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MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

University of Maine

Orono, Maine

QUARTERLY REPORT

January-March, 1948

Cooperating Agencies

Maine Department of Inland Fisheries and Game
Wildlife Management Institute
University of Maine
United States Fish and Wildlife Service

Unit Personnel

Leader - Howard L. Mendall
Assistant Leader - Jay S. Gashwiler
University Representative - Prof. Robert I. Ashman
Faculty Collaborator - Dr. Harry L. Kutz
Graduate Assistants - Malcolm W. Coulter
 Leslie L. Glasgow
Graduate Students - James R. Reilly
 Harold J. Dyer
 Gerardus C. deRoth
Clerk - Maxine Horne

MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

Quarterly Report

January-March, 1948

RESEARCH PROJECTS

MUSKRAT MANAGEMENT

Sub-project: Life history studies.

Objectives: A study of life history and environmental factors leading to management recommendations.

Assignment: Jay S. Gashwiler, Assistant Leader

Gashwiler did little field work on the muskrat project during the past quarter, spending most of his time in tabulating data previously obtained. Among such data compiled were some very interesting figures on population trends in recent years. This material is presented in the following section:

The Department of Inland Fisheries and Game compiles figures on the number of muskrats taken each year in the State. Their figures are based on voluntary reports made by trappers when they apply for their new licenses. As a result this information is always a year or more late and is subject to some inaccuracy. However, it appears that regardless of the accuracy of the data, the same variations are apt to persist from year to year and the basic trend will be evident. The reported catch for the last 13 years is as follows:

<u>Year</u>	<u>Trappers Reporting</u>	<u>Muskrats Taken</u>	<u>Av. No. per Trapper</u>
1934	---	36,173	---
1935	---	38,080	---
1936	1,766	40,225	23
1937	1,696	40,083	24
1938	1,461	39,133	27
1939	1,548	42,116	27
1940	1,522	42,634	28
1941	---	27,389	---
1942	885	17,552	20
1943	945	13,532	14
1944	952	20,079	21
1945	1,116	12,020	11
1946	1,277	28,594	22

From this listing it can be noted that the muskrat population was at the highest level from 1935 until 1940. The peak was reached in 1940 when 42,634 pelts were taken. There was a sharp decline in 1941 which continued until 1945 when only 12,020 animals were reported. The take in 1946 was materially increased from that of 1945. This should not cause undue optimism, however, for even the 1940 maximum is a low catch for a state as large as Maine with its abundant water. The average number of pelts per trapper is a very interesting column -- the largest average catch per trapper was 28 pelts in 1940 and the smallest

11, in 1945. It may be reasoned that a decrease in the trapping pressure was responsible for the low take from 1942-1945. If so, there should have been a proportionate increase in the trappers' success for there would have been more animals available to them. This is not borne out by the figures, however; an examination of the number of pelts per trapper reveals a trend closely associated with the number of muskrats caught. The take of muskrats per trapper in Maine is a very low figure. It would tend to support the belief that an average trapper cannot make a living off muskrats during the trapping season.

The productivity of animals on the study areas at Mattanawcook Lake and the Davis-Holbrook area are good examples of the poor condition of the muskrat population in Maine. The data are as follows:

Mattanawcook Lake

Year	Pre-trapping Population	Acres per Muskrat		Post-trapping Population	Acres per Muskrat		Per cent of Muskrats Trapped
		Tot. Area	Marsh Only		Tot. Area	Marsh Only	
1946	55	2.2	0.6	5	24.0	7.0	91
1947	15	8.0	2.3	3	40.0	11.7	80

Davis-Holbrook Area

(Data from this area gathered jointly by Gashwiler and Coulter)

Year	Pre-trapping Population	Acres per Muskrat		Post-trapping Population	Acres per Muskrat		Per cent of Muskrats Trapped
		Tot. Area	Marsh Only		Tot. Area	Marsh Only	
1946	165	1.4	0.9	19	12.0	7.5	88
1947	84	2.8	1.7	17	14.0	8.3	80

Many comparisons could be made with conditions elsewhere. For example, Maryland is reported to take an average of three to four muskrats per acre of marsh over the State. In contrast the pre-trapping population at Mattanawcook Lake was only one muskrat per 2.2 acres in 1946 and one animal per 8.0 acres in 1947. At the Davis-Holbrook Area the pre-trapping population was one muskrat per 1.4 acres in 1946 and one per 2.8 acres in 1947. Thus it is apparent that these areas, which are believed to be fairly typical muskrat marshes in Maine, fall far below the statewide average of Maryland.

The number of muskrats which can safely be removed from a marsh

without depleting the population has been estimated by various authorities at from 50 to 75 per cent, depending on the condition of the population and season of the year. Our fall studies in Maine have revealed a population containing 70 to 75 per cent young of the year. If we assume a winter loss of 15 per cent we could remove about 60 per cent of the fall animals and still maintain the breeding population. However, our figures indicate that from 80 to 90 per cent of our pre-season muskrat population was taken from the Mattanawcook Lake and Davis-Holbrook Areas during the spring trapping seasons in 1946 and 1947. This excessive trapping is reflected in the reduced number of animals taken--at Mattanawcook Lake the 1947 catch was 27.3 per cent of that in 1946 and at Davis-Holbrook Area the 1947 catch was 50.9 per cent of that of the previous year.

During the coming quarter Gashwiler will conduct his usual spring work with emphasis on population densities, pelt studies and checks of trapping conditions.

Sub-project: Muskrat habitat study

Objectives: To determine the seasonal use of specific muskrat habitat types and to analyse the data thus obtained as the management applications.

Assignment: Malcolm W. Coulter, Graduate Assistant.

In February, Coulter finished all work under the above heading and was awarded his Master's degree. He is now employed as biologist with the Vermont Fish and Game Service. Copies of the thesis have been sent to the Unit Cooperators, but for the benefit of readers who do not have access to the thesis, Coulter's summary is given at this time:

"The movements and seasonal habitat preferences of muskrats in a small marsh in Maine were studied during a period of low population. The habitat was classified according to its plant composition and available water and marsh area. Movements were computed by recording the distances that tagged animals travelled between known trap stations. Seasonal habitat preferences were studied by repeated examinations of the marsh to determine where the animals were located. These data were recorded with respect to the habitat type in which they occurred. The following conclusions resulted from this study:

1. Population

- a. The muskrat population was low as compared with marshes in other regions.
- b. The breeding population never exceeded 1 animal per 12 acres.
- c. The sex ratio of immature animals, from a small sample, showed a decided preponderance of males, while among adults a more balanced ratio existed.

2. Movement

a. Fifty-three per cent of the animals recaptured were last handled at locations over 200 feet from the original site.

b. Forty-five per cent of the animals travelled 501-5550 feet during the same season in which they were tagged.

c. Almost half the animals that were tagged one season, and caught the next, had moved more than one-quarter mile. The longest movement by one animal was 1.6 miles.

d. Many more muskrats located along marsh-lake edges, or along open waterways at the study area, moved over 300 feet than did those located in the marsh type along natural potholes and channels.

3. Seasonal habitat preferences

a. Because of widespread wandering in the early spring, no definite habitat preference at that season was noted. Later, breeding animals preferred pothole locations in the shrub zone of the marsh where cover was excellent. The location of the breeding population (post-trapping population) was in locations where trappers did not concentrate.

b. Exposure of the marsh because of lowered water resulted in heavy use of emergent vegetation and greater movement of muskrats. Shallow flooding of marsh type areas decreased use of emergent vegetation and resulted in a somewhat more stabilized population.

c. During the fall muskrats relocated to areas where dense emergent vegetation abounded near water 18-30 inches deep and began wintering in the same vicinity.

d. House use reached a maximum during late fall and early winter, and a minimum during the summer. The number of house sites used was proportional to the total number of house sites present for any given season.

