

SHERBURNE NATIONAL WILDLIFE REFUGE

ZIMMERMAN, MINNESOTA

ANNUAL NARRATIVE REPORT

Calender Year 1988

U. S. Department of the Interior

Fish and Wildlife Service

NATIONAL WILDLIFE REFUGE SYSTEM

REVIEW AND APPROVALS

SHERBURNE NATIONAL WILDLIFE REFUGE

Zimmerman, Minnesota

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Calendar Year 1988

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Refuge Manager

3/9/89
Date

Ed Crozier
Wildlife Associate Manager Review

3/10/89
Date

John R. Eadie
Regional Office Approval

3/13/89
Date

INTRODUCTION

Sherburne Refuge has a flat to gently rolling topography lying within a transitional zone of two major ecosystems - deciduous hardwood forest and tall grass prairie. There are approximately 12,000 acres of wetlands, 500 acres of rivers and streams, 10,600 acres of open grasslands and oak savannas, 7,000 acres of woodlands and 500 acres of buildings and roads.

The area of the St. Francis River Valley, the basis for the formation of the Sherburne National Wildlife Refuge, was originally settled in the 1870's under the Homestead Act. The St. Francis River basin was known as one of the finest wildlife areas in the state.

By the early 1940's, several developments had severely reduced the value of wildlife habitat in the basin. A ditch system built in the 1920's promoted rapid drainage to increase agricultural acreage, resulting in greater seasonal water fluctuations and fewer wetlands. Carp invaded the lakes and streams in the basin. Logging and farming had steadily depleted the upland habitats. Protection from fire subjected the oak savannas, comprised of large expanses of native prairie with scattered bur oaks, to encroachment by woody vegetation.

In the early 1940's local conservationists and sportsmen became interested in the possibility of restoring the former wildlife values of the St. Francis River basin. The Minnesota Conservation Department conducted studies with the intention of managing the area as a state wildlife area. By the early 1960's, it had become apparent that the magnitude of the project was beyond the capabilities of the Department, as over 300 individual land holdings comprising over 30,000 acres would need to be purchased. Therefore, the State of Minnesota formally requested that the Bureau of Sport Fisheries and Wildlife consider the area for a national wildlife refuge. The Bureau took on the task and Sherburne Refuge was established on May 18, 1965.

Sherburne has two primary functions: wildlife management and public use. To accomplish these functions, the refuge has identified four major objectives:

- To enhance waterfowl production and maintenance.
- To restore and maintain native vegetation and wildlife.
- To provide and enhance habitat for wildlife diversity.
- To provide the public with wildlife oriented opportunities in interpretation, recreation, and outdoor classrooms when compatible with the resource and other refuge objectives.

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A. HIGHLIGHTS

- Drought conditions continued, leaving most refuge pools (including the St. Francis pool) dry or nearly dry by freeze up (page 2).
- Farm Bill work resulted in recommendations for transfer of fee title to the Service or to states of 1970 acres and for the placement of perpetual easements on 480 acres of wetland and adjacent upland (page 4).
- Refuge manager Ron Papike died on February 7, 1988 (page 11).
- Refuge manager Tom Larson, maintenance mechanic Allan Rife and manager trainee Carla Hanson entered on duty (page 11).
- Bark beetles invaded refuge pine plantations, stressed by the drought (page 20).
- Drought conditions severely restricted prescribed burning and facilitated approximately 890 acres of wildfires (page 20).
- Production of ducks was the lowest since 1982 when the impoundment system was first flooded (page 24).
- Duck, goose and trumpeter swan use days were at record highs (page 25).
- The wood duck banding quota was met (page 32).
- A recommendation was made to terminate the entrance fee program which was not proving cost effective (page 33).
- The last government quarters on the refuge was removed and three wells were abandoned (page 40).
- A ditch at structure 2A was cleaned out, one mile of auto tour route was graveled and a new car washing concrete pad was poured at the shop (page 42).
- Deer antlerless permits were reduced from 500 to 200 and the number of deer taken on the refuge and registered decreased by 22.4% compared to 1987 (page 37).
- The refuge computer system was upgraded with the addition of three IBM computers (page 42).

B. CLIMATIC CONDITIONS

Drought conditions persisted for the second consecutive year. Rainfall of 20.38 inches was 7.34 inches below normal, or 15.52 inches below normal for the past two years (Table 1). During the first seven months of the year, precipitation was nearly nine inches below normal resulting in a very meager growth of terrestrial vegetation. Water levels in virtually all of the wetlands dropped significantly throughout the summer. By September, approximately 4500 acres of the 6137 acre impoundment system (73%) were devoid of water. Snowfall for the year was normal.

Temperatures during the months of May, June, July and August were 5.4 degrees above normal resulting in an uncomfortable summer. Temperatures for the year averaged 1.7 degrees above normal.

Table 1. Monthly precipitation and temperatures.*

Month	<u>Precipitation (in.)</u>			<u>Temperatures (°F)</u>				
	Total	Normal	Snowfall	Normal Snowfall	Max	Min	Normal Avg.	
<u>Deviation</u>								
January	0.51	0.83	7.6	9.0	42	-29	7.1	-0.3
February	0.17	0.79	2.9	7.3	46	-27	13.7	-3.5
March	1.39	1.43	6.3	10.2	54	8	25.6	5.2
April	0.73	2.26	0.2	2.5	80	16	43.0	1.5
May	2.22	3.25	-	0.1	92	31	55.8	7.8
June	0.05	4.51	-	-	102	35	65.0	6.1
July	2.64	3.35	-	-	102	45	69.8	4.8
August	5.45	4.30	-	-	99	40	67.3	3.0
September	3.19	2.78	-	T	88	33	57.4	1.4
October	0.68	2.06	0.1	0.5	77	11	46.8	-6.0
November	2.75	1.29	18.2	6.7	56	- 1	29.8	-0.7
December	<u>0.60</u>	<u>0.87</u>	<u>9.0</u>	<u>8.2</u>	<u>43</u>	<u>-15</u>	<u>15.2</u>	<u>0.8</u>
TOTAL	20.38	27.72	44.3	44.5	102	-29	41.4	1.7

* Data obtained from the weather station at St. Cloud, MN located 11 miles west of the refuge.

Numerous Type III and IV wetlands dried up early in the summer due to extreme drought conditions. The basin shown below as it appeared in early June, although not suited for duck production.....



produced an abundant stand of moist soil plants by late July. Note the parched upland vegetation in both photos. (BDE 6&7/88)



C. LAND ACQUISITION1. Fee Title

Fee title transfer of FmHA inventory properties was proposed on seven farms in Kanabec and Pine Counties, Minnesota and a portion of one farm in Barron County, Wisconsin. Table 2 summarizes FmHA inventory property status.

Table 2. FmHA Inventory Farm Status, 1988

County/State	Tract No.	Acreage	Type Easement/Proposal - Manager
Isanti, MN	10C	150	Fee Title - FWS
Kanabec, MN	10C	20	Wetlands - FWS
	11C	210	Fee Title - MDNR
	12C	160	Fee Title - MDNR
	13C	75	Wetlands - FWS
	Anderson	160	Fee Title - MDNR
*Pine, MN	Andrews	20	Wetlands - FWS
	Dietz	445	Fee Title - MDNR
	Garretson	320	Fee Title - MDNR
	Martini	30	Wetlands - FWS
	Nedegard	30	Wetlands - FWS
	Trent	365	Fee Title - MDNR
	Whyte	30	Wetlands - FWS
	Wolff	20	Wetlands - FWS
Barron, WI	10C	12.5	Trout Stream - WDNR
	11C	17.5	Trout Stream - WDNR
	12C	10.6	Trout Stream - WDNR
	13C	2.5	Wetlands - FWS
	14C	50	Trout Stream - WDNR
	15C	38	Wetlands - FWS
	16C	20	Wetlands - FWS
	17C	12.5	Trout Stream - WDNR
	Merritt	160	Fee Title - WDNR
Burnett, WI	10C	30	Wetlands - FWS
Washburn, WI	10C	64	Wetlands - FWS

*Conservation easement proposals developed by St. Cloud WAO

In Minnesota, transfer to FWS was proposed on only one farm (150 acres) while the remaining acreage (1660 acres) was proposed for transfer to the Minnesota Department of Natural Resources (MDNR). The Wisconsin

tract of 160 acres was proposed for fee title transfer to Wisconsin Department of Natural Resources (WNDR).

2. Easements

Conservation easement proposals were developed on FmHA inventory properties in nine counties of Minnesota and Wisconsin. Field evaluations were completed on a total of 33 inventory farms in these counties. Field evaluations of FmHA inventory properties in Pine County, Minnesota were completed by the St. Cloud Wildlife Assistance office (WAO) (Table 2).

A total of approximately 480 acres were proposed for resource protection on 12 inventory farms. In addition, fee title transfer was proposed on portions, or entire tracts of eight farms (Section C.1.).

D. PLANNING

2. Management Plan

The Wildlife Inventory Plan, revised in 1987, was resubmitted following a recommended change in the expansion formula for estimating dabbling duck production. The plan was approved in July, 1988.

Revision of the Marsh and Water Management Plan was rescheduled until March, 1989 due to personnel shortages and Farm Bill work commitments.

The station's Sign Plan was revised during the year to reflect the many changes in exhibit and informational kiosk panels installed in 1985 and 1986. This plan was approved in March.

Fishery management recommendations developed by Reed Glesne, Ashland Fishery Assistance Office were received in February. Recommendations were incorporated into the draft Fishery Management Plan which was submitted in July.

All Inspectors Reports for facilities and structures (August) and equipment (November) were submitted in support of the Maintenance Management System.

4. Compliance with Environmental and Cultural Resource Mandates

A right-of-way request was received from Berlinson and Associates for access to property they own on the east side of County Road 82, one half mile north of County Road 9. The request was necessitated by the alignment of County Road 82 which left a strip of refuge land east of the road. The strip measures 12 feet wide at the north end, one foot wide at the south end and extends approximately 600 feet along the road. The strip prevents direct access to County 82 from the private land to the east. The state historic preservation officer found no sites of historic, architectural, cultural, archaeological or engineering

significance within the proposed right-of-way. Final Regional Office approval of the right-of-way was pending at the close of the year.

5. Research and Investigations

Sherburne NR87 - Effects of the Mosquito Larvicide Methoprene on Mallard Broods (Unnumbered).

Professor Jim Cooper from the University of Minnesota - St. Paul directed the first field phase of a study designed to determine whether methoprene has an indirect adverse affect on the growth and development of mallard ducklings by destroying dipteran larvae, a major part of their diet. Methoprene is the mosquito larvicide used by the Metropolitan Mosquito Control District in the Minneapolis/St. Paul metro area.

Three refuge wetlands chosen in 1987 were used for the study. Each wetland was divided in half with a methoprene-impermeable bottom-to-surface barrier. One half was treated with methoprene-saturated briquets, and the other half treated with "placebo" briquets.



All three University of Minnesota study marshes are visible in this photo. The white lines are plastic barriers used to separate individual basins into treated and untreated portions. (University of MN photo - 1988)



A methoprene-impermeable barrier was installed in each study marsh. (University of MN photo - 1988)

A brood of ten game farm ducklings was placed on each half of the three wetlands 11 days after the briquets were distributed. Each brood had been imprinted on a research assistant, who accompanied them for five days on their daily activities with the aid of a small floating chair and pair of diving fins. These broods were used to train the imprinters on the experimental design. The experiment was then repeated 18 days after the briquets had been distributed, this time for four weeks, with newly hatched broods. Duckling weight was used to measure growth. Invertebrate samples were also taken on the treated and untreated halves of the wetlands, using emergent and activity traps and core samples.

The following summarizes results of the study:

- a) Effect on duckling weight: On the initial group of ducklings, a weight difference was evident by day 5, with the broods on the treated halves of the wetlands consistently weighing less than those on the control halves. There was no significant effect of methoprene on the weights of the 2nd group of ducklings. The reason for this may be the decreasing effectiveness with time of methoprene on invertebrates.
- b) Effect on duckling behavior: Broods on the methoprene treated wetlands traveled significantly greater distances than the control broods, and spent more time in locomotion and less time feeding. Approximately the same amount of time was spent in stationary activities. The treatment broods also spent 10% more time in the

near-shore vegetation zone than the control broods.

- c) Effect on invertebrates: There was no significant differences between wetlands in the total numbers of insects emerging during the four weeks of the experiment. However, it appears that the emergence levels of certain invertebrates in the treated wetlands were lower than those in control wetlands.



Numerous sampling stations were used to monitor invertebrate activity. (University of MN photo - 1988)



"Mother duck" Kathy Smith closely monitors duckling activity. (St. Cloud Times 5/88)

E. ADMINISTRATION

Rife, Priess, Larson, Ehlers, Johnson, Joarnt

1. Personnel

1. Ron Papike, Refuge Manager (EOD 9/25/77, passed away 2/7/88)	PFT	GS-12
2. Thomas J. Larson, Refuge Manager (EOD 5/8/88)	PFT	GS-12
3. Jay M. Johnson, Primary Assistant (EOD 4/1/84)	PFT	GS-11
4. Brad D. Ehlers, Assistant Manager (EOD 3/29/87)	PFT	GS-9
5. Richard I. Joarnt, Biologist (EOD 5/7/78)	PFT	GS-9
6. Jeanette M. Priess, Secretary (EOD 9/30/87)	PFT	GS-5
7. Carla D. Hanson, Manager Trainee (EOD 3/27/88)	PFT	GS-5
8. Allen W. Rife, Maintenance Mechanic (EOD 7/24/88)	PFT	WG-8
9. John Lelwica, Biological Technician (EOD 5/15/88, Terminated 9/30/88)	TFT	GS-5
10. Konrad P. Schmidt, Biological Technician (EOD 4/1/88, Terminated 8/27/88)	TFT	GS-5

Refuge Manager Papike received an incentive award. Brad Ehlers, Rich Joarnt and Allan Rife received special achievement awards for their work related to the Farm Bill. All staff members received special achievement awards for an accident free year from July, 1987 to August, 1988. Brad Ehlers received his 20 year service certificate and pin in October.

Sharon Young, administrative technician at Rice Lake NWR, once again came to our rescue. She filled in once a week, helping with time cards, bills and all the other miscellaneous administrative functions while Jeanette was out for six weeks on sick leave. Sharon helped us out in 1987 as well when there was a secretarial vacancy at Sherburne.

The following training occurred:

<u>Personnel</u>	<u>Training</u>
Papike, Johnson	Farm Bill Training, St. Cloud, MN, 1/7-8
Papike, Johnson	Wetland Restoration Workshop, Bloomington, MN, 1/20-21
Johnson, Ehlers	40 hr. L.E. refresher, Sparta, WI, Feb.
Priess	Administrative Workshop, Minneapolis, MN, 4/12-14
Priess	Public Use Workshop, Twin Cities, MN, 4/15
Ehlers	Wetland Restoration Workshop, Madison, WI, 4/1
Priess	Secretarial Seminar, St. Cloud, MN, 5/19
Larson, Johnson, Ehlers, Joarnt	Wetland Restoration Workshop, Litchfield, MN, 5/24
Priess	Federal Women's Day, Twin Cities, MN, 5/26
Refuge staff and YCC	Cardiopulmonary Resuscitation, 6/21
Refuge staff and YCC	First Aid, June
Priess	Defensive Driving, Swanville, MN., June
Ehlers, Joarnt, Johnson, Larson, Hanson	Non-game Bird Management Workshop, Bloomington, MN 8/10,11
Larson, Johnson, Ehlers	6 month firearm requalification, St. Cloud, MN, September
Priess	Wordperfect Training, Twin Cities, MN, 11/30
Priess	R:Base, WordPerfect (Advanced & Graphics), Twin Cities, MN, December
Hanson	Refuge Manager Training Program, March, 1988 -January, 1989

Three new employees came to the refuge this year, so we are once again operating at full staff. Sherburne has experienced quite a turn-over

with only two persons remaining who have been here more than two years.

