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MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

University of Maine

Orono, Maine

QUARTERLY REPORT

January-March, 1970

Cooperating Agencies

Maine Department of Inland Fisheries and Game
University of Maine
Bureau of Sport Fisheries and Wildlife
Wildlife Management Institute

NOT FOR PUBLICATION

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WILDLIFE STAFF

Howard L. Mendall, Unit Leader and Professor of Wildlife Resources
 Voit B. Richens, Assistant Unit Leader and Assistant Professor of Wildlife Resources
 Malcolm W. Coulter, Associate Director for Wildlife, School of Forest Resources
 and Professor of Wildlife Resources
 Sanford D. Schemnitz, Associate Professor of Wildlife Resources
 Ray B. Owen, Jr., Assistant Professor of Wildlife Resources
 Frederick F. Gilbert, Assistant Professor of Wildlife Resources

Unit Collaborators - Personnel from 14 University departments or State and Federal agencies are actively collaborating with the Unit. Individuals assisting with projects that are currently reported upon are listed in connection with the appropriate project summary.

Graduate Assistants: David Abell
 Myrtle C. Bateman
 Andre Bourget
 David E. Capen
 Robert D. Dunford
 James M. Ramakka

Graduate Students: Thomas J. Allen
 Victor S. Balinga
 William R. Whitman

Unit Secretary: Maxine L. Horne

Unit Coordinating Committee

Ronald T. Speers, Commissioner, Maine Department of Inland Fisheries and Game
 Albert D. Nutting, Director, School of Forest Resources
 Howard L. Mendall, Unit Leader

RESEARCH PROJECTSBIG GAMEEffects of Three Cover Conditions on Behavior and Physiological Responses of Penned White-tailed Deer

- Objectives: (1) To relate differences in behavior of deer penned under three different cover conditions to environmental factors.
 (2) To determine if the different cover conditions cause differences in some physiological parameters.

Assignment: Myrtle C. Bateman, Graduate Assistant

Thesis Advisor: Frederick F. Gilbert, Assistant Professor, Wildlife Resources

Consultants: Ray B. Owen, Jr., Assistant Professor, Wildlife Resources
 Voit B. Richens, Assistant Unit Leader
 David C. O'Meara, Associate Professor, Animal Biology

Detailed observations of deer behavior began February 24. Preliminary results indicate a peak in inactivity between 8 and 10 a.m. During this period fawns spent more time moving than did does penned under similar cover. However, the deer penned under unaltered cover were more active than those in the cleared areas. This may be partly due to disturbance of these animals by the observer, but temperatures were higher (2-9°F) and relative humidity lower in the natural cover area at the time of the observations. This may indicate increased activity related to higher temperature.

All deer showed a greater tendency, during the period of snow cover, to move around the periphery of the pens rather than across the center. Deer in the clearcut area invariably lay down within 15 feet of a fence, and they often chose a corner of the pen. This appeared to be related at least in part, to the presence of other deer in adjacent pens. It is evident that not all deer react the same to the same conditions.

Three experimental deer were killed by dogs March 3. Samples of thymus gland, adrenals and spleen were collected and will be used to aid the development of histological techniques.

Plans for next quarter: Observations of deer behavior will be continued. Positioning of marker stakes to facilitate the taking of more detailed data on movement will be completed. The enclosures will be cover mapped and wind-breaks set up in four of the pens.

UPLAND GAMEEcology of the Ruffed Grouse in Maine

- Objectives: (1) To study population dynamics of harvested and unharvested grouse populations; and to compare mortality rates of resident non-migratory species (grouse) and migratory species (woodcock) on the same area.

- (2) To determine cover preferences and use of forest clearings by adults and broods in spring, summer and fall.
- (3) To study the causes of juvenile mortality and measure the incidence of blood parasites.

Assignment: Sanford D. Schemnitz, Associate Professor, Wildlife Resources

Consultant: Robert Wade, Moosehorn National Wildlife Refuge

An abstract of "Fall and Winter Feeding Activities and Behavior of Ruffed Grouse in Maine," a paper presented at the 1970 Northeast Fish and Wildlife Conference at Wilmington, Delaware follows:

Leading foods in crops from 270 fall shot grouse collected from 1963-69 were apple, clover, aspen, birch, and hawthorne. Little change in the kinds of foods eaten was noted in the 20 year interim since Charles Brown's published Maine grouse food studies. Detailed studies of budding activities by grouse emphasized the importance of staminate buds of Populus tremuloides in the diet during the winter period December-April. General similarities were noted between current (1966-1970) grouse budding activity and previous data collected from 1943 to 1959 by Mendall. Budding behavior, species preference, habitat and slope utilization, and climatic influences are discussed. Management implications and suggestions based on this study are presented emphasizing the importance of encouraging aspen, apple, and clover.

Plans for next quarter: Adults and grouse broods will be observed in relation to cover preferences, use of clearings and mortality.

Breeding Season Studies of Male American Woodcock

- Objectives: (1) To study the fidelity and continuity of use of singing fields by individually-marked, male woodcock.
- (2) To observe any daily changes in activity that may occur on several fields in the same general area.

Assignment: James M. Ramakka, Graduate Assistant

Thesis Advisor: Sanford D. Schemnitz, Associate Professor, Wildlife Resources

Consultants: Howard L. Mendall, Unit Leader
 Malcolm W. Coulter, Professor, Wildlife Resources
 Ray B. Owen, Jr., Assistant Professor, Wildlife Resources
 William B. Krohn, Research Biologist, Bureau of Sport Fisheries and Wildlife

The study area consists of various small singing fields within a ten mile radius of Orono, Maine.

Singing males will be captured in mist nets and initially, radio transmitters will be used. If radio telemetry proves unfeasible, birds will be identified with a brightly colored neck marker. Radio tracking will be

accomplished by use of truck-mounted and hand-held antennae. If neck markers are used observers will be stationed in the fields before flight time, to observe marked birds which return to the fields.

Regardless of which method is used, the location of a marked bird over a series of nights during the peak of the courting period will be observed. A second phase of the study will involve the stationing of a trained observer in each of 12 singing fields for 10 consecutive nights during the peak of the courting period. The observers will record data relating to the activity on the field, including woodcock activity, weather conditions, and other pertinent information. Computer analysis will be used to correlate these data and relate them to the singing ground survey.

Plans for next quarter: Trapping, marking, and additional observation of woodcock will be undertaken.

Summer Behavior of American Woodcock

- Objectives: (1) To determine summer movements of woodcock, with special emphasis on birds hatched the current year.
 (2) To investigate woodcock behavior, such as times of feeding and resting, while on summer fields and in diurnal cover.
 (3) To measure vegetation characteristics of diurnal cover.

Assignment: R. Daniel Dunford

Thesis Advisor: Ray B. Owen, Jr., Assistant Professor, Wildlife Resources

Consultants: Malcolm W. Coulter, Professor, Wildlife Resources
 Sanford D. Schemnitz, Associate Professor, Wildlife Resources
 William B. Krohn, Research Biologist, Bureau of Sport Fisheries and Wildlife

The summer behavior of the American woodcock is one of the least understood aspects of the biology of this important game bird. Knowledge of the movements, range, and cover requirements of woodcock is essential for determining adequate management techniques.

In this study, detailed information on behavior patterns will be obtained through the use of radio-telemetry. Preliminary field work last summer demonstrated that this technique is feasible for studying woodcock movements. Activities this quarter: The study area was selected and cover mapping from aerial photographs begun. A preliminary research outline was prepared after consultation with staff members. In addition, a literature review is presently underway.

Plans for next quarter: Property owners will be visited and the use of the study area discussed with them. Cover mapping from photographs and on-the-ground investigations of the area will be completed. A behavioral study of penned, radio-tagged woodcock is to be undertaken in order to correlate radio signals with specific movements of the birds.

WATERFOWLDistribution of Eider Populations in Coastal Maine

- Objectives: (1) To locate the principal breeding colonies along the Maine coast.
 (2) To develop a satisfactory technique for aerial breeding ground inventory.
 (3) To determine the abundance and subspecific composition of fall and winter populations.

Assignment: Howard L. Mendall, Unit Leader
 William Snow, Game Management Agent, Bureau of Sport Fisheries and Wildlife

Consultant: Rex Tice, Division of Management and Enforcement, Bureau of Sport Fisheries and Wildlife

During the special sea duck season, ending January 10, a sample of more than 150 heads or whole eider duck specimens was obtained through hunter cooperation. The sex, age and subspecies of most was determined. A few specimens still remain to be examined, but the sample, which was well distributed along the Maine coast, is running heavily to the American eider (Somateria mollissima dresseri) as has been the case in previous seasons. Additional specimens are needed another year before definite conclusions are reached. However, on the basis of information thus far, it appears that the northern subspecies (S. m. borealis) is of minor importance in the harvest of New England eiders. This is significant from the management standpoint since it is the subspecies dresseri that breeds on the Maine coast.

Plans for next quarter: To conduct the regular aerial breeding inventory of the Maine coast.

Establishing and Increasing Local Breeding Populations of Wood Ducks by Relocating Active Nest Boxes

Objective: To establish new breeding populations of wood ducks by moving nest boxes with incubating hens and clutches to areas with no wood duck production.

Assignment: David E. Capen, Graduate Assistant

Thesis Advisor: Malcolm W. Coulter, Professor, Wildlife Resources

Consultants: J. William Peppard, Migratory Bird Research Leader, Maine Department of Inland Fisheries and Game
 Grady Hocutt, Regional Biologist, Maine Department of Inland Fisheries and Game

Much time was devoted to literature review and to correspondence and discussion with people knowledgeable about waterfowl. Areas from which boxes with nesting hens will be removed were selected in cooperation with Grady Hocutt and Jim Dorso of the Department of Inland Fisheries and Game. Capen

assisted Hocutt and Dorso with nest box maintenance, and 44 boxes used during previous years were equipped with single hinge tongues (the counter parts will be fastened to selected trees). The boxes may be detached easily from trees when they need to be moved.

Areas were also chosen on which boxes with nests will be re-located. Specific sites for re-locatinn will be determined after ice is out of natural waterways and when more details of the marshes can be seen.

Plans for next quarter: Nest box checks will begin in April followed by box re-location during May and June depending upon the nesting chronology of the season.

CURRENT PROJECTS NOT REPORTED THIS QUARTER

Woodcock Nocturnal Habitat Utilization in Relation to Sex, Age, and Molt -
R. B. Owen.
Waterfowl Distribution and Breeding Ecology - H. L. Mendall.
Eider Duck Ecology and Management - H. L. Mendall.
Ecology and Behavior of the Fisher - M. W. Coulter.
Influences of Known Populations of Deer Upon Forest Vegetation - S. D. Schemnitz.
Factors Affecting Summer Flight Behavior of White-tailed Deer on Isle au Haut -
S. D. Schemnitz.
Interrelationships of Breeding Eiders, Herring Gulls and Black-backed Gulls -
A. A. Bourget.
Deer-snow Relationships in Maine - V. B. Richens.

