MOOSEHORN NATIONAL WILDLIFE REFUGE

Calais, Maine

(Satellite station)
Carlton Pond Waterfowl Production Area

ANNUAL NARRATIVE REPORT

Calendar Year 1987

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

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MAR 02 1988
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Calais, Maine

ANNUAL NARRATIVE REPORT

Calendar Year 1987

Douglas M. Mullen	2/29/88	Edward S. Moses	4-5-88
Refuge Manager	Date	Refuge Supervisor Review	Date

Donald G. Young
Regional Office Approval

4/7/88
Date

INTRODUCTION

Moosehorn National Wildlife Refuge is located in Washington County, Maine--the easternmost county of the United States--and is approximately 375 miles (600 km) northeast of Boston, Massachusetts. The refuge is located in terrain that consists of rolling hills, large outcrops, valleys, streams, lakes, bogs, and marshes. The waters adjoining the Edmunds Unit are tidal with fluctuations of up to 24 feet (7.3 m)--the highest tides in the United States, except for Cook Inlet, Alaska.

Much of the 22,665-acre (9,176 ha) refuge is timbered, consisting of a cover of second growth aspen, birch, maple, beech, spruce, fir, and pine. A total of 1,308 acres (530 ha) of managed impoundments exist on the area and range in size from one to 160 acres (0.4 to 65 ha). Moosehorn is managed primarily for the American woodcock with secondary emphasis on breeding waterfowl. This is the only National Wildlife Refuge where the woodcock is intensively studied and managed.

Two Wilderness Areas, totaling 4,680 acres of the Baring Unit and 2,782 acres of the Edmunds Unit have been set aside by Congress as part of the National Wilderness Preservation System. Both areas are slowly reverting to old-growth climax forest.

Headquarters for the refuge is located on the Baring Unit, six miles southwest of Calais.

Vose Pond

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Nothing to Report

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A. HIGHLIGHTS

The woodcock telemetry study continued and the black duck study was completed (Section D.5)

The refuge became involved in a controversy when a new boiler was proposed for the Georgia Pacific mill complex in Woodland (Section F.12)

A contract was issued for new water control structures at Vose Pond and Popple Flowages (Section I.2)

Assistant Secretary of the Interior William Horn visited the refuge in September (Section E.8)

Refuge Secretary Helen Forsyth was selected as a "Secretary of the Year" (Section E.8)

Refuge Secretary Helen Forsyth retired after 20 years at Moosehorn (Section E.1)

Sid Bahrt was presented with a Special Commendation from Director Dunkle, for his work in promoting the protection of the bald eagle (Section J.3)

B. CLIMATIC CONDITIONS

Weather data, including daily temperatures and precipitation, is collected at refuge headquarters.

The year began with normal temperatures and heavy snowfall. A total of 53 inches was recorded during January, over twice the amount we normally receive. Temperatures during February and March were near normal, the ground remained snow covered throughout both months, with average depths of 20 and 26 inches, respectively, recorded in the vicinity of the refuge office.

During the third week of March, deer sinking depths of up to 31 inches were recorded. Above normal temperatures during the last ten days of March began melting snow and ice, with a few openings in fields and flowages appearing by month's end.

We enjoyed beautiful spring weather in April with moderate temperatures and below average rainfall.

During May, June, July and August temperatures were normal. A high of 100 degrees was recorded on August 16. Precipitation was well below normal during this period resulting in water levels below our planned objectives.

During the period of September through December we had above average temperatures. Snowfall for November and December totaled 46 inches, well above the long term average. On November 30 and December 1, 3.4 inches of rain fell on the Downeast area. This heavy precipitation, combined with run-off from melting snow washed out several roads on both units of the refuge.

A summary of weather data for 1987 is shown below:

Month	Snowfall 1987	Snowfall Normal*	Precipitation 1987	Precipitation Normal*	Temperatures Extremes Max.	Temperatures Extremes Min.	Temperatures Mean 1987	Temperatures Mean Norm.
January	53	23	5.92	4.42	45	-23	15	15
February	15	20	1.05	3.63	48	-16	18	19
March	36	19	3.78	3.74	66	-13	30	29
April	5	7	2.45	3.69	78	22	43	40
May			3.57	3.46	92	22	53	52
June			4.09	3.41	88	38	62	62
July			1.18	3.02	90	41	67	68
August			1.64	3.26	100	36	61	66
September			5.79	4.07	71	47	59	57
October		1	2.74	3.90	74	22	46	45
November	17	5	3.05	4.85	61	3	32	35
December	29	20	6.67	5.12	44	-9	22	21
TOTALS& AVERAGES	155	94	41.93	46.57	100	-23	41	42

* Based on the average of 34 years (1954-87) of weather data

C. LAND ACQUISITION

1. Fee Title

On September 29, Refuge Manager Mullen met with regional realty personnel Bob Miller, Kenneth Bodel and James Turner to look over and discuss the Lane Construction Hot Top Plant inholding, and Cobscook Bay State Park. The park, although actually part of the Edmunds Unit of the refuge, has been leased to the State since 1965.

The Service and the Maine Bureau of Parks and Recreation have been looking into the possibility of exchanging Cobscook for several refuge inholdings, state owned offshore islands, or other important wildlife parcels that would be purchased by the state for trade. As a first step, Cobscook will be appraised to determine its dollar value during the spring of 1988.

The exchange would benefit wildlife since the park would continue to be run for Wilderness camping while several wildlife tracts in the area would be saved from developers.

Cobscook Bay State Park

DMM 9/87

D. PLANNING

2.Management Plan

The 1987 Prescribed Burning Program was submitted to the Regional Office and approved in March.

Revisions to Trapping Plan were submitted and approved. The Fishery Management and Wildlife Inventory Plans were prepared and submitted to the regional office for review. To date neither has been approved. Work continued on the Law Enforcement Plan.

The refuge Handicapped Accessibility Plan and related forms were submitted to the Regional Office on December 28.

3. Public Participation

Refuge staff became involved in applying for the State permits required to replace water control structures at Popple and Vose Pond Flowages. Refuge Manager Mullen met with representatives of several state agencies and private conservation organizations to explain the project and gain their support. Assistant Manager Mills attended a meeting of the Calais Planning Board at which the project was discussed, and approved. From start to finish the entire permit process took over three months. Future permits may take up to two years!

5. Research and Investigations

Moosehorn NR87 - "Practical Application of Woodcock Trapping Techniques and Usage of Managed Cover Types" (Progress Report 53530-1)

Work on this project centered around analysis and publication of results. These publications include:

Dwyer, T.J., G.F. Sepik, E.L. Derleth, and D.G. McAuley. Demographic characteristics of a Maine woodcock population and effects of habitat management. Accepted for publication as a U.S.Fish and Wildlife Service Special Scientific Report. Expected release time is mid-1988.

Principal Investigator: Greg F. Sepik, Wildlife Biologist. Moosehorn NWR, Calais, ME 04619

Moosehorn NR87 - "Habitat Use, condition, and survival of post-fledging black ducks" (Progress Report 53530-14)

From September 10 to October 13 forty-one black ducks (31 HY females, 10 HY males) were captured at rocket net sites at Middle Magurrewock, Lower Goodall Heath, and Middle Barn Meadow flowages, and radio-marked. All birds were located daily for 90 days. Bird use was somewhat different from previous years. There was less use of areas north of St. Stephen and Milltown, N.B. During the day most of the birds were located on refuge impoundments, the St. Croix River, and streams and flowages off the river. Most birds roosted each night in the vicinity of Magurrewock and Barn Meadow Flowages with the exception of a few ducks that moved to the Dennys River and Meddybemps Lake area.

There were 11 mortalities during the observation period. Eight females died, two from undetermined predators, two by mink, and three were shot (one in New Brunswick and two in Maine). Two males were killed by raptors and one was shot in New Brunswick.

Radioed birds began to leave the refuge on November 3, with groups of birds leaving on November 8, 13, 16, and 21. Some of these birds were later located along the Maine coast from Cobscook Bay to Brunswick. On December 3 Jim Goldsberry and Dan Stotts flew from Virginia to Maine and located three of 20 missing birds. All three were located in Massachusetts, two on or in the vicinity of Parker River NWR and one on Monomoy NWR.

This was the last field season for this study. Data are being analyzed and will be published in scientific journals and C. Frazer's thesis.

Principal Investigator: Jerry Longcore, Maine Field Station, Patuxent Wildlife Research Center, 240 Nutting Hall, University of Maine, Orono, ME 04469

Moosehorn NR87 - "Habitat use and population dynamics of American woodcock during the breeding season" Progress Report 53530-30

Last year's pilot project was expanded into a large scale, three year program. This year eighty-five American woodcock (*Scolopax minor*) (54 males, 31 females) were radio-marked and tracked from 26 March to 16 June in an effort to determine survival rates in different habitat types, monitor habitat use, study selected population parameters, and make habitat management suggestions.

Period (60 days) survival rates for males differed between age classes (ASY=0.83, SY=0.61) and also between years (1986, ASY = .24, SY = .74) Overall female survival also differed between years (1986 = .69, 1987 = .92).Brood and chick survival was high in 1986 (1.0 and 0.99, for a 21 day period, respectively), but significantly lower this year (.70 and .56). These differences in survival rates between years was unexpected. We expected low survival rates for adults because over three feet of snow covered the refuge when the birds returned at the end of March. Several birds were caught at spring seeps shortly after their arrival and all survived. Brood survival was low probably due to a combination of low temperature and rain which occurred shortly after hatch.

Over 2600 diurnal locations were logged. Habitat data was collected at each location and will be analyzed to determine use preference and survival rates by stand class.

Several females on nests were monitored continuously using Rustrak Recorders. Most females left the nest for not more then one hour a day; usually at dusk and dawn. A new antenna system was developed which greatly increased the quality of the data. A paper was prepared for publication on this system and is currently undergoing "in house" review.

Renesting of females after brood and nest loss was observed. A paper is being prepared detailing these findings since they have never been documented before.

Goshawk Nest which contained two radios and two bands
GFS 6/87

A goshawk nest was located which contained two radio transmitters and bands from two woodcock which were not radio-marked. Only a handful of prey remains was found around the nest. Goshawks will specialize on a particular prey species; this one appears to have a taste for woodcock. A paper is being prepared detailing this and other observations of goshawk predation on woodcock.

Principal Investigators: Greg F. Sepik, Wildlife Biologist, Moosehorn NWR, Calais, ME 04619 and Jerry Longcore, 240 Nutting Hall, University of Maine, Orono, Maine 04469.

Moosehorn NR87 - "A Population Estimate of American woodcock on the Moosehorn National Wildlife Refuge" Progress Report 53530-32

The last population estimate of American woodcock numbers on the Moosehorn National Wildlife Refuge was made in 1980. Since then the annual singing ground survey has increased dramatically (See section G.5 for details) and habitat management has created large blocks of early successional forest. The purpose of this study was to determine the size of the population by age and sex class using the same techniques and models that were used previously (Dwyer et al. Demographic Characteristics of a Maine Woodcock Population and Effects of Habitat Management. In Press).

Near record numbers of woodcock were captured during the spring and summer using trained bird dogs, mist netting, nightlighting, and modified shorebird traps. A total of 761 woodcock were captured representing 536 different birds. Despite this fact, populations estimates were extremely low. We believe that the estimates were biased and not predictive of the true population. The reasons for this may be the large changes in habitat since the last estimates. Previously, there were only a few openings and less high quality diurnal habitat. Therefore, woodcock were more concentrated and it was possible to recapture a large number of birds. The mark-recapture models we used require large numbers of recaptures to provide reliable estimates. Apparently, the recapture rate was not adequate in 1987.

We will repeat the study in 1988 with the goal of trying to increase the number of recaptures. We will also investigate other types of models which might provide more reliable estimates of the population.

Principal Investigators: Greg Sepik, Moosehorn National Wildlife Refuge, Calais, Maine 04619 and Jerry Longcore, Maine Field Station, Patuxent Wildlife Research Center, 240 Nutting Hall, University of Maine, Orono, Maine 04469.

E. ADMINISTRATION

1. Personnel

7,2,6,3,8,5,1

Refuge Staff

1.Douglas M. Mullen, Refuge Manager, GS-12 (EOD 10/09/77) PFT
2.Maurice Mills,Jr.,Asst. Refuge Manager, GS-9 (EOD 5/12/85)PFT
3.Greg F. Sepik, Wildlife Biologist, GS-11 (EOD 11/8/78) PFT
5.Gayle A. Norton, Secretary, GS-5 (EOD 12/21/87) PFT
6.Stanley E. McConvey, Biological Technician GS-9 (EOD 5/9/51)PFT
7.Merton L. Hatton, Maintenance Worker WG-7 (EOD 1/3/56) PFT
8.Millard W. Seeley, Maintenance Worker WG-7 (EOD 9/30/84) PFT

-Not Pictured-

4.Helen E. Forsyth,Secretary,GS-5,(EOD 5/31/67)PFT Retired 11/30/87
8.William A. Jones, Maintenance Worker WG-7 (2/15 to 10/10/87)TFT
9.Suzanne Coutu, Biological Aid, GS-4 (3/15 to 6/20/87)TFT
10.Richard Speer, Biological Aid, GS-4 (3/15 to 6/20/87)TFT
11.Kristin Wood, Biological Aid, GS-5 (3/15 to 8/1/87) TFT

Emergency Pre-suppression Fire Crew

George E. Day	7/5 to 10/10/87	Motor Vehicle Operator	WG-5
Steven T. Elliott	7/5 to 9/1/87	"	"
Franklin M. James	7/5 to 10/10/87	"	"
Reid F. Leighton	7/5 to 10/10/87	"	"
Melvin W. Winchester	7/5 to 10/10/87	"	"

Sawyer, Esposito, Skinner, Hawkes, Bailey, Clark
The 1987 YCC Crew

Y.C.C. Staff

Randy Clark, Group Leader, GS-5, 6/22 to 8/14/87

Y.C.C. Enrolees

Kelli Bailey	6/22-8/14/87
Vincent Esposito	7/6 -8/14/87
Shannon Hatton	7/6 -8/14/87
Harold Hawkes	6/22-8/24/87
Richard Skinner	6/22-8/14/87
Steven Sawyer	6/22-8/14/87
Krista White	6/22-7/4/87
Brian James	6/22-8/14/87
Darcy Robinson	6/22-6/29/87

The following table depicts personnel strength over the past five fiscal years:

(Number of Employees)

	Permanent Full-Time	Permanent Part-Time	Temporary	TOTAL FTE
FY87	7	0	9	7.6
FY86	7	0	9	7.6
FY85	7	0	2	6.9
FY84	9	0	4	8.5
FY83	8	0	1	7.8
FY82	7	0	1	7.3

William Jones was hired to provide additional maintenance help during the spring and summer months. Suzanne Coutu, Kristin Wood and Richard Speer were hired as biological aids to work on the woodcock telemetry study.

Refuge Secretary Helen Forsyth retired on November 30 following over 20 years of service at the Moosehorn. Helen was honored by over sixty friends, family members and co-workers who gathered at the Calais Motor Inn on the evening of the 30th to wish her well.

Gayle Norton entered on duty on December 21 to assume the refuge secretary position. Gayle is a resident of Addison and had been working for the State of Maine at the Bucks Harbor Correctional Facility.

2. Youth Programs

Moosehorn hosted a 6 enrollee non-residential Youth Conservation Corps Program in 1987. This was the lowest number of enrollees we employed since the program began in 1971.

In March, a news release announcing the program was sent to all local newspapers, area high schools, and the Calais Job Service Office. A total of 38 applications (31 from males and 7 from females) were received for our six enrollee slots. A public drawing was held at the refuge headquarters on April 28 to select the 1987 enrollees and alternates.

Selected as enrollees were Harold Hawkes, Darcy Robinson, Krista White, Richard Skinner, Brian James and Kelli Bailey. Steven Sawyer, an enrollee in 1986, returned to serve as youth leader. Randy Clark of Woodland was selected as the group aid. Although new to Moosehorn, Randy had worked with the YCC program at Loring Air Force Base in Limestone, Maine.

On May 18 a meeting was held at refuge headquarters for all enrollees. The 1987 YCC program was discussed and all necessary paperwork completed.

The YCC program began on June 22 and ran through August 28, with a budget of $13,600. During the course of the summer a variety of work projects provided a wide range of work experience and environmental education opportunities to the enrollees. The total appraised value of the work accomplished by YCC in 1987 was $17,700.

Early in the program three enrollees, Darcy Robinson, Krista White and Brian James left the program. Vincent Esposito and Shannon Hatton were hired at the start of the third week as replacements. Harold Hawkes worked two extra weeks in order to expend allotted salary funding.

A summary of 1987 YCC Accomplishments: conducted Timber Stand Improvement on one acre; picked up litter from three public roads which go through the refuge(a total of 25 miles were cleared by the end of the summer); straightened fence and posts along the Barn Meadow Road; assisted with maintenance of water control structures including removing beaver debris, painting of risers, and installing stoplog drying racks at seven structures (this project affected eight acres of waterfowl habitat); painted and repaired all refuge gates; cleared 18,480 lineal feet of refuge trails and boundary; repaired and refinished 17 refuge signs; cleared around and fertilized 10 wild apple trees; maintained and improved three miles of existing nature walks; installed several wood duck boxes at Petit Manan NWR; and assisted with numerous grounds and buildings maintenance tasks around the refuge headquarters. As a public service project for Take Pride in America, several enrollees painted historic mile markers along U.S. Route One between Robbinson and Calais.

The five work projects which consumed the bulk of the enrollees time were maintenance of water control structures, roadside brushing, boundary clearing and posting, and sign and facility maintenance. Approximately 1500 enrollee hours were expended on these projects. There were only two rainy days throughout the summer. Dry conditions prevented us from safely burning as much brush and slash as we had hoped.

Mulching the Rehabilitated Visitor Center Parking Lot
DMM 8/87

Salvaging Firewood from the South Dudley Dike
DMM 7/87

The group leader attempted to incorporate environmental topics into discussions about scheduled work projects. Some ideas which were covered included prevention of soil erosion, effects of chemicals on the environment, the refuge woodcock research program, trail maintenance, plant tolerance, entomology, dendrology, and uses for different types of wood. The major portion of environmental education came from on-site observations of waterfowl, osprey, eagles, deer, bear, wildflowers and trees.

Problems with this year's YCC program included small crew size and a general lack of enthusiasm towards work projects by some enrollees. Youth Leader Steven Sawyer was a real asset to the program. He exhibited leadership qualities and showed real enthusiasm in most work projects.

5. Funding

The following is a table depicting our broad funding situation for Fiscal Years 1983-1987:

YEAR	ALLOTMENT	SALARIES	FIXEDCOSTS STUDIES, TRAVEL	OPERATING BALANCE
1983	269,000	189,190*	31,655	48,155
1984	353,000	206,105	49,415	97,480**
1985	319,500***	192,093	47,665	79,742
1986	295,678	217,907	26,024	51,747
1987	295,700	208,296	42,900	44,504

* FY-83 Assistant Manager Trainee Position Filled
** Fixed costs and operations balance increases due to ARMMs projects and initiation of Petit Manan NWR management projects
***FY-85 Allotment does not include funds for Petit Manan NWR
Note: The above figures do not include YCC Funds

A breakdown of our total Fiscal Year 1987 Funds follows:

Operations and Maintenance -	$ 202,220
ARMMs Projects -	$ 142,380
Fire Funds -	$ 21,650
YCC Funds -	$ 13,600
Resource Problems -	$ 20,000
TOTAL -	$ 399,850

6. Safety

Regular safety meetings were held throughout the year.

Fire suppression equipment was checked and serviced as needed prior to the 1987 fire season.

On July 14, Pete Suich, Regional Youth Programs and Fire Coordinator, was at the refuge to discuss safety and the YCC and fire program with the refuge staff.

The emergency pre-suppression fire crew cleared a 30 foot fire line around the refuge headquarters complex. This line is also used to delineate the limits of the safety and no hunting zone during the firearms deer season.

Fire and chainsaw safety were discussed with the fire crew during their initial week of training and throughout the length of their appointments.

Daily tailgate safety sessions were held with YCC enrollees. Topics discussed included chainsaw safety, proper use of hand tools, vehicle safety and good housekeeping.

As a result of the FY 1986 Maintenance Management System safety inspections the following items were completed: additional exit signs were placed in the shop and YACC building; ground fault circuit interrupters were installed in the bathrooms in the office, shop and woodcock shack; non-grounded outlets were replaced in the office, shop and residence; covers were installed on numerous electrical boxes; several two wire circuits were replaced; and N.C.F.R. non-asbestos wall shield was installed behind the wood burning stove in the woodcock shack. The switch on the shop attic fan was replaced.

The above corrected all minor deficiencies discovered during the inspection. All other items included in the report will be corrected as funds permit.