Tom Larson transferred here in May from the Minneapolis Regional Office where he had been an Assistant Division Supervisor (Division 1) for three years. He took the place of Ron Papike, who passed away on February 7. This was kind of a homecoming for Tom since he had been a manager trainee here in 1977-1978.

Carla Hanson began her first permanent assignment here in March after graduating from the University of Minnesota in August 1987. She had been a co-op student at Seney NWR and Muscatatuck NWR.



Carla Hanson, Refuge Manager Trainee, at her first permanent assignment.

(TJL 1/89)

Allan Rife transferred here in July from Trempealeau NWR to fill the maintenance position vacant since January 2 when Wes Thompson retired.

Refuge staffing during the past five years is illustrated in Table 3.

Table 3. Personnel summary, FY 84-88.

Year	Permanent		Temporary		Total FTE's
	PFT	Seasonal	Full Time	Part Time	
1984	7	1	8	1	10.7
1985	7	1	3	0	7.6
1986	6	1	2	0	6.6
1987	6	0	1	0	6.2
1988	7	0	2	0	7.9



Brad receiving his twenty year plaque from Tom. Only
twenty more to go!!!
(CDH 11/88)

2. Youth Programs

The Youth Conservation Corps program began June 13 and ended August 5. John Lelwica, the crew leader in 1987, returned to resume those responsibilities. His familiarity with the refuge greatly improved the efficiency of the YCC crew. There were four enrollees this year from three local school districts. The staff members agreed that this was one of the most productive YCC crews on record.

Major projects centered around maintenance and improvement of the refuge facilities. The YCC crew replaced rotted siding on part of the storage and carpentry shop, and scraped and repainted the entire outsides. They also repainted the inside of the office in a much brighter "sea spray blue", and replaced and stained a number of parking lot barrier posts. Minor projects included trail maintenance, litter removal, exotic tree removal, and weekly clean-up of the vehicles and shop area.

In addition to maintenance projects, the enrollees were instructed in environmental education as it fit in with the work, helped with duck banding and nest dragging, visited a DNR fisheries facility, and participated in safety training and meetings. Those enrollees not already certified were trained in First Aid and CPR, and each crew member presented a topic for discussion at a safety meeting.

The program culminated with a picnic and staff versus YCC volleyball match which the staff won two games to one!!



The 1988 YCC crew after a mornings' work. From the left: John Lelwica, crew leader; Brian Thorsten, Stephanie Hals, Lisa Hartman, and Tom Mazacek. (BDE 7/88)

3. Other Manpower Programs

A student from Vermillion Community College in Ely was selected for work study but was unable to participate due to poor grades. A replacement was unavailable because of the abundance of better paying firefighting jobs in the western states.

One community service worker completed shop clean-up for eight hours. He was referred by the Sherburne County Sheriff's Office.

4. Volunteer Program

Forty-one volunteers donated 1270 staffhours in 1988. The majority were donated by members of the St. Paul Audubon Society under the Adopt-a-Refuge program. They handled visitor reception duties on weekends during peak use periods in the spring and fall. This freed up refuge personnel for law enforcement and fire duties. They also held a spring clean-up Saturday to get the trails and schoolhouse reception area ready for the year.

Other volunteer's duties were varied. Mike George constructed twenty leaflet boxes to replace those lost to vandalism throughout the year. Linda Ernst helped run the deer check station and Bruce Weaver set up and modified computer programs. Donna Johnson led school groups on

environmental education exercises while her husband, Brad, photographed wildlife on the refuge. And the whole volunteer crew pitched in to stamp 6,000 hunting leaflets, "Closed to Waterfowl Hunting".

Dr. Al Grewe's wildlife students again assisted the refuge staff during the greater sandhill crane breeding pair count and a troop of girl scouts removed litter from major roads through the refuge in April. The volunteer program has become a real asset to Sherburne!

5. Funding

The total refuge budget for FY 88 was \$299,800, which was a 26 percent increase over the FY 87 total budget. The FY 88 budget included \$9,000 for purple loosestrife control, \$10,000 for an IBM microcomputer and \$5,000 for change of station moves (which actually cost \$38,216). The total FY 89 preliminary budget figures were 13 percent more than the FY 88 totals (Table 4). However, estimated salary costs and moving costs for FY 89 for a new position are estimated to be approximately \$57,100. When these non-discretionary items are subtracted from the FY 89 funding level, the FY 89 budget is actually six percent lower than the FY 88 budget.

On September 27, Dave Gustafson, Contract Specialist in the Regional Office, conducted a review of the refuge procurement procedures and found all records in order.

Table 4. Station funding for FY 84-89 (\$,000's).

Fund	FY 84	FY 85	FY 86	FY 87	FY 88	FY 89
O&M						
1260	<u>299.0</u>	<u>268.0</u>	<u>240.0</u>	<u>231.2</u>	<u>238.6</u>	<u>316.1</u>
Additional						
1510			.2			
BLHP	12.9					
ARMM/Flex.						
Mtce.	115.0	115.1	27.0		40.4	18.0
Threats &						
Conflicts		6.0	6.0		9.0	4.2
YCC	14.4	15.0	15.8	7.0	6.8	
EOY Funds		16.0			5.0*	
Total Add'l	<u>142.3</u>	<u>152.1</u>	<u>49.0</u>	<u>7.0</u>	<u>57.8</u>	<u>22.2</u>
Total All						
Funds	441.3	420.1	289.0	238.2	299.8	338.3

*for change-of-station moving costs

6. Safety

The refuge reported no lost time accidents in 1988, and all refuge employees received a Special Achievement Safety Award. However, one YCC enrollee contracted an extensive case of poison ivy, and another strained her back despite prior training on these safety hazards.

All permanent and temporary employees not currently certified, received CPR and Red Cross Multi-media First Aid training in June. Jeanette Priess also completed an eight hour Defensive Driving course.

Konrad Schmidt gave an excellent chain saw safety presentation in July. We will try to incorporate some of his ideas into a handout that will accompany future public firewood cutting permits.

7. Technical Assistance

Assistant Manager Johnson served as the refuge's representative on all Swampbuster consultations with USDA. Determinations regarding Swampbuster issues were made in five counties of Minnesota and four Wisconsin counties (Section C.2).

Considerable effort was spent on Farm Bill activities (Table 5). See sections C.2 and F.2 for additional information on the results of the Farm Bill activities. Brad Ehlers assisted the Wildlife Assistance Office personnel in Wisconsin with evaluations of conservation reserve lands and Carla Hanson assisted construction teams in Indiana with Farm Bill wetland restoration work there. As part of the restoration team for eastern Minnesota and northwestern Wisconsin, refuge personnel also assisted Minnesota Valley NWR and St. Paul Field Office personnel in wetland restoration efforts in their counties of responsibility. Tom Larson served as team leader. Brad Ehlers also assisted the St. Cloud Wildlife Assistance personnel with the spring waterfowl pair counts in Minnesota.

Table 5. Allocation of Staff Hours and Funds on Farm Bill Activities.

<u>Activity</u>	<u>Hours</u>	<u>Cost</u>
FmHA Inventory Review	256	\$4,160
Conser. Reserve Review, Inspection & Restoration	825	\$13,700
Swamp Buster Consultation	25	\$450
Total	1,106	\$18,310

F. HABITAT MANAGEMENT

2. Wetlands

The continuation of drought conditions for the second consecutive year resulted in a significant drop in water levels in most of the natural wetlands and impoundments. As drought conditions worsened during the spring, the decision was made to retain as much water as possible on the refuge. By late fall, however, approximately 75% of the impoundment acreage was without water. Natural wetlands were generally dry also except for the larger wetlands such as Rice Lake, Orrock Lake, Johnson Slough and Buck Lake.

Excellent wild rice (Zizania aquatica) crops developed in portions of Bohm Pool, Fox Pool, Schoolhouse Pool, Bergerson Pool, Lower Roadside Pool and Buck Lake. Orrock Lake produced only a moderate wild rice crop while Johnson Slough and Josephine Pool produced virtually no rice at all. Because of the low water, the wild rice in Fox Pool and Bergerson Pool was unavailable to waterfowl. Moist soil plant development, particularly Bidens spp., was excellent in many of the pools, but water to flood them in the fall was unavailable. Consequently, the moist soil plant foods were unavailable to waterfowl. Water levels in St. Francis Pool were below the elevation of the 1984 wild celery (Vallisneria americana) plantings throughout much of the growing season. Whether or not these plantings will survive is not known at this time.



The drought of '88 proved to be an ideal time to open up some choked Type III basins. This area is just north of the St. Francis River, west of County Road 5. (JMJ 10/88).

Planned impoundment management was not or could not be implemented in most cases. Long Pool was not drawn down to stimulate emergent vegetation establishment as planned. Rather, the control structure gates remained closed to retain as much water as possible on the refuge. The result was a relatively stable water level throughout the year in Long Pool. The only pools other than Long Pool with significant water were Bohm Pool, Josephine Pool and Deer Pool.

Due to staff shortages and new Farm Bill initiatives, vegetative surveys of pools which have been conducted in recent years were not possible in 1988.

Sherburne was assigned Farm Bill responsibilities in five counties in East Central Minnesota and four counties in Northwestern Wisconsin. Wetland restoration was offered to Conservation Reserve Program (CRP) participants by obtaining a list of names and addresses from county ASCS offices. Landowners responding to this letter were then screened via telephone calls. Many of the landowners were not familiar with the terms of the program and consequently were hopeful of wetland alterations - mostly dugouts. The remaining potential projects were then field checked, surveyed and staked. If the survey showed a basin, the project was scheduled for construction. Construction was accomplished with Service employees and equipment. The disturbed areas were then seeded to reed canary or switchgrass to match the cover in the particular field. Many positive contacts with USDA, landowners and sportsmen's groups resulted from this work. Table 6 summarizes Sherburne's wetland restoration program.

Table 6. Summary of wetland restoration projects - 1988.

State/County	Number of CRP contracts (Sign-ups 1-5)	Number of responses to letter	Number of field checks	Number of basins restored
Minnesota				
Anoka	5	2	4	0
Isanti	44	11	4	5
Kanabec	37	14	4	0
Pine	6	0	0	0
Sherburne	12	3	1	0
Chisago*			8	2
Wisconsin				
St. Croix*	--	--	12	0
Barron	17	0	0	0
Burnett	12	0	0	0
Polk	108	19	13	7
Washburn	10	0	0	0
TOTALS	251	49	46	14

* county assigned to St. Paul E.S. Field office, but restoration field checks, surveying and construction done by Sherburne staff.



Wetland restoration on private lands comprised a major portion of Sherburne's program in 1988. Both photos were taken on private lands in Isanti County, MN. A dike starts taking shape in the above photo and the finished product on the James Nyman farm below. (AWR & BDE 8/88)



Station personnel provided ten staffdays of assistance to the Madison Wildlife Assistance Office to screen Wisconsin counties for potential wetland restorations. The St. Paul Ecological Services Field Office also requested Sherburne's assistance with wetland restoration in St. Croix County, Wisconsin and Chisago County, Minnesota. The work involved field checks, surveying and construction. Two wetlands were restored in Chisago County - one on CRP and another on FmHA property. There were no restorable wetlands found in St. Croix County.

CRP participants in sign-ups 6 and 7 were sent letters at the end of the year to plan our wetland restoration work for 1989.

3. Forests

Forest management was confined to conifer plantation thinning and hardwood windbreak removal. The windbreak removal is designed to improve sharptailed grouse habitat as part of the sharptailed grouse reintroduction project. Mosinee Paper Corporation of Mosinee, Wisconsin purchased 1253.54 cords of coniferous pulpwood for \$3,760.61. Stanley Olson of Big Lake, Minnesota did the cuttings. Cutting contracts and monitoring was supervised by Cy Brock, forester at Tamarac NWR. Over .6 miles of hardwood windbreaks were removed by permit firewood cutters. The 51 permittees removed 149 cords of firewood (predominately red oak) for a revenue of \$1490.00. Also 87 permits were issued to cut 87 Christmas trees at a cost to the permittees of \$87.25.



Several oaks succumbed to the extreme drought conditions. Oak wilt was present on the south end of Sherburne, but these drought - affected single oaks were randomly scattered over the uplands. (KPS 7/88)

On October 12, Tom Larson met with Cy Brock, forester at Tamarac NWR, and Mike Connor, an entomologist with the U.S. Forest Service, to field check a severe infestation of bark beetle (Ips spp.) in refuge pine plantations. The infestations are greatest in the dense stands of pines, and are almost non-existent where the stands have been thinned. The drought conditions have been very favorable to the beetles, stressing the trees, making them susceptible to attack. Thinning operations in the pine plantations will continue to reduce their insect vulnerability and eventually convert them to more productive wildlife habitat.

5. Grasslands

Grassland management was restricted to cutting and chemically treating black locust invasion (Section F.10).

9. Fire Management

A fire ban imposed by the MDNR restricted prescribed burning to a nine acre field of introduced grasses and legumes. The burn also served as a firebreak for one of the refuge neighbors.



This wildfire in Carpenter Pool was detected by a dozer operator headed to the nearby Santiago fire. He extinguished the west (left) side while other crews were on the way to assist. Both fires were the work of suspected arsons.

(JMJ 4/88)

Wildfires were another matter. Eight wildfires consumed approximately

890 acres. Three fires started by a malfunctioning auto burned about .5 acres. One fire, apparently started by lightning, burned about 4 acres. A neighbor burning trash started another fire which burned about .5 acres of refuge habitat. Another fire, apparently started by a careless fisherman burned about two acres. The other two fires appear to be the work of an arsonist. These fires were discovered shortly after 5:00 PM on April 8. By the time the fires were controlled about 3:00 AM on April 9, 21 fire trucks, three dozers, two tractors and one aerial bomber were used in the control effort. Although no buildings or lives were lost, three houses on private land were seriously threatened. These two fires burned about 880 acres of habitat.

10. Pest Control

Most of our efforts were directed toward a continued program to control purple loosestrife. The only method used was a backpack sprayer application of Rodeo, a non-selective aquatic herbicide. Aerial spraying was discontinued in accordance with the Region 3 Purple Loosestrife Policy. Bio-tech Schmidt spent a lot of time spraying, and discovered that the stands had to be sprayed at least twice in order to kill most of the plant's age classes. He concentrated efforts on smaller stands invading wetlands where loosestrife had not previously occurred. Unfortunately, these stands were so numerous that he was unable to spray them all before they went to seed in August.

