

ANNUAL NARRATIVE REPORT
Calendar Year 1983

MOOSEHORN NATIONAL WILDLIFE REFUGE
Calais, Maine

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

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NATIONAL WILDLIFE REFUGE SYSTEM



Refuge Staff (all PFT)

1. Douglas M. Mullen Refuge Manager GS-12
2. Thomas A. Goettel Assistant Refuge Manager GS-9
3. Annette Macek Refuge Manager Trainee GS-5
4. Greg F. Sepik Wildlife Biologist GS-9
5. Stanley E. McConvey Biological Technician GS-9
6. Helen E. Forsyth Clerk Typist GS-5
7. Merton L. Hatton Maintenance Worker WG-7
8. Alton L. Sawyer Maintenance Worker WG-7

Review and Approvals

Douglas M. Mullen
Submitted By

11/02/84
Date

Thomas J. McAndrews
Refuge Supervisor Review

11-10-84
Date

Suzanne Mayne
ARD-Wildlife Resources Review

11-19-84
Date



Woodcock Telemetry Crew

DMM

Front Row - left to right:

Nancy Phelps	Suffolk University
Connie Adams	Cornell University
Brian Peters	University of Maine
Michael Fitz	University of Maine
Annette Macek	Refuge Manager Trainee
Brian Benedict	University of Maine

Second Row - left to right:

Eric Derleth	Biologist, Patuxent W/L Research
Greg Sepik	Refuge Biologist
Trish Radford	Pennsylvania State University
John Brundage	Pennsylvania State University
Glenn Wiggin	Unity College

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Nothing to report

A. HIGHLIGHTS

This was the second year of the woodcock telemetry project. Twenty to 25 birds were under observation at any one time during the summer (Section D-5).

The YCC program was re-instituted this year after a two-year absence (Section E-2).

The refuge hosted a Landowner's Workshop on Forest-Wildlife Management, attracting over 50 landowners (Section E-7).

Insect pests plaguing the refuge are believed to be on a cyclic decline (Section E-7).

The number of nesting pairs of bald eagles on the Baring Unit increased to three (Section G-2).

The refuge was open to deer hunting this year under a new "bucks only" law for eastern Maine (Section H-8).

Two garage stalls in the headquarters office building were converted to office space (Section I-2).

B. CLIMATIC CONDITIONS

Weather data, including temperatures and precipitation, is collected at refuge headquarters. The year started off with unusually mild temperatures in January, February and March. The ground remained bare until January 16 when a northeaster dumped 13 inches of snow on the area. Spring precipitation was nearly double the normal amount for March, April, and May. Woodcock brood mortality is presumed to have been high. Heavy rains in November caused minor erosion on refuge gravel roads, and accompanying high winds blew budworm-killed spruce and fir across refuge roads and trails.

Month	Snowfall		Precipitation		Temperature			
	1983	Normal*	1983	Normal*	Extremes		Mean	
					Max.	Min.	1983	Normal*
January	20.5	22.2	4.58	4.46	58	-16	19	15
February	24.5	21.2	2.78	3.75	50	-11	20	18
March	8.0	17.1	6.00	3.38	48	0	31	29
April	7.0	6.6	7.34	3.82	66	20	41	40
May	T	-	6.45	3.35	75	30	50	52
June	-	-	1.77	3.33	95	32	62	62
July	-	-	4.26	3.08	94	38	65	68
August	-	-	4.15	3.12	88	39	64	66
September	-	-	2.73	4.16	90	31	59	57
October	-	0.9	2.42	4.13	78	16	44	46
November	1.0	4.6	8.14	4.98	59	11	36	35
December	12.0	20.3	5.80	5.23	56	-15	21	21
TTLS & Averages:	73.0	92.9	56.42	46.79	95	-16	43	42

*Based on the average of 30 years (1954-83) of weather data collected at refuge headquarters.

D. PLANNING

2. Management Plan

First drafts of the Trapping Plan and the Hunting Plan were completed and submitted for approval in September. The first draft of the Fire Management Plan was completed and submitted in October. All three plans were complete revisions of previous management plans.

5. Research and Investigations

Moosehorn NR83 - "Practical Application of Woodcock Trapping Techniques and Usage of Managed Cover Types" (Progress Report 53530-1)



Woodcock in Mistnet

Ben Murphy

Woodcock banding efforts began on April 7 with the capture of the first courting male. By the end of the summer 106 birds had been captured; less than any other year since woodcock banding began on the refuge in 1961. This was due, in part, to the woodcock telemetry study. We felt it was necessary to minimize disturbance of the birds on their nocturnal roosting areas and therefore limited mist netting and night lighting activities on these areas. However, we maintained the same amount of effort on the traplines in the diurnal covers. Capture rates in these covers were the lowest we have ever observed. We believe this decrease was due to poor weather conditions during the brooding period; survival rates of the chicks was probably very low. We also had a difficult time finding broods with dogs--another indication of poor survival.

This was the second year of the woodcock telemetry project. The first of 35 woodcock were radio-marked on May 27. Twenty to 25 birds were under observation at any one time during the summer. Four woodcock were followed for over four months and at least eight birds flew south with radios still attached and working.



Locating Bird Near Strip Cut

DMM

We continued to monitor both nocturnal and diurnal locations until the end of August, and diurnal locations until migration in October. During the summer each marked bird was also flushed weekly. Earthworm abundance and numerous vegetation parameters were recorded at each flush site.

Although detailed computer analysis has not yet begun, certain interesting observations were noted this year.

1. Numerous nocturnal and diurnal locations were logged in spruce-fir stands damaged or killed by spruce budworm. Seemingly better habitat was available nearby. An indepth analysis of micro-habitat data will hopefully shed some light on this phenomena.
2. Mammalian predators, probably weasels, were the major cause of natural predation. Most predation seemed to occur to those birds favoring older covers and mature woodlands. Little predation was observed on woodcock using thick, early growth forested habitat. In fact, certain types of management may be death traps to woodcock by attracting birds while also providing good conditions for predators.
3. Individual male woodcock continued to utilize several different openings as nocturnal habitat throughout the summer. There may be competition or exploration for courting areas throughout the summer.

4. Most females also seem to spend most of their time near openings. They may also be seeking spring breeding cover.

High resolution, black and white aerial photos were taken in November. These photos will be used to cover type the refuge. The cover type maps will be digitized and merged with telemetry data to determine woodcock-vegetation relationships.

Publications based on the results of this study which were published, accepted for publication, or released this year include:

Sepik, G. F. and Dwyer, T. J. 1983. The effect of a drought on a local woodcock population. Trans. of the Northeast Sect. of the Wildl. Soc. In press.

Sepik, G. F., R. B. Owen, Jr., and M. W. Coulter. 1983. A landowner's guide to woodcock management in the northeast - Wisconsin version. Univ. Maine (Orono) Life Sci. Agric. Exp. Stn. Misc. Rep. 253. viii + 23p.

Moosehorn NR83 - "Nesting and Habitat Requirements of Trap-nesting Wasps Associated with Spruce Budworm" (Progress Report 53530-10)

In collaboration with Dr. Frank D. Parker, Bee Biology and Systematic Laboratory, USDA, Agricultural Research Service, Logan Utah, predaceous eumenid wasps were imported from Utah and released on Moosehorn. Release sites were in the strip clearcut areas along the Charlotte Road. Wasps were reared in Orono, transported to Moosehorn, and released starting June 6, 1983, and continuing every two or three days thereafter until June 23, 1983, for a total of eight release dates. Species of wasps released were: Ancistrocerus tuberculocephalus (Saussure), A. catskill (Saussure), Euodynerus hidalgo (Saussure), and E. leucomelas (Saussure). All are predators of lepidopterous larvae; potential prey includes the spruce budworm, Choristoneura fumiferana (Clemens).

Total wasps released were: 1,616 (Utah) in the strip clearcuts, plus 211 native (Maine wasps in a strip clearcut south of headquarters. Releases were made in 25-hole blocks mounted on stumps (10/rep) and in fabricated release shelters (10 blocks/shelter; 1 shelter/rep).

Estimates were made of the spruce budworm population before and after the predation period, i.e., density of L3-L4 larvae vs pupal density. Provisioned straws in each block were removed weekly (June, 20 - July, 11), transported to the laboratory and opened. Total cells/straw, prey larvae/cell, and prey identity were determined.

In addition, forest stand data were taken on 10 plots bordering each strip clearcut (2 plots/rep; 1 north and 1 south). Diameters of all trees (2 cm dbh) were measured by species. Tree heights (m) were measured with a Haga altimeter (10 trees/plot); and increment cores randomly taken (5 trees/plot).

Data summaries and analyses are in progress. Additional releases of progeny developing from 1983 nests are expected in 1984. The predatory impact of these wasps on late-instar spruce budworm larvae will be evaluated.

Moosehorn NR83 - "Plant Composition and Production Following a Fire and Clearcutting for Salvage" (Progress Report 53530-11)

Epidemic spruce budworm populations have created habitat conditions favorable for budworm perpetuation. Spruce budworm epidemics may be prevented through forest type conversion. The objectives of an ongoing study by the U.S. Forest Service are to determine the effect of prescribed fire and clearcutting for salvage on tree-regeneration, plant composition, production and quality in spruce-fir stands defoliated by spruce budworm.

During the past summer (1983) the Forest Service sampled vegetation on plots that had been clearcut and burned in 1980. Techniques used to measure the vegetation were weight estimation, clipping and weighing, and microwave attenuation. Next summer we plan to resample the same plots as well as those plots not burned. Vegetation data collected earlier on those plots is being related to forage preference studies done on the refuge several years ago with "tamed" wild moose and deer.



Forest Service Crew Sampling Vegetation

USFS

Moosehorn NR83 - "Earthworms Available to Woodcock in Relation to Forest Type, Soil, and Historical Land-use in Maine" (Progress Report 53530-13)

Earthworms were collected by formalin extraction from 96, 0.25 m² plots located within and surrounding the Moosehorn Refuge, in order to examine the relationship of forest type, soil characteristics, and history of agriculture to earthworm biomass available to woodcock.

Sites sampled represented most of the possible combinations of three soil types, four forest overstory types, and tilled vs never tilled land. Data on woody and herbaceous species composition, stand age, soil texture, drainage, percent organic matter, temperature, moisture content and pH were recorded for each site, along with whether or not the soil had ever been tilled.

The data from the refuge were pooled with that collected in other areas of the state and examined for patterns of association between the habitat variables and earthworm biomass. Agricultural history, soil type, and sampling period were found to have significant effects on earthworm biomass. Forest type was important in determining earthworm biomass only when all soil types and sampling periods were pooled, and then only conifers had significantly lower biomass than the other three forest types. PH, percent soil moisture, percent coarse material, age class of the stand, julian date, and the palatability index of the forest litter were the important variables in a multivariate regression equation used to predict point estimates of earthworm biomass. The management implications of the study are being drafted, and the thesis is in preparation. All aspects of the study are expected to be completed by May 1984.

Moosehorn NE83 - "Survival of Molting Female Black Ducks as Related to Impoundment Management Procedures" (Progress Report 14)

Because we were unable to capture molting female black ducks, we did not obtain data on survival for this post-breeding period. Although we expended considerable effort (648 hours of open bait traps and 16 rocket net shots) between July 2, 1983, and September 18, 1983, we captured only 14 adult female black ducks and 182 hatching year birds. Four of these females had not started to molt, nine had completed the molt and one was replacing its last primary. Mean weights of pre-molt females (1072 g) and post-molt females (1039 g) were not different ($P > 0.05$), although somewhat lighter, likely reflecting the weight loss during molt. The one hen still with a blood-filled primary weighed 960 g. Mean weights of hatching year black ducks that were recaptured did not change ($P > 0.05$) between captures and wing chord changes were slight (a few millimeters) suggesting that these birds had nearly completed primary feather growth by mid-September.

In short, we did not achieve the objectives set forth because we were unable to capture black ducks in molt. Lack of success was partly related to inadequate capture techniques, and partly to timing of the molt that conflicted with heavy work schedules of other ongoing studies. Use of an airboat for nightlighting and a somewhat different placement of bait traps might be tried another year.

Because of the limited resources available to conduct this study, we recommend that work be halted for now and resumed in the 1985 or 1986 field seasons when field station personnel have completed certain ongoing studies and the budget picture has improved. We suggest that the banding aspect be continued in 1984 to monitor bird condition and use of impoundments, and to augment the cooperative black duck banding efforts of the Department of Inland Fisheries and

Wildlife biologists. The continued collection of weight and growth data on HY birds seems useful, inasmuch as survival of HY birds is so low--especially for females.

This study was led by Jerry Longcore of the Patuxent Wildlife Research Center's Maine Field Station in Orono.

Moosehorn NR83 - "Integrated Forest and Wildlife Management" (Progress Report 20)

The primary objective of this study is to determine if greater diversity of habitat types in beaver flowages produces greater species richness, equitability, and diversity of avifauna compared to flowages with fewer habitat types. Research was conducted in May through August 1983. Study sites included five flowages on Moosehorn that were chosen based on their differences in vegetation structure. At least six transect lines per flowage were positioned perpendicularly to the shoreline of each flowage, and were marked at 10 m intervals to designate plot of centers. Every other plot was censused for breeding birds from May 14 to July 7 using a modified IPA method (point control). Only birds in the 7 X 28 m plot were recorded. Waterbirds were censused in the evenings, but results were inadequate to estimate the number of individuals for each species present in each flowage.

Vegetation data were collected in alternate vegetation plots and included canopy and ground cover, vertical foliage height density, species composition, and physiognomy of the vegetation. In 1984 the upland bird census will be conducted as in 1983, but more time will be devoted to the wetland bird community to develop reliable census data. Vegetation plots not measured in 1983 will be measured in 1984. Vegetation data will be analyzed to objectively determine "edge" boundaries, and bird census data will be analyzed with regard to the vegetation information to determine if habitats with greater vegetational diversity support a greater diversity of birds.

This study was led by graduate student John Bashaw of the University of Maine at Orono.

Moosehorn NR83 - "Survival of Ring-necked Broods and Effects of Acid Precipitation on Foods Eaten by Ducklings" (Progress Report 53530-21)

Six ring-necked duck nests were located on four different flowages: Magurrewock (2), Barn Meadow (2), Lower Goodall Heath (1), Daly (1). All six nests were destroyed, five by predators and one was flooded after a rainstorm. Raccoons destroyed three nests and a mink and a water snake each destroyed one nest. This amount of predation seems high considering that of eight other ring-necked duck nests located off the refuge, only one was destroyed by a predator. Although no females were marked on the refuge, we were able to follow four broods from hatching to fledging. All four hens successfully reared at least two ducklings; two fledged from a brood of six, seven from a brood of nine, three from a brood of three, and two from a brood of 10.

