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MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

University of Maine

Orono, Maine

QUARTERLY REPORT

January-March, 1958

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 - Malcolm W. Coulter  
University Representative - Gregory Baker  
Faculty Collaborators - Horace F. Quick  
                                David C. O'Meara  
Graduate Assistants - Philip U. Alkon  
                                David P. Olson  
                                William L. Robinson  
Graduate Student - Arne Krafft  
Clerk - Maxine L. Horne

NOT FOR PUBLICATION

The quarterly reports are usually statements of progress. The data presented often are incomplete and the conclusions reached may not be final. Consequently, permission to publish any of the information contained herein is withheld pending authorization from the Research Unit.

MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

Quarterly Report

January-March, 1958

RESEARCH PROJECTS

FUR ANIMAL RESEARCH

Ecology of the Fisher

Objectives: To obtain data on the distribution, habitat preferences and winter food habits of the fisher.

Assignment: Malcolm W. Coulter, Assistant Leader

Examination of the series of digestive tracts on hand was completed during the quarter. Much of the more recent study of the contents from these specimens was accomplished by graduate assistants Robinson and Alkon. Although preliminary analysis of the material has been made, some items will require further study in an effort to make more specific determinations. A tabulation that summarizes the foods found is given below. A total of 178 specimens was available. Forty-five contained insufficient material for use in the food compilations. As is often the case in specimens taken in traps, most of these contained large masses of debris, but with little or no food.

FOOD OF FISHER  
(133 Digestive Tracts)

Species	Frequency Occurrence	Frequency Per Cent
Birds	46	35
Deer	43	32
Porcupines	40	30
Hares	40	30
Shrews	29	22
Mice	25	19
Red Squirrels	18	14
Flying Squirrels	17	13
Miscellaneous Mammals	10	8
Moles	3	2
Plants	3	2
Reptiles	1	trace
Amphibians	1	trace
Crayfish	1	trace
Insects (bees)	1	trace

A detailed discussion of the foods taken by this series of fisher will not be attempted in this report. Further study will permit a more detailed outline of the food items. For example, among the bird remains found, blue jays and other song birds, grouse and owls are known to be present.

The high incidence of deer should not be cause for alarm. It undoubtedly results from feeding upon carrion. Our field studies have shown that fisher repeatedly return to carcasses. Even though little edible material remains, the animals dig about the carcasses and pick up bones, bits of skin, etc. This could result in an almost continual source of deer hair in the digestive tract of some individuals over a period of several weeks during the winter.

The break-down of foods, into the broad classifications given, does show some rather interesting points. The incidence of birds is higher than that found in most studies of carnivorous animals, including previous studies of fisher in New York and in Ontario. The high incidence of porcupines, hares, mice and squirrels might be expected. Heavy utilization of shrews, however, is unusual in most animals. The classification "miscellaneous mammals" includes raccoon, muskrat, beaver (at a time when beaver trapping was not being conducted), and gray squirrel.

Plant material was not often found in these winter specimens. It is likely that some kinds of berries as well as plant material is taken more often during summer and early autumn.

Very little field study was conducted this winter although Graduate Assistant Olson made a few trips to the Sucker Brook study area. It is anticipated that the data gathered during previous winter studies and from laboratory examination of specimens will be summarized in final form during the next few months.

Plans for next quarter: Inactive.

#### HABITAT RESEARCH

##### The Use of Aerial Photographs for Detailed Study of Marsh Vegetation in Merrymeeting Bay

- Objectives: 1. To determine the value of various kinds of aerial photographs in studying marsh vegetation.
2. To analyze the vegetative associations in Merrymeeting Bay from aerial photographs.

Assignment: David P. Olson, Graduate Assistant

All of the interpretation by the seven interpreters (discussed in the last quarterly report) has been completed, scored, and analyzed statistically. The results are based on 6,325 interpretations. Some of the analyses of minor points and that of plant transect data remains to be made.

The major findings thus far are:

1. There is no significant difference between films at any scale. However, 1:12,000 Ektacolor is better than the 1:12,000 Pancromatic, Aerecon, and Ektachrome at 9:1 odds.

2. Increase in accuracy due to scale is significant at 99:1 odds. Little difference between 1:5,000 and 1:12,000 scales was found on the first interpretations, but those of the last six interpreters have revealed a definite difference.
3. Interpreters with a knowledge of marsh ecology interpreted more correctly than those without such knowledge, regardless of prior experience in photo-interpretation.

The United States Geological Survey photographic laboratory printed the Ektacolor prints. Dr. Harold Young has been very helpful in statistical analysis of data.

The first draft of the thesis was begun.

Plans for next quarter:

1. Complete analyses of data.
2. Write thesis.

WATERFOWL RESEARCH

(a) Waterfowl Distribution and Management

Objectives: To obtain 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 breeding species, especially the black duck and the ring-necked duck.

Assignment: Howard L. Mendall, Leader

Inactive during quarter.

Plans for next quarter: Spring studies will be initiated.

(b) Renesting and Homing Study

Objectives: To study renesting behavior and the degree of migrational homing exhibited by the black duck and the ring-necked duck.

Assignment: Malcolm W. Coulter, Assistant Leader

Inactive during quarter.

Plans for next quarter: Intensive work will be conducted at the study areas in Maine and Vermont.

(c) Waterfowl Banding

Objectives: To study the movements and migration routes of waterfowl in Maine.

Assignment: Malcolm W. Coulter, Assistant Leader

Inactive, except for tabulation of band returns and of banding station repeat records. Graduate Assistant Alkon did much of the tabulating of these data.

Plans for next quarter: Inactive.

(d) Waterfowl Hunter Bag Checks

Objectives: To determine hunter success, crippling loss, and species, sex and age composition of the kill.

Assignment: Howard L. Mendall, Leader

Data gathered during the fall in cooperation with the State Game Division were tabulated and analyzed.

Fall Populations

Early departures from the breeding grounds of large numbers of ducks resulted in lower than average populations in the State at the beginning of the hunting season. A substantial influx of migrants during the latter part of October and throughout much of November, however, brought about a marked increase in the number of birds available to the gunners. Furthermore, in contrast to the situation of a year ago, most of the wintering population of black ducks, goldeneyes and greater scaups had arrived by early December.

Hunting Success

The 1957 hunting season extended from October 4 to December 12 (with the special "~~sea-duck~~" season continuing to December 31). During the bag check studies, State and Unit personnel contacted 2,121 hunters and examined 2,738 waterfowl of 19 species. This was a smaller sample than a year ago, although the scope of the study and intensity of effort were essentially the same. All sections of Maine were sampled.

Average hunter success was virtually unchanged from that of 1956. Undoubtedly it would have been considered a much more successful season had it not been for an unusually poor opening week. After mid-October, an improvement was noted, both in waterfowl populations and in weather favorable for gunning.

Hunting success, by regions, varied considerably as would be expected. In general, lower success prevailed throughout eastern Maine, both inland and coastal. There was little consistency elsewhere, with improved conditions in one area being offset by decreased hunting success nearby.

For the third consecutive year, goose shooting in Merrymeeting Bay was considered to be poor.

Crippling Loss

Figures compiled on crippling loss indicated somewhat higher mortality from this source than in 1956. It amounted to 25.8 per cent of the retrieved kill, in contrast to 22.5 per cent a year ago.

Bag Composition

The kill by species of the birds examined is given in the following tabulation:

Kill by Species - 1957  
(Exclusive of Sea Ducks)

Species	No. Birds Checked	Per Cent
Black Duck	1,236	45.1
Green-winged Teal	356	13.0
Common Goldeneye	258	9.4
Bufflehead	202	7.4
Blue-winged Teal	189	6.9
Wood Duck	185	6.8
Mergansers (3 species)	72	2.6
Ring-necked Duck	54	2.0
Mallard	45	1.6
American Widgeon	42	1.5
Pintail	35	1.3
Canada Goose	13	0.5
Ruddy	9	0.3
Barrow's Goldeneye	8	0.3
Lesser Scaup	7	0.3
Greater Scaup	7	0.3
Black x Mallard Hybrid	2	0.1
Unidentified*	18	0.6
Total	2,738	100.0

\*Chiefly birds plucked and dressed when examined.

While average hunter success showed no improvement over that of a year ago, an increased proportion of the more desirable ducks was bagged in 1957. The black duck, green-winged teal and goldeneye (all favorites of Maine gunners) registered gains in species composition. Although often regarded as a "trash duck", a substantial increase in the harvest of buffleheads was also recorded. Less abundant species, but which were taken relatively more often than a year ago, included the mallard, American widgeon, and pintail.

Most noticeable declines in the bag composition of 1957 were in the blue-winged teal, which dropped from third place in 1956 to fifth position this year; also the ring-necked duck, which was taken in fewer numbers than for several years. Other species that decreased in the 1957 bag included the wood duck, both the scaups, the ruddy and the mergansers. Fewer Canada geese were checked, but the number is meaningless because the study is not designed to adequately measure the goose kill.

#### Sex and Age Ratios

About 60 per cent of all birds examined were sexed and aged. Few changes were noted from last year, except that a higher proportion of adult males was recorded in the goldeneye, bufflehead and wood duck,

#### Sea Ducks

Hunting of the so-called sea ducks (scoters, eiders and old squaws) is a specialized sport, chiefly carried out off-shore. The bag check studies do not provide a satisfactory sample of this activity. From the limited data obtained, however, there was little doubt that excellent gunning prevailed, particularly after mid-November. Favorable weather for this sport extended throughout the entire month of December. Sea duck hunting has continued generally good for several years.

#### Conclusions

1. The 1957 waterfowl hunting season in Maine as a whole appeared to be neither better nor worse than that of 1956. Although hunting was regarded as rather poor by many gunners, it improved substantially as the season progressed. Except during the first half of October, fall populations of ducks were generally greater than a year ago. Few hunters were a-field, however, at the times when best gunning conditions prevailed,
2. A larger proportion of black ducks, green-winged teal and goldeneyes was shot in 1957 than a year ago.
3. Most noticeable declines in bag composition occurred in the blue-winged teal, the ring-necked duck and the scaups.
4. Goose hunting was unsatisfactory for the third consecutive year.
5. The good sea duck hunting that has prevailed in recent years was again evidenced in 1957.

Plans for next quarter: Inactive.

#### WOODCOCK RESEARCH

##### Woodcock Census Studies

Objectives: To conduct an annual census on the Unit's permanent census routes in Maine.

Assignment: Howard L. Mendall, Leader

In line with the transfer to the Regional Offices of the U. S. Fish and Wildlife Service, of compilation of migratory game bird inventory data, correlation of woodcock census results will be carried out in Boston this year. This is a welcome decision because handling the increasing volume of data has become a burden to Unit personnel in recent years, especially coming during the critical season of spring field work.

Mendall will continue to supervise the census studies in eastern Maine, and will assist the Game Division in planning the statewide coverage by the regional biologists.