Leafy spurge stands were treated with Rodeo, and marijuana plants were pulled by hand. The YCC crew hand cut about 4 acres of black locust saplings and the crew leader sprayed the suckers with Rodeo in an effort to kill this exotic species. All mature locusts were cut down and the stumps sprayed. Our hope is that the herbicide will spread through the roots and kill the suckers.

White-footed and deer mice continue to invade the office and Old Schoolhouse. Forty-eight mice were caught in the office and three in the Schoolhouse.

The YCC crew evicted a bat colony by removing a shutter from the office under which it had been roosting. The crew then modified the shutter so that the bats could no longer crawl through a gap behind it. Several bats were observed going into a gap under the shingles on the office roof after being evicted.

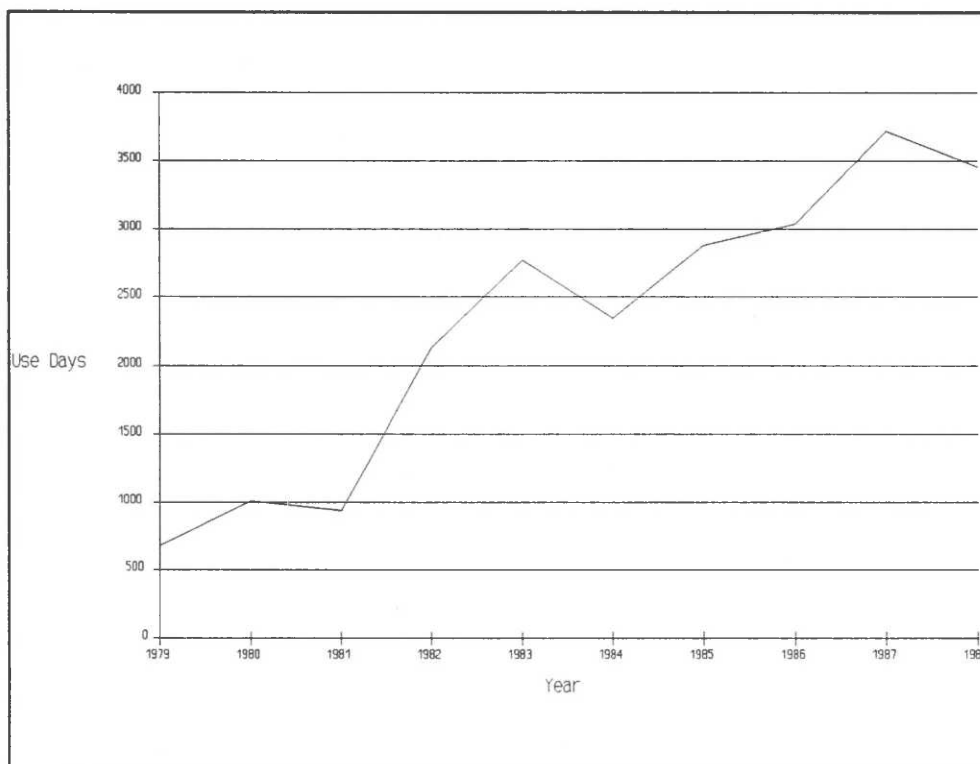
G. WILDLIFE

2. Endangered and/or Threatened Species

This was the sixth year a pair of bald eagles fledged young from the same nest. This year was unusual in that three young survived to fledging. It's possible the adults were more successful because of an abundance of winter-killed fish early in the season. Another pair of

eagles returned to a nest in St. Francis Pool which they had occupied last year, but were not successful. Spring eagle migration continued to be spectacular with as many as a dozen, mostly immature eagles, visible on or near the frozen pools at one time. A total of 3460 eagle use days was slightly lower than last year's record 3700 days.

Figure 1. Bald eagle use days at Sherburne NWR (1981-1988).



The Blanding's Turtle, a threatened species in Minnesota, is fairly common on the refuge. Sightings were recorded this year in cooperation with a MDNR and Nature Conservancy inventory of this species in central Minnesota.

3. Waterfowl

The first trumpeter swans arrived in the area in late March when a collared bird (44NC - Hennepin County Park Reserve) and three uncollared birds spent over a week in a barnyard wetland approximately two miles west of Santiago (Lee Gilyard farm). Two uncollared swans accompanied by 44NC were then sighted on Carpenter Pool on April 19.

Groups of two and three trumpeter swans were sighted regularly on the refuge from July 1 through the first week of November. The birds were

seen on Schoolhouse, Nelson and Josephine Pools in late April and early May. Three were then seen on St. Francis Pool from July 1 through August 3. They used Deer Pool, Long Pool and St. Francis Pool through August 15. They then moved to Nelson Pool through mid October and back to Long Pool until the last sighting during the first week of November. Swan use days totaled 270.

Two of these three swans were marked. One was neck collared (10NC) by the Hennepin County Park Reserve as a juvenile female in 1985. The other was a male patagial tagged (#16) by MDNR and was released on Tamarac NWR on April 22, 1987. The unmarked bird appeared to favor the Tamarac male towards the end of the summer, leaving 10NC alone. Trumpeters were first seen on the refuge on March 23, 1982. They have since become more common and we are hopeful of a pioneering nesting pair in the near future.

The restoration flock of giant Canada geese continued to grow with the production of 675 young to flight. Table 7 shows the expansion of the flock through refuge habitat in the last ten years. There appears to be room for more breeding pairs on the refuge. However, the geese have expanded into prime, private marshes also. Concentrations of goose broods used Stickney, Bergerson, Nelson, St. Francis and Long Pools.



Mallards and Canada geese congregated on the few open water areas as they pushed north. This flock was flushed along the St. Francis Pool dike during a waterfowl census. They were feeding on flooded moist soil plant seeds. (BDE 4/88)

Migrant Canadas peaked at 3600 on September 10. This was a new record high peak as were the total goose use days of 437,054 (Table 8). Migrants used St. Francis Pool the most in the spring, but concentrated on Durgin Pool, Orrock Lake and Long Pool in the fall. St. Francis Pool held some geese in the fall, but was nearly dry during the early fall period due to the drought. Feeding flights of geese to private lands occurred in every direction from the refuge, but were more prevalent out to the southwest and east.

Table 7 shows the increase in breeding pairs following pool construction in 1981, followed by a peak and leveling off in recent years for most species.

Table 7. Estimated breeding pairs, Sherburne NWR, 1979-1988.

Species	1979	1980	*1981	1982	1983	1984	1985	1986	1987	1988
Coot	50	100	335	300	100	20	180	35	76	28
Canada Goose	50	80	90	110	145	150	180	192	213	241
Mallard	62	180	590	474	945	825	880	827	615	698
Grn-winged teal	--	25	30	29	25	22	50	2	327	7
Bl-winged teal	4	175	850	522	963	677	1096	800	88	863
Shoveler	--	--	10	19	12	62	25	--	3	8
Wood duck	30	130	300	163	672	780	487	419	621	892
Ring-necked	17	20	70	42	243	62	58	60	69	70
Hooded merganser	--	--	--	20	--	12	10	30	12	33
Ruddy	--	--	--	--	--	2	--	--	--	--
Unidentified	15	25	--	--	--	--	--	--	--	--

*18 of 23 pools filled for the first time

Table 8 illustrates refuge waterfowl use. Duck use days totaled 5,411,059. Over four million of this total occurred in April, September and October. Mallards comprised 44% of the use days and wood ducks 32%. Spring use was concentrated on St. Francis and Nelson Pools. Red-breasted mergansers peaked at 200 in Durgin Pool on April 21. Fall duck use days were primarily on Long and Nelson Pools. Wigeon and gadwall arrived for the fall on August 26 on St. Francis Pool and gadwalls also used Stickney Pool throughout the fall period. Large flights of field feeding mallards roosted on Long Pool in September and October. They fed in fields east of the refuge.

Duck production was 4,034 birds to flight. Extremely low nest success on upland nesters was responsible for this low figure - the lowest since 1982, shortly after the pools were first flooded. Approximately 450 acres of uplands were nest searched twice during the peak nesting season - late May and late June. Predators destroyed 41 of 46 upland nests found during the nest dragging effort. One of seven mallard nests was successful and only four of 39 blue-winged teal nests hatched.

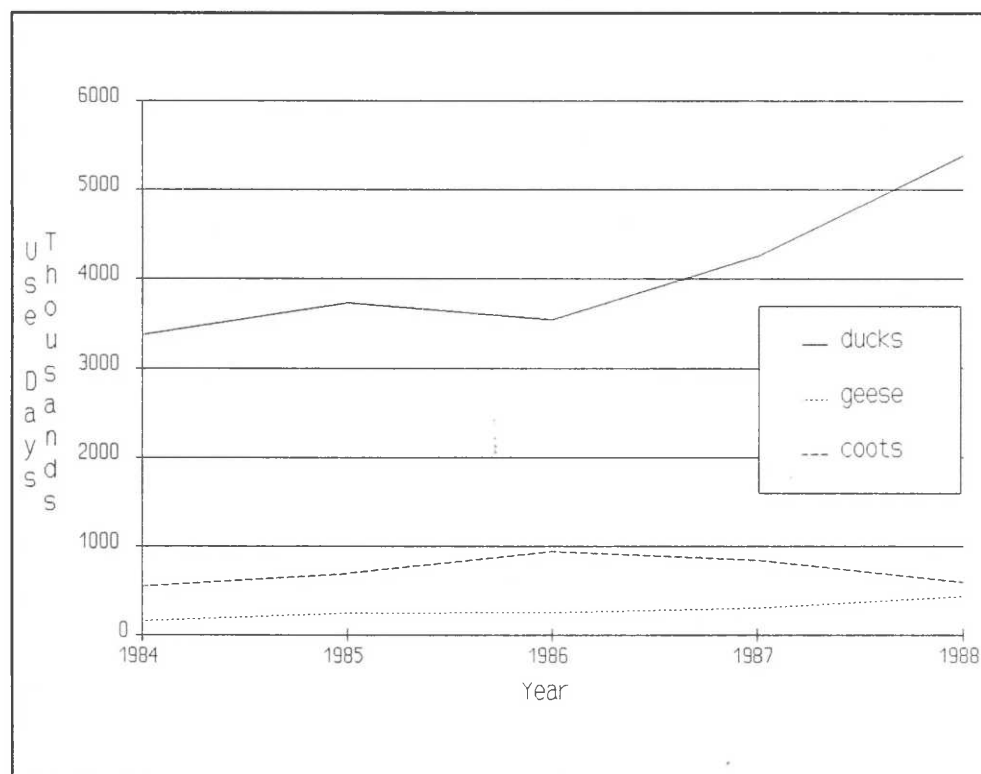
One blue-winged teal hen was also found dead (predator) at a nest site. Blue-winged teal had a much better success rate in 1986 when 15 of 37 nests hatched.

Table 8. Waterfowl use/days, Sherburne NWR, 1988.

Month	Coots	Ducks	Geese	Trumpeter Swans
March	0	244,950	9,000	0
April	18,646	1,066,754	27,130	10
May	15,640	168,969	25,167	20
June	2,880	279,120	29,460	0
July	3,360	290,730	36,150	90
August	3,870	334,380	41,580	90
September	413,775	1,978,490	194,663	45
October	139,706	950,179	34,767	15
November	0	97,487	39,137	0
Totals:	597,877	*5,411,059	*437,054	*270

* new record highs for Sherburne NWR

Figure 2. Waterfowl use days at Sherburne 1984 - 1988.





Robel pole readings were taken at all nest sites during the annual nest drag on selected fields. Konrad Schmidt, John Lelwica and Rich Joarnt served as the two drivers and one observer on this occasion. (BDE 4/88)



Nest success was extremely low with blue-winged teal comprising the vast majority of the nesting effort. Predators took most of the nests. (KPS 6/88)

An extremely dry spring and early summer resulted in poor brood habitat conditions. Most Type I and II wetlands were dry during the breeding season and many type III wetlands dried up before the brood season. However, these dry wetlands presently hold an abundance of moist soil foods and will be highly productive when water levels are restored.

4. Marsh and Water Birds

Despite poor production by most species of this group, the continually declining water levels during the growing season provided ideal foraging habitat for long legged wading birds.

Great blue herons and great egrets were present in large numbers on the extensive mud flats and shallow water areas of St. Francis Pool during late summer and early fall. Apparently, as off-refuge marshes dried up, birds from nearby rookeries sought out larger wetlands, such as this nearly 1500 acre basin. No activity was observed in the Durgin Pool heron rookery. It is presumed this rookery has been permanently abandoned as no production has been noted in recent years.



Great egrets congregated in refuge pools in late summer foraging on the abundant bullheads. These egrets found Big Bluestem Pool to their liking as the drought had concentrated the fish.
(BDE 7/88)

Approximately 50 double-crested cormorants also made use of St. Francis Pool during late summer. No cormorant nesting was observed.

Several traditional common loon nesting marshes were vacated due to low water levels. No production was noted, although loons were present during the breeding season.

This pair of common loons were unsuccessful on Stickney Pool. Loons receive a lot of attention from the MDNR, as they are the state bird. (BDE 6/88)



As in past years, a group of students from St. Cloud State University participated in a spring "unison call" survey of sandhill cranes. Ideal listening conditions occurred during the survey and an estimated 25 breeding pair were tallied. Production, however, appeared poor as only six immature cranes were present among a group of approximately 35 birds that staged in St. Francis Pool.



This juvenile double-crested cormorant with a severely deformed bill was brought to the office by a refuge visitor in September. It was sent to the National Wildlife Health Center for analysis. (BDE 9/88)

5. Shorebirds. Gulls. Terns and Allied Species

Large areas of mudflat habitat were present on the refuge, however, shorebird use was not significant. Widespread drought conditions, no doubt, provided abundant shorebird habitat, thereby dispersing migration of this group.

8. Game Mammals

The number of antlerless deer permits for the refuge was reduced from 500 to 200 in 1988. This reduction was made in response to what appeared to be a declining population.

Table 9 summarizes the deer harvest (firearms only) during the past four years.

Table 9. Firearms deer harvest, Sherburne NWR (1985-1988)*

Year	Adult (%) Male	Fawn (%) Male	Adult (%) Female	Fawn (%) Female	Total
1988	82 (47)	21 (12)	46 (26)	25 (14)	174
1987	83 (36)	36 (16)	87 (37)	26 (11)	232
1986	78 (31)	45 (18)	89 (36)	37 (15)	249
1985	76 (31)	42 (17)	91 (37)	37 (15)	246

* as compiled from registration stations in three county area by MDNR

The 60% reduction in antlerless permits produced a 25% reduction in the registered harvest. The antlerless deer harvest declined by 38% while the harvest of antlered males remained essentially the same. The proportion of antlered males in the total harvest, however, was significantly higher than in the past.