4. Productivity vs. Habitat

a. Areas where potholes and channels were present supported the greatest number of muskrats. Several areas of unbroken marsh received very little use.

b. Muck provided the best type of soil for the growth of most of the aquatic plants. Sawdust over the bottom limited plant growth.

c. Over trapping was the most important factor operating against the muskrat population, under the conditions that existed.

d. Lack of sufficient water over the marsh at all seasons is believed to be the most important factor limiting the potential productivity of the marsh for muskrats.

5. Suggestions for management

a. Based upon these conclusions, three management suggestions, exclusive of the regulation of seasons by law, are presented:

- (1) Control of water levels.
- (2) Creation of potholes and channels.
- (3) Establishment of refuge areas."

DEER MANAGEMENT

Sub-project: Winter deer yard studies

Objectives: To determine the amount of available food in several typical deer yards; to determine the preferences and utilization of the food by deer; and to obtain all possible information on the activities and mortality of deer while in the yards.

Assignment: Leslie L. Glasgow, Graduate Assistant

During March, Glasgow completed all field work on the winter yard study. He is now tabulating his data and writing his thesis. The completion report on this project will be available in the near future, so no summary of progress will be given at this time.

RUFFED GROUSE MANAGEMENT

Sub-project: Cover requirements and populations

Objectives: To determine preferred cover types and population densities.

Assignment: Howard L. Mendall, Leader

Mendall spent about a week during each month of the quarter making field checks of grouse conditions in various parts of the State. Comparatively mild weather prevailed throughout the early part of the winter but the second week of January brought subnormal cold and frequent snow storms, a condition which lasted with hardly a let-up for about 5 weeks. As a result, the change in grouse usage from hardwood to coniferous cover types was later than last year but was also much more abrupt than usual. Throughout the latter part of the winter the birds showed very little movement between covers, and selected feeding areas that were closely adjacent to the coniferous shelter where they spent their resting time. This was in marked contrast to the observations of the two preceding winters--then, short periods of severe weather were interspersed by thaws or mild weather, and considerable shifting of cover usage was noted by the birds.

Data on population continue to indicate a gradual build-up in numbers in parts of central and western Maine, but a further decline over a rather wide area in the northern part of the State.

PARASITE STUDY

Objectives: To make an ecological study of endo- and ecto-parasites of certain important wildlife species in Maine, with special reference to management applications.

Assignment: James R. Reilly, Graduate Student.

During the winter, Reilly tabulated data from all specimens which he autopsied up to last fall. These consisted of 36 grouse, 39 ducks, and 132 muskrats.

Somewhat surprisingly, the grouse were found to be more free from parasites than any of the other animals examined--15 of them or 41.7 per cent being entirely clean.

Every duck examined was found to be parasitized. Seven species were available for study and were divided as follows: black duck, 17; wood duck, 8; green-winged teal, 5; hooded merganser, 4; blue-winged teal, 2; pintail, 2; and ring-necked duck, 1.

Only 2 of the 132 muskrats autopsied were free from parasites. Part of the muskrats were examined for ecto- as well as endo- parasites.

Nematodes (roundworms) occurred most often among the infected grouse. Trematodes (flukes) was the form of parasite found most frequently in the ducks and the muskrats. Acarina (mites) constituted the most common of the external parasites affecting the muskrats.

During the coming quarter, Reilly will complete the tabulation of all data obtained in this study.

PUBLICATIONS

An article by Graduate Assistant Coulter entitled "Triangle Spike Rush as Waterfowl Food" was published in the January issue of The Auk.

COOPERATION AND EDUCATIONAL WORK

Unit personnel were at several of the Wildlife Conferences during the past quarter. Glasgow, Gashwiler, and Mendall attended the Northeastern Wildlife Conference in Boston during February. Mendall delivered a paper entitled "Water Levels and Waterfowl Management."

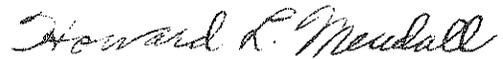
Gashwiler and Mendall attended the annual Unit Leaders' Conference and the National Wildlife Conference in St. Louis. Dr. Kutz, faculty collaborator, also attended the latter sessions.

Gashwiler and Mendall continued to serve as technical advisors to the State Federal Aid program.

Dr. Kutz conducted the undergraduate courses in Conservation of Natural Resources (a new course), and ornithology; also the Wildlife Seminar.

Considerable assistance was given to State Wardens in performing autopsies, and the usual service rendered to the general public upon request.

Respectfully submitted,



Howard L. Mendall, Leader
Maine Cooperative Wildlife
Research Unit

University of Maine
Orono, Maine
April 8, 1948

(NOT FOR PUBLICATION)

office

(NOT FOR PUBLICATION)

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Quarterly Report

April-June, 1948

RESEARCH PROJECTS

MUSKRAT MANAGEMENT

Sub-project: Life history studies

Objectives: A study of Life history and enviromental factors leading to management recommendations.

Assignment: Jay S. Gashwiler, Assistant Leader

Gashwiler spent full time during the spring trapping season in central Maine working directly with trappers. Trapping methods and results, and primeness determinations, formed the basis of this study. Complete data were obtained from 530 pelts in Penobscot and Washington counties. In addition, a total of 2,176 pelts were examined in fur houses--these represented animals taken from various localities throughout the State.

The trapping season in Penobscot County ran from April 10 to 25, while that in the most eastern county (Washington) lasted throughout the entire month of April. In the latter area, those trappers contacted reported trapping conditions similiar to those of 1947 and the catch was about the same. In Penobscot County, however, the catch was only about 70 per cent of that of a year ago. An earlier spring break-up and lower water levels appeared to be factors in the poor success of this year.

As was the case in previous years, a great many forms of animal life besides muskrats were killed during the spring trapping season. Wood ducks and black ducks continued to constitute the waterfowl suffering the heaviest losses, although the frequency of ducks in traps was not quite so high as in 1947. About the same number of mink were taken. Beaver were caught more often this year.

Post-trapping populations were conducted on the Davis-Holbrook and Mattanawcook study areas. Data for the past three years show a remarkable constancy in the trapping pressure as well as the continued low population of muskrats:

Davis--Holbrook Thoroughfare

<u>Year</u>	<u>No. Animals Trapped</u>	<u>Post-trapping population</u>
1946	146	19
1947	67	17
1948	74	19

Mattawancook Lake

<u>Year</u>	<u>No. Animals trapped</u>	<u>Post-trapping population</u>
1946	50	5
1947	12	3
1948	12	3

Sample litter counts were made on the Penobscot and Washington county study areas. In spite of an earlier spring break-up this year, the breeding season appears to have started at about the same time as in 1947. The earliest litter was born about May 15.

During the coming quarter, Gashwiler will devote much of his time to a general survey of muskrat conditions in southern and western Maine.

DEER MANAGEMENT

Sub-project: Winter deer yard studies

Objectives: To determine the amount of available food in several typical deer yards; to determine the preferences and utilization of the food by deer; and to obtain all possible information on the activities and mortality of deer while in the yards.

Assignment: Leslie L. Glasgow, Graduate Assistant

During the past quarter, Glasgow concluded all work under the above heading, and was awarded his Master's degree at the June Commencement. He has now left the Unit to accept employment as biologist with the Indiana Conservation Department. His thesis was entitled: "A Winter Habitat Study of Deer in Maine." Copies of the thesis will be sent to Unit Cooperators in the near future, but Glasgow's summary is presented at this time:

"In December, January, February and March of 1946-1947 and 1947-1948, a study of the relationship between deer activities and climatic conditions was made in a deer yard near Chesterville, Maine. In 1946-1947, the total snowfall of 73.1 inches was a departure of -4.1 inches from normal. The monthly mean temperature of 23.2° was 3.1° above average. Snow on the ground reached a depth of 24 inches late in December but because of higher temperatures and rain in January followed by freezing weather, a crust was formed which permitted deer to travel widely. The actual yarding period was limited to approximately 12 days.