COOPERATION, EDUCATIONAL WORK AND MISCELLANEOUS ACTIVITIES

Coulter, Schemnitz, Richens, Owen and several graduate students attended the N.E. Fish and Wildlife Conference at Wilmington, Delaware, January 25-28. Schemnitz presented a paper "Fall and Winter Feeding Activities and Behavior of Ruffed Grouse in Maine."

Mendall, Coulter and Schemnitz attended the annual Unit Leaders' meeting and the North American Wildlife and Natural Resources Conference in Chicago, Illinois, March 20-25. Coulter, Regional Representative of the Wildlife Society, participated in the regular 2-day meeting of the Council and also a special Council meeting.

Schemnitz, Owen and Coulter participated in the Second Maine Environmental Congress held March 28 in Waterville, Maine.

The annual 10-week Fish and Game Warden School began on February 2. Richens and Owen taught plant identification, and Schemnitz and Coulter taught game biology. Coulter also served as director of the School.

Mendall discussed the Unit's waterfowl research program at meetings of the University of Maine student chapter of the Wildlife Society, and the Knox County Fish and Game Association.

Graduate Assistant Capen participated in the Atlantic Flyway Waterfowl "Wing-bee" held at the Migratory Bird Populations Station, Laurel, Maryland, during the week of February 2-8. While there, he discussed his proposed thesis research with Dr. John Rogers and Frank McGilvrey.

Deer Management in Maine was featured at the wildlife program of the University of Maine Open House on March 31. Schemnitz and Gilbert were program participants, and the former was session chairman.

PERSONNEL CHANGES

A new Graduate Assistant, David Abell, began studies toward an M.S. degree in February. He is a 1966 graduate of the University of Maine and recently completed a period of service with the U.S. Navy.

PUBLICATIONS AND THESES

Gilbert, F. F., and E. D. Bailey. 1970. Reproductive performance of three genetic strains of female mink visually isolated after breeding. The Cornell Vet., LX(1):135-138.

Rinaldi, A. M. 1970. Deer and hare forage following strip clearcutting and slash disposal on the Penobscot Experimental Forest, Maine. M.S. Thesis, Univ. of Maine, Orono. Unpublished. 81 pp.

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July-September, 1970

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 Frederick F. Gilbert, Assistant Professor of Wildlife Resources

Unit Collaborators - Personnel from 15 University departments or State and Federal agencies are actively collaborating with the Unit. Individuals assisting with projects that are currently reported upon are listed in connection with the appropriate project summary.

Graduate Assistants: David Abell
 Myrtle C. Bateman
 David E. Capen
 R. Daniel Dunford
 Roy D. Hugie
 David M. Knupp
 James M. Ramakka
 William Sarbello

Graduate Fellows: J. George Gleich
 John F. Moroney

NSF Trainee: Gary C. White

Graduate Students: Victor S. Balinga
 William R. Whitman

Unit Secretary: Maxine L. Horne

Unit Coordinating Committee

George W. Bucknam, Commissioner, Maine Department of Inland Fisheries and Game
 Albert D. Nutting, Director, School of Forest Resources
 Howard L. Mendall, Unit Leader

RESEARCH PROJECTSBIG GAMEMobility of Deer in Three Western Maine Winter Yards

- Objectives: (1) To relate indices of deer mobility in snow in yard and non-yard areas to food, cover, snow, and weather.
- (2) To determine the boundaries of the yards during the study period and relate any changes in yard boundaries to food, cover, snow characteristics, and weather.
- (3) To test the feasibility of using track-trail relationships as indices of deer mobility in snow.

Assignment: Roy D. Hugie, Graduate Assistant

Thesis Advisor: Voit B. Richens, Assistant Unit Leader

Consultants: Malcolm W. Coulter, Professor, Wildlife Resources
 Frederick F. Gilbert, Assistant Professor, Wildlife Resources
 Marshall D. Ashley, Assistant Professor, Forest Resources

This is a new sub-project of the deer-snow relationships study. The goal is to further pursue data previously obtained by Day (1963, Winter Behavior of White-tailed Deer in North-Central Maine, M.S.Thesis, Univ. of Maine, 151 pp.), and others in Maine and to increase the scope and inference of the general study for practical management application. A closely related sub-project, Snow Support of Wintering Deer in Western Maine, is being studied by Richens. Information of mutual value to these sub-projects will thus be available.

The Hayden Brook, Black Brook and Basin Pond deer winter yards were selected for study this winter and next. During July and August a vegetation survey of these yards was conducted and a cover type map is now being prepared.

Literature pertaining to wintering of deer in general and deer response to snow in particular has been reviewed. From this information, field observations, and consultation, a detailed study plan has been written.

Most of the winter field work will be done by Hugie during the spring and fall semesters of 1971.

Plans for next quarter: Additional work will be devoted to a deer trail monitoring device used this winter. Preparations for field study during spring semester will be made.

UPLAND GAMEBreeding Season Studies of Male American Woodcock

- Objectives: (1) To study the fidelity and continuity of use of singing fields by observation of individually-marked, male woodcock.

- (2) To observe any daily changes in woodcock courtship activity that may occur on several fields in the same general area.

Assignment: James M. Ramakka, Graduate Assistant

Thesis Advisor: Sanford D. Schemnitz, Associate Professor, Wildlife Resources

Consultants: Howard L. Mendall, Unit Leader
 Malcolm W. Coulter, Professor, Wildlife Resources
 Ray B. Owen, Jr., Assistant Professor, Wildlife Resources
 William B. Krohn, Research Biologist, Bureau of Sport Fisheries and Wildlife

Three radio transmitters (of the type used during spring singing ground investigations) were placed on woodcock held in a large pen at the State University College of Forestry at Syracuse, to determine how much behavioral data could be gathered from the pulsed signals transmitted. Dr. Robert E. Chambers and Miss Margorie Pittman observed the activity of the woodcock while Ramakka monitored the radio signals from a distance.

Results of this study suggest that pulsed signal radio transmitters cannot be used to determine the behavior of woodcock on the ground. Movement could usually be distinguished by signal fluctuation, and the type of activity (walking, feeding) by signal tone. However, on several occasions, the signal fluctuated while the bird was stationary.

Plans for next quarter: Data analysis will continue and plans for next season's field work will be formulated, based on the results obtained thus far.

Summer Behavior of American Woodcock

- Objectives: (1) To determine summer movements of woodcock with special emphasis on birds hatched during the current year.
 (2) To investigate woodcock behavior, such as times of feeding and resting, while on summer fields and in diurnal cover.
 (3) To measure vegetation characteristics of diurnal cover.

Assignment: R. Daniel Dunford

Thesis Advisor: Ray B. Owen, Jr., Assistant Professor, Wildlife Resources

Consultants: Malcolm W. Coulter, Professor, Wildlife Resources
 Sanford D. Schemnitz, Associate Professor, Wildlife Resources
 Gene W. Farthing, Jr., Assistant Professor, Psychology
 William B. Krohn, Research Biologist, Bureau of Sport Fisheries and Wildlife
 J. William Peppard, Migratory Bird Research Leader, Department of Inland Fisheries and Game

Radios were attached to 10 immature male and 6 immature female woodcock during the quarter. Movement data were obtained for 190 bird-days, representing 180 hours of actual monitoring time.

Throughout the summer woodcock were tracked during 285 morning and evening flight periods. Immature females flew during 90% of the possible periods while immature males flew 86% of such time.

Four radio-tagged woodcock were killed by predators during the summer. Three of these were probably killed by mammals while the woodcock were in diurnal cover. The type of predator which killed the fourth bird was unknown.

Composition and other characteristics of woodcock diurnal cover was studied on 28 sample plots. These plots were utilized by radio-tagged woodcock 117 times during the summer.

Plans for next quarter: Inactive.

Woodcock Nocturnal Habitat Utilization in Relation to Sex, Age, and Molt

- Objectives:
- (1) To explore the feasibility of banding woodcock in their "diurnal cover" at night.
 - (2) To study the molt chronology of woodcock throughout the summer and fall.
 - (3) To compare the age, sex, and molt of woodcock remaining in the "diurnal cover" at night with those utilizing summer fields.
 - (4) To investigate the use of telemetry as a tool for locating woodcock nocturnal habitat.

Assignment: Ray B. Owen, Jr., Assistant Professor, Wildlife Resources

Consultants: Malcolm W. Coulter, Professor, Wildlife Resources
 J. William Peppard, Dept. Inland Fisheries and Game
 William B. Krohn, U.S. Bureau of Sport Fisheries and Wildlife

Data on molt and body weight were obtained from 375 woodcock captured during banding operations, making a total of 850 birds examined during two summers.

Woodcock use of known summer fields declined in August again this year. During this period attempts to locate birds remaining in the diurnal cover at night were unsuccessful. Radio-telemetry data from molting woodcock indicated that these birds do not restrict their movements during the molt period.

Plans for next quarter: Information on fat deposition in relation to molt and migration will be obtained and molt chronology for each age and sex group will be determined.

Ecology of the Ruffed Grouse in Maine

- Objectives: (1) To study population dynamics of harvested and unharvested grouse populations; and to compare mortality rates of resident non-migratory species (grouse) and migratory species (woodcock) on the same area.
- (2) To determine cover preferences and use of forest clearings by adults and broods in spring and summer.
- (3) To study the causes of juvenile mortality and measure the incidence of blood parasites.

Assignment: Sanford D. Schemnitz, Associate Professor, Wildlife Resources

Consultant: Robert Wade, Moosehorn National Wildlife Refuge

The 1970 summer grouse population as measured by trapping success, incidental to woodcock trapping at the Moosehorn Refuge, showed no change from last year with 38 captures. This low level contrasts with 97 grouse captured during the summer of 1968.

One return of a grouse from a previous year was of special interest since it represents a longevity record for the Moosehorn National Wildlife Refuge. This female grouse, (band #605-51384) was originally banded on August 5, 1965, at an age of 8 weeks. She was recaptured with 3 chicks, 4 weeks old on August 2, 1970, 1 mile from the original capture point. An adult spruce grouse with one young was captured on the Edmunds Unit of the Refuge. Another adult female without young was caught simultaneously in an adjacent trap.

Blood smears were taken from ruffed and spruce grouse for blood parasite information.

Plans for next quarter: Past climatic records and grouse trapping success will be analyzed.

WATERFOWL

Annual Production and Factors Influencing Nesting Success of the American Eider

Objectives: To determine annual production and factors related to eider nesting success in breeding colonies of Penobscot Bay.

