

MISSISQUOI NATIONAL WILDLIFE REFUGE

ANNUAL NARRATIVE REPORT
CALENDAR YEAR 1985

NATIONAL WILDLIFE REFUGE SYSTEM
FISH AND WILDLIFE SERVICE
U.S. DEPARTMENT OF THE INTERIOR

REVIEW AND APPROVALS

MISSISQUOI NATIONAL WILDLIFE REFUGE

Swanton, Vermont

ANNUAL NARRATIVE REPORT

Calendar Year 1985

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3/13/86
Date

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Regional Office Approval

3/31/86
Date

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U.S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

INTRODUCTION

The Missisquoi National Wildlife Refuge includes most of the Missisquoi Delta where it enters Missisquoi Bay which is part of Lake Champlain. The refuge is situated in the northeast corner of Vermont. The refuge boundary is within a few hundred yards of the Canadian border.

The total refuge area consists of 5,839 acres. Habitat types are diverse. A total of about 5,200 acres are in various wetland types, freshwater marsh and open water 1,619 acres, woodland and shrub swamp 3,580 acres. The remainder consists of hayfields and old fields undergoing succession, 520 acres, and about 108 acres of commercial forests. Administration lands for roads, buildings, etc. take up about 12 acres.

The floodplain and marshes of the Missisquoi Delta provide a major resting and feeding area for migrating waterfowl. Waterfowl production is also an important activity. Nest boxes supplement natural cavities for wood ducks, common goldeneyes and hooded mergansers. Nesting habitats for black ducks and other ground nesting waterfowl is limited by usually high water during the Spring.

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A. HIGHLIGHTS

- Major changes in the refuge waterfowl hunt program are implemented.
- The refuge is designated a non-toxic shot zone.
- A new barge is purchased to facilitate habitat maintenance.
- A potable water well is drilled at refuge headquarters.

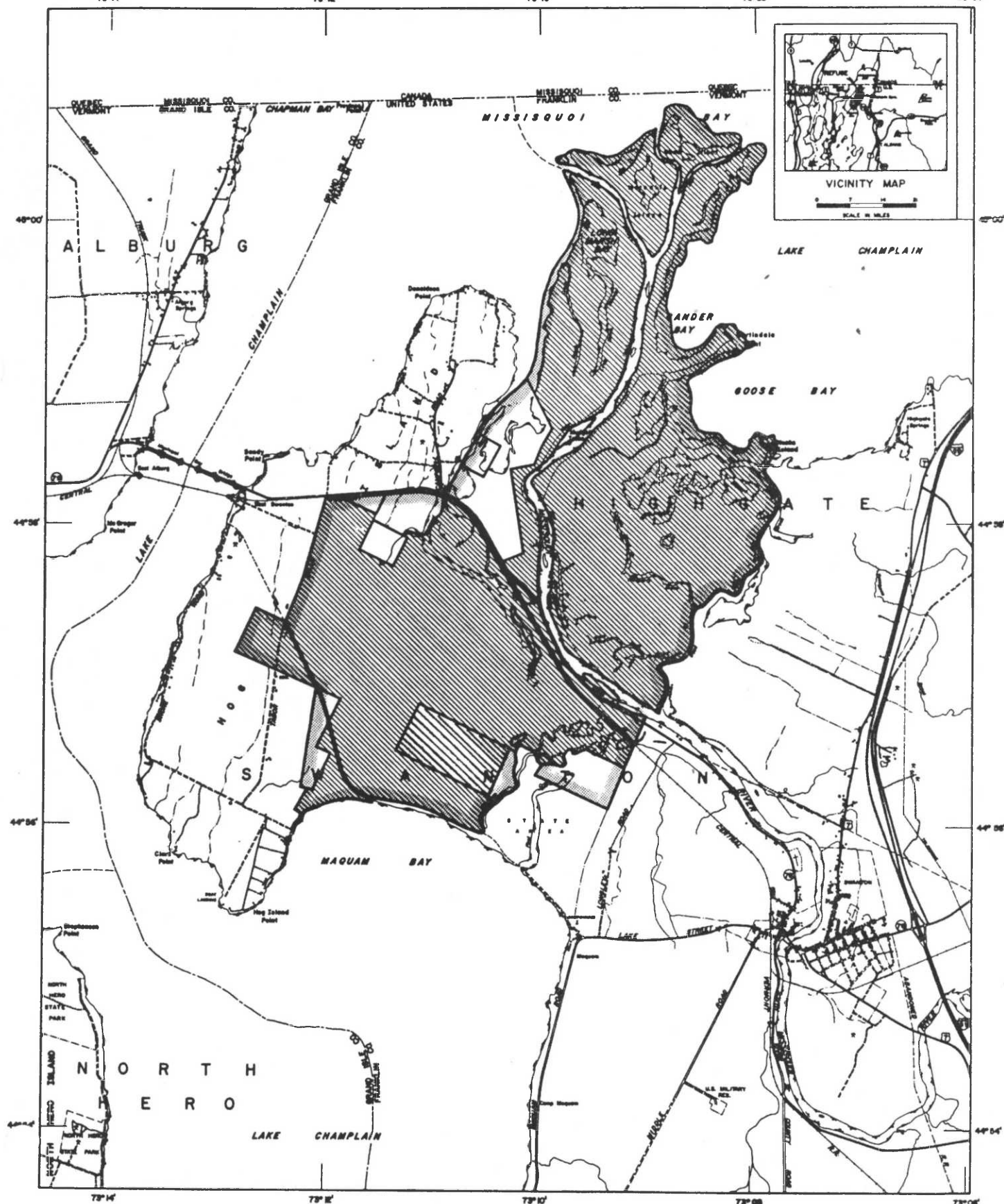
MISSISQUOI NATIONAL WILDLIFE REFUGE

MAP #1

FRANKLIN COUNTY, VERMONT

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH AND WILDLIFE SERVICE



COMPILED IN THE BRANCH OF ENGINEERING FROM
SURVEYS AND AERIAL PHOTOGRAPHS OF 1968
BY U.S. AND F.W.S.

BOSTON, MASSACHUSETTS
REV. 801118

FEBRUARY, 1968

Scale 0 1 2 3 4 5 6 7 8 9 10 MILES

MEAN
DECLINATION
1985

B. CLIMATIC CONDITIONS

Nineteen-eighty-five maintained a generally cooler summer season than 1984, with the peak high temperatures only reaching 95°F; unlike the peaks of 100°F and 102°F reached in July and August of last year. The cold season peak was -25°F (during February), lower than 1984's - -21°F; however, the months of January through March, 1985, were generally warmer than in 1984. The severity index (annual averages) shown on Table 1 also reflects the above temperature trends for 1985 when compared with the index for 1984 (High = 72°F, Low = 14°F, Average = 46°F).

The overall climate of 1985, however, is in keeping with the trend of the last five years in this area. That is, toward milder, shorter winters and a longer warm season.

The ice break-up on the Missisquoi River was a gradual one again this year. As a result, no ice jams and subsequent Spring flooding took place within the floodplain where the headquarters office is situated. The majority of refuge waterways and impoundments were free of ice by the end of March; however, the bays and Lake Champlain vicinity remained ice-locked until the second week of April.

During November, the interior and lakeshore marshes first froze over on 11/15, but subsequently reopened during milder temperatures. The second freeze occurred on 11/20, after which all water surfaces remained iced up for the rest of 1985. The first snowfall (approximately 2") took place soon after, on 11/22. Complete "ice-up" occurred during mid-December of 1985.

During 1985, Lake Champlain water levels continued the usual seasonal fluctuations of peaking during the spring, subsiding during the summer and early fall, and rising again during the later fall and winter. A lack of rainfall during August (Ref. Table 1) contributed to a general decline in lake levels to an annual low of 94.76' MSL, well below the August, 1977-1984 average low of 95.11'. Lake levels had not dropped so low since August, 1977, when they reached a mean sea level of 94.73'. The peak high lake level of 98.16' MSL was reached during May 23-24; well below the 1977-1984 average high of 99.86' MSL. The lack of rainfall in August was compensated for by a heavy rainfall in late September

(1.84") which resulted in the issuance of flood warnings throughout northern Vermont. Above average rainfalls during early October also served to offset the low rainfall of August, so that the lake levels had returned to near average levels by mid-October. By the end of 1985, lake levels were at 96.20' MSL.

Table 1 provides additional specific data relating to precipitation, monthly high and low temperatures, average monthly temperatures and annual average temperatures ("severity index").

TABLE 1 - 1985 CLIMATIC CONDITIONS*

MONTH	TEMPERATURE (°F)			PRECIPITATION ^a (inches)	
	HIGH	LOW	AVERAGE	RAIN	SNOW
January	44	-11	10.2	---	16.5
February	44	-25	20.4	1.66	2.0
March	58	-6	29.6	1.68	9.2
April	76	19	42.3	2.15	5.5
May	78	27	53.6	3.64	---
June	80	40	59.7	3.10	---
July	85	48	68.0	3.60	---
August	85	45	66.6	1.67	---
September	80	34	59.2	3.77	---
October	69	23	46.9	4.49	---
November	65	12	44.2	3.57	2.5
December	44	-19	17.7	0.79	25.7
SEVERITY INDEX 67		16	43.2	ANNUAL TOTALS 30.12	61.4

C. LAND ACQUISITION

1. Fee Title

No tracts of land were purchased in 1985. Total acreage remains at 5,839 acres.

D. PLANNING

2. Management Plans

Several management plans were prepared in 1985. These plans were a grassland management plan, law enforcement plan, wildlife inventory plan and revised hunting plan.

3. Public Participation

A public information meeting was held at Bellows Free Academy on July 30. The changes in the refuge waterfowl hunting program were announced. These changes had also been fed through the grapevine and published in the media prior to the meeting. We didn't know what to expect for turnout at the meeting. A total of about 40 to 50 people were present. The meeting was announced in the media as an informational meeting to answer questions about the changes in the program.

4. Compliance with Environmental and Cultural Resource Mandates

A final environmental assessment was prepared for the refuge waterfowl hunting program by our regional office staff assistant. The final E.A. was influenced by public input that was received during the comment period in the previous draft E.A.

A Section 7 statement was prepared for the refuge hunting program in 1985.

An extension for another year was obtained for a State permit for stabilization of the refuge dike near the Cranberry Pool water control structure. The contracting of this work had to be postponed the previous year since our barge was not operable at that time.

5. Research and Investigations

- a. Missisquoi NR-84 "Proposal to Gather Base-line Ecological Data on the Eastern Spiny Softshell Turtle (Trionyx spiniferus spiniferus)."
(53520-01)

Mr. Marc DesMeules, Director of Science and Stewardship, the National Conservancy, is the principal investigator for the survey. Some surveys for occurrence of this species were made in June 1984. Further field studies were planned for 1985. No information was gathered in 1985. This was in last year of the study. Lack of time and transportation apparently hindered the progress of this study.

- b. Missisquoi NR-84 "Inventory of Invertebrate Species of the Missisquoi Delta." (53520-02)

The purpose of this study is to provide an annotated checklist of invertebrate species in the Missisquoi Delta. Dr. Ross T. Bell, Zoology Department, University of Vermont, is coordinating the study.

Collections were made in 1985. However, a report of the results of the 1985 work is pending.

- c. Missisquoi NR-85 "Survey of Flora of the Missisquoi National Wildlife Refuge." (53520-03)

Mr. Peter F. Zika, a botanist with the Pringle Herbarium, University of Vermont, was issued a permit to identify and collect plants on the refuge.

No threatened or endangered plants were found during one or two trips to the refuge. A species considered rare in Vermont, the Lake-cress (Armoracia aquatica) was noted occurring near the East Branch of the Missisquoi River. Mr. Zika's report recommended that we avoid chemical control of weeds where this plant occurs. Currently, we have no need to control purple loosestrife where this rare plant is located.

E. ADMINISTRATION

1. Personnel



VRP

PERSONNEL

1. Robert A. Zelle....Refuge Manager, GS-11, EOD 9/2/84
PFT
2. John B. Gallegos....Asst. Refuge Manager, GS-9, EOD
5/14/84 PFT
3. Juanita Blaskowski..Secretary, GS-5, EOD 6/77, converted
to Outdoor Recreation Planner, EOD
11/10/85 PFT
4. Daniel R. Johnson...Tractor Operator, WG-6/2, EOD 7/26/82
TFT
5. Vincent R. Perelli..Biological Sciences Student Trainee,
GS-4/1, EOD 9/16/85

1985 YOUTH CONSERVATION CORPS



RAZ

YCC Enrollees:

1. Mark Rocheleau
2. Selina Yandow

During the first quarter of FY 85, Ms. Rebecca Durenleau was employed on a temporary appointment to assist with typing and correspondence until our secretary returned to a regular work schedule following the birth of a seven and one-half pound boy. This temporary appointment is included in the FY 85 staffing chart which follows.

Our secretary was converted from a part-time to a full-time work schedule in July 1985. In November, Mrs. Blasowski filled the new Outdoor Recreation Planner position.

We were able to extend Mr. Johnson for another one-year temporary appointment effective in July 1985.

TABLE 2 - REFUGE STAFFING FY 81-85

NUMBER OF EMPLOYEES

Year	<u>Permanent</u>		Temporary	TOTAL FTEs Used
	Full-time	Part-time		
FY 85	2	(a) 1	(b) 3	4.17
FY 84	2	1	1	3.37
FY 83	2	1	1	3.63
FY 82	2	1	1	3.63
FY 81	2	1	0	2.80

(a) Part-time position was converted to full-time at mid-year

(b) Includes Cooperative Education Student E.O.D. 9/16/85.

2. Youth Programs

Two youths were employed in the Youth Conservation Corps program for eight weeks. A variety of maintenance work was accomplished. One of the more labor-intensive jobs was replacing fence posts along Tract 11a. Other projects included trail maintenance, brush clearing, painting and boundary posting.

3. Other Manpower Programs

Mr. Vincent Perelli was employed from September 16 to December 20 under the Cooperative Education Program. This position provided additional staff in the Fall that was helpful in gathering hunter use and waterfowl harvest information.

4. Volunteer Program

Volunteer assistance was provided by several persons for various services and waterfowl banding. The Vermont Audubon Council provided eight volunteers who stained boardwalk sections and portions of the refuge nature trail in the Spring.

A few volunteers were signed up but were unable to work due to other commitments.

5. Funding

Funding for the Fiscal Years 82 through 86 is tabulated below:

TABLE 3 - MISSISQUOI N.W.R. FUNDING FY 82-86

Operations and Maintenance	FY 82	FY 83	FY 84	FY 85	FY 86
1210 - Migratory Birds	63,000	74,000			
1220 - Mammals and Non-migratory Birds	2,000	3,000			
1240 - Interpretation and Recreation	11,000	12,000			
1260 - Refuge Operations and Maintenance			178,000	137,000	153,900
Cyclical Maintenance					
1210 - Migratory Birds	8,000	52,000			
1240 - Interpretation and Recreation	1,000	1,000			
TOTALS	85,000	142,000	178,000	137,000	153,900

6. Safety

The refuge experienced no accidents during the year. Safety topics are usually covered during the year informally during daily work planning or staff discussions.

7. Technical Assistance

Mrs. Blaskowski participated as a member of the Vermont State Duck Stamp Committee. The Committee was organized at the request of the Vermont Commissioner of Fish and Wildlife to review the feasibility of establishing a wildlife stamp as a funding source for the Wildlife Department. Many other states have established wildlife stamp programs to fund wildlife management activities and Vermont may implement a similar program.

F. HABITAT MANAGEMENT

1. General

Missisquoi NWR's 5,839 acres are comprised of the following habitat types:

- 1,880 A. - Wooded Swamp
- 1,700 A. - Shrub Swamp
- 907 A. - Shallow Fresh Marshes
- 512 A. - Deep Fresh Marshes
- 265 A. - Non-irrigated Green Browse (Perennial)
- 200 A. - Open Fresh Water
- 178 A. - (Introduced) Grasslands
- 108 A. - Commercial Forests
- 77 A. - Brush
- 12 A. - Buildings, Roads, Parking Lots, etc.

Special emphasis is placed upon management of swamp and marsh habitats in this refuge, because of their values to waterfowl during the breeding, molting and migration seasons. Management of other natural habitat types were limited to haying in the past. During 1985, the approved Prescribed Burning Plan was implemented.

A refuge boundary inspection was conducted during the winter and completed during March. All corners were properly posted with two steel U-posts and appropriate signing, except for one corner along the northern boundary of Tract 22A, that could not be located in the wooded swamp. All other wooded shrub swamp and upland boundaries are completely posted with the more permanent galvanized steel U-posts. Signs nailed to trees along the mainland half of the refuge were removed and replaced with U-posts also. The formal written report of the boundary inspection was forwarded to the R.O. in late April, together with a request for assistance in locating the last corner and boundaries for Tracts 22A and 15B. Regional surveyors responded to that request during late May and August, located the missing corner and cut a survey trail through

dense shrub swamp to mark our boundary. The corner was posted with the (now) standard steel U-posts and signs. The boundary line will be completed during the winter when the ice allows easier access with the 15-20 U-posts required.

The temporary, or seasonal, boundary that extends into the waters of Lake Champlain to the 93.055' MSL mark, was posted as usual during July. The boundary line was carefully measured out this year and well-posted -- with signs closer together than in the past years -- to better define zones and boundaries experiencing regulation changes this year (Ref. Section H.8. - Hunting). These lakeshore signs, mounted on ten foot long 2" x 2"s, were removed during late November and early December before the ice thickened beyond 2"-3" (thick enough to walk on and thin enough to chisel through easily). Signs left out all winter are lost to the ice in the Spring thaw.

2. Wetlands

Wetlands on Missisquoi NWR include three incompletely diked impoundments (Cranberry Pool, Goose Bay Pool and Big Marsh Slough) that total approximately 1,200 acres, adjacent to 400-500 acres of unimproved marshes more directly influenced by the water levels of Lake Champlain (Ref. Map #2). Of the three "impoundments," only Cranberry Pool is successful at maintaining water levels at the desired 97' (MSL) level during the late summer when lake levels are lowest.

Goose Bay Pool comprises an estimated 100 acres of open water bordered with shrub swamp; while Big Marsh Slough is made up of 600 acres of open water and shrub swamp. The two "impoundments" are intended ultimately to become one unit, if the diking is completed. Two "gut plugs" form this unit. One - an 800' dike - closes the drainage in Big Marsh Slough, and the other - a 2,000' dike - separates Goose Bay Pool from Goose Bay proper. Lake levels control the water levels in this area until the perimeter elevation of approximately 96.5' MSL is reached. A 4' CMP outlet, equipped with stoplogs, is located on the Big Marsh Slough dike. However, it is not functional and currently serves no purpose. In addition, costly maintenance and upgrading are required upon it and the adjacent dike.

Submergent and floating plants predominating within the Goose Bay Pool - Big Marsh Slough areas are coontail (Cerato-phyllum demersum), water-weed (Anacharis (Elodea) canadensis), watershield (Brasenia schreberi) and water lilies (Nymphaea spp.).

and Nuphar spp.). Within the connecting ditches between the two areas are also found two pond-weeds - floating-leaf (Potamogeton natans) and ribbon-leaf (P. ephihydrus). Emergent plants include wild rice (Zizania aquatica), bur-reeds (Sparganium spp.), pickerelweed (Pontedaria cordata) and arrowheads (Sagittaria spp.). Buttonbush ("cripplebrush" in this area - Cephalanthus occidentalis) is the principal woody plant.

Water levels along the delta and lakeshore during the spring (April-May) high water period averaged 97.61' MSL, while the levels of 1984 averaged 96.68' MSL during the same period. The lower levels were as conducive, if not more so, to the excellent rice crop as was 1984. Other food and cover plants that benefitted from the lower-water conditions included wild celery (Vallisneria americana), arrowhead, pickerelweed and hardstem bulrush (Scirpus acutus).

The open-water areas of Goose Bay Pool - Big Marsh Slough are utilized throughout the year, except during the winter freeze. Peak use of the area normally takes place during September - October when thousands of ringnecked ducks settle in to feed together with hundreds of green-winged teal mallards and black ducks from further north. Arrowhead tubers form one of the principal duck foods in this area.

The principal sources of water to this area are precipitation, Dead Creek and Lake Champlain.

The second impounded area, or unit, is the Cranberry Pool. This pool includes 500-550 acres of open water, shrub swamp and some wooded swamp immediately east of the Missisquoi River. Unlike the Goose Bay Pool - Big Marsh Slough Unit, control over water levels therein is present, until the Missisquoi River exceeds the 99.3' MSL level; at which point water may enter Cranberry Pool via a low riverbank west of the Goose Pen Channel area. Water control is possible, despite the fact that nearly 8,400' of diking remains to be completed, because of the high riverbank along most of the adjacent section of the Missisquoi River. Two 4' CMP water control structures located just west of Dead Creek permit the desired draw-down of the pool (Ref. Map #3). A refuge water management plan, that will center around the Cranberry Pool, will be prepared during 1986.

Submergent plant composition is similar to the Goose Bay Pool - Big Marsh Slough Unit, with pondweeds, coontail, water lilies and waterweed predominating. Emergents consist of beds of wild rice along the dikes and scattered throughout

the impoundment, pickerelweed in the open pools of the interior, burreed, and arrowheads, that thrive in the dead timber zone along the pool perimeters. Rice cutgrass (Leersia oryzoides) and broad-leaf water plantain (Alisma plantago-aquatica) are also found on higher ground in the dead timber zones. Woody vegetation in Cranberry Pool is dominated by buttonbush.