In 1947-1948, the snowfall of 55.5 inches was 21.7 inches below average and the monthly mean temperature of 19.1° was 1.0° below normal. Snow on the ground accumulated to a depth of 26 inches by January 25. Because of the lack of rain and low temperatures, a crust did not form on the snow until early March. The yarding period was 52 days.

Since both winters were rather mild, deer suffered very little.

Twenty-two deer yards were surveyed in western and southern Maine to determine the condition of the food supply. The method used was a simplified technique developed by Shaler Aldous. It consisted of taking a percentage sample of the occurrence of browse and its degree of utilization within the reach of deer on 1/100 acre plots at predetermined intervals throughout the yard. The total of these samples for any given area constituted the survey for that yard. Following the surveys, the field data were transferred to yard data sheets and the necessary arithmetical computations were made for each yard. From these sheets it was possible to determine (1) the plant species browsed, (2) the utilization factor, (3) the percentage of each species browsed, (4) the percentage composition of the remaining browse and the distribution of each plant species. It was found that food conditions in 36.3 per cent of the yards were good; 36.3 per cent were fair; and 27.4 per cent were poor.

The 10 browse species making up the largest percentages of food in the western yards in order of descending importance were northern white-cedar, balsam fir, red maple, mountain maple, striped maple, hoary alder, witherod, mountain holly, sugar maple, and raspberry. The 10 browse species making up the largest percentage of food in the southern yards in order of descending importance were red maple, winterberry, yew, ground juniper, witherod, hemlock, balsam fir, witch hobble, red oak, and raspberry and blackberry.

Recommended suggestions for management were selective cutting of pulpwood and saw timber and the control of the deer population by hunting."

WATERFOWL DISTRIBUTION AND MANAGEMENT

Objectives: To obtain all possible data on the abundance, distribution, and migration of waterfowl species in Maine; and to conduct research that will assist in the management of the important species breeding in Maine, especially the ring-necked duck and the black duck.

Assignment: Howard L. Mendall, Leader

During the quarter Mendall devoted about half his time to the waterfowl project. Emphasis was placed on obtaining migration and census data, and on the breeding productivity studies. Gashwiler and Glasgow gave considerable assistance throughout this work, with the former conducting the studies of the hole-nesting ducks. During the height of the nesting period, John M. Dudley of Calais assisted Mendall for 10 days on the Washington County areas.

Migration

Good spring flights occurred throughout Maine this year with apparent increases in the following species: Canada goose, black duck, blue-winged teal, ring-necked duck, and greater scaup. There appeared to be little change from last year in the wood duck, American golden-eye, and bufflehead. The lesser scaup continued to be very scarce as a Spring migrant, a condition that has existed for several years. A slight decrease was noted in the green-winged teal.

Breeding Population

Although census studies are still incomplete, the species of inland game ducks that breed in Maine are showing an improved status this year when considered as a whole. The two most numerous breeding ducks, the black duck and the ring-neck, are both showing substantial increases over 1947. A slight increase, so far has been recorded for the wood duck this year and it is to be hoped that the heavy decline noted for this species during the past few years has now been checked. Although wood ducks again showed a decrease in eastern Maine, this was offset by increases in central and northern Maine. Little change is apparent for the American golden-eye and the two teal as yet, but it is possible that final compilations will show slight decreases for all three.

Population data are now about 3/4 complete and the tentative status of breeding ducks, exclusive of mergansers, may be stated as follows:

1. Ring-necked duck - approximately a 25 per cent increase
2. Black duck - more than a 20 per cent increase
3. Wood duck - slight increase - less than 10 per cent
4. American golden-eye - little change
5. Blue-winged teal - little change
6. Green-winged teal - little change

Precipitation for May was unusually heavy and at the Portland Weather Bureau it was the cloudiest month and the wettest May, ever recorded, with nearly 8 inches of rainfall. Flood conditions occurred on the 18th and 19th, and many duck nests are known to have been destroyed. The losses were apparently not serious to ring-necks and teal because their nesting season was in a very early stage. Hole-nesting ducks probably did not suffer too greatly, although two nests of the golden-eye that were under observation were ruined by rain beating into the nesting cavity and flooding the eggs. The principal species affected by the flood was the black duck and losses, particularly in central and eastern Maine, were heavy.

The full extent of the flood losses to black ducks cannot be ascertained until the summer brood counts have been made. Several second nests have recently been found, however, and it appears as if more birds renested than would normally be expected at this time of year.

Nesting Studies

The nesting studies have resulted in the location to date of 71 nests, the largest number found in a season during the Unit's waterfowl program. These are distributed as follows: ring-necked duck - 41; black duck - 13; wood duck - 10; hooded merganser - 4; American golden-eye - 2; green-winged teal - 1.

During the coming quarter, the population studies will be continued, the summer brood counts will be made, and all nests will be checked at intervals until hatched or destroyed.

PARASITE STUDY

Objectives: To make an ecological study of endo- and ecto-parasites of certain important wildlife species in Maine, with special reference to management applications.

Assignment: James R. Reilly, Graduate Student.

Reilly concluded his studies under the above heading and was awarded his Master's degree at the June Commencement. The thesis was restricted to the muskrat phase of the work and was entitled: "A Study of the Metazoan Parasites of the Maine Muskrat." Copies of the thesis will be sent to Unit Cooperators in the near future, but the summary is as follows:

"A study was made of the helminth and arthropod parasites recovered from 126 muskrats taken in eastern and south central Maine. The parasites recovered were fixed, stained, cleared and mounted for identification. The life cycles of the involved species were investigated from the standpoint of suggesting control measures.

Seven species of trematodes, two species of cestodes, two species of nematodes and a species of mite were recovered. Trematoda were found in 91 (71.65 per cent), Cestoda in 43 (33.86 per cent), Nematoda in 21 (16.54 per cent), and Acarina were taken from 61 (48.03 per cent) of the animals.

A comparison with the total number of currently acceptable species reported in the literature revealed that 31.89 per cent of all trematodes, 33.33 per cent of all cestodes, 20.00 per cent of all nematodes and 12.50 per cent of all mites, were recovered from 126 animals taken in Maine.

Maintenance of optimum water level and controlled burning are suggested as the only possible means of control and reduction of the incidence of parasitism."

WOODCOCK RESEARCH

Objectives: To take an annual census on the Unit's permanent census areas in Maine; and to correlate census results of cooperators throughout the northeastern states.

Assignment: Howard L. Mendall, Leader

Mendall spent about half time from mid-April through May carrying out the woodcock studies. Censuses on the Unit's regular areas in central and eastern Maine were conducted as usual. In addition the results from 33 cooperator areas in other parts of the New England states were analysed and tabulated. These data were written up as a special report on June 2 so they will not be repeated at this time. By way of summary, it may be stated that results on all areas showed a 21 per cent increase in breeding woodcock over the 1947 figures.

This year woodcock nesting season was much earlier than the average, and hatching began the first of May. The hatching peak was reached in eastern Maine during the second week of the month, and for this reason it is likely that losses to woodcock were not especially serious during the flood of May 18-19. A few nest losses apparently did occur, however, and unverified reports were obtained from southern Maine of the drowning of young.

In spite of some flood losses the status of woodcock in 1948 appears to be the best that it has been at any time since the disastrous winter of 1939-40.

PUBLICATIONS

A manuscript was completed by Gashwiler dealing with waterfowl losses during the spring trapping of muskrats. It has been submitted to the Journal of Wildlife Management for publication.

An article by Mendall entitled: "Waterfowl Management Possibilities in Maine" was published in the April issue of the Bulletin of the Maine Audubon Society.