Five ducklings were collected to determine foods eaten, but only four contained food. All ducklings were collected from Bearce Flowage (4) and Popple Flowage (1). Invertebrate samples were collected at each duckling collection site immediately after the duckling was collected. In addition, invertebrate samples were collected at various sites where broods were observed feeding. Twenty-one samples were collected during July and August 1983, from Magurrewock and Popple flowages. Samples have been sorted and identified to family.

This study was led by Jerry Longcore of the Patuxent Wildlife Research Center's Maine Field Station in Orono.

E. ADMINISTRATION1. Personnel

Assistant Manager Annette Macek (GS-5) reported for duty at Moosehorn on May 16. Annette transferred from Ecological Services, Annapolis, Maryland.

The Moosehorn National Wildlife Refuge is essentially fully staffed. The following table summarizes the personnel staffing for the past five years.

	<u>Permanent</u>		
	<u>Full-time</u>	<u>Part-time</u>	<u>Temporary</u>
FY 1983	8	0	1
FY 1982	7	0	1
FY 1981	7	0	0
FY 1980	5	1	3
FY 1979	6	1	3

Millard Seeley, seasonal Maintenance Worker, reported for duty on May 15 and was terminated on September 30.

2. Youth Programs - Youth Conservation Corps (YCC)

Prior to 1981, Moosehorn's YCC Camp operated for 10 consecutive years. In 1981 we received authorization to host a camp, but this came only a few weeks before the program was scheduled to start. We felt this was not sufficient time to prepare for a meaningful and successful program. After two years without YCC we were glad to have the program again this year to catch up on our backlog of work projects.

This was our 11th YCC Program and our first non-residential camp. This year's program was involved in 12 different work projects having a final appraised value of \$47,250. We had two Group Leaders and 20 enrollees. The Group Leaders were new to the YCC Program, but were well qualified and dedicated to their job. There was a good demographic mix of enrollees and we feel it was a good program.

Camp started on July 27 and was originally scheduled to terminate on August 19. In an effort to utilize all the money allotted for enrollee salaries we extended the program another two weeks, until September 2. During the last two weeks the enrollees were supervised by refuge personnel, as the Group Leaders were terminated August 19.

Although a diversification of work projects was provided, the non-residential camp did not benefit the enrollees as much environmentally as our former residential camps. Without the presence of a full-time environmental education staff member it was difficult to provide the enrollees with the desired amount of environmental teaching. We did encourage the staff and enrollees to stop, look, and take a few minutes to talk about the environment when something of particular interest came up. Also, each project was discussed with the enrollees--the reason we were doing the work and the value of the project to the refuge was explained.

This year our enrollee selection process was not handled by the State of Maine and thus not computerized as in previous years. During March a news release was sent out to all local papers and, along with YCC applications, to the Guidance Counselors at all the local schools within a radius of 75 miles. By April 15 all recruitment had been completed and a total of 108 applications had been received. On April 20 a public drawing was held at the Visitor Center where 10 females and 10 males, as well as several alternates, were selected. After notifying all selectees and alternates, a precamp meeting was held in mid-May at which time the program was thoroughly explained. Also, additional literature, medical forms, and letters of commitment were handed out at this meeting.

We feel, as we always have, that this is the best youth program available. However, this year, in spite of all our safety meetings, daily job hazards analysis, and environmental education discussions, many of the enrollees considered it entirely a work program. We attributed this attitude primarily to the non-residential nature of the program. In our past residential camps the enrollees and staff lived, worked, and played together and we had very few drop-outs or absenteeism. This year, with all local enrollees, it was too easy for them to call in with some reason or other to be absent.

Another factor in our drop-outs is the seasonal work available in this area such as blueberry raking. Many of the enrollees left the program for higher pay.

As previously stated, we had to extend the program an additional two weeks in an effort to use the money allotted for enrollee salaries. At the beginning of the two-week extension we had nine enrollees on board (all that were willing to stay on) and still had approximately \$400 in enrollee salaries not expended.

At Moosehorn we have no shortage of work projects and, if possible, we would like to have a residential camp next year.

3. Other Manpower Programs - Comprehensive Employment Training Act (CETA)

For approximately five months we were fortunate to have several CETA employees working on the refuge. Employees under this program are permitted to work 32 hours per week. These employees were a tremendous help in general refuge maintenance as well as cutting and burning brush in our woodcock habitat improvement program. Without these positions much of our work would not have been accomplished, especially with the loss of our YACC Program. CETA employees on board until May 1983 were as follows.

<u>CETA EMPLOYEES</u>	<u>E.O.D</u>	<u>Terminated</u>
Anne Perkins	5-02-83	5-19-83
Roger Rabideau	5-02-83	5-19-83
Gail Higgins	5-02-83	5-19-83
Joseph Caruer	5-02-83	5-12-83
Jerry Wood	5-17-83	5-19-83
Michael Polk	5-16-83	5-19-83
George Kneeland	9-17-82	2-11-83
Raymond Brown	1-13-83	5-19-83

Martin Brown	1-17-83	3-03-83
Mary Brown	5-16-83	5-19-83
Leah Alley	5-02-83	5-12-83

4. Volunteer Programs

Volunteers Glenn Wiggin, Unity College; John Brundage and Trish Radford, Pennsylvania State University; Connie Adams, Cornell; and Nancy Phelps, Suffolk University donated their entire summer to the woodcock telemetry project. They put in 10-12 hour days and nights under all types of weather conditions. What was even more impressive, three of the volunteers even did special projects including: snapping turtle population dynamics, bird utilization of a flowage before and after a drawdown, and exhibits for a visitor contact station. A small grant from the National Rifle Association, obtained by Biologist Eric Derleth, Patuxent Wildlife Research Center, was used to furnish the volunteers with a weekly food stipend.

Student Conservation Association (SCA)

The Student Conservation Association, Inc., is a public non-profit organization incorporated in the State of New York. The Association, with the cooperating agencies, conducts the Student Conservation Program, which places more than 900 high school and college students in volunteer conservation projects each year.

The SCA is supported through tax deductible contributions from foundations, members, and private individuals and through matching funds provided by federal and other agencies with which it cooperates in offering the Program each year.

This was the first year that Moosehorn took advantage of this program. We had six volunteers--three males and three females. Verbal commitments from the six selectees were received, contracts were signed, and volunteers reported for work. The students worked for 11 or 12 weeks, depending upon their school schedules. Students receive a travel grant covering expenses to and from their duty station and subsistence payments of \$35 per week. The Student Conservation Association pays 15% of these charges and the U.S. Fish and Wildlife Service the remaining 85%. SCA students who participated in this program were:

	<u>E.O.D.</u>	<u>Terminated</u>
Sue Livingston, Cheyenne, WY	6-06-83	8-26-83
Cheryl McMillen, Nelsonville, OH	6-06-83	8-26-83
Ken Deshais, E. Longmeadow, MA	6-06-83	8-26-83
David Stahl, Oshkosh, WI	6-06-83	8-26-83
Janea Little, Hannibal, MO	6-13-83	8-26-83
Ben Murphy, Brea, CA	6-13-83	8-26-83

We were extremely pleased with the students and the program. They were very dedicated and did a terrific job for us. All volunteers were well qualified and very cooperative. Projects worked on included clear-cutting of six woodcock strips, brushing and tightening wire on one mile of fence line, assisting in the woodcock research program,

supervising and working with the YCC Program, removing beaver debris from several water control structures, straightening and brushing out numerous boundary signs, mowing lawns and dikes, fertilizing dikes, assisting the crew on the waterfowl project, and assisting in posting at Petit Manan National Wildlife Refuge.

5. Funding

The following is a table indicating our broad funding situation during the Fiscal Years 1979-1983.

<u>Year</u>	<u>Allotment</u>	<u>Salaries</u>	<u>Fixed Costs, studies, travel</u>	<u>Operating Balance</u>
1979	175,300	128,405	18,696	28,199
1980	173,500	126,633*	21,950	24,917
1981	196,200	141,883**	32,954***	21,363
1982	200,000	168,749	26,875	4,376
1983	269,000	189,190****	31,655	48,155

*FY 80: Assistant Manager Position vacant.

**FY 81: Assistant Manager position filled.

***FY 81: Included \$6,688 for Assistant Manager's transfer.

****FY 83: Assistant Manager Trainee position filled.

6. Safety

Regular safety meetings were held throughout the year. Films on chain saw safety and safe boating were shown to SCA volunteers and YCC enrollees.

SCA volunteers and members of the woodcock crew were given a defensive driving course.

All fire suppression equipment was checked and serviced before the fire season.

There were no lost time accidents this year for the permanent, student volunteers, or YCC enrollees.

On March 20, Refuge Manager Doug Mullen left the refuge at 4:00 a.m. enroute to the airport in Bangor, Maine, a trip of about 100 miles, to catch an early morning flight. He was almost to the airport when he fell asleep at the wheel. The vehicle left the road, striking a guard rail and damaging the passenger side of the vehicle. All occupants of the car were wearing seat belts. No one was injured. Early morning trips to the airport will be eliminated. If travel plans necessitate an early morning flight, personnel will spend the night in Bangor.

On June 16, student volunteer Patricia Radford suffered a slight concussion when the vehicle in which she was riding hit a bump, causing her to hit her head on the rear view mirror. The injury was not serious and she returned to work.

7. Technical Assistance

Assistant Refuge Manager Goettel attended the Woodcock Wingbee at Patuxent Wildlife Research Center during the week of February 7. While there, he toured the Center and Blackwater National Wildlife Refuge.

Biologist Sepik presented a paper, entitled "The Effect of a Drought on a Local Woodcock Population" at the Northeast Fish and Wildlife Conference.

In May, Biologist Sepik conducted a tour of forest management areas for the Small Woodlot Owners' Association of Maine.

Assistant Manager Goettel attended the Natural Areas Workshop in Fort Kent, Maine, from August 22-24, sponsored by the Atlantic Center for the Environment. A major topic of discussion was management of Machias Seal Island with the Canadian Wildlife Service.

A Landowners' Workshop on Forest-Wildlife Management, which attracted over 50 landowners representing nearly 6,000 acres, was held on the refuge September 17. Co-sponsors for the workshop included: Georgia-Pacific Corporation; the Small Woodlot Owners' Association of Maine; the University of Maine; the Downeast Resource, Conservation, and Development Council; and the Maine Cooperative Extension Service. The morning was devoted to presentations by foresters and wildlife biologists from throughout the state. A tour of wildlife management areas on the refuge was conducted in the afternoon.

In November, Biologist Sepik gave a slide presentation about woodcock management techniques at a Natural Resources Manager's Workshop in Syracuse, New York. Sepik also gave a progress report on the woodcock telemetry study to the Technical Session of the Annual Meeting of the Ruffed Grouse Society, also in Syracuse.

Another edition of "A Landowner's Guide to Woodcock Management in the Northeast" has been published. This edition was tailored to Wisconsin conditions and contains a preface by Wisconsin Cooperative Extension Specialists detailing the differences between Wisconsin and the Northeast.

8. Other Items

During March and April, Refuge Manager Mullen attended a three-week Advanced Managers Training Course at Beckley, West Virginia and Washington, D.C.

Refuge personnel attended lectures at the University of Maine by Jack Ward Thomas, Pacific Northwest Forest and Range Experiment Station. Dr. Thomas later toured refuge management areas and discussed current refuge research projects.

John Tauton, Office of Migratory Bird Management and Thomas Dwyer, Patuxent Wildlife Research Center, visited the refuge during the week of July 17.

The field station evaluation team, composed of Curt Laffin, Doris Cimino, Bob Miller, and Ed Moses visited the refuge during the week of August 15.

On October 18-21, meetings were held to plan future activities for the Maine Coastal Islands refuges. Attending from the Regional Office were Tom McAndrews, Ralph Andrews, and Curt Laffin; and John Peterson from WA, Augusta.

F. HABITAT MANAGEMENT

1. General

Moosehorn National Wildlife Refuge is located in Washington County, Maine, the easternmost county of the United States. The topography consists of rolling hills, ledge outcrops, lakes, streams, bogs, and marshes. Total acreage is 22,665, consisting of 16,065 acres in the Baring Unit and 6,600 in the Edmunds Unit. The Edmunds Unit borders Cobscook Bay which has the highest tides in the eastern United States--24 feet.



Upper Goodall Heath Flowage

GFS

2. Wetlands

There are 52 managed water impoundments within refuge boundaries. Of these, 44 are located on the Baring Unit and eight on the Edmunds Unit. Six are within the boundaries of the Wilderness Area; management here is limited to monthly water level checks. In addition to managed impoundments, the refuge abounds with natural beaver flowages.

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

Water levels were maintained at, or slightly above, objective levels throughout most of the year due to abundant rainfall. Lack of rainfall in late September and early October kept several flowages below normal levels and delayed reflooding of drained and seeded flowages.



Upper Magurrewock



Fire Hole

Upper Goodall Heath, Barn Meadow #1, MacRae Flowage, Crossman Flowage, and Cedar Flowage were drawn down for the summer. Japanese millet was seeded in Upper Goodall Heath and Barn Meadow #1. In addition, mixed millet was planted in Upper Goodall Heath. Millet production was excellent in both areas.



Upper Goodall Heath Drawdown

TAG

Proper management of many impoundments is regularly hampered by intervening beaver colonies. Some flowages are plugged daily, resulting in levels well above management objectives and much manpower expended removing debris. Constant high water rapidly destroys all emergent vegetation in the impoundments, making them useless for waterfowl (also see sections G-15 and H-10).

Wild rice has been planted in several of the refuge impoundments over the last two years and is slowly taking hold. Continued planting and natural spread of the seed should provide excellent food and cover in many of our poorer flowages.

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 66 feet wide and from 100 to 1,400 feet long.

A limited amount of salvage cutting is being employed in spruce budworm damaged stands. Most merchantable stands are harvested by the Washington County Vocational Technical Institute (WCVTI), individuals who cut wood for home heating use, and private contractors. Non-commercial stands are harvested by firewood cutters, youth programs and, to a lesser extent, the WCVTI.



Popple Regeneration in a Clearcut

DMM

The market for forest products continued to be depressed. As a result only 35 acres were harvested since the WCVTI had problems recruiting students; one class had to be cancelled and most class sizes were well below normal.

Most commercial cutting this year took place on the southern end of the Baring Unit near Cranberry Lake. Part of this 60-acre block will be left to regenerate and part will be turned into a field. Cutting on several 5-acre blocks was also started.



