MAINE
COOPERATIVE WILDLIFE RESEARCH UNIT

University of Maine
Orono, Maine

1982

MAINE COOPERATIVE WILDLIFE RESEARCH UNIT
240 Nutting Hall
University of Maine
Orono, Maine 04469

COOPERATORS

MAINE DEPARTMENT OF INLAND FISHERIES AND WILDLIFE

UNIVERSITY OF MAINE

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

WILDLIFE MANAGEMENT INSTITUTE

May 1981 - April 1982

Cover Designed by Mark A. McCollough

This report details the research objectives, procedures and findings of numerous investigators. Since data contained may be preliminary and inconclusive, permission to reproduce or publish any of the contents of this report in any way is withheld pending specific authorization from the Unit Leader

TABLE OF CONTENTS

PAGE

COMPLETED THESES AND REPORTS

PERSONNEL AND COOPERATORS

COORDINATING COMMITTEE

Glenn H. Manuel, Commissioner, Maine Department of Inland Fisheries and Wildlife
Fred B. Knight, Director, School of Forest Resources
Paul A. Vohs, Supervisor, Cooperative Wildlife Research Units
Laurence R. Jahn, Vice President, Wildlife Management Institute

WILDLIFE PERSONNEL

Unit Staff

James A. Sherburne, Unit Leader, Associate Professor of Wildlife Resources
John A. Bissonette, Assistant Leader, Associate Professor of Wildlife Resources
Robert C. Burke, Wildlife Technician
Gary Costanzo, Wildlife Technician
John Dykstra, Wildlife Technician
Joyce Harrison, Wildlife Technician
Matt Miller, Wildlife Technician
Mark O'Donahue, Wildlife Technician
Fred DiBello, Wildlife Technician
Maxine L. Horne, Unit Secretary

Associate University Staff

Malcolm W. Coulter, Associate Director for Wildlife, School of Forest Resources, and Professor of Wildlife Resources
Ray B. Owen, Jr., Professor of Wildlife Resources
James G. Gilbert, Associate Professor of Wildlife Resources
Terry A. May, Assistant Professor of Wildlife Resources
Chester F. Banasiak, Associate Research Professor of Wildlife Resources
Jerry R. Longcore, Research Wildlife Biologist, USFWS
Hewlette S. Crawford, Jr., Research Wildlife Biologist, USFS
Charles S. Todd, Research Associate
Kathleen Wynne, Wildlife Technician

Maine Department of Inland Fisheries and Wildlife

Glenn H. Manuel, Commissioner
J. William Peppard, Deputy Commissioner
Robert W. Boettger, Chief, Wildlife Division
Lee E. Perry, Assistant Chief, Wildlife Division

Personnel from many University departments as well as State, Federal and private organizations are actively collaborating with the Unit. Individuals assisting with projects currently reported are listed in connection with the appropriate project summary.

GRADUATE STUDENTS

Name	Degree Candidacy	Support
Thomas A. Allen	Ph.D.	SFR; McIntire-Stennis
W. Alan Crossley	M.S.	MDIFW, SFR; McIntire-Stennis
Catherine A. Elliott	M.S.	IPC, MDIFW
William J. Galbraith	M.S.	MDIFW, USFWS-MBHRL
Margaret A. Halpin	M.S.	MDIFW
Daniel J. Harrison	M.S.	MDIFW, MCWRU
Dennis G. Jorde	Ph.D.	MDIFW, USFWS-MBHRL, SFR, Hatch Act
Gary R. Lamb	M.S.	MDIFW, WMI, NRA, L.L. Bean Inc.
John A. Litvaitis	Ph.D.	MDIFW, MCWRU
John T. Major	Ph.D.	MDIFW, MCWRU
Mark A. McCollough	Ph.D.	USFWS, NWF, NC
Paul W. Rego	M.S.	MDIFW
Arthur M. Soukkala	M.S.	SFR; McIntire-Stennis
Paul I. V. Strong	Ph.D.	MDIFW, MAS, NPS

Graduate Students: Theses completed during current period.

John J. Albright	M.S.	MDIFW, USFWS-MBHRL, SFR
Suzanne L. Caturano	M.S.	MDIFW, MCWRU
Dale W. May	M.S.	MDIFW, MCWRU
Mark A. McCollough	M.S.	MDIFW, USFWS-MBHRL
Michael W. Tome	M.S.	N.A. WILDL. FOUND.-DELTA WATERFOWL RES. STN.
Kathleen M. Wynne	M.S.	U.S. ARMY CORPS ENG., MCWRU