COOPERATION AND EDUCATIONAL WORK

Unit personal continued to serve as technical advisors to the State's Pittman-Robertson projects.

In June, Gashwiler, Glasgow, and Mendall participated in the annual State Game Warden School at Augusta.

Dr. Kutz conducted the undergraduate courses in Ornithology, and Conservation of Natural Resources; also the Wildlife Seminar.

Several public lectures were given by Unit personnel during the quarter, and the usual assistance was rendered to State Wardens and to the general public.

Respectfully submitted,

Howard L. Mendall

Howard L. Mendall, Leader
Maine Cooperative Wildlife
Research Unit

University of Maine
Orono, Maine
June 30, 1948

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Frank T. Haseltine (Game Investigations)
Graduate Students - Brian C. Carter (Game Investigations)
Harold J. Dyer (Game Investigations)
Gerardus C. deRoth (Fish Investigations)
Lyndon H. Bond (Fish Investigations)
Walter R. Welch (Fish Investigations)
Alfred W. Eipper (Fish Investigations)

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MUSKRAT MANAGEMENT

Sub-project: Life history studies

Objectives: A study of life history and environmental factors leading to management recommendations.

Assignment: Jay S. Gashwiler, Assistant Leader

Because of Gashwiler's resignation in August, no field work was conducted during the quarter. Gashwiler devoted all his time to tabulating the data and to the preparation of his final report. Copies of the complete report are being sent to the cooperating agencies of the Unit, but an abstract of the summary is presented at this time:

1. Introduction.

A muskrat project was initiated at the Maine Cooperative Wildlife Research Unit in 1945 to determine what would constitute a biologically and economically sound trapping season. Environmental studies were also conducted to help in the development of sound management plans.

2. Population.

a. The muskrat population was low on both the Mattanawcook Lake and Davis-Holbrook study areas. The pre-trapping population at Mattanawcook Lake was 1 muskrat per 2.2 acres in 1946 and 1 muskrat per 8.0 acres in 1947 and 1948. At the Davis-Holbrook Area the pre-trapping population was 1 muskrat per 1.4 acres in 1946, 1 muskrat per 2.8 acres in 1947, and 1 muskrat per 2.6 acres in 1948.

b. The house counts decreased on the Mattanawcook Lake and Davis-Holbrook Area in 1947 but increased slightly in 1948. On the Magurrewock and Barn Meadow marshes at the Moosehorn National Wildlife Refuge the house counts more than tripled from 1945 to 1947.

c. The reported muskrat catch was at the highest level from 1935 until 1940. In 1940, the peak of 42,634 pelts were reported. There was a sharp decline in 1941 which continued to 1945 when only 12,020 muskrats were reported taken. In 1946, the take increased to 28,594 but fell in 1947 to 24,851 pelts.

3. Movement.

a. Fall tagged muskrats recovered early the next spring

revealed that 79 per cent of the animals had travelled under 400 feet. The maximum distance covered was between 3,961 and 5,280 feet. Spring recoveries from summer tagged young at the Moosehorn Refuge, where a heavy population of muskrats exists, showed travel up to a distance of 3 1/4 miles.

b. Two main periods of movement were noted; the spring and fall dispersals. Winter wandering also occurs among individual animals.

4. Weights and Measurements.

a. The muskrats gained a total of 11.2 ounces from November to the following April. From the first of April to the end of the month there was relatively even decrease of 2 ounces per week. The total average weight of April and early May muskrats was 41.7 ounces.

b. The total length of the muskrats increased about 1 5/8 inches from November until the following April.

c. Six adults tagged during the late fall and recovered the following April gained an average of 5.3 ounces. Eleven subadults for the same period gained an average of 11.4 ounces.

5. Mortality.

Very little natural mortality was found among Maine muskrats. That which was found and could be classified was the result of: intra-specific strife, red fox depredations, and accidents.

6. Breeding.

a. Mating takes place from March until the last of July. Peak periods are the first week of May and the second week of June.

b. Mating takes place in the water.

c. Gestation period is considered to be 29-30 days.

d. The normal mastology of Maine muskrats is two pairs of mammae in the inguinal region and three pairs in the pectoral region or a total of 10 mammae. Maine muskrats average 1.2 more mammae than those of Louisiana.

7. Litter Study.

a. Eighty-one per cent of the litter houses were found in flooded bog-brush, sedge-meadow habitat. They were also found in flooded bog-brush, flooded swamp timber, flooded sedge-meadow, and emergent vegetation.

b. Sixty-five per cent of the house sites were found in clumps of woody vegetation. Stumps or logs, boulders or rocks, sedge-meadow marsh, floating logs, and emergent vegetation were also used.

8. Foods.

a. A plant survey of the Mattanawcook Lake and Davis-Holbrook Area revealed an abundance of plants available for muskrat food on both areas.

b. A food habits study of the Mattanawcook Lake muskrats showed that cattail (Typha latifolia), three-way sedge (Dulichium arundinaceum), sedge (Carex rostrata), and burreed (Sparganium fluctuans) were the outstanding foods during all seasons of the year. Forage ratios were high for cattail (Typha latifolia), three-way sedge (Dulichium arundinaceum), pondweed (Potamogeton natans), and iris (Iris versicolor), indicating the muskrats had a definite preference for these species.

A food habits study of the Davis-Holbrook Area revealed that sedge (Carex lasiocarpa), arrowhead (Sagittaria latifolia), pickerel weed (Pontederia cordata), and cattail (Typha latifolia) were outstanding foods throughout the year. Forage ratios were high for cattail (Typha latifolia), arrowhead (Sagittaria latifolia), and sedge (Carex rostrata), and showed the muskrats had a preference for these food species.

9. The Harvest.

a. Maine trappers trap largely from a boat or canoe. Floating logs are preferred sites since the traps are always in operating conditions.

b. The average ^{annual} catch for a total of 26 trappers over a three-year period was 72.5 muskrats; a higher average than is thought to prevail for the State as a whole. In 1947, 64.3 per cent of the total catch of five trappers was taken the first 10 days of the season. In 1948, 92.6 per cent of the total catch of six trappers was taken the first 10 days of the season.

c. Practically all species of birds and mammals frequenting water habitat are taken occasionally in spring set muskrat traps. Losses to waterfowl reach serious proportions. Mink are also frequently taken.

d. An appreciable number of muskrats are caught in fall set mink traps and in winter set beaver traps.

10. Pelt Study.

a. The average eye-length measurement of 376 November muskrats was 299.6 mm. A total of 1,354 April and May pelts averaged 320.6 mm. showing an increase of 19 mm. (About 3/4 inch).

b. About 50 per cent of the backs of November trapped muskrats were prime, 77.8 per cent of the January pelts were 3/4 prime, while those taken the first two weeks of April were about 92 per cent full prime. Primeness decreased rapidly after the second week in April until the second week in May when only 60 per cent of the backs were full prime. The bellies tended to prime up earlier in the fall and became ~~un~~prime sooner in the spring.

c. The under fur of November trapped muskrats was denser than those of April although the January pelts had the densest under fur of all.

d. Pelt damage was relatively light in November and January, but increased by the first of April to 14.8 per cent. By the fourth week of April, 44.2 per cent of the pelts were damaged.

e. Fur dealers state that on an average, spring muskrat pelts will bring 10 to 20 per cent more than fall ones. Limited data of the Maine study revealed that 1947 spring pelts brought 21 per cent more than the 1947 fall trapped animals. The 1948 spring trapped pelts netted about 25 per cent more than the 1947 fall trapped ones.