Assignment: Howard L. Mendall, Leader

Consultant: William D. Snow, U.S. Game Management Agent

Seasonal work on the 5 islands of the Rockland study area was concluded during the quarter. Supplemental data on the Islesboro study area were obtained by former Graduate Assistant Andre Bourget after completion of his graduate program in May. This permitted continuity of the studies there which will be resumed by Graduate Assistant Sarbello in 1971. Sarbello spent the latter part of the nesting season assisting Bourget and becoming oriented on the study area. Additional field assistance was provided during the spring

and summer by Bourget's wife and Mendall's wife; also by Associate Director Coulter, Assistant Leader Richens and Graduate Assistant Capen.

Estimates of breeding populations indicated a slight increase from 1969, nesting chronology was more advanced and breeding success (as measured by marked nests) was slightly higher. It is believed that eider production was likely greater than a year ago in spite of the outbreak of fowl cholera that occurred during June (See Quarterly Report, April-June, 1970).

As was the case in past years, nesting success of eiders which used the artificial nest shelters at Islesboro was appreciable higher than birds nesting in natural vegetation.

It was gratifying to note a marked increase in the 1970 breeding population of the large colony on Fisherman's Island. It was pointed out a year ago that many birds apparently left the island during the construction of a cottage and wharf there. With no extra disturbance this year and with only intermittent spring visits by humans to the island, the eider population was almost back to the 1968-69 levels. The owner of the island, Maurice Duncan, has been very considerate of the welfare of the birds and especially cooperative with Unit personnel during these studies.

In conjunction with homing and renesting aspects of the eider study, more effort was made in 1970 than previously to nest-trap and band females. This was confined largely to Tommy and Fisherman's Island at Rockland and to Mouse Island and Robinson Rock at Islesboro. A total of 159 birds was banded and an additional 37 recoveries were obtained of females banded in previous years. It should be emphasized that, because of the disturbance involved, this is not recommended as a technique for banding except to obtain special kinds of data such as homing and renesting.

A major banding accomplishment of U.S. Game Management Agent William Snow and Special Deputy Warden Alfred Teel was closely related to the Unit's studies. After considerable experimenting, and working under adverse weather conditions, Snow and Teel banded 133 flightless young and molting adults by nightlighting. Work was conducted on the outer islands of Penobscot Bay, relatively near Unit study areas. In the past, a banding limitation has been the complete lack of banded young of the year, needed to establish a known age class. It is hoped that this work can be expanded in 1971.

Plans for next quarter: Inactive.

Establishing and Increasing Local Breeding Populations of Wood Ducks by Relocating Active Nest Boxes

Objectives: To establish new breeding populations of wood ducks by moving nest boxes with incubating hens and clutches to areas with no wood duck production.

Assignment: David E. Capen, Graduate Assistant

Thesis Advisor: Malcolm W. Coulter, Professor, Wildlife Resources

Consultants: J. William Peppard, Migratory Bird Research Leader,
Maine Dept. Inland Fisheries and Game

Eleven active wood duck boxes were moved during May and June. Three were moved when the eggs were in the pipping stage of incubation; the others shortly after hatching. The hen from one box, that was relocated while the eggs were pipping, remained on the nest for more than five hours after the entrance was unplugged, but left the area immediately after emerging from the box. This duck returned more than 25 miles to the marsh from which the box had been removed; she renested there, and successfully hatched a clutch of 10 eggs. Another hen that was moved in a box with pipping eggs also abandoned her nest and the new area as soon as she left the box.

Behavior of this nature suggests an attachment for the original site which is greater than that for the clutch--at least during the pipping stage of incubation. With this in mind, an active nest box (eggs were again pipping) was shifted about 300 yards on the same marsh. This nest was also abandoned and the hen returned to within a few feet of the tree from which the box was taken. After several hours, the nest box was returned to the original site; the hen resumed incubation; and the eggs were hatched.

Six boxes were relocated after the young were hatched and dry, only a few hours before they would leave the nest. These boxes were usually moved at dusk, and the exits were plugged until about three hours after daylight the next morning. This procedure resulted in a definite change in the behavior of the hens. Two hens left the box and called the young out in an apparently normal departure. Three others abandoned their young, however, and two of them were seen leaving the new area, but this abandonment did not occur as abruptly as in the previous instances. In one case both the hen and the young left the box, which was not being observed, but whether they left independently or together is not known.

When two nests were moved, the hen and the recently-hatched young were taken from the next box and placed in a smaller plywood box from which they were released. When the hen was removed from the nest box, the primary wing feathers on one wing were clipped rendering the bird flightless. These moves were also made at dusk, and the broods were liberated the following morning. When relocated on a new area, the plywood box was hung about 18 inches above the water and rigged so that the entire front was opened by pulling a string from a blind. the first time this was tried, the hen and her young looked around from the edge of the box for several minutes before leaving; the second brood jumped into the water immediately after the box was opened. The clipped wings did not seem to induce any erratic behavior from the hens.

Much time was spent during July observing the marshes on which the broods were relocated and attempting to band the ducklings. Trapping success was quite low; no ducklings were captured and only one relocated hen was taken in the bait traps. This hen was trapped 7 and 19 days after being relocated and was one which had been wing-clipped.

Several observations were made, however, which indicated that some of the relocated broods had survived and remained on the new area. Three hens which were moved were later seen--one on each of the study areas. Also three ducklings, classes I and II, were observed, all on the same area.

Plans for next quarter: Literature review, course work, and planning for the next spring season will continue.

CURRENT PROJECTS NOT REPORTED THIS QUARTER

Waterfowl Distribution and Breeding Ecology - H. L. Mendall
 Ecology and Behavior of the Fisher - M. W. Coulter
 Factors Affecting Summer Flight Behavior of White-tailed Deer on Isle au Haut -
 S. D. Schemnitz
 Effects of Three Cover Conditions on Behavior and Physiological Responses
 on Pinned White-tailed Deer - Myrtle C. Bateman
 Snow Support of Wintering Deer in Western Maine - V. B. Richens
 Distribution of Eider Populations in Coastal Maine - H. L. Mendall

COOPERATION, EDUCATIONAL WORK AND MISCELLANEOUS ACTIVITIES

A meeting of the Unit Coordinating Committee was held in Augusta on September 14. Present were Director Nutting, Commissioner Bucknam and Mendall. This was for organizational purposes and was the first held since Commissioner Bucknam's appointment. It was agreed to continue the past policy of holding such meetings on an informal basis with no firm schedule.

Mendall participated in the annual meeting of the Maine Waterfowl Council in Augusta on August 21.

Mendall conferred in Quebec City September 22-23 and in Fredericton, New Brunswick September 29 with personnel of the Canadian Wildlife Service and with Provincial and University wildlife officials. Woodcock-pesticide problems and waterfowl studies of related interests to Maine were discussed. While in Quebec he participated as "outside examiner" in the defense of thesis of a Ph.D. candidate at Laval University. The thesis was on breeding biology of the black duck and closely related to past studies of the Unit.

Richens and Gilbert attended the meeting of the Northeast Deer Study Group held at Morgantown, West Virginia, September 7-9.

All Unit graduate students and 10 undergraduates participated in hunter-performance observations and field bag checks during the opening two days of Maine's special teal season September 11-19. Cooperating personnel were briefed in advance by Messrs. Crissey and Geis of the Migratory Bird Populations Station.

Schemnitz lectured on wildlife management at the Junior Forest Institute, Princeton and Orono, July 20, 25, 27, and at the Bryant Pond Conservation Camp, July 31. Schemnitz and Ramakka gave wildlife conservation talks to 75 boys at Maine Sportsmen's Junior Conservation Training camp, Branch Pond, Ellsworth, August 14.

Schemnitz and Richens attended the Tall Timbers Fire Ecology Conference at Fredericton, New Brunswick, August 20-21.

Schemnitz served as chairman for the Wildlife Teacher's Meeting, Northeast Section, The Wildlife Society at Storrs, Connecticut, August 31-September 2.

Coulter attended The Wildlife Society Council meeting, as Regional Representative, in Denver, Colorado during late August.

PERSONNEL CHANGES

Graduate Assistants Roy D. Hugie (Utah State University, 1970), David M. Knupp (West Virginia University, 1970), NSF Trainee Gary C. White (Iowa State University, 1970), and graduate fellows J. George Gleich (West Virginia University, 1970) and John F. Moroney (University of Maine, 1965) began their programs of study toward M.S. degrees this quarter.

PUBLICATIONS AND THESES

Gilbert, F. F. 1970. The effect of early weaning on the sexual behavior and reproductive success of ranch mink. *J. Mammal.*, 50(4):742-747.

Gilbert, F. F. and Sandra L. Stolt. 1970. Variability in aging Maine white-tailed deer by tooth-wear characteristics. *J. Wildl. Mgmt.*, 34(3):532-535.

Mendall, H. L. 1970. Research and student training in wildlife ecology. *Maine Fish and Game*, XII(3):19-21.

Schemnitz, S. D. 1970. Hawks--friend or foe? *Maine Fish and Game*, XII(2): 10-11.

November 17, 1970

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MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

University of Maine

Orono, Maine

QUARTERLY REPORT

April-June, 1970

Cooperating Agencies

Maine Department of Inland Fisheries and Game
University of Maine
Bureau of Sport Fisheries and Wildlife
Wildlife Management Institute

NOT FOR PUBLICATION

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WILDLIFE STAFF

Howard L. Mendall, Unit Leader and Professor of Wildlife Resources
 Voit B. Richens, Assistant Unit Leader and Assistant Professor of Wildlife Resources
 Malcolm W. Coulter, Associate Director for Wildlife, School of Forest Resources
 and Professor of Wildlife Resources
 Sanford D. Schemnitz, Associate Professor of Wildlife Resources
 Ray B. Owen, Jr., Assistant Professor of Wildlife Resources
 Frederick F. Gilbert, Assistant Professor of Wildlife Resources

Unit Collaborators - Personnel from 14 University departments or State and Federal agencies are actively collaborating with the Unit. Individuals assisting with projects that are currently reported upon are listed in connection with the appropriate project summary.

Graduate Assistants: David Abell
 Myrtle C. Bateman
 Andre Bourget
 David E. Capen
 Robert D. Dunford
 James M. Ramakka
 William Sarbello

Graduate Students: Thomas J. Allen
 Victor S. Balinga
 William R. Whitman

Unit Secretary: Maxine L. Horne

Unit Coordinating Committee

Ronald T. Speers, Commissioner, Maine Department of Inland Fisheries and Game*
 Albert D. Nutting, Director, School of Forest Resources
 Howard L. Mendall, Unit Leader

* Commissioner Speers resigned in June. George W. Bucknam was Acting Commissioner at the close of the quarter (see page 17).

RESEARCH PROJECTSBIG GAMEDeer-snow Relationships in Maine

- Objectives: (1) To obtain continuous winter weather records of a deer yard by cover type.
 (2) To investigate winter yard snow characteristics.
 (3) To observe reactions of deer to snow and weather.
 (4) To formulate meaningful deer-snow relationships as an aid to deer herd management in Maine.