Cranberry Lake Clearcut in Progress

TAG

Revenues from timber sales were:

Firewood	16 cords	\$ 80.00
Pulpwood	1,078 cords	5,567.24
Sawlogs	7.2 MBF	<u>309.60</u>
Total:		\$5,956.84

6. Other Habitats

Five pounds of Jerusalem artichokes, 100 black locust, 10 Siberian crabapple, 10 French crabapple, 10 bristly locust, and 10 autumn olive were planted in the abandoned gravel pits on the refuge as part of our continuing revegetation efforts.

7. Grazing

Grazing is one of our least energy intensive and least expensive tools for the management of woodcock habitat. Both of our grazing units, totaling 80 acres, are used as woodcock singing grounds and roosting fields. Our grazing season is from May 15 to October 15, with a grazing fee of \$2.50 per AUM.

<u>C.Y.</u>	<u>Permits</u>	<u>AUM's</u>	<u>Revenue</u>
1980	4	115	287.50
1981	5	115.5	288.75
1982	5	148	370.00
1983	4	116.5	291.25

8. Haying

One field was hayed in 1983. Approximately eight tons of hay was harvested on eight acres by one local permittee.

Haying accomplishes the same objective as grazing--maintaining suitable woodcock singing and roosting habitat. These hayfields are maintained for roosting woodcock, songbirds, grazing Canada geese, and deer.

9. Fire Management

Prescribed burning at Moosehorn takes two forms. Clearcut areas with moderate to heavy slash loads and light to heavy softwood regeneration are burned to decrease wildfire danger, promote hardwood regeneration, and decrease softwood regrowth. Only areas near water sources and with adequate fire breaks are burned. Fire is also used to keep woody vegetation from encroaching on old farm fields and blueberry barrens.

A wet spring precluded most prescribed burning. Only Field 29 and most of old agricultural fields along the Charlotte Road were burned.



Burning Slash on Clearcut, Mile Bridge Flowage GFS

10. Pest Control

The refuge continues to be plagued by insect pests again this year. Two species of tent caterpillar, the forest tent (Malacosoma disstria) and the eastern tent (Malacosoma americana) defoliated hundreds of acres of hardwood in the spring. All trees quickly leafed out again and by late summer foliage was once again lush. The tent caterpillar is on a cyclic decline and, with the help of natural predators, we predict almost no problems from this pest next year.



Tent Caterpillar Defoliation
(They won't eat red maple leaves)

DMM

The refuge has been able to withstand several attempts to spray the area for spruce budworm control over the last 10 years. Most stands of fir and spruce on the refuge have been destroyed. The spruce budworm cycle is essentially finished on the refuge. In some coastal areas damage to fir trees blamed on spruce budworm was actually caused by the balsam wooly aphid, especially at the Edmunds Unit of the refuge.



Spruce Budworm Damage

DMM

The gypsy moth has not yet moved into this area, but should be here shortly.

Our policy has been, and will continue to be, not to apply pesticides. We cannot justify the use of any pesticide to combat a natural cycle species. Experience has shown that natural predators will take care of these pests.

12. Wilderness and Special Areas

The following is a summary of Moosehorn's Wilderness and Natural 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
	<hr/>
Total:	7,892 A

All of the water control structures on the Baring Wilderness Area are still functional and are kept at desirable levels for waterfowl. This practice will continue as long as the structures remain operational. Most of the water control structures on the Edmunds Wilderness Area have been lost to washouts with the exception of Hobart Bog.

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

G. WILDLIFE

1. Wildlife Diversity

Current forestry activities continue to transform the refuge from a large even-aged forest to a highly diverse ecosystem. Deer, moose, woodcock, and other early successional species are increasing as the amount of early seral stages increases.

2. Endangered and Threatened Species

The eagle feeding station on the Edmunds Unit was very successful with up to 29 mature and immature eagles feeding at one time. Eagles from New Brunswick, New York, and the Chesapeake Bay have been recorded. The station is maintained by University of Maine (Orono) personnel. Road and dog-killed deer, trapping carcasses, and other "clean" food is taken to the feeding station to provide a pesticide-free food source to wintering eagles. Food is a major limiting factor in the winter survival of immature eagles.

On April 22, Charles Todd from the University of Maine Eagle Project, released a three-year-old eagle in the Barn Meadow area of the refuge. About four weeks prior to its release this eagle ran into a power line near Oak Bay, New Brunswick, Canada, and received injuries impairing its ability to fly. After receiving treatment at Fredericton, N.B. and the University of Maine it was brought to the refuge for release.



Charles Todd & Mark McCollough releasing Eagle GFS

The number of nesting pairs of bald eagles on the Baring Unit is increasing. We had three nesting pairs use the refuge this year. In addition to the nest overlooking Mile Bridge Flowage, new nests were located on

Magurrewock Mountain and in the vicinity of Vose Pond. Unfortunately, all three nests were unsuccessful for unknown reasons. We are hoping that the two new nests were first attempts by young birds and that they will have better luck next year.

Ospreys were a common sight fishing on the Magurrewock Marsh during the spring and summer. One was observed trying to build a nest on top of one of the utility poles adjacent to the Visitor Center. We have a pole on hand and will erect a nesting platform in this vicinity before the 1984 nesting season.

Two young ospreys were successfully hatched at the nest on top of a dead spruce in Cranberry Outlet Flowage. This nest has successfully produced young each year since 1978, except in the 1979 season when it was "seized" by nesting great horned owls.

Two young were produced at the nest on Fire Hole and one was produced at the Conic Flowage nest. Nests on Eaton Heath and Bearce Lake were active, but produced no young.

An injured osprey was brought to the refuge in July. The bird had an injured wing, had lost a lot of weight, and was too weak to feed on its own. After consulting Charlie Todd of the University of Maine and local veterinarian, David Cobb, we took on the task of force-feeding the osprey until it regained its strength. The woodcock crew and SCA volunteers did an excellent job of making sure the bird received his three daily feedings. When it was released on Magurrewock dike 10 days later it appeared to be in excellent health.



Volunteer Glen Wiggin releasing Osprey

AMM

3. Waterfowl

Although Moosehorn was established primarily for woodcock management and research, 52 wetland impoundments have been created over the years. These impoundments, along with the beaver flowages and natural impoundments, account for a considerable amount of waterfowl use and production. The most common nesting species on the Baring Unit include the Canada goose, black duck, ring-necked duck, wood duck, and hooded mergansers. Blue and green-winged teal are common migrants. These species are joined at the Edmunds Unit by the seaducks, including common eiders, goldeneyes, scoters, oldsquaw, and buffleheads.

The first goose brood was recorded on May 6. This was 18 days earlier than last year and the earliest on record. Although many waterfowl nests were washed out by high water early in the season, most re-nesting attempts were successful giving us good waterfowl production. Jerry Longcore of the Patuxent Wildlife Research Center's Maine field station in Orono, performed brood counts in conjunction with black duck and ring-necked duck studies (see section D-5, Research and Investigations) for the Baring Unit. Results are as follows:

<u>Species</u>	<u>No. of Broods</u>	<u>No. of Young</u>
Canada goose	29	126
Black duck	25	145
Ring-necked duck	6	36
Hooded Merganser	4	20
Wood duck	3	12

This represents approximately 20 percent of the actual waterfowl production of the refuge.

Summer water levels were again at or near management levels, encouraging good waterfowl use.

4. Marsh and Water Birds

Great blue herons, bittern, and pied-billed grebes are the most common species. Great blue herons were numerous again this summer.

On July 23 Assistant Manager Macek and student volunteers participated in a loon count on Maine Loon Day. The Loon Project, which began as a response to concern that loon populations were declining, is a state-wide effort to gather accurate data on loon populations to provide a core of information for statistical analysis and to monitor population trends. Observations were made in the morning and again in the evening on Bearce Lake, Conic Lake, Cranberry Lake, Vose Pond, and Howard Mill Flowage. A total of four loons were sighted--three on Bearce Lake and one on Conic Lake. At least one chick was produced on Bearce Lake.

5. Shorebirds, Gulls, Terns, and Allied Species

A cold, wet spring took its toll on the woodcock population during the nesting and brood rearing period this year. Details on the weather conditions and current woodcock research on the refuge are discussed under D-5, Research and Investigations.

6. Raptors

Common raptors on the Moosehorn include osprey, bald eagles, marsh hawks, broad-winged hawks, kestrels, great horned owls, barred owls, and saw-whet owls.

A great horned owl with a broken wing was taken by refuge personnel to a local veterinarian who amputated the wing. The owl died of internal injuries the following day.

On September 1, three rehabilitated barred owls from the Birdsacre Sanctuary in Ellsworth were released on the refuge. Just prior to this release a fourth barred owl was brought to the refuge with a broken wing. It was taken to the Sanctuary for treatment.



Immature Barred Owl

TAG

8. Game Mammals

The whitetail deer is the most common game species on the refuge and is the only one hunted. Our deer herd is estimated at approximately 285 animals. The 1982-83 winter was mild with little snowfall. Deer were not forced into winter yards and ranged freely all winter with an ample food supply of young hardwood growth available. The mild winter fortunately resulted in very few dog/deer problems.

Black bear are a common sight on the refuge. Several sows with cubs were sighted using the new clearcuts and blueberry fields

Moose are frequent visitors during the summer months although infrequently seen. Only four moose were observed.

9. Marine Mammals

Harbor seals are frequent visitors along the shores of the Edmunds Unit.

10. Other Resident Wildlife

Coyote, otter, mink, fisher, muskrat, beaver, porcupine, snowshoe hare, bobcat, and red fox are all common residents.

The ruffed grouse population continues to be extremely high. Grouse are frequently seen using the headquarters aspen, birch, and apple trees for budding.

11. Fishery Resources

The numerous lakes, streams, and impoundments on Moosehorn have excellent populations of native fish, especially smallmouth bass, chain pickerel, suckers, yellow perch, and brook trout. Eagles and ospreys are frequent feeders on suckers, pickerel, and alewives in the larger impoundments.

This was the third year of operation of the Canadian fishway on the St. Croix River. Thousands of alewives again made it to the Magurrewack marshes and as far upstream as Howard Mill Flowage. With the increased stocking program in the St. Croix, we hope that the fish run will once again include Atlantic salmon.

12. Wildlife Propagation and Stocking

On April 20, 400 brook trout (6-8") were stocked in Clark Brook by the Maine Department of Inland Fisheries and Wildlife.

14. Scientific Collections

Nancy Phelps, a student from Suffolk University in Boston collected snapping turtles from several refuge impoundments to determine the refuge population density as part of her internship requirements. Turtles were trapped, marked by notching scutes, and released.

15. Animal Control

Only three nuisance beaver were live-trapped this year--one each from Bearce, Daly, and Eaton Heath flowages. All were taken to locations out of the refuge's watershed and released. A shortage of vehicles prevented refuge personnel from putting as much effort as was needed into this program.

16. Marking and Banding

Jerry Longcore of the Maine Field Station, PWRC, captured and banded geese and ducks on the Baring Unit using bait traps and cannon nets (see also section D-5). A total of 190 black ducks, 6 ring-necked ducks, 24 wood ducks, 11 blue-winged teal, and 9 Canada geese were banded.

Our woodcock banding program is discussed under section D-5, Research and Investigation.

H. PUBLIC USE

1. General

Visits to the refuge totaled 12,790--down 19% from last year.

Local residents and many from St. Stephen, N.B., as well as several groups of tourists gathered wild blueberries on the refuge again this year. Visits were estimated at 960 compared with 1,400 last year. Although berries were plentiful, they were somewhat smaller in size because of the dry summer weather and therefore harder to pick, which probably discouraged many people. There were plenty left on the plants for wild animals and birds who also enjoy eating Maine blueberries.

Approximately 400 local residents cut their family Christmas trees on the refuge. This number is down from 600 last year because good trees are becoming more and more difficult to find, due to spruce budworm damage.

2. Outdoor Classrooms - Students

Instructors at Washington County Vocational Technical Institute use the refuge as an outdoor classroom. Students spent 9,096 hours on map and compass reading exercises as well as wood harvesting techniques as part of their school curriculum.

Students from Unity College, Pennsylvania State University, and Suffolk University worked on their internships during the summer. Projects included, population estimates of snapping turtles on selected flowages; wildlife use of flowages before and after a drawdown; and the design and setup of a visitor contact station.

4. Interpretive Foot Trails

Two short trails, the Woodcock Interpretive Trail and the Bird Walk, are located in the vicinity of refuge headquarters. Leaflets describing each numbered stop along these trails are provided. About 1,500 visitors walked these trails--up from 800 last year.

6. Interpretive Exhibitions/Demonstrations

The Visitor Center has been closed to the public since 1980. This year's use was for refuge programs only--no civic groups held meetings there as in the past. Two meetings were set up for Youth Conservation Corps applicants and their parents. The YCC Program was explained and 20 enrollees were selected by drawing. A total of 75 attended these meetings.

A forest management workshop was held at the Visitor Center in September which attracted more than 50 small landowners. A tour of our wildlife management areas was included in the workshop.

Refuge Biologist Sepik and his banding crews conducted several demonstrations of woodcock banding, censusing, radio telemetry, and habitat

management for interested parties upon request. Also included was a group of University of Maine at Orono summer camp students who spent a day touring the refuge with the woodcock crews; students from the University of New Brunswick wildlife management program; and a student group from the University of Maine at Machias.

A tour of the refuge was given to 13 members of the Washington County Resources Conservation and Development Committee on July 28.

Assistant Refuge Manager Annette Macek gave two slide presentations on refuge operations and showed a film about eagles at the Washington County Fair.

Refuge Manager Mullen presented a program on forest management to 35 Katahdin High School students in Sherman Station on February 10.

Assistant Refuge Manager Goettel, Refuge Manager Mullen, and Biologist Sepik gave a total of 20 film and slide programs to local schools in connection with National Wildlife Week. A total of about 1,400 students attended. These programs stressed bald eagle preservation and refuge operations.

Biologist Sepik presented a program entitled, "Where Has all the Wildlife Gone?" to the local Ruffed Grouse Society chapter.

Biologist Sepik gave a slide presentation about woodcock management techniques to a Natural Resources Manager's Workshop in Syracuse, New York. Sepik also gave a progress report on the woodcock telemetry study to the Technical Session of the annual meeting of the Ruffed Grouse Society, also in Syracuse.

Assistant Refuge Manager Macek attended Career Day at the Calais Elementary School. She gave two presentations to a total of about 60 students in grades 1, 2, and 3.

Biologist Sepik presented a program on wildlife management to members of the Maine Trappers Association at Woodland on December 15.

Assistant Refuge Manager Goettel presented film programs about the bald eagle at eight schools outside the immediate area. This was in conjunction with an eagle awareness program being conducted by the refuge, the Schoodic Chapter of the Maine Audubon Society, and the University of Maine.