10. Other Resident Wildlife

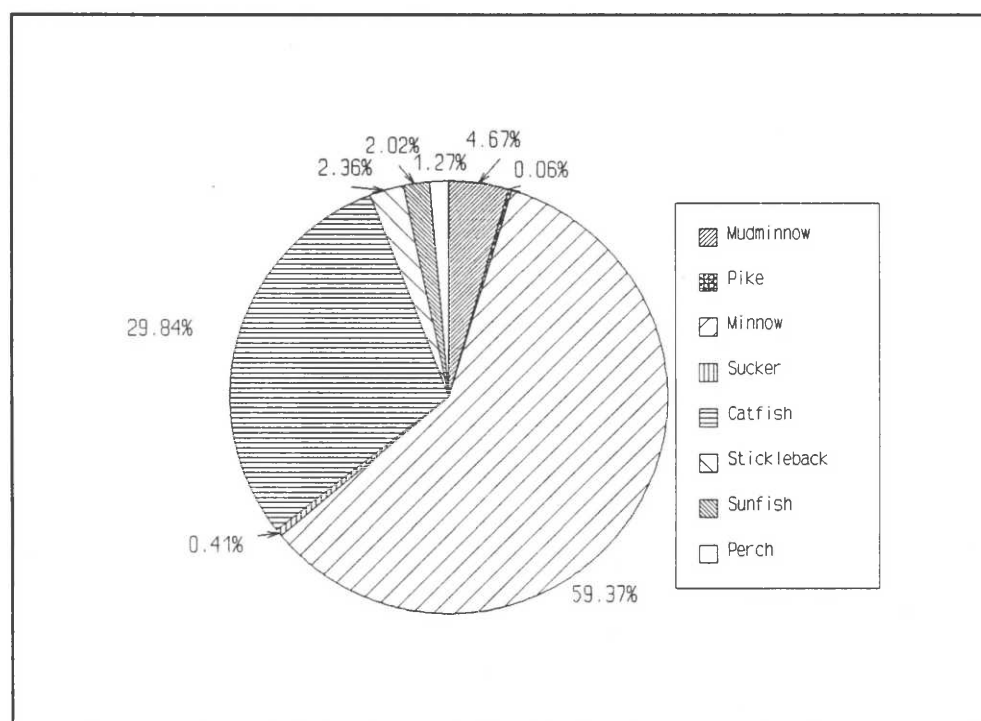
Planning continued for the re-introduction of sharp-tailed grouse. The project received high priority for funding in FY 89, but was dropped following critical budget cuts. A proposal to conduct the project was submitted by Dr. John Toepfer, Montana State University and accepted by the newly established Co-op Unit at the University of Minnesota.

11. Fishery Resources

Low water caused winter kill on Long, St. Francis, and Big Bluestem pools and Orrock Lake, making carp and bullheads readily available to scavenging birds.

Bio-Tech Schmidt conducted an extensive fish survey on the refuge. Using a variety of sampling methods, he collected 35 species of fish, 13 of which were previously unrecorded. This brings the total refuge species count to 41, most of which are non-game forage fish. Figure 3 illustrates the family composition of fishes on the refuge.

Figure 3. Percentage by family of 11,063 fish collected or observed on Sherburne from 1980 through 1988.



Schmidt pointed out that the newly developed fishery management plan addresses the conflicts arising from contrasting pool depths needed to manage sport fish and waterfowl. The non-game fishes are important food items for many piscivorous insects, amphibians, reptiles, mammals and birds, including waterfowl. Because of their size and short lifespans, these species can survive, reproduce and actually thrive in shallow water environments which are free of predatory game fishes.

Lee Newman of the Ashland Fishery Assistance Office conducted some fish surveys to determine sport fishing potential on the refuge. He concluded that the potential is almost non-existent except for several sections of the St. Francis River, where there are fair populations of crappies.



Carp on Long Pool - the way a waterfowl biologist likes to see them! Winterkill of fish occurred on most refuge pools due to low water levels and weather factors. (BDE 4/88)

16. Marking and Banding



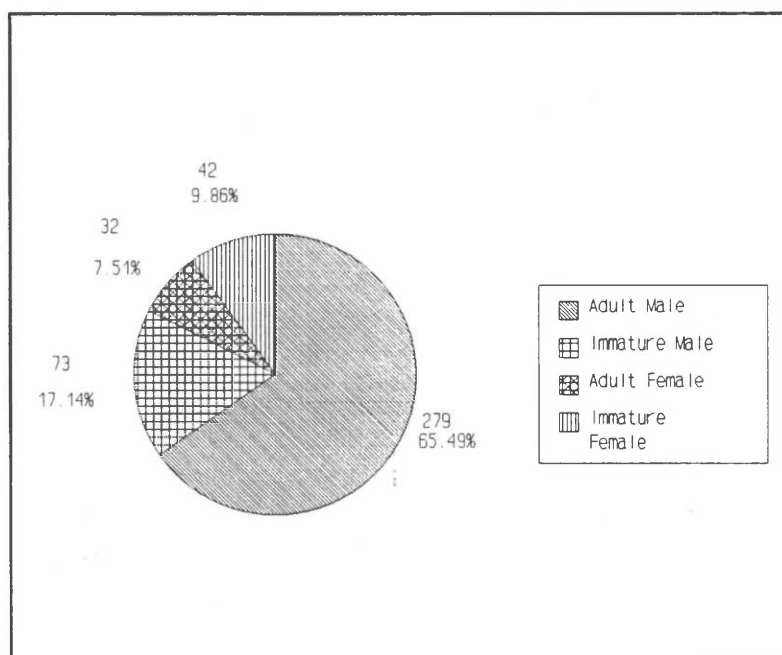
John Lelwica, teaching YCC how to band wood ducks. Woodies were concentrated on the few remaining wetlands in Sherburne County - mostly on Sherburne Refuge. (KPS 8/88)

Sherburne was assigned a 1988 banding quota of 25 wood ducks of each age and sex. A number of likely-looking banding sites were selected in early July and baited with corn beginning on July 15. These sites were generally mudflats near open water on which wood ducks had been previously observed. Traps were placed on the four most heavily used sites a week before banding and left open to allow the ducks to get used to them. Baiting of all sites continued until July 27 when banding began and several of the lesser used sites were abandoned.

The traps were set between 3:00 and 4:00 PM and checked just after dark. They were left open after banding to reduce the chances of raccoon depredation, which only occurred once when an adult male wood duck was killed.

Banding was very successful and the station quota was reached by August 8. A total of 426 ducks was banded, (Figure 4). This is an increase of 75 ducks over last year and 406 ducks over 1986. The trap on Long Pool was the most successful. It was also one of the refuge pools with a good water level. The success of the banding program was aided by ducks concentrating on refuge pools due to the lack of water off refuge. In addition to wood ducks, a number of mallards were trapped and released unbanded, along with a beaver, a green-backed heron, a grackle, and an unidentified shorebird.

Figure 4. Wood duck banding results - 1988.



H. PUBLIC USE

1. General

Public use declined slightly due to several factors (Figure 5). The entrance fee program was implemented for the first full season. This mandatory fee likely discouraged some casual users such as fishing and general wildlife observation. However, the dry summer complicated the situation. Fishing was poor for northern pike due to the low, stagnant water and many refuge pools were dry which also provided less wildlife observation opportunity. In addition, the waterfowl hunting season was closed for the first time in several years. Visits to the refuge totaled 55,030.

Entrance fees were collected from April 1 through the third week of October. Sherburne was one of the refuges selected in the pilot entrance fee program in 1987. Money collected was directed to be spent as follows: 70% to the Migratory Bird Conservation Fund for wetland acquisition and 30% back to the refuge to offset the costs of collecting the fees. Fees were scheduled for collection from April 1 - November 30. However, extensive vandalism and theft of a pipe safe and the cash from all three pipe safes prompted the decision to end the program a month early. It had also become obvious throughout the period that the fee program was not economical (Table 11).

Compliance during the program was checked on several weekends during the peak fall period and ranged from 30% to 70%. Extensive law enforcement efforts would be required to bring compliance up. Visitors were not required to display stickers in their window and did not have to possess a permit in the field. Permits were required for each vehicle, not for each person. This made enforcement of the program very time consuming and little effort was expended on it.

Table 11. Entrance fee summary, Sherburne NWR, 1987-1988.

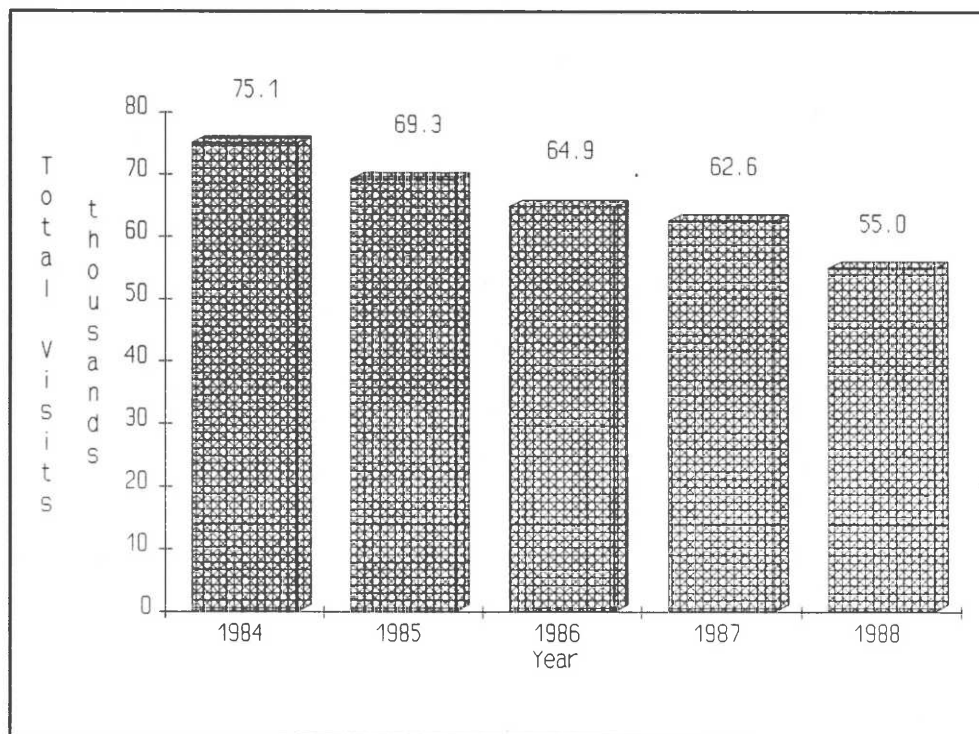
Year	Start up costs	*Operating costs	**Money collected
1987 (six wks)	\$2300	\$640	\$1493.52
1988 (Apr 1- Oct 20)	\$3500	\$3200	\$3615.49

*includes replacing vandalized signs.

** includes annual passes and daily fees.

The entry fee program reduced the number of fishermen and other "casual users". It was also thought that vandalism would be reduced. However, in late summer and early fall, that premise was laid to rest.

Figure 5. Public use visits on Sherburne NWR 1984 - 1988.



2. Outdoor Classrooms: Students

School groups continued to make good use of the refuge for outdoor studies. Environmental education is now a required part of the elementary curriculum in Minnesota. A total of 74 groups were accommodated in 1988. Most of these were elementary school classes. They were given an orientation slide show by refuge staff. Most of the teachers came prepared to complete structured activities. Others were guided by volunteer, Donna Johnson. Restrooms, displays and games are all available in the refuge's schoolhouse.

Four local school districts were provided with 150 National Wildlife Federation education kits during National Wildlife Week.

Jim Olson, elementary teacher in the Princeton School District, received the Christa McAuliffe Award for Minnesota. This award was based on his submission of an environmental education outline using Sherburne NWR as an outdoor classroom. He was awarded \$9500 for transportation and other expenses to conduct outdoor classes for the entire school district. He was relieved of some classroom duties to enable him to complete the outdoor activities. His classes were varied and ranged from pre-schoolers accompanied by one parent to senior citizens enrolled in community education classes. Most participants were in elementary school classes. Jim's efforts were widely publicized in local papers which gave the refuge some added exposure. Unfortunately, the program

is only for a one year period. Many teachers were given an introduction to outdoor classrooms through this effort and we hope many will come back on their own in the future with classes.



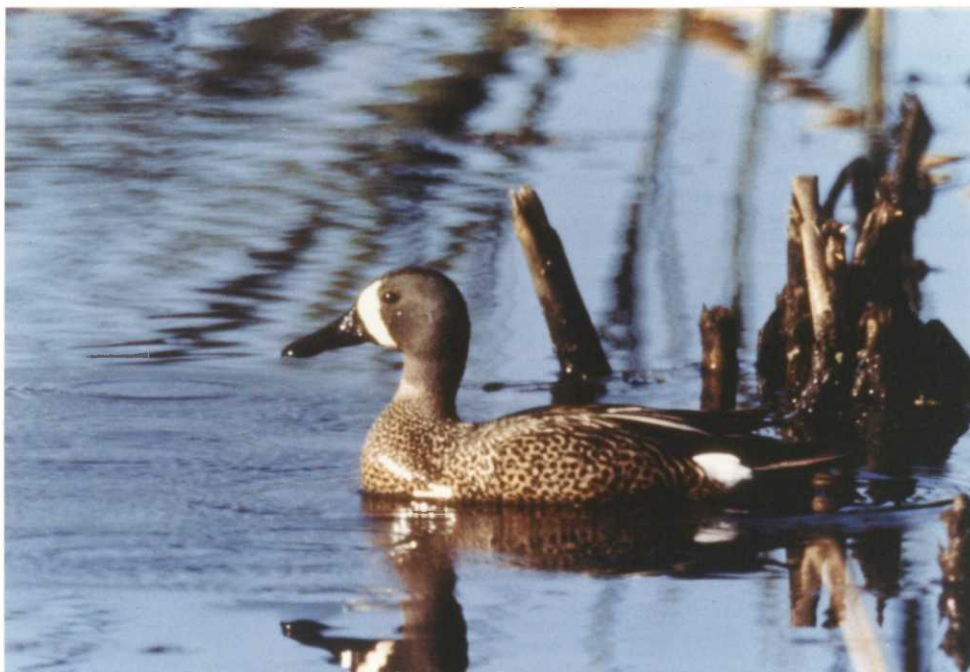
Outdoor education use on Sherburne increased this year, due largely to the efforts of local educator, Jim Olson. This group is enjoying lunch near the schoolhouse between sessions. (Jim Olson 10/88)

4. Interpretive Foot Trails

The Mahnomen and Blue Hill trails continued to receive heavy seasonal use. Hikers used them most in September when the insects were disappearing and the fall colors were arriving. Cross-country skiers waited for the winter weekends with fresh, fluffy snow, which was plentiful this year. Both trails consist of one interpreted loop and several uninterpreted loops.

The trails were maintained by refuge personnel, YCC, volunteers and a refuge neighbor who was hired to mow the trails twice during the summer growing season. Trail maintenance consisted mainly of tree removal and sign replacement. The signs and barriers at the Mahnomen trail parking area were vandalized frequently throughout the summer.

5. Interpretive Tour Route



Blue-winged teal are the most numerous nesting waterfowl species on Sherburne. Their courting antics create many enjoyable hours of wildlife observation each spring.

(Brad Johnson, volunteer, 6/88)

This was the first year the Wildlife Management Drive remained opened on weekends and holidays throughout the snow-free season. This twelve mile self-guided auto tour route allowed the public to view wildlife in a sanctuary area and to observe fire and water management in a variety of habitats. Leaflets, which interpret the drive, were available at the entrance near the Schoolhouse Information Center. This center was operated by volunteers from the St. Paul Audubon Society during peak use periods.