COLLABORATING AGENCIES AND ORGANIZATIONS

International Paper Company = IPC
L. L. Bean, Inc.
Maine Audubon Society = MAS
Maine Cooperative Fishery Research Unit = MCFRU
Maine Department of Inland Fisheries and Wildlife = MDIFW
Maine Department of Transportation = MDOT
North American Wildlife Foundation-Delta Waterfowl Research Station = DWRS
National Rifle Association = NRA
Nature Conservancy = NC
National Marine Fisheries Service = NMFS
National Wildlife Federation = NWF
Society of Sigma Xi
University of Maine: Graduate Student Board = GSB
School of Forest Resources = SFR
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service: Migratory Bird and Habitat Research Lab. = MNHRL
Office of Migratory Bird Management = OMBM
U.S. Forest Service-Northeast Forest Experiment Station = NEFES
U.S. National Park Service = NPS
Wildlife Management Institute - WMI

INTEGRATION OF FOREST AND WILDLIFE MANAGEMENT ON INTERNATIONAL PAPER COMPANY'S NORTHERN EXPERIMENT FOREST

Investigator: Catherine A. Elliott

Advisors: M. W. Coulter, Chairman
C. F. Banasiak
B. F. Hoffman
C. D. Webb

Cooperators/
Project Support: International Paper Company
Maine Department of Inland Fisheries and Wildlife

Objectives:

(1) To develop a decision making process, supported by a data base, with which the Northern Experiment Forest can be managed for wildlife, as well as timber, through the manipulation of habitat.
(2) To develop wildlife management prescriptions and a habitat diversity assessment procedure that can be used in forest management planning.
(3) To identify information gaps and areas requiring future research.

Scope:

Forest management affects wildlife by altering stand composition, structure, successional stage, and juxtaposition with other stand types. This study is the first phase of a project to integrate wildlife management into the forest management system. Use of habitat types by wildlife, wildlife management guidelines, and 3 methods of quantifying edge were developed to be used in management planning.

Project Status:

Forested stands were identified and typed by overstory composition and successional stage, based on the stand map for the Northern Experiment Station (NEF). Non-forested habitats were also mapped. Life history information and habitat requirements were collected for 43 mammal and 123 bird species presently or potentially using the NEF. Use of forested and non-forested types, forest openings and edges, brushy undergrowth, and snags was tabulated for each species, and an index of sensitivity to habitat change calculated. This information can be used to determine the effects of silvicultural treatment or stand succession on wildlife.

Vegetative diversity is one important aspect of wildlife habitat. Edge, used as a measure of diversity, was quantified using 3 methods: edge area ratio, radial grid intersect, and edge quality rating. The edge-ratio relates the length of the perimeter of a stand to its area. The greater the ratio, the more edge there is per unit area. The radial grid intersect uses a grid overlay to estimate the total length of edge on an area. The edge quality rating indicates the degree of contrast between adjacent stands. The greater the contrast the more likely the adjoining stands are to be different in their structure and the species they support, and, therefore, the diversity of species making use of the ecotone.

Forest management affects other aspects of wildlife habitat. Wildlife management guidelines concerning size, shape, spatial, and temporal arrangement of cuts, treatment of dead and down material and snags, management of riparian zones, deer wintering areas, and beaver flowages, have been developed. Together with the diversity indices, these can be used to include wildlife values in the planning process.

Future Plans:

The thesis is in preparation, expected date of completion is June, 1982.

POST-FLEDGING ECOLOGY AND BALD EAGLES IN MAINE

Investigator: Mark A. McCollough

Advisor: R. B. Owen, Jr.

Cooperators/ Project Support: Maine Department of Inland Fisheries and Wildlife
U.S. Fish and Wildlife Service
National Wildlife Federation
The Nature Conservancy

Objectives:

(1) Describe post-fledging behavior of bald eagles in Cobscook Bay with emphasis on movements in relation to parent breeding areas, habitat use, and associated adult/juvenile relationships.
(2) Obtain information on juvenile eagle dispersal and movements and location of wintering areas in Maine.
(3) Investigate winter activity and habitat use of adult and immature eagles in Cobscook Bay.
(4) Evaluate artificial feeding of bald eagles during the winter as a short-term technique to: (a) improve survival of juvenile and adult eagles, (b) provide a contaminant-free supplement to eagle diet in the winter, and (c) enhance subsequent nesting attempts of adult eagles.

Scope:

Cobscook Bay is considered a nucleus for the recovery of bald eagle populations in Maine. Highest nesting density, nesting success, and brood size are achieved in this area. Over the last 5 years, the Cobscook Bay eagle population increased to 11 pairs and fledged 49 eaglets; equivalent to 22% of the total annual bald eagle production in the northeastern U.S. A proposed oil refinery, tidal power projects, loss of habitat to land development, and recreational activity are potentially serious threats to the Cobscook eagles and therefore jeopardize the recovery of the statewide population.

This study will investigate fledgling movements and behavior, adult-juvenile relationships, and wintering ecology of bald eagles in Cobscook Bay. Adult and immature eagles will be radio-tagged to identify seasonal components of critical eagle habitat in Cobscook Bay and intensively monitered for daily movements and behavior. All eaglets in Maine will be color banded to assist in investigation of movements, dispersal, and survivorship. Supplemental food will be provided at 4 major eagle wintering areas in a short-term technique to improve survival of immature and adult eagles, provide a contaminant-free source, and enhance subsequent nesting attempts of adult eagles.

