. He has been filling the vacant assistant manager job and is a real asset.

The annual mourning dove coo count was completed by Yocum on May 27. A total of 34 doves called 115 times. While stopped, 12 singles, 6 pairs were seen. While driving, 30 singles, 16 pairs and 11 in flocks were seen. A total of 75 doves were seen during the count.

The annual November Snow and White-fronted Goose Survey--Iowa and Missouri was completed November 23. The census on refuge revealed 150,000 snow and blue geese and 6 white-fronted geese.

The annual Mid-Winter Survey of Waterfowl and Eagle Populations was completed January 5. A total of 3,508 dabbler ducks, 4 divers and 785 geese were observed for a total of 4,297 waterfowl. Also, 189 eagles (102 adults, 87 immature) were observed.

C. Items of Interest

Two revenue sharing checks were delivered to Holt County this year. Both were for the FY-79 revenue sharing payments. One check for $9,331.00 was delivered February 26 and one for $5,029.00 was delivered December 15.

Heck and Guthrie attended a seminar on cannon netting waterfowl at Swan Lake Refuge on January 29.

Heck attended a prescribed burning workshop at Flint Hills NWR sponsored by Kansas State University Cooperative Extension Service, March 17-21.

Heck attended Gyroscope III in Salt Lake City, April 7-11.

Crockett transferred to the U.S. Forest Service in his native North Carolina June 14.

Heck attended a steel shot/lead poisoning workshop in Minneapolis July 21.

Heck and Guthrie attended the Project Leaders' meeting in Kansas City August 18-21.

Heck and Guthrie attended a steel shot/lead poisoning seminar in Independence, Missouri on September 23.

Guthrie transferred to Union Slough NWR October 31. Potential Assistant Manager Ben Gastineau from Audubon NWR resigned on November 5 prior to reporting for duty here.

Heck and Zeliff attended the Administrative Workshop in Minneapolis December 16-18.

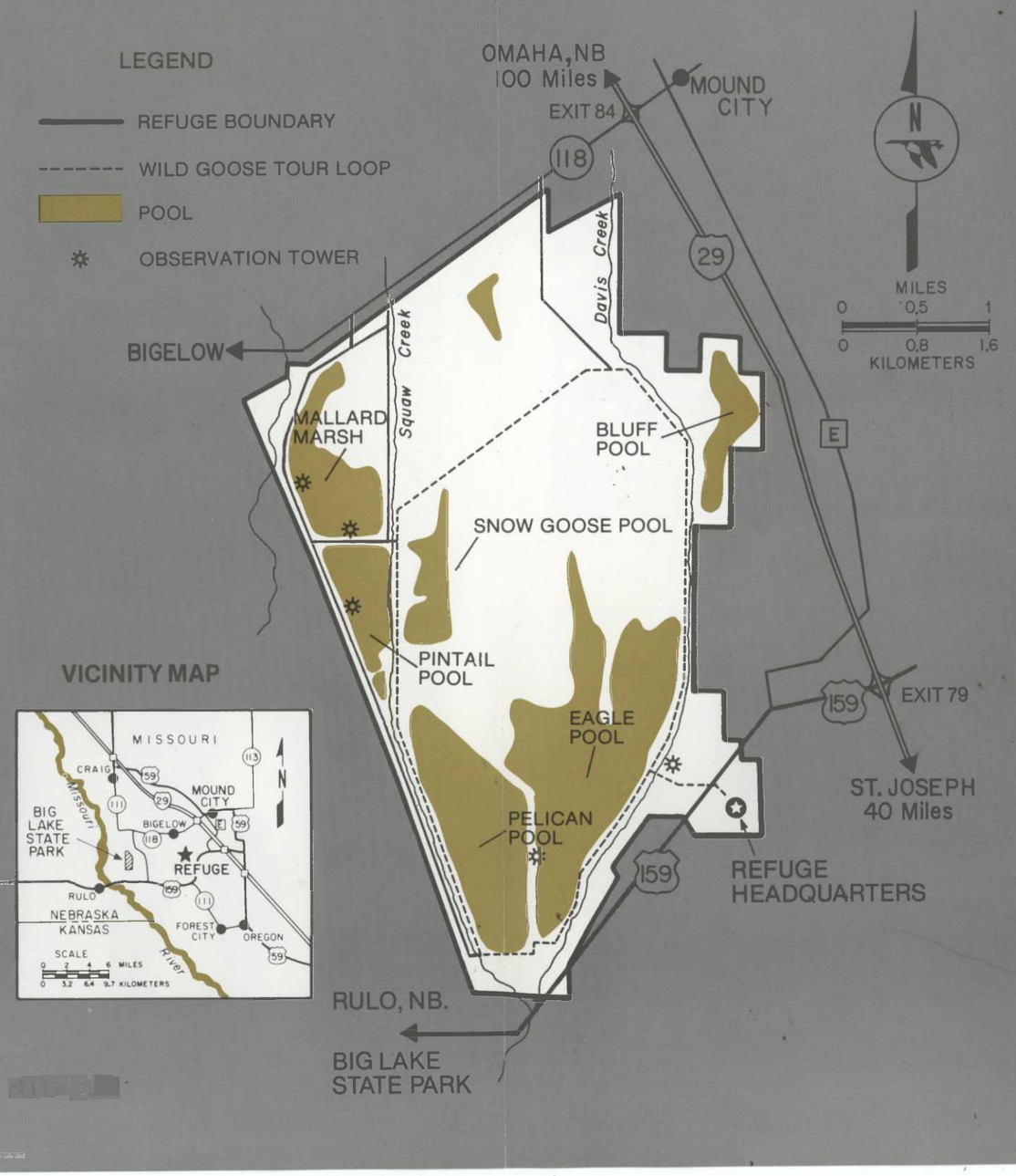
This report was completed by Heck. Graphs were prepared by Robinson. Zeliff edited and typed the report.

D. Safety

Safety meetings were held on a monthly basis. No lost time accidents were reported during the period and as of December 31, this station has recorded 1,465 accident free work days.

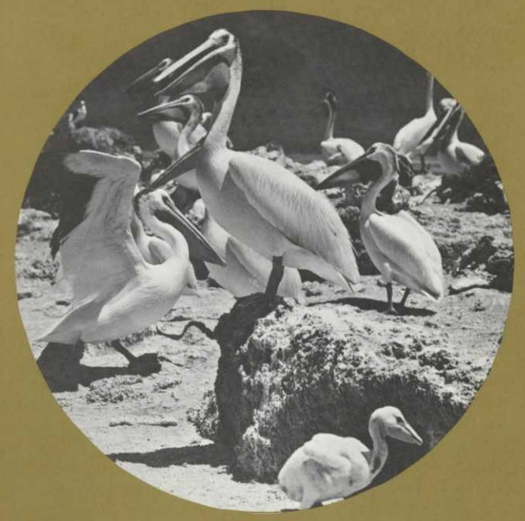
Squaw Creek National Wildlife Refuge

Mound City, Missouri



For further information, contact the Refuge Manager, Squaw Creek National Wildlife Refuge, P.O. Box 101, Mound City, Missouri 64470.

Squaw Creek National Wildlife Refuge is one of a system of refuges administered by the U.S. Fish and Wildlife Service and is dedicated to the preservation and conservation of wildlife. The financial base for this sytem was established in 1934 through the passage of the Migratory Bird Hunting Stamp Act. This Act requires waterfowl hunters to purchase an annual migratory bird or "duck stamp." Funds collected from duck stamp sales have been used to purchase numerous refuges that provide habitats necessary to sustain a variety of wildlife for both hunters and nonhunters to enjoy.