6. Interpretive Exhibits/Demonstrations

A "Duck Stamp Day" was held at the Schoolhouse Information Center on September 17, 1988 (opening day of the small game season). Displays on duck stamps, wetlands and "Take Pride in America" were erected in the schoolhouse. News releases were sent out encouraging people to "buy duck stamps - especially in drought years". Approximately 200 people came out to see the displays, but only 20 duck stamps were sold.

Three sites on the Wildlife Management Drive are interpreted through the use of signs. They emphasize grasslands, wetlands and woodlands habitat. This same management theme is repeated in other leaflets for Sherburne. These sites are used extensively and no vandalism has occurred on them in three seasons of use!

8. Hunting

Small game hunting activity hours increased in 1988 compared to 1987 (Figure 6). Deer and waterfowl hunter activity hours declined from 1987 to 1988.

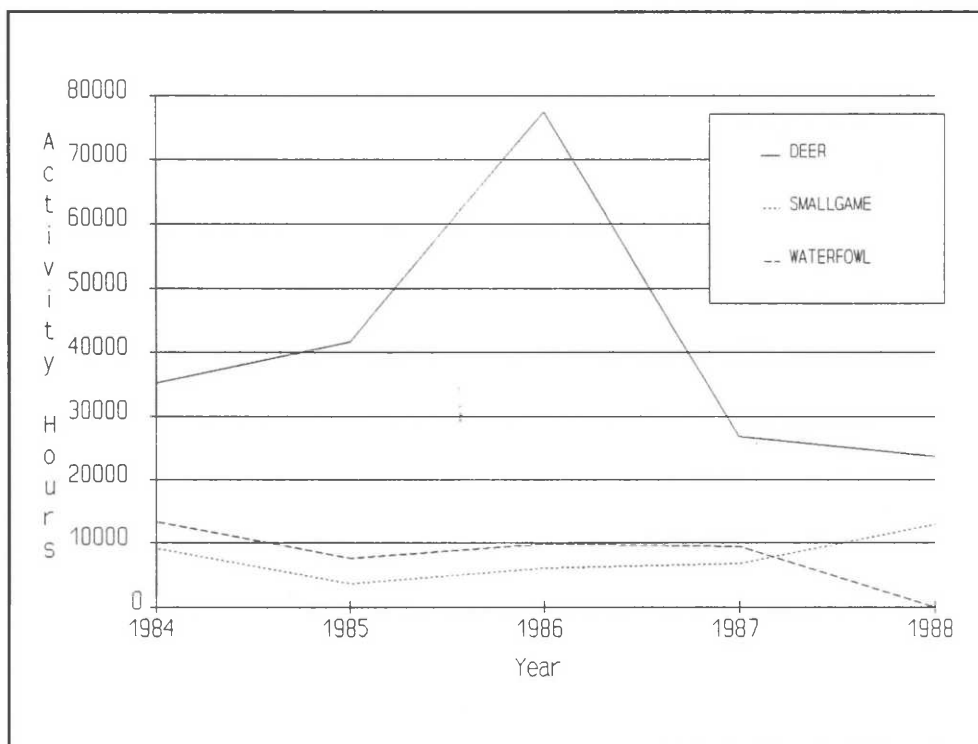
The waterfowl season was closed on the refuge due to the drought. Long Pool, the main hunting area, was one of the few remaining water areas on the refuge and it attracted and held a major portion of Sherburne's ducks. The age ratios were also heavily skewed towards adult birds (from banding data). The staff alerted the Regional Office to these facts and recommended the closure which was approved. Several hundred breeding wood ducks were saved for next year's production effort.

Firearms deer hunting continued to be the most popular hunting season. Three thousand hunters expended 16,000 activity hours pursuing whitetails. The season ran from November 5 - 13 with 200 antlerless permits.

Upland game hunting opportunities were limited due to low numbers of pheasants and ruffed grouse.

Bow hunters continued to increase their use of the refuge for deer hunting. December hunting was especially popular this year due to the snow cover and warm weather.

Figure 6. Hunter activity hours on Sherburne NWR 1984 - 1988.



9. Fishing

Fishing visits declined from 4,925 in 1987 to 1,990 in 1988. The daily entrance fee and low water conditions were both responsible for the drastic decline.

10. Trapping

Trapping of mink, muskrat and raccoon was permitted. Trappers were selected by sealed bid. Twelve of the 14 available trapping units were taken (Table 13). There were no changes in refuge trapping regulations from previous years.

Drought conditions reduced the reported trapping harvest substantially. Raccoon harvest was down 62%, muskrat harvest 38% and mink harvest 51%. Many trappers commented on the small amount of raccoon sign and several mentioned seeing sick raccoons. Speculation was that distemper was probably the cause of the raccoon population decline.

As in previous years, one person, trapped nuisance beaver throughout the year. He was also allowed to harvest beaver during the state season. Harvest for the year was 21 nuisance beaver and 24 during the state season.

Table 13. Unit bids and furbearer harvest of Sherburne's wetland trapping program - 1988.

Unit	Bids Accepted	Harvest		
		Muskrat	Mink	Raccoon
1	\$126.00	12	14	8
2	150.00	1	2	10
3	150.00	2	7	13
4	None			
5	None			
6	100.00	3	1	2
7	100.00	1	1	7
8	218.50	4	2	3
9	327.50	75	4	5
10	100.00	16	7	10
11	200.00	21	6	9
12	156.00	45	5	3
13	150.00	17	5	15
14	<u>156.00</u>	<u>20</u>	<u>9</u>	<u>15</u>
Totals	\$1934.00	217	63	100



Otters left this path across the St. Francis Pool in March. Two were also observed in the same area in September. They are rarely sighted on the refuge.

(BDE 3/88)

17. Law Enforcement

Vandalism increased markedly in 1988. Sixteen major vandalism acts were aimed at refuge facilities. Most of the incidents involved breaking locks on gates and/or smashing leaflet boxes. Most of the damage was aimed at the new entry fee program facilities. It all came to a head in October when unknown individuals broke into the three entry fee pipe safes, making off with an estimated \$300 and a safe with concrete footing, which weighed about 450 pounds. The fee system proved to be cost ineffective, and it was recommended that it be permanently suspended after this event. A final decision by the Regional Office on this recommendation is pending.

Several weeks later Manager Trainee Hanson discovered a burned car in the Mahnomen Trail parking lot. The case was turned over to the Sherburne County Sheriff's Office, who reported that the car had been stolen in Hennepin County. The number and nature of violations which were discovered during the year is summarized in Table 10.

Table 10. Summary of violations - 1988.

<u>Offense</u>	<u>Number</u>	<u>Pending</u>	<u>Warning</u>	<u>Fined</u>	<u>Total</u>
Hunting in closed area	12	2		10	\$1095
Hunting w/o safety clothing	1			1	\$ 49
Vehicle trespass	4	0	4		
Camping on Refuge	2		2		
Trapping in closed area	1		1		
Hunting without a license	2	1	1		
Possess protected species	<u>1</u>	<u>-</u>	<u>-</u>	<u>1</u>	<u>\$ 115</u>
Totals	23	3	8	12	\$1259

The manager and both assistant managers have enforcement authority. They completed the 40 hour refresher training in February and requalified with firearms at the St. Cloud Police shooting range in September.

Minnesota Conservation Officers regularly patrol county roads through the refuge. Scott Fildes patrols the northern part of the refuge and Dale Ebel, who replaced the retired Wayne Forsythe, patrols the south. Both officers have been extremely helpful.



YCC members responded to numerous instances of vandalism to refuge facilities, many of which were directed at the entry fee program. (KPS 7/88)

I. EQUIPMENT AND FACILITIES

2. Rehabilitation

Following the removal of Quarters 159 from the Maintenance Facility, the foundation was pushed in and covered. Other site rehab included removal of all boxelder trees, fencing, etc. and general landscaping. The entire area will be seeded to native grasses in the spring of 1989.

Three wells were abandoned during the year. These included the goose pen well and wells that served the Fox house and Quarters 159. Well abandonment was by Mork Well Drilling of Elk River at a total cost of \$600.00.



The house formerly occupied by Wesley Thompson was sold and moved off the refuge in August. It was the last residence on Sherburne. (KPS 8/88)

3. Major Maintenance

The extremely dry conditions facilitated the cleanout of a ditch extending from the central portion of the St. Francis Pool to a diversion structure (2A). The cleanout will improve the ability to divert water through the structure from the previous 992.0 elevation to 988.5. Essig Construction Company, Princeton completed the cleanout for a total cost of \$1475.00.

A one mile segment of the south loop of the Wildlife Management Drive was graveled. Class V gravel was purchased from and delivered by Elk River Landfill at a cost of \$4418.00.

The silo staves that served as a car wash pad were removed and a new concrete slab was installed for that purpose.



This newly rehabilitated ditch (2A) on the south side of St. Francis Pool will facilitate water diversion to several pools at lower pool levels. The dry year, again, proved to be an opportune time to accomplish this project. (KPS 8/88)

6. Computer Systems

The refuge computer hardware and software was upgraded considerably in 1988. Two IBM model 60 PS 2 computers with 70 mb hard disks were purchased. A Hewlett Packard Laserjet II printer and an IBM Quietwriter III printer were also purchased. One of the computers is also connected via modem to the telephone lines, providing telecommunications capability and access to electronic mail. This has been very useful in transmitting responses to requests with short turn around times to the Regional Office. An IBM Convertible III lap top computer was transferred to the refuge from the Regional Office. The lap top will be used to demonstrate the usefulness of a portable computer to field work, in particular the collection and computer entry of data in the field. As the staff becomes more computer literate, the demand for computer access will increase. To make optimum use of the technology, every staff member responsible for record keeping, correspondence preparation and data analysis should have a terminal on their desk.

J. OTHER ITEMS

1. Cooperative Programs

Winter Waterfowl Survey

Waterfowl and eagles were censused in the Mississippi River/Sherburne County vicinity in cooperation with the St. Cloud Wildlife Assistance Office on December 12-14, 1988. Waterfowl observed included 890 mallards, 69 common goldeneye, one common merganser, 2875 Canada geese and three trumpeter swans. One adult bald eagle was also seen.

Woodcock Singing Ground Survey

One woodcock singing ground survey route was censused in cooperation with the Wildlife Assistance Office. No woodcock were heard compared to one in 1987. Results of the statewide survey indicated an increase of 6.2% in breeding woodcock in Minnesota over 1987.

Big Game Registration Station

Volunteers and refuge personnel operated a deer registration station in cooperation with the MDNR. Registration of 121 deer was a decrease of 22.4% from last year. The primary reason for the decline was the reduction in the numbers of antlerless permits from 500 in 1987 to 200 in 1988.

Christmas Bird Count

The annual Audubon Society Christmas Bird Count was held on December 31. Eighteen observers tallied 1630 birds of 29 species.

On December 13, refuge staff met with representatives of a Benton County citizens group and Stan Smith of the St. Paul E.S. Field Office concerning a proposed solid waste disposal site. The site is within 1300 feet of the St. Francis River, the main water source for Sherburne NWR. The site is located approximately 8 miles northwest of the refuge. A multi-county commission is examining 3 sites as potential disposal sites for primarily ash from trash burned in a power plant. A final decision on selection of one site will be made in the spring of 1989. The citizens group is trying to stop placement of the disposal site in their area and is seeking information or support that will help stop the project. The refuge concern regarding the project and how it may affect the refuge water supply has been expressed to the commission.

3. Items of Interest

Discussions have been held with representatives of the Mille Lacs Band of the Chippewa Indians to discuss Indian hunting rights which may exist on Sherburne under an 1837 treaty. Solicitor's office personnel in the Regional Office and in Washington have been trying to locate

documentation which will show if Sherburne falls within the treaty boundaries. The refuge is located near the south edge of the treaty area and descriptions of the line are sketchy. The Indians would like to harvest deer on the refuge for ceremonial and subsistence purposes. By year's end, documentation pin-pointing the treaty boundary had not been located yet.

Jay Johnson attended the Fifth North American Crane Conference held at Lake Wales, Florida on February 23-25.

Wisconsin DNR Wildlife Managers Dave Evenson (Cumberland), Pat Savage (Spooner), Paul Kooiker and Jim Hoefler (Crex Meadows) toured the refuge in June. They felt that efforts to restore sharp-tailed grouse habitat on the refuge were progressing well.



Regional Director Gritman presented T-shirts to several WG employees at the Schoolhouse in December. Here Wes Thompson is accepting his shirt. (BDE 12/88)

4. Credits

Completion of the 1988 annual narrative report was a combined effort of the entire staff. The following individuals had these specific responsibilities:

Larson -----	A, D-4, E 5&7, I-6, J 2&3, K.
Johnson-----	C, D-2,G-1, G 4-10, 12-15 &17, I 1-5 & 7-8.
Ehlers-----	E 3&4, F-2, G-3, H 1-9&11-16, J-4.
Joarnt-----	B, F 1-9, H -10, J-1.
Hanson-----	D-5, E 1&2, E-6, F-10, G-2, 11&16, H-17.
Priess-----	Word Processing, Layout & Assembly

K. FEEDBACK

The success of a refuge management program is dependent upon a number of factors. Funding, local community support, acts of nature and basic productivity of the habitat all are important factors. However, the quality and dedication of our personnel is the most important factor. We sometimes fail to recognize our most important assets for successful refuge management. During the last few years, Region 3 and Refuges and Wildlife in particular, has placed considerable emphasis on employee recognition for quality performance. This is commendable and hopefully will continue.

Ron Papike was one of the many quality employees working for the Service. Under his ten years of leadership at Sherburne, the refuge water management facilities were developed and the habitat was transformed from former cropland and marginal wood lots to a diverse pattern of oak savanna, native grasslands and wetlands in a variety of successful stages. Ron set high standards and provided the example for those working with him to excel.

Ron was the first manager that I worked with when I entered the Service as a manager trainee at Sherburne. Through the years, I considered Ron a good friend and always considered him a standard upon which to judge what comprised a good refuge manager. Ron permanently influenced me as I am sure he influenced others in their careers with the Service. Ron is a testimonial to the quality Service employee and he will be missed by all who knew him.