One member of the emergency pre-suppression fire crew developed allergic reactions to insect stings on two occasions. He was transported to the Calais Regional Hospital Emergency Room where he received treatment and returned to light duty the remainder of both days. After the first incident this individual obtained a "bee sting kit". However, despite the fact that the medication in the kit was used during the second sting, he still required medical treatment.

The same individual mentioned above received a blow to his shoulder from a falling limb, which also required treatment at the emergency room. The blow resulted in a sprain and the individual was placed on light duty for a few days.

7. Technical Assistance

Biologist Sepik toured Fort Devans Army Base in Massachusetts in June for the purpose of providing woodcock management suggestions to the base biologist.

Assistant Manager Mills served as the regional coordinator for the Calais area in the 1987 Maine Loon Day Count which was held on July 18.

Biologist Sepik was assigned responsibility for coordinating the Maine Mourning Dove and Woodcock Singing Ground Surveys.

8. Other Items

The entire refuge staff attended a seminar on the changes in the federal retirement system and social security in Bangor on March 27.

Refuge Secretary Helen Forsyth, who was selected as a Secretary of the Year, traveled to Boston with Refuge Manager Mullen to attend an awards luncheon on April 1.

Steve Maslowski of Marty Stouffer Productions visited the refuge to finish filming the production entitled "Timberdoodles of the Moosehorn" during the month of March.

Brad Allen, Assistant Migratory Bird Research Leader, Maine Department of Inland Fisheries and Wildlife, spent four days at the refuge in April assisting with the woodcock telemetry project.

Ray Owen, Wildlife Department, University of Maine, and Dan Keppie, Wildlife Department, University of New Brunswick, visited the refuge in April to observe woodcock management and research programs.

Gerry Atwell, RFN Zone Biologist, visited the refuge during the week of April 19 to view the woodcock telemetry project.

On April 20, Refuge Manager Mullen attended a meeting in Cutler concerning a proposed aquaculture project to raise salmon adjacent to Cross Island NWR.

On April 24 Refuge Manager Mullen visited Carlton Pond WPA to meet with Gordon Russell (ES) to discuss a proposed low level hydro project at Carlton Pond.

In June, Revenue Sharing Payments totalling $ 38,639 were made to the Towns which contain refuge lands.

Peter Suich, Regional Youth Programs and Fire Coordinator visited the refuge on July 14 to review the YCC and fire management programs.

Biologist Sepik attended a meeting in July at the Patuxent Wildlife Research Center in Laurel Maryland. The meeting was held to discuss future research needs for the American woodcock.

Refuge Manager Mullen and Assistant Manager Mills attended the Regional Project Leaders meeting at Wells College in Aurora, NY during the week of August 3-7.

On October 22, Mr. Len Lussier, an auditor with the Department's Inspector General's Office, visited the refuge to discuss entrance and user fees.

Refuge Manager Mullen and Biologist Sepik attended "A Workshop To Help Northeastern Industrial Foresters Help Woodcock" on September 11 in Portland, Maine. Biologist Sepik presented a paper on woodcock research and habitat management that has been conducted on the refuge.

On the day following the workshop, Assistant Secretary William Horn and Peter Duncan, Executive Director, Pennsylvania Game Commission, visited the refuge to view forest management techniques used for wildlife management. The visit was covered by all local newspapers and one Bangor TV station.

On October 27 and 28, Ms. Pat Martinkovic, Assistant Supervisor for Refuge's South, visited the refuge to review FY 87 ARMM's funding and project accomplishments.

Cobscook Bay State Park

The former Edmunds Unit Campground, constructed in the early 1960's, has been managed since 1965 as the Cobscook Bay State Park by the State of Maine's Bureau of Parks and Recreation. Day use of the park during 1987 totaled 6,698 visits; overnight use totaled 20,933. Both of these figures represent substantial increases over last year, attributable to the excellent weather conditions we experienced during the summer months.

F. HABITAT MANAGEMENT

1. General

Moosehorn's primary habitat management objectives are to develop, test and demonstrate woodcock management techniques and practices, and to produce as many ducks as practical by maintaining good quality waterfowl habitat.

To meet these objectives in 1987, we continued to convert the refuge from a large even-aged forest to a highly diverse ecosystem by clearcutting strips and five-acre blocks. In an effort to meet waterfowl objectives, flowages and impoundments were maintained at prescribed levels, water control structures and waterfowl nest boxes were repaired and maintained, and wild rice and japanese millet were planted on several areas to enhance food availability during the fall.

Although several thousand acres of the refuge are actively managed, most is not due to its Wilderness status, or other considerations. These "Wild" areas provide a quiet, undisturbed place for refuge visitors.

2. Wetlands

There are 52 managed water impoundments within the refuge. Of these, 44 are located on the Baring Unit, and eight on the Edmunds Unit. Five are within the boundaries of the Baring Wilderness Area and two are within the Edmunds Wilderness Area; management here is limited to replacing stoplogs and monthly water level checks.

There are an additional 32 unmanaged natural marshes, bogs and beaver flowages on the refuge. The Edmunds Unit contains 7 acres of tidal marsh and flats which provide habitat for wintering waterfowl. The tidal fluctuations in Cobscook Bay range up to 24 feet.

Most of the managed impoundments are small 5 to 20 acre flowages, consisting of marsh, bog, and flooded timber. They provide excellent habitat for black ducks, wood ducks, ring-necked ducks, and hooded mergansers.

On March 18 Refuge Manager Mullen, Assistant Mills, Biologist Sepik, and Dan McAuley of the Maine Field Station-Patuxent Wildlife Research Station met with Pat Brown, wildlife professor at the University of Maine at Orono to discuss a proposed study of managed impoundments and drawdowns on the refuge.

Ice began to disappear from flowages and impoundments around the end of March. Canada geese were first noted back on March 25. All water control structures were inspected in April. No problems were detected and all flowages and impoundments were in good condition with optimal water levels for the nesting season.

Most flowages were at prescribed levels throughout the month of May. The Hobart Bog water control structure was checked on May 27; the water level in the bog was about two feet below its optimal level, due to the lack of water in Hobart Lake which feeds it.

Popple and Maple flowages, which were drawn down in April, were seeded with japanese millet early in May. An excellent crop was produced at Maple Flowage, and stoplogs were replaced on August 22. During late September and early October, up to 40 wood ducks, blacks and green-winged teal fed extensively on the millet at Maple, which is only about 2 acres in size. Growth was only marginal at Popple, possibly due to the predominantly rocky bottom and poor soils.

Popple Flowage Drawn Down
MM 7/87

During the summer and fall beaver periodically clogged structures at Eaton Heath, Boundary and Mile Bridge Flowages on the Baring Unit, and Alder and Trout Brook Flowages on the Edmunds Unit. However, no interference with waterfowl production was noted.

David Washburn (RO-EN) visited the refuge on May 18 and 19 to gather some additional information and survey data for the proposed rehab of the Vose Pond and Popple water control structures. During the week of May 10 a concrete wing wall on the Popple structure shifted necessitating the closure of the bridge to all traffic.

During July and August, most refuge flowages were about five inches below prescribed levels due to the lack of rainfall. Wild rice was present on at least 15 flowages, with the best stands on Upper Barn Meadow and Baker Pond. Canada geese fed on the rice in many areas, which limited its seed production. Geese also pulled up much of the pickerel weed in the Upper and Middle Magurrewock Marshes and Bearce Flowage.

Last year beaver built a dam in front of the dike which impounded the South Dudley Flowage, and raised the water level two feet. This flowage had been impounded by a dike and water control structure a number of years ago, but large rocks in the dike allowed water seepage, preventing proper management. Construction of a permanent, clay cored dike was begun in July and completed by fall. We now have the capability to manage this area and expect to produce several broods of waterfowl each year.

Above average rainfall during September filled most refuge flowages back to their optimal levels by months end.

The attempt to get wild rice established on as many flowages and impoundments as possible was continued this year. On September 24 Assistant Managers Mills and Goettel (Petit Manan) traveled to the Sandy Point Wildlife Management Area in Stockton Springs, Maine to gather wild rice. Approximately 40 pounds of rice seed was collected and planted in 20 flowages on the Baring and Edmunds Units and several areas on Petit Manan Point.

Wild rice stands were present on at least 19 locations on the Baring Unit, and 5 locations of the Edmunds Unit. See Maps 1 and 2 for locations of rice stands in 1987, and areas which were seeded this summer. While Canada goose browsing continues to slow the spread of the rice, we expect that within a few years there will be adequate stands to stay ahead of the geese.

The Lower Magurrewock Marsh produced only a marginal crop of lowbush cranberries this fall, but visitors still picked several bushels.

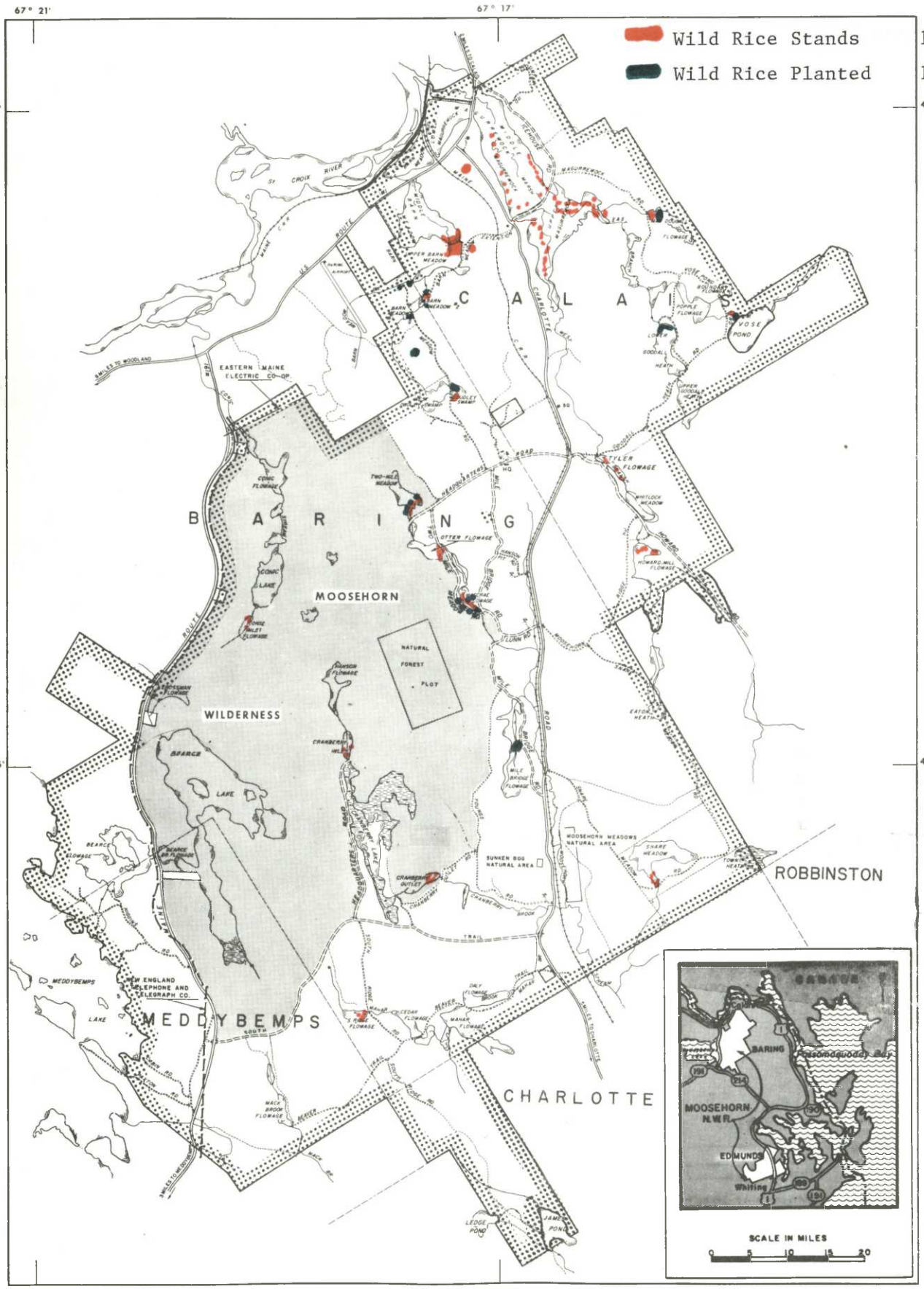
MAP NO. 1

MOOSEHORN NATIONAL WILDLIFE REFUGE

WASHINGTON COUNTY, MAINE

UNITED STATES
DEPARTMENT OF THE INTERIOR

BARING UNIT
UNITED STATES
FISH AND WILDLIFE SERVICE



COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY G.S. AND U.S.F.& W.S.

NEWTON CORNER, MASSACHUSETTS

0 2640 5280 7920 10560 FEET

0 1 2 3 4 KILOMETERS

20° Magnetic N. True North

MEAN DECLINATION 1949

5R ME. 220

MAP NO. 2

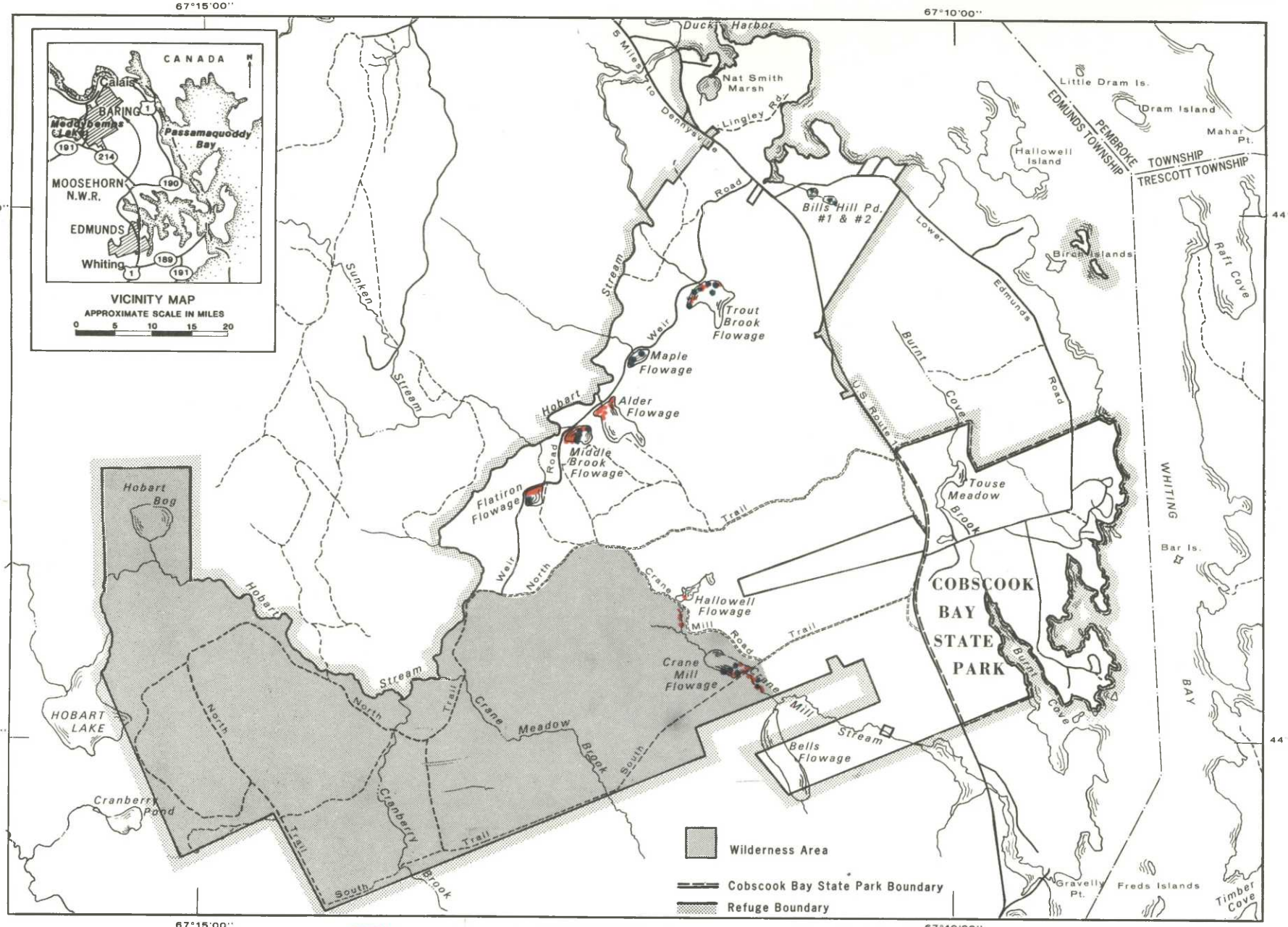
MOOSEHORN NATIONAL WILDLIFE REFUGE

WASHINGTON COUNTY, MAINE

UNITED STATES
DEPARTMENT OF THE INTERIOR

EDMUND UNIT

UNITED STATES
FISH AND WILDLIFE SERVICE



COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY U.S.G.S. and U.S.F.&W.S.

Wild Rice Stands - 1987

Wild Rice Planted - 1987

0 2000 4000 6000 8000 FEET

0 .50 1.0 1.5 2.0 KILOMETERS

MEAN DECLINATION 1977

NEWTON CORNER, MASSACHUSETTS
REVISED: JANUARY 1987

MAP NO. 2

5R ME 220

Flowages and impoundments on both units remained at prescribed levels until they began freezing over around mid-November. Most flowages and impoundments were completely frozen over by mid-December. Open water areas were limited to portions of streams and brooks.

3. Forest

The major goals of the forest management strategies employed at Moosehorn are to increase overall diversity and maintain about one-third of the area in early seral stages. To achieve these objectives the refuge must harvest between 100 and 150 acres of timber each year. For the most part, harvesting methods are limited to clearcutting--usually in 5-acre blocks or strips 100 feet wide and from 100 to 1,400 feet long.

Most merchantable stands were harvested by the Washington County Vocational Technical Institute (WCVTI) with some cutting done by private contractors and individuals for firewood. Non-commercial stands were harvested by firewood cutters, youth programs, and to a lesser extent, the WCVTI.

Commercial cutting was conducted in the vicinity of the South Ridge Road between Firehole Flowage and South Ridge Flowage. This area is predominantly over-mature hardwoods, spruce, fir and white pine with volumes exceeding 20 cords per acre. Small units were also harvested at the junction of Snare Meadow and Moosehorn Ridge Roads, Otter Flowage, and between Lunn and Hanson gravel pits.

About one-half of the red pine stand (3 acres) located behind the office complex was commercially thinned. Growth of this high quality stand had been slowed due to excessive canopy infringement. About 50 percent of the volume was removed to improve growth. An adjacent white pine stand was subjected to a pre-commercial thinning. In excess of 80 percent of the stems were removed. Both of these areas will serve as forest/wildlife management demonstration areas.

Red Pine Stand Marked For Thinning
GFS 8/87

Same Stand After Commercial Thinning
GFS 9/87

White Pine Stand During Thinning
GFS 8/87

The market for wood products has remained stable this year, however, enrollment at the WCVTI remains low. As a result, only about one-third of our annual cutting goal was achieved. We started using private contractors on a small scale and will expand their use in the future.

Revenues from timber sales during 1987 are shown below:

Pine logs	39.00 mbf	$ 1953.13
Hardwood,4'	48.90 cds	296.50
Spruce/Fir Pulpwood	22.43 cds	168.23
Spruce studs	81.00 cds	902.56
Pine Pulp	9.88 cds	49.40
Other Pulp	52.37 cds	249.48
Other		100.00
	TOTAL	$ 3,719.30

Our ongoing efforts to release wild apple and cherry trees paid off again this year. Trees were filled with blossoms during the spring and each bore a bumper fruit crop. This provided a valuable wildlife food source during the late summer, fall and early winter months. YCC enrollees thinned around 10 apple trees this summer. Most trees were also fertilized.

Many areas of the Edmunds Unit that burned during the 1985 Sunken Stream Fire provided another good crop of wild raspberries.

5. Grasslands

The refuge currently contains 384 acres of grassland. The objectives of grassland management are to provide green browse for Canada geese in the summer, to maintain openings for use by courting and roosting woodcock, and to provide openings and edge for other wildlife species.

The Dineen Field and Daly Flowage Dike were over seeded with alsike clover on April 28.

Re-shaped sections of the Vose Pond Flowage and Firehole dikes were seeded with red clover and conservation mix in May.

All dikes were mowed at least once by the end of June. Most were heavily grazed by Canada geese, deer and bear throughout the spring and summer.

During the summer all dikes and several refuge fields were fertilized with 10-10-10 by Y.C.C. and refuge staff.

The site of the former visitor center parking lot was seeded with winter rye and a variety of grasses; by September the area had greened up and was being utilized by the Canada goose flock.

The three acre field adjacent to MacCrae Flowage developed into an excellent stand of timothy and clover, and was heavily utilized by Canada geese, black bear, and white-tailed deer. Continued liming and fertilizing should make it even better.