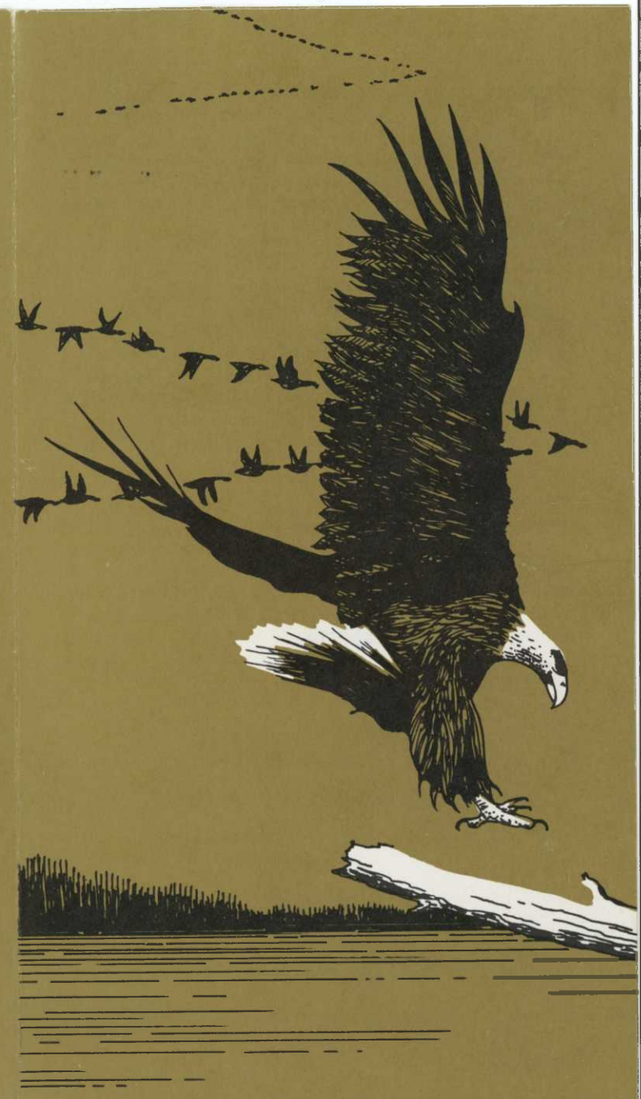
Adult and young white pelicans in nesting colony. U.S. Fish and Wildlife Service photo by David B. Marshall.

U.S. FISH AND WILDLIFE SERVICE
Department of the Interior

RF6-63560-1

July, 1979

☆ U. S. GOVERNMENT PRINTING OFFICE: 1979 — 680-579



SQUAW CREEK

NATIONAL WILDLIFE REFUGE
MOUND CITY, MISSOURI

WINGBEATS FROM THE NORTH

For thousands of years, time in the Missouri River Basin has been measured by the twice annual migration of waterfowl. Each spring and fall, northwestern Missouri was inundated by a noisy confusion of ducks and geese. From northern Canada and the prairie pothole country, they flocked into the marshes and backwaters of the wild Missouri.

However, far-reaching changes have transformed the valley in the past 150 years. Prairie cordgrass marshes and the natural, sandbar-studded Missouri River channel have largely disappeared as a result of marshland drainage and the deepening and straightening of the channel. To partially meet the needs of wildlife in a changed, less hospitable environment, Squaw Creek Refuge was established in 1935. Here, amidst 6,900 acres (2,792 hectares) of manmade marshes, waterfowl and other wildlife can still find critically needed food, water and shelter.

THE BLUFFS

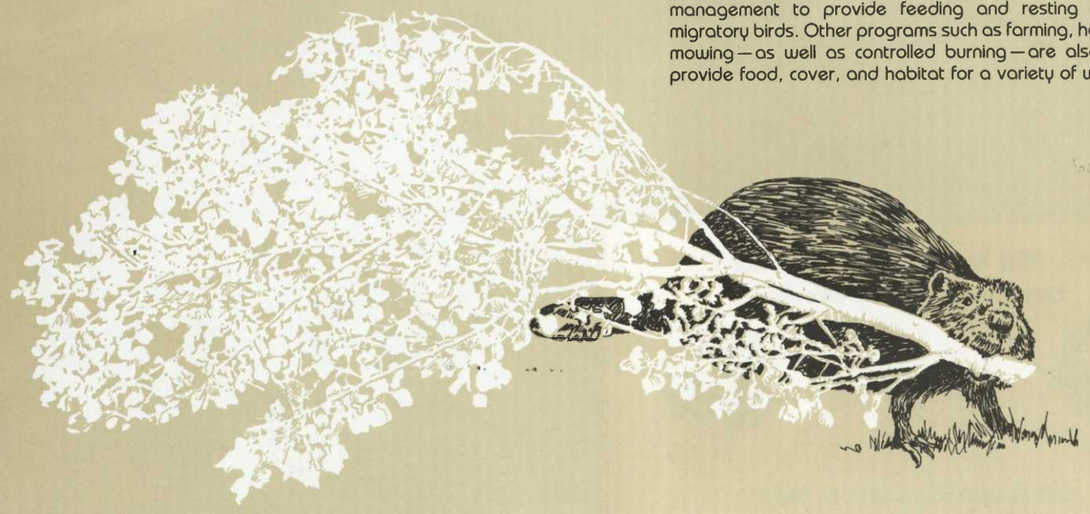
Overlooking the refuge from the east are the loess bluffs, a rare geologic formation of wind-deposited soil from the past glacial period. On top of the bluffs are some of the last remnants of the once vast native prairie that dominated the area prior to the influx of immigrants during the past three centuries. Against the backdrop of the bluffs, hundreds of thousands of migratory birds provide a stirring spectacle, just as they did for Lewis and Clark and the Indians before them.

"These first cold nights set the birds a-wing on long, strong flights . . ." — Olaus Murie

"Snow Geese Take Wing" Photo by Mary Tremaine — Omaha, Nebraska

REFUGE MANAGEMENT

The primary objective of the refuge is to preserve and perpetuate migratory birds and other species of wildlife. The refuge uses a variety of management practices to meet the needs of wildlife. A major program is marsh and water management to provide feeding and resting areas for migratory birds. Other programs such as farming, haying, and mowing — as well as controlled burning — are also used to provide food, cover, and habitat for a variety of wildlife.



FUR AND FEATHERS

Migratory birds rest and feed at Squaw Creek Refuge during their long spring and fall migrations. In September, pelicans are among the first heralds of fall. Great blue herons wade in shallow ponds, fishing for their dinner. Sandpipers running along the water's edge leave fragile patterns in the mud and are startled into flight by a swiftly passing shadow.

Other early migrants, pintail, gadwalls, and teal are soon joined by mallards, snow geese, and Canada geese. At peak migration times, 200,000 geese and as many, or more, ducks feed and rest in the marshes.

In the late fall and early winter, bald eagles ride the air currents, soaring in great arcs over the marsh below. As many as 300 of these birds, the American national symbol, winter on Squaw Creek Refuge.

The refuge is rich in its variety of wildlife. It is home for 33 kinds of mammals, 35 species of reptiles and amphibians, and 289 species of birds. Beaver and muskrat find food and cover in the marsh. Coyotes hunt the uplands and whitetail deer seek shelter in willow thickets and groves of cottonwood trees. Fields of native cordgrass prairie hide mice and voles — the prey of many species of hawks and owls.