Sherburne

National Wildlife Refuge
Minnesota



Legend

REFUGE HEADQUARTERS	
CHECK STATION—OLD SCHOOL HOUSE	
HIKING/X-SKI TRAILS	
FISHING ACCESS	
CANOE ACCESS AND ROUTE	
INFORMATION STATION	
PUBLIC RESTROOMS	
REFUGE BOUNDARY	
ROADS	
DIKES	
WILDLIFE MANAGEMENT DRIVE	

Getting To Sherburne

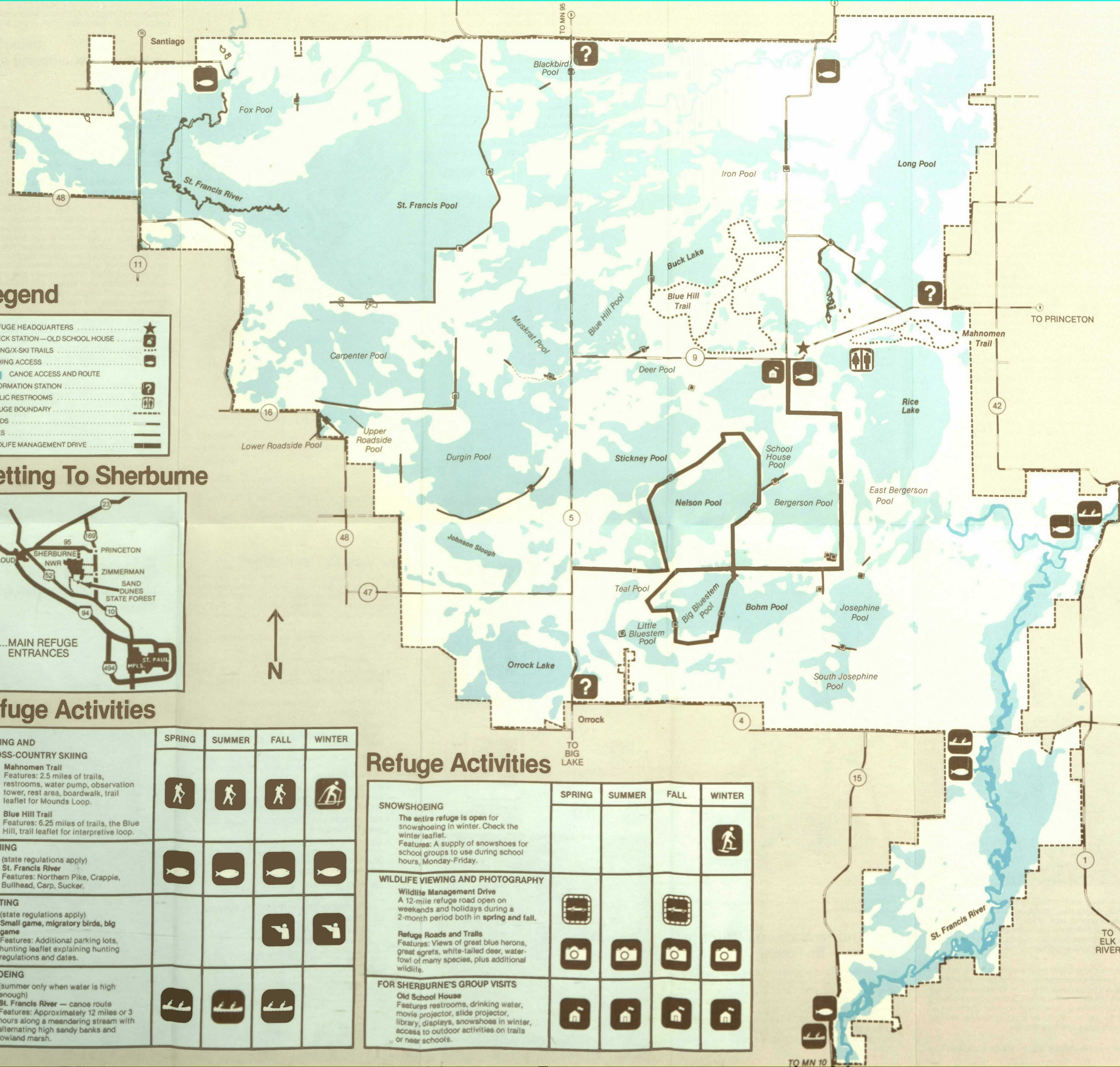


Refuge Activities

	SPRING	SUMMER	FALL	WINTER
HIKING AND CROSS-COUNTRY SKIING Mahnomen Trail Features: 2.5 miles of trails, restrooms, water pump, observation tower, rest area, boardwalk, trail leaflet for Mounds Loop. Blue Hill Trail Features: 6.25 miles of trails, the Blue Hill, trail leaflet for interpretive loop.				
FISHING (state regulations apply) St. Francis River Features: Northern Pike, Crappie, Bullhead, Carp, Sucker.				
HUNTING (state regulations apply) Small game, migratory birds, big game Features: Additional parking lots, hunting leaflet explaining hunting regulations and dates.				
CANOEING (summer only when water is high enough) St. Francis River — canoe route Features: Approximately 12 miles or 3 hours along a meandering stream with alternating high sandy banks and lowland marsh.				

Refuge Activities

	SPRING	SUMMER	FALL	WINTER
SNOWSHOEING The entire refuge is open for snowshoeing in winter. Check the winter leaflet. Features: A supply of snowshoes for school groups to use during school hours, Monday-Friday.				
WILDLIFE VIEWING AND PHOTOGRAPHY Wildlife Management Drive A 12-mile refuge road open on weekends and holidays during a 2-month period both in spring and fall. Refuge Roads and Trails Features: Views of great blue herons, great egrets, white-tailed deer, waterfowl of many species, plus additional wildlife.				
FOR SHERBURNE'S GROUP VISITS Old School House Features restrooms, drinking water, movie projector, slide projector, library, displays, snowshoes in winter, access to outdoor activities on trails or near schools.				



for food, cover, and reproduction. At Sherburne, these requirements are managed to support a diversity of wildlife within three main habitat types:

- Wetlands
- Grasslands, including oak savannas
- Woodlands

Each habitat type has its own management program.



Wetlands

Over 20 impoundments and natural lakes provide wetland homes for many species of wildlife including waterfowl, wading birds, shorebirds, mammals, frogs, turtles, and salamanders. Some of the more easily seen wetland species include the mallard, blue-winged teal, wood duck, great blue heron, red-winged blackbird, leopard frog, and painted turtle. The more persistent and cautious observer may spot some of our less conspicuous residents — common loon, American bittern, sora rail, one of 11 species of sandpipers, marsh wrens, beaver, mink, Blanding's turtle, or the blue-spotted salamander.

Although most of the wetlands are shallow and freeze out in the winter, some are capable of supporting populations of northern pike, panfish, minnows and

rough fish, which attract migrating ospreys and bald eagles. In 1983, a pair of bald eagles produced two eaglets, the first successful nesting of this species in central Minnesota in over 30 years.

Each Sherburne impoundment is managed by controlling the water level. Not all of the impoundments are kept at the same depth. These controlled fluctuations create a variety of habitats to provide for a diversity of wildlife requirements:

No Water

- Recycles nutrients and promotes growth of vegetation for waterfowl food when the impoundment is later flooded.
- Kills rough fish which create turbid water, reducing the growth of submergent aquatic plants used by waterfowl as food.

Shallow Water (less than 18" deep)

- Provides habitat for wading and shorebirds.
- Encourages growth of emergent aquatic plants for waterfowl food.

Deep Water (more than 18" deep)

- Provides resting areas for migrating waterfowl.
- Creates areas where waterfowl can feed on aquatic insects and the seeds of emergent vegetation.
- Provides protection for waterfowl broods from terrestrial predators.
- Provides habitat for muskrats which, in turn, provide nesting and loafing sites for waterfowl and prevent an overgrowth of marsh vegetation.

Grasslands

Surrounding Sherburne's wetlands are cattails and marsh grasses, which are replaced by prairie vegetation as one moves onto the drier uplands. Here Sherburne is reestablishing prairie grasses and flowers that once dominated the oak savannas found by early pioneers when they arrived in the area.

In the oak savanna plant community, occasional oaks and low shrubs are dominated by expanses of tall grasses and colorful prairie flowers.

Several species of wildflowers, such as blue lupine, hoary puccoon, and Indian paintbrush, are found in the refuge at the easternmost limits of their range. The sandy soils on Sherburne provide well-drained growing conditions for these plants, which are more typically found in more arid regions of the west.

Sherburne's oak savannas and grasslands are maintained by prescribed burning. Burning serves two primary functions. It encourages the growth of native flowers and warm season grasses such as big and little bluestem, Indiangrass, and switchgrass, providing food and cover for nesting waterfowl and upland wildlife. It also reduces competition from exotic cool season grasses and encroaching trees and shrubs.

Because of these management practices, Sherburne's grasslands show increasing use by waterfowl, openland raptors, sandhill cranes, songbirds, and coyotes.

Woodlands

In the absence of fire, the oak savannas developed into dense stands of trees which eventually shaded out the sun-loving prairie plants. Violets, anemone, bellwort, and other woodland flowers now grow on the forest floor.



Wildlife found here include ruffed grouse, woodcock, squirrels, chipmunks, rabbits, white-tailed deer, and an occasional bobcat, bear, or fox. From the tiny multipede on the forest floor to the stately oak dominating the forest overstory, Sherburne's woodlands are complete, self-sustaining animal and plant communities.

Sherburne's woodlands are managed to preserve native trees. Several exotic species, such as jack pine and blue spruce, are being removed in order to restore the natural diversity of habitat and to reduce potential hazards during prescribed burning. Snags and downed timber are retained for use by wildlife for roosting, loafing, nesting, hunting, feeding, and food storage.

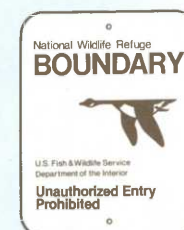
Occasional prescribed burns reduce woodland fuel

buildup which, if touched off in a wildfire, could destroy valuable wildlife habitat.

Sherburne National Wildlife Refuge — Its Future

The wildlife habitat management techniques practiced on Sherburne National Wildlife Refuge are well on their way to restoring the wildlife values of the St. Francis River area to what they were when white man first arrived here. At the same time, Sherburne is now an important link in a chain of refuges operated by the U.S. Fish and Wildlife Service along the Mississippi flyway — an ancient highway for migratory waterfowl in the central United States.

Refuge Signs— Know Their Meaning



REFUGE BOUNDARY—
UNAUTHORIZED ENTRY
PROHIBITED



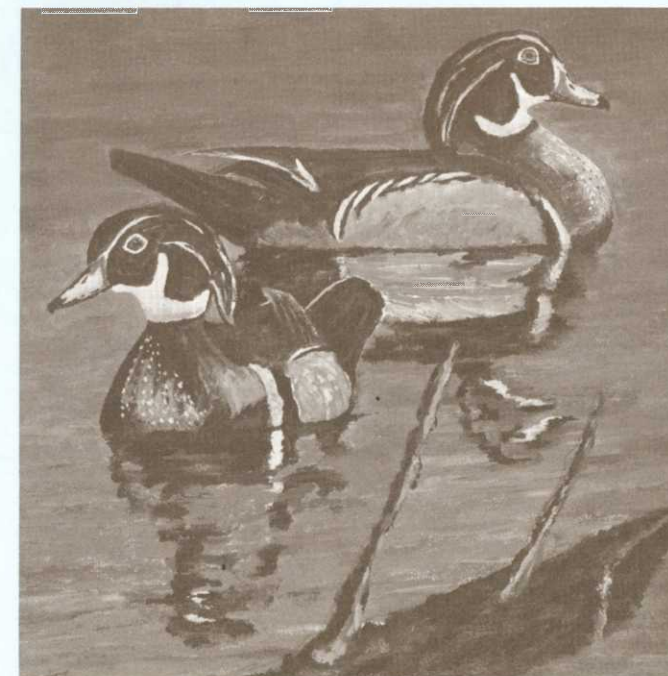
ALL PUBLIC ENTRY
PROHIBITED IN POSTED
AREA



PUBLIC FISHING AREA
DURING DESIGNATED
SEASON DATES



AREA OPEN TO
HUNTING AT SPECIFIC
TIMES



Your Visit To The Refuge

Sherburne welcomes visitors interested in viewing wildlife or in taking part in a variety of recreational and educational activities related to wildlife. Please observe the following regulations, which have been created for your safety and that of the wildlife you have come here to see.

- The refuge is open for your use during daylight hours.
- No off-road vehicle travel is permitted.
- Camping is not permitted on the refuge. Several public and private campgrounds are located nearby.
- All Minnesota fishing season regulations are in effect on the refuge.
- Canoes and boats without motors are allowed on the refuge on the designated route indicated on the leaflet map.
- All fishing, including ice fishing, is confined to the St. Francis River. Access to the river is noted on the leaflet map.
- Firearms and bows are permitted only during the hunting season for purposes of hunting. Refer to the refuge hunting leaflet for further information.
- Pets must be on leash except for dogs that are used for hunting.
- Both cross-country skiing and snowshoeing are permitted throughout the refuge except for the Blue Hill and Mahnomen Trails, which are open only to cross-country skiing.

For more information, contact:

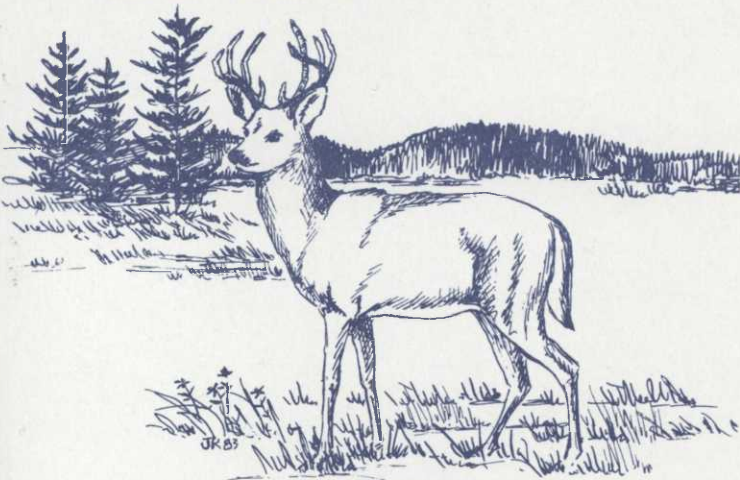
Refuge Manager
Sherburne National Wildlife Refuge
Route 2
Zimmerman, MN 55398
Phone: (612) 389-3323

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.



BLUE HILL

trail



Sherburne
National Wildlife Refuge/MN

WELCOME

The Blue Hill Trail features four vigorous hiking loops ranging from 1½ miles to almost 2¼ miles in length. Use this leaflet as a guide to the interpretive stations along the shortest loop — the green loop.

Be alert for possible sightings of wildlife such as deer, squirrels, raccoons and many species of birds. While you enjoy your hike, please remain on the trail to protect the vegetation. Make your passage without leaving signs.

BLUE HILL TRAIL

1) AN INDIAN REMEDY-AMERICAN SPIKENARD

This stout perennial of rich woodlands often reaches up to 6' high. Small greenish-white flowers grow along a central stem. They are followed by small purple berries. The thick, fleshy, aromatic roots and roots-stock have been used to make tea and flavor root beer. American Indians pounded the root to prepare a poultice for treating external wounds, bruises and chest pains.

2) RED MAPLE

The Red Maple grows rapidly, especially in moist to swampy soils, and often reaches 70' in height. This particular maple and most of the ones you find in this woods are rather small. The competition for sunlight with the oaks has limited its growth to an understory plant. The tree gets its name from the reddish leaf stems and the fact that its leaves turn red in the fall.

3) KAME-A GRAVEL MOUND

Have you noticed the large stones that are visible along this portion of the trail? Rocks of this size are not a common sight at Sherburne. They were transported and deposited by glacial activity that occurred approximately 10,000 years ago during the Wisconsin ice age.

This part of the trail passes by Blue Hill which is believed to be a "kame", a large glacially formed mound of sand and rock that collected in holes or cracks in the ice.