Approximately 12 groups used the refuge for self-guided interpretive activities, including school groups from both sides of the border, Girl Scouts, Boy Scouts, Brownies, and pre-school children.

8. Hunting

This was the second year of our new deer hunting permit system. We returned to the permit system in 1982 after a 17 year absence in order to get more accurate information on how many deer were being taken on the refuge. By re-establishing the permit system we are also able to

determine hunting pressure and are able to gather specific information on each deer taken (age, sex, weight, and antler beam diameter).

The refuge was open to deer hunting this year under a new "bucks only" law for southeastern Maine passed by the state legislature. The number of permits issued dropped from 859 in 1982 to 466 this year. The number of hunters using the refuge this year was 393 compared to 721 in 1982. Many hunters abandoned the refuge to hunt in the "either sex" zone, located only a few miles to the north. Only four bucks were taken--two at the Baring Unit and two at the Edmunds Unit.

We believe that habitat improvement is the only way to increase the deer herd. Refuge timber cutting practices should produce a better herd within the next ten years.

9. Fishing

Fishing for smallmouth bass, brook trout, and chain pickerel is excellent on the refuge. Pressure for all but brook trout is low, though. Approximately 1,340 persons fished the refuge this year, compared with 1,900 last year.

Local residents use the Edmunds Unit to dig clams. This activity is regulated by the state laws.

10. Trapping

Trapping of nuisance beaver and muskrat is permitted at Moosehorn. Trappers are annually selected by lottery.

Nine trappers took a total of 63 beaver from the refuge this year. Trapping conditions were excellent with the harvest up significantly over last year's total of 19. We are hoping the increased take will give us a breather from the almost constant cleaning of water control structures necessary with a high population.

11. Wildlife Observation

The local chapter of the Maine Audubon Society held a spring warbler walk on the refuge in May, conducted by Refuge Manager Mullen.

The Audubon Society conducted their Christmas Bird Count on December 31. A group of seven observers met at refuge headquarters and traveled 190 miles by car and four miles on foot. Refuge Manager Mullen acted as compiler and reported that 34 species and 1,748 individual birds were sighted.

Approximately 5,660 people visited the refuge to observe wildlife and the refuge environment. Birdwatchers come from near and far to view the many species found at Moosehorn. Bald eagles and osprey can be seen on the Magurrewcock Marshes almost any day that the water is open.

Canada geese graze in the fields along the Charlotte Road, sometimes by the hundreds; these attract many visitors each year.

12. Other Wildlife Oriented Recreation

The Maine Birddog Club held their annual Field Trial on Moosehorn for two days in September. Approximately 60 people attended each day.

All refuge roads and trails are open to cross-country skiing. This sport is becoming more and more popular each year. Although snow cover was scarce throughout most of the winter months, it is estimated that about 500 visits were made by skiers.

15. Off-Road Vehicling

The snowmobiling craze in this area seems to have leveled off. This year we recorded less than 500 visits in this category, compared to 2,000 in 1978. The number of ATV's or "3-wheelers" seems to be increasing steadily in the area; however, their use on the refuge is not allowed.

16. Other Non-Wildlife Oriented Recreation

The Calais Company of the Maine National Guard used Young's gravel pit for small arms practice once during the year.

In January, personnel from the Maine National Guard were granted permission to hold a "Cold Weather Training" session during a weekend. The intent of this training is to familiarize members with the unique requirements associated with living in a cold weather environment with the military equipment and clothing provided.

17. Law Enforcement

Regular law enforcement patrols are performed only in the fall to apprehend nightlighters. Nightlighting for deer was down this year on the refuge, but seemed to increase in nearby areas. No nightlighting cases were made this year.

Only one case of any kind was made in 1983--fishing in a closed area (\$50.00)--made by Assistant Manager Goettel. Two warnings were issued to juveniles for operating motorbikes on the refuge.

No cases were taken to State Court this year.

Assistant Manager Goettel attended the Law Enforcement Refresher Course at Montezuma Refuge during the week of July 25.

During the week of August 22 Refuge Manager Mullen and Biological Technician McConvey attended the Law Enforcement Refresher Course in Richmond, Virginia.

18. Cooperating Associations

The former Edmunds Unit campground, built in the early 1960's, has been managed since 1965 as Cobscook Bay State Park by the State Department of Parks and Recreation. Day use was 12,261, camping was 22,083, and total income was \$26,813.51. Total use was up 5% over 1982.

I. EQUIPMENT AND FACILITIES

2. Rehabilitation

The headquarters office building was expanded to provide additional office and storage space. This was accomplished by closing in the two



During

DMM

remaining garage stalls with an additional front wall. The interior was paneled in birch and carpeted. Eight-inch pine siding was added to the exterior with a new concrete walkway in front of the new entranceway.



After

DMM

The Green Mountain Adirondack shelter was moved from the YCC area to the headquarters area and re-stained. A concrete base and walkway to the shelter was poured. The facility will be used as a visitor contact station.



Adirondack Shelter Relocation

DMM

Eight inches of gravel was placed on 8.5 miles of refuge roads by local contractor, Thomas D. DiCenzo Company. Roads graveled were Snare Meadow, Moosehorn Ridge, Howard Mill, Goodall Heath, and McConvey Highway.

Approximately two miles of road right-of-way was cut and bulldozed on the South Ridge Road. This road was cleared of trees and rough-dozed in 1964, under the Accelerated Public Works program, but was never finished. It will be graveled next spring.

Contractor Phil Stanhope of Robbinston, Maine, hauled 860 cubic yards of clay topsoil for rehabilitation of the Bearce Flowage dike and water control structure. This topsoil will be spread and seeded next spring.

Work began on remodeling of the headquarters residence kitchen (Quarters No. 20). New windows, cabinets, countertop, ceiling, and linoleum were installed. The stairs and dining room have been relocated. Work is expected to be finished in January 1984.

3. Major Maintenance

Three bays of the refuge shop were repainted by CETA employees.

The large informational sign adjacent to Barn Meadow was repaired. All informational signs on both Units were stained and relettered.

The decking on Howard Mill Stream bridge was repaired. A new top will be installed later.

Even with the heavy rains this spring, most of the refuge roads handled the run-off exceedingly well. Approximately 100 cubic yards of gravel was used to repair four small washouts on Magurrewock and Higgins Roads. Also, the Higgins Road was ditched with the refuge grader. Forty cubic yards of gravel was placed in the emergency overflow in Lower Magurrewock cross dike.

Two water control structures were cleaned of beaver debris with the refuge backhoe.

All refuge roads and dikes were mowed. One hundred and twenty-five bags of 10-10-10 fertilizer were spread on several refuge dikes.



Spreading Fertilizer with new Spreader

DMM

A beaver control pipe was installed in the Alder Brook dike on the Edmunds Unit.

Refuge roadside boundaries were maintained. New posts and signs were installed where necessary.

Approximately four miles of refuge roadsides were brushed.

4. Equipment Utilization and Replacement

A new fertilizer spreader was purchased and installed on the rear of our International tractor.

On May 4 Assistant Refuge Manager Goettel journeyed to Blackwater National Wildlife Refuge to pick up a Chrysler boat and trailer for use with work on the Maine Coastal Islands.

6. Energy Conservation

Insulation was installed in the walls and ceiling of the new office and storage room during the headquarters office expansion.

J. OTHER ITEMS1: Cooperative Programs

The refuge measures winter snow depths weekly and sends them to the State Department of Inland Fisheries and Wildlife for use in calculating the winter severity index for deer. Daily temperature monitoring is also part of this study.

Three off-refuge woodcock census routes were run again this year in addition to the ones on the refuge. Two were south of Houlton and the other south of Milbridge.

2. Items of Interest

Pat Martin, New England representative of the Ruffed Grouse Society visited the refuge in March.

Noel Groves, senior writer for National Geographic, visited the refuge in June to obtain information for an upcoming book on National Wildlife Refuges.

In July Lloyd Swift, Director of the Wildlife Division of the U.S. Forest Service, retired, visited the refuge.

David Cupp, photographer for the National Geographic Magazine visited the refuge the week of July 10.

Dennis Aufiereau from the Philadelphia zoo visited the refuge during the week of August 15 to work on a mural for the zoo entitled "A Maine Bog".

3. Credits

Mullen: E-5; K; Editing.

Goettel: H-17.

Macek: A; B; D-2; E-1, 6, 8; F-1, 2, 6, 10, 12; G-1-6, 8-12, 14-16; H-8-10, 17, 18; I-2, 4, 6; J-1-3.

Sepik: D-5; E-4; 7; F-3, 9.

Forsyth: H-1, 2, 4, 6, 11, 12, 15, 16; Typing.

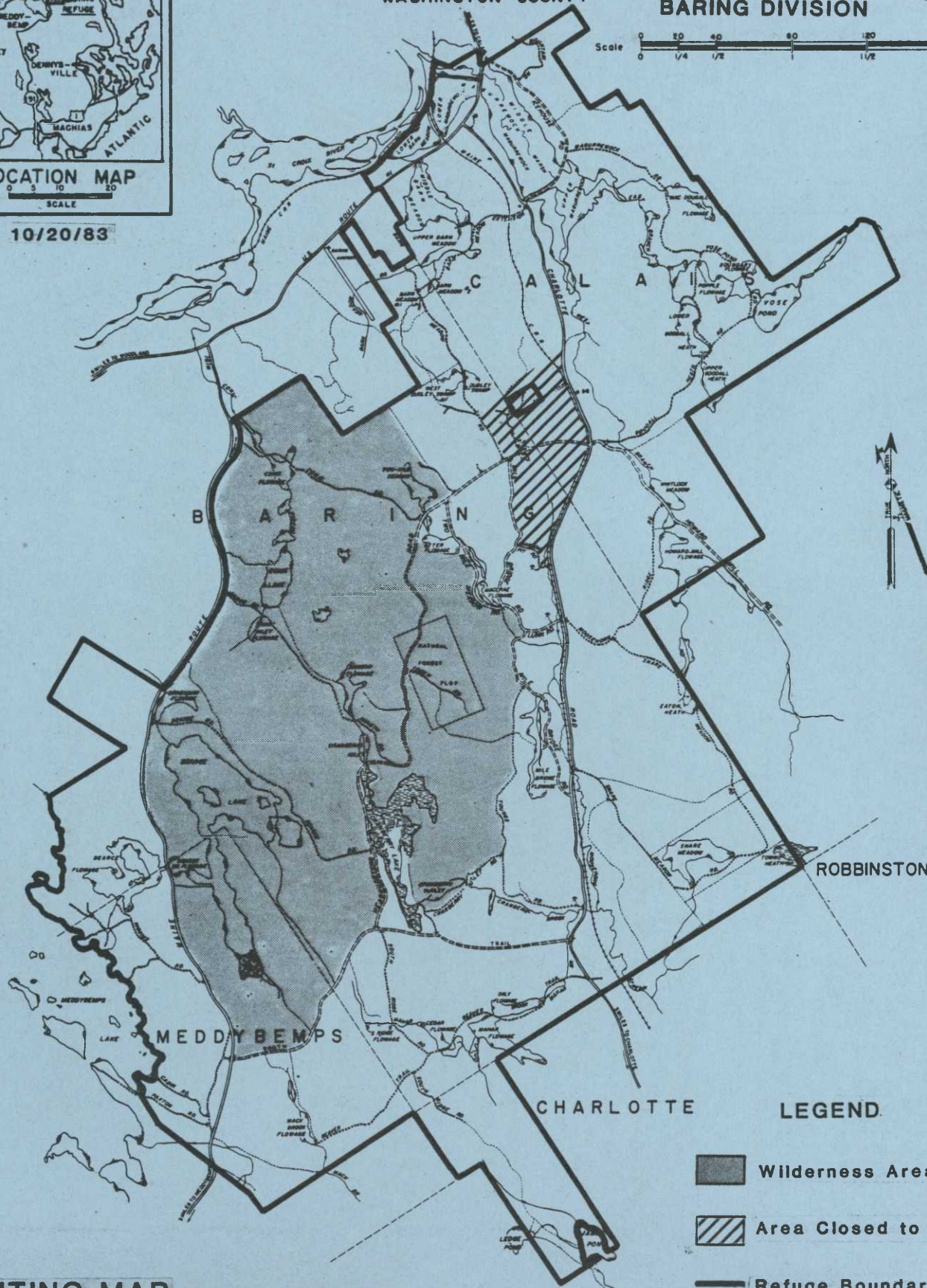
McConvey: E-2-5; F-7, 8; I-2-4.