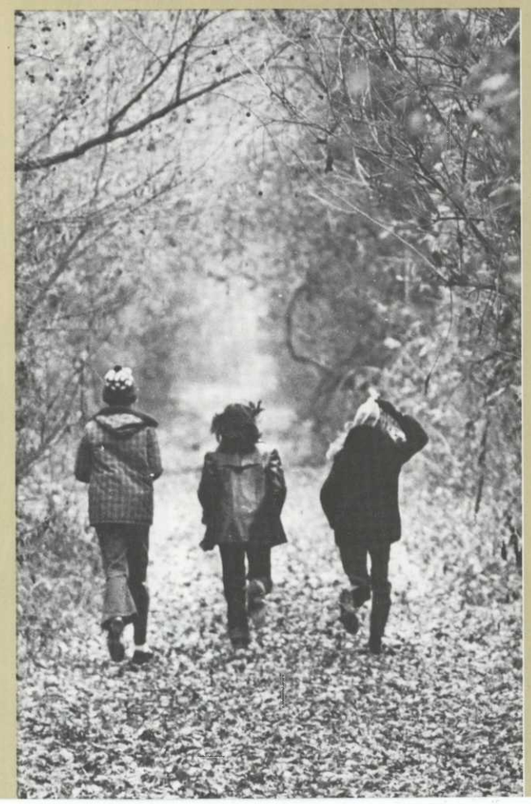
INVITATION TO SQUAW CREEK

Squaw Creek Refuge furnishes the public with an excellent opportunity to enjoy wildlife in its natural setting. Refuge roads and foot trails provide access to many wildlife observation areas. Viewing towers and wayside exhibits, located at key points, are excellent vantage points for viewing and photographing wildlife. From a high point on the Loess Bluff Trail, hikers can view the Missouri River floodplain and much of the refuge. Parts of Kansas and Nebraska can also be seen on a clear day.

Squaw Creek Refuge is open daily from sunrise to sunset, although some roads may be closed during wet weather. In addition to the spectacular viewing of waterfowl, eagles and deer, seasonal activities such as fishing and photography can be enjoyed by refuge visitors.

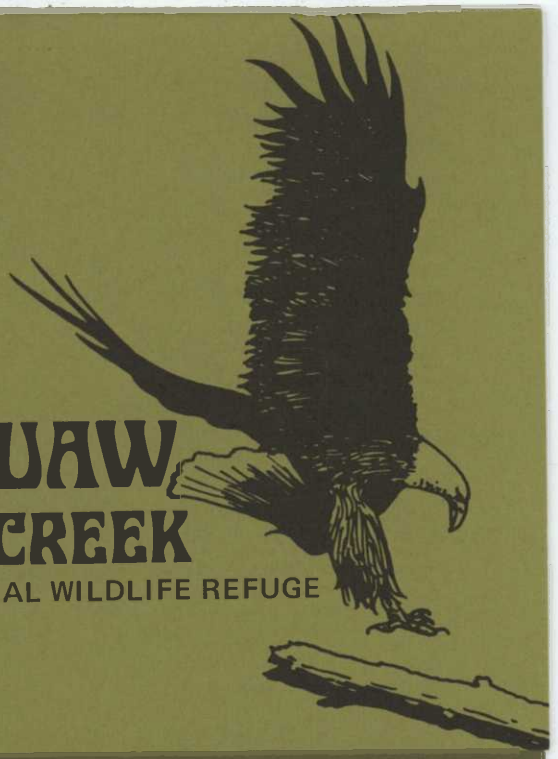
No camping is permitted on the refuge; however, camping facilities are available at Big Lake State Park, 8 miles (13 kilometers) west of the refuge. Restroom facilities are available at the Refuge Headquarters complex. Office hours are Monday through Friday from 8 a.m. to 4:30 p.m.

Photo by Don Bradley — St. Joseph, Missouri



REFUGE LEAFLETS

BIRDS
OF



SQUAW CREEK

NATIONAL WILDLIFE REFUGE

ENJOY YOURSELF. Your visit today can be the beginning of a very satisfying learning experience. We sincerely hope your adventures are successful and rewarding.

LOONS—GREBES—PELICANS—CORMORANTS—HERONS AND BITTERNS—IBISES—SWANS, GEESE, AND DUCKS

DUCKS—VULTURES—HAWKS AND EAGLES—OSPREYS—FALCONS
QUAIL AND PHEASANTS—CRANES—RAILS AND COOTS—PLOVERS

SNIPES AND SANDPIPERS—AVOCETS—PHALAROPES—
GULLS AND TERNS—DOVES—CUCKOOS—OWLS—
GOATSUCKERS—SWIFTS—HUMMINGBIRDS—KINGFISHERS

WOODPECKERS—FLYCATCHERS—HORNED LARKS—SWALLOWS—
JAYS AND CROWS—TITMICE AND CHICKADEES—
NUTHATCHES—CREEPERS—WRENS—MOCKINGBIRDS AND
THRASHERS—THRUSHES—GNATCATCHERS AND KINGLETS

PIPITS—WAXWINGS—SHRIKES—STARLINGS—VIREOS—
WARBLERS—WEAVER FINCHES—BLACKBIRDS—TANAGERS

GROSBEAKS, BUNTINGS, AND SPARROWS—ACCIDENTALS

WELCOME TO SQUAW CREEK....

National Wildlife Refuge. Established in 1935, the Refuge's main purpose is to provide feeding and resting habitat for waterfowl and other migratory birds. The Refuge contains 6,886 acres of diversified habitat including lowland cordgrass prairie, cottonwood and willow timber, impounded marshes, oak-hickory, and native prairie hills. This rich ecological diversity makes for excellent birding.

Birding is good all year, although fall and spring are the most spectacular times. White pelicans are present during September and April. Fall waterfowl populations peak in November. Wintering populations of 175 bald and one or two golden eagles are not uncommon. Most spectacular is the spring migration of snow geese numbering a quarter of a million birds. Shorebirds and wading birds are common visitors during the summer.

The following list contains 263 species observed on the Refuge. In addition 29 species have been observed only once or twice and are classified as accidentals. The list is in accordance with the Fifth A.O.U. Checklist as amended. New names are used with the former name in parentheses.

Species nesting on the Refuge are indicated by an "•." The relative abundance of each species for each season is coded as follows:

S – March-May F – September-November
S – June-August W – December-February

a – abundant ..... common species, very numerous
c – common ..... certain to be seen in suitable habitat
u – uncommon ..... present, but not certain to be seen
o – occasional ..... seen only a few times during a season
r – rare ..... seen at intervals of 2 to 5 years

Endangered species are followed by an (E).

ENJOY YOURSELF. Your visit today can be the beginning of a very satisfying learning experience. We sincerely hope your adventures are successful and rewarding.

LOONS—GREBES—PELICANS—CORMORANTS—HERONS AND BITTERNS—IBISES—SWANS, GEESE, AND DUCKS

DUCKS—VULTURES—HAWKS AND EAGLES—OSPREYS—FALCONS
QUAIL AND PHEASANTS—CRANES—RAILS AND COOTS—PLOVERS

SNIPES AND SANDPIPERS—AVOCETS—PHALAROPES—
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GOATSUCKERS—SWIFTS—HUMMINGBIRDS—KINGFISHERS

WOODPECKERS—FLYCATCHERS—HORNED LARKS—SWALLOWS—
JAYS AND CROWS—TITMICE AND CHICKADEES—
NUTHATCHES—CREEPERS—WRENS—MOCKINGBIRDS AND
THRASHERS—THRUSHES—GNATCATCHERS AND KINGLETS