Assignment: Voit B. Richens, Assistant Unit Leader

Consultants: John H. Hunt, Maine Department of Inland Fisheries and Game
 William O. Pruitt, Jr., Memorial University of Newfoundland
 Edmund S. Telfer, Canadian Wildlife Service

This past winter was a moderate one for western Maine; a snowy period of about 6 months, a snow depth of 2-3 feet during much of the time, frequent but usually low velocity winds, and frequent sub-zero temperatures of short duration were observed. Data were obtained for the winter beginning in early February. It was then, that the essential minimum equipment became available.

Snow Support. Total snow depth and the plunge depth of a Verme-type snow compaction gauge were used jointly to derive a snow hazard rating for deer in four basic plant cover types. Each rating for a biweekly-period consisted of the summed means of 10 depth and 10 plunge readings taken at 20-foot intervals along a permanent transect in each cover type. The mean hazard rating for the winter was 2.97 for mixedwood, 2.42 for hardwood, 2.91 for open, and 2.02 for softwood. For the time observed, it appears that there was really no difference in snow hazard to deer of mixedwood and open habitats, but deer in softwood were considerably more protected. The greater trafficability of snow in softwood was readily apparent to the observer on snowshoes. On April 17, for example, an icy crust in softwood easily supported a man without snowshoes (and deer) whereas snow in the other types was not noticeably crusted and provided little support. Average surface readings of the hardness gauge were 4,800 g/cm² in softwood cover and 44-517 g/cm² in the other types.

Use of snowmobile trails by deer were studied for added insight on snow support of deer. Three trails were established, and were marked at $\frac{1}{2}$ -mile intervals. The length of trail used, the numbers of deer using the trail, deer sinking depths on and off the trail, and total snow depths were recorded for each $\frac{1}{2}$ -mile sector. A summary is given in Table 1. Segments of trails were switched from one side of the road bed to the other several times, and the deer usually switched sides to use the trail. Much of this use was for traveling from one spot to another, but some deer seemed also to habitually feed from trails. The type of deer locomotion had an important bearing on sinking depth. In one instance, deer sank .5 to .6 feet into snow while walking but 1.3 to 1.6 feet when jumping; the snow was only 1.8 feet deep. On March 18 and 19, deer usually sank to 90% or more of the total snow depth with resultant limited movement.

Table 1. Deer Use of Three 6-Mile Snowmobile Trails, by Route and Date.

Snowmobile Route	Date	Feet of Trail Used	No. of Deer Using Trail	Av. Sinking Depth (Tenths of Feet)		Total Snow Depth (ft. and tenths)
				On Trail	Off Trail	
Black Brook	2/20-21	17,564	19	.20	.60	1.6
	3/4-5	1,080	4	.15	.80	1.7
	3/20-21	260	1	.20	.50	1.5
	4/17-18	970	12	.25	.90	1.0
Basin Pond	2/20-21	12,270	12	.30	.60	1.8
	3/4-5	4,025	20	.15	.75	1.7
	3/20-21	3,125	24	.20	.45	1.4
	4/17-18	10,285	32	.20	.90	1.0
Dead River	2/20-21	1,415	2	.30	.70	1.7
	3/4-5	734	6	.15	.75	1.7

The Verme compaction gauge appears to be very useful in simulating deer sinking depth. In over 100 trials there was little difference between gauge and deer-foot penetration of snow. This included crusts up to $2\frac{1}{2}$ inches thick when about .6 feet below the snow surface. Both deer and the gauge sank deeply in soft snow or snow spots, especially in areas of discontinuous snow columns--such as above brush piles. Hard crusts supported both. Light, thin, surface crusts supported the gauge but not deer and are the main drawback for gauge use.

Snow Profile. Snow pits were dug near each weather station on level ground and under representative cover. The temperature, density, hardness, snow grain characteristics, and thickness of each snow layer was recorded. The practical concern was to relate these data to deer mobility and hence winter welfare of deer. Data are limited but a few generalities can be made as follows: (1) snow density and hardness tend to increase with greater depth and time, higher snow moisture content, greater continuity of the snow column, and with lower temperatures; (2) crusts may form, disappear, and reform at various time intervals, do not support deer equally well in different areas at the same time nor in the same area at different times and may be of value to deer at various depths below the surface; (3) each snowfall forms a layer which differs from all others previously or subsequently deposited but layers tend to merge and become alike as winter progresses; (4) snow temperature is usually near 32°F at the ground surface and, during sub-zero weather, decreases rapidly toward the surface--it is an important influent on snow characteristics; (5) knowledge of the snow profile is essential to understanding deer-snow relations.

Air Temperature and Wind. Taylor maximum-minimum thermometers were placed in standard USWB instrument shelters in each cover type and were read at weekly intervals. The weekly extremes were recorded and averaged by month (Table 2). Extremes are more important to deer survival than the

"average" temperatures as deer are not subjected to averages. Every week in February had sub-zero readings as did half of those in March but none in April. The open area always had the lowest temperature and had greater temperature fluctuations than the other types. Softwood was often slightly colder than hardwood or mixedwood, presumably due to elevation differences.

Table 2. Miles of Wind and Weekly Minimum and Maximum Air Temperatures, Averaged by Month, in Four Vegetation Cover Types.

Cover Type	Miles of Wind	Temperature Extremes (°F)		Month
		Av. Min.	Av. Max.	
Mixedwood	204	-12	32	February
Hardwood	324	-11	31	
Open	449	-21	41	
Softwood	122	-15	36	
Mixedwood	416	4	38	March
Hardwood	506	3	43	
Open	395	- 8	43	
Softwood	139	- 1	39	
Mixedwood	454	18	51	April
Hardwood	490	16	55	
Open	259	12	54	
Softwood	126	15	52	

The total miles of wind (Table 2) was recorded as 1,074 for mixedwood, 1,320 for hardwood, 1,103 for an open area and 387 for softwood. Softwood apparently provides considerable protection from wind, which often occurs at cold periods; this reduces metabolic stress for deer. Based on these data, the open area was less windy than expected compared to non-softwood types. However, there are no replications by type (due to lack of funds) and the results here may not be truly representative of the cover type.

Light and Precipitation. This information will be summarized later. It is obvious, however, that amounts and distribution of these on the forest floor vary with canopy characteristics and meteorological conditions.

Plans for next quarter: Equipment will be serviced and adjusted in preparation for the coming winter, and the data will be examined more thoroughly.

Telemetry Studies of Deer Movements and Habitat Utilization at
Acadia National Park

- Objectives: (1) To study the mobility and habitat utilization of deer at Acadia National Park.
(2) To study critical wintering areas where white cedar utilization is heavy.

Assignment: Thomas J. Allen, Graduate Student

Thesis Advisor: Sanford D. Schemnitz, Associate Professor, Wildlife Resources

Consultants: Robert Binneweis, Chief Ranger, Acadia National Park
Roy W. Stamey, District Park Ranger, Acadia National Park

Allen received his M.S. degree in June, and the summary of his thesis follows:

A telemetry study was conducted at Acadia National Park, Mount Desert Island, Maine, from September, 1967, to June, 1970, to determine the movement patterns, home range, and habitat utilization of deer. Eight deer were radio-equipped during the study, 4 of which were monitored for a period of 6 months each.

1. Deer were captured during the fall and winter in box or net traps, or by using apples baited with Tranimul, a tranquilizing drug.

2. The minimum home ranges of the 4 deer studied most intensively were elongated in shape and averaged 556 acres, varying from 498 to 585 acres.

3. Average winter ranges were found to be approximately 0.5 the size of the summer range, 171 and 310 acres, respectively. Minimum home range major axis averaged 2.2 miles and varied from 1.9 to 2.7 miles. The minor axis varied from 0.6 to 0.8 miles and averaged 0.7 miles.

4. Daily movement patterns indicated an average distance between extreme daily locations (DBE) of 0.4 miles varying from 0.1 to 0.6 miles. The minimum total distance (MTD) moved in a 24-hour period averaged 0.9 miles and varied from 0.4 to 1.5 miles for the 4 deer studied most intensively.

5. Daily movements during the summer involved a feeding period from late afternoon to approximately midnight. The animals rested from midnight to just before dawn, moving only occasionally. Another feeding period began at this time and lasted until mid-morning or 11 a.m. On many occasions this morning feeding period duplicated the prior evening's feeding pattern, and the deer bedded again in the same area for the remainder of the day. In winter, deer were active more often, bedding for short periods throughout the day and night. This behavior pattern was not consistent from day to day and varied with meteorological influence.

6. A winter browse survey in a heavily used deer yard indicated very few preferred food plants available to deer. Balsam fir, a non-preferred food, comprised 84.4 percent of all available browse.

7. Seasonal shifts were noted in late fall and spring between summer and winter ranges. These shifts varied from 0.4 to 1.7 miles, but depended largely on the distance from the summer range to the nearest suitable softwood stand affording protection and cover from the winter elements.

8. Temperature and wind were important factors in determining the movement and behavior patterns of the deer. On cold, windy days the animals sought shelter in dense softwoods or leeward slopes protected from the wind and exposed to sunlight.

9. Snow depths greater than 5 inches altered movements patterns of deer in winter. Cold and wind were also important factors in restricting deer movements. Deer were inactive during snow storms.

10. Deer showed a high preference for hardwoods and meadows in the summer months, and for softwoods in winter.

11. Supplemental observations of 32 marked deer on the Park showed that yearling males move the greatest distances averaging 2.9 miles. Adult female deer exhibited the shortest movements averaging only 0.9 miles.

12. Management of heavily used wintering areas in the form of an annual or periodic harvest of surplus deer was recommended.

UPLAND GAME

Breeding Season Studies of Male American Woodcock - Part I

- Objectives: (1) To study the fidelity and continuity of use of singing fields by observation of individually-marked, male woodcock.
 (2) To observe any daily changes in woodcock courtship activity that may occur on several fields in the same general area.

Assignment: James M. Ramakka, Graduate Assistant

Thesis Advisor: Sanford D. Schemnitz, Associate Professor, Wildlife Resources

Consultants: Howard L. Mendall, Unit Leader
 Malcolm W. Coulter, Professor, Wildlife Resources
 Ray B. Owen, Jr., Assistant Professor, Wildlife Resources
 William B. Krohn, Research Biologist, Bureau of Sport Fisheries and Wildlife

Radio transmitters, weighing an average of 4.3 gm each, were placed on 9 male woodcock. These woodcock, 4 adults and 5 subadults, were captured with mist nets on 4 singing fields in the University of Maine Forest, Orono. All of the males returned to singing fields during the following evenings and 5 exhibited definite courtship behavior (peents and courtship flights).