Water levels within Cranberry Pool started at 98.95' MSL after the early April ice-out, 1.00' higher than in 1984 at that time. The level peaked at 98.96' MSL during the week of April 21-27, dropped to 98.35' MSL by the end of May, and eventually to 98.15' MSL by the end of June. This gradual drop in water levels eliminated the need for water control, via stoplog pulling, during the Spring and early Summer, to create additional nesting areas for puddle ducks.

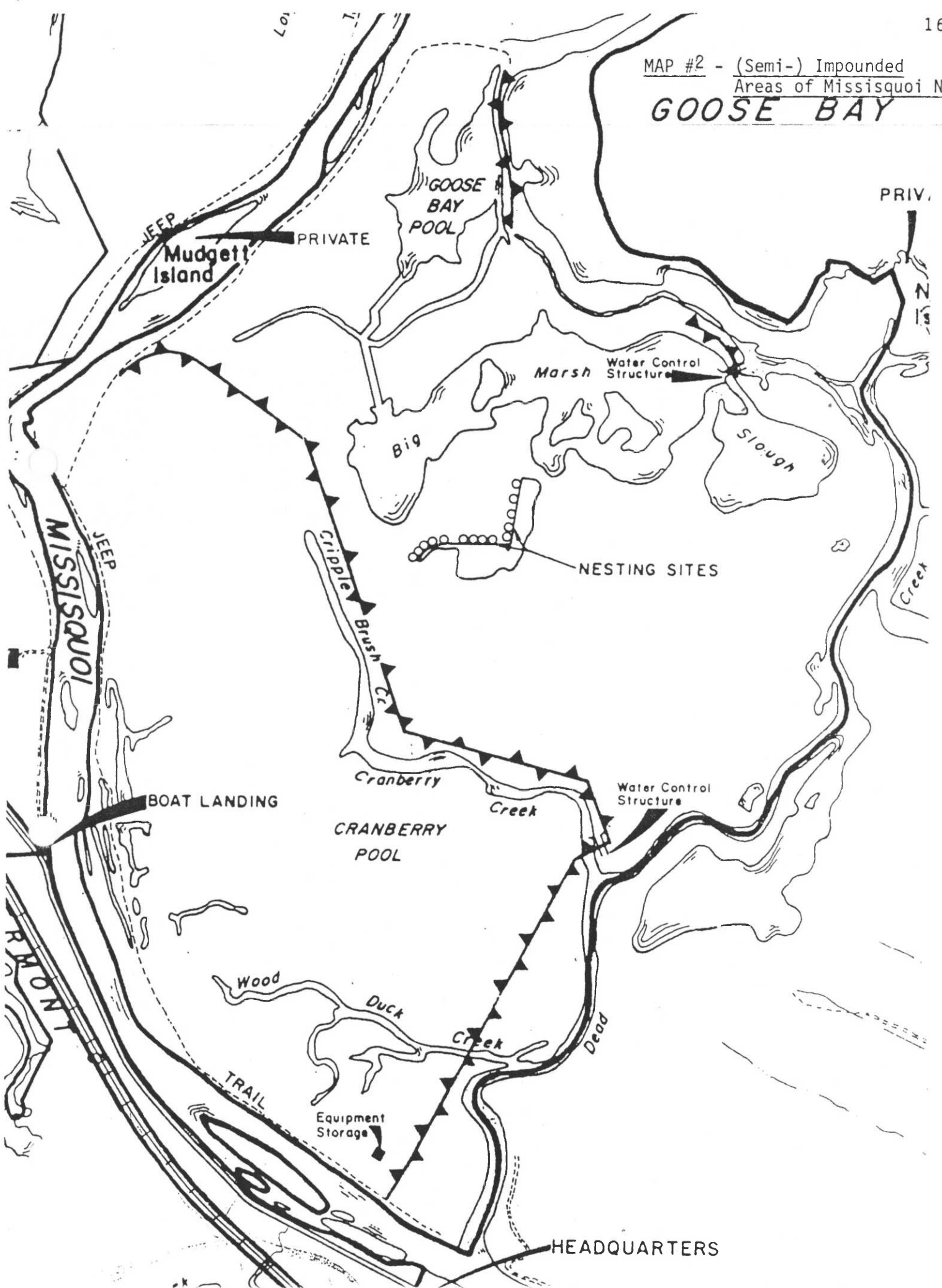
During early July, stoplogs were pulled to allow a further gradual reduction in pool water levels, intended to benefit food and cover plants such as wild rice, arrowhead and buttonbush. Between July 2-12, pool levels were dropped from 98.09' MSL to 97.23' MSL. The objective level at this time of year is 97.00' MSL; however, a buffer of approximately 0.20' MSL is also maintained to allow for evapotranspiration. Lower than normal precipitation during August resulted in pool levels dropping below the objective, to the annual low of 96.69' MSL in mid-September. Intense rainfall during the end of September and into mid-October eventually raised pool levels to 97.12' MSL by freeze-up at the end of November.

Wild rice production inside Cranberry Pool was excellent again this year, as was arrowhead, buttonbush, and other associated wetlands plants already discussed.

The other unregulated wetlands on the delta and more interior portions of the refuge are directly influenced by Lake Champlain water levels. Wild rice predominated along the more sheltered shore areas of the refuge, especially Goose and Gander Bays, Shad Island Bay and Pothole, Metcalfe Island Bay and Pothole, Long Marsh Bay and Channel, and Saxe's Pothole. In the lakeshore marshes, arrowhead, watershield, pondweeds, wild celery and hardstem bulrush also experienced excellent production. Hardstem stands are frequently used as cover by goldeneye broods in this area.

MAP #2 - (Semi-) Impounded
Areas of Missisquoi NWR

GOOSE BAY



5. Grasslands

A revised grassland management plan was submitted in the spring. The revised plan is oriented toward maintenance of dense nesting cover and possibly the use of native grasses. Since the refuge does not have the necessary equipment to till our fields, we will need to either contract for tillage and planting or work out cooperative agreements to accomplish objectives.

The refuge manager met with S.C.S. specialists in September to discuss the feasibility of growing certain native grasses on the refuge. The S.C.S. people seemed to feel that the drier upland fields off Tabor Road would be the most successful for switchgrass, while the reed canarygrass would tolerate the wetter conditions associated with the fields near the river. It was recommended that we try a small plot of switchgrass on a site off Tabor Road first to see how it works out.

A nine-acre area along Route 78 was replanted in reed canarygrass in 1981. The cooperator took one hay cutting each year for three years as his share in the agreement. This field was left unmowed in 1985 so that it could provide residual nesting cover in the early spring.

The growth and vigor of this stand appeared to be a little weak in 1985. During the September visit by S.C.S. personnel, we looked at this field. At first, they didn't realize that the field had not been mowed earlier in the year since the grass was only two to three feet high.

When we were notified that one of the hay permittees was not interested in cutting hay on the refuge in 1985, a rotational mowing arrangement was made with the subsequent permittee. A 40-acre tract along Tabor Road had been hayed annually under the previous permit. The new permittee was sold half the hay with the other half left standing to provide some residual cover in the spring. The unmowed half will be hayed in 1986 and the other half left standing. We will monitor this practice to see if brush encroachment could be a problem. It will become difficult to interest anyone in the hay if brush interferes with the operation of the mowing equipment.

8. Haying

A total of six local farmers were issued special use permits for haying privileges to 181 acres of refuge grasslands. Income derived totaled \$483 to the Government. An additional

seven acres were hayed under the last year of a cooperative agreement with Normand Lussier. The hay harvest came to 607 tons this year, from the single permitted cutting in the late summer.

In the past, refuge grasslands on the western ("mainland") side of the Missisquoi River were hayed to improve the area's goose growse. However, since few, if any, geese responded, management emphasis has recently begun to change to improving upon the puddle duck nesting potential of these fields, through a dense nesting cover (DNC) program in suitable areas not far from the water. In other areas less suitable for duck nesting, management will be directed toward maintaining open fields, through the same haying program. The new refuge grasslands management plan incorporates these concepts, together with rotational haying and delaying the hay harvest until after July 15.



JBG

Annual haying helps to keep refuge fields open. However, little residual cover is available for early spring nesting.

9. Fire Management

In accordance with the recently revised Fire Management Plan, some prescribed burning was done on refuge dikes. During

the month of April, the Goose Bay Dike, Big Marsh Dike and 1.8 miles of the Cranberry Pool Dike were burned. An attempt to burn some spoil islands in Big Marsh did not work due to a sudden rain squall. Prescribed burning of the dikes will help to retard brush and tree growth in the upper portions of the dike.



Several strip fires were ignited across the Cranberry Pool Dike. JBG



A 1.8 mile section was burned in one day in the Spring. JGB

We attempted to burn a 19-acre area of old field on the island part of the refuge in the Fall. A black line was burned around the field perimeter to contain the prescription. Foul weather following this prevented actual burning of the field. We will attempt to finish the job in the spring if conditions permit.

10. Pest Control

During 1985, no larval sawfly infestations were observed in the red pines that serve as a windbreak around the headquarters building. In the past, such infestations had occurred during July and were treated with an approved "Orthene" spray.

Refuge staff monitored the resident purple loosestrife population much more closely this year during July. The pesticide use proposal for "Rodeo" applications was approved by that time, so a serious loosestrife control program was undertaken during late July and August. The loosestrife concentrations were more widespread than earlier thought within the Long Marsh Bay - Campbell's Bay area and the Maquam Bay shoreline. Map # 3 illustrates the current, known distribution of purple loosestrife on Missisquoi NWR, together with control techniques utilized. The loosestrife population is not yet a dominant species in the areas shown, however; rather, it is salted among other wet-soil plants composing the understory of the wooded swamps and shrub swamps involved. A 1-1/2% solution of Rodeo seemed most successful. Application was by a backpack hand sprayer and smaller garden sprayer, on foot. Infested areas surrounding, or within impoundments were given the highest priority; although one late-blooming (end of September) site next to the Cranberry Pool dike was not discovered until it had already begun to die naturally. Emphasis was then directed to the more wide-spread populations along the Missisquoi Delta - primarily the areas west of the Missisquoi River, West Branch and Long Marsh Bay and Channel. Rodeo-treated areas reflected an initial kill of approximately 60%. A second, "mop-up" application boosted that to approximately 85%. Because of the scattered numbers, some plants were missed. Plant mortality took place approximately ten days after the Rodeo application. Refuge staff are interested in how much regrowth takes place in the treated areas next year. The remaining untreated areas will be worked on during 1986.



Chemical control of purple loosestrife commenced with spraying individual plants in scattered locations.

JBG



The more we looked for this plant, the more of it we found scattered throughout the swamp understory.

JBG

Significant increase in woodchuck and other small mammal hole damage to the Cranberry Pool dike during the summer was noticed this year.

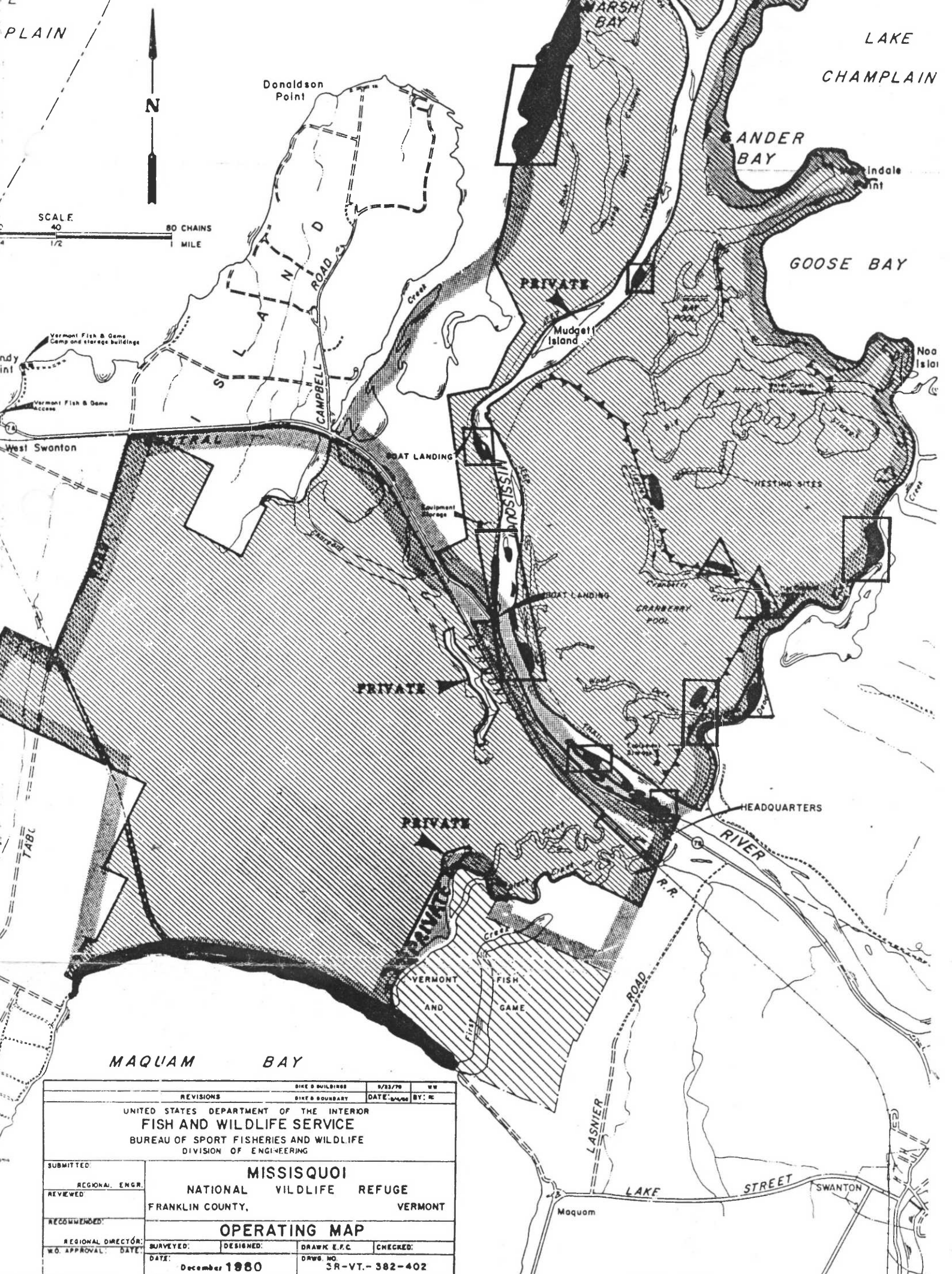
In May, a Special Use Permit was issued to a snapping turtle trapper from Maine who expressed interest in removing "snappers" from closed areas of the refuge and was highly recommended. However, he never returned.

MISSISSQUOI CO. MISSISSQUOI CO. QUEBEC VERMONT
ND ISLE CO. UNITED STATES FRANKLIN CO.

MAP # 3 - 1985 PURPLE LOOSESTRIPE CONTROL PROGRAM

LEGEND:

- = Purple Loosestrife Infestation
- = Treated with Rodeo (Larger stands)
- = Treated by Handpulling (Small clumps)



REVISIONS		DATE: 5/23/70		BY: RC
UNITED STATES DEPARTMENT OF THE INTERIOR		FISH AND WILDLIFE SERVICE		
BUREAU OF SPORT FISHERIES AND WILDLIFE		DIVISION OF ENGINEERING		
MISSISSQUOI NATIONAL WILDLIFE REFUGE				
FRANKLIN COUNTY, VERMONT				
OPERATING MAP				
SUBMITTED:	REGIONAL ENGR. REVIEWED:	DESIGNED:	DRAWN E.P.C.	CHECKED:
REGIONAL DIRECTOR:		DATE: December 1980	DRAWN NO. 3R-VT-382-402	

11. Water Rights

The decision on the mean low water boundary (93.055' Mean Sea Level) of Lake Champlain remains an open case. The lawsuit which began as a criminal trespassing violation in the Cabot/Clark Marsh by two local sportsmen (Bill Thomas and Kent Ouimette) in October 1979, reached the Vermont Supreme Court through an interlocutory appeal granted by the Vermont District Court. Thomas and Ouimette want clarification as to where between the high and low water marks landowners have control.

On November 3, 1981, the Vermont Supreme Court remanded the decision to the lower court. The reason cited for remanding the decision was due to the Supreme Court's aversion to modifying established procedures for judicial decision.

On October 12, 1982, The Honorable George T. Costes, Presiding Judge, District Court of Vermont, found the defendants, R. Kent Ouimette, William Thomas and Robert Thomas, not guilty of poaching or trespassing in the Cabot/Clark Marsh. At the same time, civil court action was pending.

During 1983, the controversy continued, as a front-page story appeared in the St. Albans Messenger on March 16, that featured interviews with the defendants and Attorney Ned Spear, counsel for the owners of Cabot/Clark Marsh. The refuge responded by issuing a news release to counter the story's possible impacts on refuge lakeshore marshes. The crux of the release stated that the federal mean low water boundary of 93.055' MSL, remains in effect regardless of recent State District Court action. No legal action occurred during the rest of 1983.

On February 23, 1984, Franklin County Superior Court Judge Alan Cheever ruled against the three defendants. In his decision, Judge Cheever ruled, "...lakeshore boundaries run to the low and not the ordinary high water mark." A permanent injunction was also issued against the defendants to prevent them from boating in the Cabot/Clark Marsh of West Swanton.

Attorneys for the defendants filed an appeal to the Vermont Supreme Court. The file was Certified to the Vermont Supreme Court on May 24, 1984.

On October 2, 1985, the matter was heard before the full Court. As of this writing, notification of decision is still pending, according to Supreme Court Clerk Jane Fitzpatrick. (Docket Nos. S-125-79FC and 84-236).

G. WILDLIFE

2. Endangered and/or Threatened Species

The following species are classified as "Endangered, Threatened or Rare" by the State of Vermont:

- a. Bald Eagle (endangered)
- b. Peregrine Falcon (endangered)
- c. Osprey (endangered)
- d. Common Loon (endangered)
- e. Common Tern (threatened)
- f. Eastern Spiny Soft-shelled Turtle (threatened)

Bald eagle sightings dropped sharply during 1985, in comparison with 1984. Refuge staff were only able to confirm one sighting on 11/13. Reports from the public also dropped off throughout the year, with only 2-3 reports coming in from the Campbell's Bay Road area adjacent to Charcoal Creek. No sightings of hacked eagles from New York or Massachusetts are known of within this area. No Peregrine Falcon sightings were made by refuge staff this year; although one possible sighting along the Missisquoi Delta was reported by a duck hunter during the fall.

Ospreys continue to be the most frequently observed state endangered species on-refuge and in the surrounding area. The first Ospreys were observed by refuge staff on 4/24, and sightings continued throughout the summer and early fall, until the first week in October. The estimated number of use days for CY 1985 totaled 410; well above the estimates for 1983 (295) and 1984 (270).

The Common Loon is only an occasional visitor during the Summer and Fall, since it prefers the outside refuge boundaries. Populations in the areas are low, with staff sightings of the bird occurring only once or twice a year. Estimated use of the refuge by this loon during CY 1985 was 27 days.

Common Terns use the refuge as a migratory stop-over during the late summer and fall. Use is confined to the mouths of Dead Creek and the three Branches within the delta area of the refuge, where logs, driftwood and debris accumulate and serve as perches for these birds. Estimated use of the refuge by the Common Tern during 1985 consisted of 2,350 days.

Information on the eastern spiny soft-shelled turtle is contained in Section G. 10 of this narrative. The least bittern, pied-billed grebe, northern harrier, short-eared owl, map turtle and New England Cottontail are formally listed by Vermont as "Species of Special Concern in Vermont." The pied-billed grebe is the most common bird and the only "Special Concern Species" known to consistently nest on-refuge. Calendar year 1985 use days for these "Species of Special Concern in Vermont" are as follows:

- | | | | |
|----|-------------------|---|-------|
| 1. | Least Bittern | - | 450 |
| 2. | Pied-billed Grebe | - | 2,800 |
| 3. | Northern Harrier | - | 525 |
| 4. | Short-eared Owl | - | 3 |

Other non-avian species are discussed in Sections G. 10 and G. 8.

Refuge researcher, Professor Peter F. Zika of the University of Vermont's Botany Department, located a "rare" plant species (known from fewer than ten contemporary sites) for Vermont during late Summer. The plant, known as lake-cress (*Armoracia aquatica*), was located in the East Branch mouth vicinity. The Professor claims that the site is one of only two known stations for this species in New England. The normal range for the lake-cress is much further to the west of New England. The plant is not carried upon any Vermont listings as Endangered, Threatened or "Species of Special Concern," however.

3. Waterfowl

The first waterfowl sighting for 1985 took place on 3/8, when two mallards were spotted in an open-water area of Maquam Creek. Canada goose flights began showing up soon after (3/15) with the first snow geese following soon after (3/19). Most (90%) of the goose migration continued over the refuge as usual without setting down.

The first American mergansers, wood ducks, goldeneyes and black ducks were seen on 3/20; while ringnecked ducks were first viewed on 3/27, and blue-winged teal on 4/18.

a. Spring Migration - Duck populations during the Spring migration peaked during the third week of April for mallards, gadwalls, green-winged teal,

blue-winged teal, wood ducks, ringnecks, lesser scaup and American mergansers, black ducks, pintails, American widgeon, shovellers, buffleheads, hooded mergansers and goldeneyes.