4) SMOOTH SUMAC

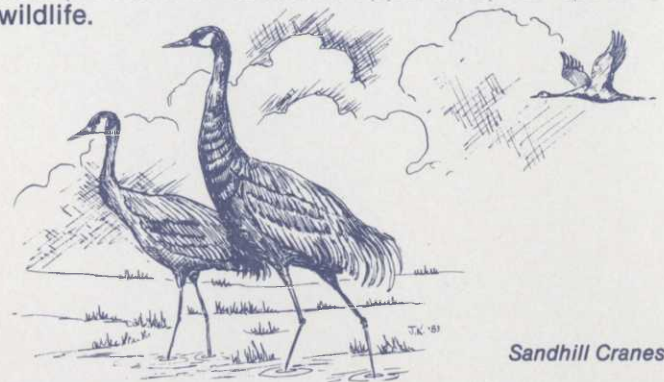
Sumac is a small tree or shrub that usually grows next to a wooded edge. The thick shoots often invade prairie areas and begin the succession of prairie to woodland. It is also an important winter food for a variety of wildlife such as ruffed grouse, pheasants, songbirds, rabbits and white-tailed deer.

5) OLD GRAVEL PIT

This small depression is the site of an old gravel pit. During the early 1950's, the farmer that owned this land hauled gravel from this area for road building. Notice how the vegetation is slowly camouflaging the area.

6) WILDLIFE VISTA

Quietly scan the area. You may see browsing white-tailed deer, a hunting raptor, or a sandhill crane. This old field provides an excellent opportunity for spotting wildlife.



Sandhill Cranes

7) SPRUCE PLANTATION

This plantation consists mainly of white spruce. Close examination of the sharp, stiff needles reveals that they are not round but four-sided. The trees were planted by farmers 30-50 years ago to serve as windbreaks for crops and to decrease wind erosion of the sandy soil.

8) A GIANT SANDBOX-ANOKA SAND PLAIN

Most of the refuge is covered by this rather fine sandy soil. This sand or outwash called the Anoka sand plain was deposited by glacial meltwater flowing from a retreating glacier.

9) SOUNDS AND SMELLS

Pause for a moment and listen to the eerie whistling created by the wind as it passes through the spruce trees. Let your nose absorb the fragrant scent.

10) LANDMARK AND LEGEND-BLUE HILL

In the distance, you see Blue Hill which rises approximately 90' above the surrounding terrain. The hill served as a landmark for Indians and early settlers. Legend has it that an army paymaster, during the Civil War, was enroute to Camp Ripley with the payroll. Fearing an Indian attack, he allegedly buried the payroll on Blue Hill.

11) ICE BLOCK LAKE

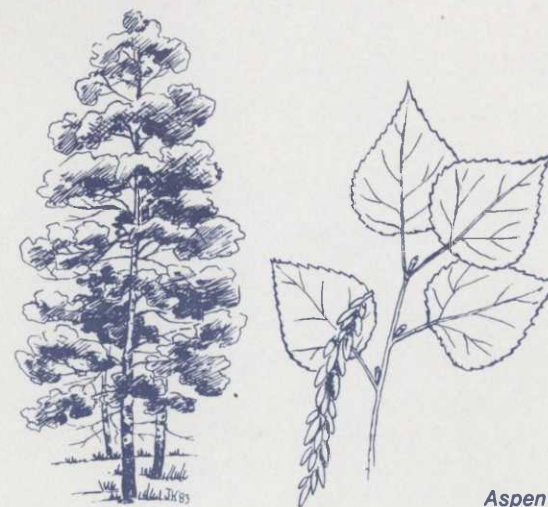
Buck Lake is one of the few natural lakes within the refuge. The basin was formed by a large stagnant ice block that separated from a retreating glacier. The ice block was covered by sand called outwash. When the ice melted, it left a basin or pit which then filled with water.

12) AN UNUSUAL RIDGE

This small ridge or the shore of Buck Lake probably is an ice rampart. When lake ice freezes, it attaches itself to the shore and to the bottom of shallow lakes. A rapid fall in air temperature causes the lake ice to contract. Since it cannot pull away from the shore to which it is frozen, tension cracks develop in the ice. Repeated expansion and contraction of the ice forms a ridge from loose and yielding shore material.

13) ASPEN TREES

One of the most widely distributed trees in North America, the quaking aspen also is known as popple and trembling aspen. It is found throughout Canada, the northern United States and the western mountain ranges.

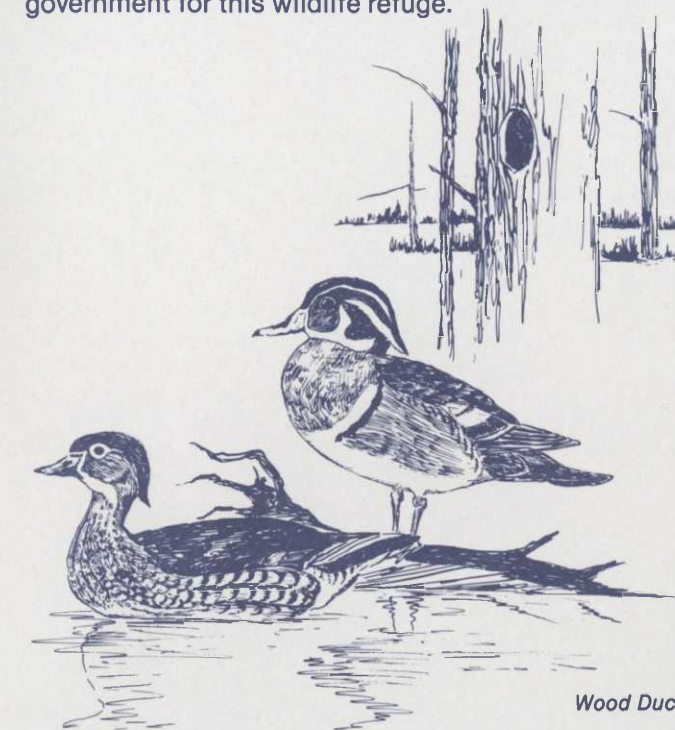


Aspen

Aspens are important food trees for many kinds of wildlife. The buds and catkins are valuable winter and spring foods for ruffed grouse. Deer feed upon aspen twigs and foliage. Rabbits feed on both bark and foliage and porcupines relish the bark. The aspen is preferred food of the beaver, making up a fourth to half of its diet.

14) SKI RUN

Can you locate the notch on Blue Hill? The notch is a reminder of trees being cleared for skiing. The three ski runs on Blue Hill closed in the early sixties when neighboring residents were concerned with liability. A few years later, the land was purchased by the federal government for this wildlife refuge.



Wood Duck

15) DRAINAGE DITCH

The footbridge passes over a ditch that was constructed around 1906 by the county to drain wetlands and provide more farmland. A few miles to the east, the water empties into the St. Francis River.

Today, ditch plugs and dikes are being constructed to create more wetlands. Over 20 impoundments have been developed to provide more wetland habitat for wildlife.

16) A YOUNG FOREST

Compare the trees and the ground vegetation to what you saw along the beginning of the trail near Blue Hill. Here the oak trees are much smaller, but grass is still able to get enough sunlight to survive. As the trees grow larger and block out more sunlight, the grass will give way to plants that can thrive on less sunlight.

17) WOODLAND MARSH

Marshes are more than mosquito breeding grounds. They provide water, food, and habitat for a variety of wildlife. They also function as filters, removing pollution sediments from water flowing through them. Nutrients in the water are broken down by bacteria and other microbes and absorbed by plants.

18) EVIDENCE

This mud provides more than a place to get your shoes dirty. Examine the area carefully for signs of wildlife that probably passed here on their way to drink. Can you find any tracks of deer, raccoons, or squirrels?

19) BLACK CHERRY

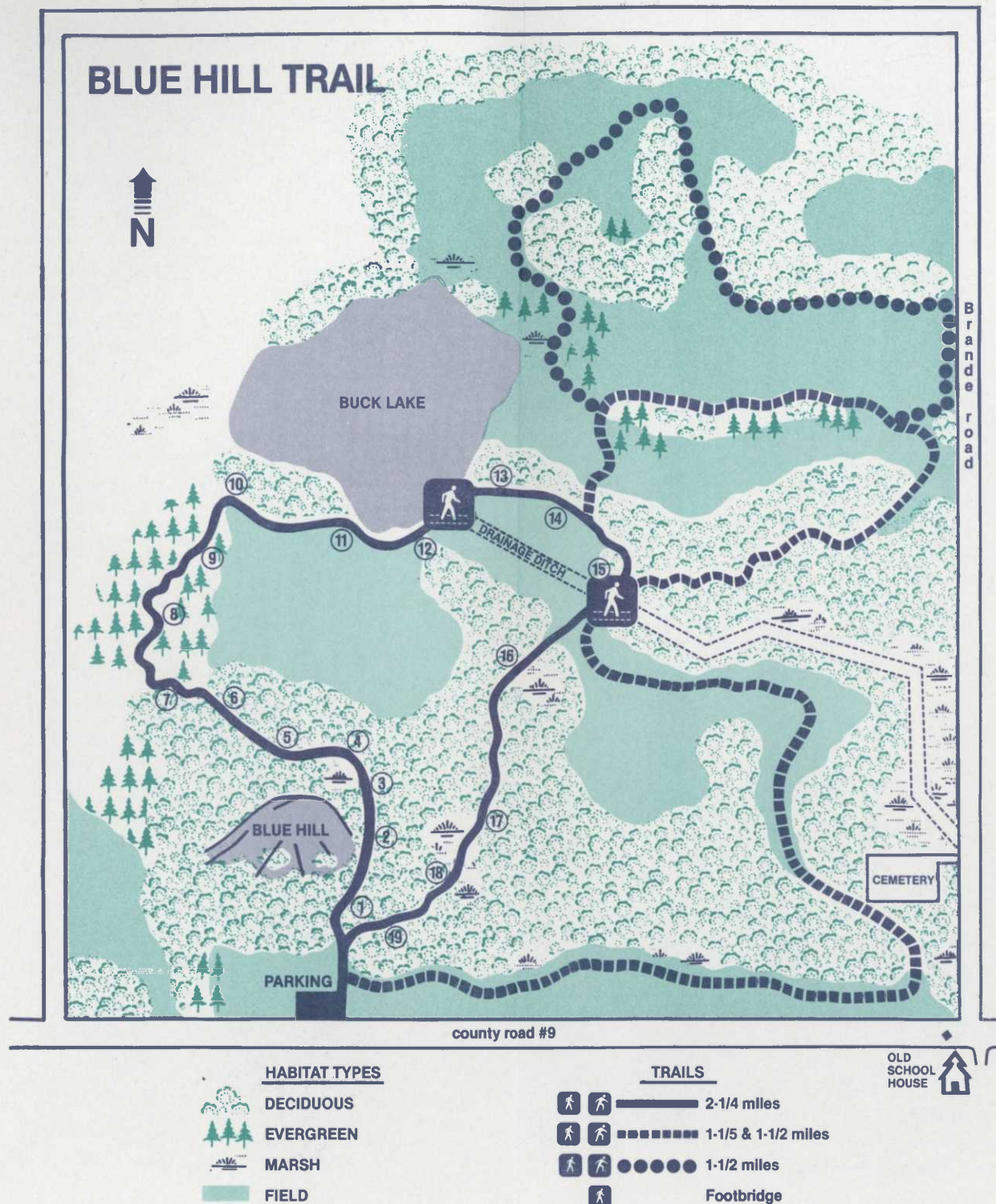
The black fruit which begins to ripen in summer is eagerly sought by wildlife, especially birds. This particular tree probably was used by yellow-bellied sapsuckers. The birds typically make numerous aligned holes in tree bark.

We hope you have enjoyed your hike along the Blue Hill Trail. Please don't litter the refuge with this leaflet. Take it with you or return it to the box so that others can share it.

Trail maintained in cooperation with the St. Paul Audubon Society.

For more information, contact:

Manager
Sherburne National Wildlife Refuge
Rt. 2
Zimmerman, MN 55398
Phone: (612)389-3323



MAHNOMEN

trail



Sherburne
National Wildlife Refuge/MN

WELCOME

Welcome to the Mahnomen Trail on Sherburne National Wildlife Refuge. "Mahnomen" is an Ojibwa word for wild rice which used to grow abundantly in nearby Rice Lake.

The trail has three loops designed to let you choose your walking distance as you visit the variety of wildlife habitats present on the refuge. The mile-long mounds loop contains interpretive stations, described in this leaflet. The 3/4 mile marsh loop features a floating boardwalk that takes you through the middle of a woodland marsh. The 3/4 mile hiker's loop gives you a chance to stretch your legs and absorb the quiet beauty of nature.

Take your time and enjoy the wildlife as you hike the trail. Please remain on the trail to protect the vegetation. Take only pictures and leave only footprints.

MAHNOMEN TRAIL

1) GRASSLAND

Grasslands play an important role in wildlife management. They provide habitat for nesting waterfowl such as mallards and teal. Other wildlife that use grasslands include pheasants, grouse, deer, songbirds and birds of prey. Refuge staff plants big bluestem, little bluestem, Indian grass and switchgrass to help restore native prairie.

2) COMMON IRRITANT - POISON IVY

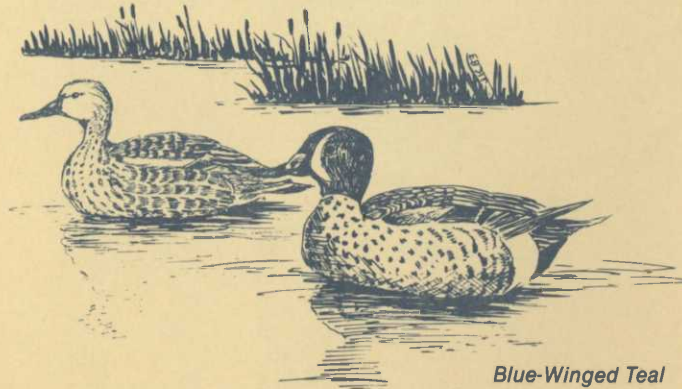
Do not touch it! Learn to recognize this plant. Poison ivy contains a poisonous resin. Contact with **any part** of this plant can result in a severe skin rash. The plant has three highly variable leaflets which can appear glossy or dull and toothless or sawtoothed. Near the base of the woody stem grows clusters of greenish-yellow to white berries. Wildlife can eat this plant with no reaction at all.



Poison Ivy

3) RICE LAKE

This lake got its name from the wild rice that grows in its waters. This 600 acre wetland habitat is fed by water from the St. Francis River. During spring and fall migration, waterfowl such as mallards, teal and Canada geese, pause at Rice Lake to rest and feed. The lake is also an ideal spot for summer resident ducks to raise broods.



Blue-Winged Teal

4) ANCIENT INHABITANTS

In prehistoric times, this area was the location of an Indian village. Archeologists have found fragments of clay cooking pots, broken stone tools, and weapons such as knives, scrapers and arrowpoints. Archeologists believe these artifacts are from the Late Woodland period (500 A.D.) or the early Protohistoric period (1500 A.D.). Help preserve these ancient historical sites.

5) WILDLIFE SNACK - HAZELNUT

American Hazelnut is a tall shrub associated with oak woods. It has rough, hairy, double-toothed leaves. Like birch trees, it produces thin, elongated flower structures called catkins. The fruit is a husk-enclosed nut which begins to develop during the early summer. It is popular with both wildlife and people in late summer and fall.