Project Status:

Preliminary radio telemetry work in 1981 provided valuable information on movements, foraging areas, and several communal resting and feeding areas used by at least 10 to 15 immature eagles near Cobscook Bay. This

is the largest concentration of eagles recorded in Maine in the last 20 years. A winter feeding program was initiated in Cobscook Bay, Penobscot estuary, and Merrymeeting Bay. Over 15,000 pounds of food (furbearer carcasses, road-killed deer and moose, livestock, poultry) were distributed at these sites. At least 56 eagles (14 adults and 42 immatures) were observed at the feeding stations.

Future Plans:

During 1982, 4 fledging, 2 subadult, and 2 adult eagles will be radio-tagged in Cobscook Bay and subsequently monitored to identify the seasonal components of critical bald eagle habitat. The eagle winter feeding program will be continued at 4 major wintering areas. All eaglets in Maine will be banded with individually coded color bands and band tags to investigate movements, dispersal and survivorship.

BOBCAT MOVEMENTS IN RELATION TO SNOWSHOE HARE DENSITY

Investigator: John A. Litvaitis

Advisor: J. A. Sherburne

Cooperators/
Project Support: Maine Department of Inland Fisheries and Wildlife
Maine Cooperative Wildlife Research Unit

Objectives:

(1) Examine bobcat movement patterns including vegetative cover-types used and territory size.
(2) Determine relative snowshoe hare density by cover-type, season, and within individual bobcat territories.
(3) Examine the relationship of bobcat territory size and snowshoe hare density.

Scope:

Several factors are believed to influence territory size of bobcats, including habitat composition, intraspecific and interspecific relations, reproductive requirements and prey density. Among these factors, prey density has been suggested as a major determinant of bobcat territory size and population density. This project was initiated to examine the relationship of bobcat movements, territory size and the density of snowshoe hare, the major prey items of bobcat in Maine.

Project Status:

Eight bobcats (6M,2F) were captured, equipped with transmitters, and released during the period, including 3 bobcats obtained from area trappers. Three marked bobcats were shot by hunters during the 1981-82 season, 1 adult female died of unknown causes and the radio on a juvenile male ceased transmitting. Sufficient data to estimate territory size have been collected on 6 bobcats in the Cherryfield study area. Movement data have also been collected on 6-8 bobcats by John Major during a concurrent study in western Maine (Pierce Pond).

Bobcat food habits are being investigated by collecting feces in the Cherryfield study area and from trapper/hunter harvested bobcat carcasses statewide (Table 1). The major prey in both samples included snowshoe hare *(Lepus americanus)*, white-tailed deer *(Odocoileus virginianus)* and small mammals (cricetine and microtine rodents). Based on gastro-intestinal analysis, it appears that large bobcats (>10 kg) consume deer more often than do smaller bobcats. This suggests a pattern of intra-specific resource partitioning.

Relative abundance of snowshoe hares within major understory types is being investigated using mark/recapture, radio-telemetry, snow track counts and pellet (feces) count methods. One hundred forty-three hares were captured 293 times during the fall census periods in the Cherryfield and Pierce Pond study areas. Five hares were also equipped with radio

transmitters in the Cherryfield area. Hare tracks were counted along 29 km of transects in both study areas and pellets were counted in Cherryfield.

Future Plans:

A spring mark/recapture census and hare pellet counts will be made in both study areas. Extensive sampling of understory vegetation within bobcat territories will be made to estimate composition. Collection of bobcat feces and carcasses will continue. Additional bobcats will be marked in both study areas.

Table 1. Percent occurrence of prey identified in bobcat feces collected in the Cherryfield, Maine area, and in gastrointestinal tracts collected throughout the state.

Prey	% Occurrence	
	Feces[1] (n=175)	GI tracts[2] (n=68)
Snowshoe hares	78.6	57.4
White-tailed deer	21.1	22.2
Small mammals	16.6	14.7
Porcupines	4.0	8.8
Muskrats	2.3	1.5
Beavers	0.6	1.5
Flying squirrels	0.6	4.4
Red squirrels	2.3	0
Unknown mammals	0.6	0
Fruits	1.7	0
Birds	4.6	11.8

[1]Feces collected during January-December 1981.

[2]Gastrointestinal tracts collected during the 1980-81 and 1981-82 trapping and hunting seasons (November-February).

DENNING ECOLOGY, MOVEMENTS, AND DISPERSAL OF COYOTES IN EASTERN MAINE

Investigator: D. J. Harrison

Advisors: J. R. Gilbert, Chairman
M. W. Coulter
W. E. Glanz
J. A. Sherburne

Cooperators/
Project Support: Maine Department of Inland Fisheries and Wildlife
Maine Cooperative Wildlife Research Unit

Objectives:

(1) Investigate the denning ecology of coyotes in eastern Maine including den characteristics, adult movements in relation to dens, and family interactions.
(2) Study dispersal and mortality of juvenile coyotes.
(3) Study coyote food habits in eastern Maine with emphasis on changes in diet associated with pup development.