Plans for next quarter: Conduct the spring studies on the Unit census areas in eastern Maine.

#### UPLAND GAME BIRD RESEARCH

##### Ruffed Grouse Cover Requirements and Populations

Objectives: To obtain data on preferred winter cover types and population densities.

Assignment: Howard L. Mendall, Leader

One trip was made to each of the two active study areas during early winter and again toward the last of the winter period. A marked contrast was noted, both in cover utilization and in grouse populations. These may be directly related to climatic conditions. On the first checks the birds were found primarily in open, upland covers. In late February and in March, they were nearly all in lowland, sheltered growths. Furthermore, on each study area, during the second check, less than half the number of grouse were noted in comparison to the earlier observations. Although only limited data were available, and sampling errors undoubtedly exist, it would seem that noticeable population losses had occurred.

Weather from December through March showed striking departures from the normal. Temperatures and precipitation of December and January were both considerably above average; furthermore, the precipitation was largely rain, and with freezing rain or sleet occurring often. During February and March, especially in southern and central Maine, temperatures were closer to average, although still slightly above normal. Precipitation continued above average, but, in contrast to early winter, was almost entirely snow.

In the past such a combination of warm, rainy weather during early winter, followed by deep snow in late winter (together with frequent freezing rains, sleet or wet snow) has been associated with population losses. It is in line with findings from grouse studies elsewhere, particular in Minnesota and in New York. Thus, although the current data are very limited, it may well be that more than usual grouse mortality has occurred this winter in some parts of Maine.

Plans for next quarter: Inactive.



BIG GAME RESEARCH

(a) Moose Studies in Norway

Objectives: To study the productivity and management of moose on a private forest of 80,000 acres in Romerike, Norway.

Assignment: Arne Krafft, Graduate Student

No report available as to progress on the thesis write-up.

(b) Winter Cover Studies of the White-tailed Deer

Objectives: To measure the effects of a deficiency of winter cover on penned fawn deer.

Assignment: William L. Robinson, Graduate Assistant

The study was conducted with 6 fawn deer (3 of each sex) instead of 12 as originally planned. Additional deer were not available when the study began. Details of the pens, feeding, etc., were reported in the last quarterly report.

Methods of Study:

a. Measurement of environmental conditions.

Temperature (maximum and minimum), humidity and air movement were recorded daily at stations moved about systematically within each of the three pens. Snow depth was recorded at several places in each of the pens throughout the winter.

b. Condition and activities of deer.

Activity was measured at intervals by plotting the number of tracks found along previously established grid lines after each snowfall. These data were expressed as the number of tracks per foot of line per hour.

Counts of beds and determinations of their use were also made throughout the winter. Notes about wariness were also recorded, together with a variety of miscellaneous activities that might in any way reflect the condition of the deer.

Physical condition was evaluated weekly. A check-list of characteristics including such items as visibility of ribs, smoothness of coat, thinness of neck, etc., was employed to some advantage in recording these observations. While these are of some help, it is anticipated that the post-mortem examination at the end of the experimental period will provide the best clue to differences in physical condition.

Results:

a. Environmental conditions.

Results from the measurement of environmental conditions indicate that deer in the open pen were subjected to greater daily fluctuations in temperature and also to more air movement. Snow depth was also greatest in this pen. Significant differences in humidity were not apparent.

#### b. Activities.

During the first half of the winter, most of the deer repeatedly used the same beds. By mid-winter some of the beds consisted of depressions in the snow that were as much as 18 inches deep. All deer were found to make several beds during very cold weather and fewer beds during mild weather. Differences in bedding behavior between pens are not readily apparent although they may become so with further study of the data. It was interesting to note that even during storms, deer in the open pen continued to use established beds in open sites rather than to take advantage of what little cover was afforded by the pole-stage conifers present. Activity, as indicated by track counts, was erratic and not readily explained.

Individual behavior characteristics were apparent, between deer, but not between pens. As the winter progressed some individuals became quite tame. This hampered observation of normal reactions.

#### c. Physical Condition.

Physical condition of the animals likewise showed variation between individuals, but not between pens. A more accurate assessment of physical condition will be possible at the end of this season's experiment.

#### Miscellaneous:

Three semi-domesticated fawns, received in January from the State Game Farm, were placed with a surplus adult doe in a fourth pen. These deer were used in experimenting with techniques of capture and handling. They were also used for browse palatability tests by Graduate Assistant Alkon in connection with his study of the nutritive value of hardwood tops.

An experiment with anesthetization by a nicotine salt was conducted with the cooperation and assistance of Paul Favour, Park Naturalist, Acadia National Park, Bar Harbor, Maine. A Crossman air rifle, converted to shoot pre-prepared dart capsules manufactured by the Paul Chemical Company, was used. The deer selected as a target lapsed into a helplessly cateleptoid condition for approximately 8 minutes. During this period it was possible to handle her and take measurements. Effects of this experiment were apparent in the actions of the animal for at least one week. It was decided, because of the undesirable effect on the deer, that this technique would not be used on the ~~shelter~~ experiment animals.

A technique to capture deer by use of a snare described by G. Ashcraft and D. Reese (California Fish and Game, 43:3, 1957) was also attempted. One deer was captured and released unharmed five minutes after the snare was set. Subsequent trials, however, on the experimental deer failed.

Plans for next quarter: Early in the quarter all experimental deer will be killed and autopsied. Body weight, heart girth, hind foot length, fat content of bone marrow, hematology, and parasitism will all be considered

in the evaluation of condition of the deer!

Analysis of the first winter's data will be completed and an annual P-R report submitted.

(c) A Study of Hardwood Browse for Deer

Objectives: To determine the time at which supplemental hardwood cuttings for deer should be made in order to provide the most nutritious and palatable winter food.

Assignment: Philip U. Alkon, Graduate Assistant

The 7 monthly collections of browse for use in both the chemical analyses and the laboratory mice study were completed. A total of 54 samples, 18 for each of the 3 plant species being measured (sugar maple, red maple and paper birch) was collected. Samples were obtained at the time of cutting from trees felled during September and October; also from these trees at monthly intervals through March. All other samples were collected only at the time of cutting. Each sample consisted of approximately 1 pound of twigs cut to a maximum diameter of 3/16 inch. Twigs, collected by means of modified pruning snips, were placed in plastic freezer-bags and delivered to the Maine Agricultural Experiment Station for analysis. In addition, collections of annual growth of birch were made to determine differences in the nutritional composition of such growth as compared to that of the standard twig sample.

Browse samples were chemically analyzed for moisture content, protein, fat, fiber, ash and nitrogen-free extract. Analysis of the samples obtained in March was not completed in time to be included in this report.

Throughout the 6-month period moisture content was appreciably higher in browse from the October-cut trees and those felled monthly, as compared to the trees cut in September. For all species, the September-cut browse averaged about 10 per cent lower in moisture.

Average protein content was likewise lowest in browse from the September cuttings, although the differences were small. On only 2 occasions was a difference greater than one-half per cent in protein composition shown.

Average fat content was lowest in September-cut browse, and, for the two maples, was highest in twigs from October-cut trees. Fat values ranged from 1.09 per cent to 1.76 per cent in sugar maple; 1.49 per cent to 3.08 per cent in red maple; and 5.37 per cent to 7.13 per cent in paper birch.

Differences in fiber composition were very small. The average content for the 3 species was close to 30 per cent in browse cut in October, averaging somewhat less than in the other 2 sample groups.

Ash content was highest in the fresh sugar maple; October-cut red maple, and September-cut birch. The variation in ash content for the samples of any species during a single month was small.

For both paper birch and sugar maple, average nitrogen-free extract values were highest in October-cut browse and lowest in that from September.

In red maple, October-cut browse ranked lowest and fresh material highest. Differences for all species throughout the winter were small.

These observations represent a tentative appraisal of the analysis. The results have not been subjected to statistical evaluation nor has the extent of the errors involved in the sampling and analysis procedures been determined.

Following several exploratory trials, 3 preference tests were conducted using 4 penned deer. Browse samples were tied to a portion of fence adjoining a well-used runway. The per cent of available twigs browsed was used as criteria in determining preference.

In the February tests with sugar maple, deer ignored September-cut browse and utilized both the October-cut and fresh material very lightly. With red maple, the animals preferred October-cut browse to the fresh-cut or September-cut food. Twigs from fresh and from October-cut birch were very heavily browsed, with the September material utilized less.

In March, the September-cut sugar maple twigs were browsed very lightly with the fresh-cut and October-cut samples showing somewhat heavier use. For red maple, the fresh twigs were browsed heavily, the October material moderately, and the September collections lightly. In September-cut birch, the twigs were untouched, October samples was moderately browsed, and fresh birch was very readily consumed.

Alkon, accompanied by Chester Banasiak of the Game Division, and Malcolm Coulter, visited the R. B. Jackson Memorial Laboratories and discussed various aspects of the proposed study of laboratory mice with Dr. Kenneth Fuller. Eighteen mice, 6 of each of the 3 strains suggested by Dr. Fuller, were purchased. This phase of the study will be initiated in early April.

Several conferences with University personnel were held. Dr. Harold Gausman of the Agronomy Department provided a design for the experiment with mice. Dr. Donald Tappan of the Biochemistry Department and Dr. George Kish of the Psychology Department provided facilities and suggestions for conducting those studies.

#### Plans for next quarter:

1. Continue browse preference tests with penned deer in order to determine the most satisfactory method of testing browse and to obtain more information regarding preference ratings of the plant samples.
2. Conduct studies on laboratory mice to determine which strain is suitable for testing browse and in what form the browse is acceptable.
3. To subject the completed chemical analysis to statistical examination and to determine the extent of the errors embodied in the sampling and the analysis procedures employed.

#### COOPERATION AND EDUCATIONAL WORK

Coulter and Mendall continued to furnish technical aid when requested to the State P-R program.

Assistance was given the general public in arranging for autopsies, identifying specimens, and in furnishing technical information.

Several speaking engagements were taken during the quarter by Mendall, Coulter and Quick.

Coulter supervised the wildlife seminar of Unit-Game Division personnel, with bi-weekly meetings being held throughout most of the winter.

Mendall, Coulter and O'Meara attended the Northeastern Wildlife Conference in Montreal, Canada in January. O'Meara delivered a paper at the wetlands panel. Mendall served as Vice-chairman of this panel.

Mendall attended the North American Wildlife Conference and annual Unit Leaders' meetings in St. Louis, Missouri in March. Quick also attended the general conference and delivered a paper.

Coulter, Quick and Mendall gave instruction at the State Game Warden School in Augusta.

Coulter attended the Waterfowl Technicians' meeting in Quakerstown, New Jersey in February.

#### PUBLICATIONS

Coulter, Malcolm W.

Big game and fur-bearing animals of Maine. Maine Extension Service Bulletin #425 (Revised). 32 pp.

A new waterfowl nest trap. (Accepted for publication in Bird-Banding).

O'Meara, David C.