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
MOOSEHORN NATIONAL WILDLIFE REFUGE
WASHINGTON COUNTY BARING DIVISION MAINE

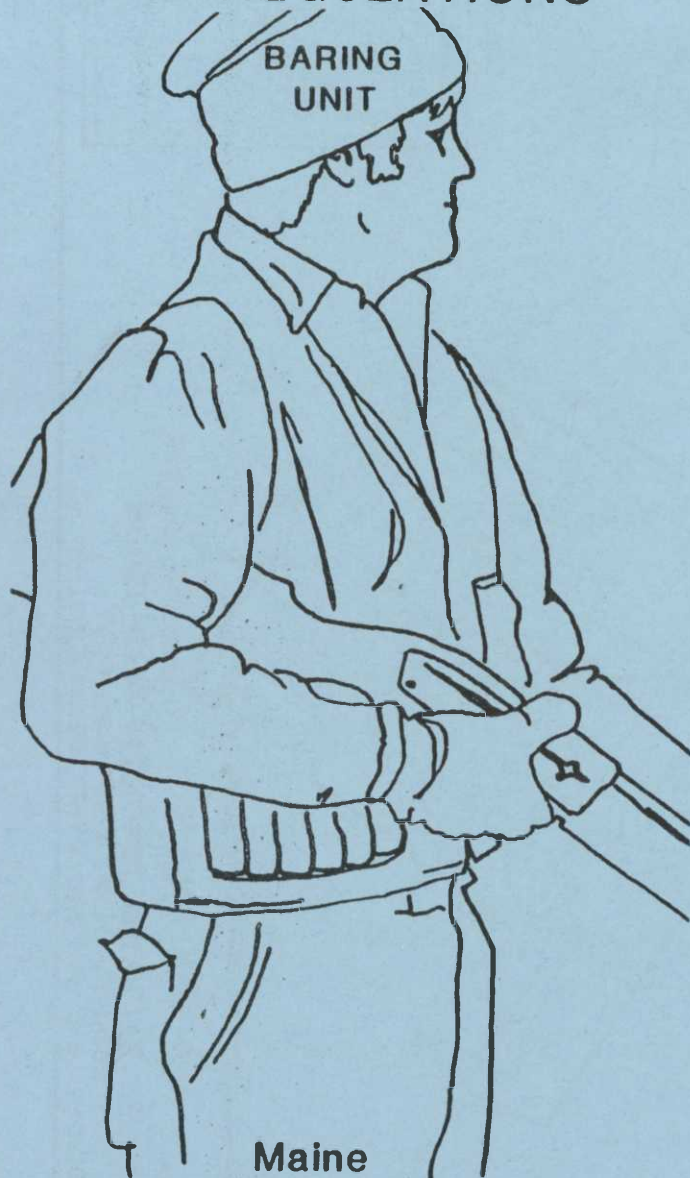
Scale 0 20 40 60 80 100 MICHIGANS
0 1/4 1/2 1 1 1/2 2 MILES



10/20/83



MOOSEHORN
National Wildlife Refuge
HUNTING MAP
AND REGULATIONS



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

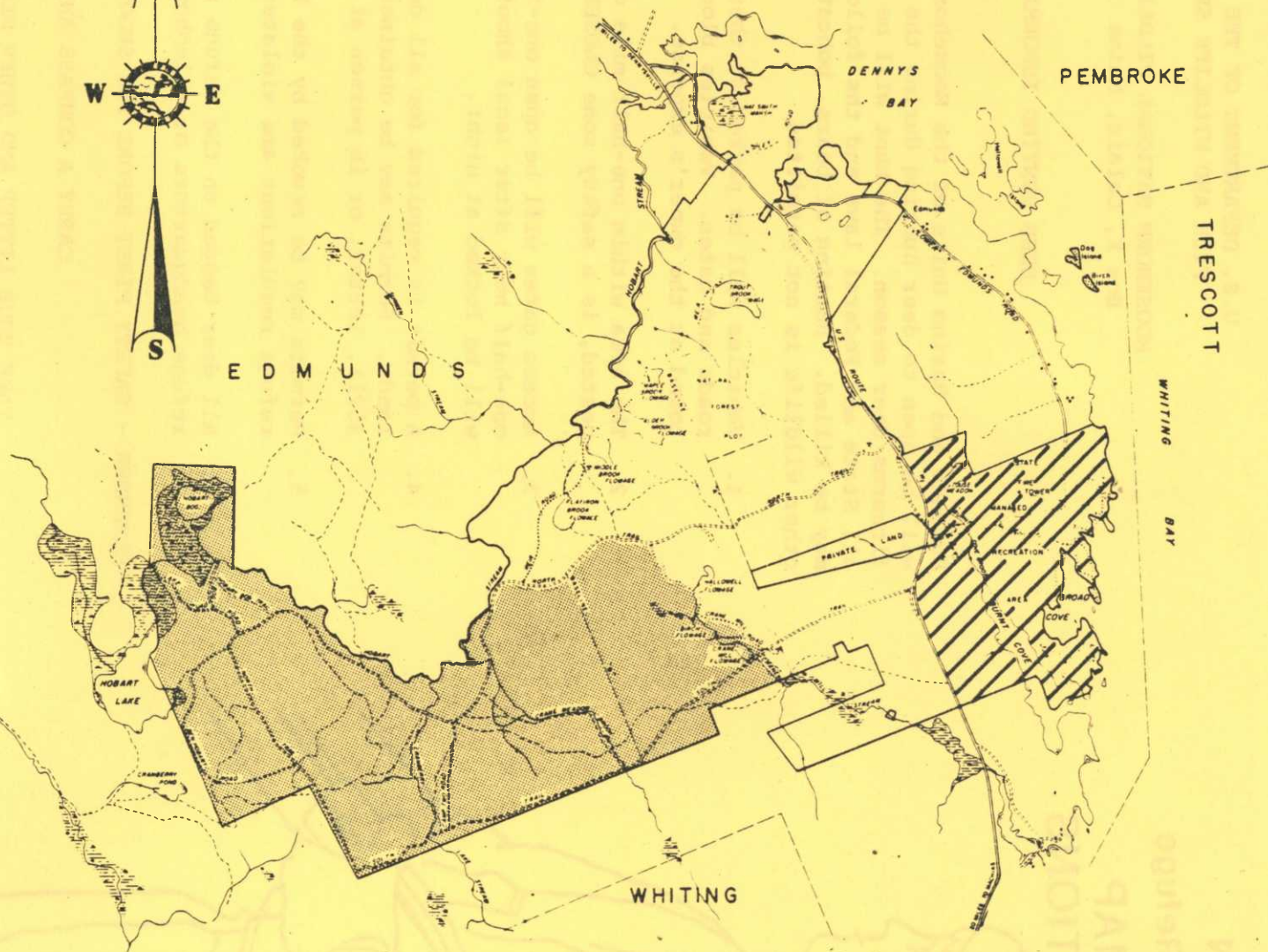
MOOSEHORN NATIONAL WILDLIFE REFUGE

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



JR 680201

MOOSEHORN
National Wildlife Refuge
HUNTING MAP
AND REGULATIONS

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

MOOSEHORN NATIONAL WILDLIFE REFUGE
Box X, Calais, Maine 04619

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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



Maine

DEPARTMENT OF THE INTERIOR

CARLTON POND WATERFOWL PRODUCTION AREA

Troy, Maine

ANNUAL NARRATIVE REPORT

Calendar Year 1983

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

A. HIGHLIGHTS

A revenue sharing check in the amount of \$801.00 was presented to the town of Troy tax collector by Assistant Manager Goettel.

E. ADMINISTRATION

1. Personnel

Carlton Pond Waterfowl Production Area is administered and staffed by Moosehorn National Wildlife Refuge and is only visited two or three times each year.

5. Funding

There is no separate funding for Carlton Pond. All funds come out of the Moosehorn budget. No management can take place at our present level of funding.

F. HABITAT MANAGEMENT

1. General

Carlton Pond is located 140 miles from Moosehorn in the town of Troy, Maine. No active management, beyond stabilizing water levels, is done by refuge personnel.

This 1,068 acre area consists of Carlton Pond, plus some small parcels of adjacent upland. One water control structure, on the site of an old spool mill, controls the water levels. Water levels remained relatively constant throughout the year.

The area is approximately 38 percent open water, 14 percent shallow freshwater marsh, 33 percent deep freshwater marsh, and 15 percent upland.

G. WILDLIFE

1. Wildlife Diversity

Species common on the area include black, ring-necked, and wood ducks; hooded mergansers; blue and green-winged teal; whitetail deer; muskrat; beaver; and osprey.

3. Waterfowl

The Maine Department of Inland Fisheries and Wildlife maintains 25 wood duck boxes on the area. Utilization is close to 100 percent annually.

8. Game Mammals

A cow moose was spotted daily during the first two weeks of September feeding in the shallow marsh areas of the pond. Moose are not common visitors to the area.

H. PUBLIC USE1. General

Public use on Carlton Pond consists mostly of waterfowl hunters, deer hunters, muskrat and beaver trappers, and fishermen. Recreational boating is not popular because of the marshy conditions. None of the activities are closely monitored due to the distance from Moosehorn.

17. Law Enforcement

Nearly all of the law enforcement on the area is done by the local game warden. Assistant Manager Goettel visited the area twice during the waterfowl hunting season. On opening day, 31 hunters were checked; no violations were found. On the following visit, only 10 hunters were checked, and no violations were found. No late shooting or black duck overbagging were found.

I. EQUIPMENT AND FACILITIES2. Rehabilitation

Assistant Manager Goettel visited the area in August for a boundary inspection and to contact refuge neighbors. His visit was followed up in September by Assistant Manager Macek who wrote the boundary inspection report. The entire area must be re-surveyed and posted.

J. OTHER ITEMS3. Credits

Goettel: A; H-17; I-2

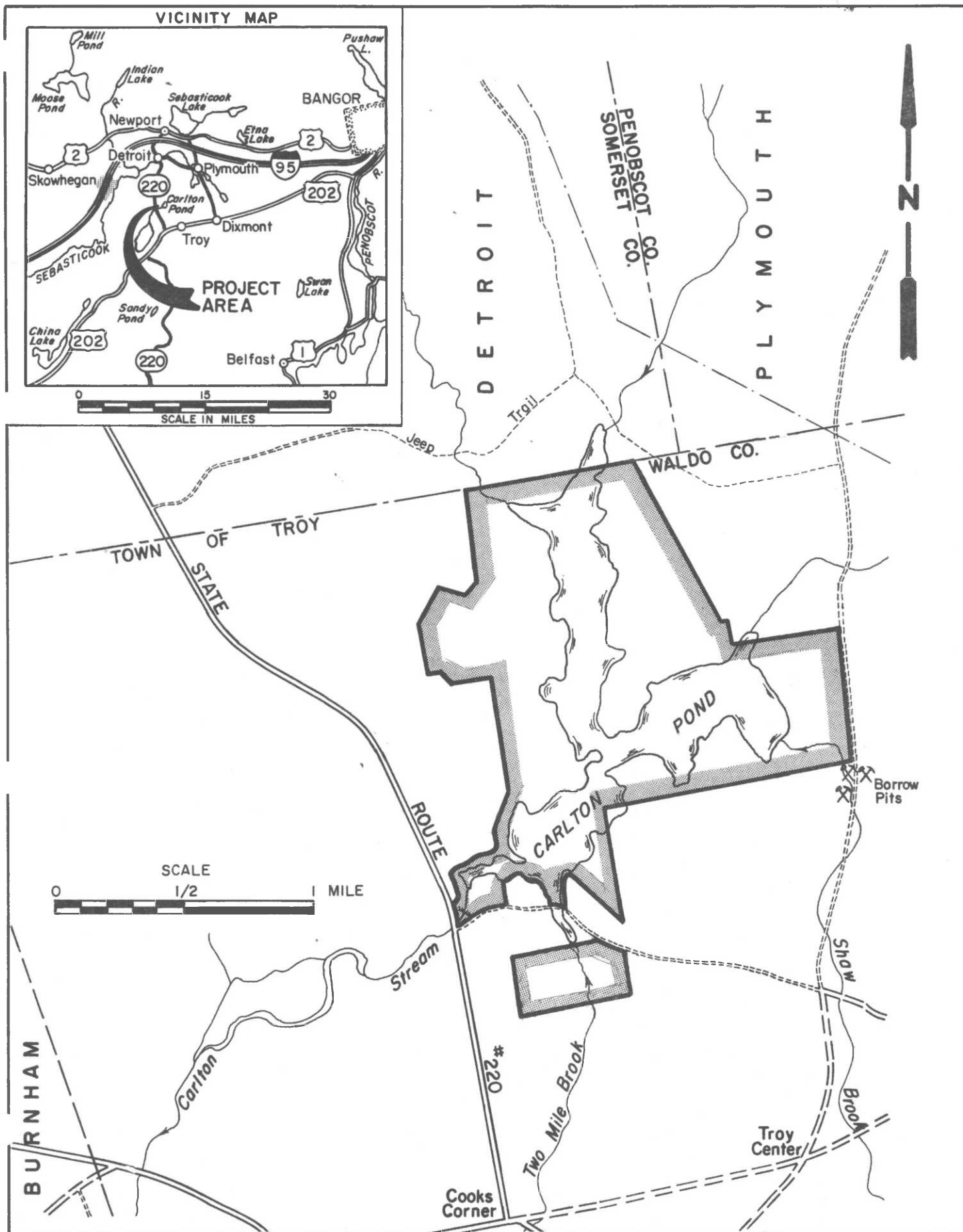
Macek: All other sections

Mullen: Editing

Forsyth: Typing

CARLTON POND WATERFOWL PRODUCTION AREA

WALDO COUNTY, MAINE



PETIT MANAN NATIONAL WILDLIFE REFUGE

Milbridge, Maine

ANNUAL NARRATIVE REPORT

Calendar Year 1983

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

A. HIGHLIGHTS

Tom McAndrews, Curt Laffin, and Ralph Andrews of the Regional Office and John Peterson of Wildlife Assistance in Augusta visited the refuge in October to discuss future management plans.



GFS

Revenue Sharing checks in the amounts of \$3,303 (Milbridge), \$5,484 (Steuben), and \$35 (Addison) were delivered by Assistant Refuge Manager Goettel in March.

B. CLIMATIC CONDITIONS

The climate of Petit Manan is oceanic, subject to frequent fog and storms, with about 45 inches of precipitation annually. In general, the temperatures are tempered by the surrounding ocean and are 10-20°F cooler in summer and 10°F warmer in winter than the mainland.

E. ADMINISTRATION

Petit Manan is administered and staffed by Moosehorn National Wildlife Refuge. In March, Assistant Manager Goettel was directed to work full time on the Maine Islands Refuges, out of Moosehorn office.

F. HABITAT MANAGEMENT

1. General

Petit Manan National Wildlife Refuge is a 3,135 acre refuge complex south of Milbridge, Maine. It is composed of 1,991 acres on Petit Manan Peninsula, 1,130 acres on Bois Bubert Island, 9 acres on Petit Manan Island, and 5 acres on Nash Island.

Petit Manan Peninsula is one of the few remaining peninsulas in Maine that is still largely in its natural state. Only 300 acres on the peninsula are in private ownership, 175 acres of which are under a conservation easement to the refuge.



Petit Manan Point

TAG

Habitat Management in the future will be mowing and burning to maintain habitat diversity for the shorebirds, woodcock, deer, bear, and other edge species. There are no plans for habitat management on the island units at present.

2. Wetlands

Both the peninsula and Bois Bubert Island contain important fresh and saltwater marshes that are noted as staging areas for black ducks. The peninsula also is noted for its raised heath peatlands, seldom found outside of coastal Washington County.

3. Forests

The Petit Manan peninsula and Bois Bubert forests are composed largely of red spruce and balsam fir with scattered stands of jack pine, larch, gray and yellow birch, mountain ash, and alders.

5. Grasslands

The old sheep pastures on the peninsula are slowly growing into alders. We will be mowing and burning them in the future to maintain habitat diversity.

6. Other Habitats

The old blueberry barrens on the peninsula are important to migrating shorebirds and songbirds, and will be maintained by burning.

Petit Manan and Nash Islands are small treeless islands vegetated by low grasses and forbes. They are especially noted for their populations of the rare plants Iris hookerie (beachhead iris), Mertensia maritima (seal lungwort), and Sedum rosea (roseroot stonecrop).

7. Grazing

Only half of Nash Island, acquired in 1983, is refuge; the other half is privately owned by a local sheep farmer. The sheep have always been given the run of the island, although we have not yet determined if this is beneficial or detrimental to refuge objectives.