Project Status:

Sixteen coyotes (4 adult, 12 juvenile) representing 3 family groups were radio monitored to investigate denning ecology, family interactions, movements and mortality. To date, over 2,800 relocations have been obtained. Dispersing juvenile coyotes were tracked from the air to study the intraspecific spacing mechanisms and social structure of coyote populations in eastern Maine. Approximately 400 scats were collected at dens, rendezvous sites, and on trails and roads. These are being analyzed to document the changes in diet associated with pup development.

Intensive searching resulted in the location of 7 den sites used by 2 different coyote family groups. A total of 16 pups were tatooed for later identification. Dens varied greatly in structure and associated habitat, but all were situated in well drained areas with southern exposures.

At 6 weeks of age, 5 juvenile coyotes were equipped with self expanding radio collars. These collars were worn successfully and provided valuable data on pup movements, associations, and mortality.

As of April 1982, 7 of 11 coyotes born in spring 1981 had left their natal home ranges. Three juveniles dispersed in October 1981 and 4 dispersed during the breeding season (February 1982). An additional juvenile coyote was radio tracked within its natal home range until its transmitter expired during March 1982. Dispersers have been relocated up to 150 miles from their birth sites. To date, none of these animals has settled into a stable home range.

Future Plans:

Radio collared coyotes will be monitored until their transmitters cease to function. Additional study animals will be trapped in spring and summer 1982 and studies of coyote social structure and dispersal continued. Data analysis will continue, and a progress report will be completed by August 1982.

WINTER HABITAT USE AND HISTORICAL ASPECTS OF RED FOX IN MAINE

Investigator: M. A. Halpin

Advisors: J. A. Bissonette, Chairman
W. A. Halteman
J. W. Peppard
J. A. Sherburne

Cooperators/
Project Support: Maine Department of Inland Fisheries and Wildlife
Maine Cooperative Wildlife Research Unit

Objectives:
(1) Examine winter habitat use by red fox.
(2) Document historical occurrence and relative abundance of red fox in Maine.

Scope:

Red fox winter habitat use is being examined using snow tracking. The study was initiated to provide background information on the species and its role as a member of the complex of predators in Maine. Fox activity, habitat characteristics, and snow conditions along fox trails are recorded and the distribution of hunting, traveling, and resting activities among habitat types evaluated relative to food availability, social interactions, and snow conditions. Habitats are being classified by cover type and understory density. Tracks of other species encountered along fox trails are also recorded, and fox prey remains and feces collected to examine food habits. The number of fox traveling together and encounters with other fox tracks along trails are noted. Fox urine markings are described by site, location, frequency, and probable sex. Snow depth and structure are monitored weekly in stands of hardwood, softwood, mixed, and open vegetation.

In addition, a variety of documents will be examined and trappers interviewed to develop a historical perspective of the presence and relative abundance of red fox in the state.

Project Status:

The first field season was completed in early April, 1982. Fifty-seven kilometers of fox trails were followed. Sixty-seven feces and 23 samples of prey remains were collected. Snow depth and structure were recorded weekly for 14 weeks.

Preliminary analyses indicate that red foxes traveled through all available cover types but concentrated hunting in areas with patchy and dense undergrowth. Snowshoe hare seemed to be the major prey in these areas.

Pairing was evident by the end of January, and movements were restricted by early March. Apparently, most activity was concentrated around denning sites at this time.

More snow accumulated in hardwood stands than in other cover types but remained longer in softwood and mixed stands. Supporting surface crusts formed in all cover types.

Future Plans:

The first season's data will be analyzed and field work continued in the winter of 1983. Records and notes will be examined to document the historical occurrence of red fox in Maine.

RESOURCE UTILIZATION AND INTERSPECIFIC RELATIONS AMONG LARGE MAMMALIAN PREDATORS IN WESTERN MAINE

Investigator: J. T. Major

Advisors: J. A. Sherburne, Chairman
M. W. Coulter
J. R. Gilbert
W. E. Glanz

Cooperators/
Project Support: Maine Department of Inland Fisheries and Wildlife
Maine Cooperative Wildlife Research Unit

Objectives:
(1) Document food habits and habitat utilization by bobcat, coyote and red fox.
(2) Compare the utilization of these resources among the three species with special reference to competitive interactions and mechanisms by which competition is reduced.

Scope:

Resource utilization and interspecific relations among coyote, bobcat and red fox are the subject of this study in the Pierce Pond area of western Maine. The dissertation, which is in preparation, will examine aspects of niche overlap (for food, habitat, and activity patterns), spatial distribution, and the effects of predation and disturbance on the structure of this carnivore community.