A total of 194 man-hours were spent monitoring and locating these birds. Information gathered by radio tracking suggests that male woodcock have a strong attachment to a particular singing field. Six of the 9 birds equipped with transmitters used only one field during the period they were monitored. In flights from the diurnal cover, males often bypassed other singing fields without stopping. One of three birds which shifted to other fields carried on courtship activity in three fields on three different nights during a 7-day period. This shifting between fields occurred simultaneously with the singing ground census. Furthermore, what appeared to be suitable diurnal cover was often less than 100 yards from the singing field used by a male. Yet, frequently the bird would spend the day in similar cover elsewhere.

The first transmitter was placed on a male on April 11 and the last on May 20. Tracking ceased on June 5. The birds carried the radios for an average of 14 days each. Seven of the 11 radios used were recovered from live birds by the end of the field season. All of the males recovered appeared to be in good health. Three had gained weight (an average of 5 gm). This would seem to indicate the feeding behavior and physical condition were not adversely affected due to carrying the transmitters. Wing feathers were slightly worn where the surgical rubber radio harness made contact with the wing. There was no indication that this hampered the bird's ability to fly. However, based on observations of territorial conflicts and the subsequent displacement of radio-marked males, it is suggested that woodcock with radios may become sub-dominant in the social hierarchy. Whether this loss of dominance is due to the presence of the transmitter and harness or is the result of capture and handling needs further study.

Plans for next quarter: Further analysis of data and resumption of course work will be undertaken. In addition, captive woodcock will be monitored and observed to discover how much behavioral data can be gathered from the signal emitted by the transmitters. This project will be done at Syracuse University in cooperation with Dr. Robert Chambers of the State University College of Forestry.

Breeding Season Studies of Male American Woodcock - Part II

Objectives: To intensively study woodcock activity on individual singing grounds.

Assignment: Sanford D. Schemnitz, Associate Professor, Wildlife Resources

Consultants: Malcolm W. Coulter, Professor, Wildlife Resources
Ray B. Owen, Jr., Assistant Professor, Wildlife Resources
Thomas J. Allen, Graduate Student

A study of male woodcock behavior on individual singing grounds was carried out in the vicinity of Orono, Maine. Twelve undergraduate wildlife students, after an initial training period, were each assigned to a singing field for 12 consecutive nights during the peak of the breeding season, May 1-12, 1970. Each observer watched from an assigned location and began his observation on the singing ground either 15 or 22 minutes after official sunset depending on cloud cover. With the aid of a stopwatch the activity

by woodcock (peenting and/or singing) on one singing site was tallied for 36 minutes at 2 minute intervals. Activities of woodcock that could be heard on nearby areas were also tallied.

A preliminary examination of the data has been made. A computer simulation is planned to answer the following questions based upon data collected at 12 sites for 12 consecutive nights:

1. Influence of weather on performance.
2. Frequency of peenting and courtship flight activity in relation to time after sunset.
3. Relationship of density of males to frequency of courtship activity.
4. Comparison of activity during 12 nights during the peak of the census period.

Sites were selected for detailed observation for the 12 nights based on the proximity of birds to the observers and the consistency of landing in the same place. During the census period, woodcock were present on the 12 sites during 97.8% of the observation periods. However, because all of them did not perform regularly during the entire census period each night, the number that would have been counted on a typical 10-stop census route varied. The data from the 10 sites will be used to test the fluctuations in the number of birds performing at any given time during the census period. Although there was a considerable variation in the number of birds active on a certain ground throughout the census period, the total number of birds on all 12 grounds changed little from night to night.

Plans for next quarter: To tabulate the spring field data.

Summer Behavior of American Woodcock

- Objectives: (1) To determine summer movements of woodcock with special emphasis on birds hatched during the current year.
 (2) To investigate woodcock behavior, such as times of feeding and resting, while on summer fields and in diurnal cover.
 (3) To measure vegetation characteristics of diurnal cover.

Assignment: R. Daniel Dunford

Thesis Advisor: Ray B. Owen, Jr., Assistant Professor, Wildlife Resources

Consultants: Malcolm W. Coulter, Professor, Wildlife Resources
 Sanford D. Schemnitz, Associate Professor, Wildlife Resources
 Gene W. Farthing, Jr., Assistant Professor, Psychology
 William B. Krohn, Research Biologist, Bureau of Sport
 Fisheries and Wildlife
 J. William Peppard, Migratory Bird Research Leader,
 Department of Inland Fisheries and Game

Evening observations of courting male woodcock were made on the study area in April and May. Each singing field was marked on a cover map of the

area. The main concentration fields were observed each evening beginning June 1, and the number of birds seen flying into the fields was recorded. These data will be used to correlate summer movements of juvenile birds with spring behavior of adults.

All equipment and methods were tested prior to attaching radios on woodcock. Thus far, two juvenile males have been equipped with transmitters. One bird has moved in the diurnal cover, but has made no flights or movements onto summer fields. The other bird has been making daily flights between summer fields and diurnal cover.

Plans for next quarter: Observations will continue on these two birds, and transmitters will be attached to approximately 18 more birds for additional observations throughout the summer.

WATERFOWL

Interrelationships of Breeding Eiders, Herring Gulls and Black-backed Gulls

Objective: To determine the effects of the presence of gulls on eider ducks nesting in mixed colonies.

Assignment: Andre A. Bourget, Graduate Assistant

Thesis Advisor: Howard L. Mendall, Unit Leader

Consultants: Frederick F. Gilbert, Assistant Professor, Wildlife Resources
Ray B. Owen, Jr., Assistant Professor, Wildlife Resources
Voit B. Richens, Assistant Unit Leader

Graduate Assistant Bourget completed his thesis during the quarter and received his M.S. degree in June. The abstract is as follows:

The interrelationships between the American eider (Somateria mollissima dresseri), the herring gull (Larus argentatus), and the black-backed gull (Larus marinus) nesting in mixed colonies were studied on four islands in the Islesboro area of Penobscot Bay, Maine during the spring and summer of 1969. Primary objectives were to determine which species of gull was the more important predator on eider eggs; the predator pressure in relation to the breeding chronology of the gulls concerned; the relationship of territorial defense by gulls to eiders nesting in the vicinity; and the influence of environmental factors upon gull predatory tendencies. The investigation involved direct observation from a blind of the coactions between the breeding birds; also, nesting success data from a sample of nests of both the gull species and eider ducks.

The black-backed gull had a more adverse effect on eider production than did the herring gull, because of its higher predatory tendencies and the longer time spent with the eider on the nesting islands.

Predation rates by both gull species were related to their breeding cycles. A high degree of predation was associated with a peak of aggressiveness at nest initiation time of the herring gull, while the height of predatory acts by the black-backed gull occurred prior to and at hatching of its own eggs.

Eider nesting success was affected by island size, topography, and cover. These three factors influenced the predatory behavior of gulls, as well as their aggressiveness and territorial defense. Nest losses to predation were higher on small islands with rugged topography that provided perches for gulls among eider nests. Small patches of vegetative cover present on small islands were more readily investigated by gulls than were the extensive stands that occurred on large islands. Population studies showed that nest losses were related directly to bird density, and to the herring gull:black-backed gull ratio. Although herring gulls outnumbered black-backed gulls on the study area, the latter were more predatory on the eggs and young of other species than were herring gulls.

It was concluded that several physical and ecological factors, as well as gull predatory behavior, influenced eider nesting success. The extent of predation was strongly related to the breeding chronology of the three species concerned, both individually and collectively.

Distribution of Eider Populations in Coastal Maine

- Objectives: (1) To locate the principal breeding colonies along the Maine coast.
 (2) To develop a satisfactory technique for aerial breeding ground inventory.
 (3) To determine the abundance and subspecific composition of fall and winter populations.

Assignment: Howard L. Mendall, Unit Leader
 William Snow, Game Management Agent, Bureau of Sport Fisheries and Wildlife

Consultant: Rex Tice, Division of Management and Enforcement, Bureau of Sport Fisheries and Wildlife

The aerial inventory of breeding eider ducks was conducted along the Maine coast and offshore islands from May 3-7 inclusive. In addition to Agent-pilot Snow and Unit Leader Mendall, Agent Donald Blais also participated as he has for the last 4 years. Approximately 20 hours flying time was spent on the survey.

A total of 45,260 eiders were recorded. A random sample of sex and age ratios were obtained amounting to about 14% of the total count. These figures were used in adjusting the total tally for a more accurate estimate of pairs. Sub-adult males made up about 8% of the total and it is assumed approximately the same proportion of sub-adult females also existed in the population sampled. Sex ratios ran close to 50:50, although slightly more to males than in past years. However, the season was more advanced chronologically than during recent years and some females were already in nesting cover (confirmed

by subsequent ground checks), and hence not flushed or counted. For this reason it is believed the total count is very conservative.

From the data obtained, the minimum breeding population in Maine in 1970, is estimated as 20,000 pairs. This is approximately the same as in 1968, the last year a complete inventory was made. Based on only a sample census a year ago it was believed that a decline had occurred. If so, it is apparent the eiders recovered this year and were back at their record high level of 1968.

Plans for next quarter. Inactive.

Annual Production and Factors Influencing Nesting Success of
the American Eider

Objectives: To determine annual production and factors related to eider nesting success in breeding colonies of the Muscle Ridge Channel of Penobscot Bay.

Assignment: Howard L. Mendall, Leader

Seasonal breeding ground studies on the 5 islands of the Rockland study area were carried out during the quarter. Graduate Assistants Bourget and Sarbello conducted comparable studies in the Islesboro region. Since the work was still in progress at the close of the quarter, it will be summarized in detail in the next Unit Report.

Special attention was given to an outbreak of fowl cholera among breeding eider ducks that occurred in June along the central Maine coast. On the basis of data compiled, total mortality was greater than that of the 1963 occurrence, which was the last recorded evidence of the disease in Maine.

First indication of trouble was noted by Mendall on June 9 during the regular nest checks which are part of the breeding ecology studies. A dead eider was found on her nest in one of the largest of the Penobscot Bay colonies (Fisherman's Island). The bird was sent to the Animal Pathology laboratory of the University of Maine. Before an autopsy report was received, 16 carcasses were found June 12 and 13 on the same island, 3 being nesting birds. One was alive when found but died shortly. Two dead herring gulls were also collected.

Fowl cholera was suspected and sanitation measures were applied at once. All carcasses not saved for autopsy were buried. Pools of stagnant water were disinfected. All that was immediately available for this purpose (since it was on a weekend) was a commercial product containing cresylic acid. Later, an iodine solution furnished by the Animal Pathology laboratory was used.

Ten of the eiders and the 2 gulls were autopsied. All of these eiders, plus the eider obtained June 9, yielded positive cultures for fowl cholera. Tests of the gulls were inconclusive.

From June 12 until the second week of July, both nesting cover and beaches at Fisherman's Island were searched almost daily when weather conditions permitted landing. Professor David O'Meara of the University Pathology laboratory and Dr. Pierre Brunet of the State Division of Animal Industry also visited the island. Both agreed with the sanitation measures taken. Several incubating eiders were live-trapped and blood samples obtained, with negative tests for cholera.