The absence of gross symptoms in Leucocytozoon-infected pen-reared black and ring-necked ducks. (Paper delivered at 1958 Northeastern Wildlife Conference, Montreal, Canada).

Quick, Horace F.

Estimating effects of exploitation with life tables. (Paper delivered at 23rd North American Wildlife Conference, St. Louis, Missouri).

Respectfully submitted,

*Howard L. Mendall*

Howard L. Mendall, Leader  
Maine Cooperative Wildlife  
Research Unit

University of Maine  
Orono, Maine  
April 17, 1958

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University of Maine

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April-June, 1958

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(Effective July 1 - Albert D. Nutting)  
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# MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

## Quarterly Report

April-June, 1958

### RESEARCH PROJECTS

#### FUR ANIMAL RESEARCH

##### Ecology of the Fisher

Objectives: To obtain data on the distribution, habitat preferences and winter food habits of the fisher.

Assignment: Malcolm W. Coulter, Assistant Leader

No field or laboratory work was conducted during the quarter. Coulter completed a manuscript dealing with the status and distribution of the fisher in Maine.

Plans for next quarter: Inactive.

#### HABITAT RESEARCH

##### The Use of Aerial Photographs for Detailed Study of Marsh Vegetation in Merrymeeting Bay

Objectives: 1. To determine the value of various kinds of aerial photographs in studying marsh vegetation.

2. To analyze the vegetative associations in Merrymeeting Bay from aerial photographs.

Assignment: David P. Olson, Graduate Assistant

Olson completed all work on his thesis during the quarter and will be awarded the Master's degree at the August Commencement. Copies of the thesis will be sent to the Unit cooperating agencies as soon as they are returned from the binder. The thesis summary and conclusions are as follows:

Aerial photographs of marsh habitat in Merrymeeting Bay, Maine, were studied to determine the kind of information relative to marsh vegetation that could be obtained from them, and also to determine the accuracy of the photographic interpretation. Four films were exposed at 3 altitudes over the same section of the marsh. On the basis of the photographic images, the vegetation on the study area was classified into 11 types: wildrice, river bulrush, round stem bulrush, yellow waterlily, pickerel weed, sweetflag, three-square bulrush, submersed aquatics, mixtures of the above, sand, silt, and high tide zone. Eighty areas representing all of these types were selected for interpretation tests. Each area was identified on the ground and accurately located on the aerial photography. Seven individuals, representing 4 levels of photo interpretation experience and/or experience in marshes, interpreted the 80 areas on the aerial photographs. The photo

interpretations were compared with the ground identifications. The most important of the results were analysed statistically. The following conclusions may be deduced from this study:

1. The testing procedure appeared to be satisfactory for evaluating film, scales, and interpreters. It also seemed adequate for the classifications of vegetation with the exception of three-square bulrush.
2. The classes of vegetation, recognizable on the aerial photographs, are similar to the plant associations that can be recognized on the ground with the exception of plants which usually grow in sparse stands.
3. There were no differences between the relative accuracies of interpretations on the 4 film materials.
4. With each increase in the scale of photography, an increase in accuracy of interpretation was obtained. The increase (10 per cent) between scales of 1:20,000 and 1:12,000 was larger than the increase (5 per cent) observed between the scales of 1:12,000 and 1:5,000.
5. Biologists who have had experience in ecology of marshes, even though lacking prior training in photo interpretation, were able to interpret aerial photographs of marshes more accurately than experienced photo interpreters who had no experience in marshes.
6. Training in the satisfactory use of the stereoscope can be accomplished in 2 hours or less. Likewise, only 3 to 10 hours of practice in the identification of images on aerial photography (provided training aids and/or instruction are available) will permit interpretation of such aerial photographs with a relative high degree of accuracy.
7. The images produced on aerial photographs result as much from the physical structure of the plant or stand of vegetation as they do from the color or tone of the plants.
8. Density of the marsh vegetation could not be interpreted accurately from the photographs, regardless of scale.
9. Mixtures of vegetation were interpreted with less accuracy than were pure stands.
10. Photographic penetration of water was less than 2 feet with the film materials used.
11. Aerial photographs are a useful means of studying marshes. In addition to recognizing the general types of marsh vegetation and the broad ecological zones, many plant species and associations can be recognized with a reasonable degree of accuracy.

Plans for next quarter: None. This project is now completed.



## WATERFOWL RESEARCH

### (a) Waterfowl Distribution and Management

Objectives: To obtain 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 breeding species, especially the black duck and the ring-necked duck.

Assignment: Howard L. Mendall, Leader

The regular seasonal studies were conducted throughout the spring and summer. Mendall's annual status report (as of July 15) is reproduced at this time:

This report summarizes the results, to date, of 1958 waterfowl breeding ground studies in northern, eastern and central Maine. These investigations were conducted by the staff of the Maine Cooperative Wildlife Research Unit under the supervision of the writer.

This is the 20th consecutive year of these studies. Techniques were the same as in previous years. Coverage was reduced, however, by about 25 per cent from last year because of limitations in man-power and pressure of necessary work on other projects.

### Breeding Populations

Initial breeding stock showed little overall change this year on the study areas. This follows a definite increase a year ago; thus, populations as a whole are reasonably satisfactory. Most noticeable increase in 1958 was with the black duck. The only species showing a decline was the ring-necked duck.

Results of breeding pair counts or estimates are summarized as follows:

<u>Species</u>	<u>Status in 1958</u>
(Measured on census areas)	
Black Duck	8% increase
Wood Duck	No change
Ring-necked Duck	9% decrease
(Estimated)	
Green-winged Teal	Slight increase
Blue-winged Teal	No change
Common Goldeneye	No change

### General Breeding Conditions

From the standpoint of phenology and climatic conditions, the 1958 season has been very retarded. The growing season currently is some two weeks behind average. A very early break-up of ice and abnormally warm weather in late March and the first half of April resulted in early migration

and an advance in nesting chronology. However, this ended abruptly the third week of April. Thereafter, unseasonably cool weather, a minimum of sunshine, and frequent heavy rainfalls have prevailed. Water levels have remained high, with flood levels during late April and early May.

The foregoing conditions have resulted in a very prolonged nesting season. A few remarkably early nesting records were obtained but these were the exception, especially among the normally early nesters (black duck, goldeneye, wood duck). Later breeders such as the ring-necked duck and the two teals were closer to schedule. In fact ring-neck hatching peaks were advanced by a few days from average, although about a week behind the 1957 schedule. The black duck peak was retarded by several days from the 20-year average and was about 10 days later than a year ago.

#### Nesting Success

Because of restricted coverage this year, a smaller than usual sample of nests was available. A total of 38 was kept under observation, all but one of which were nests of either the black duck or the ring-neck. At present, a few (late renests) are still being incubated. Of the remainder, hatching success is considerably below average - only slightly over 50 per cent. Predation by crows and raccoons has been greater than usual. Also a rather heavy proportion of early nests were presumed lost during the floods of late April and early May. These occurred, however, early enough to permit extensive renesting.

#### The Brood Season

Because of the retarded and prolonged nesting season, only 42 complete and aged broods had been recorded at the time of this writing. These data are shown in table 1. Average sizes are higher than those of a year ago. Moreover, excellent rearing conditions prevail on the marshes of the State, and are likely to continue. Even a drought during the remainder of the summer cannot reduce water levels for broods to a dangerous point. Therefore, rearing success can be expected to be comparatively high.

#### Conclusions

1. Initial breeding populations were similar to those of 1957.
2. The breeding season is considerably retarded and prolonged in comparison with 1957.
3. Nesting success is below both the long term average and that of 1957.
4. Rearing success is currently running slightly above that of 1957 as well as the long term average.
5. Considering similar breeding populations, decreased nesting success, but increased rearing success, it may be expected that ultimate production in 1958 will not show a significant change from that of 1957.

Table 1

Average Brood Sizes by Age Classes  
(Complete counts only, as of July 15, 1958)

Species	Total	Class I		Class II		Class III	
	Broods	Broods	Av. Size	Broods	Av. Size	Broods	Av. Size
Black Duck	29	18	8.3	8	7.5	3	5.3
Ring-necked Duck	8	7	7.1	1	8.0		
Wood Duck	2	2	9.0				
Blue-winged Teal	1	1	12.0				
Green-winged Teal	1	1	9.0				
Common Merganser	1	1	6.0				
Totals	42	30	8.1	9	7.6	3	5.3

Plans for next quarter: The nesting and brood studies will be continued through August.

(b) Renesting and Homing Study

Objectives: To study renesting behavior and the degree of migrational homing exhibited by the black duck and the ring-necked duck.

Assignment: Malcolm W. Coulter, Assistant Leader

Intensive field work on this project was resumed during late April when the first black ducks begin to incubate their clutches. Study was again conducted on three areas in Maine as well as on a series of islands in Lake Champlain, Vermont. Graduate Assistants Robinson and Alkon conducted much of the work on the Goose River study area near Belfast, Maine. The work in Vermont was carried out by Coulter and by William Miller of the Vermont Fish and Game Service. As was the case last year, the supplemental study in Vermont was very productive because of the high densities of nesting ducks on small islands.

Techniques were essentially the same as in 1957, i.e., nesting hens were trapped at their nests, banded, color-marked and released. Eggs thus obtained were placed in incubators and the young reared for release on the study areas.

Much effort was devoted to locating renests of the marked hens. Results to date have been gratifying. Because the season's work will not be complete until mid-summer only highlights of the quarter's progress will be reported at this time:

1. Field tests with a new paint (Day Glo, Type B - a quick drying showcard spray paint) indicates that use of this material has some promise for improving the markings applied to trapped hens.

2. A total of 41 nesting hens (28 black ducks, 6 mallards, 6 ring-necked ducks and 1 red-breasted merganser) were trapped, banded and marked. The eggs from most of these nests were collected and placed in incubators.

3. Fifteen of the marked birds (10 black ducks and 5 mallards) had been found renesting by late June. These nests have been left to hatch naturally.

4. Approximately 250 ducklings, hatched in incubators, are being reared for release on the study areas.

5. The return of hand-reared ducklings, released on the study areas last year, has been very low. By comparison a higher return was obtained of adult hens nesting in the same areas where they were trapped last year.

Plans for next quarter: Continue the field work until the close of the nesting season.

#### (c) Waterfowl Banding

Objectives: To study the movements and migration routes of waterfowl in Maine.

Assignment: Malcolm W. Coulter, Assistant Leader

Inactive except for limited work in connection with the renesting study.

Plans for next quarter: Largely inactive.

#### (d) Waterfowl Hunter Bag Checks

Objectives: To determine hunter success, crippling loss, and species, sex and age composition of the kill.

Assignment: Howard L. Mendall, Leader

Inactive during quarter.

Plans for next quarter: Inactive.

### WOODCOCK RESEARCH

#### Woodcock Census Studies

Objectives: To conduct an annual census on the Unit's permanent census routes in Maine.