The Dragon Products Company of Unity, Maine was contracted to spread lime on refuge dikes and fields in 1986, however due to wet conditions only 50 tons was spread. The remainder was spread during May 1987 on the following areas: thirteen tons on all dikes, portions of gravel pits and firelines on the Edmunds Unit; twenty-six tons on the old Tyler Farm site, Headquarters Fields, Upper Goodall Heath, Vose Pond Flowage, Otter and MacCrae dikes on the Baring Unit.

Over 40 acres of grass and brushy fields had been mowed by the end of October.

During September, a one acre opening off the South Ridge Road was leveled and made into a field. It was seeded with winter rye and a variety of grasses and clover.

On December 15, Manager Mullen attended a meeting at the Washington County SCS office in Machias to explore the use of wood ash from the Ultrapower wood fired power plant in Jonesboro and fish scales from the Mearl Corporation, in Eastport to fertilize refuge fields, pastures and dikes. The two materials would supply all the nutrient needs of our grasslands, at no cost to the refuge. We are hoping that permits can be obtained to spread both materials on selected refuge lands during 1988.

6. Other Habitats

Most black locust trees, which were planted in gravel pits on both units of the refuge continued to grow despite browsing by moose and porcupine. Locust trees in the McLauflin pit behind the YCC camp have begun to root sprout, adding additional cover to the bare gravel banks.

7. Grazing

Grazing is used as an inexpensive means to maintain openings for woodcock singing grounds and nocturnal roosting fields. The two grazing units, known as the Stewart Pasture, located near the Magurrewock Marsh, and the Barn Meadow Fields, off Route 1 in Baring, total 80 acres. Grazing was permitted from June 1 to October 15; the rate charged was $2.50 per AUM again this year.

Two permittees grazed a total of 26 head on both units during 1987. They were charged for 120 AUM's, which generated a revenue of $300.00. The table below summarizes the grazing program over the past eight years.

C.Y.	No. Permits	AUM's	Revenue
1980	4	115	$287.50
1981	5	115.5	288.75
1982	5	148	370.00
1983	4	116.5	291.25
1984	3	107.5	268.75
1985	3	119	297.50
1986	2	110	275.00
1987	2	120	300.00

Five acres of the Stewart Grazing Unit field was rotary mowed during the third week of November.

8. Haying

The fields adjoining the Middle Magurrewock Marsh and Visitor Center on the Baring Unit, and the field adjacent to Nat Smith Marsh, and several small fields off the Loop Road at Edmunds were hayed by three local farmers. Approximately ten tons of hay was harvested.

Haying is used primarily to maintain grazing areas for Canada geese and to provide roosting and courting areas for woodcock. As more and more farms go under in Washington County, it becomes increasingly difficult to get refuge fields hayed. In the future, most fields will have to be mowed by refuge staff.

9. Fire Management

The Annual Prescribed Fire Program was submitted to the Regional Office for review and approval during March.

Maintenance Workers Seeley and Jones attended Fire Management Training at Wallops Island, Virginia on February 22-27.

Assistant Manager Mills assisted with prescribed burning operations at Petit Manan NWR on April 14 and 15.

We were again alloted funding for a five person emergency pre-suppression fire crew this year. The five positions, classified as WG-5 motor vehicle operators, were advertised locally. The individuals selected were George Day, Calais, Steve Elliot, Alexander, Melvin Winchester, Calais, Frank James, Charlotte, and Reid Leighton, Dennysville.

The crew entered on duty on July 6. Alan Carter, Fire Management Officer from Great Dismal Swamp NWR, was present on July 7 to 9 to provide Basic Fire Management Training S-130 and S-190. A two and one-half acre clearcut off the Snare Meadow Road was prescribe burned as part of the training.

Pete Suich, Regional Fire Coordinator, visited the refuge on July 14 to review our fire management program.

The crew completed their tour of duty on October . A total of 10 miles of fireline was cleared around the Baring Unit. Where possible, slash and debris were piled with the use of the refuge skidder. Some saw logs and firewood were also salvaged from the firelines.

Prescribed Burn at Moosehorn Ridge Clearcut
MM 7/87

The following areas were prescribe burned during April 1987:

Edge of Charlotte Road	20 acres
Field 1	5 acres

Dry conditions and high winds during our burning season prevented us from burning several other areas. All burns went well with no major problems accomplishing our objectives.

Firelines were bulldozed around two of our blueberry fields in preparation for prescribed burning during Spring 1988.

10. Pest Control

The spruce budworm outbreak seems to be over on the refuge but a few weakened old growth spruce and fir trees continue to die. Young fir and spruce regeneration is rapidly replacing the dead trees. The refuge has steadfastly opposed using chemical sprays to control insect outbreaks. For the first time in 30 years no budworm spraying was conducted by the state of Maine during 1987.

While mowing the field adjacent to Baker Pond in August, maintenance worker Jones found a small stand of purple loosetrife. Approximately 20 plants were present, and it appeared that the stand was several years old. The plants had probably never bloomed before, as the field is usually mowed in early July. The entire clump was removed with the bucket on the tractor, bagged, and burned in one of the refuge gravel pits.

Clump of Purple Loosetrife Found in the Baker Field
MM 8/87

An effort will be made to locate and eradicate any additional stands of this pest plant before it can become established on refuge wetlands. It continues to move north and east in the state, with several stands within 15-20 miles of the refuge boundary.

12. Wilderness and Special Areas

The following is a summary of Moosehorn's Wilderness and Special Areas:

Baring Unit Wilderness Area	4,680 A.
Edmunds Unit Wilderness Area	2,782 A.
Edmunds Unit Natural Forest Plot (Red spruce - balsam fir)	160 A.
Bertrand E. Smith Natural Forest Plot (White pine)	160 A.
Moosehorn Meadows Natural Area (Managed woodcock habitat)	50 A.
Camp Two Natural Area (Balsam fir)	40 A.
Hobart Natural Area (Northern white cedar)	10 A.
Sunken Bog Natural Area (Sphagnum bog)	10 A.
Total:	7,892 A.

All of the water control structures on flowages within the Baring Wilderness Area are still functional. These flowages are maintained at levels which provide the maximum amount of waterfowl habitat. This practice will continue as long as the structures remain operational. With the exception of Hobart Bog and Crane Mill Flowage, the water control structures within the Edmunds Wilderness Area have been lost to washouts.

Most of the roads on the Baring Unit Wilderness Area are still passable as foot trails, although they have become overgrown with alders and conifers in some areas. They are still popular with refuge visitors and provide good hiking and cross-country skiing trails.

The wilderness area at the Baring Unit is a Class 1-A air quality region. Therefore, any development around this area must meet strict standards so that both the visual and chemical quality of the region is not degraded. The Georgia-Pacific Corporation complex, which produces processed pulp, paper products, wafer board, and lumber, is about five miles from the wilderness area.

The company has applied for permission to construct a new recovery boiler. This unit will reduce some forms of pollutants from the mill, but, because of the higher temperatures generated, will create increased amounts of nitrous oxides. These gases could cause large plumes which would be visible from the wilderness area. The refuge is cooperating with the Air Quality Division, National Park Service, Permit Review and Technical Support Branch by maintaining a visual monitoring station on the refuge. This information is being used as part of the permit review process.

The monitoring station consists of an 8mm movie camera. The camera is set to take one frame per minute during the daylight hours. It is located on a ridge top at the end of McConvey where emissions of the mill complex are always visible.

Air Quality Monitoring Station Located off McConvey Road
DMM 1/88

In conjunction with the GP case, Refuge Manager Mullen attended an air quality workshop at Acadia National Park in Bar Harbor, Maine to review the Federal Visibility Program and discuss Integral Vistas on May 19. He also attended a public workshop on Maine Air quality regulations in Augusta on May 20.

Refuge Manager Mullen attended a meeting in Boston between representatives of Georgia-Pacific Corporation and Fish and Wildlife Service Air Quality Division personnel on June 30 to discuss the proposed recovery boiler at the Woodland Mill.

G. WILDLIFE

1. Wildlife Diversity

Current forestry activities continue to transform the refuge from a large even-age forest to a highly diverse ecosystem. Most of the large contiguous blocks of forest now harbor two age classes--mature woodland and clearcuts less than seven years old. A second series of clearcuts was begun last year on some of these same areas creating an interface of mature woods, new openings, and thick, early-growth cover.

2. Endangered and Threatened Species

Eagle nesting sites at Bald Mountain and Upper Magurrewock were periodically checked during March for signs of activity. The nest at Upper Magurrewock was the only one which was active; incubation was first noted on April 3. This nest was active until May 18 when it was abandoned. The two adults were sighted several times between the Magurrewock Dike and Vose Pond Flowage, but never returned to the nest. We were also advised by state personnel working on the eagle project that the nest on one of the Birch Islands in Dennys Bay on the Edmunds Unit was active this year, but unsuccessful. State personnel speculated that this pair of eagles may have been from a nest across the bay, which was inactive this year. Statewide, there were a record number of nesting pairs of eagles, but overall production was lower than anticipated.

Several immature eagles frequented the Trout Brook Flowage at Edmunds from late April to mid-May; an adult eagle was sighted at the Bald Mountain nest on May 17, and an immature was noted at Cranberry Outlet on May 22.Three adults were sighted at Upper Magurrewock on October 22; and two adults and three immatures were noted over the marsh on November 25.

The University of Maine at Orono and the Maine Department of Inland Fisheries and Wildlife continued a scaled down eagle feeding program during the 1986-87 winter period. The purpose of the program is to provide chemical-free food for wintering eagles. Food availability during the winter is thought to be a major limiting factor on the survival of immature eagles.

The 1986-87 winter feeding program was begun in early November, and by the end of the month, the carcasses of a several horses, and animals harvested by trappers (including raccoon, fox, bobcat, coyote, otter, muskrat and mink) had been placed in the gravel pit off the Weir Road on the Edmunds Unit. To remove all

chances of lead poisoning, parts of animals that contained shot were removed before feeding.

Only a few eagles were seen at the feeding station until colder weather and ice set in at the end of the month; use increased markedly with at least 24 eagles present on December 1.

A peak of 18 eagles was noted during January. Refuge personnel assisted with the program by picking up food from a freezer locker in Ellsworth, and keeping the site stocked between visits by the University and State crews, who had hoped to capture, band and radio mark several eagles during the course of the winter.

During February food was also placed at a second site in a field adjacent to Nat Smith Marsh. This site had attracted over 70 eagles a day in previous years. Eagle visits during February were disappointing with little use at either site. A large fish waste dump near Addison was attracting up to 100 eagles. The birds prefer fish over the carrion set out at feeding stations. Many of the eagles which normally winter between Calais and Machias were staying close to the Addison site. No eagles were captured at any of the feeding stations.

Due to a lack of use, the eagle feeding program at Edmunds was discontinued in February. On March 3, three boxes of carcasses were placed on the Upper Barn Meadow Dike on the Baring Unit; three eagles were at the site on March 4. Feeding at this site continued through the end of March with a maximum of 7 eagles observed on March 13.

Osprey were common on the refuge from their arrival on April 13 to their departure in October. Nesting activity was first noted on April 20, active nests were located at Mile Bridge Flowage, Cranberry Outlet, the back end of South Ridge Flowage and Mahar Flowage. One pair of ospreys began building a nest in the platform adjacent to the former Visitor Center site in May, but no young were produced.

The nests at Cranberry Outlet, Mile Bridge and South Ridge each produced two young. No production data was collected from the other two nests, however, we believe they each fledged at least one young.

3. Waterfowl

Although Moosehorn was established primarily for woodcock management and research, 52 wetland impoundments were created and have been maintained over the years. These impoundments, along with numerous beaver flowages and natural wetlands, provide nesting habitat for waterfowl such as Canada geese, black ducks, wood ducks, ring-necked ducks and hooded mergansers. The tidal waters of Cobscook Bay at the Edmunds Unit provide wintering habitat for small numbers of sea and bay ducks, as well as black ducks and Canada geese. The majority of waterfowl use during migration occurs on the Magurrewock Marshes, Upper and Middle Barn Meadow, and Bearce Flowages on the Baring Unit, and at Nat Smith Marsh on the Edmunds Unit.

During 1987, fifteen species of waterfowl accounted for 206,069 use-days. Two species, black ducks and Canada geese, accounted for 72% of the total use days reported.

Throughout the winter months waterfowl use is restricted to the tidal waters of Dennys Bay adjacent to the Edmunds Unit, and a few unfrozen stretches of streams and brooks.

Up to 100 Canada geese, several black ducks, buffleheads and hooded mergansers were using the tidal areas adjacent to the Nat Smith Marsh at Edmunds during the month of February.

Waterfowl began returning to the Baring Unit as soon as the ice began to break up in late March. Canada geese were first noted at the Magurrewock Marsh on March 25. By the end of March, black ducks and hooded mergansers, in addition to 100 Canada geese were present.

As more areas of the marshes and flowages opened up, more species returned in April. Green-winged teal were first noted at Upper Barn Meadow on April 1, followed by blue-wings on the eighth. A pair of snow geese were sighted at Vose Pond on April 14.

By the end of April, common mergansers, ring-necked ducks, wood ducks, hooded mergansers, red-breasted mergansers, buffleheads, common goldeneyes and mallards had been sighted

Canada geese began nesting on most of the flowages on the Baring Unit in April, the first nest was noted on the fourteenth. The first goose brood was noted on May 10 at Vose Pond. Hatching continued throughout the month. There was little fluctuation of water levels throughout the nesting season which resulted in optimal conditions and excellent production.

Ring-necked Ducks on Dudley Swamp
MM 6/87

Canada Goose Brood at Upper Barn Meadow

MM 5/87

The first black duck brood was sighted on May 21. Waterfowl use of refuge flowages declined towards the end of the month as females nested and males departed for summer moulting areas. Noteworthy sightings for May included 35 black ducks at Nat Smith Marsh on May 14; an American wigeon at Upper Magurrewock on May 4; and a gadwall at Lower Magurrewock on May 27.

Our ongoing dike rehabilitation program has resulted in a greater availability of high quality goose browse on the dikes. This has kept many broods at the flowages where they were hatched for longer periods of time. Previously, most goose broods would move to the Magurrewock Marshes once they were old enough to travel.

During the 1987 brood season, 15 flowages or impoundments were each surveyed twice, once around mid-June, and once around mid-July. Surveys consisted of one or more observers, positioned in tree stands for a period of two hours around dawn or dusk. Approximately 80 man-hours were expended on this year's brood surveys.

In order to get an estimate of overall production (managed impoundments plus natural flowages and wetlands), a factor is used to account for nesting in areas not covered by the production study. This factor takes into account the number of natural flowages and other wetlands with suitable nesting habitat, and the estimated percentage of these areas that actually produce waterfowl.

A summary of our waterfowl production for 1987 is shown in the following table:

1987 Waterfowl Production Summary

Species	# of broods	Mean Brood Size	Estimated Production
Canada goose	45	4.3	193
Black duck	117	4.2	490
Hooded Merganser	25	3.0	75
Ring-necked duck	33	3.0	99
Wood duck	18	3.0	54
Green-winged Teal	3	4.0	12
Blue-winged Teal	3	4.0	12
Common Merganser	1	6.0	6
TOTALS:	245		941

Despite an average annual production of 130 Canada geese, our nesting population has remained fairly stable. Some of the refuge flock is harvested each year by Maine and New Brunswick hunters along the St. Croix River and in Passamoquoddy Bay. Others are probably taken on their wintering grounds, or during their migration south.

Despite excellent production, waterfowl were scarce on the refuge and surrounding areas during late summer. Due to the dry conditions, many birds probably moved either to the coast, or to larger interior flowages.

Canada geese fed heavily on emergent vegetation in the Upper and Middle Magurrewock Marshes during the early summer months. Once the fields adjacent to the Visitor Center had been hayed, most of the flock began upland grazing on these fields as well as the former visitor center building site which had been seeded to winter rye. Several groups have also been utilizing several of the smaller interior flowages.

About 100 black ducks were present in the Magurrewock Marshes during October. Most wood ducks and teal departed the refuge by mid-month. A flock of 35 buffleheads was noted at Bearce Flowage on October 26. An American wigeon was present at Nat Smith Marsh on October 23, and sixty ring-necked ducks were observed at Vose Pond on October 29.

Most Canada geese left the Baring Unit around mid-November when flowages and impoundments froze up. Some birds returned periodically until the last week of the month. Several hundred geese remained in Dennys and Whiting Bays, adjacent to the Edmunds Unit, through year's end.

Wood duck nesting boxes were checked during the winter months. Use by waterfowl during the 1986 nesting season was as follows:
Total number of boxes checked: 44
% used by wood duck.....4.5
% used by hooded merganser.....13.6
% used by tree swallow.....13.6
% used by starlings..... 2.3
% not used 65.9

Apparently, there are adequate numbers of natural nesting cavities available.

4. Marsh and Water Birds

The most common species of this group that uses the refuge is the great-blue heron. Four great-blue herons were sighted at Upper Barn Meadow on April 1 (this was the first sighting of 1987). Single birds were frequently observed fishing on the flowages throughout the refuge during the summer months. An estimated peak of 15 individuals were present on both units. The largest concentrations were noted in the Magurrewock Marshes.The last sighting date for this species was on November 30, when a single bird was observed at Moosehorn Stream on the Baring Unit.

American bitterns are common residents of the refuge during the summer. A single bird at Upper Goodall Heath on April 19 was the first sighting of the year. This species nests on several of the flowages on both units of the refuge.

A green-backed heron was sighted at Boundary Flowage on May 20.

A common moorhen was sighted in the upper end of Mile Bridge Flowage on June 18.

Pied-billed grebes nested on several flowages again this year. A brood of 4 was noted at Lower Goodall Heath on June 16. Other sightings were made at Upper Goodall Heath and Two Mile Meadow on the Baring Unit, and Alder and Hallowell Flowages and Nat Smith Marsh on the Edmunds Unit.

Double-crested cormorants were occasionally observed fishing in some of the larger flowages and impoundments during the spring, summer, and early fall.

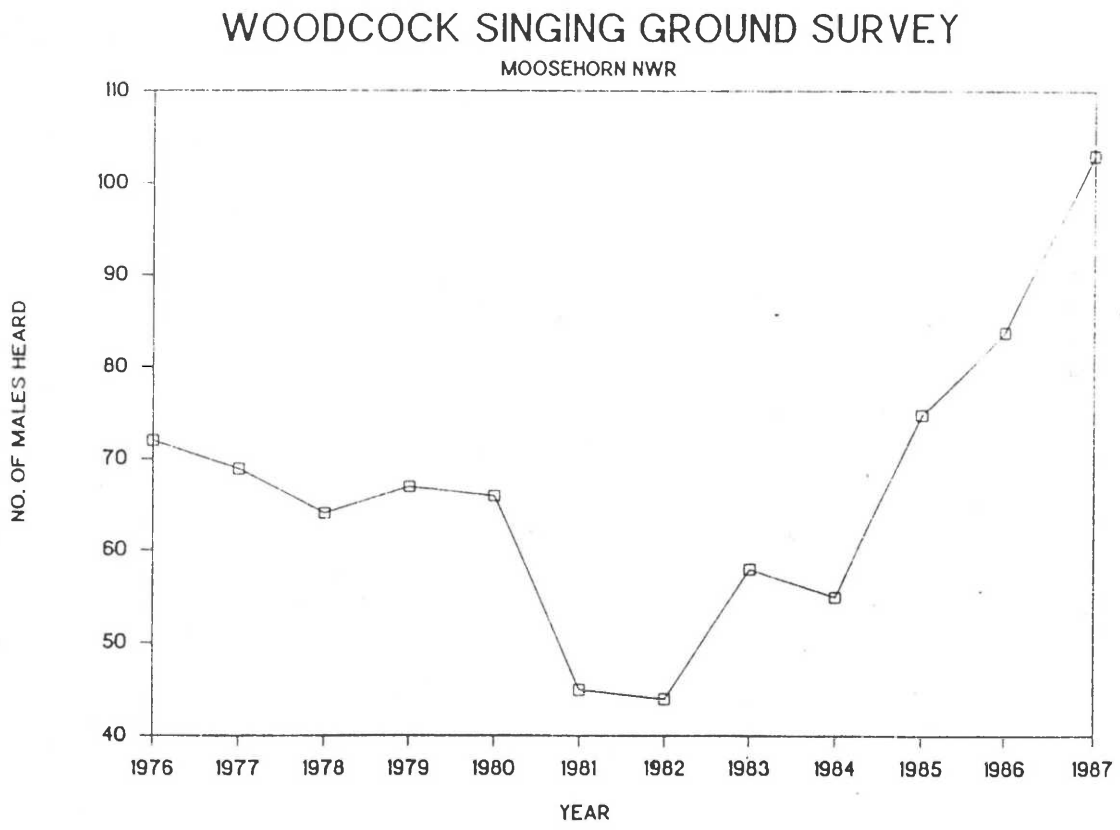
Common loons were observed at Bearce Lake, Conic Lake, Cranberry Lake and Vose Pond during the spring and summer months. The pair at Vose Pond were observed regularly from May 8 to June 28, but apparently left around the end of June without nesting.