11. Management.

a. From the results of this study it appears that the chief justification for spring trapping lies in the fact that spring skins are considered to be worth from 10 to 20 per cent more than fall pelts. This argument seems more than offset by the objectionable features of spring trapping.

b. It is recommended that the muskrat season be changed to the fall. It is also suggested that the State be zoned along climatic lines rather than on county lines. Such re-zoning would permit a shortening of both the muskrat and mink seasons in the fall since similar climatic conditions would be incorporated in each zone. If the spring season on muskrats is continued then it is recommended that the time be shortened to 14 days in each of the proposed zones; also that the open season be as early as possible.

c. Water control to maintain optimum conditions on a marsh is one of the simplest and best methods of creating a productive marsh. Potholes and channels can be used to break up large expanses of solid marsh habitat. Refuge areas to insure sufficient breeding stock may be useful under intensive management.

WATERFOWL DISTRIBUTION AND MANAGEMENT

Objectives: To obtain all possible data on the abundance, distribution, and migration of waterfowl species in Maine; and to conduct research that will assist in the management of the important species breeding in Maine, especially the ring-necked duck and the black duck.

Assignment: Howard L. Mendall, Leader

During the quarter Mendall devoted all possible time to the continuation of the waterfowl breeding studies that were described in the April-June report. Since the population and productivity data herein summarized are not confined to one quarter, the material constitutes a seasonal progress report covering the entire breeding season.

WATERFOWL BREEDING CONDITIONS IN MAINE = 1948

Habitat and Coverage

The majority of Maine's waterfowl breeding areas lie in the interior of the State. The ^{coastal} section, including many salt marshes, is extensively used by migrating and wintering waterfowl, but is of slight importance to nesting birds. A few black ducks and blue-winged teal breed there, and the American eider nests in large numbers on the coastal islands. Aside from this latter species, however, waterfowl productivity in the coastal belt appears to be of insufficient importance to justify intensive study. Accordingly, the investigation herein reported on is confined to the interior marshes. The northern and eastern sections of the State are most widely used by all species except wood ducks and it is in this zone that the study areas of the Maine Unit are located.

A few important breeding areas are in open, agricultural lands but the bulk of the ducks are produced in the vast forested regions. The waterways consist of the larger rivers (St. John, St. Croix, Penobscot, and Kennebec), and their tributary streams; also a tremendous number of small rivers, lakes, ponds, streams, and deadwater brooks that are scattered throughout the entire section. Waters, for the most part, range from very slightly alkaline to strongly acid; true alkaline waters are almost non-existent in Maine. Most of the waterways are flooded in spring, and the run-off -- normally gradual from May to July -- is all too frequently interrupted by a return to flood conditions. Drought, as affecting waterfowl, is never a factor in the annual productivity and the chief danger is from floods. If these do not occur or if they come early during the nesting season, waterfowl productivity is high. If they occur in late May or June, potential increases from the season's breeding are seriously cut down.

Exclusive of mergansers, the breeding ducks of the region are listed in the order of their abundance as follows: black duck, ring-necked duck, American golden-eye, wood duck, blue-winged teal, and green-winged teal.

Techniques of Study

A sample nesting study is conducted annually on a few of the more important breeding areas. Since nesting ducks (other than the ring-neck) do not concentrate to very much extent in Maine, in comparison with the

west and mid-west, the number of nests that can be found by the limited Unit personnel is not large. But the data which accrue have proven to be of considerable help in evaluating the success of the breeding season, when used in conjunction with other population and brood data.

Permanent check areas have been maintained by Unit personnel for several years, some of them since 1938. Population data are obtained by using a combination of two methods: (1) a count of territorial males and pairs prior to and during the early stages of nesting; (2) population and brood checks two or three times on each area from June through early August. All broods are classified as to approximate age.

It is admitted that this does not result in all the information desired, in that no total population figures are obtained -- merely trends. But for practical management in the northeast, trends appear sufficient. Estimates of total populations are impossible in this region, much of which is still in a "wilderness" condition. Whether the Unit's check areas represent a tenth of one per cent or five per cent of the total breeding population in eastern Maine is pure speculation and one extreme would appear as accurate as the other! The areas were laid out with one objective -- to obtain as much data over as wide a portion of the State as possible in a minimum of time. Even so, the writer is barely able to cover the ground during the season.

It would be more desirable if all data as to status could be obtained by the "territorial count" method rather than by relying upon brood checks for part of the coverage. Unfortunately two factors prevent this. Black ducks and golden-eyes are actually starting to hatch before many ring-necks and teal are even beginning to lay and it would be necessary to make territorial counts several times on each area between mid-April and June to obtain the desired information on all species. Even if this were feasible, of even more importance is the fact that, immediately after pairing, many black ducks, golden-eyes, and wood ducks resort to flooded timber areas, remote brooks, and beaver ponds to nest. Appraisals of these birds cannot be made until they return to the open marshes, with or without broods, in July.

The establishment of transect check areas such as have recently proven very satisfactory further west do not appear practical in Maine. The writer has experimented with plane transects in recent years but has abandoned their use to return to the original method of coverage. On the large, open marshes much more accurate results can be obtained by boat. In the wooded country a large proportion of the ducks are missed from a plane; and in this connection it should be pointed out that the total waterfowl production in this State is greatest in the woodland habitat. Transect checks by car or boat likewise appear impractical in this region.

Breeding Populations - 1948

Final compilation of all data indicates that the number of breeding ducks in Maine this year was noticeably greater than in 1947.

The important black duck, and also the ring-necked duck, registered substantial gains for the second year in a row. An increase was apparent for the wood duck and it is to be hoped that the heavy decline noted in this species for several years in Maine has now been checked. Although both species of teal showed decreases this year, their total numbers in Maine in any year are so small as to have little significance. Data in the following tabulation for the black duck and ring-neck are actual measurements obtained entirely on the Unit's permanent study areas; in the cases of the less numerous species supplementary data are used from a few other waterways as well -- the status as given for them thus represents an estimate rather than a measurement.

<u>Species</u>	<u>Status in 1948</u>
1. Black Duck	21% increase
2. Ring-necked Duck	20% increase
3. Wood Duck	10% increase
4. American Golden-eye	No appreciable change
5. Green-winged Teal	5% decrease
6. Blue-winged Teal	10% decrease

Nesting Success

The spring season throughout Maine in 1948 was cold and wet, in spite of the fact that the ice went out of the lakes and streams much earlier than last year. Temperatures for April and May were somewhat below normal and precipitation was considerably above normal. At the Portland Weather Bureau, it was the cloudiest month ever recorded, and the wettest month of May. Because of these conditions the nesting season for all waterfowl species except the ring-necked duck was later than usual. This proved to be a blessing, however, for a severe flood occurred on May 18th and 19th and many duck nests were destroyed. In an average year a flood at this date would be disastrous.

The losses were not very serious to ring-necks and teal because their nesting cycle was in an early stage. Hole nesting ducks did not appear to suffer too greatly, although two nests of the golden-eye that were under observation were ruined by rain beating into the nesting cavity and flooding the eggs; undoubtedly other nests of this species and also of the wood duck were destroyed in this manner. But the principal species affected by the flood was the black duck, as was the case a year ago. Many black duck nests are known to have been lost, particularly in central and eastern Maine; in extreme northern Maine the flood was much less severe.

It was surprising to find that, in spite of the lateness of the season (as far as black ducks were concerned), considerable renesting occurred. On one of the Unit's study areas where intensive nest hunting was carried out, over two thirds of all black ducks (which had lost nests in their first attempts) renested. Included were two pairs whose original nests were in an advanced stage of incubation at the time of the flood. Renesting was very successful and so, except for

lowered clutches and very late hatchings, the effects of the flood were less than were first believed.

During the nesting studies, a total of 80 nests of six species were located; nests of the ring-necked duck and black duck made up 63 of this total. All nests were checked at intervals until hatched or destroyed. Success for all species (including both original nests and re-nestings) was very satisfactory, being 71 per cent. Considerable variation among different species occurred; black ducks were 57 per cent successful, wood ducks 70 per cent, and ring-necked ducks 82 per cent. Principal nest losses were from floods. Predation, although relatively slight, resulted in a few more losses than in 1947; the crow, raccoon, and mink were the principal predators.