Assignment: Howard L. Mendall, Leader

Spring studies were conducted on the Unit census areas in eastern Maine.

Assistance was given by John M. Dudley and Louis Beckett of Calais and by personnel of the Moosehorn National Wildlife Refuge. Mendall tabulated, as well, the census results for Maine as obtained by the State Regional Biologists and other cooperators.

At the request of the Fish and Wildlife Service, coverage in the State was reduced this year to bring the volume of data more in line with that from other states, thus permitting better comparisons.

A total of 52 routes were run in Maine this year, in contrast to 84 a year ago. Results of the census showed virtually no change from the measured population of 1957. Comparative figures, obtained only from the routes covered in both years are as follows:

Year	Total stops all routes	Total birds all routes	Av. No. birds per stop per route
1957	876	875	1.00
1958	818	809	0.99

No significant variation, geographically, was noted from the data although there were many local changes. In general there was a tendency, in 1958, for routes in lowland covers to show decreases, with corresponding increased usage of the upland covers. This is logical in view of the excessive precipitation throughout the spring, which resulted in flooded covers in many lowland areas adjacent to streams and brooks.

Plans for next quarter: Inactive.

#### UPLAND GAME BIRD RESEARCH

##### Ruffed Grouse Cover Requirements and Populations

Objectives: To obtain data on preferred winter cover types and population densities.

Assignment: Howard L. Mendall, Leader

Inactive during quarter.

Plans for next quarter: Inactive.

#### BIG GAME RESEARCH

##### (a) Moose Studies in Norway

Objectives: To study the productivity and management of moose on a private forest of 80,000 acres in Romerike, Norway.

Assignment: Arne Krafft, Graduate Student

During the last of the quarter, Krafft was able to resume work on his

thesis write-up.

Plans for next quarter: To continue work on the thesis.

(b) Winter Cover Studies of the White-tailed Deer

Objectives: To measure the effects of a deficiency of winter cover on penned fawn deer.

Assignment: William L. Robinson, Graduate Assistant

The first season's study was concluded during the quarter. Robinson's summary report is as follows:

In early April the first winter's study was terminated with the killing and autopsy of the six experimental fawns. Milton Friend, wildlife student and expert rifleman, shot the animals and Dr. J. F. Witter of the Department of Animal Pathology supervised the autopsies. Measurements that were made at the beginning of the experiment (weight, hind foot length, heart girth) were duplicated and blood samples were taken. In addition, observations on visceral fat, analysis of fat content of bone marrow, and examination for internal parasites were made.

(For convenience reference to pens shall be as follows: open cover -- Pen O; moderate cover -- Pen M; and dense cover -- Pen D).

Body weight changes, when considered by pens, were practically negligible. This was probably a result of the diet being in excess of the desired level for this study. It was found that, in general, the heavier deer at the beginning of the experiment lost the most weight, while the lighter animals maintained their weight or even gained slightly.

Measurements of hind foot length supplied an indicator of skeletal growth during the winter. The hind foot of all deer grew at least 0.5 inches. In Pen O growths of .5 and 1.25 inches were recorded, in Pen M 1.0 and .5 inches, and the hind foot of the buck in Pen D grew .75 inches. Measurement of the hind foot of the doe in Pen D was overlooked in April.

Condition of an animal is possibly best expressed as a weight: height ratio, or the relationship of size of frame to the amount of weight carried upon it. A comparison between hind foot length and body weight was attempted. An index resulted from dividing body weight by hind foot length. This index is positively correlated with condition of the animal: As condition gets poorer, the index number expressing condition becomes smaller.

Change in the condition index was more important than final condition alone. The doe in Pen M experienced the greatest negative change in condition (-.51), probably a result of the buck's aggressiveness in feeding. The buck apparently improved his condition. The respective total changes in condition of the deer in Pens O and M were similar. Because of great individual variation, and the lack of a pronounced differentiation in condition between pens, no positive results could be determined.

Heart girth measurement, although by nature only a rough observation, corresponded with body weight measurements, although not in close proportion, when examined on an individual deer basis. In no case was a loss in body weight accompanied by a gain in heart girth or vice versa.

During the autopsy, observations were made of the presence and amount of visceral fat. Only two deer, the females in Pens O and M, had visceral fat. This was present about the heart and kidneys. A correlation between this and weight loss or the condition index was not apparent.

Bone marrow fat content showed great individual variation, with the lowest percentage (12.72%) fat evident in the doe in Pen D, while the buck in the same pen had the highest percentage (76.00%). The averages of the three pens were strikingly similar, ranging from 39.61 per cent fat in Pen O to 44.36 per cent in Pen D.

The percentage of moisture in the bone marrow was, as could be expected, inversely related to the fat content, and the same relationship between pens was shown.

#### Blood

Because of the difficulty with which blood samples were obtained and the great strain on the animals at the time of sampling, results of blood chemistry were not conclusive. Examination of the data disclosed that no differences in blood chemistry related to the deer's winter exposure were evident.

The amount of glucose present was greater for all except one deer in April than in December. The deer in December had been transported in crates for several hours before the blood samples were taken, and exhaustion may have caused a low glucose content at that time.

Extreme individual variations in calcium and phosphorus values rendered interpretation of the small samples impossible. No definite trends between pens could be noted.

#### Parasites

Incidence of nasal bots (Cephanomyia sp.) in all experimental deer was observed. The heaviest infestation was found in the buck in Pen D. Thirty-nine larvae were extracted from his nasal passages. All other deer had moderate to heavy infestations. During the winter this deer frequently shook his head as if an ear was bothering him. He also was often observed to suddenly make headlong dashes for several yards as if he had been stung by a wasp. It is quite probable that the heavy nasal bot infestation was responsible for this unusual behavior. Dr. Witter believes that the presence of large numbers of these grubs may have an adverse effect on the health of the host.

Examinations of rumens and feces for stomach worms showed only a few worms present in the stomachs of all but one animal, which had none. Incidence of stomach worms at such a low level probably had negligible effect upon the hosts.

\*\*\*\*\*

In conclusion, no apparent effects of deficient winter shelter were demonstrated, either in condition or behavior of the fawns, under the circumstances of the experiment during the winter of 1957-1958.

Several recommendations for next year's study were made in the hope of obtaining more conclusive results. These are as follows:

1. Eliminate all spruce in pens within reach of deer, as some browsing on spruce was noted.
2. Make an effort to obtain and install scales that weigh deer regularly at the feeder.
3. Use four deer per pen instead of two.
4. Obtain deer earlier in winter, preferably in November.
5. Reduce daily feed rations to approximately one-half of 1957-1958 rations.
6. Continue observations of weather, with improvement in measuring chilling effect by use of thermometer in liquid exposed to elements in pens for a given time interval.
7. Continue observations on activity and physical condition.
8. Conduct autopsies in mid-March rather than in April.

Plans for next quarter: Make browse cuttings in pens, attempt to procure satisfactory scales, and arrange for acquisition of fawns.

#### (c) A Study of Hardwood Browse for Deer

Objectives: To determine the time at which supplemental hardwood cuttings for deer should be made in order to provide the most nutritious and palatable winter food.

Assignment: Philip U. Alkon, Graduate Assistant

During the quarter the analysis of browse samples collected in March was completed, thus terminating this phase of the study until September when collections will be resumed. Another preference test was carried out, and a series of feeding tests with mice was conducted.

Major findings of the analysis of browse samples collected monthly from September through February have been presented in previous reports. It was found that, with the exception of moisture content, differences in the chemical composition of browse from September-cut, October-cut, and fresh-cut trees were small. Moisture content was appreciably higher in fresh- and October-cut samples as compared to those from trees felled in September. These tentative findings were substantiated by analysis of samples collected in March.

One trend, however, seems worthy of mention. In March, October-cut sugar maple, fresh- and October-cut red maple, and fresh-cut paper birch



showed a significant decrease in fiber composition (per cent of dry weight) with, or as a result of, a corresponding increase in nitrogen-free extract. A sharp rise in fat and/or ash content was also shown for these samples.

A third test to determine the palatability value of browse samples was carried out by means of four penned deer. Twigs collected in April from trees of sugar maple and paper birch felled in September, October and April were offered during a three week interval to determine preference ratings for samples exposed for a relatively long period of time. In addition, all samples of birch were offered in a single bundle to ascertain if preferences would be exhibited for samples prepared in such a manner.

As was shown in previous tests, browse from September-cut trees received the lightest use. Fresh-cut samples were preferred to October-cut twigs of sugar maple. This was also true for paper birch where the deer exhibited decided preferences despite the fact that all samples were offered in a single bundle.

A series of feeding tests were conducted with mice to determine their value as subjects for reflecting differences in the nutritional value of browse samples. Males and females of three strains, suggested by personnel of the R. B. Jackson Memorial Laboratory as being particularly suited for nutritional tests, were used. In four tests the animals were offered ground, air-dried browse alone, and supplemented with non-nutritive sweetening solution or corn oil. The mice refused to accept the browse regardless of its preparation. Several animals starved during the testing program and all exhibited considerable weight losses in each test. It was concluded that mice are unsatisfactory subjects for feeding tests with browse.

#### Plans for next quarter:

1. Conduct pilot feeding tests with rats and, if these animals prove more satisfactory than did mice, carry out the full scale browse feeding experiment.
2. Make preparations for the second annual collection program to be initiated in September.
3. Select a site for preference tests to be conducted around a known yarding area.

#### COOPERATION AND EDUCATIONAL WORK

Coulter and Mendall continued to furnish technical aid when requested to the State P-R program.

Assistance was given the general public in arranging for autopsies, identifying specimens, and in furnishing technical information.

Several speaking engagements were taken during the quarter by Mendall, Coulter and Quick.

Coulter supervised the wildlife seminar of Unit-Game Division personnel, with bi-weekly meetings being held throughout the early spring.

Coulter, Robinson and Alkon together with J. William Peppard and Myron Smart of the Game Division, Department of Inland Fisheries and Game, devoted much time during June to the preparation of lectures and exhibits for the Boy Scout Camp-o-rama to be held in the first week of July. Wildlife exhibits for this program are being sponsored jointly by the Unit and the State Game Division. It is expected that 2,000 boys will be enrolled.

#### PUBLICATIONS

Mendall, Howard L.

1958. The ring-necked duck in the northeast. Maine Studies, No. 73, University of Maine Bulletin, Vol. 60, No. 16, 317 pp.

A manuscript by Coulter on the distribution, food and weights of the snapping turtle in Maine has been accepted for publication in the Maine Field Naturalist.

Coulter and Mendall completed the revision of Extension Bulletin 443 (Game Birds of Maine) which is to be reprinted by the University of Maine Agricultural Extension Service.