The peak Spring waterfowl population totaled nearly 5,000 birds; with Canada geese (1,000), snow geese (500), black ducks (465), mallards (330), ringnecks (1,190), American mergansers (340), goldeneyes (275) and lesser scaup (200) the most common species.

b. Breeding Season - The annual waterfowl breeding pair count was conducted during the last week of April. A total of 186 pairs of ducks were observed, of which mallards, wood ducks, goldeneyes and black ducks predominated, in descending order of frequency. The last breeding pair survey was conducted in 1982, at which time 217 pairs were counted.

c. Waterfowl Brood Surveys - Intensive brood surveys were conducted during 6/14-6/29, during both early morning and pre-sunset, 1-1/2 - 2 hour periods. Three techniques were utilized this year; the new "Bennett" technique (recently approved by the R.O.), incidental observations and a rough estimate. The 13 survey units of the refuge were surveyed as follows:

(1.) The four units known to be the peak production areas (Long Marsh area, Goose Bay Pool, Big Marsh Slough, and Cranberry Pool) were surveyed intensively, using the Bennett technique of counting from an elevated (tree) stand for 1-1/2 - 2 hour intervals, after sunrise and before sunset during 6/24 - 6/29. The number of broods counted is then plugged into the formula.

$$Q = \frac{B}{\log (N+1)} \quad Q \times \log (54 \times Q) = \begin{array}{l} \text{Total \#} \\ \text{Broods in} \\ \text{Survey Unit} \end{array}$$

where,

B = Total # of different broods seen.

N = Total # of all broods seen including repeats.

(2.) Eight of the thirteen units were surveyed either by canoe, outboard motorboat, or on foot just before, during and immediately after the 6/24 - 6/29 period.

(3.) One unit (Patrick Marsh - Charcoal Creek) was unable to be surveyed in time, and a rough estimate was made of the number of broods therein.

Estimates from the 13 units were added together and provided a brood total of 137; of which 36% were goldeneyes, 41% wood ducks and 15% mallards. The remainder were black ducks, blue-wings and hooded mergansers.

Ideally, all 13 units will one day have elevated observation platforms and, with the use of the Bennett Formula, will provide reliable and consistent production data. However, construction of the required numbers of durable elevated stands that provide a good view of the survey areas meant taking the time to construct safe and solid tree stands out of pressure-treated wood, 25' - 30' high. The initial cost is high in terms of man-hours and dollars, however, the years of use and data from these stands will be worth it in the long run. A total of seven tree stands are presently constructed. An additional 7-8 stands are proposed for construction in the next year or two, as time permits, until the entire refuge can be surveyed using the Bennett Technique (Ref. Map 4).

An estimated 322 wood ducks, 285 goldeneyes, 114 mallards, 30 hooded mergansers, 8 black ducks and 5 blue-winged teal, were produced this year. The estimated total production of 764 is only slightly higher than last year's production estimate of 760. A comparison of duck production during the last five years is reported in Table # 4.

TABLE # 4 - 1981-1985 ESTIMATED WATERFOWL PRODUCTION
MISSISQUOI NWR

Species	1981	1982	1983	1984	1985
Wood Duck	385	385	450	136*	322
Goldeneye	125	165	200	250	285
Mallard	345	200	200	200	114
Hooded Merganser	15	25	20	24	30
Black Duck	205	80	50	50	8
Blue-winged Teal	70	65	100	100	5

* May be due to error on new surveyor's part.

d. Post-breeding Season - Concentrations of post-breeding males began being noticed on-refuge during mid-June. Wood ducks and mallards utilized Cranberry Pool, Big Marsh Slough and Goose Bay Pool most heavily at this time. The post-breeding population peak occurred during the last week of June.

Molters using the refuge during June and July appeared to be more numerous during 1985 than 1984, with an estimated 5-10% of refuge mallards, woodies and ringnecks observed to be "flappers" within the brushier, buttonbush areas of Big Marsh Slough, Green Bay Pool, Long Marsh Channel and Cranberry Pool.

After the usual build-up of post-breeding males, there seems to be a continual turnover of adult birds, both male and female, on the Missisquoi Delta throughout the Summer molting period. However, the influx of females into the area to molt does not reach the magnitude of the early summer build-up of males.

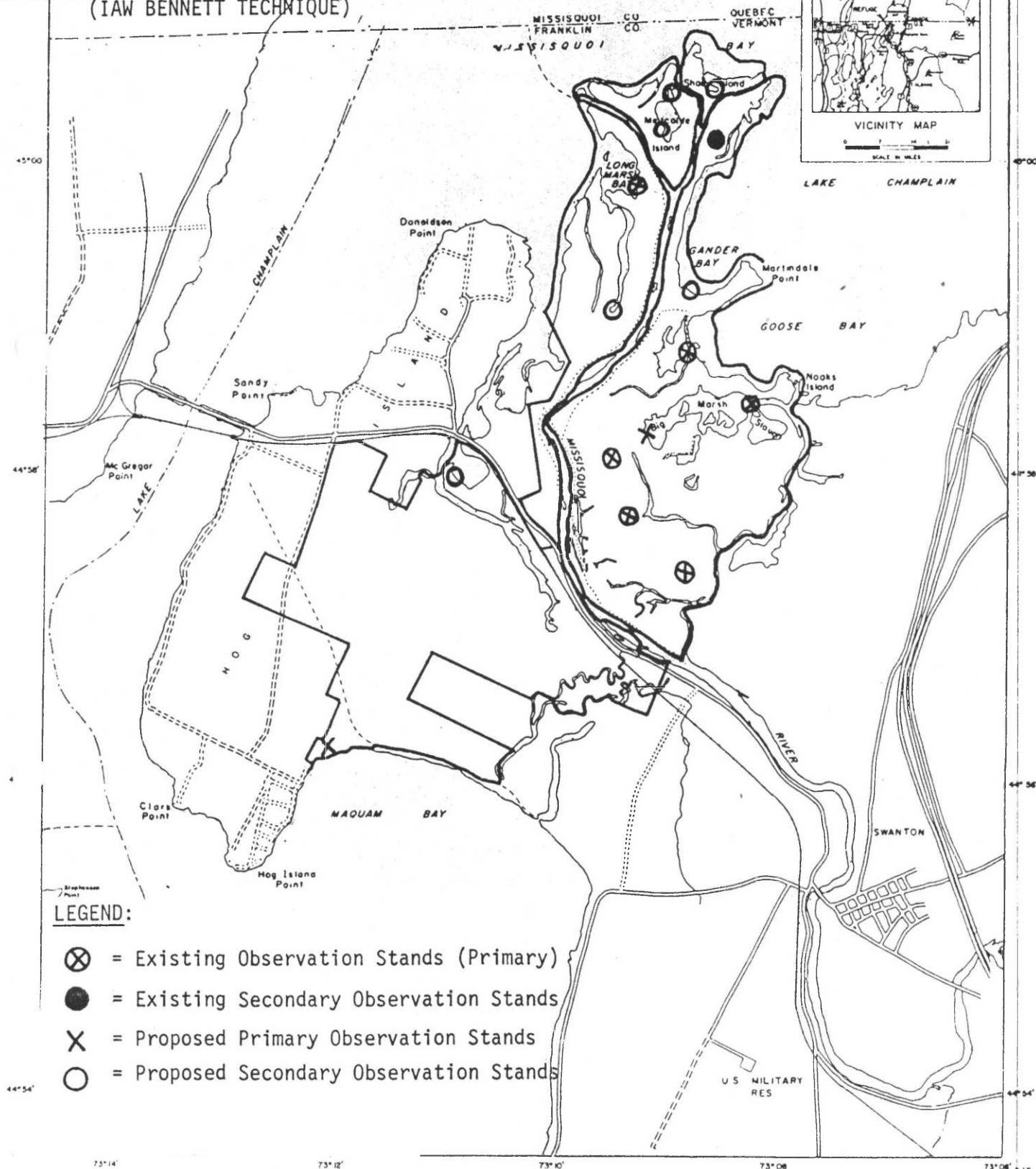
MISSISQUOI NATIONAL WILDLIFE REFUGE

FRANKLIN COUNTY, VERMONT

UNITED STATES
DEPARTMENT OF THE INTERIOR
73°14'

UNITED STATES
FISH AND WILDLIFE SERVICE
73°08'

MAP 4- EXISTING AND PROPOSED BROOD SURVEY OBSERVATION STATIONS (IAW BENNETT TECHNIQUE)



e. Nest Box/Can Program - Refuge nest-cans and boxes were serviced during January and February, when favorable ice conditions permitted easy snowmobile access to all wetland areas. Seventeen additional wood duck (wooden) boxes were built and placed within Wood Duck Creek (2), Long Marsh Bay (4), Metcalfe Island (2), Shad Island (3), Gander Bay (4), Saxe's Creek (2), Martindale Point (1), and Goose Bay (2). Of the 17 new boxes placed, 11 were used by wood ducks or both wood ducks and goldeneyes. Several cans were also relocated to new locations, when analysis revealed no production during the past five years. A total of 106 metal nest cans and 29 wooden nest boxes are currently available for cavity-nesting waterfowl. An additional 13 wooden boxes are planned for placement in February of 1986, for increased wood duck production.



JBG

Metal nest cans have been utilized successfully for decades. Goldeneye ducks and wood ducks are our primary tenants.

Of the 135 nesting structures available for waterfowl use during 1985, 58 were utilized; for a utilization rate of 43%. Of the 58 structures utilized, 38 were metal cans and 20 were wooden boxes. Wood ducks continue to prefer the wooden nest boxes mounted on trees, and goldeneyes the metal, "stovepipe" cans mounted upon 2" pipes over water. The 43% utilization rate is slightly lower than the 44% rate of 1984, when 53 nesting structures were utilized of 120 available. Duck nesting use of artificial structures increased slightly within the Maquam Beaver Pond, Long Marsh Bay, Shad Island, Gander Bay, Dead Creek and Maquam Creek areas by 1-3 structures utilized. Cranberry Pool and Charcoal Creek reflected the same use levels as in 1984; while Metcale Island, Saxe's Pothole, Goose Bay Pool and Big Marsh Slough reflected use declines of 1-4 nest cans.



JBG

Tractor operator, Dan Johnson, serviced all nest boxes via snowmobile during the winter.

Surveys provided an estimated production of 220 wood ducks, 253 goldeneyes, and 21 hooded mergansers from refuge nesting structures during 1985, for a total of 494 ducklings. The nest box program is estimated to have contributed 88.8% of our goldeneye production, 68.3% of our wood duck production, 70% of our hooded merganser production, and 64.7% of our overall duck production (from brood survey data).

Production per nest structure this year was 9.7 ducklings per successful nest; much higher than this estimates of 1984 (6.2) and 1983 (7.6).

The remaining nest structures not used by waterfowl were mostly used by grackles; although several were used by tree swallows, and several not used at all.

Only one nest structure (Box # 91 - Long Marsh Bay) was depredated by a crow. The nest was abandoned thereafter. Three wood duck eggs were lost. Six nests were abandoned - two of which may have been the result of grackle competition; because grackles had built a nest over the two goldeneye clutches of six and seven eggs. Thirteen wood duck eggs and three goldeneye eggs were stolen from two nest cans in Saxe's Pothole.

f. Fall Migration - The Fall waterfowl migration began during August with an increase in wood duck and ring-necked duck populations of approximately 200 birds of each species. The expected increase of dabblers never developed in August, however, presumably because of the lower than normal (94.78' MSL) lake-water levels, that converted the delta open water areas to mud-holes. The end result was unusually low waterfowl populations for August. During September, the lake levels rose enough to flood these areas and the waterfowl migration into the refuge began in earnest. Species diversity greatly increased as green-wings, blue-wings, widgeon, ruddy ducks, woodies, mallards, blacks and some ring-necks began pouring in from Canada. The most noticeable population increase took place on and after 9/21 - the opening day of the Canadian duck season. Refuge waterfowl populations jumped upward by more than 3,000 ducks on that weekend, and remained at that peak (nearly 20,500) throughout the rest of September.

The peak annual waterfowl population occurred on-refuge during late October. An aerial survey in early October revealed only 5,000+ ducks; however, during late October, the populations jumped to nearly 13,500 birds. At this time, black ducks, ring-necked ducks, gadwalls, green-winged teal, widgeon, hooded mergansers

and buffleheads increased; while wood ducks, golden-eyes and blue-winged teal declined. By the end of October, ring-necked ducks, mallards, black ducks, widgeon, wood ducks and green-winged teal were the predominate species, in descending order of abundance.

Thereafter, waterfowl numbers dropped to an average of approximately 6,000 birds, with a peak of 9,500 birds during November; and down to 122-360 ducks during December, until total freeze-up.

Other less common waterfowl species using the refuge during the Fall migration and not already mentioned, include pintails, blue-winged teal and shovelers.

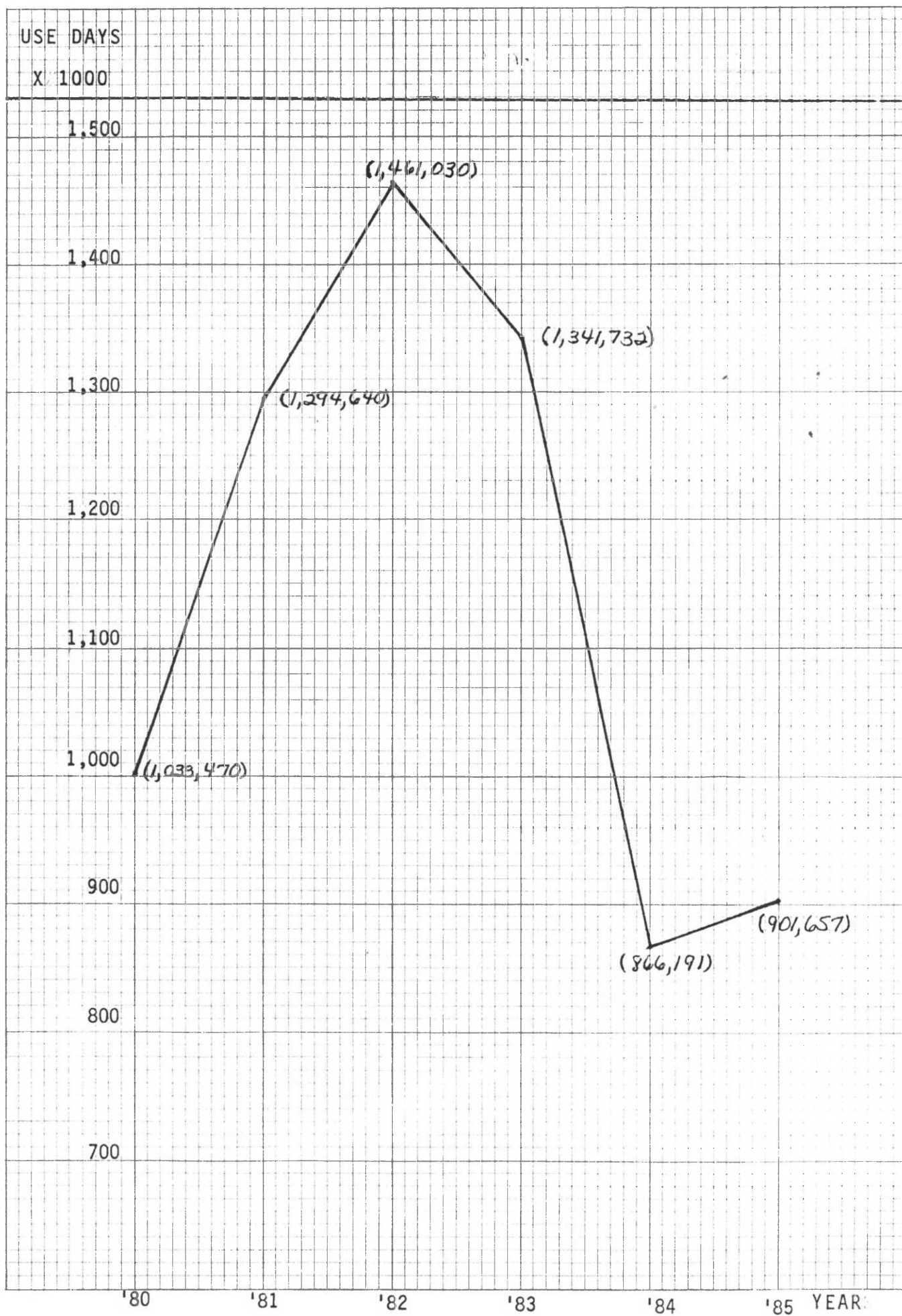
Ring-necked ducks, or "marsh bluebills" are the most common waterfowl species that use the refuge during October and November. They first showed up this Fall on 8/5. Their population concentrations are not yet very evident, however, since, during 1985, they concentrated most heavily within the closed areas of Big Marsh Slough, Cranberry Pool, Long Marsh Bay Creek and Goose Bay Pool. Early morning and evening flights into and out of these areas, in addition to waterfowl harvests, are the only visible evidence of their presence to the casual observer outside of the closed areas. Their numbers this year appeared higher than last year at this time, by an average of 2,000 birds in October and 1,000 in November. Ring-necked duck use of the refuge by molters was limited during 1985, as in 1984, to about 100 birds during October.

Goose use of Missisquoi Refuge was the usual minimal during 1985; although hundreds of Canadas and snows could be seen flying over the delta during September and October.

g. Total Waterfowl Use - The refuge received an estimated 891,885 duck-use days, 8,547 goose-use days and 1,225 coot-use days during 1985. Table # 5 and Graph# 1 depict annual waterfowl use trends between 1980-1985. The change in waterfowl-use days between 1983 and 1984 could be partially accountable to the personnel change that took place then. However, the 1985 use days should have cleared up any discrepancies that resulted from the change in waterfowl surveyors. The apparent drop in waterfowl is principally created by a decline in ring-necked duck numbers of several thousand. Graph # 2 depicts the annual total of black duck-use days between 1980-1985, and reflects a similar decline.

TABLE # 5 - Annual Peak Populations and Use Days for Waterfowl Species - (1981-1984)

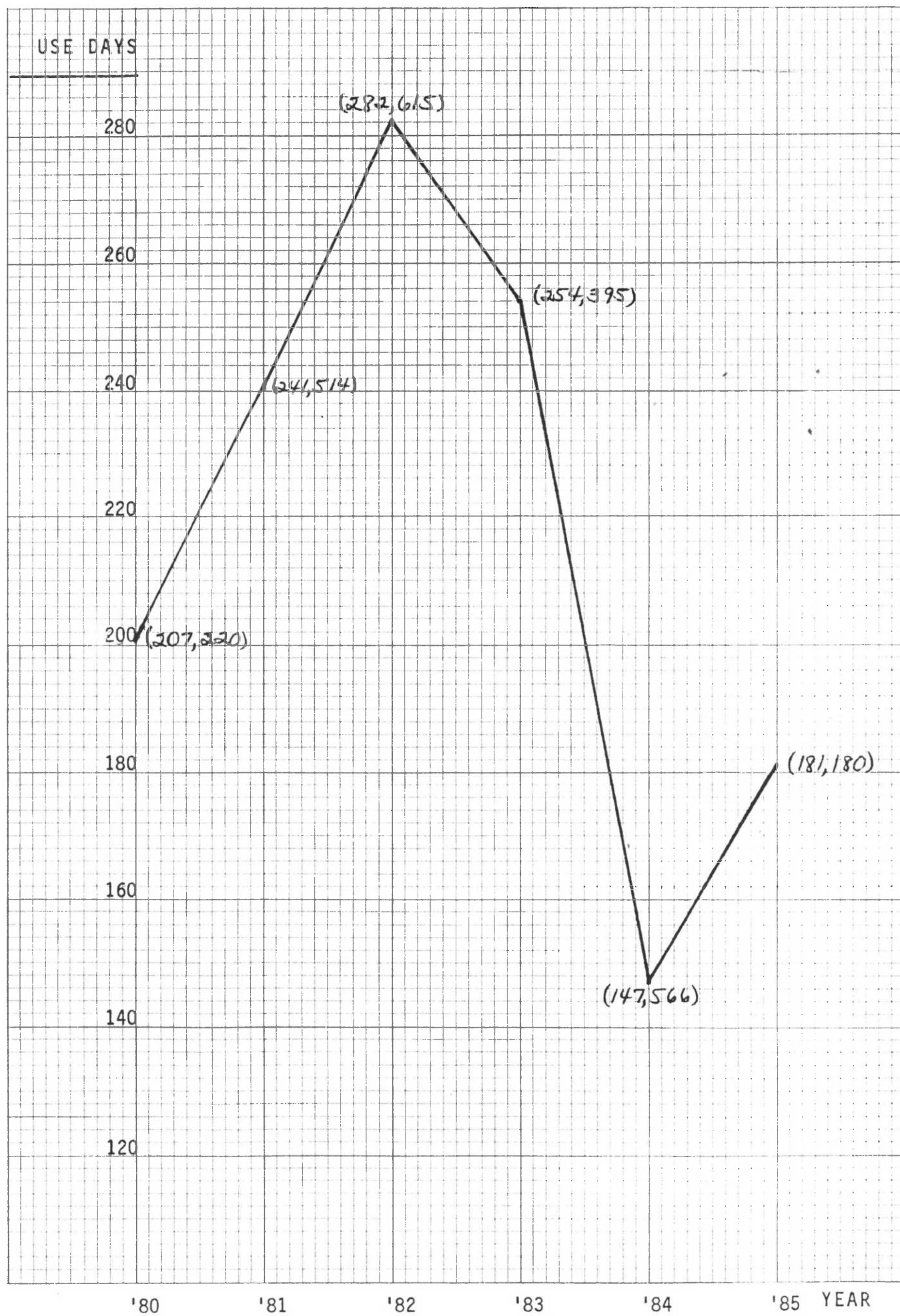
Species	1981		1982		1983		1984		1985	
	Peak Pop.	Use Days	Peak Pop.	Use Days	Peak Pop.	Use Days	Peak Pop.	Use Days	Peak Pop.	Use Days
Mallard	6,500	481,736	9,100	560,035	5,440	462,335	8,700	383,245	5,000	337,070
Black Duck	3,500	241,514	4,900	282,615	3,060	254,395	4,100	147,566	3,100	181,180
Gadwall	50	1,316	325	14,263	275	9,709	100	2,446	430	8,752
Pintail	550	22,480	400	15,354	800	24,877	200	5,340	100	4,527
GWT	250	20,305	400	30,730	250	23,755	300	15,475	525	23,995
BWT	225	14,881	250	14,775	300	19,825	350	16,850	300	14,807
Widgeon	250	10,827	600	29,537	1,000	36,344	300	5,615	750	28,134
Shoveler	25	1,253	50	2,761	35	2,078	50	1,370	40	944
Wood Duck	1,500	114,831	1,500	97,375	1,200	112,356	1,600	110,450	1,300	76,736
Ring-necked Duck	8,200	353,407	8,500	388,526	7,685	356,865	4,000	138,495	4,000	186,224
Hooded Merganser	100	2,997	75	4,585	75	5,311	50	3,355	125	4,715
American Goldeneye	400	17,759	300	14,005	200	11,897	150	12,996	197	12,815
All Other Ducks	--	5,289	--	4,467	--	9,327	130	4,478	127	11,986
TOTAL DUCK USE DAYS	1,288,595		1,459,028		1,329,074		848,131		891,885	
TOTAL GOOSE USE DAYS	4,800		851		11,743		16,845		8,547	
TOTAL COOT USE DAYS	1,245		1,151		915		1,215		1,225	
TOTAL WATERFOWL USE DAYS	1,294,640		1,461,030		1,341,732		866,191		901,657	