Brood Success

Hatching peaks were much later than usual this year for all species except ring-necks and teal, these being only slightly behind schedule. Brood sizes for downy young were somewhat lower than the 11 year average for nearly all species. As would be expected as a result of the flood, they were proportionately lowest for the black duck. Juvenile mortality has seldom been exceptionally heavy in Maine in the past, and, based upon brood averages of ducklings near the flying age, the 1948 season apparently followed the usual pattern in this respect. However, data are not as extensive on this point as usual because of so many late hatchings. Even by the last week of August, there was still a large number of ducklings that were far from the flying age.

After the recession of the May flood, favorable water levels prevailed throughout most of the summer.

Conclusions

1. The general status of waterfowl in Maine at the start of the breeding season was noticeably improved in 1948 with substantial increases in the black duck and the ring-necked duck.
2. The breeding season was delayed for most species by a cold, wet spring.
3. A severe flood in mid-May caused serious losses among nesting ducks. The black duck suffered the most and the ring-neck the least.
4. A surprisingly large number of black ducks, losing nests in the May flood, re-nested successfully.
5. Total nesting success for all species was better than in 1947. Resulting broods were smaller in size, however, and hatched later.

- 3 -

6. Juvenile mortality appeared to be about the same as in the average year.

PUBLICATIONS

A paper delivered last winter in Boston by Mendall and entitled "Water Levels and Waterfowl Management" was published in the Proceedings of the 1948 Northeastern Game Conference.

COOPERATION AND EDUCATIONAL WORK

Unit personnel continued to serve as technical advisors to the State's Pittman-Robertson projects. Mendall participated in several conferences and field inspection trips in connection with this work.

Dr. Kutz conducted the summer camp session for wildlife undergraduates.

PERSONNEL CHANGES

Many personnel changes occurred at the Unit during the quarter. The most important one was the resignation in August of Assistant Leader Gashwiler to accept employment with the Fish and Wildlife Service in Utah. Although Gashwiler's successor has not been appointed as yet, it is hoped that the vacancy will be filled shortly.

Several new Graduate Assistants (financed by Unit fellowships) and Graduate Students (who finance their own programs) began working during the quarter for Master's degrees at the Unit. These are as follows:

Graduate Assistant Jim D. Rearden who obtained a Bachelor's degree in wildlife at Oregon State College and who received some excellent training under Arthur Einarsen. Rearden has been assigned to the woodcock project.

Graduate Assistant Frank T. Haseltine who obtained his Bachelor's degree in wildlife at the University of Maine last spring. Haseltine will work on the Unit's newly organized beaver project.

Graduate Student Brian C. Carter who obtained a Bachelor's degree in forestry at the University of New Brunswick and then did a year of graduate work at the University of Toronto. Carter's Master's thesis will be on waterfowl. He is currently on leave of absence from his duties with the Northeastern Wildlife Station at Fredericton, New Brunswick.

Three recent graduates of the University of Maine's wildlife curriculum are now doing graduate work here in fisheries research. These men are Lyndon H. Bond, Walter R. Welch, and Alfred W. Eipper.

Respectfully submitted,

Howard L. Mendall

Howard L. Mendall, Leader
Maine Cooperative Wildlife
Research Unit

University of Maine
Orono, Maine
October 25, 1948

(NOT FOR PUBLICATION)

MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

Quarterly Report

October-December, 1948

RESEARCH PROJECTS

During the past quarter several new studies were initiated at the Unit. With the appointment of Coulter as Assistant Leader to fill the vacancy caused by Gashwiler's resignation last summer, the muskrat project was reactivated in December. Graduate Assistant Haseltine began work on his beaver project. He selected two study areas in Penobscot County for detailed investigations, and started mapping them. Graduate Assistant Rearden spent much time organizing his woodcock study which will be started this Spring, in reviewing literature on the subject, and in analyzing Unit file data. Since insufficient time has elapsed as yet for the accumulation of specific data on the foregoing studies, no report will be included at this time. They will be covered in detail in the next quarterly report of the Unit.

WATERFOWL DISTRIBUTION AND MANAGEMENT

Objectives: To obtain all possible data on the abundance, distribution, and migration of waterfowl species in Maine; and to conduct research that will assist in the management of the important species breeding in Maine, especially the ring-necked duck and the black duck.

Assignment: Howard L. Mendall, Leader

During the past quarter Mendall spent over one third of his time in the field obtaining data on the fall flights of waterfowl throughout the State and on the various factors relating to the 1948 hunting season. This material was organized into a special report which may be of sufficient interest to be included at this time.

THE 1948 WATERFOWL HUNTING SEASON IN MAINE

Waterfowl Populations

Weather conditions during the autumn were even more unusual than they were a year ago. Temperatures were far above average throughout the entire period, and many inland lakes, ponds and streams were still open in December. These factors caused the late flights of black ducks and goldeneyes to be greatly retarded and very difficult to measure. Instead of coming in heavy waves, the late migration occurred as a constant dribble of small flocks. This had a noticeable effect on the bag composition during the second portion of the hunting season as is discussed later.

As accurately as could be determined, the status (in comparison with 1947) of those species on which sufficient data were obtained is as follows:

Increase - black duck, wood duck, green-winged teal, ring-necked duck, greater scaup, ruddy duck.

No change - blue-winged teal, goldeneye, bufflehead.

Decrease - pintail, lesser scaup.

The increase noted for the ring-necked duck was spectacular and reflects directly the increased breeding population last spring and the unusually successful nesting season that this species enjoyed. A substantial increase was evident for the black duck and green-winged teal. The slight increase recorded a year ago for the lesser scaup was more than offset by a heavy decrease this year. Once a common migrant in eastern and central Maine, the lesser scaup is now of little consequence in the fall flights.

No comparative data were available for the sea ducks or for geese. However, it is the impression of most reliable observers that scoters and eiders were more numerous than for several years. Even though specific figures are lacking, the tremendous flocks observed along the Maine coast this past fall indicate no scarcity of these birds. As for the Canada Goose, all indications point to the fact that this bird was likewise increased in numbers this year.

The Hunting Season

The 1948 waterfowl season in Maine ran from October 8-19 and November 26-December 7, with a special longer season on scoters and eiders in open coastal waters. In view of the limited but valuable data obtained by the Maine Cooperative Wildlife Research Unit a year ago, it was decided to intensify the work this year in checking the hunters' bags. Accordingly, Unit personnel under Mendall entered into a joint study with the State Federal Aid personnel under Merwin Marston on this phase of the waterfowl problem. The result of this combined study was a good sample of most of the important waterfowl hunting areas within the State. Prior to the hunting season a number of specimens were collected under permit and a

"school" was held in the Unit laboratory at Orono. Instructions were given in the sexing and aging technique to all of the technical men who were expected to participate in the bag checks; each man had a chance to learn the technique personally. Members of the State Federal Aid staff who participated in the study were: Nathan Fellows, Jr., Stephen Powell, John Maasen, Edgar Dangler, Kenneth Hodgdon, John Hunt, Samuel Carney, Donald Dorr, and Merwin Marston. Unit personnel who participated were: Frank Haseltine, Jim Rearden, G. C. deRoth, Harry L. Kutz, Richard Harlow, John Dudley, and Howard Mendall. Most of the data were obtained on the opening and closing days of each of the two split seasons and on each Saturday, as it was felt that these would be the days when the largest number of hunters would be out. However, several of the technical men were in the field on other days as well, so some data were obtained on almost every day of the season.