Project Status:

Fieldwork was completed in March 1982. Since September 1979, 43 animals (26 coyotes, 11 bobcat, and 6 fox) were captured and ear tagged. Of these, 24 (11 coyote, 10 bobcat, and 4 fox) were equipped with radio transmitters. Over 7,000 radio locations and nearly 200 km of snowtracking were obtained. Home range estimates calculated by the convex polygon method averaged 42 km^2 for coyote, 24 km^2 for fox, 139 km^2 for male bobcats, and 21 km^2 for female bobcats. Home ranges of bobcats overlapped both coyote and fox home ranges. Coyote and fox seemed to occupy areas exclusive of each other.

Preliminary analysis of activity patterns indicated synchronization of activity periods among individuals of the 3 species.

Analysis of 800 scats (more remain to be analyzed) showed snowshoe hare to be a very important item in the diet of all the furbearers year-round. Deer occurred in the diets of both coyote and bobcat almost as frequently as snowshoe hare during winter and spring, but occurred very infrequently in scats collected during summer and fall. Fox ate some deer in winter, but seemed to rely more on small mammals than either coyotes or bobcats. In the summer months, small mammals surpassed snowshoe hare in the fox diet. Raspberries occurred in more than 25% of both coyote and fox scats collected in the summer, but none were seen in the few bobcat scats collected at this time of year.

Habitat use and availability will be determined from Landsat imagery. Base maps have been drawn on 7 1/2 minute U.S.G.S. orthophotoquads, and a Landsat classification system for the study area is being developed in cooperation with MDIFW Planning Division personnel.

Mortality causes for 19 tagged animals (7 bobcat, 11 coyote, 1 fox) have been determined. Severe conditions of deep, soft snow and cold temperatures in late 1981 and early 1982 hampered bobcat mobility and resulted in several instances of starvation in both tagged and untagged cats in western Maine. One radio-tagged male was found dead under a stump, and had lost 40% of his original body weight. An untagged, emaciated female cat was observed floundering in deep snow, and efforts to revive her failed. A tagged yearling cat in emaciated condition was struck by a car and then shot 32 km west of the study area. A radio-tagged yearling cat in good condition was shot about 56 km southeast of the study area in early winter. We previously had reports of 2 other cats struck by cars, 1 cat shot, and 1 trapped. Eleven tagged coyotes have been reported killed. Six were trapped, 4 shot, and 1 hit by a car. One radio collar from a fox believed to have been trapped has been recovered.

Several indices to prey densities have been recorded throughout the study. Snap trapping for small mammals on permanent grids in several major habitat types each July and October have indicated low populations throughout the study, averaging 1.96 captures/100 TN. Snowshoe hare populations have been high throughout the study. Both pellet plots and snowtrack transects have been used to detect major fluctuations in hare populations. A more detailed study of the hare populations in both this study area and WMU 6 is being conducted by Ph.D. candidate John Litvaitis (see accompanying report). Wintering deer densities are determined by MDIFW Big Game Project personnel each spring, and have averaged about 2 deer/km^2 throughout the study. Fourteen deer carcasses were found in WMU 3 during the past winter in an area experiencing the highest measured Winter Severity Index in the past decade. Six deer fatalities were attributed to predation, probably coyote, and 1 was determined to be an accidental death caused by splaying on ice. Femurs and jaws were collected from deer where available for analysis.

Programs are currently being developed to analyze the distribution of simultaneous separation distances between neighboring animals, and to analyze the cell frequency use distribution for non-synchronous spatial overlap.

Future Plans:

Complete analyses and write the dissertation.

CHARACTERISTICS OF THE MARTEN HARVEST IN MAINE AND THE EFFECTS ON A LOCAL POPULATION

Investigator: A. M. Soukkala

Advisors: M. W. Coulter, Chairman
J. R. Gilbert
G. L. Jacobson

Cooperators/ Project Support: School of Forest Resources--McIntire-Stennis

Objectives:

(1) To examine the interrelationships of harvest distribution, sex ratio, age structure and forest coverage within and between groups of townships.
(2) To estimate from live-trapping the sex ratio, age structure and minimum density of marten in a heavily trapped area.
(3) To examine the relationships between trapping pressure and access roads.

Scope:

The harvest of marten in Maine has increased from 152 tagged marten in 1973 to over 5,000 in 1981. This study was designed to examine the harvest characteristics and the effects of exploitation on a local marten population. Carcasses were collected from trappers during the 1980 and 1981 trapping seasons to examine the sex ratio and age structure of the harvest. Date and township trapped were also recorded for each carcass. Cementum annuli were used to estimate the age of marten. A study area consisting of parts of 4 townships was chosen to represent a heavily exploited area. Marten were live-trapped and a premolar extracted to study the sex ratio, age structure, and density of this population.