#### NEW PROJECTS

A new project will be initiated during the coming fiscal year dealing with experimental marsh management in a variety of habitat types. This will permit the Unit to test, on a small scale, several promising ideas and techniques that have been developed during several years of detailed studies of the behavior and requirements of nesting waterfowl. This is to be conducted as a joint Unit-Game Division study. During the quarter several conferences relative to preliminary details of the project were held with Howard Spencer, Jr., State Waterfowl Project Leader; W. Russell DeGarmo, Chief of the Game Division; and with Commissioner Roland H. Cobb.

With completion of the ring-necked duck publication, sub-project (a), Waterfowl Distribution and Management has been reduced in scope; some of the management aspects will be included in the new project just described.

#### PERSONNEL CHANGES

With the appointment of a Director of the School of Forestry, Professor Gregory Baker (who has been acting in this capacity since Professor Ashman's retirement) terminated his duties as University Representative to the Unit. His many services and assistance during the past year are greatly appreciated. The new Director is Professor Albert D. Nutting, former Commissioner of the State Forestry Department. Professor Nutting has long been associated with the forestry program in Maine, having served as Extension Forester at the University of Maine prior to his several terms as Commissioner.

Graduate Assistant Olson completed all Unit duties in June and is now conducting research at the Delta Waterfowl Station in Manitoba. He will continue graduate studies this fall at the University of Minnesota, working toward a Doctorate.

Respectfully submitted,

*Howard L. Mendall*

Howard L. Mendall, Leader  
Maine Cooperative Wildlife  
Research Unit

University of Maine  
Orono, Maine  
August 28, 1958

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MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

University of Maine

Orono, Maine

QUARTERLY REPORT

July-September, 1958

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 - Malcolm W. Coulter  
University Representative - Albert D. Nutting  
Faculty Collaborators - Horace F. Quick  
David C. O'Meara  
Graduate Assistants - Philip U. Alken  
Fred E. Hartman  
William L. Robinsen  
Graduate Student - Arne Krafft  
Clerk - Maxine L. Horne

NOT FOR PUBLICATION

The quarterly reports are usually statements of progress. The data presented often are incomplete and the conclusions reached may not be final. Consequently, permission to publish any of the information contained herein is withheld pending authorization from the Research Unit.

MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

Quarterly Report

July-September, 1958

RESEARCH PROJECTS

FUR ANIMAL RESEARCH

Ecology of the Fisher

Objectives: To obtain data on the distribution, habitat preferences and winter food habits of the fisher.

Assignment: Malcolm W. Coulter, Assistant Leader

Inactive during quarter.

Plans for next quarter: Complete the study of bird remains found during previous food habits examination.

WATERFOWL RESEARCH

(a) Waterfowl Distribution and Management

Objectives: To obtain 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 breeding species, especially the black duck and the ring-necked duck.

Assignment: Howard L. Mendall, Leader

During August, the season's breeding and production studies were completed. In the last quarterly report the findings were summarized as of July 15. It will be recalled that the annual census showed little change in breeding stock from 1957. Nesting and brood studies were, at that time, still incomplete, especially the latter; tentative conclusions were that nesting success was below that of 1957, while rearing success was slightly above last year.

Field work during late July and August indicated relatively no change from the predictions that overall production in 1958 would be virtually the same as in 1957. However, minor changes in comparative breeding success were found. Several late renests of both the ring-necked duck and the black duck were successful, thus raising the figure for total hatching success to 56 per cent, approximately the same as a year ago. This figure is still below the long-term average. Since these observed renests (and others not located but based upon brood findings) resulted in decreased clutches, the final compilations of brood averages were slightly lower than anticipated. These revised figures were close to the 1957 findings, especially for the important Class II and Class III ages.

In Table 1, data are presented for all nests that were kept under observation. This excludes nests used during the renesting and homing studies (sub-project "b"); also several nests found in Merrymeeting Bay are not included, since a special predation problem exists there that is not typical of conditions in the State as a whole.

Table 1. 1958 Nesting Success

Species	No. Found	Hatched	Failed	Percent Hatched
Ring-necked Duck	23	13	10	57
Black Duck	14	7	7	50
Wood Duck	1	1	--	100
Green-winged Teal	1	1	--	100
Total	39	22	17	56

Most nest losses were occasioned by crows, ravens, raccoons and minks. In general avian predation was highest on the ring-neck, with the majority of black duck losses charged to mammals.

Average sizes of broods are given in Table 2.

Table 2. Average Brood Sizes by Age Classes - 1958  
(Complete counts only)

Species	Total Broods	Class I		Class II		Class III	
		Broods	Av. Size	Broods	Av. Size	Broods	Av. Size
Black Duck	38	18	8.3	10	7.5	10	5.8
Ring-necked Duck	23	14	7.2	5	6.1	4	6.0
Wood Duck	5	2	9.0	3	4.7	--	--
Blue-winged Teal	3	1	12.0	--	--	2	6.0
Common Merganser	2	1	6.0	--	--	1	6.0
Green-winged Teal	1	1	9.0	--	--	--	--
Common Goldeneye	1	--	--	1	6.0	--	--
Totals	73	37	8.0	19	6.6	17	5.9

As mentioned in the April-June report, the nesting season was both retarded and prolonged. Several July hatchings of black ducks and August hatchings of ring-necked ducks were recorded on the study areas. A very

remarkable black duck hatch in the lower St. John Valley of New Brunswick was estimated to have occurred approximately August 10.

In spite of the foregoing, there were, of course, numerous early hatches of all species. Flying young of several species had been recorded by early August; by the end of that month many birds were already leaving the smaller breeding marshes, while populations were beginning to build up at the larger concentration points and in Merrymeeting Bay.

Plans for next quarter: The usual fall population data will be obtained in conjunction with the hunter bag checks (sub-project "d").

#### (b) Renesting and Homing Study

**Objectives:** To study renesting behavior and the degree of migrational homing exhibited by the black duck and the ring-necked duck, and, to a limited extent, by the mallard.

**Assignment:** Malcolm W. Coulter, Assistant Leader and William Miller, Waterfowl Project Leader, Vermont Fish and Game Service

The season's field work was completed during late August. Study techniques were essentially the same as those used last year, i.e., hens were trapped, marked, banded and released at their first (or early) nests. The nest was "destroyed" by removing the eggs for subsequent hatching in incubators. An effort was made to study the behavior of the hens to gather data about renesting activities.

A total of 18 instances of renesting was observed and studied. These included renests of 10 black ducks and 5 mallards, and the discovery of 3 marked ring-necked duck hens with broods. Adverse water levels and a decreased population on the principal ring-neck study area resulted in fewer renest records than usual for that species.

The data for all species, when combined with those from 1956 and 1957 provide information relative to 31 instances of renesting. This represents approximately 40 per cent of all females that have been marked during the study. Thus, to date, at least 4 of every 10 hens whose first nest has been destroyed has renested. Since there can be little question that some cases of renesting are not discovered, it is likely that at least 50 or 60 per cent of all nests destroyed were followed by second nesting attempts. Although our data are still too few to permit definite conclusions, a progressive decline in renesting seems evident among nests destroyed in succeeding stages of incubation.

There also appear to be differences in the persistence of renesting between species. To date, among the three species studied, the mallard has been the most persistent renester. Two-thirds of the mallards trapped have been known to renest.

Homing, among hand-reared juvenile birds, has been very low. Although a higher return of adults to nest in the same area has been found, this too has been rather low, especially with the black duck. However, in some

instances the same hen has been known to return to nest in the same area for as long as 4 years.

During the quarter all hand-reared ducklings were released at the study areas. Hatching and rearing success for the birds handled in Maine was high. Ninety-three ducklings were released when 4 1/2 to 6 weeks old. Approximately 175 black ducks and mallards were reared and released in Vermont as a result of the joint studies there.

All data gathered thus far have been tabulated and studied, although at least another season's data will be needed before definite conclusions can be made.

Plans for next quarter: Inactive.

(c) Waterfowl Banding

Objectives: To study the movements and migration routes of waterfowl in Maine.

Assignment: Malcolm W. Coulter, Assistant Leader

Tabulation of recoveries and of repeat data was continued by Graduate Assistant Alkon. No summer banding program was conducted.

Plans for next quarter: Continue tabulation of recoveries and repeat data.

(d) Waterfowl Hunter Bag Checks

Objectives: To determine hunter success, crippling loss, and species, sex and age composition of the kill.

Assignment: Howard L. Mendall, Leader

Inactive during quarter.

Plans for next quarter: Hunter bag checks will be conducted in cooperation with State Game Division personnel. The work will be on a curtailed, "spot-check" basis this fall, pending the 10-year analysis of accumulated data. It is hoped that this analysis can be accomplished this winter.

WOODCOCK RESEARCH

Woodcock Census Studies

Objectives: To conduct an annual census on the Unit's permanent census routes in Maine.

Assignment: Howard L. Mendall, Leader

Inactive during quarter.

Plans for next quarter: Inactive.



## UPLAND GAME BIRD RESEARCH

### Ruffed Grouse Cover Requirements and Populations

Objectives: To obtain data on preferred winter cover types and population densities.

Assignment: Howard L. Mendall, Leader

Inactive during quarter.

Plans for next quarter: Inactive.

## BIG GAME RESEARCH

### (a) Moose Studies in Norway

Objectives: To study the productivity and management of moose on a private forest of 80,000 acres in Romerike, Norway.

Assignment: Arne Krafft, Graduate Student

Krafft continued work on his thesis and submitted portions of it for review.

Plans for next quarter: Continue work on thesis write-up.

### (b) Winter Cover Studies of the White-tailed Deer

Objectives: To measure the effects of a deficiency of winter cover on penned fawn deer.

Assignment: William L. Robinson, Graduate Assistant

This is the second year of this study. During the summer work was restricted to basic aspects: reviewing pertinent literature, corresponding with other deer research personnel, and formulating plans for the coming winter's study. A few conferences with John Gill of the State Game Division were held regarding the acquisition this fall of experimental fawns. In August all potential browse, including spruce, was cut in Pen O (open cover), and in September most of the browse in Pen M (moderate cover) was cut.

Also during the summer a pellet group count in the enclosures was made. Although this was not specifically connected with the shelter requirement project, it was felt that an opportunity to make such counts under the controlled conditions of the experiment should not be overlooked. The objective was to determine the average number of pellet groups that a deer voids per day.

Methods used were essentially the sampling based upon the suggestions of Robinette, Ferguson, and Gashwiler, Problems Involved in the Use of Deer Pellet Group Counts, Trans. 23rd N. A. Wildl. Conf., 1958), with the

exception that square plots were used. The sampling units were transects consisting of three 6 x 6 foot plots. Each transect was 30 feet long by 6 feet wide with two 6 x 6 foot segments omitted.

Stratified random sampling was employed with two strata defined: (1) a strip 6 feet wide along the inside perimeter of the fence, and (2) the remainder of the enclosure. Stratification was necessary to account for the great difference in deer use between the two areas, the one along the fence being used heavily and regularly, with the interior of the pen being used more or less randomly by the animals.