The repeated checks on Fisherman's Island afforded a rather complete case history of the epidemic and both the chronology and extent of the loss appeared well documented. A total of 43 dead or dying birds were found, 20 of which were on nests or in nesting cover. The remainder were on the beaches or rocks. All except one were adult females. Mortality was largely confined to the period June 12-20 with a rapid decline thereafter. Only one known death occurred after the 25th (on June 30) even though some 30 females were still incubating at that time. Since the colony consisted of about 300 pairs it is believed that total mortality did not exceed 20%.

Meanwhile, the Maine Fish and Game Department was notified that a seal-collecting party from the Syracuse Municipal Zoo had found 55 dead eiders the week of June 14 on 3 islands in Muscongus Bay, adjacent to Penobscot Bay to the west. Two specimens autopsied, plus one of the seals that died in transit, yielded positive cultures for fowl cholera, according to Zoo officials. Determinations were by the New York Department of Environmental Conservation.

Monitoring of many of the State's eider colonies was carried out during the latter part of June as follows:

1. Penobscot Bay by Mendall and Unit Graduate Assistants Bourget and Sarbello.
2. Muscongus Bay and outer islands by U.S. Game Management Agent William Snow.
3. Casco Bay by State Game Division personnel under the supervision of J. William Peppard, assisted by W. Sidney Howe.

The most serious report came from Agent Snow. On 8 islands searched in Muscongus Bay, he found a total of 513 dead eiders. A few of these birds were on nests or in nesting cover but the majority were on the beaches. None of the carcasses were fresh and it is likely most mortality occurred about mid-June. Four important offshore colonies were checked with dead eiders (19) being found on only one.

In West Penobscot Bay dead eiders were found on 3 islands (35 carcasses) apart from Fisherman's. Six nearby colonies gave negative results.

A total of 22 islands in East Penobscot Bay were searched with only 6 carcasses found. It was noteworthy that the island checks of the Islesboro region were completely negative. This is the portion of the State hit by the 1963 outbreak.

Thirteen islands in western Maine (Casco Bay) were checked and detailed searches made on 4 of these. No evidence of dead or sick birds was found. Limitations of time and manpower precluded coverage of eastern Maine eider colonies. However, in view of the progressive decline of losses in Penobscot Bay east of Rockland, it seems doubtful if the epidemic reached Hancock or Washington counties.

In summary, evidence indicates that the outbreak reached a peak about June 12-15, and then declined rather rapidly. It appears that Muscongus Bay was the area most seriously affected. Several colonies in Penobscot Bay suffered some mortality but on only one island (Fisherman's) did it approach 20% of the colony. Relatively few losses on the important offshore islands were found. The western and east-central portions of the coast appeared to suffer virtually no losses.

Although a considerable number of dead ducks, mostly females, were found, it is not likely that a major loss in the overall breeding population occurred. Data from the 1970 spring aerial census indicated an increased population from 1969, with a minimum of 20,000 pairs in Maine at the start of nesting. The breeding chronology was advanced from average this year and the hatching peak had already taken place on some of the islands when the outbreak occurred. Otherwise, losses might have been much greater. Limited brood checks in Penobscot Bay and islands offshore from Muscongus Bay have subsequently been carried out by Mendall and by Agent Snow. These checks have detected no evidence of sickness or deaths among the flocks of molting adults and flightless young.

It has been speculated that there may be a relationship to the major epidemic of February in Chesapeake Bay. Many scoters were involved then and, while eiders do not winter in Chesapeake Bay, the two species are associated on the Maine coast during spring migration.

Plans for next quarter: To complete the season's nesting study and tabulate the data.

Establishing and Increasing Local Breeding Populations of Wood Ducks by Relocating Active Nest Boxes

Objectives: To establish new breeding populations of wood ducks by moving nest boxes with incubating hens and clutches to areas with no wood duck production.

Assignment: David E. Capen, Graduate Assistant

Thesis Advisor: Malcolm W. Coulter, Professor, Wildlife Resources

Consultants: J. William Peppard, Migratory Bird Research Leader, Maine Department of Inland Fisheries and Game

Nine wood duck boxes with active nests have been moved. Three were moved while the eggs were in the pipping stage; the others were moved shortly after hatching. The hens of clutches in the pipping stage abandoned their nests. One returned to the original area about 25 miles away and began a re-nest.

Of six nest boxes moved after the ducklings had hatched, three hens abandoned. Two others emerged from the boxes and called the young; this behavior was similar to that observed in a natural situation. The fate of one relocated nest is uncertain: the young left the nest, but whether they did so with the hen is not known.

Plans for next quarter: Much time during July will be spent observing the marshes on which the broods were relocated, and an attempt to band ducklings on these areas will be made.

CURRENT PROJECTS NOT REPORTED THIS QUARTER

Woodcock Nocturnal Habitat Utilization in Relation to Sex, Age, and Molt -
R. B. Owen.
Waterfowl Distribution and Breeding Ecology - H. L. Mendall.
Ecology and Behavior of the Fisher - M. W. Coulter.
Factors Affecting Summer Flight Behavior of White-tailed Deer on Isle au Haut -
S. D. Schemnitz.
Ecology of the Ruffed Grouse in Maine - S. D. Schemnitz.
Effects of Three Cover Conditions on Behavior and Physiological Responses on
Pinned White-tailed Deer - M. C. Bateman.

COOPERATION, EDUCATIONAL WORK AND MISCELLANEOUS ACTIVITIES

The sixth Annual Warden School, held at the University of Maine, described in the January-March report, was concluded April 13. Enrollees included one Baxter State Park Ranger.

Staff and graduate students of the University of Maine, Acadia University in Nova Scotia and the University of New Brunswick held a wildlife seminar April 3-4 at Fredericton, New Brunswick. Graduate students from each institution gave informal presentations of their theses; each was followed by suggestions and/or general discussion, by faculty and students. This seminar was sponsored by the New England-Atlantic Provinces Study Center. It was the second such meeting, the first being held a year ago at the Visitor Center of the Moosehorn National Wildlife Refuge.

Staff members participated in the University of Maine "Earth Day" activities April 22, as well as in the preliminary teach-in sessions. Owen was a member of the panel discussing agricultural pollution and Coulter served on the April 22 summary session.

Mendall and Schemnitz participated in the annual woodcock singing ground census at the request of the State Game Division and the Division of Management and Enforcement of the Bureau's Regional Office.

Owen and Schemnitz led an undergraduate wildlife ecology field trip to the Champlain Valley of Vermont and to the Adirondacks in New York in June.

Schemnitz and Owen helped coordinate the summer woodcock banding program in cooperation with Refuge personnel at the Moosehorn National Wildlife Refuge.

Schemnitz, Coulter and Mendall attended the dedication of the Rachel Carson Refuge at Wells, Maine. Secretary of the Interior Hickel was the featured speaker.

Mendall continued to provide technical assistance to the Maine Department of Inland Fisheries and Game, Nature Conservancy and the Maine Audubon Society in the coastal island preservation activities of those organizations.

Coulter, Mendall and Schemnitz conferred with Kenneth Anderson, of the State Planning Office, and with J. William Peppard, Maine Department of Inland Fisheries and Game, on the State's Comprehensive Wildlife Plan.

PERSONNEL CHANGES

A new Graduate Assistant, William Sarbello, arrived in June and began the program toward an M.S. degree. He is a B.S. graduate of 1970 from Cornell University.

Graduate students Thomas J. Allen and Andre Bourget completed all requirements and received M.S. degrees in June. Allen will be employed by the West Virginia Fish and Game Department and Bourget by the Canadian Wildlife Service.

Ronald T. Speers, resigned in June as Commissioner of Inland Fisheries and Game, to devote full time to his campaign for Congress. Deep appreciation is herewith expressed to him for his constant interest in and assistance to the Unit program during his many years with the Fish and Game Department.

George W. Bucknam, Deputy Commissioner for 17 years, was named as Acting Commissioner, and subsequently has been appointed as Commissioner. Thus, he has had long familiarity with the wildlife programs at the University. The staff extends best wishes to him.

PUBLICATIONS AND THESES

- Allen, T. J. 1970. Telemetry Studies of Deer Movements and Habitat Utilization at Acadia National Park. Unpub. M.S. Thesis, Univ. of Maine, Orono. 153 pp.
- Bourget, A. A. 1970. Interrelationships of Eiders, Herring Gulls, and Black-backed Gulls Nesting in Mixed Colonies in Penobscot Bay, Maine. Unpub. M.S. Thesis, Univ. of Maine, Orono. 121 pp.
- Gilbert, F. F. 1970. Deer Losses--What Do They Amount To? Maine Fish and Game, XII(2):31-32.

August 7, 1970

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MAINE COOPERATIVE WILDLIFE RESEARCH UNIT

University of Maine

Orono, Maine

QUARTERLY REPORT

October-December, 1970

Cooperating Agencies

Maine Department of Inland Fisheries and Game
University of Maine
Bureau of Sport Fisheries and Wildlife
Wildlife Management Institute

NOT FOR PUBLICATION

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WILDLIFE STAFF

Howard L. Mendall, Unit Leader and Professor of Wildlife Resources
 Voit B. Richens, Assistant Unit Leader and Assistant Professor of Wildlife Resources
 Malcolm W. Coulter, Associate Director for Wildlife, School of Forest Resources
 and Professor of Wildlife Resources
 Sanford D. Schemnitz, Associate Professor of Wildlife Resources
 Ray B. Owen, Jr., Assistant Professor of Wildlife Resources
 Frederick F. Gilbert, Assistant Professor of Wildlife Resources

Unit Collaborators - Personnel from 15 University departments or State and Federal agencies are actively collaborating with the Unit. Individuals assisting with projects that are currently reported upon are listed in connection with the appropriate project summary.

Graduate Assistants: David H. Abell
 Myrtle C. Bateman
 David E. Capen
 R. Daniel Dunford
 Roy D. Hugie
 David M. Knupp
 James M. Ramakka
 William Sarbello

Graduate Fellows: J. George Gleich
 John F. Moroney

NSF Trainee: Gary C. White

Graduate Students: Victor S. Balinga
 William R. Whitman

Unit Secretary: Maxine L. Horne

Unit Coordinating Committee

George W. Bucknam, Commissioner, Maine Department of Inland Fisheries and Game
 Albert D. Nutting, Director, School of Forest Resources
 Howard L. Mendall, Unit Leader

RESEARCH PROJECTSBIG GAMEImportance of Snow Support in the Welfare and Survival of Wintering
Deer in Western Maine

- Objectives: (1) To investigate characteristics of the snow cover that determine trafficability for deer.
- (2) To explore hardness gauges and sinking depth simulators as aids in determining snow support for deer.
- (3) To study snow stratification as a component of snow support.
- (4) To relate snow strength and stratification to cover type, weather conditions and deer mobility.