PIPITS—WAXWINGS—SHRIKES—STARLINGS—VIREOS—
WARBLERS—WEAVER FINCHES—BLACKBIRDS—TANAGERS

GROSBEAKS, BUNTINGS, AND SPARROWS—ACCIDENTALS

	S	S	F	W
___Common Loon	r		r	
___Horned Grebe	u		u	
___Eared Grebe	u		u	
___Western Grebe	r		r	
___Pied-billed Grebe•	a	u	c	r
___White Pelican	a	u	a	
___Double-crested Cormorant	c	r	c	
___Great Blue Heron	c	c	c	r
___Green Heron•	u	c	o	
___Little Blue Heron	o	u	o	
___Cattle Egret	o	o	o	
___Great Egret *(Common)*	c	c	r	
___Snowy Egret	r	u		
___Black-crowned Night Heron•	o	c	o	
___Yellow-crowned Night Heron•	o	o	o	
___Least Bittern•	o	o	r	
___American Bittern•	o	u	u	r
___White-faced Ibis	o	r	r	
___Whistling Swan	r		r	r
___Canada Goose•	a	u	a	c
___White-fronted Goose	u		c	r
___Snow Goose *(Snow & Blue)*	a	r	a	o
___Ross' Goose	u		u	r
___Mallard•	c	c	c	a
___Black Duck•	c	o	c	u
___Gadwall	c	r	c	r
___Pintail•	c	r	c	o
___Green-winged Teal	c	r	c	u
___Blue-winged Teal•	c	o	c	r
___Cinnamon Teal	c		r	
___American Wigeon *(Am. Widgeon)*	c	r	c	o
___Northern Shoveler *(Shoveler)*	c	r	c	r
___Wood Duck•	o	c	c	r
___Redhead	o	r	c	r
___Ring-necked Duck	o		c	r
___Canvasback	u		u	r
___Greater Scaup			r	
___Lesser Scaup	c	r	c	

LOONS—GREBES—PELICANS—CORMORANTS—HERONS AND BITTERNS—IBISES—SWANS, GEESE, AND DUCKS

DUCKS—VULTURES—HAWKS AND EAGLES—OSPREYS—FALCONS QUAIL AND PHEASANTS—CRANES—RAILS AND COOTS—PLOVERS

SNIPES AND SANDPIPERS—AVOCETS—PHALAROPES—GULLS AND TERNS—DOVES—CUCKOOS—OWLS—GOATSUCKERS—SWIFTS—HUMMINGBIRDS—KINGFISHERS

WOODPECKERS—FLYCATCHERS—HORNED LARKS—SWALLOWS—JAYS AND CROWS—TITMICE AND CHICKADEES—NUTHATCHES—CREEPERS—WRENS—MOCKINGBIRDS AND THRASHERS—THRUSHES—GNATCATCHERS AND KINGLETS

PIPITS—WAXWINGS—SHRIKES—STARLINGS—VIREOS—WARBLERS—WEAVER FINCHES—BLACKBIRDS—TANAGERS

GROSBEAKS, BUNTINGS, AND SPARROWS—ACCIDENTALS

	S	S	F	W
___Common Goldeneye	o		o	u
___Bufflehead	u		u	
___White-winged Scoter			r	
___Ruddy Duck	u	u	u	
___Hooded Merganser	u	u	u	r
___Common Merganser	c		o	c
___Red-breasted Merganser	o		o	r
___Turkey Vulture	u	c	u	
___Goshawk				r
___Sharp-shinned Hawk•	u	u	u	u
___Cooper's Hawk•	o	o	o	o
___Red-tailed Hawk• *(Harlan's)*	c	o	c	c
___Red-shouldered Hawk•	o	o	o	o
___Broad-winged Hawk	o	o	o	
___Swainson's Hawk	o		o	
___Rough-legged Hawk				c
___Golden Eagle			r	o
___Bald Eagle (E)	u		c	c
___Marsh Hawk•	c	o	c	c
___Osprey	o		o	

Red-bellied Woodpecker

___Prairie Falcon			r	
___Peregrine Falcon (E)	r		r	
___Merlin *(Pigeon Hawk)*	r		r	r
___American Kestrel *(Sparrow Hawk)*	c	o	o	
___Bobwhite•	u	u	c	c
___Ring-necked Pheasant•	c	c	c	c
___Sandhill Crane	r	r	r	
___King Rail•	u	u	u	
___Virginia Rail•	u	o	u	
___Sora	c	u	c	
___Yellow Rail	r		r	
___Common Gallinule	o	o		
___American Coot•	a	o	a	
___Semipalmated Plover	u	u	o	
___Piping Plover	o	o	r	
___Killdeer•	c	c	c	o
___American Golden Plover	u		o	
___Black-bellied Plover	c	r	u	
___Ruddy Turnstone	u	o	r	

DUCKS—VULTURES—HAWKS AND EAGLES—OSPREYS—FALCONS
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GROSBEAKS, BUNTINGS, AND SPARROWS—ACCIDENTALS

	S	S	F	W
___American Woodcock	r		o	
___Common Snipe	u	o	u	r
___Long-billed Curlew	r	r		
___Whimbrel	r			
___Upland Sandpiper• *(Plover)*	r	r	r	
___Spotted Sandpiper•	c	c	c	
___Solitary Sandpiper	o	o	o	
___Willet	u	r	o	
___Greater Yellowlegs	u	u	u	
___Lesser Yellowlegs	c	c	c	
___Red Knot *(Knot)*	r		r	
___Pectoral Sandpiper	c	u	c	
___White-rumped Sandpiper	c	u	u	
___Baird's Sandpiper	u	o	o	
___Least Sandpiper	c	c	c	
___Dunlin	u	r	r	
___Short-billed Dowitcher	u	u		
___Long-billed Dowitcher	c	o	c	
___Stilt Sandpiper	u	u		
___Semipalmated Sandpiper	c	c	c	
___Western Sandpiper	o	o	r	
___Buff-breasted Sandpiper	r	o		
___Marbled Godwit	o		r	
___Hudsonian Godwit	a	r		
___Sanderling	r	o	r	
___American Avocet	o	o	o	
___Wilson's Phalarope	u	c	c	
___Northern Phalarope	u	c	c	
___Herring Gull	u	r	u	r
___Ring-billed Gull	c	o	c	o
___Franklin's Gull	c	o	c	
___Bonaparte's Gull	o	r	r	
___Forster's Tern	c	o	c	
___Common Tern	o		u	
___Least Tern	u	u		
___Caspian Tern	o	r	o	
___Black Tern•	c	c	o	
___Rock Dove•	o	o	o	o
___Mourning Dove•	c	c	c	o
___Yellow-billed Cuckoo•		c	u	
___Black-billed Cuckoo•	u	u	u	
___Barn Owl•	r	r	r	r
___Screech Owl•	u	u	u	u
___Great Horned Owl•	c	c	c	c
___Barred Owl•	c	c	c	c
___Long-eared Owl	o		r	r
___Short-eared Owl	o	r	o	c
___Saw-whet Owl		r		o
___Chuck-will's Widow	o	o		
___Whip-poor-will•	u	u	r	
___Common Nighthawk	o	o	o	
___Chimney Swift•	o	o		
___Ruby-throated Hummingbird•	o	u		
___Belted Kingfisher•	■	u	u	r

SNIPES AND SANDPIPERS—AVOCETS—PHALAROPES—
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GROSBEAKS, BUNTINGS, AND SPARROWS—ACCIDENTALS

	S	S	F	W
___Common Flicker● *(Yellow-shafted)*	c	c	c	u
___ *(Red-shafted)*	r		o	r
___Red-bellied Woodpecker●	c	c	c	c
___Red-headed Woodpecker●	u	u	u	u
___Yellow-bellied Sapsucker	o		o	u
___Hairy Woodpecker●	u	u	u	u
___Downy Woodpecker●	c	c	c	c
___Eastern Kingbird●	c	c	u	
___Western Kingbird	r		r	
___Great Crested Flycatcher●	u	u	u	
___Eastern Phoebe●	r	u	u	
___Yellow-bellied Flycatcher	r		r	
___Acadian Flycatcher●	r	u	u	
___Willow Flycatcher● *(Traill's)*	o	o		
___Least Flycatcher	u	u		
___Eastern Wood Pewee●	r	u	o	
___Olive-sided Flycatcher	r	r	u	
___Horned Lark●	u	u	u	c
___Tree Swallow●	c	u	c	
___Bank Swallow●	c	c	a	
___Rough-winged Swallow	u	u	u	
___Barn Swallow●	c	c	a	
___Cliff Swallow	c	a	a	
___Purple Martin●	■	c	c	