Assistant Manager Mills served as the regional coordinator for the Calais area in the 1987 Maine Loon Day Count which was held on July 18. This was the fifth year of the statewide count, which was established by the Maine Audubon Society to monitor Maine's loon population. Observations were made from 7-7:30 AM on 14 area lakes (four of which are on the refuge) by 16 observers, 10 of whom were from the refuge crew. Fifty-three adult loons and 15 chicks were reported.

5. Shorebirds, Gulls, Terns, and Allied Species

The American woodcock is the most common species of this group on the refuge. The first woodcock was heard courting on the Baring Unit on March 25 near Upper Goodall Heath.

Twenty-eight woodcock singing ground survey routes were run on the Baring Unit to help monitor population trends and habitat management success. One hundred and three males were heard compared with 84 last year, representing a 23 percent increase and the highest count since the survey was initiated in 1976. Over the past three years the number of courting males has increased dramatically, probably as a result of our habitat management program.



We have developed production estimators for woodcock based on the ratio of the number of young/adult females captured during the summer. Two of the three estimators indicated above average production. Ground trapping indicated lower then average production, but this method is less predictive then either nightlighting or mist netting. We therefore conclude that production was well above the long term average despite poor survival rates of broods and chicks (See Section D-5, Research and Investigations for details).

Woodcock Production Indices at the Moosehorn NWR

	Capture Method		
Year	Night-lighting	Ground Traps	Mist Netting
1976	7.26	10.50	17.80
1977	5.48	5.05	21.35
1978	5.40	5.07	16.80
1979	3.65	4.30	6.07
1980	4.90	5.25	10.11
1981	5.00	5.13	8.56
1982	3.28	4.31	5.50
1983-84		Insufficient Data	
1985	3.25	4.66	3.20
1986	6.50	--	--
Avg(76-86)	4.78	4.95	11.19
1987	6.17	3.59	13.25

Total woodcock production for 1987 was estimated at 1100. Nesting conditions for woodcock were fair with occasional wet, cool weather causing some chick mortality. However, the hatch was asynchronous so the impact of the poor weather was not great. The first brood was sighted on May 5.

Other species of shorebirds which nest on the refuge include the killdeer, common snipe, and spotted sandpiper. Killdeer were first noted on the Baring Unit on March 25; snipe were first reported on April 4; and spotted sandpipers were first observed at the Edmunds Unit on May 8. Four least sandpipers were present on May 12 at Popple Flowage . Several greater yellowlegs were noted at Mahar Flowage on the Baring Unit between May 12 and June 8. A solitary sandpiper was observed at Maple Flowage on the Edmunds Unit on May 13, two were present at Flatiron Flowage at Edmunds on July 28, and several were present at South Dudley on the Baring Unit on August 21.

6. Raptors

Common raptors include osprey, bald eagles, northern harriers, broad-winged hawks, red-shouldered hawks, kestrels, great-horned owls, barred owls, and saw-whet owls.

Broad-winged hawks were first reported on April 6 on the Baring Unit. Several pairs nested and were sighted throughout the summer months.

Northern harriers were first observed along the Charlotte Road on April 11. Kestrels were first noted on April 13, and a Cooper's Hawk was sighted along the Magurrewock Road on April 16.

A turkey vulture was reported over the Magurrewock Marshes during May.

Red-shouldered hawks were observed at several locations; there were probably several nests on the Baring Unit.

Red-tailed hawks were observed near Barn Meadow #2 and at Mile Bridge Flowage during October, and at the Weir Road clearcut on November 23.

A goshawk was sighted at the Cranberry Lake Clearcut on November 13.

Both barred and great horned owls were heard in the vicinity of the Railroad Tracks and Snare Meadow Road on the Baring Unit in April and May, and near the North Trail at the Edmunds Unit during November.

7. Other Migratory Birds

On January 4, Refuge Manager Mullen and Assistant Mills participated in the Calais area 1986-87 Christmas Bird Count; 38 species were observed compared to 35 in 1986, and 41 in 1985.

Refuge Manager Mullen coordinated the 1987-88 count which was held on December 26; a total of 35 species were recorded.

The refuge birdlist contains information on 209 species which have been identified on the refuge since its establishment in 1937. This number includes 23 species of warblers which nest on the refuge, and several boreal species which attract birdwatchers visiting the area.

Among the boreal species sought after by many refuge visitors are the boreal chickadee, spruce grouse, black-backed three toed woodpecker, and gray jay. Boreal chickadees were noted at four locations on the Edmunds Unit in November. This species has become increasingly rare over the past few years. Black-backed three toed woodpeckers are common in areas of dead spruce and fir, and in the burn area off the North Trail at Edmunds. No sightings of gray jays were reported this year.

Many migrants moved into the eastern Maine area on March 25 and 26. Among the species noted were red-winged blackbirds, song and fox sparrows, juncos, and robins. Most of these species usually arrive 3 to 4 weeks earlier than they did this year.

The following list of arrival dates was compiled by refuge staff and technicians working on the woodcock telemetry project, most of whom were avid birders: phoebe - 4/10; tree swallow - 4/11; hermit thrush - 4/14; palm warbler,belted kingfisher - 4/22; rufous-sided towhee - 4/23; yellow-rumped warbler - 4/25; white-throated sparrow - 4/28; savannah and swamp sparrows, eastern kingbird - 5/3; solitary vireo, black and white warbler, chestnut-sided warbler, yellow warbler - 5/4; barn swallow - 5/5; chipping sparrow, black-throated green warbler - 5/7; nashville warbler, northern parula, pine warbler - 5/8; black-throated blue warbler, least flycatcher, blackburnian warbler, northern waterthrush, American redstart - 5/10; common yellowthroat, Cape May warbler, magnolia warbler, ovenbird, whip-poor-will - 5/11; bay-breasted warbler, blackpoll, rose-breasted grosbeak, northern oriole - 5/12; wilson's warbler, Lincoln's sparrow, bobolink, gray catbird, olive sided flycatcher - 5/13; ruby-throated hummingbird - 5/17; Canada warbler - 5/18 scarlet tanager - 5/19 eastern wood peewee - 5/22.

An male eastern bluebird was sighted near the intersection of the Weir Road and North Trail at Edmunds on May 17. This is the first report of this species on the refuge in several years.

Pileated woodpeckers were commonly seen and heard on both units of the refuge.

Snow buntings were noted on April 20 at Snare Meadow Dike, November 1 at the Weir Road gravel pit on the Edmunds Unit, and on November 3 along Youngs Road on the Baring Unit.

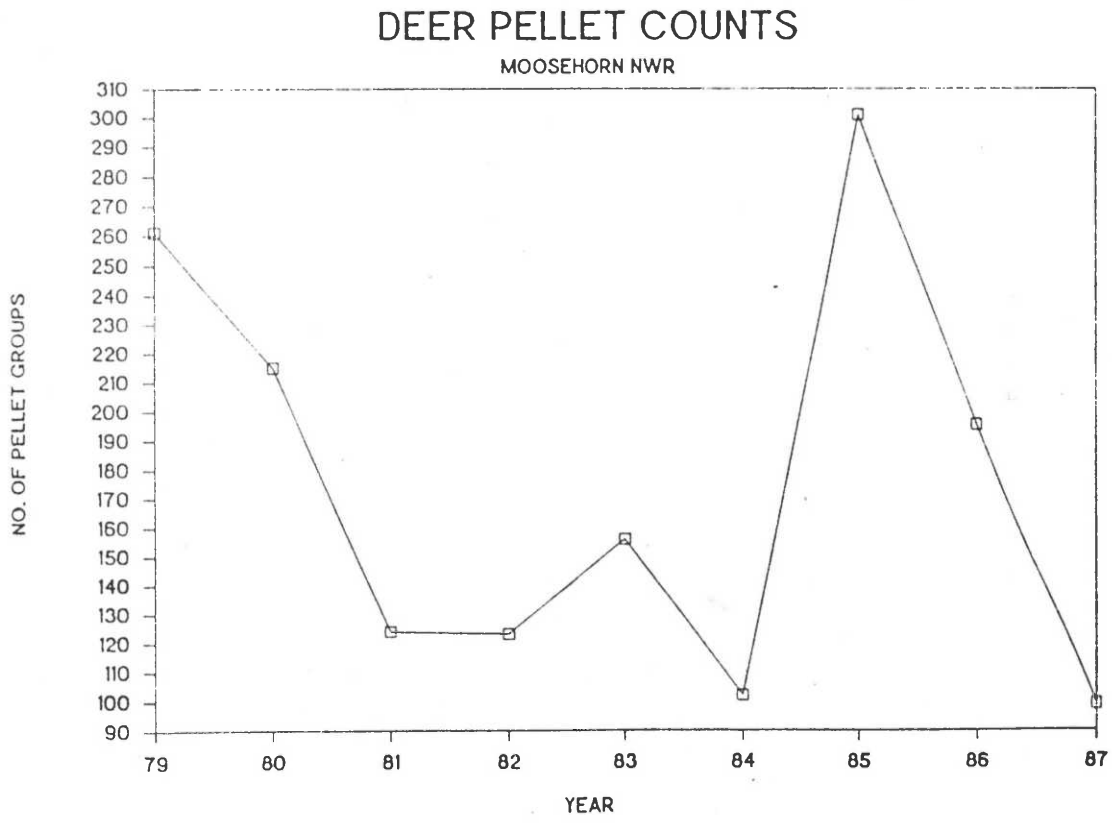
Northern shrikes were observed near Vose Pond on April 2, and along the southern Boundary of the Edmunds Wilderness Area on November 24.

8. Game Mammals

The white-tailed deer is the most common game species on the refuge, and the only one hunted. The winter of 1986-87 had above average snow depths. There were no thaws during the winter and snow accumulation exceeded three feet thus restricting deer movement. There was plenty of young hardwood growth available as browse on, and adjacent to the refuge. The continued establishment of permanent fields and the fertilization of dikes and fields provided early, high quality forage during the critical early spring period.

Deer wintered in a portion of the Edmunds Unit, extending from the North Trail south to the Edmunds/Whiting town line.

Deer population trends on the refuge have been monitored since 1979 by counting pellet groups on permanent transects covering about 33.5 miles. The results of pellet counts made over the past nine years are shown below:



Pellet counts revealed a sharp decline in deer numbers with the number of pellet groups encountered at its lowest point since the survey was started. We attribute this decline to a combination of two factors. First, the unusually harsh winter may have increased adult mortality and/or reduced production. Also, the number of bear on the refuge seems to be at an all time high. Research in Michigan and New York have shown that black bear take a significant portion of the fawn crop (33%). It may be that we will be unable to maintain both a high bear and a high deer population. We are attempting to convince the University of Maine or the Maine Department of Inland Fisheries and Wildlife to conduct a study on deer/bear interactions on the refuge.

Black bear were a common sight on the refuge from May through mid-October. The first bear was sighted on April 13 in a clearcut off the Charlotte Road. It was not uncommon to see 8-10 bear each evening grazing on clover on the dikes early in the spring. Several sows with triplets were periodically sighted in the vicinity of refuge headquarters and Lower Goodall Heath. It was also hard to find an old stump or ant hill that hadn't been ripped apart. Most cherry and apple trees also suffered numerous broken limbs from foraging bears. This dramatic increase in bear numbers is probably due to the elimination of the spring bear hunt by the state and the extensive habitat management activities on the refuge.

Black Bear Grazing on Barn Meadow # 1 Dike
MM 5/87

Single moose were observed at Goodall Heath on April 17; South Dudley Swamp on May 19; and at Cranberry Outlet on June 17. A bull, which had been frequenting the area between Tyler Flowage and Howard Lake was shot adjacent to Howard Lake in October(off refuge). The Maine Warden Service investigated the incident, but no arrests were made.

Other species in this group which inhabit the refuge include the eastern coyote, river otter, mink, fisher, muskrat, beaver, snowshoe hare, bobcat, red fox, and gray squirrel.

Coyotes are present on both units of the refuge; numerous tracks were noted along the Weir Road at Edmunds, and on the road to James Pond at Baring in February. Very little sign was noted along North Trail in the Edmunds Wilderness Area in May, where coyotes have been especially common over the past two years. Several coyotes were sighted around the Weir Road gravel pit in October.

River otters were sighted throughout the summer and fall on both units of the refuge. A group of four were present at Nat Smith Marsh on the Edmunds Unit on October 16. Up to six otters were observed several times during November on the Magurrewock Marshes, and at MacDougal, and Upper Goodall Heath Flowages.

Muskrat numbers seem to be increasing; no trapping of this species had occurred on the refuge for the past few years. A large number of houses were constructed at Lower Barn Meadow just before freeze-up. Damage to some dikes has been detected. Muskrats also provide a good source of food for our wintering eagles when they "freeze out" and come up through the ice during February and March.

Beaver are common throughout the refuge, and persisted in clogging up some water control structures on a daily basis. Twenty beaver were trapped during the January season, but it didn't seem to slow their assault on the water control structures.

Snowshoe hare were more abundant than they have been over the past few years; the peak of their 11 year cycle is approaching. Gray squirrels were sighted at the oak grove off Barn Meadow Road.

A bobcat was sighted near Trout Brook Flowage on the Edmunds Unit on October 29.

9. Marine Mammals

Harbor seals are the only member of this group which occurs on the refuge. They are frequently observed in the tidal waters of Cobscook Bay on the Edmunds Unit.

10. Other Resident Wildlife

Ruffed grouse numbers were generally higher in 1987 than in 1986, but still below the levels observed in 1985.

Spruce grouse are present on several areas of both units of the refuge. One male was observed several times along the North Trail at Edmunds.

Snapping turtles and painted turtles are common residents of refuge waters; both species were first noted on the Baring Unit on April 20.

Porcupines were commonly observed on both units of the refuge. One individual that spent a week in October feeding on apples along the Headquarters Road was photographed by many refuge visitors.

This Porcupine Spent a Week Feeding on Apples along the Headquarters Drive and was Observed and Photographed by many Refuge Visitors

MM 10/87

Several ring-necked pheasants were sighted in the vicinity of the Barn Meadow Road. They were undoubtedly birds that escaped or were released by local individuals. They seldom can survive a normal winter in this area.

11. Fishery Resources

The lakes, ponds, streams, flowages and impoundments on Moosehorn have good populations of native fish, including small-mouth bass, chain pickerel, suckers, yellow perch, and brook trout. Eagles and osprey constantly feed on suckers, pickerel, and alewives in the larger impoundments.

This is the fifth year of operation of the Canadian fishway on the St. Croix River. The stocking of Atlantic salmon smolts in the St. Croix River, which forms the northern border of the refuge, was continued this year. A viable, harvestable run of Atlantic salmon should be available in the St. Croix within the next ten years.

Approximately 350 alewives were captured at the outflow of Meddybemps Lake (Dennys River) and transported to Bearce Lake and Cranberry Lake on June 9. Both of these lakes are within the drainage area of Meddybemps Lake.These alewives produced large numbers of fry which provided forage for larger game species.

16. Marking and Banding

Woodcock were banded in the spring and summer as part of two research studies detailed under Section D-5, Research and Investigation

Rocket nets were used to capture black ducks for banding and radio marking by biologists from the Maine Field Station of the Patuxent Wildlife Research Center (see details in Section D-5, Research and Investigations). Net sites used this year were located at Upper Barn Meadow, Middle Magurrewock Marsh, and Lower Goodall Heath. Other species of waterfowl captured were also banded.

A summary of banding results follows:

Species	Number Banded During 1987
Black Duck	84
Wood Duck	107
Mallard	4
Mal. X Black Hybrid	0
Green-winged Teal	5
Blue-winged Teal	3
TOTAL	203

H. PUBLIC USE

1. General

Refuge visits totaled 13,506, an increase over last year when we received 11,890 visits. This increase was probably due to the improved weather conditions and increased tourist activity in the area.

2. Outdoor Classrooms-Students

Instructors at the Washington County Vocational Technical Institute have been using the refuge as an outdoor classroom since 1971. Students learn woods harvesting techniques as well as map and compass exercises. This use has been declining rapidly each year--from as many as 12,686 activity hours in 1978. While the opportunity for woods harvesting still exists on Moosehorn, the school has been finding it more and more difficult to recruit students for this type of training.

Two classes, totaling 44 students from the Calais Elementary School visited the refuge as part of their science course curriculum on October 21 and 22.

4. Interpretive Foot Trails

Two short trails, the Woodcock Trail and the Bird Walk, are located in the vicinity of refuge headquarters. Leaflets describing each numbered stop are provided. About 1,200 visitors used these trails during 1987.

6. Interpretive Exhibits/Demonstrations

In February, Biologist Sepik presented a program to the Calais Rod and Gun Club entitled: " Wildlife in Washington County- Past, Present and Future".

Refuge Manager Mullen spoke to a class at the University of Maine at Orono on the National Wildlife Refuge System and operations at Moosehorn on February 24.

Refuge Manager Mullen presented a slide program on the wildlife of Washington County, past, present and future at the St. Stephen New Brunswick Tourist Information Center on March 16.

Steve Malowski of Marty Stouffer Productions visited the refuge to finish filming the production entitled " Timberdoodles of the Moosehorn ". It will air during February, 1988.

On April 8, Biologist Sepik presented a slide-talk to the Calais Rotary Club on Wildlife Management Decision Making. Sepik was also the guest speaker at the Southern Maine Chapter of the Ruffed Grouse Society's annual banquet on April 16, over 200 people were in attendance.

On April 21, Refuge Manager Mullen presented a slide show about the refuge to 23 senior citizens at St. Stephen, New Brunswick, Canada. On April 27, he presented a talk as part of the Career Day Activities at the Woodland Elementary School, and on the 29th, he presented a talk to pre-schoolers at Woodland.

Biologist Sepik and Manager Mullen gave tours to 29 students from the University of Maine Forestry and Wildlife Summer Camps during the weeks of May 17 and 24. Manager Mullen also participated in an evening session on job opportunities at the Suffolk University Field Station in Edmunds on May 26.

Refuge Manager Mullen presented a talk and tour of the refuge to 29 grade school students from Cherryfield, Maine on May 26. He also gave a tour of the refuge to 22 students of the Small World Pre-School on May 27, and presented a talk and film about bald eagles to the Calais Lions Club at their father and son night on May 27.

Assistant Manager Mills gave tours of the refuge to the following groups during May: Center Drive School, Orrington, Maine - 38 eighth graders on May 1; Presque Isle Audubon Group - 15 people on May 17; Calais Cub Scouts on May 20; and Salmon Falls Senior Citizens Club, from St. Stephen, New Brunswick on May 26.

Assistant Manager Mills conducted a wildflower walk for 14 Girl Scouts and several leaders from Calais on June 2.

Refuge Manager Mullen presented a program on bald eagles to 31 members of the Princeton Rod and Gun Club on June 18.

Biologist Sepik gave a slide presentation on woodcock ecology and management at Great Meadows NWR in Sudbury, Massachusetts in July.

A group of five girls and three leaders from the Abenaki Girl Scout Camp Natarsevi visited the refuge on July 20 and 21. Assistant Manager Mills provided a slide program and tour of the refuge. The group also assisted with checking wood duck nesting boxes at Popple Flowage, and observed woodcock mist netting operations.

On September 26, Refuge Manager Mullen was at Cobscook Bay State Park during a boy scout camporee. A movie on bald eagles and talk about the refuge were presented to about 50 scouts.

On October 13, Assistant Manager Mills gave a tour of the Baring Unit to 19 sixth grade students from the Eastport School System. Mills also led a group of 15 Cub Scouts from St. Andrews, New Brunswick on a tour of the Edmunds Unit on October 25.

Refuge Manager Mullen provided tours of the Baring Unit to 27 students from the Passamaquoddy Indian School and 20 students from the Calais Elementary School on October 20 and 28, respectively.

7. Other Interpretive Programs

Biologist Sepik's regular column entitled "The Woodcock's Way", appeared in the Ruffed Grouse Society's publication, "The Drummer" throughout the year.

8. Hunting

Deer hunting was permitted during the state firearms season which ran from October 31 to November 27, with the first day reserved for residents only. Only male deer, with at least one three inch antler were legal again this year. Either sex deer permits were issued for most areas of the state ; however, no permits were allocated for the zone which includes the refuge.

A mandatory hunting permit system which was initiated in 1982 was continued this year. The permit consists of three parts, one of which serves as our office record, one which the hunter maintains in possession, and one which is required to be returned to the refuge within 10 days of the close of the season. This last section is a simple questionnaire on which hunters report the unit(s) they hunted on, days hunted, and assign a rating to the refuge hunting conditions.

A new special regulation requiring that all refuge hunters wear a minimum of 400 square inches of solid hunter orange clothing was in effect this year. State law requires only a piece of hunter orange clothing, in serviceable condition and visible from all directions, be worn. Compliance was excellent with only a few complaints from hunters.