Nash Island

TAG

G. WILDLIFE

2. Endangered/Threatened Species

Osprey and bald eagles are common on the refuge throughout the year. There are at least two osprey nests on the refuge.

3. Waterfowl

Black ducks, green-winged teal, and wood ducks are common nesters on the refuge. Common eiders nest only on Nash and Petit Manan Islands. Sea ducks (eider, white-winged scoter, and oldsquaw), plus goldeneye and buffleheads are also common offshore. Bois Bubert and the peninsula are important black duck staging areas. Petit Manan Island is one of the most important eider molting areas in Maine; a September census by the state counted 10-12,000 individuals.

4. Marsh and Water Birds

The great blue heron and bittern are common summer residents.

5. Shorebirds, Gulls, Terns, and Allied Species

The peninsula is noted for its shorebird migrations, particularly whimbrels, woodcock, plovers, ruddy turnstones, and sandpipers.

Nash Island has a small common and arctic tern colony of approximately 50 pairs. Approximately 50 pairs of herring and great black-backed gulls nest on the private portion of the island, but as yet do not compete for nesting space with the terns. The sheep grazing on the island do not appear to bother the terns or the gulls.



Arctic Tern

BLG

Petit Manan Island once had the largest tern colony in Maine with 700 pairs of common terns, 700 pairs of arctic terns, and 20 pairs of roseate terns. Competition by the herring and great black-backed gulls finally broke up the tern colony in 1980. As tern populations in Maine have declined 60 percent in the last decade, restoration and active protection of this former colony will be given top priority.

Black guillemots also nest on Nash and Petit Manan Islands.

8. Game Mammals

Whitetail deer, black bear, and coyotes are all common on the peninsula. A lone bull moose wandered around the peninsula during the summer months. A larger bull moose was found drowned off Petit Manan Island in September, tangled in lobster gear. Was he really attracted to the foghorn as the oldtimers claim?

9. Marine Mammals

Harbor seals can be seen year round loafing on the refuge's many ledges and rocks.

10. Other Resident Wildlife

Ruffed grouse, raccoon, muskrat, beaver, and snowshoe hare are all common.

11. Fishery Resources

The waters off Petit Manan support an important herring fishery, which is essential to the success of the local tern colonies. Clams and mussels are harvested on the refuge.

H. PUBLIC USE

1. General

Public use is not encouraged because of the fragile character of the ecosystems. However, a small parking lot, bulletin board, and a short trail to the shore have been built for visitor information and safety.

The refuge is popular with hikers, birdwatchers, and cross country skiers. Hunting, trapping, and camping are not allowed. Fishing is permitted.

Les Line of the National Audubon Society visited Petit Manan Refuge to lead a small photography class.

The Nash and Petit Manan Island Units are closed to all public use during the colonial seabird nesting season, from April 1 to July 31.

17. Law Enforcement

Law enforcement patrols were increased this year. Most were done with the local Marine Warden. No refuge violations were found; all cases made were also state violations (littering, MBTA, etc.), and were therefore prosecuted in state court by the state officer.

Deer poaching is, has been, and probably always will be a major problem on the refuge. Lack of staff visibility and lack of posting make enforcement very difficult, but we are beginning to make some progress as the local residents realize our increased emphasis on the island refuges. However, until someone is stationed nearby, law enforcement will only be partially effective.

On October 8 the Warden Service staked out Petit Manan Island for black duck overbagging, but no violations were found.

I. Equipment and Facilities

3. Major Maintenance

Nearly all of the interior boundaries were posted this year. Refuge staff was assisted by the Student Conservation Association volunteers, and by Moosehorn's YCC crew. Posting ledge outcroppings and boulder beaches is still a slow job, though!

A 20-foot Aquasport with a 140 Inboard/outboard was transferred from Chincoteague National Wildlife Refuge. Over \$2,000 was spent in repairs to the engine and outdrive, but lack of a good trailer prevented it from being used. A spare boat, 20-foot Chrysler Aqua-Vee with 115 outboard was transferred from LE (Cambridge, MD). This unit is still not operable.

Both boats are minimal for Maine waters and restrict the field season greatly. Hopefully, a larger boat will be acquired in the near future.

I. OTHER ITEMS

2. Items of Interest

A woodcock census route was run May 4 by Assistant Manager Goettel.

3. Credits

Goettel: All sections

Mullen: Editing

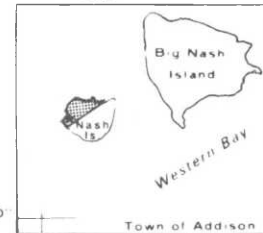
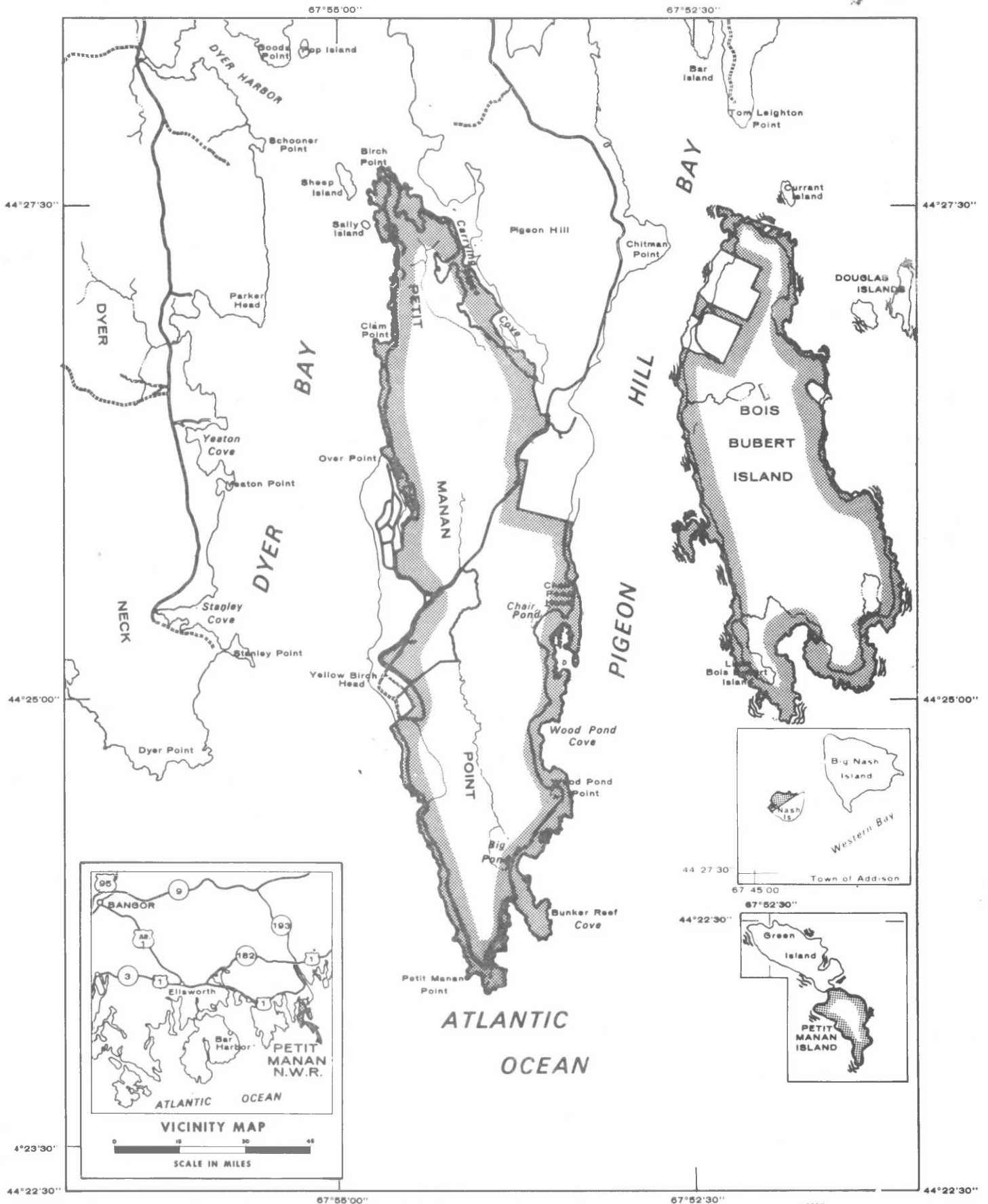
Forsyth: Typing

PETIT MANAN NATIONAL WILDLIFE REFUGE

UNITED STATES
DEPARTMENT OF THE INTERIOR

WASHINGTON COUNTY, MAINE

UNITED STATES
FISH AND WILDLIFE SERVICE



COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY G.S.

SCALE 0 2000 4000 6000 8000 FEET
1 5 0 1 KILOMETER

19½°
True North
Magnetic N.

MEAN
DECLINATION
1948

BOSTON, MASSACHUSETTS JULY 1974

SEAL ISLAND NATIONAL WILDLIFE REFUGE

Matinicus Isle, Maine

ANNUAL NARRATIVE REPORT

Calendar Year 1983

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

A. HIGHLIGHTS

Assistant Refuge Manager Goettel visited the refuge on July 13 with personnel from the Canadian Wildlife Service, the National Audubon Society, and Hurricane Island Outward Bound to investigate future colonial seabird management.

Tom McAndrews and Curt Laffin from the Regional Office visited the refuge with Assistant Manager Goettel on September 11 to discuss colonial seabird management and the ordnance problem. They were accompanied by National Audubon Society personnel, Maine State personnel, and Maine Audubon Society personnel.

On October 18-21 a meeting was held at the Moosehorn headquarters with Tom McAndrews, Curt Laffin, Ralph Andrews (RO) and John Peterson (WA, Augusta) to discuss future management plans on the Maine coastal island refuges.

Revenue sharing checks in the amount of \$588 were presented to the town of Friendship by Assistant Manager Goettel.

B. CLIMATIC CONDITIONS

The climate of Seal Island is oceanic, subject to frequent fog and storms, with about 48 inches of precipitation annually. In general, the temperatures, tempered by the ocean, are 10-20°F cooler in summer and 10°F warmer in winter than the mainland. Snow accumulation is insignificant, although over 50 inches may fall annually.

D. PLANNING

5. Research and Investigations

Seal Island is believed to have been one of the principle puffin and tern nesting islands until market hunting depleted the Maine populations over 100 years ago. Dr. Stephen Kress of the National Audubon Society and Cronell University has worked since 1973 on restoring puffin and tern colony sites in Maine, and would like to expand his management to the refuge.

His work involves clearing the puffin and tern habitat of nesting gulls, transplanting puffin chicks from Newfoundland, and placing decoys and vocalization recordings in nesting habitat. We are now in the process of working out the liability question, as Seal Island is a former Navy bombing range and unexploded rounds are occasionally found.

E. ADMINISTRATION

Seal Island is administered and staffed by Moosehorn. In March, Assistant Manager Goettel was directed to work full time on the island refuges out of the Moosehorn office.

F. HABITAT MANAGEMENT

1. General

This 65 acre outer island refuge is located approximately 25 miles off Rockland, Maine, in Knox County. It is a glaciated granitic outcrop island with a maximum elevation of 70 feet. Dominant species include various grasses, raspberry, wild rose, beach plum, bayberry, nettles, and cow parsnip.



Seal Island

TAG

The island was formerly used as a U.S. Navy bombing target and was acquired by the Fish and Wildlife Service in 1972.

No active habitat management is planned.

G. WILDLIFE

3. Waterfowl

Approximately 200 pairs of common eiders nest annually. Other sea ducks are always present offshore.

5. Shorebirds, Gulls, Terns and Allied Species

The refuge's real value lies in its colonial seabird colonies. It is believed to be one of the largest Leach's storm-petrel colony in Maine, with over 1000 nesting pairs; one of the largest black guillemot nesting islands in Maine, with over 200 pairs; and some of the best puffin and tern habitat on the coast. Unfortunately, as the refuge is only infrequently visited, accurate counts are not available.

9. Marine Mammals

Harbor and gray seals are common on the refuge, as the name implies. They are attracted to the rich fishing grounds offshore.

H. PUBLIC USE1. General

Public use is not allowed on Seal Island because of the unexploded ordnance. As it is over 25 miles offshore and as landing is very hazardous, public use is practically non-existent.

J. OTHER ITEMS3. Credits

Goettel: All sections

Forsyth: Typing

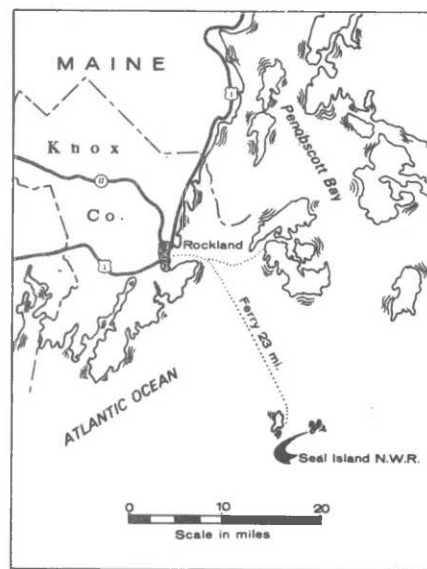
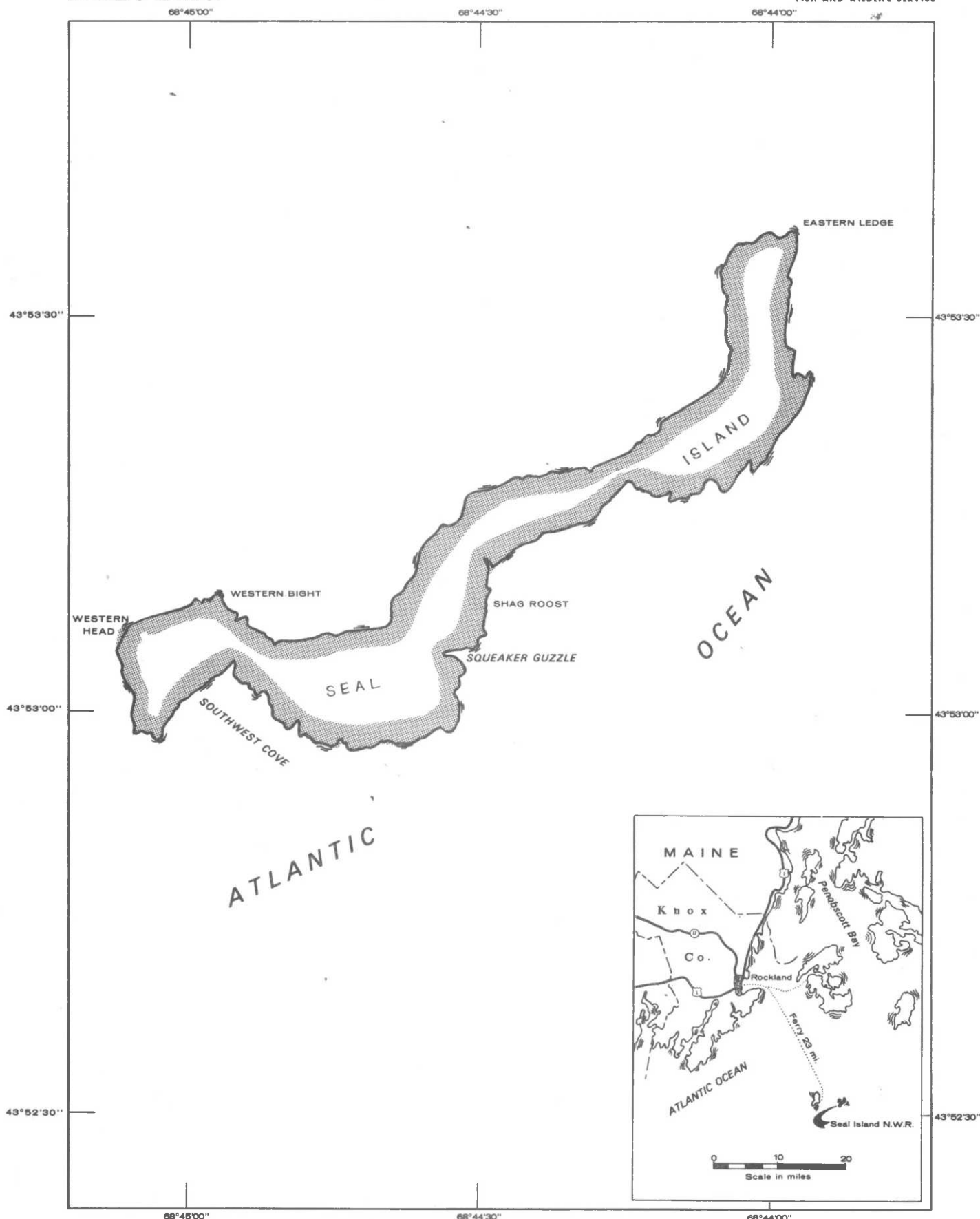
Mullen: Editing