Project Status:

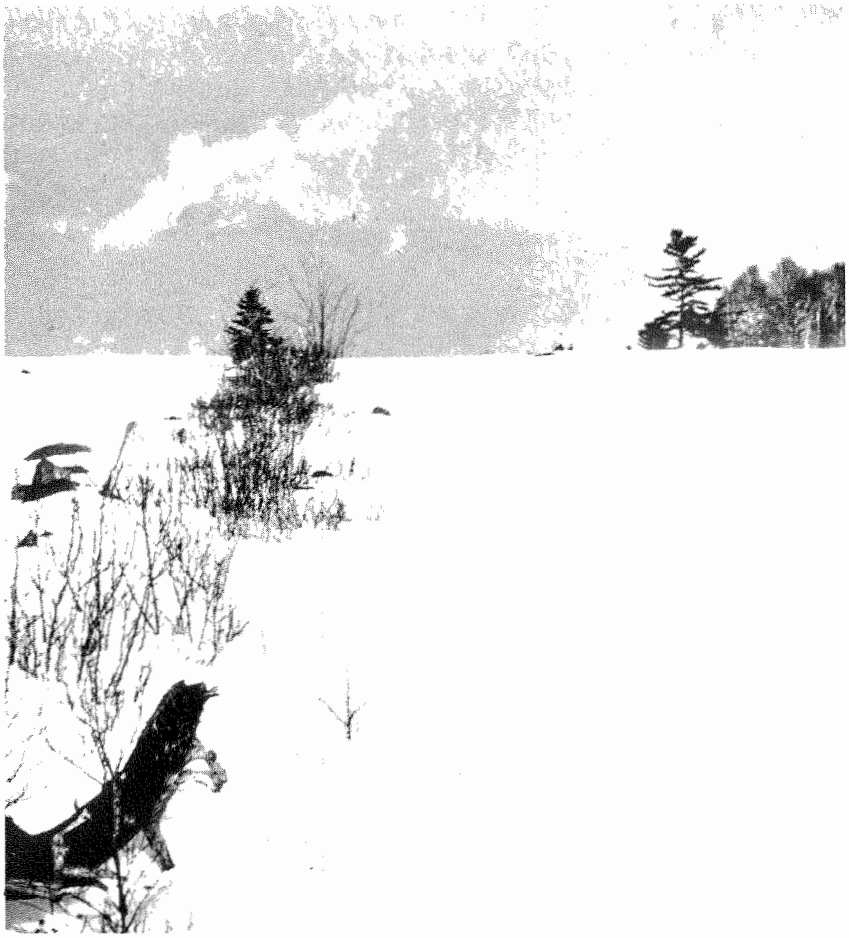
Two hundred and forty-three carcasses were analyzed from the 1980 trapping season, including 59 of 102 marten harvested from the study area. Males predominated in the sample (146M,97F) however, the harvest from the study area consisted of proportionately more females (26M,33F).

During the 1981 field season 6,033 trap nights yielded 310 captures of 41 juvenile (30M,11F) and 70 adult (31M,39F) marten. Four marten (1M,3F) died in traps. Thirty-two percent (34) of the tagged animals remaining were recovered in the harvest. Thirty-seven percent (11) of the juvenile males and 50% (5) of the juvenile females were harvested. Males were predominant in the harvest of yearling and older animals; 40% (12) of the tagged males were returned compared to 16% (6) of the tagged females. A majority of the marten were trapped directly from access roads.

Currently, age structure and sex ratio data are being analyzed from a carcass sample exceeding 1,300 animals collected during the 1981 harvest. This will be used to examine regional variation in harvest characteristics. A density estimate will be made for the study area using live-capture results and locations of tagged and untagged animals taken in the harvest.

Future Plans:

Data analysis will be completed by late June. Projected date for project completion is September 1982.




8954

DISTRIBUTION AND HABITAT USE BY FISHER *(MARTES PENNANTI)* AT LOW DENSITY IN SOUTHEASTERN MAINE

Investigator: P. W. Rego

Advisors: J. A. Bissonette, Chairman
J. A. Sherburne
M. W. Coulter

Cooperators/ Project Support: Maine Department of Inland Fisheries and Wildlife
Maine Cooperative Wildlife Research Unit

Objectives: To examine potential factors responsible for the low fisher density in southeastern Maine.

Scope:

A large difference in fisher densities exists between Wildlife Management Units 6 and 7 of southeastern Maine. Both Units were reoccupied by fishers following their range expansion in the 1950's and 1960's. The Penobscot River is a border between Units 6 and 7 and it acted as a barrier, slowing range expansion into Unit 6. Areas west of the Penobscot River (including Unit 7) have greater fisher densities than those to the east. This study seeks to examine the reasons for the lower population densities in Unit 6.