Based on observations and the results of the tabulated data obtained during the bag checks, it is likely that there was only a slightly larger kill of ducks in Maine this year than a year ago -- when it was comparatively low. Lacking specific figures on the total number of duck hunters it is difficult to be accurate on this subject but the impressions of the technical men and wardens who were in the marshes both years indicate a slight decrease in the number of hunters during the early period but a slight increase in those who were out during the late season. Hunter success data as shown in table 1 indicate a slightly higher kill per man day of hunting, although the size of the sample in 1947 may be too small to be fairly compared. In this connection the method by which these figures were computed should be explained. If a man hunted part or all of both morning and afternoon he was credited with having hunted a full day. On the other hand, if he hunted part or all of either morning or afternoon but not both he was credited with only a half day. Since some of the studies conducted elsewhere are figured on a straight man day basis, comparison of those with the present Maine data would indicate Maine hunters to be more successful than is actually the case, unless allowance is made for the method of recording.

Table 1 - Hunting Success - 1947 and 1948

	Early Season		Late Season	
	1947	1948	1947	1948
Man days of hunting	98	201	61	224
No. ducks bagged	127	342	134	512
Av. per hunting day	1.3	1.7	2.2	2.4

Crippling Loss

Crippling loss was found to be of serious concern, as was the case a year ago. In addition to the overall results, a special study was conducted in eastern Maine of hunters who were using retrievers as compared to those not using dogs. Table 2 gives the tabulation on crippling loss.

Table 2 - Crippling Loss - 1948

	No. Hunters	No. Ducks Killed	No. Cripples Lost	Loss in Percent
Without dogs (eastern Maine only)	214	366	112	31%
With dogs (eastern Maine only)	64	187	16	9%
All hunters - statewide	838	1187	302	25%

These figures show the total crippling loss to have been 25%, a figure similar to that obtained in 1947. It was of interest to note that it was highest on the opening day of the first hunting period. At this time the largest number of hunters were out, much hunting was done in thick marsh vegetation, and many novices were included among the gunners who made little effort to retrieve birds. The loss October 8 ran as high as 46 percent among one group of 104 hunters checked, and 60 percent among another group of 43 hunters.

Bag Composition

The kill by species among the hunters whose bags were checked is shown in table 3 for the two hunting periods. No sea ducks are included. Scoter and eider hunting is a specialized sport in Maine and is participated in only by a limited number of gunners around off-shore ledges. It was impractical for the technical staff to contact enough sea duck hunters to obtain a representative sample. It was believed more desirable to concentrate on the other waterfowl anyhow, since the population of eiders, old squaws, and scoters is at a high level in Maine and is not subjected to heavy hunting pressure.

Table 3 - Kill by Species - 1948

(Exclusive of Sea Ducks)

Species	No. Killed Early Season	No. Killed Late Season	No. Killed Entire Period	Percent
Black Duck	401	234	635	43.1
Green-winged Teal	226	36	262	17.8
American Goldeneye	2	135	137	9.3
Wood Duck	98	--	98	6.7
Blue-winged Teal	60	1	61	4.1
Ruddy	36	22	58	3.9
Ring-necked Duck	51	--	51	3.5
Bufflehead	2	40	42	2.9
Canada Goose	2	28	30	2.0
Pintail	20	5	25	1.7
Greater Scaup	11	10	21	1.4
Mergansers (3 species)	6	15	21	1.4
Lesser Scaup	11	3	14	0.9
Mallard	6	2	8	0.5
Shoveller	3	--	3	0.2
Baldpate	2	--	2	0.2
Canvasback	--	1	1	0.1
Barrow's Goldeneye	--	1	1	0.1
Redhead	--	1	1	0.1
European Widgeon	1	--	1	0.1
Totals	938	534	1472	100.0

The foregoing tabulation is of considerable interest and probably gives a reasonably good picture of the relative importance of most waterfowl species to Maine duck hunters. However, the percentages require qualification in the

cases of several of the species. Because of the ease of coverage, Merrymeeting Bay was sampled heavier than all other sections of the State. Therefore, the ruddy duck, Canada Goose, and green-winged teal assume greater importance than conditions throughout the entire State would warrant. For this same reason the importance, in the State as a whole, of the goldeneye, ring-necked duck, and bufflehead are minimized somewhat.

In spite of this unbalanced sampling, there is no doubt but that the green-winged teal replaced the goldeneye this year throughout Maine as the second most important species. Last year's figures showed the goldeneye in second place (22.6 percent) while the green-winged teal made up only 6.2 percent of the total bag. Weather conditions this year favored a heavy teal kill. A large number of "bluebird" days prevailed and the absence of any freeze-up kept teal in the State until the end of the December hunting period. This same mild weather kept the goldeneyes from concentrating in their usual coastal haunts; in fact many were still scattered on inland waters when the season ended.

It was interesting to note that in spite of the very small sample last year, the total proportions of the bag occupied by the black duck and wood duck were approximately the same during both years.

Sex and Age Ratios

During the bag inspections a total of 1,472 birds was examined and of this number 1,348 were sexed and aged.

When the data were tabulated and examined, it was apparent that conditions during the October season in Merrymeeting Bay were not typical for those in the rest of the State. Separate tabulations were prepared and these are presented in tables 4 and 5 for those species where a reasonable number of specimens was examined. During the late season, the pattern in Merrymeeting Bay followed much more closely that in the rest of the State and the data are combined, being shown in table 6.

Table 4 - October Season - 1948

Maine - Exclusive of Merrymeeting Bay

(Leading species only)

Species Check	Ad. ♂	Ad. ♀	Im. ♂	Im. ♀	Misc.*	Ad.-Im. Ratio	Sex Ratio Male-Female	Total
Black Duck	23	20	44	42	13	1:2	52:48	142
Wood Duck	24	10	18	13	12	1:0.9	65:35	77
Ring-neck	1	5	11	13	--	1:4	40:60	30
Bl. w. Teal	0	1	9	9	6	1:18	47:53	25
Gr. w. Teal	1	3	9	6	2	1:3.8	53:47	21
Totals (All species)	51	40	97	90	36	1:2.1	53:47	314

* Ducks where complete sex and age data were not obtained.

Table 5 - October Season - 1948

Merrymeeting Bay

(Leading species only)

Species Check	Ad. ♂	Ad. ♀	Im. ♂	Im. ♀	Misc.*	Ad.-Im. Ratio	Sex Ratio Male-Female	Total
Black Duck	108	65	47	36	3	1:0.5	61:39	259
Gr. w. Teal	47	45	61	49	3	1:1.2	53:47	205
Ruddy	4	4	19	8	1	1:3.4	66:34	36
Bl. w. Teal	10	10	9	5	1	1:0.7	56:44	35
Ring-neck	6	4	7	4	0	1:1.1	62:38	21
Wood Duck	14	3	2	1	1	1:0.2	80:20	21
Pintail	1	1	11	4	0	1:7.5	71:29	17
Totals (All species)	200	138	158	108	20	1:0.8	59:41	624

* Ducks where complete sex and age data were not obtained.

Table 6 - Late Season - Statewide - 1948

(Leading species only)

Species Check	Ad. ♂	Ad. ♀	Im. ♂	Im. ♀	Misc.*	Ad.-Im. Ratio	Sex Ratio Male-Female	Total
Black Duck	44	44	58	62	26	1:1.4	49:51	234
Goldeneye	14	17	38	36	30	1:2.4	50:50	135
Bufflehead	24	4	7	5	--	1:0.4	78:22	40
Gr. w. Teal	12	7	3	11	3	1:0.7	45:55	36
Canada Goose	5	2	11	5	5	1:2.3	70:30	28
Ruddy	2	3	14	2	1	1:3.2	76:24	22
Totals (All species)	114	82	141	129	68	1:1.4	55:45	534

* Ducks where complete sex and age data were not obtained.