SEAL ISLAND NATIONAL WILDLIFE REFUGE

UNITED STATES
DEPARTMENT OF THE INTERIOR

KNOX COUNTY, MAINE

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.

BOSTON, MASSACHUSETTS

AUGUST 1972

0 250 500 750 1000 FEET



MEAN
DECLINATION
1953

5R MA 848 402

FRANKLIN ISLAND NATIONAL WILDLIFE REFUGE

Friendship, Maine

ANNUAL NARRATIVE REPORT

Calendar Year 1983

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

A. HIGHLIGHTS

Assistant Manager Goettel presented the town of Friendship a check for \$76.00 in Revenue Sharing funds.



Franklin Island

TAG

B. CLIMATIC CONDITIONS

The climate is oceanic, subject to frequent fog and storms, but temperatures are tempered somewhat by the moderating effect of the ocean. Summer temperatures are generally 10-20°F cooler than the mainland while winter temperatures are 10°F warmer. Average annual precipitation is 40 inches. Snow accumulation is insignificant, although total snowfall may be over 100 inches per year.

E. ADMINISTRATION

1. Personnel

The refuge is administered and funded by Moosehorn National Wildlife Refuge. In March Assistant Manager Goettel was directed to work full time on the Maine island refuges out of the Moosehorn office.

F. HABITAT MANAGEMENT

1. General

Franklin Island is located in Muscongus Bay, about 10 miles from Port Clyde, Maine, in Knox County. This 12 acre island is composed mostly of glaciated granite and schists, with a thin acid sandy loam duff layer. Maximum elevation is 35 feet. The island is all upland, vegetated with white spruce, rose, raspberry, elderberry, blueberry, bayberry, and various forbes and grasses.

An automated light on the island is still run by the Coast Guard.

The Two Bush Island Unit of Franklin Island National Wildlife Refuge is located in Penobscot Bay. Two Bush is a small, two-acre island owned by the Coast Guard and leased to the Fish and Wildlife Service.

The only habitat management is being done by Dr. Stephen Kress of the National Audubon Society, who is providing artificial nesting burrows for the Leach's storm-petrel. No other habitat management is planned.

C. WILDLIFE

2. Endangered and/or Threatened Species

One active osprey nest is located on the island. Bald eagles frequent the area during migrations.

3. Waterfowl

Franklin Island has the largest common eider colony in Maine, approximately 1,300 nesting pairs. The eider is the only seaduck nesting in the eastern United States. Maine is the southern limit of the eider's breeding range and is the only one of the lower 48 states which supports a substantial breeding population. Black ducks and Canada geese also nest on the island.

Two Bush has a small colony of 75 pairs of eiders.

5. Shorebirds, Gulls, Terns, and Allied Species

Franklin Island has 20 pairs each of black guillemots, herring and great black-backed gulls, and Leach's storm-petrels. Two Bush Island has approximately 50 pairs of herring gulls, 20 pairs of great black-backed gulls, and 15 pairs of black guillemots.

9. Marine Mammals

Harbor seals frequently use the island for loafing and basking.

H. PUBLIC USE

1. General

Due to the rugged shoreline, few people visit the refuge. Public use is not believed to present any problems to date. An interpretive sign erected by the Coast Guard informs people of the history of the light.

3. Credits

Goettel: All sections

Mullen: Editing

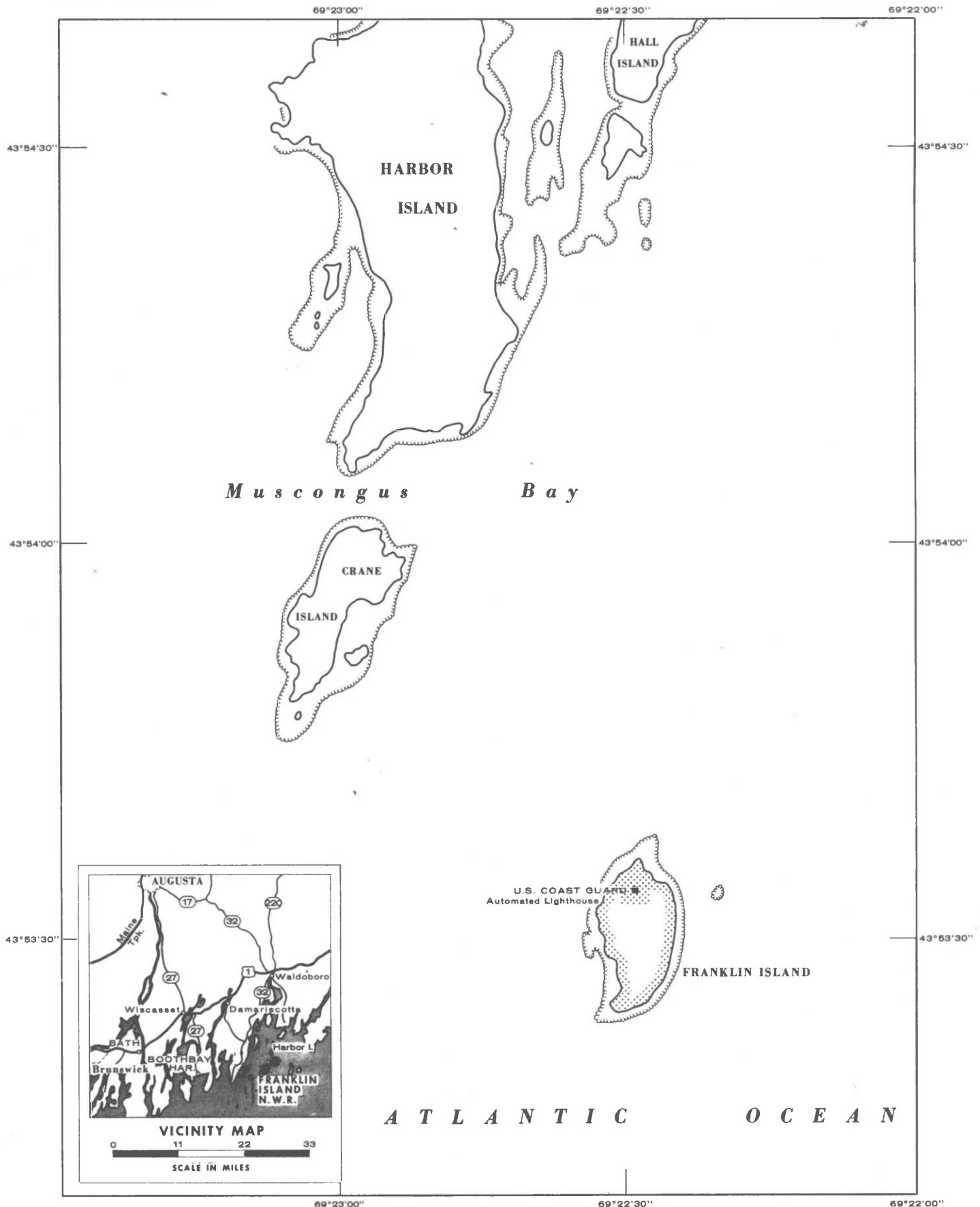
Forsyth: Typing

FRANKLIN ISLAND NATIONAL WILDLIFE REFUGE

UNITED STATES
DEPARTMENT OF THE INTERIOR

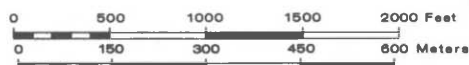
KNOX COUNTY MAINE

UNITED STATES
FISH AND WILDLIFE SERVICE



A T L A N T I C O C E A N

COMPILED IN THE DIVISION OF ENGINEERING
FROM SURVEYS BY G.S. AND B.S.F. & W.



MEAN
DECLINATION
1955

BOSTON, MASSACHUSETTS

JULY 1974

5R ME. 864

CROSS ISLAND NATIONAL WILDLIFE REFUGE

Cutler, Maine

ANNUAL NARRATIVE REPORT

Calendar Year 1983

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

A. HIGHLIGHTS

Hurricane Island Outward Bound announced the creation of the Island Institute to be headquartered at the Cabot Biological Station in the former Coast Guard Station on Cross Island.

Revenue Sharing checks in the amount of \$3,632 were presented to the town of Cutler by Assistant Manager Goettel.

B. CLIMATIC CONDITIONS

The climate is oceanic, subject to frequent fog and storms. Temperatures are tempered somewhat by the moderating effect of the ocean. Summer temperatures are generally 10-20°F cooler than the mainland, while winter temperatures are 10°F warmer. Average annual precipitation is 48 inches.

C. LAND ACQUISITION

The Nature Conservancy launched a major fundraising drive for Maine project called the "Islands of Life" campaign. First priority was Northwest Head, a 130 acre inholding on the refuge. The owner was willing to sell for \$145,000. The Nature Conservancy plans to lease it to the refuge until acquisition funding comes through. The original 1,355 acres of the refuge was donated to the Fish and Wildlife Service through the Nature Conservancy in 1980.

E. ADMINISTRATION

1. Personnel

The refuge is administered and funded by Moosehorn National Wildlife Refuge. In March, Assistant Manager Goettel was directed to work full time on the Maine coastal island refuges out of the Moosehorn office.

F. HABITAT MANAGEMENT

1. General

The Cross Island complex is located in the town of Cutler, Washington County, Maine. The complex is composed of six islands: Cross Island, 1,306 acres; Scotch Island, 10 acres; Inner Double Head Shot Island, 8 acres; Outer Double Head Shot Island, 14 acres; Mink Island, 11 acres; and Old Man Island, 6 acres.

No habitat management is planned for the near future as no additional funding is available.

2. Wetlands

Freshwater wetlands of the complex are limited to mostly alder stands and a few small ericaceous bogs (heaths).

Several tidal marshes, ponds, and mudflats are found on the west and north shores. Approximately three percent of the refuge is wetland.

3. Forests

Approximately 85 percent of the 1,355 acre refuge is red spruce-balsam fir forest. Paper birch and striped maple are also common.

The islands were last commercially logged in 1941. Logging roads can still be seen, especially from the air.



Logging Roads can still be seen.

TAG

5. Grasslands

About one percent of the refuge is grassland, most of which is found on Inner and Outer Double Head Shot Islands.

6. Other Habitats

Rocks and rocky cliffs, some over 100 feet high, comprise eight percent of the refuge, dominate the scenery, and provide excellent habitat for nesting colonial seabirds, especially black guillemots and razorbill auks.

G. WILDLIFE

2. Endangered and/or Threatened Species

Bald eagles frequent the area. One pair nests on Cross Island, although the nest has not been successful for several years.

A ground-nesting pair of osprey nest annually on Inner Double Head Shot. Ten additional pairs nest in the Machias Bay area.

3. Waterfowl

Approximately 200 pairs of common eiders nest on Old Man and Outer Double Head Shot Islands. The marsh east of Northwest Head is an important staging area for black ducks. Seaducks (eiders, white-winged scoters, and oldsquaw), buffleheads, and goldeneye all frequent the surrounding waters.

5. Shorebirds, Gulls, Terns, and Allied Species

One hundred pairs of great black-backed gulls, 700 pairs of herring gulls, and 215 pairs of double-crested cormorants nest on the complex. The gulls appear to be a limiting factor on the nesting success of the alcids on the islands.

The rugged, steep, high (100 feet) cliffs of Cross Island, together with Old Man Island and the Double Head Shots, support approximately 200 pairs of nesting black guillemots.

Forty to 50 razorbill auks, approximately 40 percent of the Maine population, can be found in the Old Man Island vicinity. At least 10 pairs nest there.



Razorbill

Common murres, thick-billed murres, and dovebies all winter in the vicinity.

8. Game Mammals

Cross Island supports a healthy population of whitetail deer and black bear.

9. Marine Mammals

Harbor seals frequent the islands for basking and loafing.

10. Other Resident Wildlife

Raccoon and ruffed grouse are common on the island.

H. PUBLIC USE

1. General

Public use on the islands is very limited due to the distance from the mainland. With the Cabot Biological Station, however, public use probably will increase. Public use is prohibited on the nesting islands from April 1 to July 31. Some illegal hunting does occur and probably will continue until the refuge has personnel stationed closer.

J. OTHER ITEMS

2. Items of Interest

The Island Institute was created to direct and coordinate research projects on the Maine islands to give direction and guidance to owners and managers. Their focus is on management of the 3,000 Maine islands. They are not preservation or acquisition oriented. Their presence on Cross Island is a definite asset as it will increase Fish and Wildlife Service visibility and will be a good source for research projects. We expect the Island Institute to evolve as a highly visible, pro-management force over the years.