Project Status:

Livetrapping was conducted from December 1981 through March 1982 in Unit 3 of western Maine. No fisher were captured. Limited snow tracking was conducted to determine areas of fisher activity. The study location will concentrate in Units 6 and 7 of southeastern Maine. Harvest data from these Units are being examined to determine recent distribution and densities of fishers. A research proposal is being drafted.

Future Plans:

The distribution of forest cover types in Units 6 and 7 will be compared to the distribution of fishers in these areas. Vegetation parameters and prey abundance will be investigated on restricted areas within Units 6 and 7.

Fisher carcasses from the 1982 trapping season will be collected to examine differences in food habits, sex and age composition, body condition, and reproductive characteristics of animals taken in Units 6 and 7.

Livetrapping will continue in early fall and radio-collared fishers will be released in Unit 6 and monitored to determine habitat use and movements.

SUMMER POND USE BY MOOSE IN NORTHERN MAINE

Investigator: W. A. Crossley

Advisors: J. R. Gilbert, Chairman
M. L. McCormack
J. A. Bissonette

Cooperators/
Project Support: School of Forest Resources--McIntire-Stennis
Maine Department of Inland Fisheries and Wildlife

Objectives:
(1) To determine the optimal time seasonally and diurnally to conduct aerial summer pond surveys.
(2) To determine the effects of changing biomass and nutritional quality of aquatic vegetation on summer pond use.

Scope:

The purpose of the project is to identify the best time seasonally and diurnally to conduct aerial cow-calf surveys. The surveys are designed to provide information on calf production and cow:calf ratios. Time of arrival and departure, sex, and activities of moose are recorded during the summer to determine peak pond use times. Aquatic vegetation is sampled to test the effect of changing biomass and nutritional quality on the pond use activities of moose.

Project Status:

Six cows were radio-collared from June through August in the Mooseleuk Lake area of northern Maine. Moose were collared in ponds from a 12 foot aluminum V-hull boat using a noose pole. All collared moose were monitored throughout the summer to provide information on summer pond use and disuse, home range size, and comparative pond use patterns of cows with and without calves.

Time of arrival and departure, sex, and activities of moose were recorded at ponds during the summer for a total of 383 hours of observations. Frequency distributions of pond use were calculated to determine the best time seasonally and diurnally to conduct aerial cow-calf pond surveys.

Aquatic vegetation was sampled at 2-week intervals during the summer for biomass and mineral analyses. Grab samples of each species were obtained in different areas of each pond. Samples were bagged by species, dried, and analyzed for 13 minerals. Analysis is currently being done to relate the hypothesized changing biomass and nutritional quality of the plants to the pond use activity of moose.

As an adjunct effort, moose were located weekly during the winter by plane to determine winter home range size and habitat use. All 6 collars are still functioning.

Future Plans:

A second field season is scheduled to begin in mid-May and continue through late September. Cows will be relocated throughout the summer. Observations on pond use activities will be continued. Aquatic vegetation sampling will be expanded to include additional ponds in the study area. Grab samples will be analyzed for mineral content, crude protein, and crude fiber. Terrestrial vegetation will be sampled for the same analyses. Changes in terrestrial and aquatic plant nutrients through the summer will be compared with the pond use patterns of moose.

Final analysis and thesis preparation will be completed by December 1982.

HOME RANGE AND HABITAT UTILIZATION OF FEMALE BLACK BEARS IN NORTHERN MAINE

Investigator: G. R. Lamb

Advisor: J. A. Sherburne

Cooperators/ Project Support: Maine Department of Inland Fisheries and Wildlife
L. L. Bean, Inc.
Wildlife Management Institute
National Rifle Association

Objectives:
(1) To determine if differences exist in home range size for adult female black bears in heavily and lightly exploited populations.
(2) To describe habitat utilization by female black bears with major emphasis on highly exploited populations.

Scope:

Home range and habitat utilization data were collected using radio telemetry equipment. During summer 1980, bears were captured and fitted with radio transmitter collars. During winter 1980-81, dens were visited and biological and habitat data were collected. Bears were monitored regularly during 1981 from den emergence in April to denning in September and October.

Project Status:

The project is on schedule. Field work has been completed. Data analysis and thesis preparation are scheduled for summer, 1982.

HARBOR SEAL POPULATIONS AND MARINE MAMMAL-FISHERIES INTERACTIONS

Investigators: J. R. Gilbert
J. L. Stein
K. M. Wynne

Cooperators/
Project
Support: Northeast Fisheries Center, National Marine Fisheries Service

Objectives:
(1) To estimate New England harbor seal distribution and abundance.
(2) To define harbor seal habitat use patterns and develop capture/tagging techniques to allow evaluation of population distribution and discreteness.
(3) To identify and assess interactions between marine mammals and commercial fisheries in New England

Scope:

Conflicts between commercial fisheries and marine mammal populations include direct and indirect competition for commercially valuable fish species, entanglement of marine mammals, and damage to fishing gear. Such conflicts have intensified with increasing near-shore fishing but have not previously been documented in New England. Because harbor seals *(Phoca vitulina concolor)* are abundant on the Maine coast and prey on commercial fish species, their population level, distribution, and discreteness have become a concern of commercial fisheries.