Data were calculated and statistically analysed on a transect basis (as suggested by Robinette, Ferguson, and Gashwiler, op. cit.); and also, for purposes of comparison, on an individual plot basis. Results were as follows:

Pen	Mean (Groups/deer/day)	Standard Error (80% Confidence)	
		By Plots	By Transects
O (Open Cover)	9.06	± 2.13	± 2.28
M (Moderate Cover)	6.35	± 1.35	± 3.08
D (Dense Cover)	9.98	± 2.06	± 2.06

These results may be deemed unusual for two reasons: (1) the average number of pellet groups per deer per day appears to be lower than that found by other authors, (although not greatly lower than the rate found for fawns by Eberhardt and Van Etten [Evaluation of the Pellet Group Count as a Deer Census Method, J. Wildl. Mgt., 20, 1956]); and (2) the standard error is not, ~~as would be expected,~~ greater when considered on a transect basis than when computed from the individual plot data.

The irregular results appear to be explainable. The low average of groups per day results from a low total pellet group count. The high deer density (1 deer per 0.75 acres) resulted in pellets being trampled into the ground and lost; also the time of the count may have been too late to avoid missing groups that had disintegrated or those that had been carried off by small mammals or devoured by insects.

The difference in standard error between the two methods resulted from too few plots being included in each transect, thereby not lessening the variation between transects sufficiently to off-set the disadvantage of the reduced number of samples that resulted from combining plots into transects.

Plans for next quarter:

1. To complete the elimination of all available browse from the pens, including marginal species such as spruce.

2. To organize the details connected with the winter study including testing and installing meteorological equipment.
3. To receive, test and distribute to the proper pens the experimental deer.
4. To attempt a fall pellet group count.

(c) A Study of Hardwood Browse for Deer

Objectives: To determine the time at which supplemental hardwood cuttings for deer should be made in order to provide the most nutritious and palatable winter food.

Assignment: Philip U. Alkon, Graduate Assistant

During the quarter the following preparations were made for the second season of the study:

A series of three feeding tests was carried out to determine the value of albino rats as subjects for testing differences in the nutritional value of browse. Five animals were offered ground, air-dried browse alone and variously supplemented. It was found that the animals accepted browse supplemented with non-nutritive sweetening solution. Consequently, 65, seven to nine week-old albino rats, scheduled to arrive in October, were ordered. These animals will be used in a full scale experiment to test browse samples collected during the previous fall and winter.

\* Sixty-five animal cages and two mobile stands for supporting the cages were constructed and a variety of equipment for watering and feeding the rats was obtained. Arrangements were made with Dr. Radke, Head of the Department of Biochemistry, for housing the rats in the Department animal room.

With the cooperation of Director Nutting and Dr. Griffin of the Forestry School, a five acre area within the University of Maine Forest was selected as the site for this year's collection program. A total of 95 trees of each of the three study species (red maple, sugar maple and paper birch) were marked for cutting during the period September through March. The same collection plan followed last year will be repeated during the current season; browse samples from the tops of trees felled in September and October will be collected at the time of cutting every month thereafter. Samples will be obtained from trees cut during the months of November through March only at the time these trees are felled. An aluminum tag coded as to indicate species, month of cutting and individual tree number was affixed to each tree. In addition, the trees were marked with bands of yellow timber-marking paint. Approximately two pounds of material will be collected for each browse sample. This represents an increase in size of sample as compared to last year's collection and is based on the estimated amount of browse necessary to conduct a feeding experiment with rats as subjects.

During the latter part of September, the first set of browse samples was collected and delivered to the Maine Agricultural Experiment Station for analysis.

Preparations were made for conducting a preference experiment around a known yarding area. The Lower Ship Pond yard near Willimantic, Maine was selected as the study site. Within this yard, which is located on property of the Penobscot Development Company, deer management practises are being conducted under recommendations of the Department of Inland Fisheries and Game. The following procedure will be used in the preference study:

1. Eleven trees of each species will be felled on two separate locations and the tops made available for browsing. On each site three trees of each species will be felled during the months of September and October and one during each of the months of November through March.

2. Preferences will be determined by comparing the number of twigs browsed to the total available twigs. The tops of those trees felled in September and October will be inspected monthly through March. Portions of trees cut in preceding months will be checked only once following a 30-day period of exposure.

3. Results will be statistically evaluated. Two "sets" of trees are used to obtain a replication of data. Dr. Gausman of the Agronomy Department assisted in the preparation of the design.

Thanks are due to the Penobscot Development Company and John Gill of the Department of Inland Fisheries and Game for cooperation in this phase of the study. Numerous conferences regarding all phases of the investigation were held with Chester Banasiak of the Department of Inland Fisheries and Game and Malcolm Coulter. Coulter also accompanied Alkon on one trip to the Willimantic study area.

Plans for next quarter: Continue the browse collections and preference tests, and carry out a full scale feeding experiment with rats.

#### COOPERATION AND EDUCATIONAL WORK

Assistance was given the general public in arranging for autopsies, identifying specimens, and in furnishing technical information.

Coulter and Mendall continued to furnish technical aid when requested to the State Department of Inland Fisheries and Game.

#### Participation in Scout Program

Coulter, Robinson and Alkon, together with J. William Peppard, Regional Game Biologist of the Department of Inland Fisheries and Game, devoted one week to instruction in the conservation program at the Camp-o-Rama of the Katahdin Area Council of the Boy Scouts of America. Approximately 1500 boys participated. Classes of from 10-30 boys were conducted during parts of 5 days.

The joint Unit-Game Division program included 4 exhibits or demonstrations. The general theme of the game exhibits was Wild Game is a Renewable Crop. One exhibit and lecture described what happens to the potential crop, and illustrated that part of the fall population may be harvested, with the

remainder left for breeding stock. Actual duck nests, ducklings, specimens (representing natural mortality) and full-grown live ducks were used as props.

Another demonstration involved big game. Simulated browse lines, antlers and deer jaws were used to demonstrate some aspects of problems concerning the annual crop of deer.

A third demonstration included a trap line, complete with actual sets, and a lean-to with stretchers, fur, etc.

The fourth demonstration was on hunting safety - one of the problems associated with harvest of the crop. It included a 5 minute skit by 2 gunners on a hunting trip. The Scouts scored the actors on the mistakes in hunting safety observed and then discussed them with the instructor. Props included cross sections of wood into which small caliber rifles had been fired and also barrels of guns that had exploded because of neglect in removing dirt or obstructions.

In addition to the above, several live animals and birds (including bear, deer, foxes, raccoons and others), provided by the State Game Farm, were on exhibit.

#### PUBLICATIONS

Coulter, Malcolm W. and Howard L. Mendall

1958. Game Birds of Maine. Maine Extension Service Bulletin 443  
(Revised), 37 pp.

Coulter, Malcolm W.

1958. Distribution, Food and Weight of the Snapping Turtle in Maine.  
Maine Field Naturalist, 14(3):53-62.

A manuscript by Coulter entitled "The Status and Distribution of Fisher in Maine" has been accepted, to appear in Vol. 41 of the Journal of Mammalogy.

Coulter, in collaboration with Clarence Faulkner, Regional Supervisor, Branch of Predator and Rodent Control, U. S. Fish and Wildlife Service, devoted considerable time to preparation of a new Extension Service Bulletin concerning small mammals and their control. The manuscript was nearly complete at the end of the quarter.

#### PERSONNEL CHANGES

A new graduate assistant, Fred Hartman, reported to the Unit in September. He is a graduate of Pennsylvania State University. He has been assigned to

the waterfowl project, and his thesis will deal with winter ecology of waterfowl of the Penobscot estuary.

Respectfully submitted,

*Howard L. Mendall*

Howard L. Mendall, Leader  
Maine Cooperative Wildlife  
Research Unit

University of Maine  
Orono, Maine  
December 10, 1958

MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

University of Maine

Orono, Maine

QUARTERLY REPORT

October-December, 1958

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 - Malcolm W. Coulter  
University Representative - Albert D. Nutting  
Faculty Collaborators - Horace F. Quick  
                                David C. O'Meara  
Graduate Assistants - Philip U. Alkon  
                                Fred E. Hartman  
                                William L. Robinson  
Graduate Student - Arne Krafft  
Clerk - Maxine L. Horne

NOT FOR PUBLICATION

The quarterly reports are usually statements of progress. The data presented often are incomplete and the conclusions reached may not be final. Consequently, permission to publish any of the information contained herein is withheld pending authorization from the Research Unit.

MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

Quarterly Report

October-December, 1958

RESEARCH PROJECTS

FUR ANIMAL RESEARCH

Ecology of the Fisher

Objectives: To obtain data on the distribution, habitat preferences and winter food habits of the fisher.

Assignment: Malcolm W. Coulter, Assistant Leader

Examination of food habits material, previously obtained, was completed during the quarter.

Plans for next quarter: Largely inactive although limited field checks in northern Maine are scheduled for March.

WATERFOWL RESEARCH

(a) Waterfowl Distribution and Management

Objectives: To obtain 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 breeding species, especially the black duck and the ring-necked duck.

Assignment: Howard L. Mendall, Leader

Inactive except as reported under sub-project (d).

Plans for next quarter: Inactive.

(b) Renesting and Homing Study

Objectives: To study renesting behavior and the degree of migrational homing exhibited by the black duck and the ring-necked duck, and, to a limited extent, by the mallard.

Assignment: Malcolm W. Coulter, Assistant Leader and William Miller, Waterfowl Project Leader, Vermont Fish and Game Service

Inactive except for completion of the tabulations of last season's data.

Plans for next quarter: Inactive.



(c) Waterfowl Banding

Objectives: To study the movements and migration routes of waterfowl in Maine.

Assignment: Malcolm W. Coulter, Assistant Leader

Tabulation of recoveries and of repeat data was continued by Graduate Assistant Alkon.

Plans for next quarter: Continue tabulation of recoveries. A start will be made in the analysis of all black duck banding data.

#### (d) Waterfowl Hunter Bag Checks

Objectives: To determine hunter success, crippling loss, and species, sex and age composition of the kill.

Assignment: Howard L. Mendall, Leader

For the 11th consecutive year personnel of the Unit and State Game Division cooperated in a joint bag check study of waterfowl hunting. However, work was conducted on a curtailed basis this year, pending a 10-year analysis of all data previously obtained. Upon completion of this analysis, it is expected that a decision can be made as to how extensive the annual field checks should be to adequately supplement data obtained through the Federal postal questionnaire.

Merrymeeting Bay, the Sebasticook drainage, the Penobscot Valley, and various portions of Penobscot Bay including the Estuary, were checked proportionately heavier than the remainder of the State. The areas mentioned are among the more important of Maine's duck hunting spots and it is anticipated that they will be included in any ultimate program of bag checking. In spite of this emphasis, however, all portions of Maine received some attention. A total of 868 hunters was contacted and 1380 birds were examined.