On April 8, Assistant Manager Goettel attended a meeting with the Island Institute in Rockland to discuss mutual interests. On September 10 and September 11, Tom McAndrews and Curt Laffin from the Regional Office, and Assistant Manager Goettel attended the first Island Institute Conference on Hurricane Island, off Rockland.

3. Credits

Goettel: All sections

Mullen: Editing

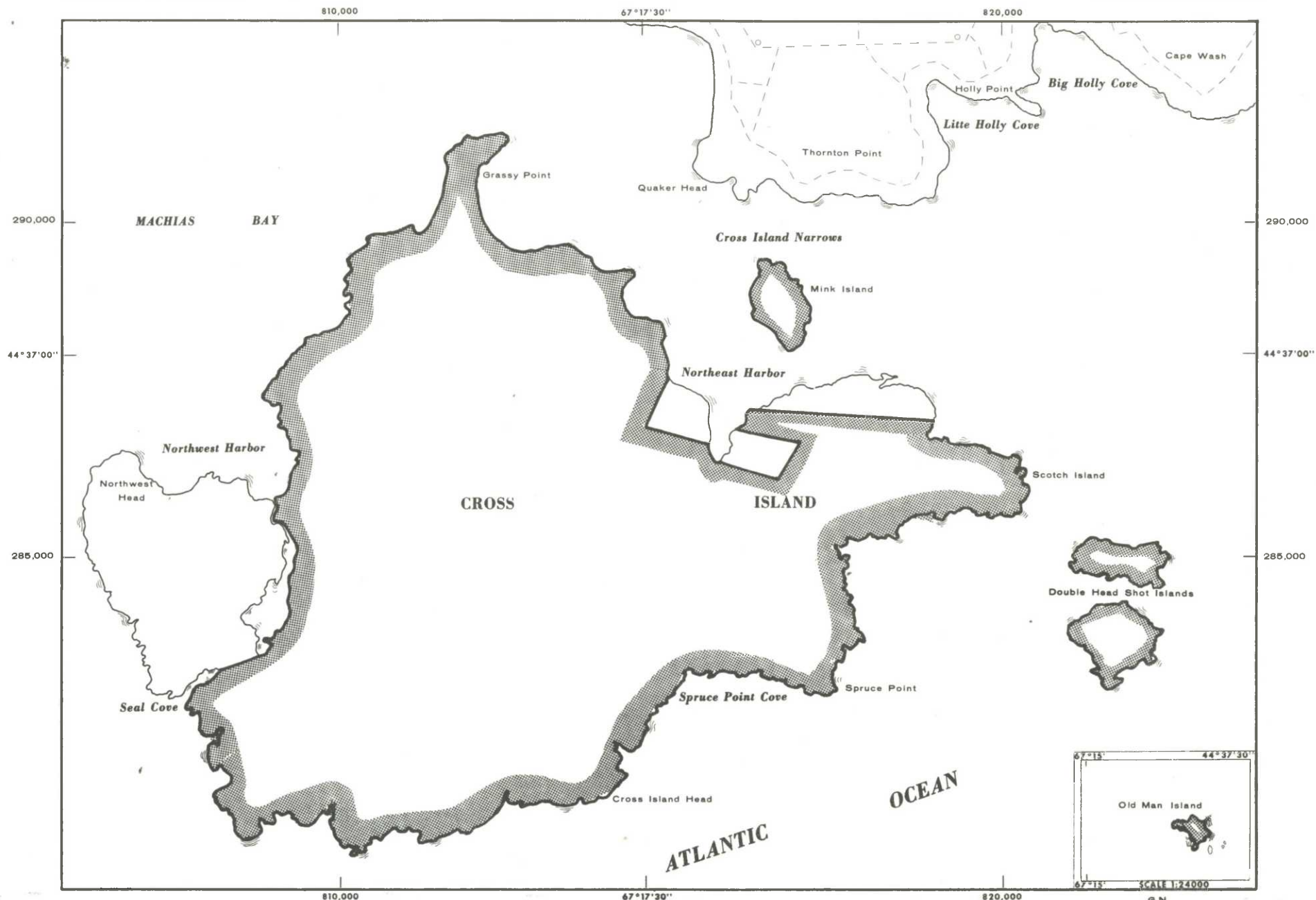
Forsyth: Typing

CROSS ISLAND NATIONAL WILDLIFE REFUGE

UNITED STATES
DEPARTMENT OF THE INTERIOR

WASHINGTON COUNTY, MAINE

UNITED STATES
FISH AND WILDLIFE SERVICE



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

NEWTON, MASS. FEBRUARY 1981
POSTED:

SCALE 0 1000 2000 3000 4000 FEET
0 1/2 1 KILOMETERS

T.N. S. G.N.
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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
— 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
— Wood Duck†	c	c	c
— Green-winged Teal†	c	c	c
— American Black Duck†	a	a	a
— Mallard†.....	u	u	u
— 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
— Barrow's Goldeneye	r	r	o
— Bufflehead.....	a	a	a
— Hooded Merganser†	u	u	u
— Common Merganser†	c	u	c
— Red-breasted Merganser	u	u	c
— Ruddy Duck	o	o	

HAWKS - FALCONS

— Osprey†	c	c	c
— Bald Eagle†	c	c	c
— Northern Harrier.....	c	c	c
— Sharp-shinned Hawk†	u	u	u
— Cooper's Hawk†.....	u	u	u
— Northern Goshawk†	u	u	u
— Red-shouldered Hawk†	o	o	o
— Broad-winged Hawk†	c	c	c

s S F W

— 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

s S F W

— 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

— Eastern Bluebird†	r	r	r
— Veery†	c	c	c
— Gray-cheeked Thrush	u	r	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

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





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.

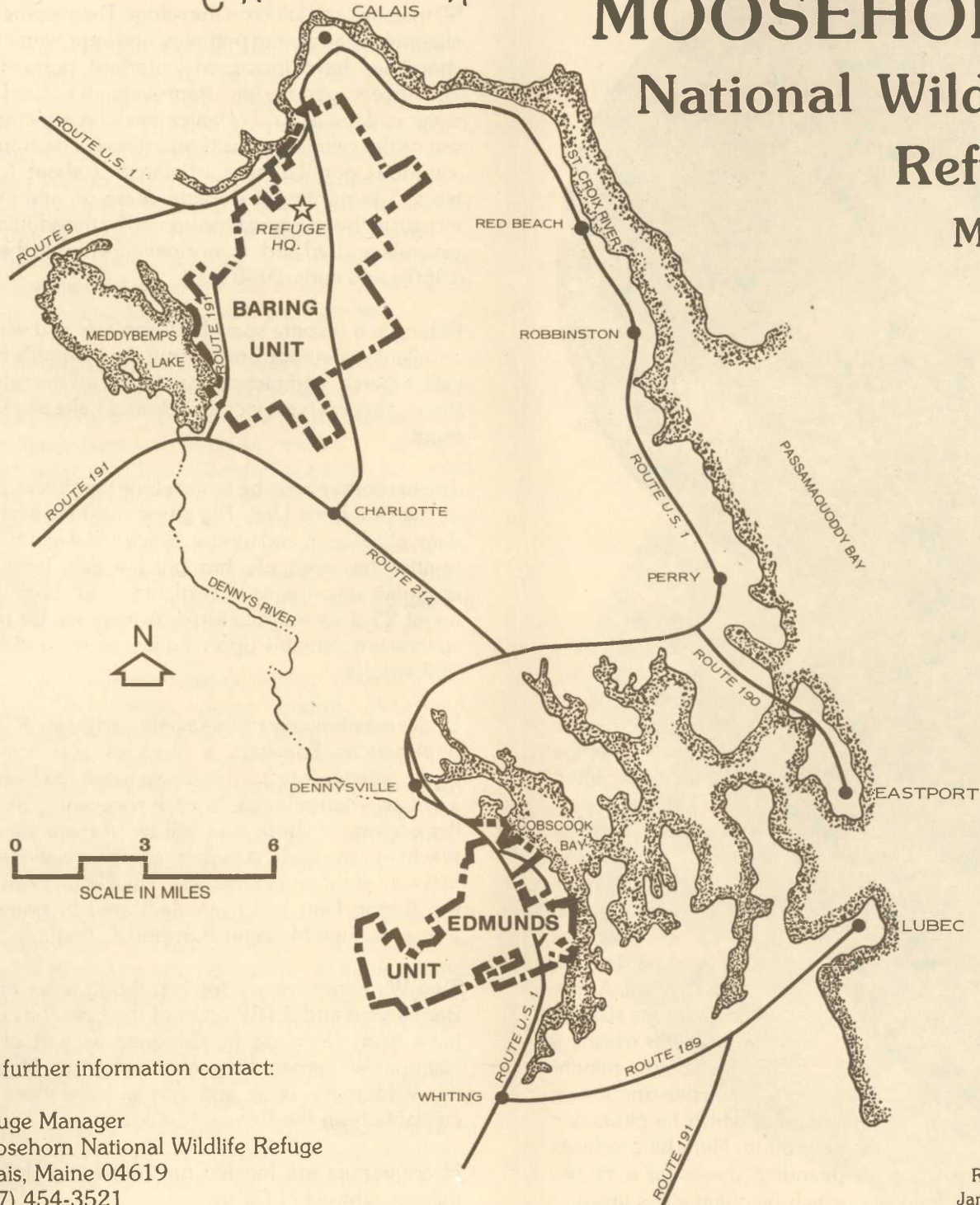
Two Wilderness areas, totaling 4,680 acres of the Baring Unit and 2,782 acres of the Edmunds Unit, have been set aside by Congress as part of the National Wilderness Preservation System. Maps of the Wilderness areas and special regulations are available from the Refuge Headquarters.

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

C A N A D A
CALAIS

MOOSEHORN

National Wildlife Refuge Maine



For further information contact:

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

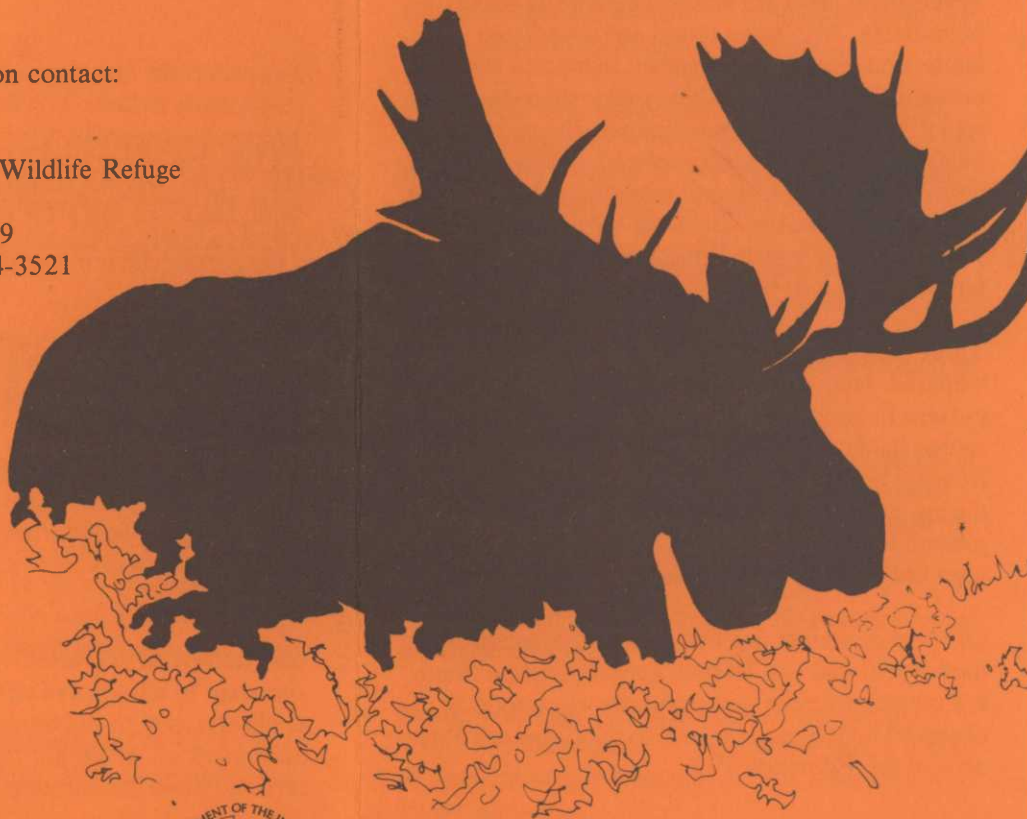
RL 53530-1
January 1984

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.

MAMMALS OF MOOSEHORN NATIONAL WILDLIFE REFUGE

For further information contact:

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



DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE
RL53530-3
September 1979



MAINE

The Moosehorn National Wildlife Refuge is located in extreme south-eastern 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 6,600 acres in size, lies along U.S. Route 1 at Edmunds. It is bounded on the east by waters of Cobscook Bay, an arm of the Bay of Fundy, and between 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 sub climax 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 calf during late spring and early summer. Black bear are present in small numbers at all times but usually seen only during the summer.

Of special interest are two marine mammals, the harbor seal and the Atlantic harbor porpoise. Seals are commonly seen and porpoises occasionally observed both being confined to 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 39 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 Kellogg, 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.

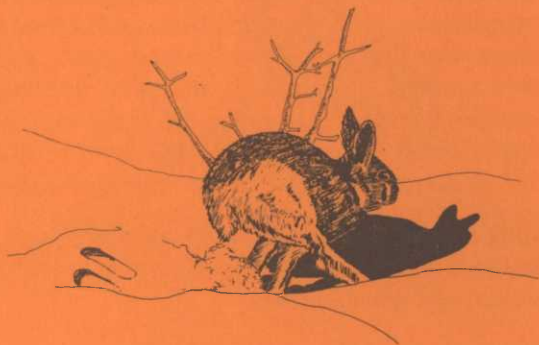
Masked Shrew (*Sorex cinereus*). Fairly abundant along stream bottoms and in moist, heavily-vegetated areas, under woodpiles and in hollow stumps.

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.

Star-nosed 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, behind window blinds, 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, shoots, and 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. During winter months 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 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. May occasionally be routed from hollow trees by pounding on the trunk.

Beaver (*Castor canadensis*). Several colonies occur. Dams and houses may be observed from refuge roads and trails, and evidences 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 above either in appearance or habits.

Boreal Redback Vole (*Clethrionomys gapperi*). Occurs in abundance 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.

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



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

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 occasionally observed during summer. A few are seen in winter.

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*). Exact status in this area not known. Expansion of range in New England may now encompass the refuge.

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.



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

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.