A study of the foregoing data reveals several possibilities for interpretation. It does not seem wise to draw many conclusions from the 1948 data which may or may not be typical of an average year. Several of the tabulations could be viewed with concern if it were known that they were typical, especially the data from Merrymeeting Bay where far too many adults were shot in comparison with immature birds. This ratio was seriously unbalanced in the important black duck and was not satisfactorily counteracted even by the favorable ratios elsewhere in the State. The sex ratio likewise ran much more heavily to males in Merrymeeting Bay than in other areas of Maine.

Merrymeeting Bay is the largest marsh area in the State. Although primarily of fresh water it is subject to considerable tidal fluctuation and is of very little importance to breeding ducks. It is, however, an adult summer concentration area. Many adult males, and to some extent females, apparently come into Merrymeeting Bay prior to the molt from a considerable radius. Others arrive late in summer after having molted elsewhere. These large summer flocks of adults generally consist of black ducks and blue-winged teal, primarily, with lesser numbers of wood ducks, green-winged teal, ring-necked ducks, and goldeneyes. In 1948, these birds were still present in October whereas only a few migrating young birds had arrived at that time. It would seem highly desirable to conduct a comprehensive bag check for several years to see if 1948 conditions are typical, both in Merrymeeting Bay and in other parts of Maine.

A few other points are worthy of mention. Both the sex and age ratios in the case of the bufflehead are influenced by selective shooting. In areas where good bufflehead hunting was obtained, it was found by personal observations that selective shooting was an important factor, as was the case with goldeneyes a year ago. With the bag limit of only 4 birds many hunters, at good gunning stands, were shooting only at adult males. Deliberate selective shooting, however, was seldom more than a minor factor with the wood duck. In this species, the extremely heavy proportion of adult birds that were bagged may be a matter of some concern. This condition was not confined to Merrymeeting Bay but was prevalent throughout the State. It was also true in 1947. There is no logical explanation, since banding studies which the Maine Unit carried out annually for several years just prior to the hunting season showed a consistently good adult-immature ratio among wood ducks.

The 1948 bag inspection study brought to light many unanswered questions, some of which are of importance in management, and it is to be hoped this work can be continued on an intensive basis for several consecutive seasons.

Conclusions

1. Waterfowl populations in Maine during the fall of 1948 were good, with most species showing an increase over 1947.
2. Hunting conditions were somewhat improved over 1947, but largely because of unusually warm, calm weather the kill was probably only slightly higher than a year ago.
3. Excellent sea duck shooting was afforded to the limited number of hunters to whom this sport appeals.
4. Five species (black duck, green-winged teal, wood duck, blue-winged teal, and ring-necked duck) made up the bulk of the hunters' bag in October, while the black duck and the goldeneye bore the brunt of hunting pressure in the late season.
5. Goose shooting was the best in Merrymeeting Bay that it has been for several years.

WILDLIFE MANAGEMENT PLAN FOR BAXTER STATE PARK

Objectives: To conduct surveys and to prepare a plan for the management of wildlife in the park, with emphasis on game species and fur animals.

Assignment: Harold J. Dyer, Graduate Student

During the autumn, Dyer completed the write-up of his thesis under the above heading and was awarded his Master's degree. This project was initiated in 1940 but was interrupted by the war. Dyer is employed as Chief Ranger at Baxter State Park.

Copies of the thesis have been sent to the Unit Cooperators, but Dyer's summary is presented at this time:

"Baxter State Park in the Katahdin region of northern Maine is generally of mountainous terrain which rises from a comparatively flat and extensive area of forest land. The region is distinguished by the severity of its winters. The park generally coincides with the Katahdin Wildlife Sanctuary of 141,397 acres.

1. Wildlife Investigations

As the result of surveys and observations made from February 1941 to June 1942, information was assembled for basic wildlife management with special emphasis on game species and furbearers.

- a. The general abundance and forest type preferences of wildlife were determined by surveys during the critical winter months with special consideration given to moose and deer yarding conditions.
- b. Three general forest types occur on the area: (1) the extensive burn type common to the easterly half of the park, (2) the coniferous forests heavily cut-over since 1900, and (3) the virgin growth at higher elevations.

2. Type Use and Distribution in Winter

The old growth, mixed growth and softwoods were the most productive forest types. The recent cut-over stands were least suitable for wildlife. The extensive burn type was lacking in suitable browse for moose and deer, but was utilized extensively by beaver.

- a. Moose were most common in the old growth types where balsam fir, mountain maple and mountain ash provided ample food.
- b. White-tailed deer showed a preference for old growth types where northern white cedar, balsam fir and mountain maple were important as browse.
- c. Marten were concentrated in the old growth types on the higher mountain slopes.

- d. Fisher were most common along the water courses particularly on the eastern half of the park.
- e. Beaver were most abundant in the burn type.
- f. Ruffed grouse were well established throughout the area; a few spruce grouse also were observed.
- g. The snowshoe hare was the most abundant wildlife species recorded.
- h. Red foxes were well distributed in all areas.
- i. Bobcats were concentrated to some extent about the deer yards.
- j. Otter were most numerous about the deadwaters and beaver flowages.
- k. It is believed that potential caribou habitat exists on Mount Katahdin and in The Klondike.

3. Type Use and Distribution in Summer

- a. Summer habitat of moose and deer was extensive throughout, generally being in the vicinity of water.
- b. Raccoon were common particularly along the stream bottoms.
- c. Black bears were numerous.
- d. The limited area of water and marsh restricted extensive muskrat and waterfowl populations.
- e. Woodcock were most common in the burn type.

4. Management

The policy of the park is to preserve and perpetuate all species of wildlife common to the northern Maine wilderness. The objectives of wildlife management there are to instigate environmental and population controls. Whenever a species is threatened with extinction, it is intended to build up population levels of that species. It also appears desirable to re-establish species in depleted areas, and to restock former natural species wherever possible.

Management recommendations are for only those species which, in the writer's opinion, need special consideration; and for those areas in which the State has full control of the land and timber.

The management projects considered are: (1) Forest improvement, (2) Caribou restoration, (3) Re-establishment of deer yards in the Wassataquoik District, (4) Development of woodcock singing grounds, (5) Spruce grouse management, and (6) Beaver Management.

Other species, such as the moose, marten, and fisher, should benefit by the general forest improvement program."

PUBLICATIONS

A condensed version of Gashwiler's final muskrat report was accepted for publication as a bulletin of the Maine Department of Inland Fisheries and Game. This will be printed this winter.

Two special reports by Mendall entitled "Waterfowl breeding conditions in Maine - 1948" and "Woodcock census studies in northeastern states - 1948" were published in Special Scientific Report 60 of the U. S. Fish and Wildlife Service and Dominion Wildlife Service.

COOPERATION AND EDUCATIONAL WORK

Unit personnel continued to serve as technical advisors to the State's Pittman-Robertson projects. In addition the special waterfowl study (constituting much of this quarterly report) was a project sponsored jointly by the Unit and Pittman-Robertson program.

Several lectures were given by Mendall during the quarter to sportsmen's and service organizations.

Dr. Kutz conducted the Wildlife Seminar and the undergraduate courses in Conservation, and Game Management.

PERSONNEL CHANGES

The vacancy in the Assistant Leader position which has existed since August was filled by the appointment in December of one of our former Graduate Assistants, Malcolm W. Coulter. He is a war veteran with active service in Africa and Italy. His undergraduate work was in wildlife under Neil Hosley at the University of Connecticut. During his graduate work at the University of Maine he did his Master's thesis on muskrats under Gashwiler's supervision. Following this, he was Biologist with the Vermont Fish and Game Service where he served as Federal Aid Project Leader of research studies being conducted on fur animals.

Respectfully submitted,

Howard L. Mendall
Howard L. Mendall, Leader
Maine Cooperative Wildlife
Research Unit

University of Maine
Orono, Maine
January 15, 1949

(NOT FOR PUBLICATION)