#### Fall Populations

It was quite apparent, both to the biologists and to the majority of hunters contacted, that waterfowl populations during the fall were considerably improved over those of 1957. This applied to most species but was especially noticeable in the black duck and green-winged teal. The only important species that were probably present in decreased numbers were two divers - the ring-necked duck and the goldeneye.

Yet distribution of the birds was much more irregular than usual. Many inland marshes and some of the rivers as well had relatively few birds, especially in early October. This was apparent throughout a wide area in northern and eastern Maine. For example, the Penobscot River, ordinarily an early and mid-season hunting area of considerable importance, was largely devoid of birds throughout much of the season. Unusually high water on this, and several other rivers and streams, prevailed since the heavy summer rains; undoubtedly this was an important factor in the lack of waterfowl use. Early departure (in September) of many birds from the breeding marshes of northern and eastern Maine also contributed to relatively poor hunting opportunities there.

By contrast, early fall concentrations, larger than in recent years, were reported in many portions of central, western and southern Maine.

Fall flights into the State were more pronounced in 1958 than a year ago and occurred generally in two waves. One took place about the third week of October and coincided with the first freeze in northern New Brunswick and Quebec. The second occurred between November 10 and 15 when large numbers of inland waterways froze abruptly. This resulted in a sudden and

spectacular influx of waterfowl along the coast. Differing from the situation in recent years, this inland freeze-up was largely permanent; likewise it took place earlier than usual.

#### Hunting Success

The 1958 season extended from October 10 to December 8. This was a reduction of 10 days from the 70-day season of a year ago. It was the latest opening date in 20 years. In addition to the regular season, the special "sea duck" season extended to January 15.

Average hunter success, as determined by the bag check studies, was 2.3 birds per man-day of shooting. This was a substantial improvement over the figures of the two previous years.

Statements already given as to distribution of fall populations apply rather generally to shooting success as well. Thus, most areas of northern and eastern Maine had lower hunting success than did those of central, western and southern Maine. On the coast, relatively low hunting success was obtained east of Penobscot Bay. In Merrymeeting Bay, opening day success was the highest ever recorded.

Goose hunting showed an improvement in Merrymeeting Bay in 1958 after three consecutive years of poor results. A fair number of geese came into the Bay somewhat earlier than usual, while substantial flights occurred during late October and early November.

An appreciable decline was noted, as compared to previous years, in the number of hunters afield during the final week of the season. It is believed that the severe and prolonged cold wave, accompanied by freezing of many tidal areas that are ordinarily open, was primarily responsible for this decrease in hunting.

This study is not designed to measure sea duck hunting. From reports received, it appears that fairly good shooting of scoters (sea coots) was obtained in southwestern Maine during November. Along the central and eastern Maine coast there appeared to be a decrease in the number of white-winged scoters, the species that constitutes the principal target for the sea duck enthusiasts. Hunting of "coots" and eiders was considerably curtailed this year by the unseasonable cold and severe ice conditions that prevailed during much of December and early January.

#### Crippling Loss

Figures compiled on crippling loss showed this mortality to be 24.4 per cent. This is only slightly lower than the figure for 1957. As is nearly always the case, it was highest on inland waters at the beginning of the season.

#### Bag Composition

The kill by species of the birds examined is given in the following tabulation:

1958 Waterfowl Bag Checks  
Species Composition, Exclusive of Sea Ducks

Species	No. Checked	Per cent
Black Duck	844	61.2
Green-winged Teal	147	10.6
Common Goldeneye	96	7.0
Wood Duck	46	3.6
Blue-winged Teal	44	3.2
Ring-necked Duck	43	3.1
Bufflehead	40	2.9
Mergansers (3 species)	39	2.8
Mallard	23	1.7
Pintail	18	1.3
American Widgeon	14	1.0
Canada Goose	6	0.4
Ruddy	6	0.4
Greater Scaup	3	0.2
Lesser Scaup	3	0.2
Black x Mallard Hybrid	2	0.1
Shoveler	1	---
Unidentified	5	0.4
Totals	1380	100.1

Principal change in species composition from that of 1957 was in the black duck which rose from 45 per cent to 61 per cent in 1958. This is the highest figure reached by this duck in 11 years. The green-winged teal and goldeneye, in second and third place respectively, occupied their usual standings.

Aside from the black duck, the major changes of 1958 were declines in the proportional kill of the blue-winged teal, wood duck and bufflehead. This was expected with the two former because of the later opening date - both species being early migrants. With the bufflehead, also, a decline this year is logical in view of improved hunting conditions. The bufflehead is a fairly reliable "barometer" of the quality of late season coastal gunning, i.e., the better the shooting on more desirable species the fewer buffleheads are taken.

Sex and Age Ratios

Approximately half of all birds examined were sexed and aged. Slightly more males than females were taken, a desirable situation. The age ratio of all species was somewhat less satisfactory, biologically, being 1 adult to 1.6 immatures. Whether this is an indication of a less favorable breeding season or whether it merely reflects a limited sample is difficult to state. As pointed out in previous reports, sex and age data from a restricted study such as this have little significance unless comparative data are available from other parts of the northeast.

### Conclusions

1. The 1958 waterfowl hunting season in Maine was substantially improved over both 1957 and 1956. It was, however, marked by more extremes on a geographic basis than is usually the case.

2. A much larger proportion of black ducks was recorded this year in the hunters' bags than a year ago. The second and third place species, green-winged teal and goldeneye, were killed in numbers similar to 1957.

3. Principal declines in the bag occurred among the blue-winged teal, wood duck and bufflehead.

4. Goose shooting in Merrymeeting Bay showed an improvement after 3 consecutive years of poor hunting.

5. For the first time in several years, sea duck hunting was not considered satisfactory along the central and eastern Maine coasts, with an apparent decline in numbers of scoters.

Plans for next quarter: Work will be started on the 10-year analysis of bag check data covering the period 1948-1957.

### (e) Ecology of Waterfowl Wintering in the Penobscot Estuary

**Objectives:** To determine the food habits of waterfowl, especially the black duck, utilizing the Penobscot Estuary during late fall and winter; to determine the location and abundance of the important foods within the area, and to classify, accordingly, the mud flats and salt marshes.

**Assignment:** Fred E. Hartman, Graduate Assistant

### Statement of Project

This is a new project, initiated during the quarter, with Hartman's study comprising one phase of it. It is proposed that an investigation of the waterfowl ecology of a portion of the Penobscot Estuary be initiated and conducted as a series of graduate theses for a period of at least 4 to 5 years. Selection of this area, including the Penobscot River from Winterport to Stockton Springs and the tidal portion of the Orland River in Orland and Bucksport, offers the following advantages:

1. The entire area is within 45 miles of campus. Its nearness will permit study with a minimum of travel expense.

2. Its location will permit the graduate student to make greater use of undergraduate assistance on many phases of study. This is desirable from the standpoint of undergraduate training as well as a source of extra manpower for the project.

3. The area supports comparatively large numbers of ducks (at times in excess of 3,000) during much of the period from November 1 to April 1.

4. There appears to be little question that considerable dredging of the river channel will be conducted in the future to aid navigation.

By working with local river and harbor improvement commissions and with the Corps of Army Engineers during the planning stages for proposed improvements, it is likely that minor modifications in plans can be effected if it can be clearly shown that these will preserve or improve waterfowl habitat. At present so little is known about the waterfowl ecology of this and similar areas that no one can offer more than speculative suggestions.

The first segment of study will concern food habits relationships. It seems obvious that large numbers of ducks are attracted to certain marine environments because of an abundance of readily available foods. What are they; where are they located; how will they be influenced by dredging operations; are there feasible means for increasing the abundance of these foods? These are some of the questions that need to be explored first.

#### Progress During the Quarter

Following a study of available literature and consultation with advisers and specialists, a tentative project outline was prepared and the study area boundaries were selected.

The study area is that part of the Penobscot Estuary that is situated between Winterport and the southern part of Verona Island. There are four main sections of the study area that are used most by the ducks. They are designated as Marsh Bay, Winterport, Porcupine Island, and Orland River areas. (1) The Marsh Bay section includes Marsh Bay proper, north branch of Marsh Stream to Frankfort, and the south branch of Marsh Stream to where Route 174 crosses it. (2) The Winterport section includes that part of the river slightly above Winterport and down to the vicinity of Bowden Point. (3) The Porcupine Island section takes in that part of the eastern channel of the river from a point slightly below Bucksport down to that part slightly above Leeches Point. (4) The Orland River section includes the Orland River up to the dam at Orland, the mouth of the Orland River, and that part of the eastern channel of the Penobscot River visible from Leeches Point.

Methods being used in the study are:

1. Laboratory examination of collected gizzards and gullets to determine kinds and quantity of foods eaten. The volumetric and percentage of occurrence methods will be used in this analysis. Unit personnel, State Game Division personnel, and several cooperating duck hunters are supplying the gizzards and gullets. A tag is attached to each digestive tract bearing the date, species of duck, location within the study area, and time of day. Also available at the Unit, are a number of gizzards and gullets collected in previous years that are to be examined.

2. Direct observation of feeding activities of ducks to determine the amount of usage of various food beds, time of day and stage of tide when feeding occurs, location of beds where feeding occurs, and location of and relationship between loafing and feeding areas.

3. Systematic sampling to determine the relative abundance of food items as a basis for the classification of habitat. The mud flats will be sampled by running a series of plots (a foot square by four inches deep) on transect lines running perpendicular to the low tide line and continuing up to the high tide line. The mud from the sample plots will be thrown on a series of screens and washed, and the number of various kinds of invertebrate organisms recorded. A soil sample will be taken from beside each sample plot on which will be run a mechanical analysis and tests for amount of organic matter, pH, and salinity. Also, the shallow water below the low tide line will be dredged for invertebrate organisms.

From the resulting information on the invertebrate sampling and the soil sampling, a system of classifying the mud flats will be determined.

Various specialists have been consulted concerning the phase of the study with which they could provide helpful information. Dr. Marvin C. Meyer, Professor of Invertebrate Zoology, is giving assistance in the identification of invertebrate animals. Aid in plant identification is being given by Dr. Charles Richards, Professor of Botany. Information on methods of sampling and soil properties was provided by Dr. Joseph Trefethen, Professor of Geology. Dr. Harold Gausman, Professor of Agronomy, was also consulted on the sampling methods. Mr. Robert Rupp, State Fishery Biologist, gave helpful advice on methods and materials used in sampling.

Actual field work was initiated during mid-October. Periodic counts of the population were made and these will be continued throughout the winter. The three principal species using the study area are the black duck, greater scaup and common goldeneye. Birds have been present since the first counts were made in October but the first heavy influx occurred in mid-November. This coincided with an abrupt and general freeze-up of inland waters. Peak numbers recorded during the quarter occurred during the second and third weeks of December. Maximum count was approximately 3500 birds, divided roughly as follows: 1700 scaup, 1200 black ducks, 600 goldeneyes.

A number of samples of invertebrate animals and vegetation were collected for identification prior to plot sampling on the transect lines.