A summary of hunter use of the refuge over the past few years follows:

Year	# of Hunters	#visits/hunter	#visits	Harvest
1982*	653	4.69	3,065	17
1983**	400	3.95	1,579	4
1984***	499	4.01	2,193	4
1985***	479	2.66	1,275	13
1986***	431	4.70	2,042	4
1987***	487	2.76	1,343	6

*Either sex hunt - three week season
**Bucks only hunt - three week season
***Bucks only hunt - four week season

A total of six deer were harvested from the refuge, four on the Baring Unit and two on the Edmunds Unit. Three of the deer taken from the Baring Unit exceeded 200 pounds dressed weight. Hunting pressure was very light again this year, both on and off the refuge.

This 17 point, 222 lb. Buck was taken near Moosehorn Ridge
DMM 11/87

9. Fishing

Fishing for smallmouth bass, brook trout, and chain pickerel is excellent on the refuge. All lakes and ponds, and most streams are open to public fishing during the state seasons; however, a delayed opening is in effect in waterfowl nesting areas to reduce disturbance.

A total of 985 fishing visits were reported during 1987, 165 of which were for warmwater fishing, and 820 for coldwater fishing. Activity hour figures were 3,260, 600 and 2,660, respectively.

10. Trapping

A public beaver trapping program was announced in December; 1986; only 4 applications were received, so it was not necessary to hold a drawing since we could issue up to ten permits. Only 3 of the permittees actively trapped during the season which ran from January 1 to February 28. A total of 20 beaver were removed from 9 flowages as follows: Howard Mill 6, Popple 5, Vose Pond 2, Cedar 2, Snare Meadow 1, Bearce Flowage 1, Cranberry Lake 1, Conic Flowage 1 and Crossman Flowage 1. This seems to have had a positive effect on our water management program as there was a decrease in the number of beaver related problems during 1987.

Several changes were made to the Trapping Plan; these included moving up some of the dates so trappers will know further in advance if they will be able to trap an area so they can scout and prepare more efficiently. The public meeting and reporting requirements were also made a part of the plan.

In an effort to reduce predation on locally produced waterfowl and woodcock, a fall furbearer trapping program was held for the second time in recent years. A public meeting to describe the program and answer questions was held on October 2 at refuge headquarters; five local trappers attended. A public bid opening was held on October 5. Winning bids were $151.50 for Unit 1; $441.00 for Unit 2; and $56.00 for Unit 3. The 1987 trapping season ran from October 24 to December 4.

Trapper take was as shown below:

Species	Unit 1	Unit 2	Unit 3
Muskrat	115	202	56
Mink	3	20	6
Raccoon	-	2	-
Coyote	4	-	3
Weasel	3	2	1

Trappers did considerably better this year than last. All were satisfied with how the program went and there were no incidents or conflicts with other refuge visitors.

A news release on the 1988 beaver trapping program was issued in November. Eight permits will be issued for that season which begins on January 1.

11. Wildlife Observation

Approximately 6,000 people visited the refuge to observe wildlife and the refuge environment during 1987. Bird watchers come from near and far to observe the many species found on the refuge. Bald eagles could be seen in the vicinity of the Magurrewock Marshes during most of the year. This year over 350 Canada geese grazed on the Magurrewock fields during the summer and fall months providing excellent viewing and photographic opportunities to the public.

The Schoodic Chapter of the Maine Audubon Society conducted its annual Warbler Walk in May.

12. Other Wildlife Oriented Recreation

The Northeast Grouse Field Trial Association held a National Wild Bird Dog Trial on the refuge in October. Over 150 woodcock and 40 grouse were flushed during the two day event representing a nearly three-fold increase in the number of birds encountered during any previous year.

All refuge roads and trails are open to cross-country skiing. Excellent snow conditions during much of the winter resulted in an increase in visits from 290 last year to 1410 in 1987.

15. Off-Road Vehicling

Snowmobiling is permitted on portions of interior road systems on both units of the refuge. The Sunrise Snowmobilers groomed the trails several times throughout the winter. Snowmobile use began to increase this year, after a steady decline over the past few years. Total use this year totaled 1410 visits compared to 600 in 1986.

Some Young Cross Country Skiiers Ready to Hit the Refuge Trails
GFS 1/87

16. Other Non-Wildlife Oriented Recreation

The Calais Company of the Maine National Guard used Young's gravel pit for small arms practice during the year. The pit was also used throughout the year for firearms qualifications by personnel from the Department of Customs and Immigration in Calais and the U.S. Coast Guard stationed in Eastport.

Several hundred refuge visitors cut their family Christmas tree on the refuge again this year. Young fir trees are rapidly replacing budworm killed stands providing better Christmas trees each year.

The wild blueberry crop on the refuge was slightly below normal this year, but still provided an opportunity for more than 900 visitors to take advantage of this resource.

Lowbush cranberries were not too plentiful this year. A few visitors picked some from the Lower Magurrewock Marsh in September.

17. Law Enforcement

Refuge Manager Mullen, Biological Technician McConvey and Assistant Manager Mills attended the annual Law Enforcement Refresher Training sessions at the Eastern Shore of Virginia NWR during February and March.

Refuge officers McConvey, Mills, Goettel (Petit Manan), and Hendrix (Craig Brook NFH), qualified with their service revolvers at the refuge range on September 25.

Assistant Manager Mills was detailed to Parker River NWR on August 23-29, and September 15-20, to assist with their law enforcement program.

Work on the refuge's Law Enforcement Plan was continued throughout the year. We hope to have the plan complete by the end of CY 88.

A bull moose, which had been frequenting portions of the refuge, was illegally shot in October near Howard Lake. Assistant Manager Mills assisted district game wardens with the preliminary investigation. No apprehensions or arrests have been made to date.

The refuge gate on the Howard Mill Road was cut off at the base by an unknown party in October. Maintenance worker Seeley had just completed painting the gate less than an hour prior to its being cut with a torch. This gate has always been a source of controversy among the individuals who own camps, accessible only by this road. Some individuals want the gate closed and locked, others want it open. We have not been asked to replace the gate.

No violation notices were issued for cases made by refuge officers this year. State game wardens made several cases on and adjacent to the refuge in November and December.

I. EQUIPMENT AND FACILITIES

1. New Construction

A 100 foot dike was constructed on the South Dudley Flowage and a 36 inch half-circle riser with 50 feet of corrugated metal pipe was installed in order to permit management of this 20 acre flowage. Local contractor Phil Stanhope hauled 768 cubic yards of fill and 100 cubic yards of screenings to the site. The remainder of the work, including dike construction, placing the pipe and riser, seeding, fertilizing and mulching was done by YCC and the refuge maintenance staff. Several thousand dollars was saved by not contracting this project out.

South Dudley Flowage Prior to Construction of Dike
MM 5/87

Clearing the Dike Line and Slopes
MM 7/87

Refuge Maintenance Crew Spreading Fill and Shaping Slopes
DMM 8/87

The Completed Dike and Structure
DMM 10/87

2. Rehabilitation

During February the maintenance crew overhauled the International 2504 tractor; a new water pump, brake linings and base gaskets were installed.

Summer rehabilitation was directed at resloping dikes, stabilizing the toes with screenings and replanting with clover and timothy. Approximately 300 cubic yards of fill was hauled and spread on Vose Pond Flowage Dike-downstream side; 75 cubic yards of fill and 175 yards of screenings on the Firehole Dike; 150 cubic yards of fill and 300 cubic yards of screenings on the upstream side of the Boundary Flowage Dike; 75 yards of fill and 150 yards of screenings on Bearce Flowage Dike by refuge maintenance personnel. Contractor Phil Stanhope also hauled 1232 cubic yards of fill to the Boundary Flowage Dike. Following final grading, all disturbed areas were fertilized, seeded and mulched.

Resloping the Boundary Flowage Dike
DMM 8/87

Vose Pond Flowage Dike after Resloping and Adding Screenings
to Eliminate Burrowing by Muskrats and Beaver
DMM 8/87

The ARMMs project of installing new concrete aprons on three of our headquarters buildings was completed. This project involved removing the old concrete, excavating for new forms, installing reinforcing rod and pouring 17 cubic yards of pre mixed concrete. New aprons were installed at the shop, storage building and fire equipment building.

Old Concrete Aprons Were Removed and Forms Constructed
DMM 6/87

New Concrete Aprons in front of Vehicle Storage Building
DMM 7/87

New culverts were installed in the Barn Meadow Road, and the Snare Meadow Road.

Road Bridges over Tyler Flowage, Vose Pond Flowage and Popple were repaired as needed.

All roads on both units of the refuge were graded during August and September.

A small washout on the Weir Road near Alder Flowage was repaired.

A new concrete base was poured at the MacDougal Flowage to repair a small leak under the stoplogs.

All interior roads on both units of the refuge were graded during August and September.

In April new power poles were set by a private contractor between the old Charlotte Road and refuge headquarters. New wire and a transformer have been installed, and we are now waiting for the telephone line to be installed on the new poles.

Repairs to the large entrance sign located on the southern boundary of the Baring Unit along the Charlotte Road were completed in April . The support frame was also replaced using cedar posts. This sign had been damaged by vandals during the fall of 1985.

All of the gravel and pavement from the visitor center parking lot was removed during the summer. The area was final graded, fertilized, seeded and mulched in August. As soon as sprouts began to appear, the Canada geese began to graze on it.

Approximately 7000 board feet of lumber (boards and dimension stock) was delivered to the refuge in September. The lumber was sawed from logs salvaged during fireline construction by the emergency pre-suppression fire crew.

Refuge boundary signs along the Charlotte Road, US Route One, and State Route 191 were checked and replaced as necessary. The fourth field test period of 18 fiberglass signs was completed in October. All signs were found to be in their original condition with no fading, cracking, loss of resin or paint peeling noted.

4. Equipment Utilization and Replacement

A new Model 100 MO Trim Mower with a 17 foot boom was received in September. The John Deere 1650 tractor, to which the mower will be attached, has not yet been received; scheduled delivery date is February 1988.

A new concrete base and one concrete block were constructed and approximately two and one-half cubic yards of concrete poured for our new radio tower. A local contractor installed this 60 foot "Rohn" tower and a new antenna. The old crank up tower which was damaged several years ago, was removed by refuge staff.

On November 11 a 1988 Chevrolet Astro 8 Passenger Van was received; this will replace the 1979 Ford Station Wagon, which was used as a trade in.

A 1988 GMC Rack/Dump truck was delivered to the refuge on December 7. This will replace the 1956 Ford Rack we acquired from Iroquois, which is worn out.

An eight foot Fisher Quick Switch Snowplow was ordered from the local Chevrolet dealership. It will be installed on the 3/4 ton pickup which was requisitioned last year, and should be delivered early in 1988.

New 60 Rohn Tower and Antenna in Foreground
DMM 8/87

New Chevy Astro Van replaces 1979 Ford Wagon
DMM 12/87

New GMC Rack Truck Replaces 1956 Ford
DMM 12/87

5. Communications Systems

The new radio tower increased the range of our refuge radio system; mobile units at Edmunds can now reach the Baring headquarters.

6. Computer Systems

An Hewlett Packard LaserJet Series II laser printer was purchased to replace our aging, but still reliable Epson MX100. The long waits for printouts has almost ceased to exist and the quality of the print is excellent. We also obtained Systat, a very powerful statistical analysis package which is very easy to use.

7. Energy Conservation

Since the energy crunch the refuge staff has tried to make refuge buildings as energy efficient as possible. All heating systems were cleaned and inspected prior to the 1987-88 heating season.

Approximately 10 cords of firewood for use in heating the refuge office and shop, was salvaged from the firelines cleared during the summer months.

J. OTHER ITEMS

1. Cooperative Programs

The refuge recorded winter snow depths and deer sinking depths weekly and reported them to the Maine Department of Inland Fisheries and Wildlife. This information is used to calculate a monthly winter severity index for deer.

As previously discussed, refuge personnel cooperated with the University of Maine and Department of Inland Fisheries and Wildlife in the winter eagle feeding program.

Six off-refuge woodcock census routes for the National Survey were run this year: Wesley, Amity, Danforth, Grand Lake Stream, Lambert Lake and Princeton, by Refuge Manager Mullen.

3. Items of Interest

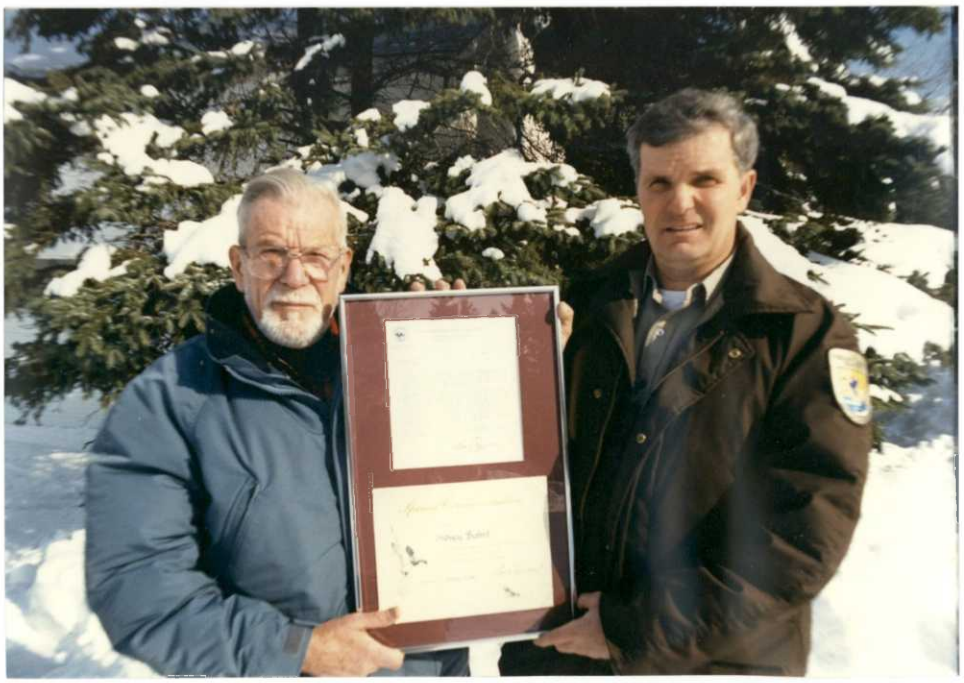
Refuge Secretary Helen Forsyth retired on November 30 following over 20 years of service at Moosehorn. Helen was honored by over sixty friends, family members and co-workers who gathered at the Calais Motor Inn on the evening of the 30th to wish her well.

Over Sixty People Gathered at the Calais Motor Inn on November 30 to Wish Helen the Best in Her Retirement
MM 11/87

Refuge Manager Mullen Presenting Helen with a Gift from Refuge Staff and Friends

MM 11/87

Sid Bahrt, a resident of Pembroke, was awarded a "Letter of Commendation" from the Director for his work in furthering the understanding of the bald eagle. The award was presented to Sid by Refuge Manager Mullen.



Refuge Manager Mullen Presenting Award to Sid Bahrt

MM 12/87

Take Pride in America

"Take Pride in America" was incorporated into several aspects of refuge operations during 1987. YCC enrollees painted a series of historical mile markers between Robbinston and Calais, on Route One, as a public service and take pride project. The "Take Pride" slogan was painted on an additional 10 trash cans. Litter was removed from 154,400 feet of refuge and public roadways; "Take Pride" signs were posted at either end of the roadway from which litter was being removed.

YCC Enrollee Shanon Hatton Painting Historic Mile Markers
DMM 8/87

4. Credits

McConvey: E.2,6,7 I. 1,2,4

Mills: A., C.1, D.2,3, E.7, F.1,2,5,6,7,8,9,10,11, G.1,2,3,4,5,6,7,8,9,10,11, H.1,2,4,6,7,8,9,10, 11,12,15,16, J.1

Mullen: Editing

Norton: B., E.1,5,8, J.3

Sepik: D.5, F.3,12, G. 5,8,16, I.6

CARLTON POND WATERFOWL PRODUCTION AREA

Troy, Maine

ANNUAL NARRATIVE REPORT

Calendar Year 1987

A. HIGHLIGHTS

A revenue sharing check in the amount of $ 481 was presented to the Town of Troy tax collector.

E. ADMINISTRATION

1.Personnel

Carlton Pond Waterfowl Production Area is administered by Moosehorn National Wildlife Refuge, and is usually only visited a few times each year.

5. Funding

All funds expended for Carlton Pond come from the Moosehorn NWR budget. No management can take place under current levels of funding.

8. Other

On April 24, Refuge Manager Mullen met with Gordon Russell (ES) to discuss a proposed low level hydro project at Carlton Pond. The request for an easement was denied by the Service, since the project would have required manipulating water levels in a manner inconsistent with our management objectives.

F. HABITAT MANAGEMENT

1. General

Carlton Pond Waterfowl Production Area is located 140 miles southwest of the Moosehorn NWR Headquarters in the town of Troy, Maine. This 1,068 acre WPA consists of Carlton Pond, the surrounding freshwater marsh and several small parcels of forested lowlands and uplands.One water control structure, on the site of an old spool mill, controls the water level, which remained stable throughout most of the year.

Remnants of the Old Dam and Mill Located Downstream of the Dike
DMM 10/87

Thirty-eight percent of the area consists of open water, 33 percent deep freshwater marsh, 14 percent shallow freshwater marsh and 15 percent upland forest. Typical emergent and floating vegetation include pickerel-weed and water-lily.A good stand of wild rice was present near the Bog Road, and scattered plants were noted throughout the marsh. Cattail, though present, is sparsely scattered throughout the marsh. Floating mats of vegetation thick with leather-leaf and buttonbush provide cover for many wildlife species. A narrow fringe of forested upland surrounding the marsh is made up primarily of birch and aspen interspersed with pine, spruce and fir. A healthy spruce bog borders a portion of the western edge of the marsh.

Typical Marsh Vegetation on the Upper End of Carlton Pond
Note Black Terns over the Marsh
GA 7/87

Habitat management objectives are directed primarily at stabilizing water levels. The water control structure maintains the water level of the pond at the site of an old spool mill. No other active management has been undertaken since 1968, when several acres of upland were managed for deer and woodcock. The Maine Department of Inland Fisheries and Wildlife maintains 25 woodduck nesting boxes within the production area.

Existing Water Control Structure and Dike
DMM 10/87

3. Forests

Portions of Tracts 11 and 12 border the Plymouth Road. There was an extensive amount of blown down popple in this area, some of which would occasionally block the road. Mr. Joseph Klein, a resident of Unity, contacted the refuge about salvaging downed popple in this area. On July 31, Refuge Manager Mullen met with Mr. Klein to discuss the salvage cut. Assistant Manager Mills also met with him several times in October and November. Mr. Klein was issued a special use permit in November. He salvaged approximately 70 cords of aspen pulpwood, and paid $ 432.38 in stumpage. We expect resprouting of popple to provide excellent woodcock habitat within two to three years.

G. WILDLIFE

3. Waterfowl

Common waterfowl which use Carlton Pond include Canada geese, black ducks, mallards, ring-necked ducks, wood ducks, hooded mergansers, blue-winged teal and green-winged teal.

4. Marsh and Water Birds

Great-blue herons and American bitterns are common summer residents of the area.

5. Shorebirds, Gulls, Terns and Allied Species

Carlton Pond WPA contains one of only six known active nesting colonies of black terns in the state of Maine.

6. Raptors

Kestrels, red-tailed hawks, red-shouldered hawks, osprey and turkey vultures are occasionally observed on the area.

8. Game Mammals

Beaver, muskrat and river otter inhabit Carlton Pond. White-tailed deer are present in good numbers along the upland edges of the wetland, and on adjacent private lands.

H. PUBLIC USE

1. General

Public use on Carlton Pond consists primarily of upland game, waterfowl and deer hunters, muskrat and beaver trappers, and fisherman. Recreational boating is not popular due to the marshy conditions. None of these activities are closely monitored by refuge personnel due to the distance of the area from Moosehorn.

On October 27, Assistant Managers Mills and Goettel visited Carlton Pond to check on a complaint of a floating duck blind on the area. The blind was not causing any problems or damage to the marsh. A note was posted inside, requesting that it be removed. If it is still in place in the spring of 1988, it will be removed by refuge personnel.

I. EQUIPMENT AND FACILITIES

2. Rehabilitation

An ARMM s project to bring the Carlton Pond Dike up to standards was funded during FY 87, however, bids were higher than anticipated. The project was postponed until 1988, at which time the work will be done by Moosehorn maintenance personnel.

Depression in Carlton Pond Dike - Fill Will Be Added in 1988
DMM 10/87

Much of the boundary at Carlton Pond was never adequately surveyed or posted. A regional survey crew spent several weeks on the area during October and November working on the boundary. On November 4, Assistant Manager Mills met with Mike Hayden of Surveys and Maps to become familiar with the location of the boundary. Weather conditions prohibited posting the newly established lines during 1987, but it will be done early in 1988.