Assignment: Voit B. Richens, Assistant Unit Leader

Consultants: John H. Hunt, Maine Dept. of Inland Fisheries and Game
William O. Pruitt, Jr., University of Manitoba
Edmund S. Telfer, Canadian Wildlife Service, Edmonton

This report covers more than the October-December quarter. In view of the severity of the current winter and the widespread concern for the deer herd in Maine, it seemed timely to summarize project data for this winter up to mid-February.

Snow and cold have made this a harsh winter thus far. Recorded snowfall on the Flagstaff study area was 53 inches in December, 16 in January, and 23 in the first half of February for a total of 92 inches. Sub-zero air temperatures have been recorded nearly every week since early December in all four cover types. In the open type there were 48 days below freezing and 27 days below zero in December and January; for softwood it was 49 and 30 days.

Snow Depth and Sinking Depth. Data on snow depth and simulated deer sinking depth were obtained as described in the Unit Quarterly Report for April-June, 1970. Twice as many readings were taken this year, however, due to replication of transects by cover type. Snow depth generally increased in all types as the winter advanced (Table 1). Softwood had the least snow and the open type the greatest, with a February difference of one foot.

Simulator results (Table 1) suggested that the deer had been sinking from 50-95% of actual snow depth in all cover types in all months, except for softwood and open types in February. Depth measurements of deer tracks corresponded closely with these simulated results with the exception noted above. Simulator sinking depths were 12-14%, whereas deer sank 50-75% of the snow depth. In this case surface or near-surface crusts occurred; the simulator does not give good estimates of deer sinking depth when there are surface crusts (see April-June report). When February figures are adjusted to actual sinking depths (see brackets in Table 1), it is obvious that at no time this winter has the snow cover provided much support for deer.

Sinking depths of 1.3-2.4 feet have forced deer to expend great amounts of energy to move beyond yard limits for food.

In areas without trails, observations of deer and their tracks revealed that the animals spread their feet and tended to place them on the snow in a more horizontal position to gain additional support. They also tried different methods of locomotion (jumping, walking, etc.), presumably in an effort to overcome the baffling problem of "going somewhere." Deer observed on the study area appeared unable to make many successive jumps and they frequently lost their balance and fell forward when trying to do so. Deer rested frequently when pushing through deep snow; a body-formed furrow of 0.6-1.1 feet was stark evidence of the energy-consuming struggle. Following the warming trend since February 4, deer largely ceased belly-dragging the snow but they did fall through the recent crust--the strongest crust of the winter. An additional 8-10 inches of low density snow [even more since February 15] since crusting renewed difficult travel.

Two adult bull moose wintering in the Hayden Brook area offered an interesting comparison. In mid-February, they were sinking into the snow from 2.7-3.3 feet in the open where average snow depth was about 3.5 feet. The chest of the moose appeared to be making a furrow 0.4-0.5 feet deep but they still moved around the area a good deal, whereas deer were mostly confined to small pockets of cover and well-used trails due to lesser strength and leg length.

The danger that snow poses for deer is represented by the sum of average snow depth and average sinking depth--a snow hazard rating--presently unknown for Maine deer. A figure for snow hazard is probably most meaningful when deer sinking depth is 40% or more of the hazard rating value. Snow depth is important as it represents potential sinking depth and potential elevation height of deer above the ground surface.

Snow Hardness and Density. The resistance of the snow surface to penetration (hardness) by deer varies with moisture content, density and temperature of snow. Vertical surface hardness this winter has been low due primarily to the absence of surface crusts. Fragile crusting or crusting over a dry, weak snow profile has also resulted in little support. The hardness figures for February (Table 1) appear high and, in theory, a surface of this hardness should hold a deer's weight. Deer were not generally supported by this surface, however, due to weak sub-crust snow. Hardness values this winter have ranged from 2-8 g/cm² for fresh snow (virtually no support) to 18,000 g/cm² (theoretically good but actually poor support) for the strongest icy crust.

Density values for snow have ranged from a high of 30% near the ground surface in mid-February to approximately 6% at the surface in December and January. Most density values of the snow profile are now between 15% and 25%, probably still 5-10% too low for good deer support. The snow has usually had a density of 10-12% soon after snowfall, gradually increasing with time and with weight of additional layers above, and also changing in grain size and shape. Consistently low temperatures during much of the winter has slowed these changes to an extreme degree, thus long maintaining low density, hardness and small grain size. None of these characteristics is conducive to the adequate support of deer.

Deer and Moose Trails. Most deer trails are a succession of foot pockets which gradually build up at the bottom from new increments of snow, a wearing down of partitions between pockets and widening of pocket bottoms due to inexact foot placement. Trails somewhat circumvent deep snow effects as do trafficable crusts. Thus, track-trail ratios have been widely used as an index of difficult snow conditions for deer. The more that deer are confined to the use of trails, the more severe travel conditions are thought to be. Many trails were body-formed for an average of about 0.8-1.0 foot down from the snow surface in late December and again in late January, and the main ones now give good support. New snow-falls and wind-blown snow frequently fills these trail pockets, and sometimes also the upper body-formed portion. Several days may pass before trails are laboriously re-opened. Trails vary little in width, which is apparently more a function of snow and sinking depth than of numbers of deer using them. The heavy use trails have larger and more compacted pockets than those used less often. Moose trails are commonly used by deer for travel when near the yard area. Deer jump from one moose foot-pocket to another especially when the snow is soft. When partitions between pockets have hardened deer may successfully step from one partition to another with little penetration of snow and without the hazard of jumping into pockets which are deeper than their own leg length.

Use of Snowmobile Trails. These trails have been readily used by deer (Table 2) for feeding, traveling and flight. This is apparently because of the support they provide making travel comparatively easy and effortless. The usual sinking depth for deer was 0.2-0.3 feet on a trail and was 1.3-2.2 feet when off the trail.

Food plants along these trails were heavily used, and it was commonly noted that deer had slipped off trying to reach nearby food. Tracks showed they usually got back on the trail at the slip-off point. Some deer have been observed to travel on snowmobile trails for nearly 3 miles in one trip. Some use of these trails appears to be for exercise or from curiosity; deer have used side trails into the project weather stations and back out again only to enter the woods elsewhere. They have followed loops into woods and back out and they have gone to the end of dead-end trails and then returned to a favorable exit. Where several snowmobile trails occurred side by side these animals appeared to follow the trail which gave the best support, regardless of how recent it was made.

Two deer, met by Richens on the trail at Hayden Brook, fled directly away toward the nearest cover but floundered badly in the deep snow; they immediately returned to the trail by the shortest route (toward the observer) and ran up the snowmobile trail and thence downhill on a deer trail. On another occasion 2 deer were feeding about 30 feet off a snowmobile trail when Richens came along on a Ski-doo. They gave me quick look and turned around and jumped toward the trail. The fawn fell down when it jumped but got up and followed the doe down the path until they found a deer trail. Except for the snow, their fastest and safest flight direction would have been directly away from the snowmobile trail. Many other examples could be given of deer orientation toward man-made trails, including those made with snowshoes and boots.

Food Cover Relations. Many areas of good food are without deer trails, often only 100-200 yards from cover. Food plants within reach along trails and under yard cover are severely hedged and/or highlined; this includes heavy current use of hemlock and balsam fir as well as white cedar, hazelnut, maples and the poplar group. Low temperatures, deep snow and wind, coupled with limited food, has placed these deer under severe stress. Two females, a fawn and a yearling, were found dead in the Hayden Brook area in late January. Bone marrow examination in the field suggested they died of starvation but this has not yet been verified by laboratory analysis. Graduate Assistant Hugie will deal with food and cover relations more fully in the next Unit report.

Weather. Data on wind and temperature are given in Table 3. It is evident that the open cover type is the most windy and softwood the least so; the difference is threefold. However, the softwood type was the coldest this winter during most weeks, while the open type was only slightly warmer. This is a reversal of the generally accepted notion that softwood stands are warmer than other cover types. This is also the reverse of last winter's data. The long period of continuous cold and the low solar radiation into the softwood this season may more than offset the moderating effect of the trees; hence, under some conditions softwood stands are colder instead of warmer than other cover types. The physiological stress on deer would nonetheless be much lower in softwood than in the open because of wind and snow differences.

Plans for next quarter: Observations of snow, weather and deer response will be continued until snowmelt. A ram penetrometer will soon be completed and will be tested as a gauge for measuring snow hardness on the study area.

Table 1. Simulator snow support measurements by month* and cover type for December, January and early February 1970-71.

Plant Cover Type	Mean Snow Depth (ft.)	Mean Sinking Depth (ft.)	Snow Hazard Rating	Mean Surface Hardness** (g/cm ²)
Mixed wood	1.8	1.7	3.5	.2.8
	2.1	1.8	3.9	.5.0
	2.8	1.3	4.1	6.055.0
Hardwood	2.0	1.9	3.9	1.8
	2.3	2.0	4.4	4.5
	3.1	1.4	4.5	6.975.0
Open	2.8	2.4	5.2	6.4
	2.8	2.0	4.7	29.9
	3.5	0.5 [1.5]	4.0 [5.0]	6.155.0
Softwood	2.0	1.9	3.9	6.5
	2.0	1.3	3.3	9.7
	2.5	0.3 [1.3]	2.8 [4.1]	11.385.0

*The first row for each cover type is for December, the second for January and the third for early February.

**Snow hardness varies greatly for different regimes of temperature, moisture, etc., the high figures were obtained for a surface rain crust in early February.

Table 2. Deer use of 6-mile snowmobile trails, by route and date, 1970-71.

Snowmobile Routes	Date	Feet of Trail Used	No. of Deer Using Trail	Av. Sinking Depth (ft.)		Total Snow Depth (ft.)
				On Trail	Off Trail	
Black Brook	1/2	146	3	.10	1.9	2.2
	1/17	1,908	4	.20	1.6	2.1
	1/29	135	1	.20	1.8	2.4
	2/20	4,587	4	.20	2.0	2.8
Basin Pond	1/2	None	None	---	2.1	2.4
	1/17	364	2	.20	1.7	2.2
	1/29	None	None	---	1.8	2.3
Dead River	1/4	8,255	16	.20	1.9	2.3
	1/17	1,456	10	.20	1.9	2.3
Hayden Brook	1/17	4,438	17	.20	1.8	2.3
	1/29	2,015	7	.20	1.9	2.4
	2/20	15,755	14	.30	1.3	3.2

Table 3. Cumulative miles of wind and weekly minimum and maximum air temperatures, averaged by month, in four vegetation cover types.