___Blue Jay●		c	c	c
___Common Crow●	■	■	■	■
___Black-capped Chickadee●	■	c	c	c
___Tufted Titmouse●	■	c	c	c
___White-breasted Nuthatch●	■	u	u	u
___Red-breasted Nuthatch	r		r	o
___Brown Creeper	u		u	u
___House Wren●	c	c	u	
___Winter Wren	r		r	o
___Bewick's Wren	r	r	r	
___Carolina Wren●	o	o	o	o
___Long-billed Marsh Wren●	u	u	u	
___Short-billed Marsh Wren●	u	u	u	
___Mockingbird●	o	o	■	r
___Gray Catbird● *(Catbird)*	c	■	□	
___Brown Thrasher●	c	c	u	
___American Robin● *(Robin)*	c	c	c	o
___Wood Thrush●	u	u		
___Hermit Thrush	o	o	o	
___Swainson's Thrush	u		u	
___Gray-cheeked Thrush	o		o	
___Eastern Bluebird●	u	u	u	r
___Blue-gray Gnatcatcher●	■	■		
___Golden-crowned Kinglet	■		■	c
___Ruby-crowned Kinglet	c		■	o

WOODPECKERS—FLYCATCHERS—HORNED LARKS—SWALLOWS—
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GROSBEAKS, BUNTINGS, AND SPARROWS—ACCIDENTALS

	S	S	F	W
___Water Pipit	r		r	
___Bohemian Waxwing				o
___Cedar Waxwing●	c	u	c	o
___Northern Shrike				r
___Loggerhead Shrike	u	u	u	u
___Starling●	c	c	c	a
___White-eyed Vireo	o	r	r	
___Bell's Vireo●	c	c	u	
___Yellow-throated Vireo	o	r	o	
___Solitary Vireo	o		o	
___Red-eyed Vireo●	c	c	u	
___Philadelphia Vireo	r		u	
___Warbling Vireo●	c	c	u	
___Black-and-white Warbler	u		u	
___Prothonotary Warbler●	r	r	r	
___Tennessee Warbler	u			
___Orange-crowned Warbler	u			
___Nashville Warbler	u			
___Northern Parula *(Parula Warbler)*	u			
___Yellow Warbler●	c	c		
___Magnolia Warbler	u			
___Yellow-rumped Warbler *(Myrtle & Audubons)*	c			
___Black-throated Green Warbler	u			
___Blackburnian Warbler	u			
___Chestnut-sided Warbler	u		u	
___Blackpoll Warbler	u		u	
___Palm Warbler	u		u	
___Ovenbird●	u	u	u	
___Northern Waterthrush	u		u	
___Louisiana Waterthrush	o		o	
___Kentucky Warbler●	o	u		
___Mourning Warbler	o		o	
___Common Yellowthroat● *(Yellowthroat)*	c	c	u	r
___Yellow-breasted Chat●	c	c		
___Wilson's Warbler	u		u	
___Canada Warbler	o		o	
___American Redstart●	c	u	u	
___House Sparrow●	a	a	a	a
___Bobolink●	r	u	u	
___Eastern Meadowlark●	c	u	c	o
___Western Meadowlark	o	o	o	o
___Yellow-headed Blackbird●	u	u	u	r
___Red-winged Blackbird●	c	c	a	a
___Orchard Oriole●	c	c	o	
___Northern Oriole● *(Baltimore & Bullock's)*	c	c	r	
___Rusty Blackbird	c		c	o
___Brewer's Blackbird	r	o	u	
___Common Grackle●	a	c	a	c
___Brown-headed Cowbird●	a	c	a	o
___Scarlet Tanager●	o	o	r	
___Summer Tanager●	r	u		

PIPITS—WAXWINGS—SHRIKES—STARLINGS—VIREOS—
WARBLERS—WEAVER FINCHES—BLACKBIRDS—TANAGERS

GROSBEAKS, BUNTINGS, AND SPARROWS—ACCIDENTALS

	S	S	F	W
___Cardinal•	c	c	c	c
___Rose-breasted Grosbeak•	u	u	o	
___Blue Grosbeak•	o	o		
___Indigo Bunting•	c	c	o	
___Painted Bunting	r	r		
___Dickcissel•	c	c		
___Purple Finch				r
___Pine Siskin				o
___American Goldfinch•	c	c	c	u
___Red Crossbill				r
___White-winged Crossbill				r
___Rufous-sided Towhee•	c	c	c	o
___Savannah Sparrow	u	u	u	
___Grasshopper Sparrow	o	u	o	
___Sharp-tailed Sparrow	r		r	
___Le Conte's Sparrow	o		o	
___Henslow's Sparrow	u	u	u	
___Vesper Sparrow•	c	o	c	
___Lark Sparrow•	u	u	o	
___Dark-eyed Junco *(Slate-colored Oregon & White-winged)*	c		c	c
___Tree Sparrow	c		c	c
___Chipping Sparrow•	u	u	o	
___Clay-colored Sparrow	o		o	
___Field Sparrow•	c	o	c	
___Harris' Sparrow	o		u	u
___White-crowned Sparrow	c		c	o
___White-throated Sparrow	c		c	o
___Fox Sparrow	u		o	u
___Lincoln's Sparrow	o		o	
___Swamp Sparrow•	u	o	u	u
___Song Sparrow•	c	c	c	u
___Lapland Longspur				o

These 29 additional species are considered accidentals; they have been observed on the refuge only once or twice.

Louisiana Heron
Glossy Ibis
White Ibis
American Flamingo
Brant
Black-bellied Tree Duck
Fulvous Tree Duck
European Wigeon
Surf Scoter
Mississippi Kite
Whooping Crane (E)
Snowy Plover
Ruff
Black-necked Stilt
Red Phalarope
Parasitic Jaeger
Sabine's Gull
Ground Dove
Snowy Owl
Black-backed Three-toed Woodpecker
Scissor-tailed Flycatcher
Black-billed Magpie
Veery
Mountain Bluebird
Townsend's Solitaire
Bronzed Cowbird
Evening Grosbeak
Common Redpoll
Lark Bunting

Bobwhite Quail

For additional information contact: Refuge Manager, Squaw Creek National Wildlife Refuge, Box 101, Mound City, Missouri 64470.

Squaw Creek National Wildlife Refuge is one of a system of refuges administered by the U.S. Fish and Wildlife Service and dedicated to the preservation of wildlife. The financial base for this system was firmly established in 1934 through the passage of the Migratory Bird Hunting Stamp Act. This Act requires waterfowl hunters to purchase annually a migratory bird or "duck stamp." Funds collected from duck stamp sales have been used to purchase numerous refuges that provide habitats necessary to sustain a variety of wildlife for both hunters and nonhunters to enjoy.