J. OTHER ITEMS

3. Credits

Mills: All sections

Photos: GA - Gerry Atwell, RFN Biologist
DMM - Douglas M. Mullen, Refuge Manager

MOOSEHORN
National Wildlife Refuge

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.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

Washington County
Calais, Maine

WELCOME

Moosehorn National Wildlife Refuge, on the eastern coast of Maine, was established in 1937 as one of a chain of migratory bird refuges extending from Maine to Florida. The refuge consists of two units. A northern one, known as the Baring Unit and containing 16,065 acres, is partially bounded by the St. Croix River, which here forms the boundary between the United States and Canada, and is crossed by U.S. Highway 1. The Edmunds Unit of 6,600 acres borders the tidal waters of Cobscook Bay, a branch of Passamaquoddy Bay, near Dennysville.

The history of the area includes the boom days of logging in the 1800's when masts of numerous lumber boats stood in the harbor at Calais. Later, woodlands were cut over a second time, and forest fires swept through what is now the refuge. Several of the fires, including the last one in 1933, burned over large areas, damaging surface soil and destroying humus. Blueberries now grow on many of the burns. Water flowages constructed in the early logging days assisted in driving long logs to the mill. Old logging roads in the woods still provide excellent trails.

The highly glaciated terrain consists of rolling hills, large ledge outcrops, valleys, streams, lakes, bogs, and marshes. Geological formations offer unique subjects for study by amateur geologists. Tidal fluctuations in waters adjoining the Edmunds Unit are approximately 24 feet, and, in the St. Croix River, 28 feet. These are the highest tides in the United States except for the Cook Inlet in Alaska.

Much of the refuge supports a cover of second growth aspen, beech, birch, maple, spruce, fir, and pine. It also has scattered mature white pine stands and other merchantable timber. Refuge timber harvest provides employment to many local people. Receipts from pulp wood, fuel wood, and sawtimber sales are substantial. A percentage of these receipts goes to Washington County for schools and roads. These forestry operations are of much value to wildlife, since the new growth provides food and cover for the woodcock, deer, snowshoe hare, and other species.

THE AMERICAN WOODCOCK AT MOOSEHORN NATIONAL WILDLIFE REFUGE

Moosehorn Refuge is managed chiefly to increase habitat for the American woodcock and waterfowl. Of approximately 417 national wildlife refuges, this is the only one where the American woodcock is intensively studied and managed. The average summer woodcock population is 1,800 birds. More than 3,000 birds are on the refuge in spring and fall migrations.

In early spring the usual mating performance of the woodcock may be observed in refuge clearings. When light reaches a specific intensity at dusk and dawn, the male soars several hundred feet into the air from his clearing. At the peak of his soaring he executes whistling notes for about a minute during a distinctive undulating flight, after which he plummets to the ground. Here he produces a series of "peenting" noises for a minute or more, following which he again soars upward.

Waterfowl management has benefited by the installation of structures for regulating water levels on over 50 marshes and lakes on the refuge. Development of channels, islands, and potholes, and improvement of shorelines have increased waterfowl populations and encouraged nesting. Improvement of food and cover and the control of water levels have increased use of the refuge by ducks and geese. The summer waterfowl population is estimated at about 1,800 birds. The nesting of Canada geese on and in the vicinity of the refuge was promoted by the addition of several hundred birds from elsewhere during the late 1950's and early 1960's.

Fishing is a favorite sport both summer and winter; excellent waters for brook trout, smallmouth bass, yellow perch, and pickerel are found on the refuge. Boating access is provided on Bearce Lake and Vose Pond.

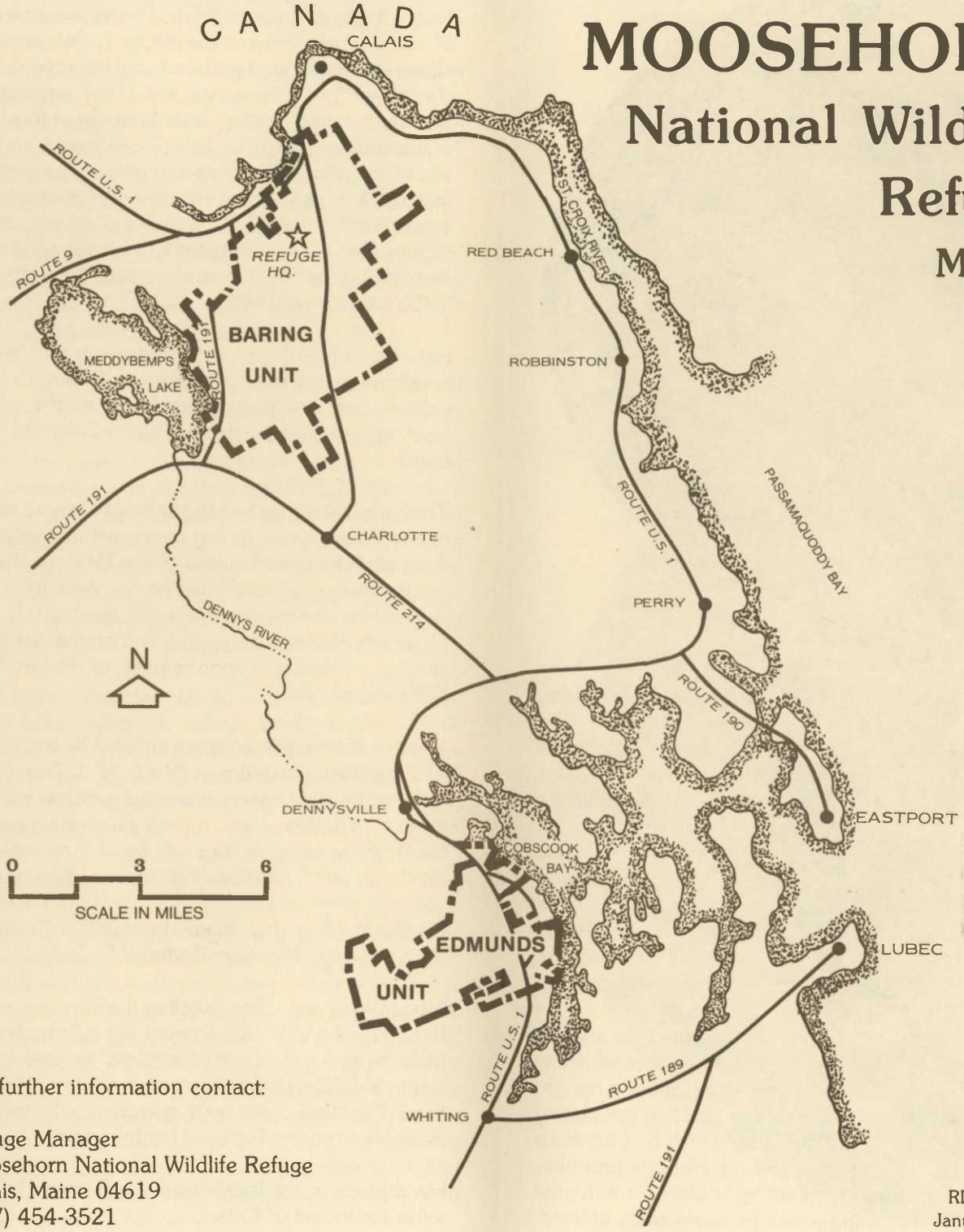
The harbor seal may be found along the shore waters of the Edmunds Unit. Big game includes whitetail deer, black bear, and moose. Since 1954, controlled hunting has gradually brought the deer herd into desirable balance with available food. Each year about 25 deer are harvested. A mammal list of 39 species is obtainable upon request, as is a bird list of 207 species.

Under a nationwide program initiated by the Society of American Foresters, a block of 160 acres of representative forest types on each unit has been set aside as a natural area. In each succeeding decade the ecology of these sites will be of more value in reaching an understanding of the relationships between plant and animal life. The Natural Area on the Baring Unit has been dedicated in honor of former Refuge Manager Bertrand E. Smith.

Two Wilderness areas, totaling 4,680 acres of the Baring Unit and 2,782 acres of the Edmunds Unit, have been set aside by Congress as part of the National Wilderness Preservation System. Maps of the Wilderness areas and special regulations are available from the Refuge Headquarters.

Headquarters are located on the Baring Unit, six miles southwest of Calais.

MOOSEHORN
National Wildlife Refuge
Maine



For further information contact:

Refuge Manager
Moosehorn National Wildlife Refuge
Calais, Maine 04619
(207) 454-3521

RL 53530-1
January 1984

For further information, contact:

Refuge Manager
Moosehorn National Wildlife Refuge
Box X
Calais, Maine 04619
Telephone: (207) 454-3521

NOTES

Location _____

Date _____ Total _____

Observers _____

Weather _____ Wind _____

Time _____

_____

_____

_____

_____

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

RL 53530-2

June 1983

BIRDS
Moosehorn
National Wildlife Refuge

Maine

Moosehorn National Wildlife Refuge is located in the easternmost tip of Maine. Consisting of 22,665, acres, it varies from the salt waters of Cobscook Bay to the upland spruce-fir of boreal forests.

Unlike many National Wildlife Refuges, Moosehorn is primarily upland. However, almost every type of habitat found in Maine is present, including 54 freshwater ponds and marshes. The Refuge lies in the heart of the American woodcock's northeastern breeding range. It is the only National Wildlife Refuge on which this bird has prime management consideration.

Refuge headquarters is six miles south of Calais, off U.S. Route 1 on Charlotte Road.

This folder lists 209 birds that have been identified on Moosehorn Refuge since its establishment in 1937. This list is in accordance with the Sixth American Ornithologists' Union Check-list (1983).

Enjoy yourself. Whether you're a seasoned birder or a beginner, we wish you a rewarding and memorable experience from this visit to your refuge.

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.

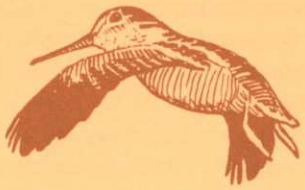
RELATIVE ABUNDANCE

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				
___ Red-throated Loon	u		u	u
___ Common Loon†	c	c	c	c
___ Pied-billed Grebe†	c	u	c	
___ Horned Grebe	o		o	u
___ Red-necked Grebe	r			r
CORMORANTS				
___ Great Cormorant				c
___ Double-crested Cormorant	c	c	c	
BITTERNS - HERONS - IBIS				
___ American Bittern†	c	c	c	
___ Great Blue Heron	c	c	o	
___ Green-backed Heron	o	o		
___ Glossy Ibis	o			
GEESE - DUCKS				
___ Brant	u		o	
___ Canada Goose†	a	a	a	o
___ Wood Duck†	c	c	c	
___ Green-winged Teal†	c	c	c	
___ American Black Duck†	a	a	a	u
___ Mallard†	u	u	u	o
___ Northern Pintail	o		o	
___ Blue-winged Teal†	c	c	c	
___ Gadwall	o	r	o	
___ American Wigeon	u	r	u	
___ Ring-necked Duck†	a	a	a	
___ Greater Scaup	o		o	
___ Lesser Scaup	o		o	
___ Oldsquaw			c	o
___ Black Scoter	o		o	
___ Surf Scoter	c		c	o
___ White-winged Scoter	c		c	o
___ Common Goldeneye†	a	u	a	a
___ Barrow's Goldeneye	r		r	o
___ Bufflehead	a		a	a
___ Hooded Merganser†	u	u	u	
___ Common Merganser†	c	u	c	c
___ Red-breasted Merganser	u		u	c
___ Ruddy Duck	o		o	
HAWKS - FALCONS				
___ Osprey†	c	c	c	
___ Bald Eagle†	c	c	c	c
___ Northern Harrier	c	c	c	
___ Sharp-shinned Hawk†	u	u	u	o
___ Cooper's Hawk†	u	u	u	
___ Northern Goshawk†	u	u	u	u
___ Red-shouldered Hawk†	o	o	o	
___ Broad-winged Hawk†	c	c	c	
___ Red-tailed Hawk†	o	o	o	
___ Rough-legged Hawk	u		u	
___ American Kestrel†	c	c	c	o
___ Merlin	o	r	o	
GROUSE				
___ Spruce Grouse†	u	u	u	u
___ Ruffed Grouse†	a	a	a	a
RAILS - COOT				
___ Virginia Rail†	c	c	c	
___ Sora†	c	c	c	
___ American Coot†	o	o	o	
PLOVERS - SANDPIPERS				
___ Black-bellied Plover	o	o	o	
___ Lesser Golden-Plover			r	
___ Semipalmated Plover	u	u	u	
___ Killdeer†	c	c	c	
___ Greater Yellowlegs	c	u	c	
___ Lesser Yellowlegs	o	c	u	
___ Solitary Sandpiper	u	u	u	
___ Spotted Sandpiper†	a	a	a	
___ Upland Sandpiper	r	r		
___ Whimbrel		r		
___ Ruddy Turnstone	r	r	r	
___ Sanderling	u	u	u	
___ Semipalmated Sandpiper	u	a	c	
___ Western Sandpiper		r		
___ Least Sandpiper	u	a	c	
___ Short-billed Dowitcher		u		
___ Common Snipe†	c	c	c	
___ American Woodcock†	a	a	a	
GULLS - TERNS				
___ Bonaparte's Gull	r	a	a	r
___ Ring-billed Gull	o	o	o	o
___ Herring Gull	a	a	a	a
___ Great Black-backed Gull	c	c	c	c
___ Common Tern	c	c	c	
___ Arctic Tern	o	o	o	
DOVES - CUCKOOS - OWLS - SWIFTS - HUMMINGBIRDS				
___ Mourning Dove†	u	u	u	
___ Black-billed Cuckoo†	u	u	u	
___ Yellow-billed Cuckoo†	o	o	o	
___ Eastern Screech-Owl†	u	u	u	u
___ Great Horned Owl†	c	c	c	c
___ Snowy Owl				o
___ Barred Owl†	c	c	c	c
___ Long-eared Owl	r	r	r	r
___ Short-eared Owl	o	o	o	o
___ Boreal Owl				o
___ Northern Saw-whet Owl†	u	u	u	r
___ Common Nighthawk†	c	c	c	
___ Whip-poor-will†	c	c	c	
___ Chimney Swift†	c	c	c	
___ Ruby-throated Hummingbird†	c	c	c	
___ Belted Kingfisher†	c	c	c	r
WOODPECKERS - FLYCATCHERS				
___ Red-headed Woodpecker	r	r	r	
___ Yellow-bellied Sapsucker†	a	a	a	
___ Downy Woodpecker†	c	c	c	c
___ Hairy Woodpecker†	c	c	c	c
___ Three-toed Woodpecker				r
___ Black-backed Woodpecker†	r	r	r	r
___ Northern Flicker†	a	c	a	
___ Pileated Woodpecker†	u	u	u	u
___ Olive-sided Flycatcher†	c	c	c	
___ Eastern Wood-Peewee†	c	c	c	
___ Alder Flycatcher	c	c	c	
___ Yellow-bellied Flycatcher†	u	u		
___ Least Flycatcher†	c	c	c	
___ Eastern Phoebe†	c	c	c	
___ Great Crested Flycatcher†	o	o		
___ Eastern Kingbird†	c	c	c	
LARKS - SWALLOWS - JAYS and CROWS				
___ Horned Lark	u			u
___ Purple Martin†	r	r		
___ Tree Swallow†	a	a	a	
___ Bank Swallow†	c	c	u	
___ Cliff Swallow†	c	c	u	
___ Barn Swallow†	a	a	u	
___ Gray Jay†	u	u	u	u
___ Blue Jay†	c	c	c	u
___ American Crow†	a	a	a	c
___ Common Raven†	c	c	c	c
TITMICE - NUTHATCHES - WRENS				
___ Black-capped Chickadee†	c	c	c	c
___ Boreal Chickadee†	u	u	u	u
___ Red-breasted Nuthatch†	c	c	c	c
___ White-breasted Nuthatch	o	o	o	c
___ Brown Creeper†	c	c	c	c
___ House Wren†	u	u	u	
___ Winter Wren†	c	c	c	
___ Sedge Wren†	c	c	c	
___ Marsh Wren†	u	u	u	
KINGLETS - THRUSHES - THRASHERS				
___ Golden-crowned Kinglet†	c	u	c	u
___ Ruby-crowned Kinglet†	c	u	c	

	s	S	F	W
___ Eastern Bluebird†	r	r	r	
___ Veery†	c	c	c	
___ Gray-cheeked Thrush	u		u	
___ Swainson's Thrush†	c	c	o	
___ Hermit Thrush†	c	c	c	
___ Wood Thrush†	c	c	c	
___ American Robin†	a	a	a	o
___ Gray Catbird†	c	c	c	
___ Northern Mockingbird	r	r		
___ Brown Thrasher†	o	o	o	
WAXWINGS - SHRIKES - STARLING				
___ Water Pipit				r
___ Bohemian Waxwing				r
___ Cedar Waxwing†	c	c	c	
___ Northern Shrike	o		o	o
___ Loggerhead Shrike	o	o		
___ European Starling†	a	a	a	c
VIREOS - WOOD WARBLERS				
___ White-eyed Vireo		r		
___ Solitary Vireo†	u	u	u	
___ Yellow-throated Vireo†	r	r	r	
___ Warbling Vireo†	u	u	u	
___ Philadelphia Vireo†	u	u	u	
___ Red-eyed Vireo†	c	c	c	
___ Tennessee Warbler†	c	c	c	
___ Nashville Warbler†	c	c	c	
___ Northern Parula†	c	c	c	
___ Yellow Warbler†	c	c	c	
___ Chestnut-sided Warbler†	c	c	c	
___ Magnolia Warbler†	c	c	c	
___ Cape May Warbler†	u	u	u	
___ Black-throated Blue Warbler†	c	c	c	
___ Yellow-rumped Warbler†	c	c	c	
___ Black-throated Green Warbler†	c	c	c	
___ Blackburnian Warbler†	c	c	c	
___ Pine Warbler†	r	r	r	
___ Palm Warbler†	u	u	u	
___ Bay-breasted Warbler†	u	u	o	
___ Blackpoll Warbler†	o	o	o	
___ Black-and-white Warbler†	c	c	c	
___ American Redstart†	a	a	a	
___ Ovenbird†	c	c	c	
___ Northern Waterthrush†	c	c	c	
___ Mourning Warbler†	o	o	o	
___ Common Yellowthroat†	c	c	c	
___ Wilson's Warbler†	u	u	u	
___ Canada Warbler†	o	u	o	

	s	S	F	W
TANAGERS - SPARROWS				
___ Scarlet Tanager†	u	u	u	
___ Rose-breasted Grosbeak	u	u	u	
___ Indigo Bunting†	o	o	o	
___ Rufous-sided Towhee	o	o	o	
___ American Tree Sparrow	c		c	c
___ Chipping Sparrow†	c	c	c	
___ Field Sparrow†	u	u	u	
___ Vesper Sparrow†	c	c	c	
___ Savannah Sparrow†	c	c	c	
___ Sharp-tailed Sparrow†	o	o	o	
___ Fox Sparrow	o		o	o
___ Song Sparrow†	c	c	c	
___ Lincoln's Sparrow†	u	u	u	
___ Swamp Sparrow†	u	u	u	
___ White-throated Sparrow†	c	c	c	o
___ Golden-crowned Sparrow	u		u	
___ Dark-eyed Junco†	c	c	c	u
___ Lapland Longspur				o
___ Snow Bunting				c
BLACKBIRDS - FINCHES				
___ Bobolink†	c	c	c	
___ Red-winged Blackbird†	a	a	a	r
___ Eastern Meadowlark†	u	u	u	
___ Rusty Blackbird†	u	u	u	
___ Common Grackle†	c	c	c	
___ Brown-headed Cowbird†	c	c	c	r
___ Northern Oriole†	u	u	u	
___ Pine Grosbeak†	o	o	o	c
___ Purple Finch†	c	c	c	o
___ Red Crossbill†	o	o	o	o
___ White-winged Crossbill†	o	o	o	o
___ Common Redpoll	o			c
___ Pine Siskin	o	o	o	c
___ American Goldfinch†	c	c	c	u
___ Evening Grosbeak†	c	u	c	c
___ House Sparrow†	a	a	a	a



U.S. Fish and Wildlife Service

Moosehorn is one of more than 430 refuges in the National Wildlife Refuge System administered by the U.S. Fish and Wildlife Service. The National Wildlife Refuge System is a network of lands and waters managed specifically for the protection of wildlife and wildlife habitat and represents the most comprehensive wildlife resource management program in the world. Units of the system stretch across the United States from northern Alaska to the Florida Keys, and include small islands in the Caribbean and South Pacific. The character of the refuges is as diverse as the nation itself.

The Service also manages National Fish Hatcheries, and provides federal leadership in habitat protection, fish and wildlife research, technical assistance, and the conservation and protection of migratory birds, certain fish and marine mammals, and threatened and endangered species.