Cover Type	Miles of Wind*	Temp. Extremes (°F)**		Month
		Av. Min.	Av. Max.	
Mixedwood	510	-5.2	28.4	December
Hardwood	483	-4.8	25.4	
Open	669	-6.4	30.6	
Softwood	208	-7.4	27.0	
Mixedwood	516	-18.5	27.2	January
Hardwood	345	-20.0	26.2	
Open	661	-24.2	28.2	
Softwood	275	-25.0	24.8	
Mixedwood	297	-17.3	28.3	February
Hardwood	322	-17.3	33.0	
Open	365	-22.7	37.0	
Softwood	125	-24.3	31.3	

*Wind is measured by totalizing anemometers and the figures in this column are cumulative for monthly periods. Recording wind this way enables comparisons to be made between cover types. Average wind velocity (in miles per hour) can be obtained for the month by dividing miles of wind by the number of hours in the month.

**The weekly extremes were recorded and averaged by month for each cover type.

Effects of Fertilization on Nutrient Content of Deer Browse and Forest
Vegetation in a Recently-Cut Area

- Objectives: (1) To measure seasonal nutrient content of selected browse species subjected to different fertilization treatments.
- (2) To measure effects of fertilization on forest composition and growth during the season in which fertilizer is applied.

Assignment: David H. Abell

Thesis Advisors: Sanford D. Schemnitz, Associate Professor, Wildlife Resources
Frederick F. Gilbert, Assistant Professor, Wildlife Resources

Consultants: Charles E. Schomaker, Associate Professor, Forest Resources
Roland A. Struchtemeyer, Professor, Plant and Soil Sciences

The great majority of forest fertilization studies have been designed to increase tree production and have generally neglected practices that might benefit deer. To investigate the effects of fertilization on deer browse, treatments of nitrogen, phosphorus, and potassium will be applied singly and in combination to forested plots. The nutrient content of selected woody browse species will be determined before and after fertilizer application. In addition, growth rate and species composition during the first growing season after fertilization will be measured.

During the present quarter, a study area was selected in Sebec, Maine. The area is a recently-logged woodlot owned by the Dead River Company. The major portion of the logging was done between 1961 and 1963. Natural regeneration on the area is predominately aspen, red maple, sugar maple, beaked hazelnut, and balsam fir. A cooperative agreement was drawn up with the Dead River Company to ensure that fertilization plots will remain undisturbed for a period of ten years. Along with making arrangements for nutrient analysis of browse, a literature review is presently underway.

Plans for next quarter: Fertilization plots will be established on the study area. Plot characterization will be undertaken to determine which browse species will be used for nutrient analysis. Such analysis of selected species will be determined on all plots before fertilization in the spring.

WATERFOWL

Distribution of Eider Populations in Coastal Maine

- Objectives: (1) To locate the principal breeding colonies along the Maine coast.
- (2) To develop a satisfactory technique for aerial breeding ground inventory.
- (3) To determine the abundance and subspecific composition of fall and winter populations.

Assignment: Howard L. Mendall, Unit Leader
 William Snow, Game Management Agent, Bureau of Sport
 Fisheries and Wildlife

Consultant: Rex Tice, Division of Management and Enforcement, Bureau
 of Sport Fisheries and Wildlife

Game Management Agent Snow and Mendall continued to obtain data and specimens of eider ducks during the fall and early winter; also a series of eider heads were sent to the Unit by cooperating hunters. In addition to subspecies determinations and tabulations of sex and age ratios, blood samples were obtained from some of the freshly-killed birds for bacterial cultures because of the fowl cholera outbreak of last summer (see Unit Quarterly Report, April-June, 1970).

Schemnitz assisted considerably in this work. Graduate Assistant Myrtle Bateman is conducting a plumage study of the specimens available.

Record-breaking snowfall and near record low temperatures in southern and central Maine and the coastal belt curtailed much of the normal December waterfowl hunting. Sea duck hunting was especially affected and was a marked contrast from the excellent shooting of a year ago. Nevertheless, a reasonable number of specimens were obtained and these are presently being examined.

Plans for next quarter: To complete the laboratory study of the specimens.

Renesting of the American Eider in Penobscot Bay Colonies

Objective: To determine the extent to which eiders renest following loss of initial clutches.

Assignment: William Sarbello, Graduate Assistant

Thesis Advisor: Howard L. Mendall, Unit Leader

This is a new project. It is a continuation of the Unit studies of the breeding ecology of the eider duck. Several segments have been Master's thesis studies on the Islesboro study area, which will be the site of the present investigation.

A study will be made of the frequency of renesting under varying conditions of habitat and chronology. Females will be caught on their nests, banded and/or color marked, and released. Some of the clutches will be removed to simulate natural loss. Subsequent behavior and renesting attempts, if made, will be recorded.

During this quarter, a literature review was begun and tentative plans were made for the spring field work.

Plans for next quarter: The review of pertinent literature will continue. A thesis outline will be prepared and an attempt will be made to design a new type of nest trap to supplement the kind used in the past.

OTHER PROJECTSA Comparative Study of Selected Public Conservation Areas of
Northeastern North America

Assignment: Victor S. Balinga, Graduate Student

Thesis Advisor: Malcolm W. Coulter, Professor, Wildlife Resources

Balinga completed the thesis during the quarter, an abstract of which follows:

An analysis was made of policies, policy evolution and a comparison of current and projected needs, the administrative systems, finance, management programs and problems of selected conservation areas. Comparable situations in Africa are discussed.

Included in this study are two national parks, two national wildlife refuges, one national forest, the Maine state parks and the state game management areas. The smallest of the federal areas is Parker River National Wildlife Refuge with an area of 4,650 acres, and the largest is the White Mountain National Forest with 725,792 acres.

Each area was established for a specific purpose either on the initiative of an individual, group of people or a government agency, but they were all established basically to conserve wildlife and vegetation in unique locations. About 60 percent of the land area in the study places was purchased, 37 percent donated, and 3 percent acquired by public or private transfer of land; in Africa, most land for conservation areas to date has been donated.

Information in the thesis was obtained by visits to the areas, discussions with staff, and from study of the literature.

The basic policy has been and is to keep conservation areas unspoiled for both the present and future generations, but the method of application of policy has differed in parks, refuges, national forests, and game management areas.

Three systems exist in the administrative organizations: by area, function or both. In Africa, organization is mainly by area.

Five methods are used to finance public conservation areas: government appropriations, trust funds, dedicated revenue, donations and income from the areas. The most prevalent method is by government appropriation and this seems to be the only means of financing African conservation areas.

Information and education, recreation, and fire protection are stressed in all areas. Some variation in programs exists from one area to another.

The most significant problem in public conservation areas is their use by too many people; with these populations of people come many social problems.

Environmental Studies on the Lower Penobscot River

Assignment: Gary C. White, NSF Trainee
John F. Moroney, Graduate Fellow

This is a new project financed by the Ford Foundation, administered through the Director of the Water Resources Center, Mr. Edgar Imhoff, and coordinated by the Center for Environmental Studies. The study involves an interdisciplinary approach to investigating the ecological, sociological, economic, and political aspects of pollution in the lower Penobscot River. The research team includes graduate students in wildlife, sociology, history, geology, and business administration. Staff members studying various segments of the project are Dr. Johannes Delphendahl, Agricultural and Resource Economics; Dr. James Henderson, Political Science; and Dr. Frank Woodard, Civil Engineering. In addition, Dr. Malcolm W. Coulter, and Dr. Ray B. Owen, Jr., are serving as staff consultants in ecology.

Moroney and White are attempting to describe and measure current ecological conditions of the study area. A well-defined ecological base is necessary to measure the changes in the river that will occur if the pollution load is changed in volume or composition.

Moroney and White have participated in several meetings of the research team. They have also met with representatives of various agencies that have carried out biological studies on the river. Meetings have been held with representatives of the Atlantic Sea-Run Salmon Commission, Great Northern Paper Company and the Maine Cooperative Fishery Unit. Detailed plans for these projects will be developed during the next quarter.

CURRENT PROJECTS NOT REPORTED THIS QUARTER

Mobility of Deer in Three Western Maine Winter Yards - R. D. Hugie
Breeding Season Studies of Male American Woodcock - J. M. Ramakka
Summer Behavior of American Woodcock - R. D. Dunford
Woodcock Nocturnal Habitat Utilization in Relation to Sex, Age, and Molt -
R. B. Owen, Jr.
Ecology of the Ruffed Grouse in Maine - S. D. Schemnitz
Waterfowl Distribution and Breeding Ecology - H. L. Mendall
Ecology and Behavior of the Fisher - M. W. Coulter
Factors Affecting Summer Flight Behavior of White-tailed Deer on Isle au Haut -
S. D. Schemnitz
Effects of Three Cover Conditions on Behavior and Physiological Responses
on Pinned White-tailed Deer - Myrtle C. Bateman
Annual Production and Factors Influencing Nesting Success of the American
Eider - H. L. Mendall
Establishing and Increasing Local Breeding Populations of Wood Ducks by
Relocating Active Nest Boxes - D. E. Capen

COOPERATION, EDUCATIONAL WORK AND MISCELLANEOUS ACTIVITIES

Mendall was a participant at the 88th Annual Meeting of the American Ornithologists' Union held in Buffalo, New York October 4-9.

Coulter, Gilbert and Schemnitz and seven wildlife graduate students attended the annual meeting of the Atlantic Chapter, Canadian Society of Fishery and Wildlife Biologists, held at Fredericton, New Brunswick, November 4-6, 1970. Coulter was the moderator at the morning session on November 4 that featured a number of papers on water and oil pollution. Gilbert was elected Chairman of the Chapter for the coming year. Dr. Gardiner Bump was the keynote speaker at a half-day panel session on exotic game animals. Additional timely papers featured the controversial Canadian seal harvest and fishing for Atlantic Salmon on the high seas near Greenland.

Coulter attended a Wildlife Society Council meeting in Alton, Illinois, December 18-20, 1970.

From October 18-20 visiting scientist Gordon Gullion visited the University. He discussed ruffed grouse research and management with wildlife students, faculty, and Inland Fisheries and Game biologists and presented a public lecture to an audience of 185. He was accompanied on field trips to the coastal belt and Moosehorn National Wildlife Refuge by Schemnitz. At the Refuge, Gullion was impressed by the potential value to ruffed grouse of the clearings made primarily for woodcock. Gullion's visit to New England was jointly sponsored and financed by the Universities of Maine, Massachusetts and New Hampshire.

Members of the staff participated in 3 television and 1 radio programs, met with several local civic groups, and served as consultants to the Penobscot County Forester and others.

PERSONNEL CHANGES

Balinga completed all requirements for an M.S. degree and returned to West Cameroon to his former position of Wildlife Management Officer.

PUBLICATIONS AND THESES

Clark, S. H. 1970. The American eider. *Sea Frontiers*, 16(5):302-308.

Krohn, W. B. 1970. Woodcock feeding habits as related to summer field usage in central Maine. *J. Wildl. Mgmt.*, 34:769-775.

Schemnitz, S. D. 1970. Fall and winter feeding activities and behavior of ruffed grouse in Maine. *Trans. N.E. Wildl. Conf.*, 27:127-140.