NOTES

Date_____ Time _____

Weather _____

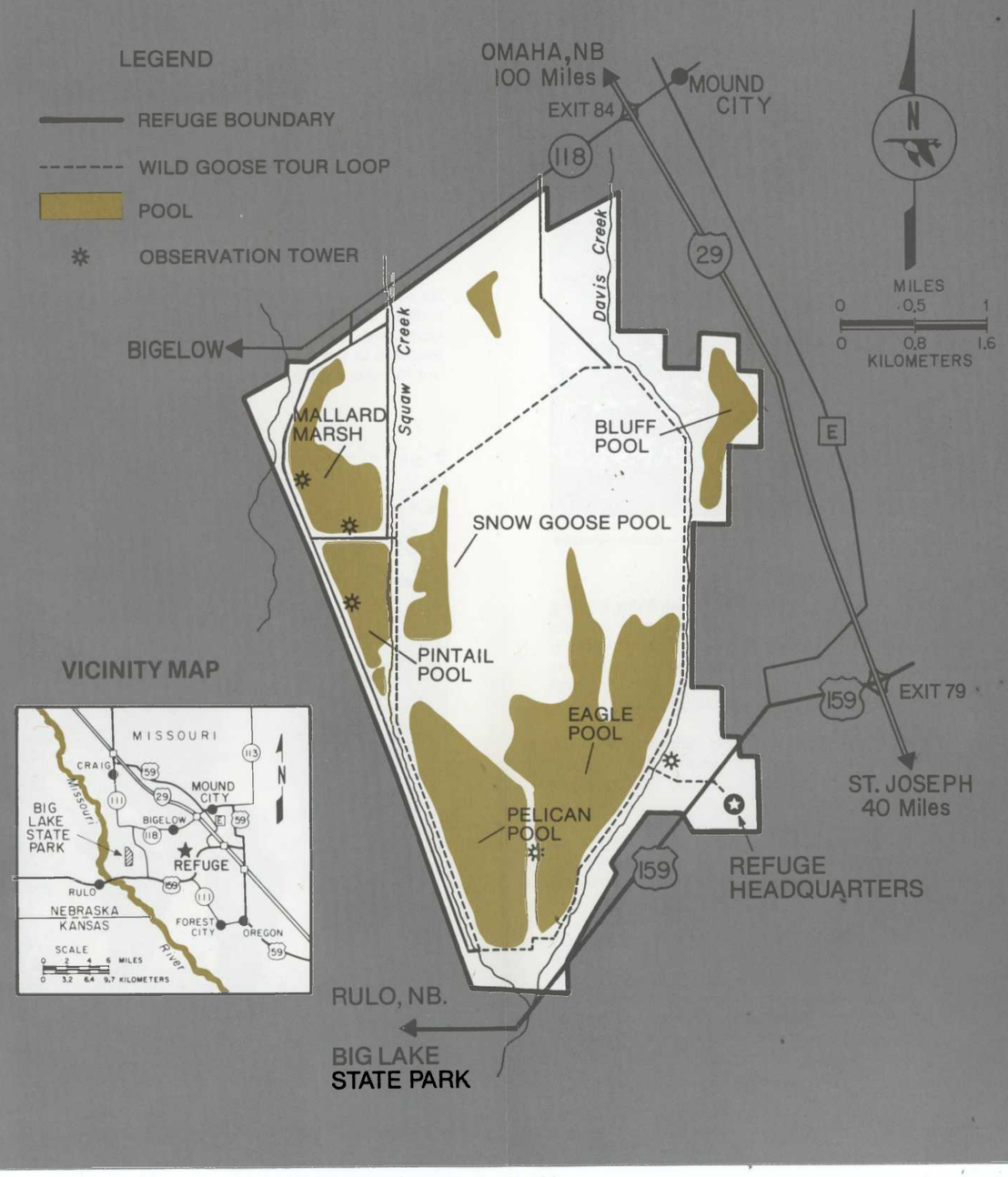
FISH AND WILDLIFE SERVICE
U.S. DEPARTMENT OF THE INTERIOR

RF–663560–2

★ GPO 1979-680-976

Squaw Creek National Wildlife Refuge

Mound City, Missouri



For further information, contact the Refuge Manager, Squaw Creek National Wildlife Refuge, P.O. Box 101, Mound City, Missouri 64470.

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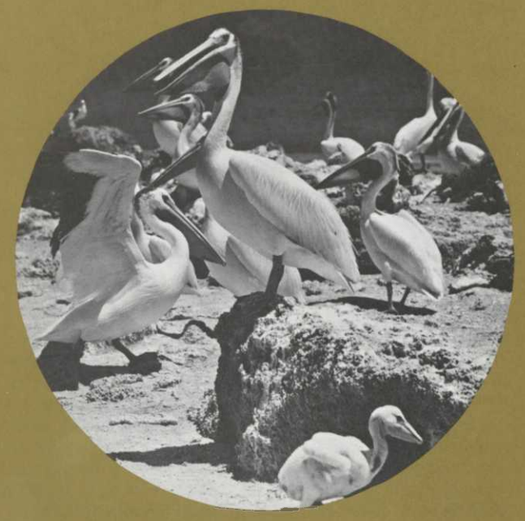


Adult and young white pelicans in nesting colony. U.S. Fish and Wildlife Service photo by David B. Marshall.

U.S. FISH AND WILDLIFE SERVICE
Department of the Interior

RF6-63560-1

July, 1979

☆ U. S. GOVERNMENT PRINTING OFFICE: 1979 — 680-579

SQUAW CREEK

NATIONAL WILDLIFE REFUGE
MOUND CITY, MISSOURI

WINGBEATS FROM THE NORTH

For thousands of years, time in the Missouri River Basin has been measured by the twice annual migration of waterfowl. Each spring and fall, northwestern Missouri was inundated by a noisy confusion of ducks and geese. From northern Canada and the prairie pothole country, they flocked into the marshes and backwaters of the wild Missouri.

However, far-reaching changes have transformed the valley in the past 150 years. Prairie cordgrass marshes and the natural, sandbar-studded Missouri River channel have largely disappeared as a result of marshland drainage and the deepening and straightening of the channel. To partially meet the needs of wildlife in a changed, less hospitable environment, Squaw Creek Refuge was established in 1935. Here, amidst 6,900 acres (2,792 hectares) of manmade marshes, waterfowl and other wildlife can still find critically needed food, water and shelter.

THE BLUFFS

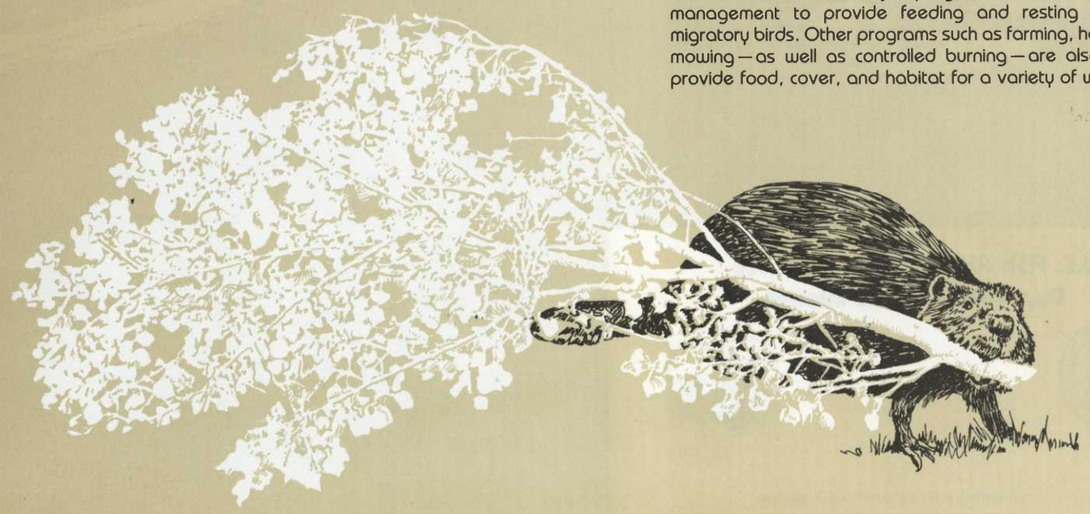
Overlooking the refuge from the east are the loess bluffs, a rare geologic formation of wind-deposited soil from the past glacial period. On top of the bluffs are some of the last remnants of the once vast native prairie that dominated the area prior to the influx of immigrants during the past three centuries. Against the backdrop of the bluffs, hundreds of thousands of migratory birds provide a stirring spectacle, just as they did for Lewis and Clark and the Indians before them.