For further information contact:

Refuge Manager
Moosehorn National Wildlife Refuge
Post Office Box X
Calais, Maine 04619
Telephone: (207) 454-3521

Take Pride in Moosehorn National Wildlife Refuge

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

RL-53530-3
August 1986

U.S. GOVERNMENT PRINTING OFFICE: 1986-602-368

MAMMALS OF MOOSEHORN NATIONAL WILDLIFE REFUGE

MAINE

The Moosehorn National Wildlife Refuge is located in extreme southeastern Maine. It was established in 1937, as the northeastern end of a chain of migratory bird refuges extending from Maine to Florida, and consists of two units. The primary unit of about 16,000 acres is bounded on the north by the St. Croix River, which forms the boundary between the United States and Canada. Refuge headquarters are located on this unit, six miles south of the city of Calais. The secondary unit, over 6,700 acres in size, lies along U.S. Route 1 at Edmunds. It is bounded by the waters of Cobscook Bay, an arm of the Bay of Fundy, and the mouths of the Dennys and Whiting Rivers.

The Moosehorn Refuge is primarily upland area, including nearly all types of habitat found in Maine. Seven small lakes are wholly or partially within the boundaries. Also to be found are abandoned farmlands, small freshwater marshes, numerous streams, northern bogs, salt marshes, rocky shorelines, and rocky, hilly terrain. Some original pine and spruce-balsam forest growth has survived, but much of the area is forested with second-growth stands in various stages of succession—from the subclimax hardwoods resulting from burning, to the mixed softwood-hardwood climax types.

Three big game species occur on the refuge—the whitetail deer, moose, and black bear. Deer are present in good numbers and may be observed in refuge fields and along roads and trails. Moose frequent both refuge units at times, moving in to calve during late spring and early summer. Black bear are present in good numbers at all times, but usually are seen only during the spring, summer and fall.

Of special interest are two marine mammals, the harbor seal and the Atlantic harbor porpoise. Seals are commonly seen and porpoises occasionally observed in the Cobscook Bay area of the Edmunds Unit.

Only one bat, the little brown myotis, has been positively identified, but additional species are known to be distributed throughout the State. It is believed that additional field work may well discover some or all of these species on the refuge.

Some of the most common smaller mammals are the snowshoe hare, red fox, red squirrel, porcupine, muskrat, beaver, and raccoon. Beaver dams and houses and muskrat houses may be observed from several locations along public highways and from refuge access roads and trails.

The following list, representing 36 species, was prepared by refuge personnel. It is believed that further field work will reveal the presence of additional species, especially bats. Order of listing and scientific names follow Miller and Kellog, List of North American Recent Mammals. Common names are given in Burt and Grossenheider, A Field Guide to Mammals.

ANNOTATED LIST OF MAMMALS OF THE MOOSEHORN NATIONAL WILDLIFE REFUGE.

Masked Shrew *(Sorex cinereus).* Fairly abundant along stream bottoms and in moist, heavily vegetated areas, under woodpiles and in hollow stumps.

Shorttail Shrew *(Blarina brevicauda).* Most abundant of the shrews, occurring in all types of habitat, particularly in the litter of the forest floors where they build runways and use those constructed by mice.

Hairytail Mole *(Parascalops breweri).* Fairly abundant in all types of upland habitat but difficult to observe due to nocturnal and burrowing habits. Specimens observed are usually those caught by cats and other nocturnal predators.

Starnose Mole *(Condylura cristata).* This peculiarly-marked insect eater swims and dives well, preferring to make its home in wet meadows and marshes. Common near refuge water areas.

Little Brown Myotis *(Myotis lucifugus).* This small bat is commonly found in old buildings and attics, and in hollow trees, caves and rock ledges. Most often seen flying over or near water, on summer evenings, in search of insect food.

Snowshoe Hare *(Lepus americanus).* Most common of the small game mammals. Found in almost any type of wooded habitat, but prefers second-growth forest where it feeds voraciously upon the bark of young trees, twigs, buds and shoots. Is often seen along roadsides during spring and summer. Color varies from brown in summer to white during the months having snow.

Woodchuck *(Marmota monax).* Member of the squirrel family, fairly abundant in old fields and pastures and along stone walls. From October to March this animal is in hibernation.

Eastern Chipmunk *(Tamias striatus).* Fairly abundant along stone walls, fence corners, and fallen tree trunks. Most often seen away from deep forested areas and while actively engaged in gathering and storing food.

Eastern Gray Squirrel *(Sciurus carolinensis).* Only a few are found on the refuge. They are confined to hardwood forests on ridges.

Red Squirrel *(Tamiasciurus hudsonicus).* Occurs in all spruce-balsam type forests where it is more often heard than seen. Abundant.

Northern Flying Squirrel *(Glaucomys sabrinus).* Fairly abundant, but not often seen due to nocturnal habits.

Beaver *(Castor canadensis).* Dams and houses may be observed from refuge roads and trails, and evidence of their feeding on poplar and other trees can be seen on almost all watercourses.

Deer Mouse *(Peromyscus maniculatus).* Very abundant in woods near fields, along hedgerows, and especially in outbuildings. Frequently occupies tree nests of other species.

White-footed Mouse *(Peromyscus leucopus).* An abundant species, difficult to distinguish from the deer mouse either in appearance or habits.

Boreal Redback Vole *(Clethrionomys gapperi).* Abundant in fields and in mossy floors of woodlands. Its travel is less restricted to tunnels than that of its cousin, the meadow vole.

Meadow Vole *(Microtus pennsylvanicus).* Undoubtedly the most abundant mammal on the refuge. Very adaptable, occurring in most any type of habitat where it lives in an elaborate system of underground runways.

Muskrat *(Ondatra zibethicus).* Fairly abundant in most flowages and impoundments. Houses constructed of aquatic vegetation may be observed from refuge roads and trails.

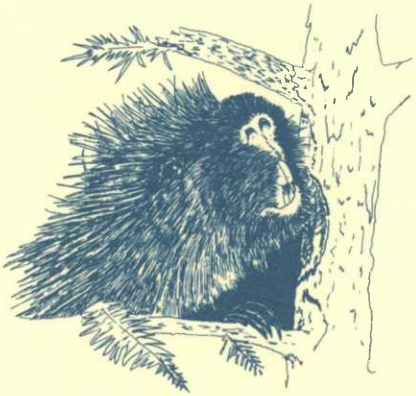
House Mouse *(Mus musculus).* Sometimes found in refuge buildings.

Meadow Jumping Mouse *(Zapus hudsonius).* Frequents marshlands and meadows where it may be seen traveling in tremendous leaps when disturbed by the passerby.

Woodland Jumping Mouse *(Napaeozapus insignis).* Similar to the meadow jumping mouse in appearance, this common rodent prefers a heavily wooded habitat.

Atlantic Harbor Porpoise *(Phocoena phocoena).* Occasionally observed in Cobscook Bay adjacent to the Edmunds Unit.

Porcupine *(Erethizon dorsatum).* Fairly abundant in most types of habitat. Feeds on inner bark of trees, especially in winter, and various green plants.



Whitetail Deer *(Odocoileus virginianus).* Numbers estimated at about 400 animals. May be observed from refuge roads and trails.

Bobcat *(Lynx rufus).* Found in limited numbers, mostly in remote and rocky areas.

Black Bear *(Euarctos americanus).* Individuals or their signs are frequently observed during spring, summer and fall.

Red Fox *(Vulpes fulva).* Common in all refuge upland habitat but prefers old farmlands, meadows, and other clearings.

Raccoon *(Procyon lotor).* Abundant along waterways and around bodies of water.

Fisher *(Martes pennanti).* Found in limited numbers throughout the refuge.

Mink *(Mustela vison).* Inhabits all waterways, flowages and impoundments. Common in both coastal and upland areas.

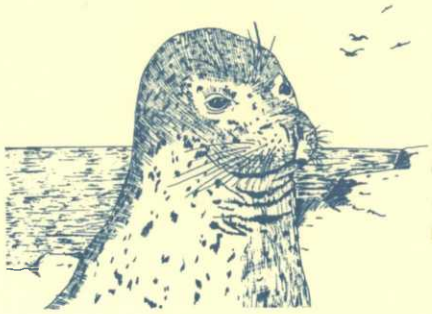
Shorttail Weasel *(Mustela erminea).* Occurs in fair numbers in most refuge habitats, but prefers the coniferous forests.

Longtail Weasel *(Mustela frenata).* Occurs in moderate abundance throughout the refuge, preferring the more open sites.

Striped Skunk *(Mephitis mephitis).* Occurs in fair numbers; areas close to human habitation are commonly used.

River Otter *(Lutra canadensis).* Occurs on all main waterways, traveling from watershed to watershed in search of its fish staple.

Harbor Seal *(Phoca vitulina).* May be frequently observed in saltwater areas of the Edmunds Unit.



Moose *(Alces alces).* Occasionally seen during summer months. In rare instances may remain throughout the winter.

Coyote *(Canis latrans).* Common in all refuge upland habitat.

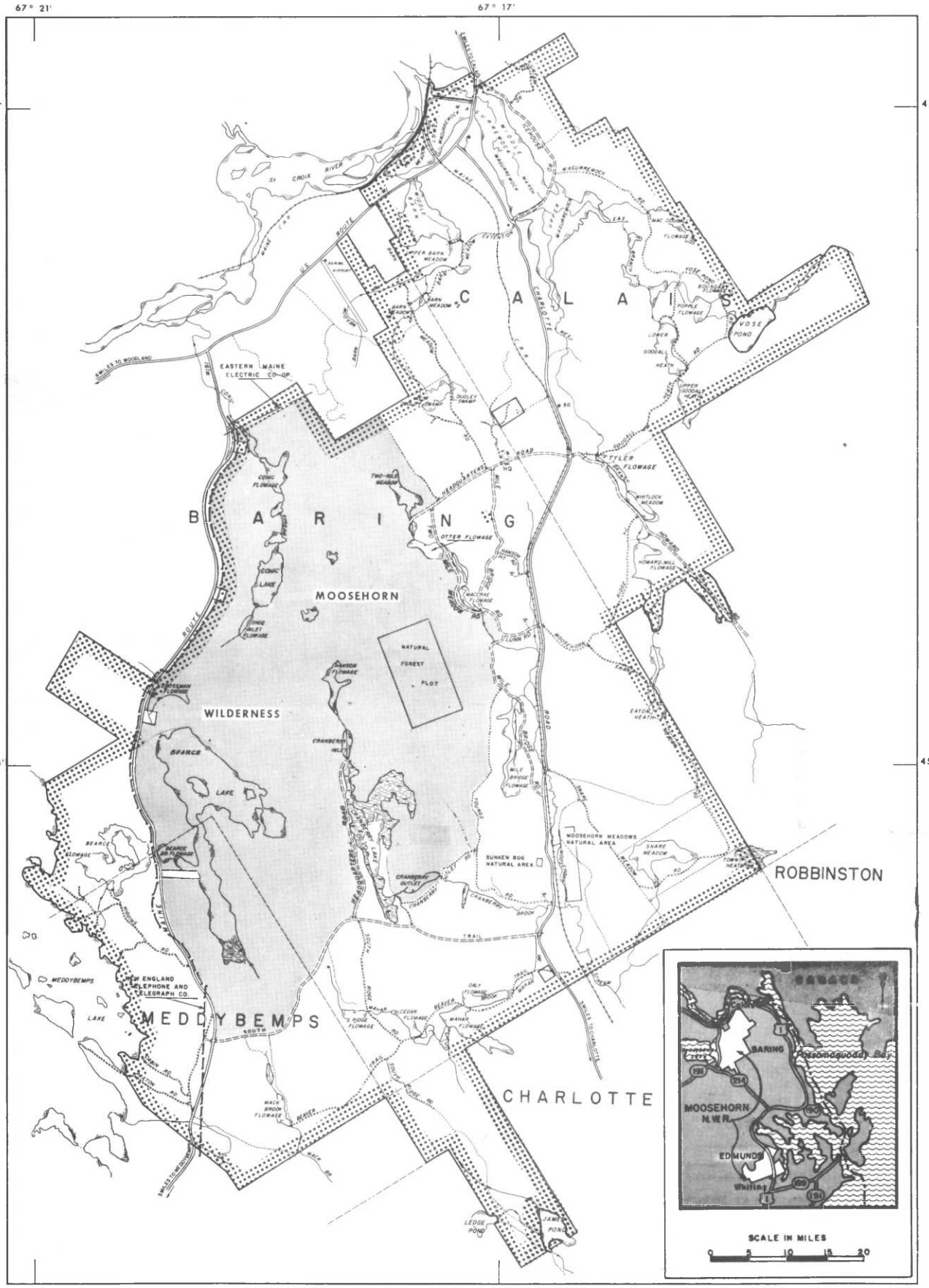
MOOSEHORN NATIONAL WILDLIFE REFUGE

WASHINGTON COUNTY, MAINE

UNITED STATES
DEPARTMENT OF THE INTERIOR

BARING UNIT

UNITED STATES
FISH AND WILDLIFE SERVICE



COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY G.S. AND U.S.F.& W.S.

NEWTON CORNER, MASSACHUSETTS

0 2640 5280 7920 10560 FEET

0 1 2 3 4 KILOMETERS

20° Magnetic N. True North

MEAN DECLINATION 1949

5R ME. 220

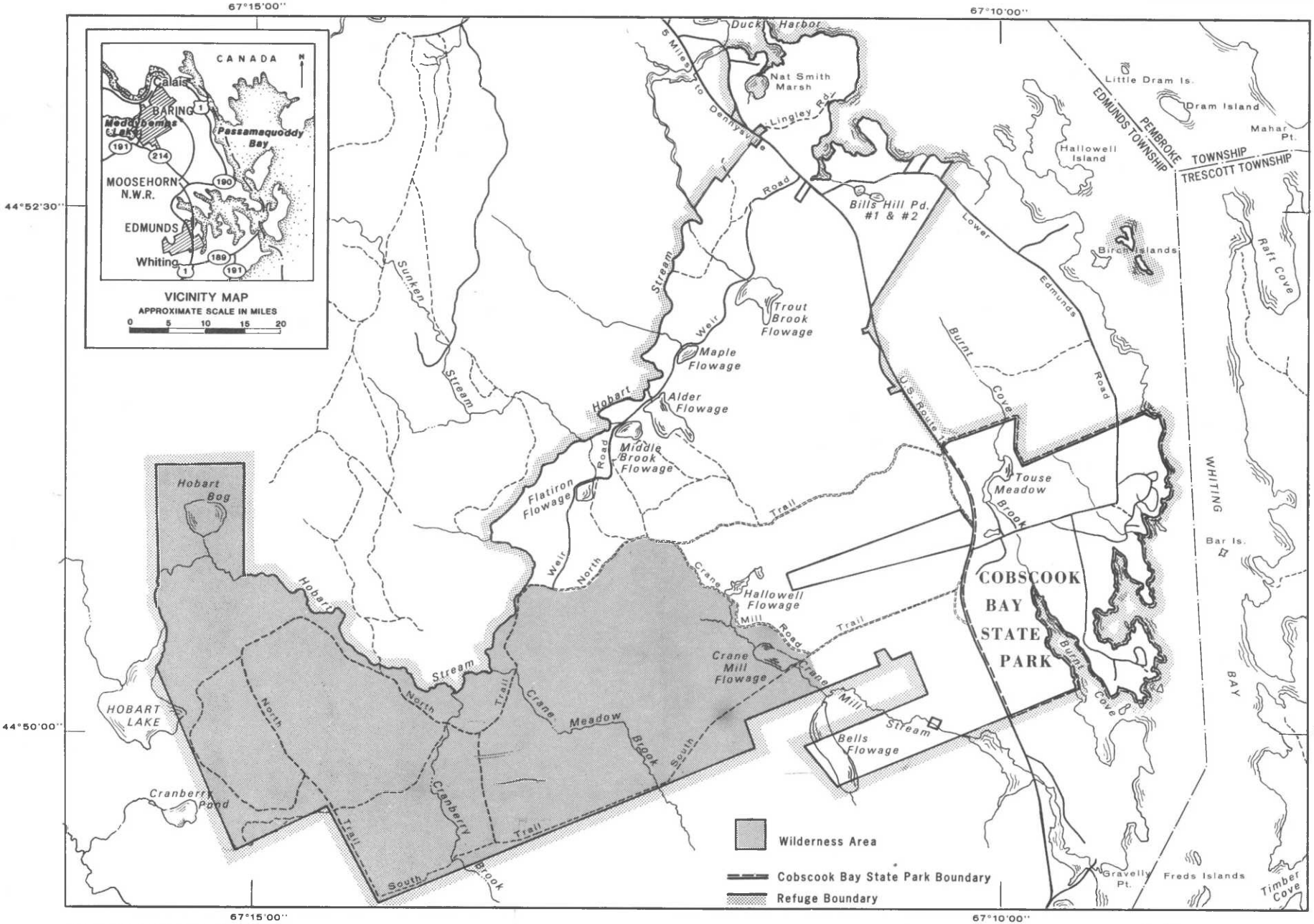
MOOSEHORN NATIONAL WILDLIFE REFUGE

WASHINGTON COUNTY, MAINE

UNITED STATES
DEPARTMENT OF THE INTERIOR

EDMUNDS UNIT

UNITED STATES
FISH AND WILDLIFE SERVICE



COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY U.S.G.S. and U.S.F.&W.S.