Local residents were contacted for the purpose of obtaining approval as to the parking of cars and the crossing of land while in the study area. Permission to use several old fishing shacks was secured. The most strategically located shack has been remodeled somewhat, equipped with a stove, and will serve as the principal observation post. Several local duck hunters cooperated by saving the gullets and gizzards of ducks they shot in the study area. These hunters were supplied with jars containing 10 per cent formalin and tags for the digestive tracts. As a result of the cooperation of these hunters, of Unit personnel, and of several State game officials, a total of 55 digestive tracts were obtained.

#### Plans for next quarter:

1. To take samples of invertebrate organisms and soil samples from various mud flats.
2. To obtain a few black duck specimens, under permit, each month during January, February, and March. In addition to providing needed digestive

tracts for analysis, these will be available for weighing the liver and observing the amount of fat on various parts of the body as an aid in determining progressive winter changes in bodily health and vigor.

3. To start food analysis of the gullet-gizzard combinations.

4. To continue observations of the ducks as to feeding habits, utilization of various areas, movements, and mortality.

#### WOODCOCK RESEARCH

##### Woodcock Census Studies

Objectives: To conduct an annual census on the Unit's permanent census routes in Maine.

Assignment: Howard L. Mendall, Leader

Inactive during quarter.

Plans for next quarter: Inactive.

#### UPLAND GAME BIRD RESEARCH

##### Ruffed Grouse Cover Requirements and Populations

Objectives: To obtain data on preferred winter cover types and population densities.

Assignment: Howard L. Mendall, Leader

Inactive during quarter.

Plans for next quarter: It is hoped that limited field work may be possible in January and March. The contemplated calendar of administrative duties, however, will prevent much accomplishment on this project.

#### BIG GAME RESEARCH

##### (a) Moose Studies in Norway

Objectives: To study the productivity and management of moose on a private forest of 80,000 acres in Romerike, Norway.

Assignment: Arne Krafft, Graduate Student

Inactive during quarter.

Plans for next quarter: Recent correspondence from Krafft indicates that work will be resumed this winter on the thesis write-up.



(b) Winter Cover Studies of the White-tailed Deer

Objectives: To measure the effects of a deficiency of winter cover on penned fawn deer.

Assignment: William L. Robinson, Graduate Assistant

This quarter marked the beginning of the second winter of the deer shelter experiment. The techniques of study remained essentially the same as last year. The study area in the University of Maine Forest consists of three 1 1/2-acre enclosures: one (Pen D) containing a dense (73 per cent crown cover) growth of mature conifers, another (Pen O) containing relatively open (34 per cent) crown cover resulting from a heavy pulpwood cutting, and a third (Pen M) containing moderate cover (55 per cent), an all-aged mixed stand of hardwoods and softwoods. Equal groups of deer in each pen are maintained and fed controlled diets throughout the winter.

On October 29 fourteen semi-domesticated fawns were received from the State Game Farm at Gray. These were placed in the pens along with two deer received from the same source on October 2. On December 19 an additional four fawns which had been wild-trapped on the Swan Island State Refuge were received and placed in the pens. It was decided at that time that five deer per pen would be used in the shelter experiment, with four excess animals being retained in a fourth enclosure for use in Alkon's browse preference tests.

Before releasing the deer each was weighed, its heart girth and hind foot length measured, and a sample of blood for analysis was taken. Handling of the deer was accomplished by a crew of five men: two holding the struggling animal, one taking measurements, one taking blood samples, and the other recording the data. Each deer at this time was also given a colored collar for individual identification.

Regular observation of behavior was initiated. The amount of activity after each snowfall was recorded, as based upon grid-intercept track counts. Frequent cruising throughout the pens revealed the bedding areas used by the deer, the number of beds and the time of their use. The dominance order and the intensity of dominant behavior in each pen was recorded as observed of the fighting among the deer during their daily feeding.

A diet consisting of Eastern States Goat Ration and Eastern States Alfapels, in a 4:1 ratio, was provided the deer. The quantity of feed, based upon the findings of last year's study, was considerably reduced, to a sub-maintenance level, in order to simulate wild conditions wherein the deer experience a shortage of food. A series of periodic reductions in quantity of food is planned so that the final reduction, reached on February 15, will be approximately one half of an estimated maintenance level. A continuance of this quantity for the remainder of the study is expected, unless observations indicate that mortality might occur.

In order to record microclimatic variations between the pens several instruments were employed. Maximum-minimum thermometers, along with anemometers devised from automobile odometers, were used. These were placed on portable stands and moved systematically about the pens at bi-daily intervals. Besides these instruments a third device was tried in an effort

to record chilling effect. This instrument was fashioned from a vacuum bottle,  $3/4$  filled with an alcohol-water solution. A  $1/2$ -inch diameter hole in the plastic stopper of the bottle allowed air to circulate over the liquid, and a thermometer suspended in the solution provided an indicator of the heat lost from the liquid. Trials with six of these instruments before an electric fan gave satisfactory results. A notable temperature drop was recorded in the bottles submitted to the fan's breeze as compared with those a short distance to the side. Interchange of the position of the bottles indicated that a measurable heat loss in the liquids occurred as a result of the chilling effect of the fan. A portable sun shade, made of two 2' x 2' pieces of Masonite supported in parallel horizontal planes by dowels was constructed for each pen to minimize the effect of sunshine on the bottles. These shades were painted white on the top and bottom to reflect light, and left natural brown on the inner surfaces to absorb light. A "team" of two bottles per pen was employed. A single Friez Hygrothermograph was placed in a shelter in Pen M to make continual recordings of temperature and humidity fluctuations in a central portion of the study area. Snow depth was measured at regular intervals by taking 80 readings along a transect in each pen.

Over-all December conditions contrasted with those of a year ago. This winter, snow arrived in late November and by December 19 (the date of arrival of the last experimental deer) an accumulation of about a foot of snow was on the ground. Temperatures also were severe. A minimum of  $-14$  degrees Fahrenheit was recorded on December 20, and six of the last 12 days of the month showed sub-zero temperatures.

Following the pattern of last year, temperature variations in the pens showed the greatest fluctuations in the open area and the most regular readings in the dense area. Mean readings were not greatly different between the pens.

Among the other observations of this season's experiment, only the bedding situation offered some early conclusions. In the open pen, beds were made in nearly the identical sites as those chosen by the deer last winter, while in the medium and dense enclosures the areas chosen were different from last year's and scattered about the pens. This observation would seem to indicate a limitation of preferred bedding areas in the open range with an apparent abundance of potential bed sites in the other two pens.

In mid-November a pellet group count was conducted in one of the pens to determine the rate of defecation of 6-month old deer. A 100 per cent sampling of the 1.5 acre enclosure that had held 5 fawns for 20 days was used. It was hoped that various sampling techniques might be tested by comparison with the 100 per cent count, but early snowfall prevented further counts.

Strips 12 feet wide marked with string were laid out in the pen and a class in Wildlife Management supervised by Professor Horace F. Quick performed the counting. A short orientation explaining purpose and methods was held, and demonstrations were conducted in how to tell last year's pellets from recent droppings. A two-man team was assigned each strip. Each team was supplied a 13-ounce shaker of flour with which the counted

groups were marked. This technique was successful in avoiding duplicate counts, especially of those groups on borderlines between two strips.

The count yielded a total of 1270 groups for 100 deer-days of use or an average of 12.7 groups per deer per day. This figure corresponds exactly with the findings of Eberhardt and Van Etten (Evaluation of the pellet group count as a deer census method, Jour. of Wildl. Mgt., 20:70-74, Jan. 1956) and McCain (A method for measuring deer range use. Trans. N. A. Wildl. Conf., 13:431-441, 1946).

Due to the high concentration of deer and the resulting high pellet density in the pens, it is probable that spring counts will be impracticable.

Plans for next quarter:

1. To take a complete set of photographs of the study.
2. To continue detailed observations of deer condition and behavior.
3. To conduct night observations of temperature patterns and deer activity.
4. To conclude the field work in late March by taking weights, measurements, and blood samples.

(c) A Study of Hardwood Browse for Deer

Objectives: To determine the time at which supplemental hardwood cuttings for deer should be made in order to provide the most nutritious and palatable winter food.

Assignment: Philip U. Alkon, Graduate Assistant

During the quarter 65 albino rats, ordered in September, arrived and a series of three feeding tests was carried out in an attempt to determine the relative nutritional value of browse samples as reflected by weight changes in living animals. The rats were fed browse, air-dried and ground, supplemented with non-nutritive sweetening solution. For both Test No. 1 and Test No. 2 each rat was offered one of the 54 samples, obtained in last year's collection, for a period of seven days. In Test No. 3 the procedure was modified; browse samples of the three study species were combined by cutting, i.e., red maple, sugar maple and paper birch cut in September and collected in January, and offered at the rate of two rats per diet for a period of five days. Diets were randomly assigned in each test and food was made available to the animals continuously. At the conclusion of the experiment the rats were donated to the Biochemistry Department.

Although the results of the study have not been subjected to statistical analysis, they seem to indicate little difference in the nutritional value of the samples as reflected by weight changes in the rats. On the basis of both species and time of cutting, differences in body weight were minor in scope and inconsistent in pattern. It appears that individual variations among the animals in their ability to accept and become accustomed to a browse diet, as well as the resultant weight changes, nullified the possibility

of detecting differences for the samples used in this experiment.

The browse collection program was continued and samples for the months of October, November and December were gathered and analyzed. The composition of twigs collected thus far is similar to those collected during the same period last year, according to the results of chemical analysis. However, some differences in moisture, fat and ash content have been detected; these will be discussed in a future report.

As part of the study of browse preferences of yarding deer, regular monthly trips were made to the Willimantic study area. On each of two sites located on the periphery of a deer yard, three trees of each study species were felled in October and one of each in November and December. All twigs on the tops of the felled trees were counted and trees cut previously were inspected for evidence of browsing. Little use was made of the tops in October and November. With the advent of heavy snow and low temperatures, however, deer moved into the area in numbers and considerable browsing of the tops was noted on the December visit. Sugar maple tops from trees felled in September, October and November were heavily browsed, but tops of paper birch of all cuttings received little attention.

Plans for next quarter: Continue monthly collection of browse samples for chemical analysis and to study preferences of yarding deer. A study of preferences of penned deer will also be conducted.

#### COOPERATION AND EDUCATIONAL WORK

Assistance was given the general public in arranging for autopsies, identifying specimens, and in furnishing technical information.

Coulter and Mendall continued to furnish technical aid when requested to the State Department of Inland Fisheries and Game.

#### PUBLICATIONS

Coulter, Malcolm W.

1958. A new waterfowl nest trap. Bird-Banding, XXIX:236-241.

Respectfully submitted,

*Howard L. Mendall*

Howard L. Mendall, Leader  
Maine Cooperative Wildlife  
Research Unit

University of Maine  
Orono, Maine  
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