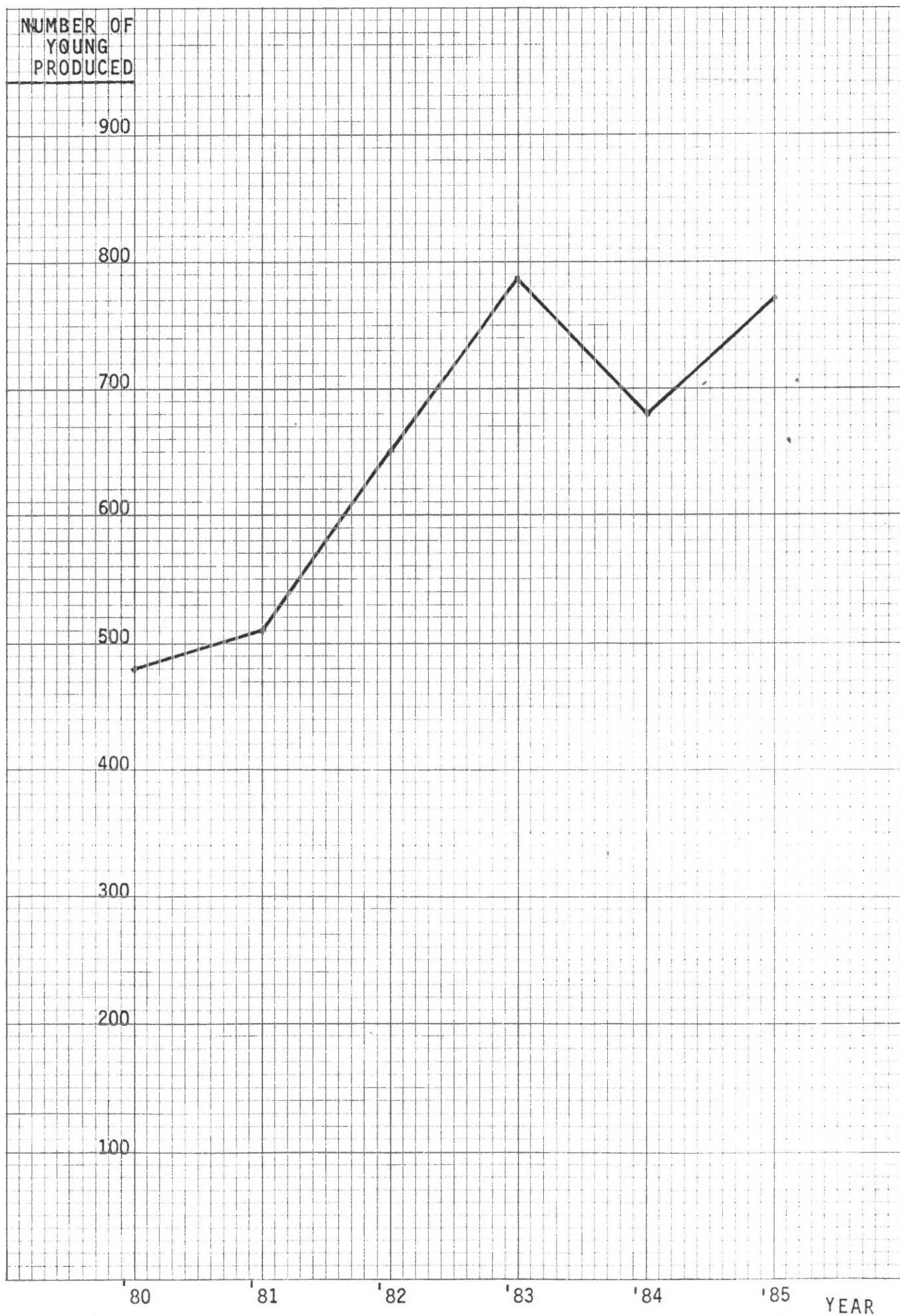


4. Marsh and Water Birds

The first great blue heron observation was made by refuge staff on March 8 on Maquam Creek; earlier than the 1983 and 1984 sightings of 3/20 and 3/22, respectively. The last local sighting was well after the freeze-up, on January 13, immediately southeast of refuge headquarters along the Missisquoi River. During February, the Shad Island Great Blue Heronry was photographed from the eastern and western sides. The slides were later analyzed for a total nest count of the colony. A total of 292 nests were counted. During the breeding season, an estimated 29 new nests were built, for a total of 321 nests within the colony during 1985. Production surveys of the Heronry were conducted the morning of 6/14. Of 108 nests counted, 95 were occupied, for a utilization rate of 87.96%. Of these 95 nests occupied, 37 were clearly visible, so that all 101 occupants could be counted, for a production estimate of 2.73 young per nest. The total estimated production for 1985 was 770 young. Mortality was very low, with only 3-4 carcasses counted during a walk through the colony grounds in late July. Production from the Shad Island Heronry between 1980-1985 is shown in Graph # 3. The peak population great blue herons using the Shad Island colony was estimated to be 1,334, during early June, while the peak refuge population was estimated to be 1,400 during that same period. Black-crowned night herons continued to utilize the Cranberry Pool - Big Marsh Slough areas during the Summer and Fall. The population peak of 50 occurred during late August. Numbers of these herons have remained in the 35-50 bird vicinity during the past five years. A roost within the eastern Cranberry Pool, next to the dike, maintains an overnight population of 20-25 herons that use the tall snags there.

The first green-backed herons were seen during mid-April, particularly along the open-water areas bordering Cranberry Pool dike, and Big Marsh Slough. The peak population for this water bird was 50, during mid- to late August. Green-backed heron use rose well above the use days for 1983 and 1984. Other marsh and water birds seen and/or heard frequently at Missisquoi NWR include common gallinules (suspected to breed in Big Marsh Slough), sora rails, and pied-billed grebes (confirmed breeders in Cranberry Pool). American bitterns are suspected to breed in the shrub swamp in Big Marsh Slough and west of Maquam Creek; since many were heard calling frequently in those areas from the end of April to late May. Unusual sightings in this category include two great egrets seen on 4/14 (one of which stayed in the Cranberry Pool area for most of the warm season), a least bittern seen on 6/25 (in the southeastern end of Cranberry Pool), and a double-crested cormorant on 5/23, in Metcalfe Island Bay.





BELOW 1/8" X 10 TO 1 INCH
1/4" LINE HEAVY

5. Shorebirds, Gulls, Terns and Allied Species

The first black tern was seen on-refuge on 5/2. Black terns were only surveyed incidentally, during the course of other surveys in 1985, due to time and manpower limitations. Missisquoi NWR maintains a breeding population of these unique terns, but the actual size of that population is presently not well known, nor is its production incidental. Surveys conducted during 1984 and 1985 have provided a rough picture of refuge breeding areas (Ref. Map # 5), which provides a rough estimate of production and total population. Prior to 1984, very little work was done on the black tern. An estimated 65 young were fledged from the known breeding spots on-refuge. The average number of eggs per nest observed was 2.75. Known colonies are small (5-10 nests each). Nests were generally located on floating mats of rotting bulrush and burreed in areas supporting these common emergents - buttonbush cover-types. The peak black tern population of approximately 200 birds occurred during mid-July. Data provided by the regional biologist during the summer indicates a national decline in black tern breeding populations. Additional surveys are planned for all areas of the refuge, with typical breeding habitat types, during 1986, to ensure that all breeding colonies are discovered and documented.

No special surveys are conducted on any other species in this category. Population data is obtained during waterfowl surveys and other refuge duties.

During Summer, common terns also frequent the refuge along the delta and lakefront in limited numbers, where they perch on logs and snags dropped by the waterways emptying into Lake Champlain. The peak concentration of 75 took place during late August; up from the 55 of 1984. Nesting is not known to occur in this area.

The refuge supports a significant common snipe population throughout most of the year. During 1985, this shorebird was commonly seen during the late afternoons and early evenings of August, within Big Marsh Slough, Cranberry Pool and most other wetlands of the refuge. Their calls and "winnowing" flights were common during the last half of May. Refuge populations peaked at approximately 250 birds during late August; well above the 150-175 birds of 1984. Average populations during 1985 were estimated at 190.

Woodcock populations are scattered throughout most of the higher ground of the refuge. On 5/23, a singing woodcock was heard in Big Marsh Slough at 4:47 PM (sunset was 8:19 PM).

The refuge population was estimated to average 50 birds during the Summer season. Production is unknown.

Other species using the refuge in significant numbers include ring-billed gulls, spotted sandpipers (suspected to nest along the southern half of Dead Creek - east of Cranberry dike), greater yellowlegs, killdeer, solitary sandpipers and semi-palmated sandpipers.

MISSISQUOI

BAY

MAP # 5 - 1984-1985 KNOWN BLACK TERN
BREEDING COLONIES

( = Known Colony)

KE
PLAIN

GRAND ISLE
FRANKLIN CO
CO



SCALE

0 40 80 CHAINS
1/4 1/2 1 MILE

Donaldson
Point

Shad Island

Melville
Island

LONG
MARSH
BAY

LAKE
CHAMPLAIN

SANDER
BAY

GOOSE BAY

PRIVATE

Mudgett
Island

GOOSE
BAY
POOL

Water Control
Structure

NESTING SITES

BOAT LANDING

Equipment
Storage

MISSISQUOI

BOAT LANDING

CRANBERRY
POOL

PRIVATE

PRIVATE

HEADQUARTERS

RIVER

VERMONT FISH

Vermont Fish & Game
Camp and storage buildings

Vermont Fish & Game
Access

West Swanton

BOH

6. Raptors

Information on bald eagles, peregrine falcons and osprey are contained in Section G. 2.

American kestrels, red-tailed hawks and norther harriers are the most frequently observed raptors on-refuge during the warmer months; and are viewed mostly along the Tabor Road hayfields, Mac's Bend Road hayfield and within Cranberry Pool.

Common wintering raptors include the rough-legged hawk, northern harrier, great-horned owl and screech owls. Screech owls utilize refuge waterfowl nest cans and boxes during the winter, in the Long Marsh Bay and Channel - Campbell's Bay area.

Less common raptors include the turkey vulture, sharp-shinned hawk, cooper's hawk, barred owl, short-eared owl and goshawk.

Surveys specific to this group of migratory birds are not conducted. Survey information is obtained during the course of other surveys and refuge duties.

8. Game Mammals

The white-tailed deer is the only big-game mammal found at Missisquoi Refuge. The refuge herd is estimated to consist of 40 deer; many of which move on- and off-refuge freely. Our population normally winters within the refuge's Maquam Swamp (the Maquam Creek - Black Creek vicinities); although some also yard up within the Dead Creek - Cranberry Pool area. Despite deep snow cover, the winter of '84-'85 did not appear to pose any serious difficulties to the herd. Sightings of groups of deer feeding in the refuge hayfields along the Mac's Bend Road and Tabor Road are common during the Spring months. However, after May, the herd seems to disperse into the wooded swamps throughout the rest of the refuge. Deer hunting with bow and arrow, shotgun and rifle are permitted in some parts of this station during the State seasons.

Beaver populations are scattered about within the Missisquoi Delta, Goose Bay Pool, Big Marsh Slough, Cranberry Pool and the Black Creek - Maquam Creek headwaters. Populations decreased significantly following the trapping season of January - March. The refuge beaver population was initially estimated at 135, after the beaver trapping season ended in March. However, later spot-checks revealed

more inactive beaver lodges than previously thought. By later 1985, the refuge beaver population estimate was revised to 114; of which approximately 55% are located outside of the refuge trapping units. This 55% utilizes the Maquam Shore Delta and Patrick Marsh - Charcoal Creek areas of the refuge. An extensive and accurate beaver population survey will be undertaken during January of 1986, prior to the trapping season, using 1-6 beaver per lodge as our index - depending on food cache size, lodge improvements, new cuttings, etc. The intent of this survey will be to document a current beaver population estimate for future trapping policy. Beaver trapping is permitted in Cranberry Pool, Goose Bay Pool, Big Marsh Slough and the Black Creek - Maquam Creek area. Beaver dams in the headwaters of Black Creek appeared to be causing flooding onto an adjacent landowner's tree farm. Complaints from that farmer resulted in a subsequent inspection of the site by refuge managers. As a result of that inspection, refuge staff opened the two dams in January and authorized the trapping permittee to remove all six beavers from the nuisance lodge. The flooding problem abated and the adjacent landowner was satisfied. Staff continued watching the area throughout 1985 for any dam improvements and sign of new residents in the affected lodge.

Muskrat populations were estimated at 5,000 during the Fall prior to the November trapping season, and 4,700 by late December. A muskrat survey (bank dens and houses) is planned for January - February of 1986, weather conditions permitting. Muskrats are trapped in some areas of the refuge during a 30-day season in November and a (nearly) 3-month season during January - March.

The raccoon population appears to be building up within the closed areas comprising Cranberry Pool, Big Marsh Slough and Goose Bay Pool. Families were observed again this year during banding operations, forcing control measures to be undertaken (Ref. Section G. 15). In addition, during November, muskrat trappers were authorized to remove raccoons, incidental to their muskrat trapping activities to reduce muskrat losses to this mammal. Raccoons were only trapped after muskrat losses; no raccoons were established to the satisfaction of management staff. No formal raccoon hunting or trapping program is in place at Missisquoi NWR. Until surveys are conducted specific to this mammal, such a program may not be possible.

Otters are becoming well-distributed throughout Cranberry Pool, Goose Bay Pool, Big Marsh Slough and Black and Maquam Creeks. During 1985, refuge staff became aware of

the fact that either past populations were underestimated or there was a significant increase in otters on-refuge. Otter trapping is not permitted on-refuge, but takes place in the surrounding area. By late 1985, the otter population was estimated to be 40; much higher than 1984's estimate of 17 and 1983's estimate of 15.

The cottontail rabbit is a "Species of Special Concern" in Vermont - indicating that the population is low and/or declining, by Vermont Fish and Wildlife Department standards. The refuge population is low and confined to areas within Big Marsh Slough, the hayfields along Tabor Road and the southwestern side of Cranberry Pool. The actual population at present is unknown, but is estimated at 50.

The low rabbit population could be accounted for by the diverse predator population that inhabits the same area. Great horned owls, barred owls, red-tailed hawks, red foxes, etc. are fairly common throughout the refuge. Red-fox numbers are highest along Cranberry dike, the ditches between Goose Bay Pool and Big Marsh Slough, the Big Marsh Slough nesting islands, the western banks of the Missisquoi River and the Black-Maquam Creek higher ground areas. Although population surveys are not conducted, the frequency of sightings of tracks indicates that the refuge population may number 20-25.

Other common mammals utilizing Missisquoi NWR include woodchucks, gray and red squirrels and weasels. Bobcats, porcupines, coyotes, fishers and mink are occasional visitors.

10. Other Resident Wildlife

On March 13, ten-to-twelve wild turkeys were seen near several large hay bales on the Clorith Colgan Farm, next to the refuge lands off of Tabor Road. Turkey sightings are rare in this area and normally only two-to-three are reported. The refuge turkey population is estimated to consist of five individuals. Spring turkey hunting is permitted in lands surrounding the refuge.

Gray partridges are known to utilize refuge lands along Tabor Road, Charcoal Creek and the Cranberry dike. Sightings of coveys of two-to-ten individuals were made by refuge staff during January, March and October in those areas. The refuge population is estimated to be 15 partridges.

Ruffed grouse frequent refuge upland woodlots. An estimated 20 grouse are year-round refuge residents. Most sightings occurred during the Fall and Winter of 1985; probably because of the lack of leaf cover.

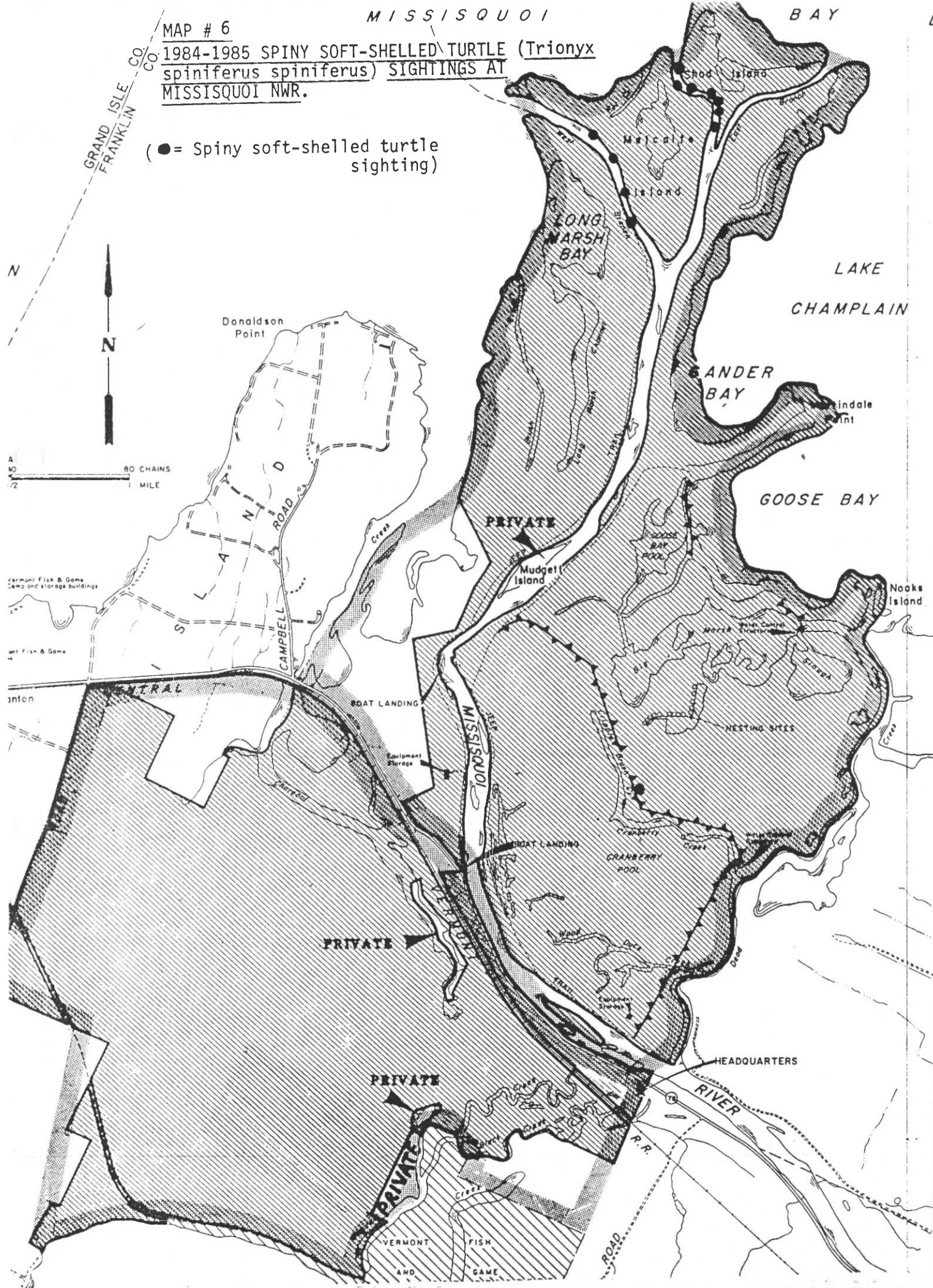
Other common noteworthy migratory birds utilizing the refuge during the warmer months include great-crested flycatchers, belted kingfishers, assorted woodpeckers, eastern kingbirds, assorted warblers, grackles and common crows. The great-crested flycatcher and kingbird populations suddenly swell during May, as do the warbler populations. All breed throughout the wooded swamps of the refuge's Missisquoi Delta.

Common reptiles on-refuge include the northern water snake, the map turtle (Graptemys geographica), snapping turtle and eastern spiny softshell turtle (Trionyx spiniferus spiniferus). The eastern spiny soft-shelled turtle is a threatened species in Vermont; while the map turtle is a Vermont species of special concern. Refuge staff began taking note of spiny softshell sightings during the last two years, after Nature Conservancy biologists expressed interest in the distribution of these uncommon reptiles in Vermont. Map # 6 depicts the 1984-1985 "spiny" sightings within this field station. A viable population of these softshells appears to be present on-refuge, although no nesting areas have yet been located. In general, the spiny softshell seems to prefer the shallower waters of the Middle and West Branches of the delta area, with the exception of one sighting within the exterior Cranberry dike **borrow** ditch.