0 2000 4000 6000 8000 FEET
0 .50 1.0 1.5 2.0 KILOMETERS

MEAN DECLINATION 1977

NEWTON CORNER, MASSACHUSETTS
REVISED: JANUARY 1987

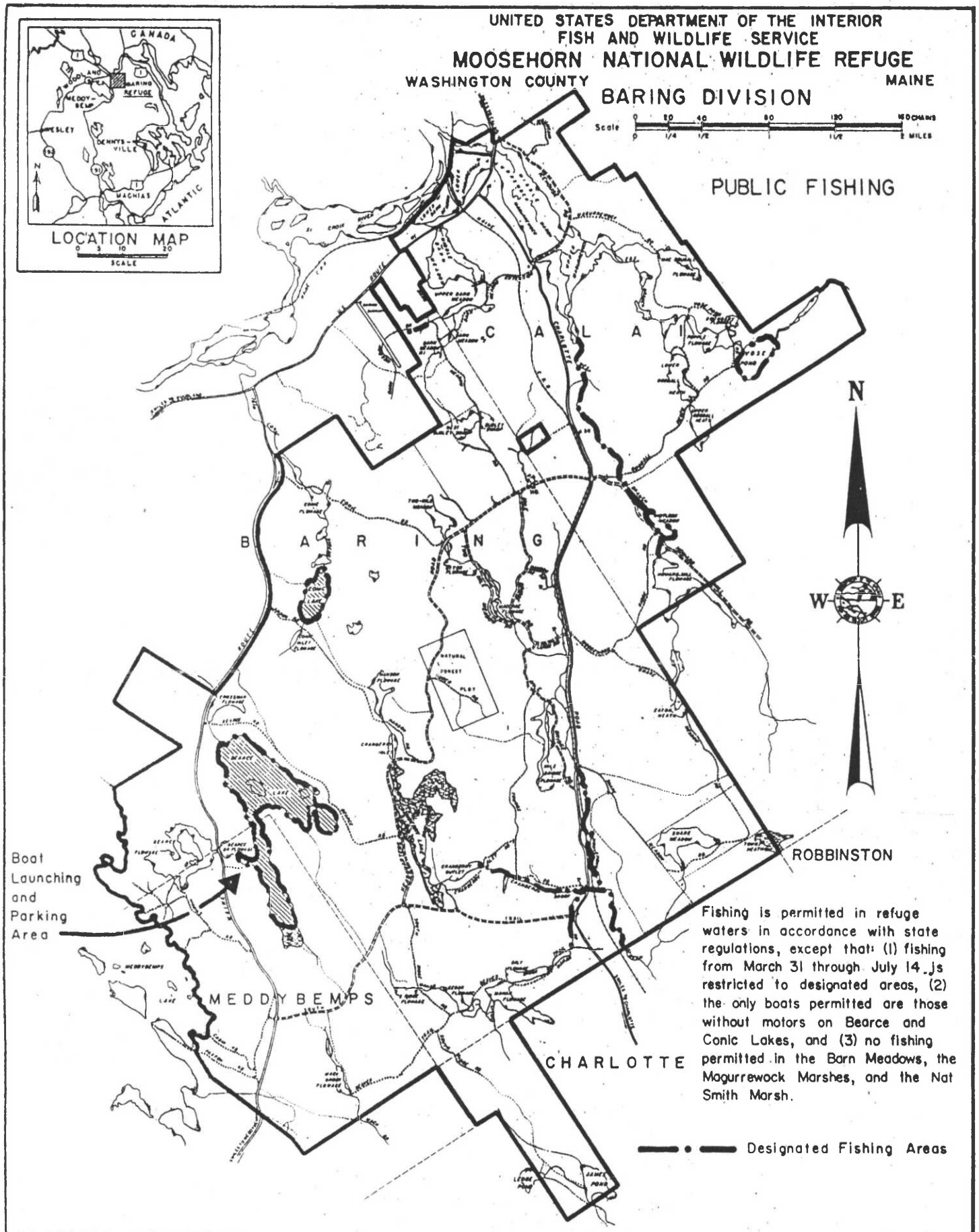
5R ME 220

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

MOOSEHORN NATIONAL WILDLIFE REFUGE

WASHINGTON COUNTY MAINE

BARING DIVISION



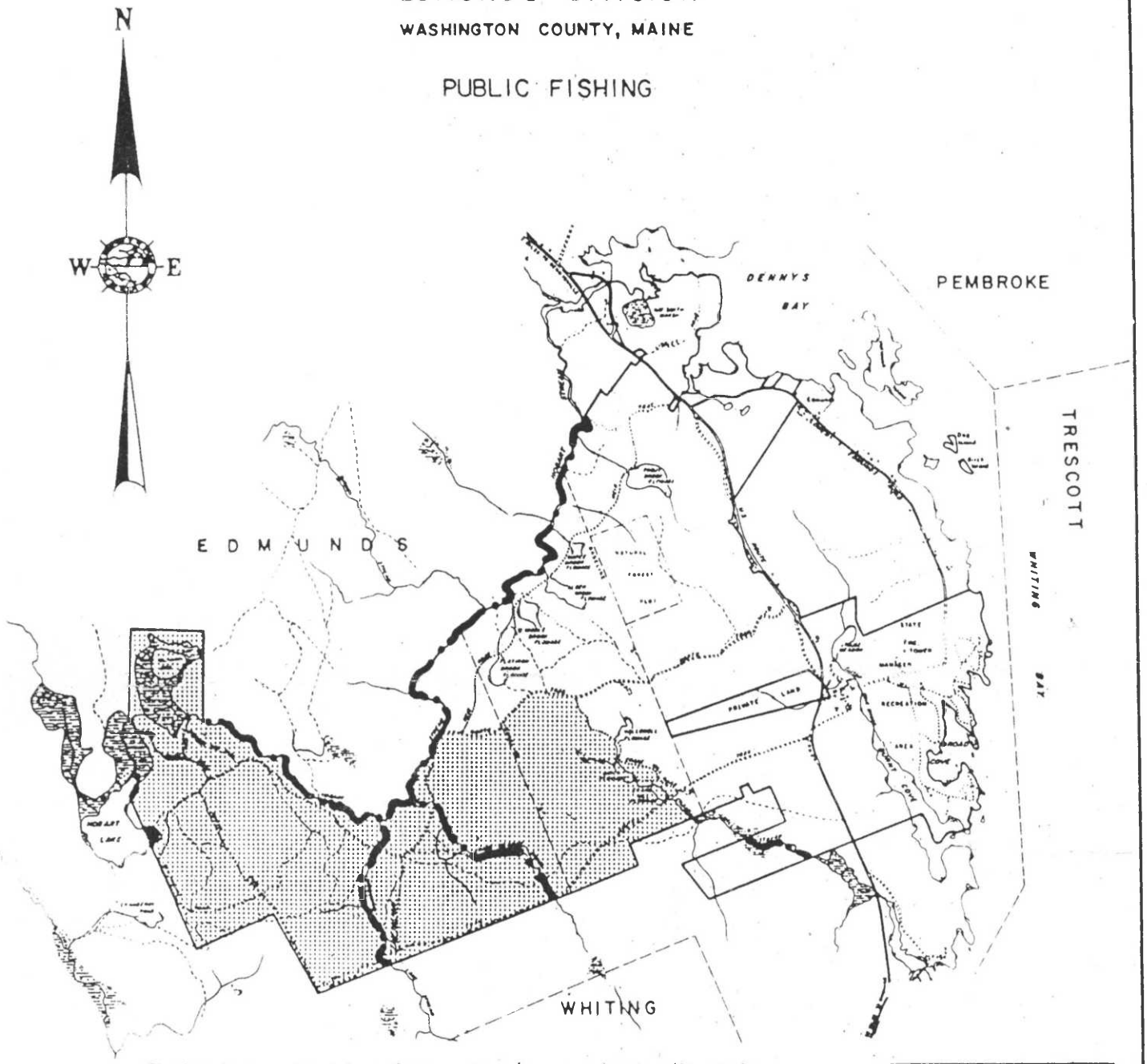
JM 670608 REV. 690506

MOOSEHORN NATIONAL WILDLIFE REFUGE

EDMUNDS DIVISION

WASHINGTON COUNTY, MAINE

PUBLIC FISHING



Fishing is permitted in refuge waters in accordance with state regulations.

Wilderness Area

Designated Fishing Area

Scale 0 1/2 1 2 3 4 MILES

Rev. 12/4/75

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

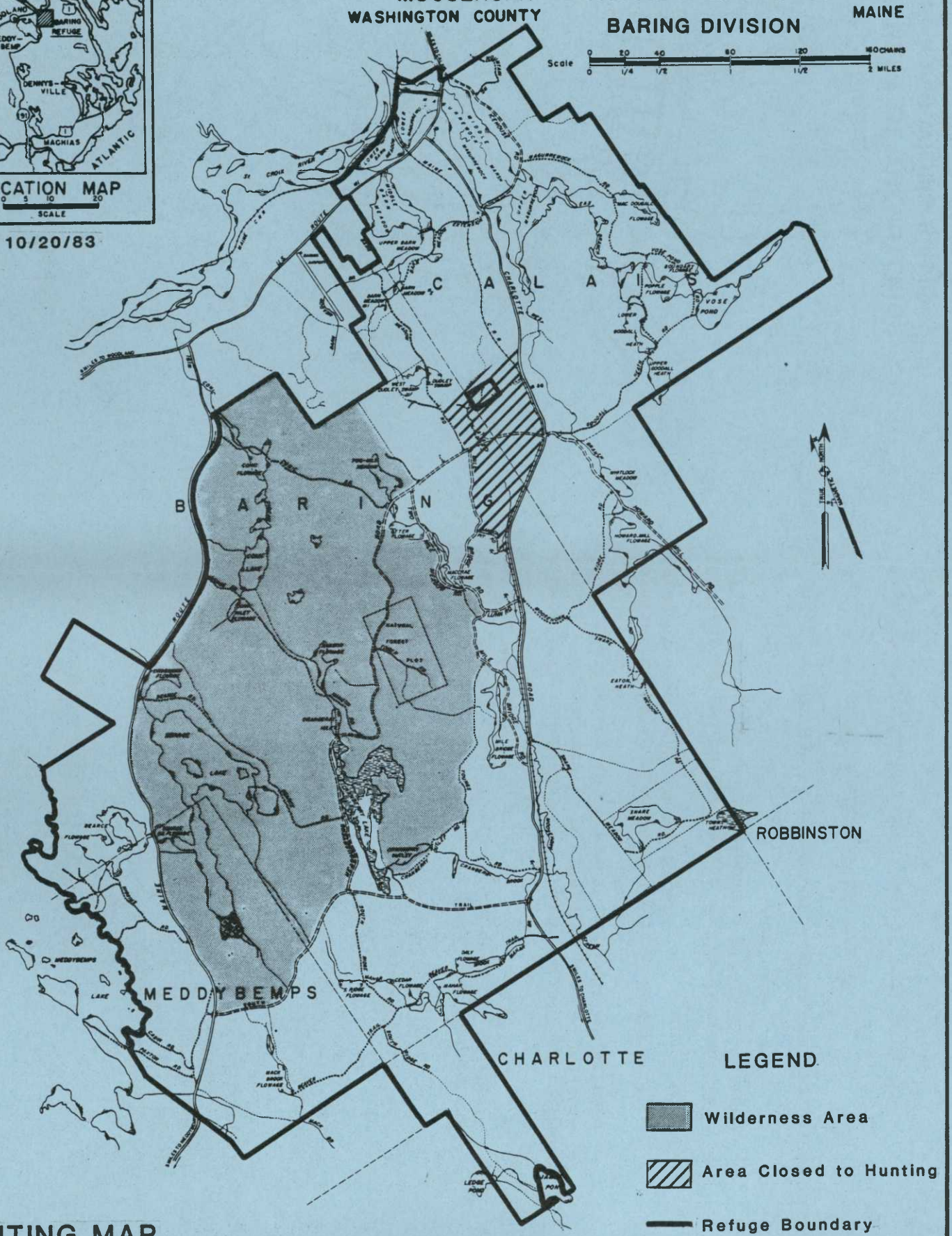
MOOSEHORN NATIONAL WILDLIFE REFUGE

WASHINGTON COUNTY — MAINE

BARING DIVISION

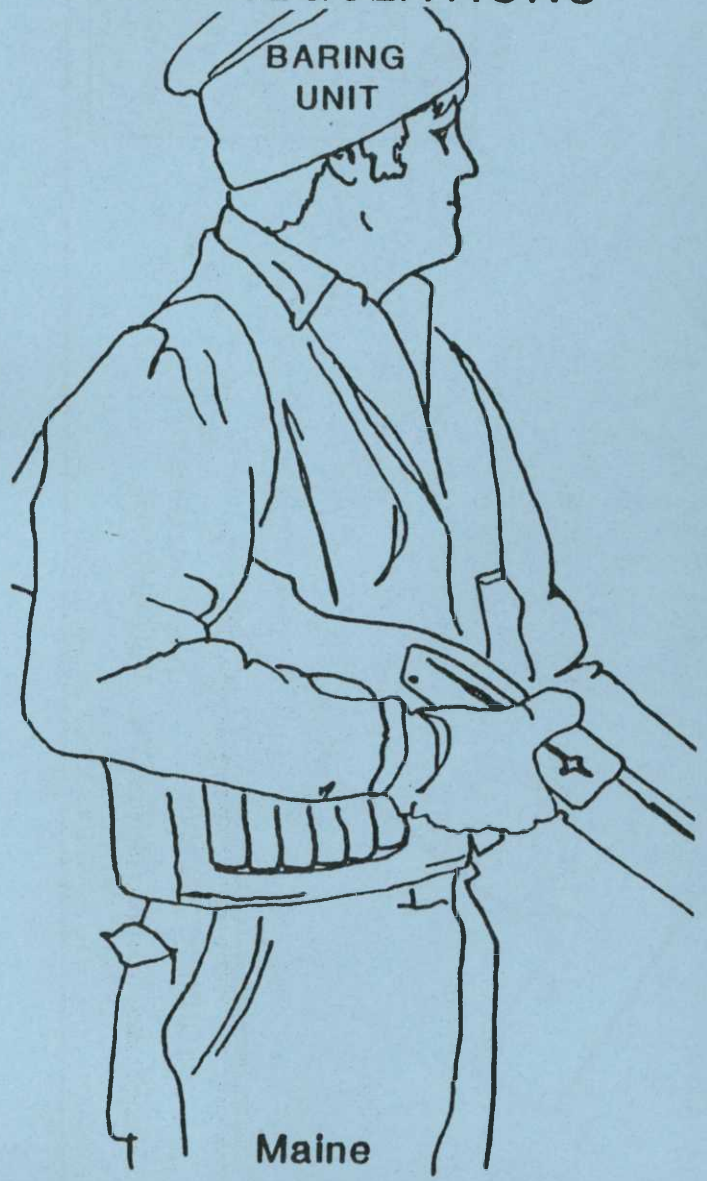
Scale 0 20 40 80 120 160 CHAINS; 0 1/4 1/2 1 1 1/2 2 MILES

10/20/83



HUNTING MAP

MOOSEHORN
National Wildlife Refuge
HUNTING MAP AND REGULATIONS



Maine

DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service

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

MOOSEHORN NATIONAL WILDLIFE REFUGE
Box X, Calais, Maine 04619

DEER HUNTING INFORMATION

Edmunds and Baring Units of the Moosehorn National Wildlife Refuge will be open to deer hunting during the State of Maine's regular firearms deer season. The hunt will be conducted in accordance with all State and Federal laws and the following regulations. ONLY DEER may be killed. Hunting of bears, bobcats, game birds, porcupine, or other wildlife is not permitted.

1. Vehicles will be parked so they do not block refuge roads and gates. Vehicles blocking roads will be towed at the owner's expense.

2. The area within one-half mile of headquarters, as posted, is a safety zone CLOSED TO HUNTING.

3. Access gates will be open one-half hour before and one-half hour after legal shooting hours. Gates will be locked at night.

4. A permit is required for all deer hunting on refuge lands. Permits may be obtained by phone (207-454-3521), letter, or in person at refuge headquarters.

5. Permits may be revoked by the Refuge Manager if refuge regulations are violated.

6. All deer bagged on the refuge must be brought to refuge headquarters or telephone 454-3521, collect.

REMEMBER - SAFETY FIRST BEFORE YOU SHOOT - OTHER HUNTERS MAY BE NEAR

CARRY A COMPASS AND USE IT

TAKE YOUR LITTER AND OTHER DEBRIS HOME WITH YOU

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH & WILDLIFE SERVICE

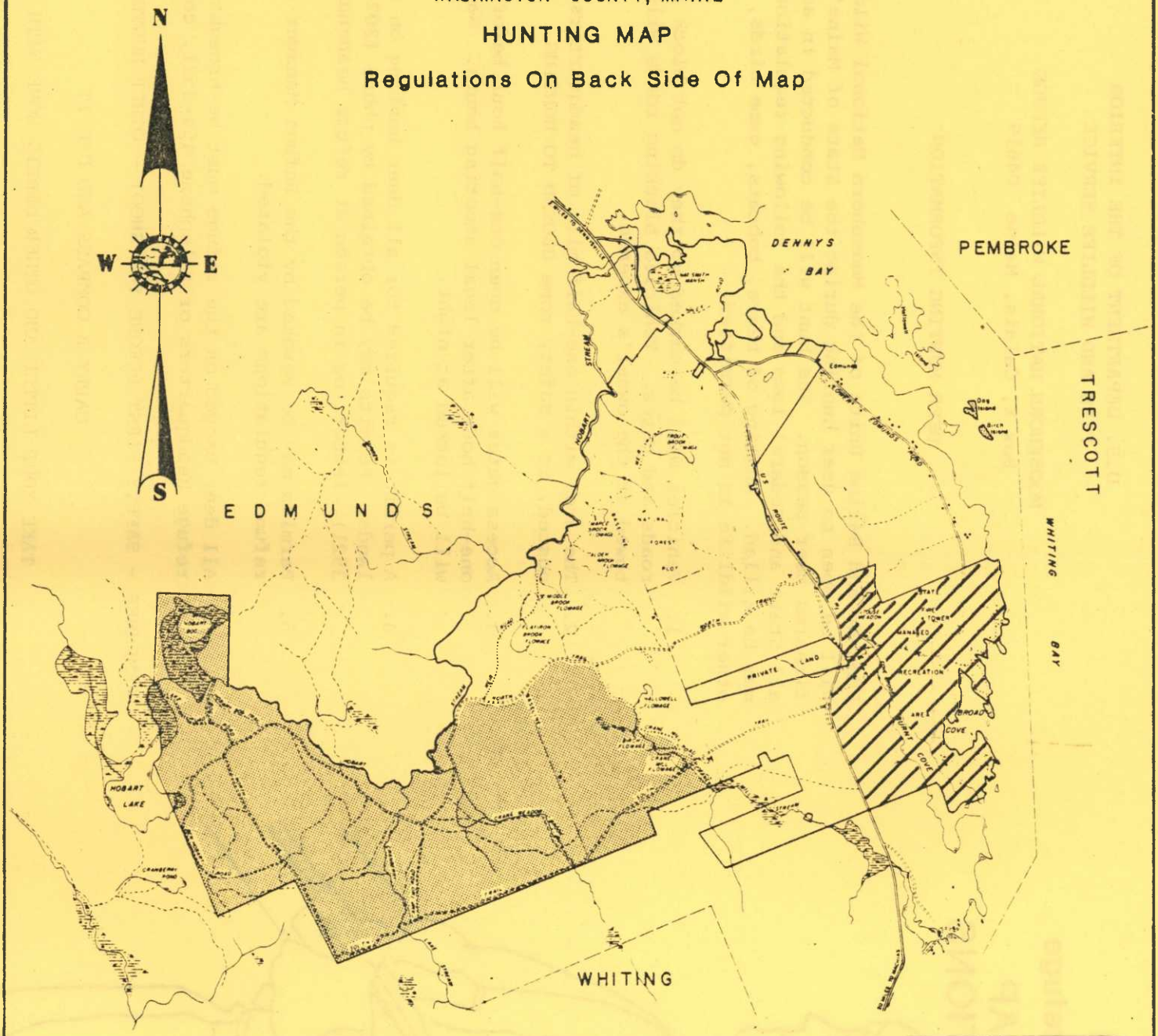
MOOSEHORN NATIONAL WILDLIFE REFUGE

EDMUNDS DIVISION

WASHINGTON COUNTY, MAINE

HUNTING MAP

Regulations On Back Side Of Map



AREA CLOSED TO HUNTING

MOOSEHORN NATIONAL WILDERNESS AREA

Scale 0 1/2 1 2 3 4 MILES

LOCATION MAP

JR 680201

MOOSEHORN
National Wildlife Refuge
HUNTING MAP AND REGULATIONS

Maine

DEPARTMENT OF THE INTERIOR

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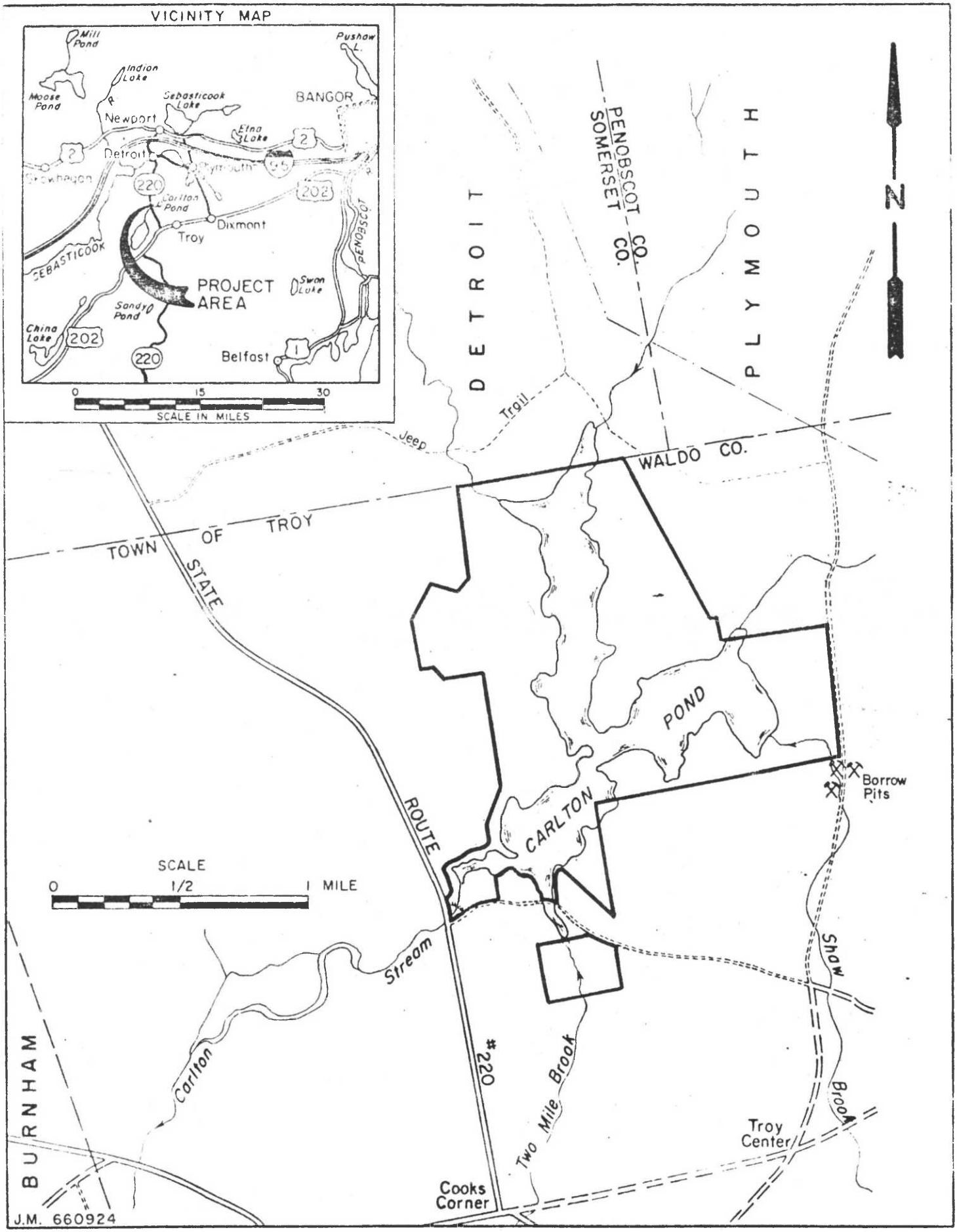
CARLTON POND WATERFOWL PRODUCTION AREA

WALDO COUNTY, MAINE