"These first cold nights set the birds a-wing on long, strong flights. . . " — Olaus Murie

"Snow Geese Take Wing" Photo by Mary Tremaine — Omaha, Nebraska

REFUGE MANAGEMENT

The primary objective of the refuge is to preserve and perpetuate migratory birds and other species of wildlife. The refuge uses a variety of management practices to meet the needs of wildlife. A major program is marsh and water management to provide feeding and resting areas for migratory birds. Other programs such as farming, haying, and mowing — as well as controlled burning — are also used to provide food, cover, and habitat for a variety of wildlife.



FUR AND FEATHERS

Migratory birds rest and feed at Squaw Creek Refuge during their long spring and fall migrations. In September, pelicans are among the first heralds of fall. Great blue herons wade in shallow ponds, fishing for their dinner. Sandpipers running along the water's edge leave fragile patterns in the mud and are startled into flight by a swiftly passing shadow.

Other early migrants, pintail, gadwalls, and teal are soon joined by mallards, snow geese, and Canada geese. At peak migration times, 200,000 geese and as many, or more, ducks feed and rest in the marshes.

In the late fall and early winter, bald eagles ride the air currents, soaring in great arcs over the marsh below. As many as 300 of these birds, the American national symbol, winter on Squaw Creek Refuge.

The refuge is rich in its variety of wildlife. It is home for 33 kinds of mammals, 35 species of reptiles and amphibians, and 289 species of birds. Beaver and muskrat find food and cover in the marsh. Coyotes hunt the uplands and whitetail deer seek shelter in willow thickets and groves of cottonwood trees. Fields of native cordgrass prairie hide mice and voles — the prey of many species of hawks and owls.

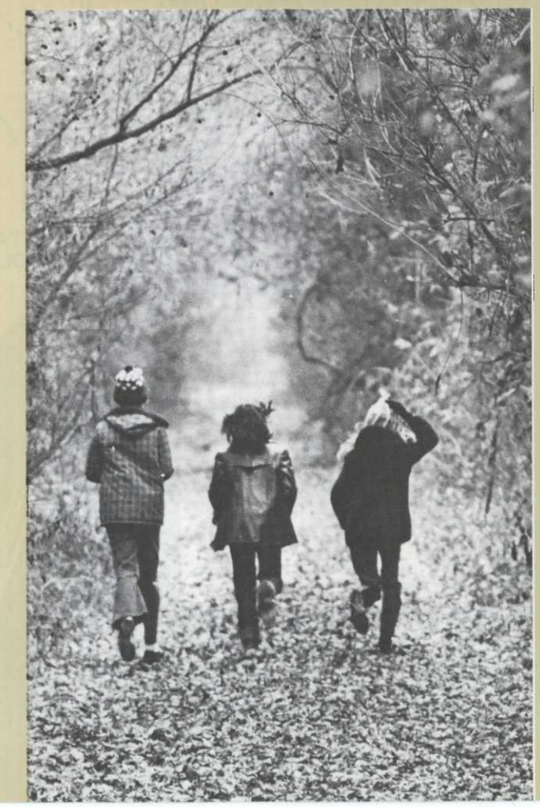
INVITATION TO SQUAW CREEK

Squaw Creek Refuge furnishes the public with an excellent opportunity to enjoy wildlife in its natural setting. Refuge roads and foot trails provide access to many wildlife observation areas. Viewing towers and wayside exhibits, located at key points, are excellent vantage points for viewing and photographing wildlife. From a high point on the Loess Bluff Trail, hikers can view the Missouri River floodplain and much of the refuge. Parts of Kansas and Nebraska can also be seen on a clear day.

Squaw Creek Refuge is open daily from sunrise to sunset, although some roads may be closed during wet weather. In addition to the spectacular viewing of waterfowl, eagles and deer, seasonal activities such as fishing and photography can be enjoyed by refuge visitors.

No camping is permitted on the refuge; however, camping facilities are available at Big Lake State Park, 8 miles (13 kilometers) west of the refuge. Restroom facilities are available at the Refuge Headquarters complex. Office hours are Monday through Friday from 8 a.m. to 4:30 p.m.

Photo by Don Bradley — St. Joseph, Missouri



Prairie Vole *(Microtus ochrogaster).* An abundant short-tailed mouse found in grass on the loess bluffs as well as in marsh areas. An important prey species of nearly all predators.

Muskrat (*Ondatra zibethicus).* The largest "mouse" and the most important furbearer of the refuge. Its burrows and holes often cause severe damage to dikes and levees. Muskrats build lodges in the water each fall and spend the winter in them.

Norway Rat *(Rattus norvegicus).* Like the house mouse, the Norway rat was introduced to North America from Asia via Europe. Its preference for the habitat of man causes extensive damage to buildings and grain.

House Mouse *(Mus musculus).* Another alien invader, the house mouse is common in the area, and most people are very familiar with this pest. Those living in the field are often brighter colored than those in buildings and develop deep brown and red-brown pelages.

Meadow Jumping Mouse *(Zapus hudsonius).* Only one record for the refuge exists, indicating that it is one of the rarest mammals of the refuge. Its long tail, large hind feet, and ability to hop cause it to be confused with kangaroo mice and kangaroo rats which are not found in Missouri. It hibernates.

Coyote *Canis latrans).* Now the most common of the "wild dogs" of the refuge. It is often seen in early morning on refuge roads. It is an omnivorous opportunist eating anything that is available. This makes the coyote a very successful predator.

Red Fox *(Vulpes fulva).* A grassland species that preys heavily on mice. Its numbers are inversely related to those of the coyote. When coyotes are numerous, red fox are uncommon, and *vice versa.*

Gray Fox *(Urocyon cinereoargenteus).* A rare denizen of woodlands seldom seen on the refuge. Like the red fox, it is omnivorous.

Raccoon *(Procyon lotor).* Abundant throughout the refuge. Omnivorous, it can be a serious predator of nesting birds.

Longtail Weasel *(Mustela frenata).* Formerly common; now rarely seen. No apparent reason for the decline.

Mink *(Mustela vison).* A large member of the weasel family, it is the most important predator of the muskrat and is relatively common.

Badger *(Texidea taxus).* The largest weasel of the area. These are prairie mammals that live on mice and ground squirrels, but are rare on the refuge.

Spotted Skunk *(Spilogale putorius).* Formerly common; now rarely observed.

Striped Skunk *(Mephitis mephitis).* Common in the more brushy areas. Skunks are slow and methodical and usually take much provocation before spraying.

Mountain Lion *(Felis concolor).* Several reliable persons have reported sightings of this animal. These recent sightings indicate the mountain lion may be returning to Missouri.

Bobcat *(Lynx rufus).* A wary cat infrequently seen. Tracks have been observed on the refuge boundary and there is one reported sighting.

Mule Deer *(Odocoileus hemionus).* A straggler from the west. A buck was shot in the immediate vicinity of the refuge several years ago.

Whitetail Deer *(Odocoileus virginianus).* Most deer had disappeared from northwestern Missouri by 1910. The first deer reappeared on the refuge in 1946, and deer now number between 100 and 300.

The following 13 mammals are documented as occurring in nearby counties:

Masked Shrew *(Sorex cinereus)*
Silver-haired Bat *(Lasionycteris noctivagans)*
Eastern Pipistrel *(Pipistrellus subflavus)*
Big Brown Bat *(Eptesicus fuscus)*
Hoary Bat *(Lasiurus cinereus)*
Evening Bat *(Nycticeius humeralis)*
Whitetail Jackrabbit *(Lepus townsendii)*
Thirteen-lined Ground Squirrel *(Citellus tridecemlineatus)*
Southern Flying Squirrel *(Glaucomys volans)*
Plains Pocket Mouse *(Perognathus flavescens)*
Plains Harvest Mouse *(Reithrodontomys montanus)*
Meadow Vole *(Microtus pennsylvanicus)*
Pine Vole *(Pitymys pinetorum)*

For further information, contact the:
Refuge Manager
Squaw Creek National Wildlife Refuge
Box 101
Mound City, Missouri

U.S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

RF6-63560-3

August 1979
GPO 852 - 167

Mammals of

SQUAW CREEK

NATIONAL WILDLIFE REFUGE

SQUAW CREEK NATIONAL WILDLIFE REFUGE lies in northwestern Missouri near Mound City in Holt County, near the center of that broad intermediate zone where plants and animals of the grasslands meet those of the eastern deciduous forest. The refuge, established in 1935 and now containing 6,849 acres of open water, marsh, cropland, and loess-bluff woodland and dry prairie, is one link in a chain of refuges extending from the Gulf of Mexico to Canada. A principal function of the refuge is to furnish sanctuary and habitat for migrating waterfowl. In so doing, it provides a refuge also for other types of wildlife—and plants from prairie wild flowers to native mammals.