MAP # 6

1984-1985 SPINY SOFT-SHELLED TURTLE (*Trionyx spiniferus spiniferus*) SIGHTINGS AT MISSISQUOI NWR.

(● = Spiny soft-shelled turtle sighting)



The map turtle is probably the most common turtle on Missisquoi Refuge and may be mistaken for the eastern painted turtle, at a distance. It also prefers the shallower waters of the delta, where it is most frequently seen, sunning on driftwood and trees touching the water.

The most common amphibians on-refuge are the leopard frog (Rana pipiens) and green frogs. Their abundance during the early summer allows refuge staff to issue several permits to local fisherman for collecting small frogs along the Cranberry dike and the Mac's Bend Road hayfields.

During May, the passerine migration is spectacular throughout the refuge's wooded swamplands as hundreds of great-crested flycatchers, kingbirds, diverse warblers, vireos, peewees and yellow-bellied sapsuckers move in. Kingbirds, flickers and great-crested flycatchers are common breeders throughout the refuge. The area also supports breeding, on a lesser scale, of six woodpecker species (including the Pileated woodpecker), five other flycatcher species, three swallows, belted kingfishers, and numerous other passerines. Refuge staff spotted the rarer Pileated woodpecker on 1/31 (Shad Island), 5/15 (Maquam Creek) and 12/9 (Martindale Point). Other unusual species seen in 1985 include pine grosbeaks (11/3), Baltimore orioles (5/8), bay-breasted warblers (5/20) and purple finches (4/16).

During August, the passerine migration picks up again as flickers, kingfishers, blackbirds and warblers congregate in wooded swamps and wild rice stands, before moving southward.

15. Animal Control

The only wildlife species of Missisquoi NWR for which control is currently necessary are muskrat, beaver, woodchuck and raccoon. Muskrats and beavers are managed through a public trapping program, as detailed in Section H.10. Raccoons and woodchucks are occasionally controlled but only when the need arises. Such situations occur, in the case of raccoons, when duck trapping and cannon-netting operations are interfered with significantly; or when trappers' harvests are appreciably diminished. With woodchucks, serious tunneling within impoundment dikes that threatens to result in a collapsing of the road surface atop the dike, warrants control of the specific pest(s). No woodchuck control was conducted during 1985. However, numerous new large holes were discovered along the top of Cranberry dike during the late Fall. During banding operations this year, entire families of raccoons began moving onto the baited cannon-net and

lily-pad trap sites and feeding on the corn, while keeping the nearby target ducks away from the bait. Subsequently, refuge staff removed six raccoons with a .22 rifle and ten raccoons with "Have-a-Heart" live traps, from the two banding stations. During the muskrat trapping season, refuge trappers were authorized to remove eight raccoons, with conibear type traps, that were destroying trapped muskrats within the three refuge trapping units. The total number of raccoons removed from Missisquoi NWR, for animal control purposes during 1985, was 24.

16. Marking and Banding

Objectives of this year's preseason program consisted of filling the 100 bird wood duck and 50 bird black duck quota. The wood duck quota requested for 1985 was 25 of each age and sex. No breakdown on the black duck quota was requested.

A total of 454 ducks were handled; of which 364 were banded and 92 were retraps. Tables #6 and #7 depict breakdowns of the season's cannon-netting and "lily-pad trapping" operations. One black duck and five mallards were retraps that had been banded at other locations.

Trapping commenced on 8/23 and ended on 10/1. The cannon-net was test-fired successfully on 8/19. The same two sites used during 1984 were used again this year. A "lily-pad trap" was used for the first time at this station, in an attempt to trap black ducks that were not coming to the cannon-net site. The trap accounted for only three black ducks, however. Cannon-netting was much more successful than the "lily-pad trap," and provided 90% of the ducks trapped. Placement of one more "lily-pad trap" within the Goose Pen Channel area of Cranberry Pool is planned for 1986. Large numbers of mallards and some blacks were observed in that area toward the end of September.



JBG

A swim-in type trap was tried in 1985 in an attempt to capture more black ducks.

The requested quota for wood ducks was exceeded. The quota for black ducks was 27 birds short.

Both the cannon-net and "lily-pad trap" sites were regularly baited during the banding season; although baiting at the "lily-pad trap" site was halted two days prior to cannon-net shots, to provide a greater concentration of birds at the net site for the shot. The per shot average of ducks handled was 68 by cannon-netting. An average of ten ducks was captured by trapping. The per shot average of ducks banded this year was 55.3. The cannon-net figures are well above the comparable averages of 1983 (24. ducks handled and 21. ducks banded); and on a level with per shot averages of 1984 (66.5 ducks handled and 58.8 ducks banded).

Table #6- Chronological Breakdown of 1985 Trapping

Date	Time of Day	Trapping Technique	# Ducks Banded	# Ducks Handled
8/23	6:50 PM	Cannon-net	57	60
8/28	6:40 AM	Cannon-net	89	103
8/31	6:45 PM	Cannon-net	64	75
9/6	6:20 PM	Cannon-net	71	102
9/11	5:15 PM	Cannon-net	41	53
9/25	10:15 AM & 5:00 PM	Lily Pad Trap	6	14
9/26	9:20 AM	Lily Pad Trap	1	5
9/27	4:30 PM	Lily Pad Trap	4	7
9/30	7:15 AM	Cannon-net	13	14
9/30	8:15 AM	Lily Pad Trap	12	15
10/1	10:00 AM	Lily Pad Trap	6	6
Totals			364	454

Table #7- 1985 Breakdown of Ducks Banded

Species	L-M	L-F	HY-M	HY-F	AHY-M	AHY-F	Totals
Wood Duck	-	-	33	34	90	35	192
Mallard	-	-	12	45	35	55	148
Black Duck	-	-	2	6	6	9	23
Pintail	-	-	-	-	-	1	1
Totals	0	0	47	85	132	100	364



JBG

Banding with the cannon-net was successful in meeting the wood duck quota. Mr. Norbert Blaskowski (right) assisted refuge staff with banding activities.

No mortality or serious injury occurred to any ducks as a result of the banding program this year; although some lacerations, several cases of cloacal worms and leeches were recorded. Birds were segregated by species, and evenly distributed throughout the seven holding cages used. On one occasion, a reporter from the St. Albans Messenger accompanied the banding crew for a story.

A roll of lamp cord was purchased and used this year to minimize the wire splicings of 1984, together with an AC/DC ohmmeter, for insuring a complete circuit prior to firing. The refuge's 33' x 57' skirted, waterfowl net, powered by Miller cannons was used again this year. An estimated 2,000 pounds of whole corn was used during banding operations.

H. PUBLIC USE

2. Outdoor Classrooms - Students

The 1.5 mile interpreted nature trail was most heavily used by visiting school students during the months of May through October. This year the trail was used by several local preschool classes.

On June 25, Secretary Blaskowski assisted 80 Girl Scouts with wildflower identification.

3. Outdoor Classrooms - Teachers

On April 13, Professor Linck, Sterling College, and 13 of his Wildlife Management Techniques students viewed a refuge slide program on wildlife management presented by Assistant Manager John Gallegos. After the presentation, the class was permitted entry by canoes into the Cranberry Pool for a first-hand look at refuge impoundments, wetlands ecology and resident waterfowl.

On June 25, Dr. Robert Fuller, University of Vermont, School of Natural Resources, conducted a canoe field trip with 12 students in an aquatic plants class through refuge marshes.

On August 26, 12 students from the University of Massachusetts, College of Food and Natural Resources visited the refuge.

4. Interpretive Foot Trails

The 1.5 mile Black and Maquam Creek Nature Trail is one of only two self-guided wildlife interpretive trails in Vermont. An estimated 1,525 visitors used the trail in 1985.

7. Other Interpretive Programs

On March 21, Assistant Manager Gallegos and Secretary Blaskowski presented two programs (morning and afternoon) on wetlands ecology and values, and the Missisquoi NWR to Grades 5, 6, 7 and 8 of the St. Albans City Elementary School.

On March 26, Assistant Manager Gallegos and Secretary Blaskowski participated in a successful joint "Poetry Workshop" with the Missisquoi Valley Union High School,

several professional poets and 21 high school students and four teachers. The program was geared toward meeting standards of the "Partners in Education" program that President Reagan urged federal workers to get involved in. The focus of the program was concentrated primarily upon wildlife and nature. This is the second year that the program has been in effect.

On April 12, Dr. Carl Pagel, Water Resources, once again assisted in judging posters for the National Hunting and Fishing Day poster contest. The winning posters were forwarded to NHF Day Headquarters for entry in national competition.

On April 17, Manager Zelley provided a program at the University of Vermont to 30 students of Professor Fuller's Wildlife Management class on the National Wildlife Refuge System and Missisquoi NWR.

On May 16, Secretary Blaskowski visited the Richford Elementary School and showed the film, "America's Wetlands" for the 5th Grade students.

On May 18, a fishing derby for youngsters and senior citizens was held at Mac's Bend. Forty youths and two senior ladies participated. Fishing tackle donated by local businesses was awarded as prizes.

On June 22, a fishing activity day was held at Mac's Bend. Exhibits or demonstrations in fly tying, taxidermy, and filleting were provided by area experts. Eighteen youths and 24 adults participated in the fishing derby.

On September 28, the refuge celebrated National Hunting and Fishing Day. A fishing derby and hunting and fishing exhibits and demonstrations were held at the Mac's Bend area. The public turnout was much less than in previous years, possibly due to the foul weather the previous day from Hurricane Gloria.

On October 5, Refuge Manager Zelley attended the annual Vermont Audubon Council's Wildlife Festival in East Montpelier. Refuge literature was made available and three federal duck stamps were sold.

On November 7, Secretary Blaskowski presented a slide program, "The Unendangered Species" to 5th and 6th Grade classes at St. Albans Elementary School. The slide series was donated by the local chapter of Ducks Unlimited.

On November 14, Outdoor Recreational Planner Blaskowski presented a slide program, "The Unendangered Species" to 7th and 8th Grade students at St. Albans Elementary School. The school is participating in the annual National Hunting and Fishing Day poster contest.

On November 25, Refuge Manager Zelley and ORP Blaskowski presented programs about the refuge and local history of herbs and their uses at the Swanton Historical Society meeting.

8. Hunting

Hunting is a significant recreational interest in Vermont. This type of activity accounted for about 17% of total visits to the refuge during the year. Most of this activity occurs during the months of October and November.

The refuge is open to hunting for waterfowl, other migrating birds, upland game birds, small game and deer. However, waterfowl hunting accounts for about 75% of hunter visits, and deer hunting visits represented 24% of hunter visits. Steel shot was required for waterfowl hunting on the refuge in 1985.



RAZ

An information board and register were placed at Mac's Bend during the 1985 waterfowl hunting season.

Waterfowl Hunting

Total waterfowl hunting visits on the Missisquoi Delta were estimated at 1,036 hunter visits with a total estimated harvest of 1,189 birds. Hunter success averaged about 1.2 birds per hunter visit for the season. The overall crippling rate in 1985 was 18.3%.

The primary species bagged were mallards, 49.6%, black ducks, 20.5%, wood ducks, 11.5%, widgeon, 5.2%, and ring-necks, 4.5%. This year differs from previous years in that more were taken in the vicinity of Shad Island and the East Branch of the Missisquoi River.

Saxe's Pothole and Creed and Shad Island Pothole

These two potholes have been popular hot-spots for waterfowl hunters, particularly at the beginning of the hunting season. These locations were previously included in what used to be the unregulated public waterfowl hunting area before 1985. Special regulations were implemented on this area in 1985 to reduce overcrowding, poor sportsmanship and crippling losses that occurred in the past.

One-time use was limited to a maximum five parties of up to two hunters each in Saxe's Pothole and Creek and two parties in Shad Island Pothole. Numbered stakes were used to zone hunting locations. Hunters were required to hunt with one retriever per party and to hunt within 100 feet of the numbered stakes.

From the opening day through the second weekend of the duck hunting season, preregistered permits were required in order to hunt this area. During this permit period, a permittee had to sign in at the boat launching area before 7:00 A.M. After that time, other hunters were allowed to sign in and use unoccupied zones. After the second weekend of the season, permits were not required. Hunters had to hunt within 100 feet of one of the zone stakes and use a retriever.

The seven zones were not utilized fully during the first five-day split portion of the duck season. Two or three of the seven zones were unoccupied each day. Apparently hunters were unfamiliar with the workings of the sign-in system at the beginning of the season. No one signed in or used this area in the afternoon after the original permittees had signed out.

More complete utilization of the hunting zones occurred during the opening weekend of the second split of the duck season.

From October 28 (Monday) through the remainder of the waterfowl season, no preregistered permits were required. After the opening weekend, hunter use declined to the extent that no more than three of the seven zones were in use at one time.

This year was the first time the use of retrievers was mandatory on this area. The crippling loss as determined from hunter reports was 13.3% for this area. The 1985 crippling rate is equal to the overall crippling rate that was reported during the period 1979 to 1983 when retrievers were not mandatory. During that five-year period, 1979-1983, the overall crippling rates for hunters using retrievers was 11.4%, compared to the 16.9% for hunters without retrievers.

Hunters averaged 1.3 birds per hunter visit. The frequently bagged species were mallards (62%), black ducks (19%), and wood ducks (14%).

Delta Lakeshore Area

This area comprises what used to be the unregulated portion of the public waterfowl hunting area from Martindale Point to the Middle Branch of the Missisquoi River, excluding Saxe's Pothole/Creek and Shad Island Pothole. New, special, regulations for hunting waterfowl within the refuge boundary in this area prohibited blind staking and construction of permanent blinds, and prohibited jump shooting within 200 yards of a party in a temporary blind or boat in addition to the steel shot requirement.

Prior to 1985, this area was open to waterfowl hunting with no regulations other than the applicable State hunting laws. On State waters, hunters can legally stake a claim to a location for a blind, and build a permanent blind on the site in the fall. This traditional practice allowed the same individuals (if they were aggressive enough) to essentially claim a portion of the public hunting area as if they owned it. In fact, one of the hunters who built a permanent blind in Gander Bay in 1984 did so only after getting permission from one of the other hunters who used the area. This was necessary because sometimes blind stakes mysteriously get pulled or blinds get destroyed when a newcomer tries to move into an area.

Prior to the 1984 hunting season, Vermont waterfowl hunters were provided an opportunity to comment on a proposal for revision of the waterfowl hunting program. This draft proposal would have allowed permanent type blinds to be constructed, however, fewer blinds would be allowed in order to regulate the spacing between them and selection of hunters who would be allowed to build a blind would have been by a drawing. The hunter response at public meetings was almost total opposition to this proposal.

After observing the hunting activity in 1984, the manager considered the public comments and the conditions in the area. It was decided to just eliminate the permanent blinds in Gander Bay and Shad Island areas. This allowed equal opportunity to hunt on a public area without having to deal with squatters' rights. Since no limit is placed on the number of hunters allowed in the area, the potential for less than ideal hunter densities at the beginning of the season continues to exist. The attendees at the public input sessions generally disagreed about the need to place limits on numbers of hunters except possibly at Saxe's Pothole.

An informational meeting was held in the local area on July 30, 1985, to explain what the changes would be for the 1985 season. The meeting went poorly at first. There was one irate individual and a few established permanent blind-holders who had to let off steam and express their opinions. They felt that eliminating the permanent blinds was going to increase the crowding of the area. Also, hunters who had permanent blinds in other areas outside the refuge boundary line would experience competition and crowding from people displaced from Gander Bay. After about an hour, the irate one and his entourage left the meeting. The 20 or so attendees who remained discussed the workings of the program and several signed up for a mailing list to receive permit applications. When the hunting season opened on October 9, there were no major problems. There were no unauthorized persons in the Saxe's Pothole zoned area. The hunters actually shot ducks over decoys. There was an incident of a hunter encroaching too close to Shad Island Pothole in the morning. The hunting density in Gander Bay appeared to be no more than previously occurred. It is possible that the implementation of new refuge regulations and the requirement to use steel shot may have discouraged some hunters from using the area. There appeared to be no evidence of displaced blind builders encroaching on other areas around the refuge boundary. One former Gander Bay blind owner built a large platform blind on the Canadian boundary line just off from the Middle Branch of the Missisquoi River. The blind was located on the Canadian side of the line so that they could enjoy the September opening of the Canadian season.

Hunters hunting in Gander Bay and the shoreline area around to Shad Island Bay averaged 1.05 birds per hunter visit. The reported crippling rate was 15.9%. The mallard was the species most frequently bagged (56%), followed by black duck (25%), ringneck ducks (4%), and wood ducks (4%).

Patrick Marsh/Charcoal Creek Controlled Hunt

The Patrick Marsh/Charcoal Creek controlled hunt was conducted under the same rules as past years with one change. The

shot shell limit was increased from 15 to 25 shot shells. The only other difference was the steel shot requirement for waterfowl hunting that was implemented in 1985.

A total of 108 applications for the 30 preregistered permits were received. The permits were drawn September 21. There were a total of 85 hunter visits for the season. Hunter success averaged 1.15 birds per hunter. The crippling rate appeared to be higher than in previous years. A review of individual hunt reports for this area revealed that three parties totaling six hunters accounted for 42% of the total of 26 crippled birds lost.

If we look at hunters using retrievers and those not using one, the crippling rate for the hunters with retrievers was 18.3%, compared to 39.5% for hunters without retrievers.

The most frequently bagged species were mallards (48%), black ducks (20%), wood ducks (20%), and ringneck ducks (7%).

Junior Waterfowl Program

A special hunting program for youths 12 to 15 years-of-age has been provided on the refuge since 1976. The program has been a cooperative effort by the refuge, the Vermont Department of Fish and Wildlife and the State Chapter of Ducks Unlimited.

A one-day training session was held on September 8. The adult instructors and youth were presented programs about hunter ethics, waterfowl identification, regulations, construction of blinds, use of decoys, shot patterns and use of retrievers. A total of 13 adults and 19 youth attended the September 8 training program. Several adults were sponsoring more than one youth hunter this year.

Following the September 8 training program, the participants refurbished or reconstructed the blinds in the Junior Waterfowl Hunt Area. The area was set aside for their use for the first five weekends of the waterfowl season.

Hunter participation dropped off after the first couple of weekends. A total of 43 youth hunter visits resulted in a total bag of 56 birds for an average of 1.3 birds per hunter visit. The crippling rate was 21.4%.

Adult Access to the Junior Waterfowl Hunt Area

In response to hunter demands for more areas on which to hunt on the refuge, a limited amount of public access was allowed in the Junior Waterfowl area in 1985. Use of seven of the youth blinds, which are located in Long Marsh Channel and Long Marsh Bay, were available to adult hunters on Wednesday mornings only with the first available date coming after the opening weekend of the waterfowl season.

Hunters were required to use a minimum of six decoys and were limited to a maximum of 25 shot shells. The first three Wednesday dates were by advance permit with no standby provision. Because the State of Vermont established a Lake Champlain Zone with a split duck season, the first available date when hunters could use this area occurred on October 30. Only three of the permittees registered for that day hunted the refuge. One of these permittees elected to hunt in Saxe's Creek instead of the Junior Hunt area.

Due to the lateness of the season when hunters began using this area, the area was underutilized. After the three Wednesdays that were under advance permit, the weather became colder and waterfowl use, as well as hunter use, declined generally. A total of seven parties totalling 14 hunter visits were reported at the bag check area at Mac's Bend.

Maquam Swamp Area

An area of approximately 200 acres located between Maquam and Charcoal Creeks was reopened to waterfowl hunting in 1985 in response to public input requesting some expansion of refuge areas open to waterfowl hunting. This is a very difficult area to hunt. The terrain consists of soft muck, hummocks and dense buttonbush brush. One of the reasons for removing it from the public waterfowl hunting area about ten years ago was that high crippling losses occurred on the area. To mitigate the crippling problem, the area was opened to waterfowl hunters with retrievers only.

To our knowledge, no waterfowl hunting occurred in this area in 1985. Lack of rainfall during the summer and very low lake levels resulted in very little water in this area. About the only open water was on some privately-owned pot-holes. No permit is required to hunt this area. The retriever requirement plus the difficulty of access should be somewhat self-regulating for hunter density.

Maquam Shore Area

Almost 30 acres of refuge marsh along the shoreline of Maquam Bay is open to public waterfowl hunting in accordance with State and Federal regulations. No refuge specific regulations were established for this area since it has not exhibited any of the problems such as overcrowding or poor sportsmanship associated with other refuge areas in the past. However, steel shot was required on this area since the entire refuge comprises a steel shot zone.

This area was patrolled on October 12. Only two permanent blinds were located on the refuge portion of the shoreline. No one was hunting on the refuge area. A few hunters were checked for compliance with hunting laws in the area.

Deer Hunting

The archery deer season opened October 12 and ended October 27. To our knowledge, no deer were taken during that period. The firearm season ran from November 16 to December 1. We believe a total of three deer were taken this year. Our information was gathered by way of the local grapevine since no specific reporting requirement exists for hunters to report hunt success or lack of it.

This was the first year when either sex deer permits were issued by the State for Franklin County. Some local hunters were concerned that all the doe hunters would descend on the refuge. Our observations of hunter activity did not show any excessive hunting pressure on the area.

Upland Small Game Hunting

Cottontail rabbit, grey squirrels and ruffed grouse hunting activity was very light. No successful small game hunters were encountered during the season.

9. Fishing

Fishing is a popular activity along the Missisquoi River and surrounding waters. Most on-refuge fishing activity occurs along Route 78 near the first boat launching area and at the highway crossing over Charcoal Creek. Fishing also occurs along the Missisquoi Bay shoreline in refuge waters.