6) ANCIENT CEMETERY

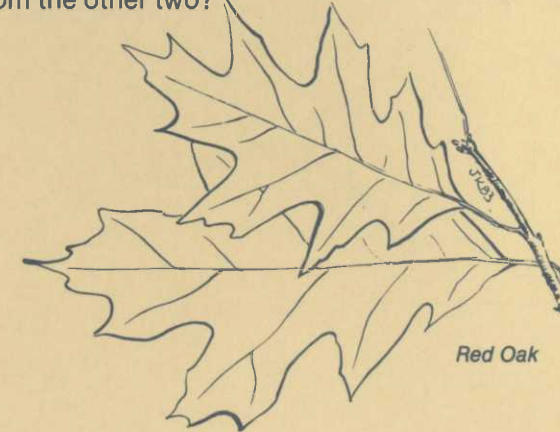
The mounds you see along the shore of Rice Lake are Indian burial mounds. A survey of thirty-four mounds indicates that there are at least two types. Archeologists believe that some of the mounds were built at different time periods and perhaps by different tribes. Rice Lake attracted wildlife, and ancient people were drawn to this source of plentiful food and clothing.

7) A BETTER LIFE?

As you pause at this bench, try to imagine what life in this woods might have been like two hundred or two thousand years ago. How would you survive the severe Minnesota weather? What types of berries, plants, roots and animals do you see here which you might hunt and devour? These woods can remind us of the essentials for life which we share with plants and animals.

8) SHERBURNE OAKS

This woods contains four different types of oak trees: red, white, pin and bur. How many of these oaks can you locate here or along the trail? Notice red and pin oaks have pointed lobes and that they hold their leaves throughout winter. How are red and pin oaks different from the other two?



Red Oak

9) A VANISHING ACT - BLUEBERRIES

This low woody shrub which provides a tasty treat for people and wildlife was probably once abundant in this area. As the surrounding forest trees matured, less sunlight filtered through the canopy to reach the forest floor. As a result, blueberries probably will not be growing here in a few years — unless some trees fall over or a fire occurs, which would provide plenty of sunlight once again.

10) OLD FIELD SITE

This area was farmed until the early 1960's when the land was acquired by the federal government for a wildlife refuge. The refuge staff is restoring fields such as this to the condition they were in before the settlers arrived. Restoring native prairie grass is for the benefit of wildlife. Wildlife management begins with habitat management.

11) NATIVE PINE - EASTERN WHITE PINE

The White Pines that you see along the trail were planted by an earlier landowner. These trees can be recognized by their thin needles growing in bundles of five.

White pine were once part of the mixed conifers/deciduous forest that scientists believe grew in scattered locations at Sherburne during pioneer times. For this reason white pines are being preserved at Sherburne.

12) PINE PLANTATION

Compare the vegetation that grows beneath these pines with the vegetation beneath the oaks on the opposite side of the trail. These red or Norway pine, with long needles that grow in bundles of two are not native plants.

When these trees were planted by farmers 30-50 years ago, the trees were very useful in providing windbreaks for crops. Today, however, they reduce the amount of food and cover available to wildlife. So, they are being thinned or removed.

13) OAK ENCROACHMENT

Can you spot the small oak trees in the meadow before you? This grassland is evolving to woodland as the trees slowly shade out the grasses. To prevent some grasslands from becoming woodlands the refuge staff uses fire to set back the invasion of trees and other woody plants, as well as control non-native grasses.

Now, properly timed, controlled burning is used under select weather conditions to maintain grasslands. A fire's ashes also return nutrients locked up in the grasses back to the soil as a natural fertilizer to increase soil fertility.

You have completed the Mahnomen Trail tour. We hope you have enjoyed your visit. If you do not want to keep this leaflet please return it to the box.

Trail maintained in cooperation with the St. Paul Audubon Society.

For more information, contact:



Manager
Sherburne National Wildlife Refuge
Rt. 2
Zimmerman, MN 55398
Phone: (612)389-3323



RESTROOMS



OBSERVATION TOWER



REST AREA



BOARDWALK



TRAILS

Mounds Loop — 1 mile

Marsh Loop ■■■■ .75 miles

Hikers Loop ●●● .756 miles



HABITAT TYPES

Deciduous



Marsh



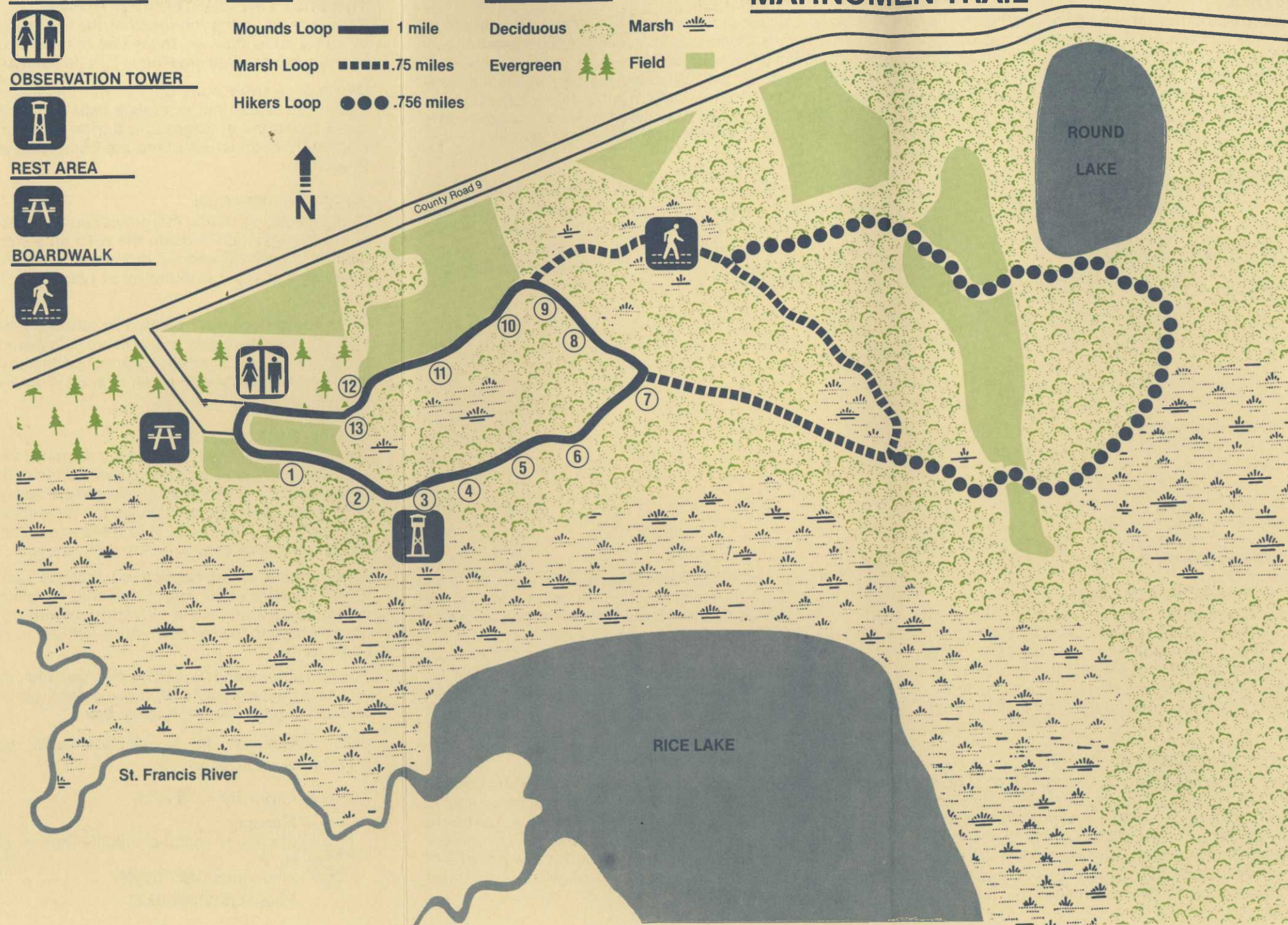
Evergreen



Field



MAHNOMEN TRAIL



MAHNOMEN

trail



Sherburne
National Wildlife Refuge/MN

HUNTING

ENTIRE REFUGE CLOSED TO
WATERFOWL HUNTING

MAP & REGULATIONS

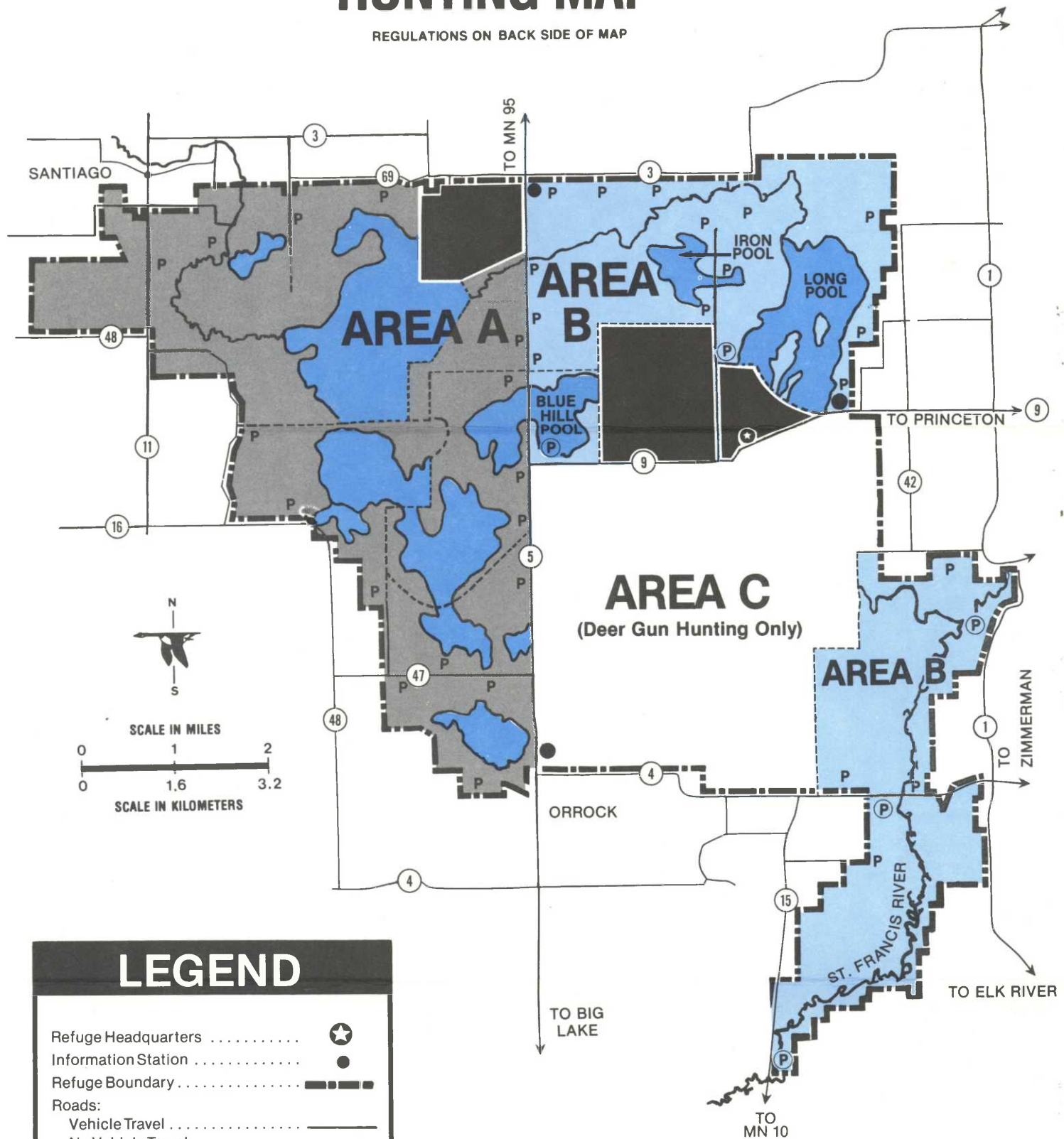


SHERBURNE

National Wildlife Refuge/MN

HUNTING MAP

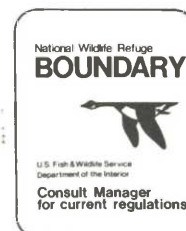
REGULATIONS ON BACK SIDE OF MAP



LEGEND

Refuge Headquarters	★
Information Station	●
Refuge Boundary	— — — — —
Roads:	
Vehicle Travel	—————
No Vehicle Travel	- - - - -
Parking Areas	P
Boat Access	Ⓟ
Closed to All Hunting	■
Area A:	
Open Hunting:	■
Except Migratory Birds	
Area B:	
Open Hunting:	■
Area C:	
Deer Gun Hunting Only	□
Impoundments & Lakes	■

REFUGE SIGNS — KNOW THEIR MEANING



REFUGE BOUNDARY
SIGN—UNAUTHORIZED
ENTRY PROHIBITED



AREA OPEN TO
HUNTING AT
SPECIFIC TIMES



SANCTUARY AREA—
OFF LIMITS TO
THE PUBLIC UNLESS
OTHERWISE SPECIFIED

Hunting Regulations

SMALL GAME

Ruffed Grouse
Gray & Fox Squirrel
Rabbit & Hare
Pheasant

AREA A
STATE SEASON
STATE SEASON
STATE SEASON
STATE SEASON

AREA B
STATE SEASON
STATE SEASON
STATE SEASON
STATE SEASON

AREA C
CLOSED
CLOSED
CLOSED
CLOSED

MIGRATORY BIRDS

Ducks, Coots & Geese
Rails
Woodcock
Wilson's Snipe

CLOSED
CLOSED
CLOSED
CLOSED

STATE SEASON
STATE SEASON
STATE SEASON
STATE SEASON

CLOSED
CLOSED
CLOSED
CLOSED

BIG GAME

Deer (Bow & Arrow)
Deer (Shotgun: Antlered
Bucks Only)
Deer (Shotgun: Antlerless Permit)

STATE SEASON

STATE SEASON
STATE SEASON

STATE SEASON

STATE SEASON
STATE SEASON

CLOSED

STATE SEASON
STATE SEASON

ENTIRE REFUGE CLOSED TO
WATERFOWL HUNTING



HUNTING ON THE REFUGE IS IN ACCORDANCE WITH STATE AND FEDERAL
REGULATIONS SUBJECT TO THE FOLLOWING SPECIAL CONDITIONS:



SPECIAL CONDITIONS

- **NO TARGET OR INDISCRIMINATE SHOOTING
- STEEL SHOT REQUIRED TO HUNT DUCK, COOT AND GEESE
- Field possession of migratory birds is prohibited in areas of refuge closed to migratory bird hunting.
- Only non-motorized boats can be used and must be launched at designated access sites.
- Decoys and boats must be removed from the refuge at the end of each day.
- Blinds must be removed at the end of each day except for blinds made entirely of marsh vegetation.
- Only portable stands may be used, and they must not be left overnight.
- Park vehicles only in designated parking areas.
- Overnight camping and open fires are prohibited.
- All vehicle travel is prohibited except on designated roads and parking areas (see map).
- Please report any accidents or injuries to the Refuge Manager at the Headquarters on County Road 9, Monday through Friday, phone 612/389-3323.

RF-3-32550-6-2/88