Mammals are much more difficult to see than birds because of their nocturnal habits and the dense habitats they choose. However, an interested person may see gray and fox squirrels in the woodlands along the loess bluffs, while in the evening and at night he may observe whitetail deer, raccoons, opossums, and coyotes along the roads, and bats hawking for insects or drinking from ponds and streams.

One of the best ways to detect the presence of mammals is to look for their tracks in snow, dust, or mud. The drama of their lives may be read in these—how they raise their young, catch their food, and in turn may be caught for food. Signs of beaver and muskrat are easily found along creeks and drains. Field mice leave narrow winding runs under thick vegetation. Pocket gophers push up large mounds of obvious dirt along rights-of-way and in cultivated fields. Smaller mounds and linear ridges indicate the presence of moles.

Although quiet and usually inconspicuous, mammals are important in the ecology of the refuge. Herbivores such as mice and rabbits convert plant food energy into animal protein which then becomes available to predators—coyotes, mink, hawks, and owls. Larger mammals including foxes, coyotes, raccoons, and opossums often play the role of scavenger as well as that of predator.

The following 34 mammals have been observed on the refuge since 1935 by refuge personnel and by mammalogists from educational institutions. Common and scientific names provided here follow the respective arrangements of Burt and Grossenheider, *A Field Guilde to the Mammals,* Houghton Mifflin Co., 1962; and Miller and Lellogg, *List of North American Recent Mammals,* U.S. National Museum Bulletin No. 205, Information concerning specific ranges and life histories may be found in Schwartz and Schwartz, *The Wild Mammals of Missouri,* University of Missouri Press, 1959. Information on related mammal distribution can be obtained from *Handbook of Mammals of Kansas* by E.R. Hall, University of Kansas Museum of Natural History Misc. Publ. No. 7 (1955), and *Distribution and Taxonomy of Mammals of Nebraska* by J.K. Jones, UKMNH Publ., Vol. 16, No. 1 (1964).

Virginia Opossum *(Didelphis marsupialis).* A common mammal of the refuge and the only one in which the mother carries the young in an abdominal pouch. Its omnivorous diet includes everything from fruit to carrion.

Shorttail Shrew *(Blarina brevicauda).* This mouse-sized animal is relatively common in dense vegetation where it uses some of the same trails and runs as mice. It feeds on any animal it can subdue, including insects and mice.

Least Shrew *(Cryptotis parva).* A tiny mammal whose weight approximates that of a penny. It is found infrequently in old fields and grassy areas, and often around or under rocks, boards, and piles of grass. Its diet is similar to the shorttail shrew.

Eastern Mole *(Scalopus aquaticus).* An abundant insectivore that spends most of its life underground burrowing for insects, worms, etc. Molehills may be confused with gopher mounds, but the latter are larger and are carefully and tightly plugged with dirt.

Little Brown Myotis *(Myotis lucifugus).* This bat has not been found on the refuge, but one was caught in nearby Mound City. Little brown myotise bats develop nursery colonies in buildings during the summer, but spend the winter in mines and caves.

Red Bat *(Lasiurus borealis).* One of the more handsome North American bats. It is swift-flying, often seen late in the evening hawking near a woodlot or group of trees. Females give birth to three or four young in a tree and are often preyed upon by blue jays and small hawks.

Eastern Cottontail *(Sylvilagus floridanus).* Found throughout the refuge, this prolific animal is an important prey of the larger predators like coyote, great horned owl and hawks.

Woodchuck *(Marmota monax).* An important mammal because of its dens which serve as shelters for other mammals. This species has declined drastically in number and none have been sighted in recent years.

Franklin Ground Squirrel *(Citellus franklinii).* This ground squirrel is found in Missouri only in prairie regions north of the Missouri River. It is occasionally seen sitting in the short vegetation along refuge roads. It hibernates from early autumn to mid-spring.

Eastern Gray Squirrel *(Sciurus carolinensis).* This animal is smaller and less obvious than the fox squirrel because of its swift movements and its preference for dense woods. It is common in the oak-hickory woods along the loess bluffs.

Eastern Fox Squirrel *(Sciurus niger).* A larger squirrel, often found in fence rows and isolated clusters of trees. It is frequently killed on the highway because it spends so much time on the ground. Leaf nests constructed in late spring and early summer become easily visible in the fall and winter. The black phase is occasionally observed on the refuge.

Plains Pocket Gopher *(Geomys bursarius).* Colonies of this burrowing mammal are found in the refuge's loess soils, and often in fields of deep-rooted legumes.

Beaver *(Castor canadensis).* The first were seen on the refuge in 1941. They have since become a common animal of the waterways. Beaver cuttings, including those of cottonwoods and willows, may be seen in many parts of the refuge. Lodges are seldom constructed; homes are dug into ditch banks instead.

Western Harvest Mouse *(Reithrodontomys megalotis).* A small seed-eating mouse that, judging from the number of skeletons found in pellets cast by the small saw-whet owls, may be more common than trapping records indicate.

Deer Mouse (Peromyscus maniculatus). An abundant mouse of grasslands throughout the refuge. Although a seed eater, it takes quantities of insects. It is food for many predators.

White-footed Mouse *(Peromyscus leucopus).* A common mouse quite similar to the preceding form, but restricted to woodlots and old fields being invaded by trees.

Southern Bog Lemming *(Synaptomys cooperi).* The only lemming of Missouri. It looks like the prairie vole and occupies a more moist habitat. Few have been caught in traps, but the occurrence of their bones in pellets of long-eared owls indicates that they may be common.

Calendar of Events

Squaw Creek
National Wildlife Refuge
P.O. Box 101
Mound City, Missouri

Wildlife measures a year not in days, weeks and months, but in the greening of the trees, the arrival of the geese, the birth of young, and a million other natural events. Some of the significant natural events occurring on the refuge are listed below.

January 1—February 1: Most prominent species—pheasants, hawks, coyotes and a large wintering deer herd. Dress warmly, and be prepared to walk as the roads may be closed by snow drifts.

February 1—April 1: Northward migration of waterfowl; best time of year to observe greatest variety of waterfowl in bright plumage. Some years the birds bypass the refuge and there are no large concentrations of waterfowl. Beaver cuttings seen along refuge creeks.

Mid-March—May 1: Spring, red bud time—a wonderful time for a hike in the loess hills to observe wild flowers, passerine birds.

April 1—December 31: Refuge open to public fishing. No special permit required, just state license. State laws govern methods and limits.

May 1—May 20: Warbler migration.

Late July—Early August: American lotus (water lily) in bloom on refuge impoundments. Deer with fawns may be seen along the tour routes.

Mid-August—Mid-September—Shorebirds on mudflats around refuge impoundments.

October 1—December 1: Fall waterfowl migration in full swing, concentrations of up to 200,000 snow geese and 250,000 ducks common.

Mid-November—January 1: One of the largest concentrations of bald eagles in United States may be seen here. More than 300 birds peak population.

Restrooms and picnic tables available at headquarters, five miles south of Mound City, Highway 159 exit off I-29.

Ten miles of auto touring roads provide ready access to refuge (or bring your bicycle).

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