Excellent fishing opportunities exist at all seasons in the area. Popular species are northern pike, walleye, bass and bullhead catfish.



JBG

This young fisherman enjoyed the fishing derby during the National Hunting and Fishing Activity Day.

10. Trapping

The refuge trapping program was revised during 1985 to provide a four-week, fall muskrat trapping season. The 1984 season length was two weeks, during November. This change in season length also required a revision of the refuge trapping plan. The changes were approved by the R.O. during the fall, and initiated in November. Trapping permittees trapped their units heavily during the first two weeks and stopped before and during the third week. A total of 311 muskrats were harvested during that period, by the three permittees; well below the harvest of last year - the first year that the refuge initiated the four-week November muskrat trapping season. Muskrat poaching is suspected along the Southern Cranberry dike where a trap with a muskrat in it was found in late October.

The earlier January - March, Winter Beaver and Muskrat Trapping Season resulted in an additional harvest of 41 beavers and 20 muskrats. The total annual harvests for beaver and muskrats during the fall and winter seasons are illustrated in Table 8, for the period 1976-1985.

TABLE # 8 - (1976-1985 ANNUAL BEAVER AND MUSKRAT HARVEST ON
MISSISQUOI N.W.R.)

YEAR (CY)	# BEAVER HARVESTED	# MUSKRATS HARVESTED
1976-1977	(Est.) 32	No Trapping
1977-1978	(Est.) 38	No Trapping
1978-1979	54	No Trapping
1979-1980	43	216
1980-1981	52	255
1981-1982	No Trapping	66
1982-1983	43	74
1983-1984	No Trapping	No Trapping
1984-1985	41	523
1985-1986	Yet to Occur	311 (To Date)

Beaver harvest quotas are set annually for each trapping unit, and are based on population surveys conducted during winter. In low population years (ie. - 1981-1982) beaver trapping may be halted. There are no harvest limits on muskrats.

12. Other Wildlife Oriented Recreation

Blueberry picking is a popular activity during the summer. This activity is concentrated on the western side of Maquam Swamp. The area is generally referred to by residents as the Blueberry Marsh.

17. Law Enforcement

Duck egg stealing was noticed again in Saxe's Pothole; although not as many eggs were taken this year, due to limited duck use of the 12 nest cans. It seems that the goldeneyes may also be getting frustrated by the thief/thieves, because only three cans were used - of which only one was a serious nesting attempt. Two cans were used by goldeneyes one of which abandoned after laying three eggs, while the other was a one-egg, "dump nest." The third can was used by a wood duck and possessed ten wood duck and three goldeneye eggs. All of the above eggs, except the egg in the "dump nest" were stolen on May 22 check, despite several all-night stake-outs of the area by refuge officers on weekends during that period. Special Agent Ed Spoon assisted during one of these stake-outs. The eggs are presumed to have been removed during the week of May 13-18.

The suspect apprehended after last year's egg thefts has not yet been prosecuted. The case is still pending.

As a result of the new steel-shot law now in effect upon Missisquoi NWR and the new refuge hunting restrictions within the delta pothole areas, refuge officers were prepared for a barrage of violation notice issuances. However, we were pleasantly surprised to discover nearly 99% compliance to all new refuge regulations. The principle enforcement technique utilized this year was hunter surveillance from nearby wooded swamps, with occasional spot checks.

Several breasted-out, black duck and mallard carcasses were found in the Shad Island and Metcalfe Island Bays during mid-November. This occurrence, in one case, near a hunting party, resulted in a search of their boat, blind and equipment, but no duck breasts were found.

Violation notices were issued for the following offenses:

Taking nongame migratory bird (Grebe)	- 1
Waterfowl hunting w/unplugged shotgun	- <u>1</u>
TOTAL VIOLATION NOTICES	- 2

Two suspects are under investigation for possible game law offenses with no charges filed to date.

Written warnings were issued for the following offenses:

Waterfowl hunting in a closed area	- 2
Waterfowl hunting with improperly plugged shotgun	- 2
Muskrat hunting (rifle) in a closed area	- 1
Fishing w/o a valid state license in possession	- <u>4</u>
TOTAL WRITTEN WARNINGS	- 9

After receiving several reports of prior "deer-jackings" and spotlighting on-refuge, enforcement personnel conducted several night stake-outs, before and during the November fire-arms deer season, in areas where deer were being consistently seen. However, surveillance of those fields, along Mac's Bend and Tabor Roads, did not produce even a trespass violation.

On 9/21-9/22, the opening weekend of the Canadian duck season, refuge officers combined forces with Special Agent Ed Spoon and State Game Warden Dan Swainbank, in stake-out surveillances of the Shad Island and Missisquoi Bay areas. Complaints from American duck hunters that Canadians were crossing onto the American side and hunting in Shad Island Bay during our closed season, prompted this action. No violations were observed.

During early November, prior to the trapping season, refuge officers discovered an unauthorized leg-hold trap set on a muskrat feeding platform. This trap had a muskrat in it. The location of the violation was the interior borrow ditch of the Cranberry Pool dike's southern one-third. No apprehension was made. The area will be watched during late October and early November of 1986.

Refuge officers attended the FWS Law Enforcement Refresher Training earlier this year and requalified with their service revolvers.

I. EQUIPMENT AND FACILITIES

1. New Construction

No new construction occurred in 1985. However, some advance work was accomplished in anticipation of funding for a new headquarters. Regional surveyors mapped the contours on the proposed site. The State Historic Preservation Office has been contacted by the Regional Historic Preservation Officer. Percolation tests and soil borings were obtained in December.

2. Rehabilitation

A contract was let to Chevalier Drilling Company in the amount of \$3,850. to drill a domestic well at the present headquarters location.

Past attempts in the 1950s to install a well with potable water were unsuccessful. Subsequently, a cistern with a roof collection system was installed and used to provide drinking water until 1979, when it was considered unsafe to drink. Asbestos fibers were found to be present in the water from the roof shingles.



JBG

A potable water well was drilled at refuge headquarters in December. A pump system will be installed in 1986.

In 1984, a next-door neighbor replaced a well and found potable water at 50 feet adjacent to our boundary line. Encouraged by this event, we gave it one more try in 1985.

A good volume of water was found at a depth of about 73 feet. As of this writing, the final results of chemical/bacteriological tests have not been received from the contractor. If the water meets requirements for safe consumption, a pump and water line will be installed later.

3. Major Maintenance

A total of 295 tons of Number 2 black peastone gravel were added to the Mac's Bend access road this year. Materials cost \$663.75 at the pit. Delivery via tailgate approaching cost \$760.

Sixty feet of 12 inch corrugated metal pipe was purchased to replace rusted and broken pipes on the Junior Waterfowl Hunting Area jeep trail access. Inspection of the old pipes in the spring resulted in a decision by the manager to remove all the old pipes without replacing them. None of the locations would have drained any water anywhere. One pipe was installed by Y.C.C. enrollees on a stone ford near the beginning of this jeep trail.

Thirty-two tons of one and one-half inch gray limestone were placed on the worst areas of this jeep trail using our front-end loader-equipped tractor.

The remainder of the fencing (about 1,900 feet) on Tract 11a was completed in 1985 by Tractor Operator Dan Johnson and our two Y.C.C. enrollees. This job turned out to be a lot more difficult than anticipated. A lot of clearing, removal of old fence wire and posts, combined with areas of ledge near the surface, made this the major Y.C.C. project of the summer.



RAZ

Replacing the fencing on Tract 11a was a big job this summer. The presence of ledge near the surface made post installation difficult.

4. Equipment Utilization and Replacement

The new tractor was indispensable for some of our maintenance activities on the mainland portion of the refuge. The brush hog and scraper blade attachments were put to use

grading the Mac's Bend Road and jeep trail, mowing brush and road edges. Just a little bit of equipment in the right place can really make a difference in our capability to take care of things.

Two new trucks were delivered in FY 85. A Dodge 350 4X4 purchased in FY 84 was delivered in February 1985. It replaced a GSA rental. A Chevrolet S-10 2X4 pickup was purchased and delivered in FY 85 to replace the 1979 Dodge 2X4 pickup.

A 1980 Ford Fairmont Sedan was acquired via transfer from Moosehorn N.W.R. in October 1984. This vehicle was a needed addition to our fleet for the numerous errands in the local area, plus it prevents the Refuge Manager from getting stranded at the office when the trucks are being used by the staff.

A snowplow was purchased for use on the Dodge 4X4.

The old Navy barge which had served the refuge for 25 or 30 years transporting refuge and contracting equipment across the Missisquoi River was replaced with a new barge in 1985. The new barge was delivered from Fishermen's Boat Shop, Inc., Everett, Washington, in October 1985.

The delivery of the barge section occurred in time for the opening of the second split in the duck season. Therefore, the sections were unloaded that week and the assembly was completed the following Monday when the area was not packed with cars and trailers.



RAZ

The sections of the new barge were lifted by use of a crane onto the water for assembly.



RAZ

The new barge is on the water and ready for the first trip across the river.

We plan to proceed with some dike repair work in FY 86 now that we have the means for contractors to get their equipment across the river.

J. OTHER ITEMS

1. Cooperative Programs

Refuge staff completed woodcock singing ground counts in May. Three survey routes were covered off-refuge, two in Vermont and one in New York. Twelve woodcock were heard on the New York route. No woodcock were heard in one Vermont survey route, while eight were heard on the second route. Snipe were consistently heard during all routes. Results of the surveys were similar to woodcock counts of past years.

The refuge headquarters also cooperates as a non-biological state deer-check station for this area, although use by the public has been limited to one or two deer checked per year during bow season.

The refuge participated in the National Bald Eagle Survey during January. No Bald Eagles were seen during the three survey days. With the solid freeze and low food availability, this is not unusual.

Missisquoi Refuge provides its wildlife output reports on a quarterly basis, to the Vermont Institute of Natural Science (VINS). Vermont Institute of Natural Science periodically requests such data by postcard for their computer records on wildlife production, occurrences and populations in Vermont. The refuge has been made an honorary member of the Institute.

The refuge maintained close ties with the Vermont Audubon Council during 1985, with Manager Zelley attending two of their meetings and occasional telephone conversations with Wally Elton. Missisquoi Refuge was formally adopted by the Council on 5.27.84.

3. Items of Interest

January 19, Refuge Manager Zelley attended a meeting of the Vermont Audubon Council and it was voted to assist with the Gifts Catalog by paying for the printing of bumper stickers to be given as mementos of appreciation to donors.

January 21-25, Refuge Manager Zelley attended the Wildlife Resources Project Leader's meeting at Leetown.

February 4-8, Refuge Manager Zelley attended a basic course in Fire Management at Wallops Island, Virginia.

12

March 11-29, Refuge Manager Zelley attended the three week Advanced Refuge Managers Academy at Washington, D.C.

March 25, Assistant Refuge Manager Gallegos and Secretary Blaskowski attended a "PAYPERS" meeting at Great Meadows NWR.

April 17, Al Steiner RO/AWR visited Missisquoi for a first-hand look at our brood census program. The existing three brood survey stations were examined and additional sites reviewed.

April 23, Marvin Armstrong and Brian Hodgkins of RO/EN visited Missisquoi for a site inspection of the proposed new headquarters area along Tabor Road in order to begin some preliminary planning.

May 5-10, Refuge Manager Zelley attended a 40-hour annual training course in law enforcement at Bombay Hook NWR.

May 21, Refuge Manager Zelley attended a meeting of the Swanton Board of Selectmen. The possibility that a new headquarters building might be constructed on Tabor Road was discussed.

May 28-30, Roger Tornstrom, Tim Barry and Mike Hayden, from RO/EN plotted out contours for the proposed headquarters location and attempted to locate some boundary corners in the Maquam Swamp.

June 12, we were notified that two local contestants, Matt Spear and Eric Beauregard had won merit awards, \$50. U.S. Savings Bonds, for their entries in the National Hunting and Fishing Day poster contest. Both contestants were in the Junior Division; Eric, a fifth grade student, and Matt, a sixth grade student. This is the fifth consecutive year that a local entry won a national prize in this contest.

June 18, Refuge Manager Zelley was interviewed by Mr. Howard Moshen, "Country Journal" magazine to gather information about the refuge for a future travel article.

June 13, Refuge Manager Zelley attended a meeting of the Vermont Audubon Council and provided an update on the hunting plan status at Missisquoi NWR.

July 23, Mary Parkin, Regional Planner, visited Missisquoi to discuss needs to be included in a new headquarters and visit the proposed site on Tabor Road.

August 12, Refuge Manager Zelle was interviewed by Mr. Steve Swinburne of the "Country Journal" for a future story about the refuge.

September 6, Secretary Blaskowski attended a Federal Women's Program Seminar at the University of Vermont. The theme was "New Horizons for Women."

September 25, Secretary Blaskowski was appointed to the Vermont State Duck Stamp Committee. The Committee was established to explore the feasibility of implementing a state duck stamp program for Vermont.

October 5, Refuge Manager Zelle attended the annual Vermont Audubon Council's Wildlife Festival in East Montpelier. Refuge literature was made available and three federal duck stamps were sold.

In December, 1985, Mrs. Blaskowski received a \$300. Special Achievement Award in recognition of her efforts to establish a gifts catalog for the refuge.

4. Credits

Manager Robert A. Zelle wrote Sections A, C, D, E, F5 and F9, H8, H 9 and H 12, I and K.

Assistant Manager John Gallegos wrote Sections B, F 1, F 2, F 8, F 10 and F 11, G, H 10 and H 17, J 1 and J 4.

Outdoor Recreation Planner Juanita Blaskowski prepared Sections H 2 through H 4 and H 7, J 2 and L.

Our new secretary, Sheila Bluto typed this narrative.

K. FEEDBACK

Occasionally, we have experienced some problems with the handling of obligating documents between the field station and the finance center. When we notice that a purchase hasn't been listed on the OTR or we get a late bill from a vendor, we find that the obligating documents have been lost somewhere between here and there. Copies of our file copy of the material are then forwarded; sometimes these copies are lost.

This problem seems to occur most often when there is a turnover in personnel who handle the paper routing. Documents that are in transit when a reorganization is made or staff turnover occurs are most likely to get misplaced.

A practice that may contribute to lost documents is the procedure of sending everything back to the field if a code number is incorrect or a control number isn't the way it should be. Perhaps the finance center should retain a reference copy of everything so that the material doesn't have to be reconstructed if the original document is lost. When it is feasible to do so, some problems should be solved with a telephone call, rather than exposing the documents to eight days of travel back and forth by mail.

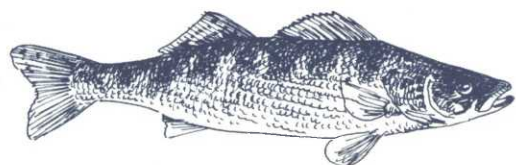
Along this line, I wonder if we might eventually see the development of some sort of credit card system for making small purchase up to \$1,000. With adequate controls, some purchasing could be handled more efficiently this way with a lesser amount of paper document handling.

Fishing

ON THE
MISSISQUOI
DELTA



MISSISQUOI
National Wildlife Refuge
Vermont



Walleye

Walleye

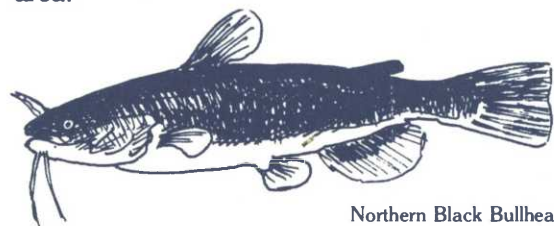
Walleye, while closely related to yellow perch, grow much larger and are much sought after by fishermen. Suggested baits are minnows, mayfly larvae, hellgrammites, bucktail jigs trailing a pork rind, plastic worms, or nightcrawlers. Work the jigs slow and deep. As a general rule, you'll find most walleye over sandy, rocky or gravel bottoms. In the Missisquoi River, try below the Swanton Dam, in rapids, and alongside eddies in the spring. The deep water along undercut banks and pools is also a good location. Walleye are active night feeders, often feeding in shallow water near shore; thus, evening ice fishing can be very productive.

Catfish

Night fishing is most productive. Use earthworms, minnows, leeches, bread balls, or chunks of beef or liver.

Bullhead

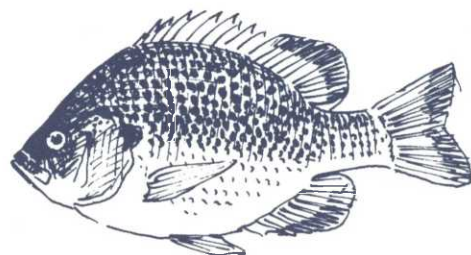
The bullhead is mainly a bottom feeder, foraging mostly at night. It is omnivorous and a notorious scavenger with crayfish the preferred food. Minnows, crayfish, corn kernels, hellgrammites, bread balls and nightcrawlers are good bait. Bullheads usually bite best at night or during the day when the water is muddy after a heavy rain. Because of its good eating qualities and lack of excessive bones, it is one of the prime targets of fishermen in the area.



Northern Black Bullhead

Muskellunge

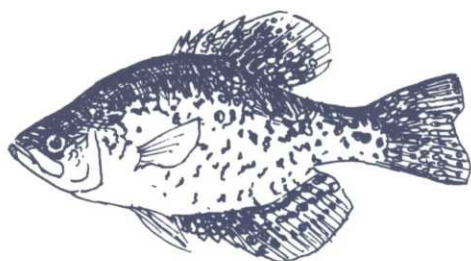
Underwater vegetation beds, points of land, or islands which extend into the water are good spots to fish for muskellunge. Spoons and plugs up to 7 or 8 inches will attract these big fish.



Pumpkinseed Sunfish

Pumpkinseed

These panfish prefer quiet shallow waters. Bread balls, worms, small lures, flies, and minnows are suggested baits.



Black Crappie

Crappie

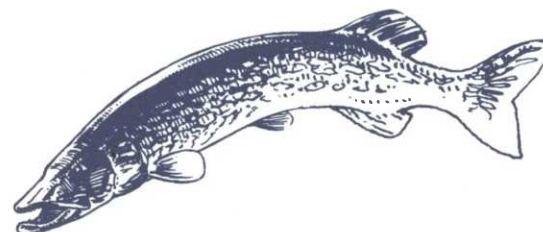
Crappie are often found in weed beds and around sunken brush and trees. Preferred baits are minnows, flies, jigs or spinners.

Salmon

An excellent place to fish for landlocked salmon in the spring and fall is in the Missisquoi River. Landlocked salmon strike more often on windy, cloudy days. Commonly used baits consist of salmon eggs, minnows, and flashy red lures. Bits of sponge can be substituted for salmon eggs.

Northern Pike

Pike are one of the more popular sport fish in the area. Prime fishing spots are coves with aquatic vegetation, edges of lily pads, shorelines with many fallen trees and driftwood, and sudden drop-offs from shallow weed beds. In the river, deep still pools, eddies, backwaters, and shorelines with cover such as weeds and overhanging branches are favored haunts. Suggested baits are large minnows, weedless silver spoons with pork rind, red-eye wigglers, or red and white spoons.



Northern Pike

Carp

Soft-shelled crayfish, bread balls, and whole kernel corn are good baits. It is best to fish for carp early in the morning or in the evening.

Bass

Smallmouth bass are frequently found in rocky areas. Largemouth bass prefer weed beds, sunken trees, logs, and snags. Nightcrawlers, minnows, frogs, crayfish, surface poppers, and rubber or plastic worms are good baits.

Yellow Perch

Many perch are caught in Lake Champlain and in the slower moving sections of the Missisquoi River. Mayfly larvae or a small spinner with a strip of pork or a worm on the hook are good baits. Ice fishing for perch is usually better towards evening.

Missisquoi

NATIONAL WILDLIFE REFUGE

A great variety of fish abound in the waters in and surrounding the Missisquoi refuge. Walleye, northern pike, bullhead, and yellow perch are the most sought after fish on the delta. Other species caught are: burbot, carp, catfish, bowfin, white and redhorse suckers, American eels, chain pickerel, muskellunge, sheepshead, crappie, gar, pumpkinseed, smallmouth bass, largemouth bass, rock bass and landlocked Atlantic salmon.

The use of firearms to take fish is prohibited. For current regulations, contact the Refuge Manager, Missisquoi National Wildlife Refuge, Swanton, Vermont 05488, (802) 868-4781.

Vermont Annual Record and State Record Fish forms are available at Refuge Headquarters, local bait shops, and from the Vermont Fish and Wildlife Department, I&E Section, Montpelier, Vermont 05602.

Consult the Vermont Fish and Wildlife regulations for seasons and limits.

While fishing in lakeshore areas you may notice numerous metal and wooden boxes. These boxes provide nesting sites on the refuge for waterfowl. Waterfowl require solitude and seclusion to successfully hatch their eggs. To minimize nest abandonment, sportsmen should try to maintain a distance of approximately 75 yards or more from nest boxes.

Fishing Record

DATE _____ TIME _____

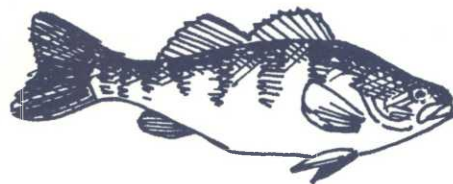
AIR TEMPERATURE _____

WATER TEMPERATURE _____

CLOUD COVER _____

WIND _____

CATCH _____



Yellow Perch

The cover drawing, a largemouth, was contributed by artist Julien Beauregard.

For more fish information contact:
Refuge Manager

Missisquoi National Wildlife Refuge
Swanton, VT 05488

or the

Vermont Fish and Wildlife Department,
Montpelier, VT 05602.



United States
Department of the Interior
Fish and Wildlife Service



RL 53520-5

September 1985

Mammals

of
Missisquoi
National
Wildlife
Refuge



Vermont

Missisquoi National Wildlife Refuge is approximately 50 miles north of Burlington in Franklin County, Vermont. It is located on the eastern shore of Lake Champlain near the Canadian border with the headquarters on Highway 78, two miles northwest of Swanton.

The refuge encompasses 5,839 acres, a little over 95 percent of the 6,000-acre Missisquoi River delta. About one-third of the area is swamp dominated by silver maple. The woodlands also contain red maple, American elm, white ash, and white oak. Bulrush, wild rice, sedge, spikerush, burreed, and pickerelweed are the most common marsh plants, but many shrubs, such as willow, alder, sweet gale, hardhack, and buttonbush grow where the water is shallowest.

Although the refuge was established primarily for waterfowl, many species of mammals are present. Among the most readily observed are white-tailed deer, muskrat, raccoon, and red and gray squirrels. Some, because of their size or habits, are less likely to be seen.

The following list of 34 mammals has been prepared by refuge personnel from observations made over the years. The hypothetical listing of bats based on reported range was submitted by Dr. Robert Fuller, University of Vermont.



Muskrat

Shorttail
Shrew

(*Blarina brevicauda*)
Common over most of the refuge. Digs tunnels and uses burrows of other species, especially voles. Feeds mainly on insects, plants, worms, snails, and small vertebrates.

Starnose
Mole

(*Condylura cristata*)
Found throughout the area in damp meadows and woods with moist soils. An excellert swimmer, its diet consists of aquatic insects, earthworms, crustaceans, snails, small fish, and small amounts of vegetable material. Their eyesight is poor and the projections on its nose are sensitive feelers, helping it locate its prey.

Bats

- This list is based on reported ranges. The following probably occur on Missisquoi National Wildlife Refuge.
- Little Brown Myotis (*Myotis lucifugus*)
 - Big Brown Bat (*Eptesicus fuscus*)
 - Keen's Myotis (*Myotis keenii*)
 - Small-footed Myotis (*Myotis leibii*)
 - Silver-haired Bat (*Lasionycteris noctivagans*)
 - Red Bat (*Lasiurus borealis*)
 - Hoary Bat (*Lasiurus cinereus*)
 - Eastern Pipistrelle (*Pipistrellus subflavus*)

New England
Cottontail

(*Sylvilagus transitionalis*)
Present in small numbers in brushy and second growth hardwoods on the mainland portion of the refuge. Their summer diet consists of grasses and herbs and their winter diet consists of seedlings, bark, twigs, and buds. Rabbits bear naked, blind young.

Snowshoe
Hare

(*Lepus americanus*)
Present in small numbers in brushy and second growth hardwood stands on the mainland portion of the refuge. Feeds mainly at twilight and evenings; in summer on clover, grasses, and ferns; in winter on twigs, buds, and the bark of small trees and seedlings. Young are born with dense fur and open eyes.

Eastern
Chipmunk

(*Tamias striatus*)
Present in small numbers in the drier woodlands that have dense undergrowth. Feeds on seeds, nuts, fruits, bulbs, and insects.

Gray
Squirrel

(*Sciurus carolinensis*)
In small numbers where there is mast-producing timber. Tall trees are used for dens or leaf nests. Their diet consists of nuts, buds, seeds, grains, fungi, fruits, bird eggs, and inner bark of trees.

Red
Squirrel

(*Tamiasciurus hudsonicus*)
Found throughout most wooded areas but not common. Prefers to nest in natural cavity or abandoned woodpecker hole. They may construct globular leaf nests near top of tree or use ground burrows. They prefer a conifer woodland because their diet is partially made up of seeds of conifer cones. They also eat nuts, buds, fruits, sap, flowers, fungi, bird eggs, and nestlings. They are an important food source for hawks and owls.

Northern Flying
Squirrel

(*Glaucomys sabrinus*)
Present throughout wooded portions. Favors cool, heavily wooded conifer and deciduous forests. Summer nest may be on a limb next to a tree trunk and winter nest is in a cavity. They often use old woodpecker holes. They eat nuts, seeds, catkins, fruits, buds, insects, mushrooms, bird eggs, and nestlings.

Woodchuck

(*Marmota monax*)
Very common in and around open fields and agricultural lands. Digs extensive systems of burrows including hibernation and nest chambers. Prefers green vegetation such as herbs and grasses.

Beaver

(*Castor canadensis*)
Common along streams bordering and coursing through the refuge. Beaver are most often observed during evening hours along the Missisquoi River, Dead Creek, and the Black and Maquam Creek Trail. Beaver build dams to flood areas where they feed and construct lodges. The water areas created by beaver dams benefit waterfowl, marsh birds, and other mammals. The den is enclosed in a large lodge made of mud and sticks and is used for raising young and providing winter shelter. Burrows dug in banks are also used as dens. The beaver consumes bark of deciduous trees and is particularly fond of swamp white oak and birch. Food is stored under the ice for winter use.

White-footed
Mouse

(*Peromyscus leucopus*)
Common over much of the refuge. They feed on seeds, acorns, nuts, fruits, tender green plants, insects, and small amounts of carrion.

Meadow
Vole

(*Microtus pennsylvanicus*)
Very common in the meadows and fields. Diet consists of grasses, bulbs, seeds, grains, and small amounts of carrion. Nests in sheltered areas under rocks and logs and builds extensive tunnel systems. Females are very prolific, capable of producing a hundred young within a year. They are an important food source for birds of prey and small carnivorous mammals.

Muskrat

(*Ondatra zibethicus*)
Seen frequently in all water areas. The muskrat uses cattails, burreed, arrowhead, wild rice, cutgrass, bulrushes, pondweeds, water lilies, and other marsh plants for food and houses, creating openings in the dense marsh vegetation. The openings provide habitat for waterfowl. Ducks and geese use the muskrat houses for nesting sites. Muskrats are mainly nocturnal, but may be seen in daylight. They are active throughout the year.

Norway

Rat

(*Rattus norvegicus*)

Present mainly along Missisquoi River, but occasionally found in marshes. They are omnivorous and will consume fruits, grains, vegetables, carrion and fresh meats, and garbage.

Porcupine

(*Erethizon dorsatum*)

The few porcupines present are confined to an area in the West Swanton section of the refuge where there are small, scattered hemlock stands. Den sites are in protected places such as rock ledges, trees, and abandoned fox or beaver dens. They eat herbaceous and woody vegetation, grasses, leaves, twigs, mast and bark.

Coyote

(*Canis latrans*)

A few present but seldom seen. Have been seen along Tabor Road. Den is usually in an excavated burrow, well hidden by vegetation or rock. They are omnivorous and will consume carrion, small mammals, and vegetation.

Red Fox

(*Vulpes vulpes*)

Not numerous but may be seen occasionally over most of the refuge except where limited by water. Prefers to use existing burrows for rearing young and escaping from predators, but will dig dens. Preys mainly on small mammals and birds, insects, carrion, and fruits.

Raccoon

(*Procyon lotor*)

Common throughout the refuge. Dens are usually located in trees but culverts, abandoned woodchuck burrows, and other protected areas are also used. They are omnivorous and will consume fruits, insects, crayfish, buds, seeds, grass, and garbage. Primarily nocturnal but may be seen in daylight.

Fisher

(*Martes pennanti*)

An occasional visitor. Dens in hollow trees, logs, or abandoned porcupine dens. Fishers are one of the few predators that prey on porcupines. Shrews, mice, squirrels, toads, berries, nuts, and carrion are also included in their diet.

Shorttail

Weasel

(*Mustela erminea*)

Present in small numbers in wooded areas. Eats mice, chipmunks, moles, shrews, and occasionally birds and insects. Molts to white in winter.

Longtail

Weasel

(*Mustela frenata*)

Present in small numbers in drier sections. Dens in natural holes or crevices or excavated burrows. Feeds primarily on small mammals, ground nesting birds, and insects.

Mink

(*Mustela vison*)

Present but not numerous. Favors forested wetlands. Dens inside hollow logs, natural cavities under tree roots, or in burrows along streams. They are excellent swimmers and prey on both aquatic and terrestrial animals, including muskrats, fish, rabbits, and snakes.

Striped

Skunk

(*Mephitis mephitis*)

Occasionally seen on drier areas of the refuge. Dens may be in abandoned burrows, stone walls, rock crevices, and stumps. The diet of the skunk includes small rodents, bird eggs, fruits, grains, nuts, grasses, berries, insects, garbage, and carrion.

River Otter

(*Lutra canadensis*)

Frequently seen in the Missisquoi River, Maquam Creek, and Charcoal Creek. Den may be in an abandoned beaver lodge or muskrat house, dense thickets bordering water, or under fallen trees. Diet consists of fish, frogs, turtles, snakes, and birds.

Bobcat

(*Lynx rufus*)

An occasional visitor. Prefers to den in rock crevices, under fallen trees, or in hollow logs. Most prey is taken by stalking. Diet consists of small mammals such as snowshoe hares, cottontails, squirrels, mice, voles, birds and their eggs, snakes, fish, insects, and some vegetation. Will also eat dead animals if the meat is fresh.

White-tailed

Deer

(*Odocoileus virginianus*)

Frequently seen over entire refuge. Preferred habitat is forest edges, swamp borders, areas interspersed with fields, and woodland openings. Deer browse on woody deciduous plants, twigs, and young bark. They graze on grasses, herbs, berries, and mushrooms.

Reports of additional species will be welcomed.

Please contact:

Refuge Manager

Missisquoi National Wildlife Refuge

RFD #1

Swanton, Vermont 05488

Telephone: (802) 868-4781

Illustrations by Julien D. Beauregard

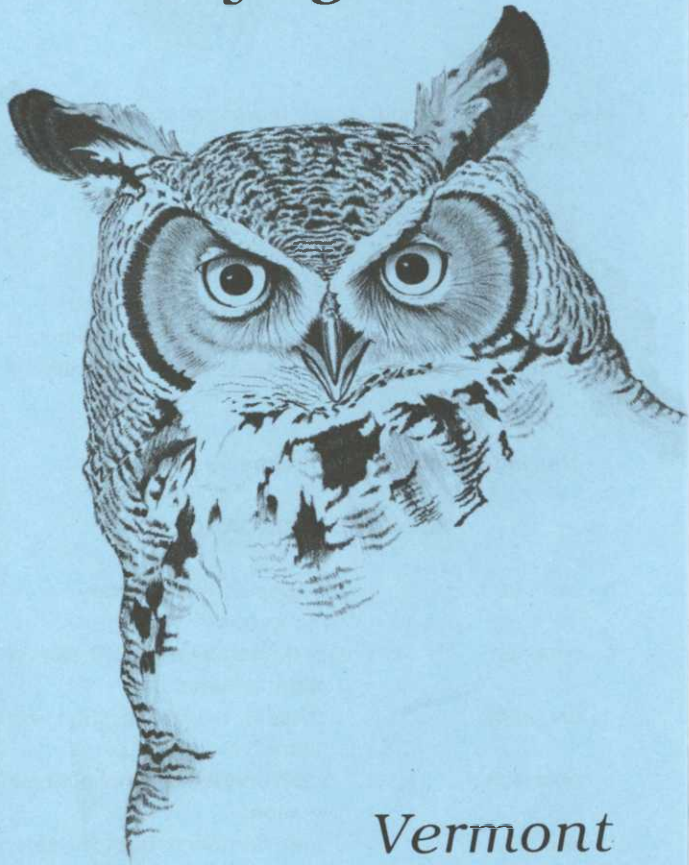
Swanton, Vermont



United States
Department of the Interior
Fish and Wildlife Service



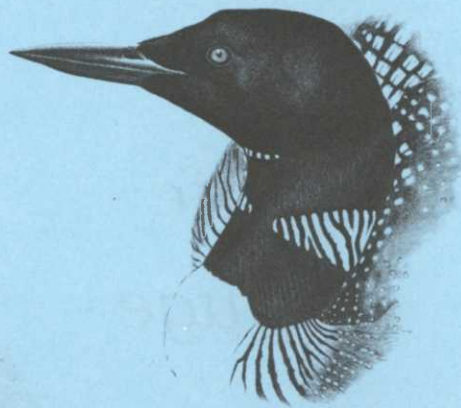
BIRDS
of
Missisquoi
National
Wildlife
Refuge



Vermont

Welcome to the Missisquoi National Wildlife Refuge. This leaflet lists 199 species of birds that have been identified on Missisquoi National Wildlife Refuge since its establishment in 1943.

This list was prepared in cooperation with Judy Clair, Ruth Nissen of Swanton, Vermont and Dr. H. Shadowen, Biology Department, Western Kentucky University, and was illustrated by Julien Beauregard, Swanton, Vermont. This list is in accordance with the Sixth A.O.U. Check-list.



Most birds are migratory, therefore their seasonal occurrence is coded as follows:

SEASON	
s - Spring	March - May
S - Summer	June - August
F - Fall	September - November
W - Winter	December - February

† - Nesting has occurred on the refuge.

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

	s	S	F	W
LOONS - GREBES - CORMORANTS				
Common Loon.....	o	o	o	
Pied-billed Grebe†.....	u	c	u	
Horned Grebe.....	o	o	o	
Red-necked Grebe.....	o	o		
Double-crested Cormorant.....	o	o	o	
BITTERNS - HERONS				
American Bittern†.....	c	c	o	
Least Bittern†.....	r	u		
Great Blue Heron†.....	c	c	c	r
Great Egret.....	r	r		
Green-backed Heron.....	u	c	o	
Black-crowned Night-Heron.....	o	c	o	
GEESE - DUCKS				
Snow Goose.....	u	u		
Brant.....	r	r		
Canada Goose.....	o	o	c	r
Wood Duck†.....	a	a	a	
Green-winged Teal†.....	c	o	c	
American Black Duck†.....	a	a	a	r
Mallard†.....	a	a	a	r
Northern Pintail.....	c	o	c	
Blue-winged Teal†.....	c	c	o	
Northern Shoveler.....	c	o	c	
Gadwall.....	o	o	c	
American Wigeon.....	o	o	c	
Canvasback.....	o	c		
Redhead.....		o		
Ring-necked Duck.....	c	o	c	
Greater Scaup.....	u	u		
Lesser Scaup.....	c	c		
Oldsquaw.....	o			
Black Scoter.....	o			
Surf Scoter.....		r	r	
White-winged Scoter.....	o			
Common Goldeneye†.....	c	c	c	o
Bufflehead.....	u	o		
Hooded Merganser†.....	c	c	c	
Common Merganser.....	c	c	o	
Red-breasted Merganser.....	r	r		
Ruddy Duck.....	o	o		
VULTURES - HAWKS - FALCONS				
Turkey Vulture.....	o	o		
Osprey.....	o	o	o	
Bald Eagle.....	o	o	r	
Northern Harrier†.....	c	c	c	
Sharp-shinned Hawk.....	o	o	o	
Cooper's Hawk.....	o	o	o	

	s	S	F	W
NORTHERN GOSHAWK - TURKEY				
Northern Goshawk.....	o	o	o	o
Red-shouldered Hawk†.....	o	o	o	
Broad-winged Hawk.....	r	r		
Red-tailed Hawk†.....	c	c	c	o
Rough-legged Hawk.....	u	r	o	o
American Kestrel†.....	c	c	o	
Merlin.....	r	r	r	
Peregrine Falcon.....	r	r	r	
GROUSE - TURKEY				
Gray Partridge†.....	u	u	u	u
Ruffed Grouse†.....	u	u	u	u
Wild Turkey†.....	u	u	u	u
RAILS - COOT				
Virginia Rail†.....	o	c	c	
Sora†.....	o	o	o	
Common Moorhen†.....	c	c	o	
American Coot.....	o	r	c	
PLOVERS - SANDPIPERS				
Black-bellied Plover.....	o			
Semipalmated Plover.....	o	o		
Killdeer†.....	c	o	c	
Greater Yellowlegs.....	c	c		
Lesser Yellowlegs.....	o	o		
Solitary Sandpiper.....	o	o		
Spotted Sandpiper†.....	o	c	o	
Sanderling.....	o			
Semipalmated Sandpiper.....	o			
Least Sandpiper.....	o			
White-rumped Sandpiper.....	o	o		
Pectoral Sandpiper.....	o			
Dunlin.....	o			
Common Snipe†.....	c	c	c	
American Woodcock†.....	c	c	c	
GULLS - TERNS				
Bonaparte's Gull.....	r	r	r	
Ring-billed Gull.....	c	c	c	o
Herring Gull.....	u	u	u	
Common Tern.....	c	o	c	
Black Tern†.....	c	c		
DOVES - CUCKOOS - OWLS - SWIFTS - HUMMINGBIRDS				
Mourning Dove†.....	u	o	o	o
Black-billed Cuckoo.....	u	u	u	
Yellow-billed Cuckoo.....	u	u	u	
Eastern Screech-Owl†.....	o	o	o	o
Great Horned Owl†.....	c	c	c	u
Snowy Owl.....	r	r	r	
Northern Hawk-Owl.....	r	r	r	

	s	S	F	W
BARRED OWL - KINGLETS - THRUSHERS				
Barred Owl†.....	u	u	u	u
Short-eared Owl.....	o	o	o	
Northern Saw-whet Owl.....	o	o	o	o
Common Nighthawk.....	o	o	r	
Whip-poor-will.....	o	o	o	
Chimney Swift†.....	o	o	o	
Ruby-throated Hummingbird†.....	o	u	o	
Belted Kingfisher†.....	u	c	o	
WOODPECKERS - FLYCATCHERS				
Red-headed Woodpecker†.....	r			
Yellow-bellied Sapsucker†.....	o	c	o	
Downy Woodpecker†.....	c	c	c	c
Hairy Woodpecker†.....	c	c	c	c
Northern Flicker†.....	o	c	o	
Pileated Woodpecker†.....	u	u	u	u
Olive-sided Flycatcher.....	o	c	o	
Eastern Wood-Pee-wee†.....	o	c		
Alder Flycatcher.....	c	o		
Least Flycatcher.....	u	o	o	
Eastern Phoebe†.....	o	u	o	
Great Crested Flycatcher†.....	c	c	o	
Eastern Kingbird†.....	c	c		
LARKS - SWALLOWS - JAYS and CROWS				
Horned Lark.....	o	o	o	o
Purple Martin†.....	o	o	o	
Tree Swallow†.....	c	a	o	
Northern Rough-winged Swallow.....	r			
Bank Swallow†.....	c	c	o	
Cliff Swallow.....	o	o		
Barn Swallow†.....	c	c	o	
Blue Jay†.....	c	c	c	o
American Crow†.....	c	c	c	o
TITMICE - NUTHATCHES - WRENS				
Black-capped Chickadee†.....	a	c	c	a
Boreal Chickadee.....	r	r		
Red-breasted Nuthatch.....	r	r	r	r
White-breasted Nuthatch†.....	c	o	c	c
Brown Creeper†.....	c	u	c	c
House Wren†.....	o	o	o	
Winter Wren.....	r	r	r	
Marsh Wren†.....	o	c	o	
KINGLETS - THRUSHES - THRASHERS				
Golden-crowned Kinglet.....	r	r		
Ruby-crowned Kinglet.....	u	r		r
Blue-gray Gnatcatcher†.....	u	u		
Eastern Bluebird.....	r	r	r	
Veery†.....	c	c	o	
Swainson's Thrush.....	r	r		

s S F W

— Hermit Thrush† o o
 — Wood Thrush† c c
 — American Robin† c c c
 — Gray Catbird† o c o
 — Brown Thrasher o o o

WAXWINGS - SHRIKES - STARLING

— Water Pipit o
 — Cedar Waxwing† o c o
 — Northern Shrike u r u u
 — Loggerhead Shrike r
 — European Starling† a c a c

VIREOS - WOOD WARBLERS

— Solitary Vireo o o o
 — Yellow-throated Vireo o c o
 — Warbling Vireo o c o
 — Philadelphia Vireo o o r
 — Red-eyed Vireo† c c o
 — Tennessee Warbler r r
 — Orange-crowned Warbler r
 — Nashville Warbler o o o
 — Yellow Warbler† c c o
 — Chestnut-sided Warbler o o
 — Magnolia Warbler r r
 — Cape May Warbler o o
 — Black-throated Blue Warbler o o o
 — Yellow-rumped Warbler o r
 — Black-throated Green Warbler r r r
 — Blackburnian Warbler o o o
 — Palm Warbler r
 — Bay-breasted Warbler o o o
 — Blackpoll Warbler r
 — Black-and-white Warbler o o
 — American Redstart† o c o
 — Ovenbird† o o
 — Northern Waterthrush† o u r
 — Louisiana Waterthrush o u
 — Common Yellowthroat† c c c
 — Canada Warbler o o o

TANAGERS - SPARROWS

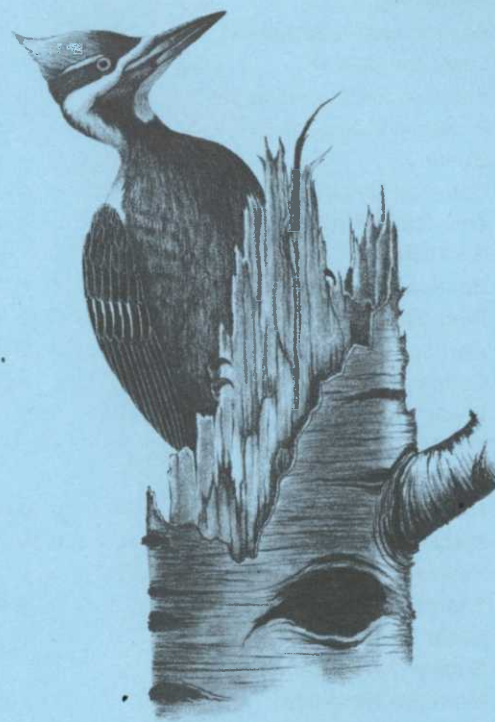
— Scarlet Tanager r r r
 — Northern Cardinal† u u u c
 — Rose-breasted Grosbeak† c c o
 — Indigo Bunting o o o
 — American Tree Sparrow c r o c
 — Chipping Sparrow† o c o
 — Field Sparrow† o c o
 — Vesper Sparrow o o o
 — Savannah Sparrow† c c

s S F W

— Fox Sparrow o o o
 — Song Sparrow† c c o
 — Lincoln's Sparrow r
 — Swamp Sparrow o o o
 — White-throated Sparrow† c c o
 — White-crowned Sparrow o o o o
 — Dark-eyed Junco c r o c
 — Snow Bunting o r o c

BLACKBIRDS - FINCHES

— Bobolink† c c o
 — Red-winged Blackbird† a a c
 — Eastern Meadowlark† c c o
 — Rusty Blackbird u u o
 — Common Grackle† c c o
 — Brown-headed Cowbird† c o o
 — Northern Oriole† c c
 — Purple Finch o o o o
 — White-winged Crossbill o r o
 — Common Redpoll r
 — Pine Siskin r r r
 — American Goldfinch† c c c o
 — Evening Grosbeak c o o c
 — House Sparrow† c c c c



Please report any unusual sightings to the Refuge Manager.

For further information contact:

Refuge Manager

Missisquoi National Wildlife Refuge

RFD #2

Swanton, Vermont 05488

Telephone: (802) 868-4781

Office Hours: M-F 8:00 a.m. - 4:30 p.m.

NOTES

Location _____

Date _____ Total _____

Observers _____

Weather _____ Wind _____

Time _____



**UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE**



JUNE 1983

RL 53520-2

A WALK IN A
WETLAND HABITAT



BLACK CREEK AND MAQUAM CREEK TRAIL



MISSISQUOI
NATIONAL WILDLIFE REFUGE
VERMONT

WELCOME

These trails were constructed by the Mississquoi Youth Conservation Corps, an organization designed to give young people gainful employment while learning and doing something about the environment. They are designed with an emphasis upon the interaction of organisms within an ecosystem. They total approximately 1½ miles in length and take about two hours to walk at a leisurely pace.

Follow the numbered stations and march them with the numbers in your trail guide. Please walk quietly and carefully.

HELPFUL HINTS

1. Walk only on the marked trail. This prevents accidents and keeps environmental damage to a minimum.
2. Please leave nothing behind but footprints.
3. In summer, insect repellent may be desirable.

BLACK CREEK TRAIL



The dead tree just ahead of this sign is alive with carpenter ants. Typical signs of carpenter ants are sawdust and little holes in the tree. Carpenter ants and their near relatives are found all over the world and form one of the largest groups of ants. They could do considerable damage if allowed to spread and infest buildings. Carpenter ants speed up the decay process in dead trees, thereby recycling nutrients to the soil.



Behind this sign, you will see an American Elm, which is one of the most widespread and well-known of our American trees. The recent invasion of Dutch Elm disease threatens this tree. The disease occurs as a result of the activity of two different organisms. A beetle first eats a hole in the tree carrying a fungus which is then able to spread, eventually causing the death of the tree.



AMERICAN ELM



The tree surrounded by wire netting is a Swamp White Oak. The netting has been put there to prevent beavers from chewing through the bark. Oaks are important to wildlife because they produce acorns. Acorns are excellent food for wood ducks.



The hole in the ground directly behind this sign is most likely a collapsed muskrat burrow. Muskrats are mostly herbivorous (plant-eating). Their main source of food in this area is bur-reed, arrowhead, wild rice, cut-grass and water lily. As you can imagine, the burrowing habits of the muskrat can reduce the stability of the stream bank.



BEAVER



Notice the beaver damaged tree. If netting were not placed around trees in this area, this type of damage would be widespread. Look up in the tree and notice the lack of growth. When the bark is chewed completely around the tree, the tree becomes "girdled." This means the conducting tissue is cut and no water will reach the leaves, causing death.



The large tree leaning over the water serves as a resting site for birds, particularly ducks. This can be called a "loafing site." This might also be an ideal nesting site for various types of ducks. Black ducks and Mallards would build a nest in a crotch or on a "shelf" of a tree such as this.



Do you see the hole in the beaver lodge? During the winter months refuge personnel have witnessed raccoon hibernating in abandoned lodges such as this one. Lodges also are used as nesting and loafing sites for ducks. This particular lodge must have been built when the water was at a higher level.



GOOSE PEN

In the 1950's a wire enclosure was constructed for the purpose of establishing a resident breeding flock of Canada Geese. Because of predation and poaching, and other factors, the experiment failed. Periodically this pen is brushed out so that it might still be used as a holding area for effected waterfowl if an oil spill should occur on Lake Champlain.

POINT OF INTEREST NOT ON NATURE TRAIL



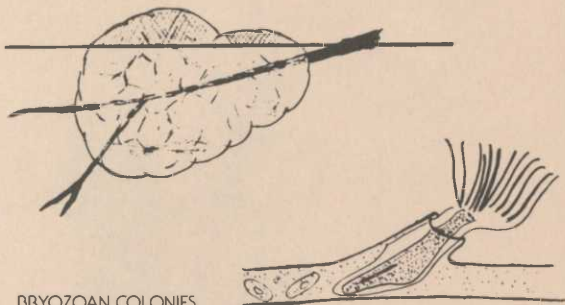
8

At the water's edge, you will observe many different aquatic plants. These serve a variety of functions in their water environment. Plants return oxygen to the water which is used by various micro-animal organisms and fish. Plants also serve as hiding places for fish, ducks, and frogs.



9

Look in the water 10 to 12 feet behind this sign. You will see several large jelly-like masses called bryozoan colonies. Bryozoan colonies are composed of individual animal organisms living permanently massed together. The single units of this colony each have hair-like tentacles called "cilia." The cilia wave back and forth in the water, directing the food particles into the bryozoan's mouth. The foods eaten by these minute organisms are microscopic algae, and single celled animals and plants.



BRYOZOAN COLONIES

MAQUAM CREEK TRAIL



10

Notice the lack of large plants in the area directly behind this sign. What you are seeing is a secondary succession area. Succession is a cyclic replacement of vegetation which eventually results in a mature (climax) community. (Contrast this situation to that of the next station.)



11

Observe the difference in vegetation from the previous station. This vegetation is approaching the climax stage of succession.



12

Directly behind the sign is a "beaver run." Such a run is useful to beavers when they need to transport branches and small logs to the water. Beavers also use these for quick and direct access to the water to escape from danger.



13

The dead tree you see serves as a feeding station for woodpeckers. On the opposite side of this tree, near the top, you will observe large oval holes which are direct evidence of the work of the Pileated Woodpecker. These cavities serve as natural sites for wood duck nests.



14

Do you see a pile of mud directly behind this sign? This pile was constructed by a beaver and is called a "scent mound." Beavers erect these mounds in order to establish a territory for themselves. You will observe numerous scent mounds on both trails.



15

The Birch tree behind this sign has numerous fungal growths protruding from its bark. These are called bracket fungi. Bracket fungi serve as decomposers (organisms which break down the remains and wastes of other organisms into simpler organic substances). The large protruding structure is called a conk.



FERN



16

Ferns are abundant here because of the moist woodland environment. Ferns are a food source for browsing deer and rabbits, although their primary value to wildlife in this area is to conceal smaller animals from predators. As you walk the trail you will be aware of the movement of various animals in the ferns, but you may not be able to see them.



17

This is the largest beaver lodge on the trail. Observe the materials used in its construction. The size of the beaver lodge is directly related to the number of family members it houses.



18

Notice the remnants of saplings (stumps of young trees). These small trees have become part of a beaver lodge.



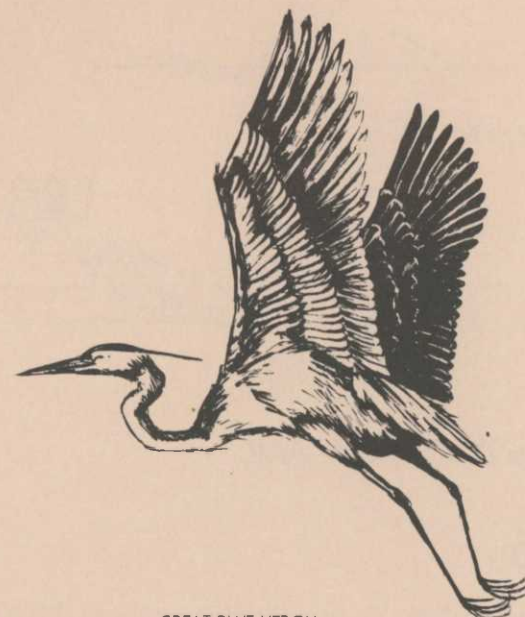
19

In the water behind this sign you should see more evidence that muskrats and beavers live nearby. The path-like areas are routes these animals have recently taken while searching for food.



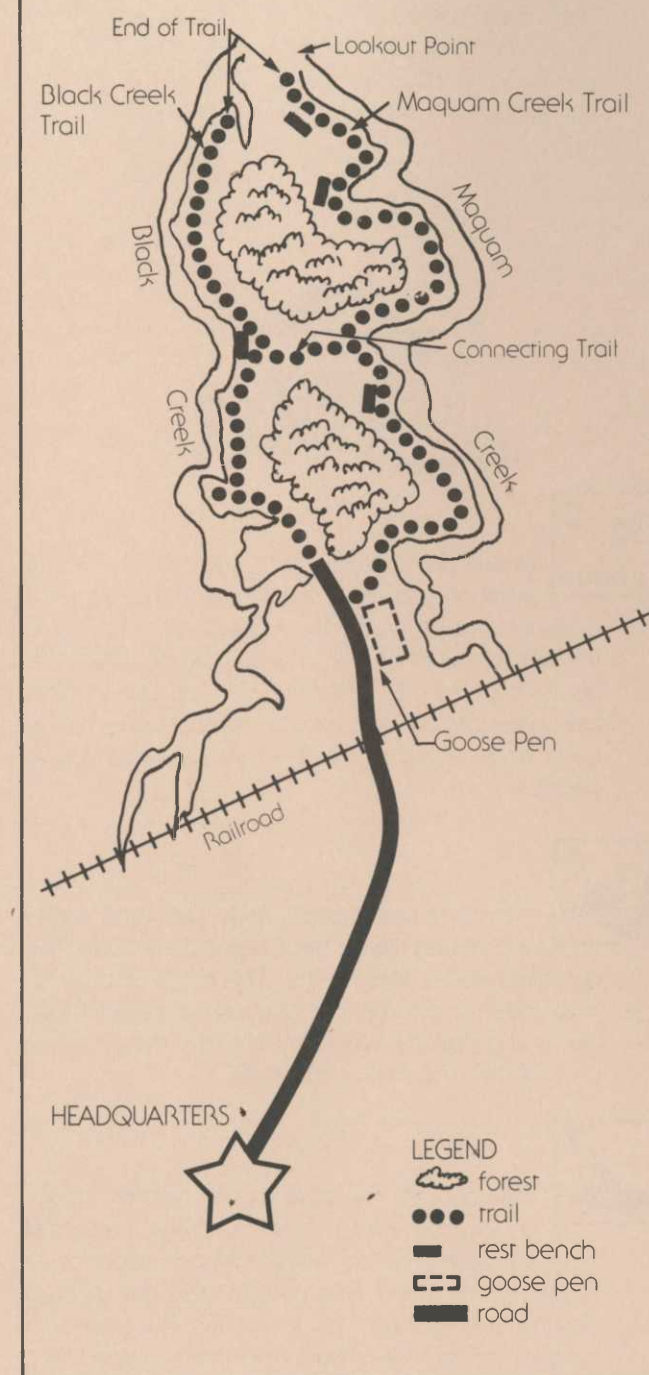
20

As you approached this final point on the Maquam Creek Trail you may have seen some very large birds in flight. These are Great Blue Herons, the second largest of the wading birds that occur in the Northern states. The Missisquoi Refuge contains the largest nesting colony (rookery) of these birds, in Vermont.



GREAT BLUE HERON

BLACK CREEK AND MAQUAM CREEK TRAILS



For further information contact:

Refuge Manager
Missisquoi National Wildlife Refuge
RFD #2
Swanton, Vermont 05488
Telephone: (802) 868-4781

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.



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



March 1980

MISSISQUOI

**NATIONAL
WILDLIFE
REFUGE**



SWANTON, VERMONT

WELCOME

INTRODUCTION

Missisquoi National Wildlife Refuge is approximately 50 miles north of Burlington, in Franklin County, Vermont. It is located on the eastern shore of Lake Champlain near the Canadian border with the headquarters on Highway 78 two miles northwest of Swanton.

This 5,651-acre refuge, occupies much of the Missisquoi River delta and consists of marsh, open water, and wooded swamp. The area is divided by numerous channels and remnants of old water courses, some of which have been closed off by silt deposition. Narrow belts of agricultural land occupy the ridges.

The Missisquoi Refuge and the delta are a water and marsh wonderland with winding channels, woods, and wildlife. The Indian word, "Missisquoi," means an area of "much waterfowl" and "much grass." This describes the delta very well, as many ducks and geese are attracted by richly vegetated shorelines and marshes that produce an abundance of choice foods.

PURPOSE

Missisquoi National Wildlife Refuge is a link in the chain of refuges extending from the northern migratory bird breeding grounds to the southern wintering areas. The refuge was established in 1942 to produce waterfowl and provide feeding and resting areas for migrating waterfowl in the northern Lake Champlain section of the Atlantic Flyway. With increasing losses of wildlife habitat as a result of human population growth and industrial and residential expansion, the refuge has become increasingly



important to the preservation of wildlife resources. While secondary to wildlife benefits, refuge use for wildlife oriented recreation; interpretation; and environmental education is encouraged.

A 1½ mile wildlife interpretive trail, partially boardwalk, is located behind the headquarters building. The trail is open from daylight to dark the entire year.

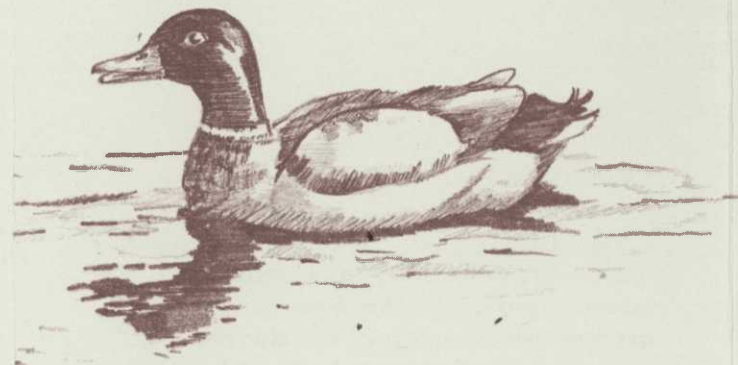
HISTORY

Silt and sand carried down the river during the spring floods created the delta now covered with marshes and timbered areas. Channels were cut in the sand bars formed at the river's mouths, thus extending the

river into the lake. As water velocity dropped, the lighter particles of fine silt were deposited farthest back in the slack-water areas on each side of the main channel. This light material was rich in plant nutrients, and plant life blossomed where there had once been nothing but sand. Quite often a section of the lake was enclosed by the higher deposits along the sides of main channels, forming marshes protected from the wind and waves. These are the marshes which produced aquatic plants most favored by waterfowl and which became an attraction for birds migrating through Lake Champlain. Due to natural succession, a good share of this duck habitat gradually changed to brush and trees, the marsh area dwindled and fewer ducks stopped in migration.

MANAGEMENT

The management of this refuge is aimed primarily at enhancing duck habitat by encouraging wet marsh conditions on some 1,800 acres of flooded plains. Safe sites for nesting and resting areas are also maintained.



BIRDS

Ducks that migrate through this portion of the flyway come primarily from the numerous lakes and marshes in the provinces of Quebec and Ontario, from the St. Lawrence River Valley, and from the Hudson Bay area. During the peak of the fall migration there may be as many as 22,000 ducks present on the refuge at one time. Waterfowl are also numerous on adjacent private marshes and in Lake Champlain on Missisquoi and Maquam Bays. Canada geese can be found using refuge lands in April and May.

The largest concentrations of waterfowl occur during April, September and October. Black ducks, mallards, wood ducks, and common goldeneyes are the most numerous nesting waterfowl, but there are also a few blue-winged teal, and hooded mergansers.

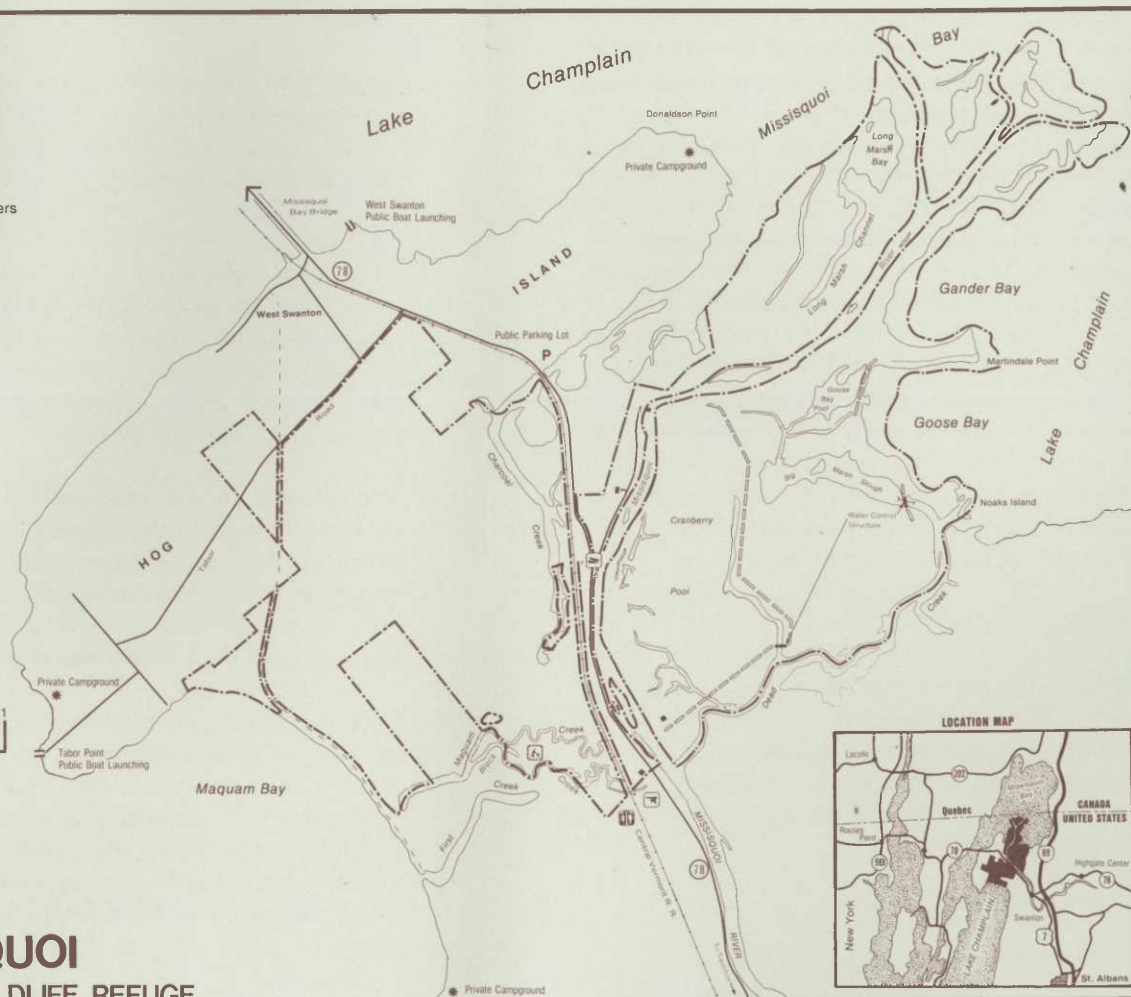
A variety of other birds are also present during the spring, summer, and fall. Nesters include the great blue heron, American bittern common gallinule and many species of songbirds. Marsh hawks, red-tailed hawks, great horned owls, barred owls, ospreys, and an occasional bald eagle also may be seen.

OTHER WILDLIFE

Other forms of wildlife also inhabit the refuge. Deer are seen from time to time, especially in spring. Red fox, beaver, red and gray squirrels, chipmunks, and raccoons may be observed on occasion as well as mink and otter. Muskrats are seen frequently in water areas.

Legend

- Refuge Boundary
- ☒ Refuge Headquarters
- 🚶 Nature Trail
- 🚤 Boat Launching
- 🛖 Rest Rooms
- Dikes



MISSISQUOI NATIONAL WILDLIFE REFUGE

FISH

Warm-water fish are numerous in the waters surrounding the refuge. There is fishing for walleyed pike, bass, northern pike, and bullheads. Fishing is permitted on the refuge only along the banks of the Missisquoi River. Contact the Refuge Manager for current regulations.

HUNTING

Hunting is permitted in specified locations. Contact the Refuge Manager for current regulations.

SEEING THE REFUGE

Public use areas of the refuge are open during daylight hours for the purpose of nature study, wildlife observation, photography, hiking and general sightseeing. Visitors with more specified needs or special interests should apply at refuge headquarters for special use permits and further information.

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**UNITED STATES
DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service**



RL53520-1
March 1980