Project Status:

The New England coast was surveyed aerially in March, 1981, to determine late winter seal distribution and numbers. The coast of Maine was surveyed in June, 1981, to identify pupping sites and to estimate seal numbers. The number of seals counted on the Maine coast in June (10,483) is nearly twice that counted in 1973, suggesting seal numbers have increased following implementation of the Marine Mammal Protection Act (1972).

Several capture techniques were used through the summer of 1981 in an attempt to capture seals in the Holmes Bay and Machias Bay area. Two seals were caught in hoop nets by nightlighting animals that had hauled-out on half-tide ledges. Both were tagged and one was equipped with a radio transmitter.

Radio monitoring and intensive observations of 2 haul-out sites provided information on site tenacity, tidal influence, and disturbance factors.

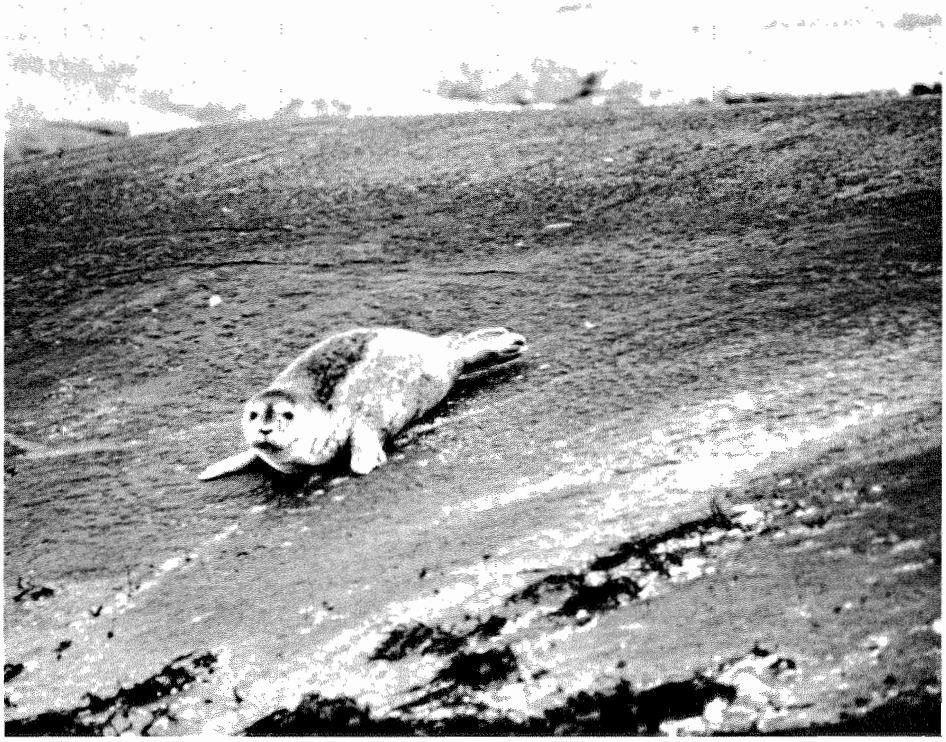
A preliminary survey of marine mammal-fisheries interactions indicated that potential and existing conflicts are greatest with gillnet, weir, and sein fisheries. Intensive interviews of eastern Maine weir fishermen and Cape Cod Bay mackerel gillnetters were conducted in Fall and Winter 1981-82 to assess the severity of conflicts with seal and cetacean populations.

A network of volunteers was organized to count seals at numerous New England haul-out sites on a biweekly basis in order to detect population trends, seasonal distribution, and movement patterns.

Future Plans:

Harbor seal pups will be tagged in late May and June 1982. Location of tagged pups along the coast will be monitored by periodic aerial surveys and volunteer observers. Atlantic salmon sportfishermen will be interviewed in May to document perceived conflicts with coastal seals. Marine mammal interactions with gillnet, stop-seine, and weir fisheries in and around Penobscot Bay will be assessed through intensive interviews of fishermen and accompaniment on their boats throughout the summer.

Capture of adult seals will be attempted in August and September. Radio-tagged animals will be monitored through the fall and winter to document seasonal migration and movement patterns.



A COMPARISON OF HABITAT USE BY SYMPATRIC POPULATIONS OF SPRUCE AND RUFFED GROUSE IN MAINE

Investigator: T. A. Allan

Advisors: T. A. May
M. L. Hunter, Jr.
R. B. Owen, Jr.
W. E. Glanz

Cooperators/ Project Support: School of Forest Resources--McIntire-Stennis

Objectives:
(1) To describe the characteristics of habitats utilized by sympatric spruce and ruffed grouse.
(2) To measure ecological and spatial overlap in habitat use by spruce and ruffed grouse.

Scope:

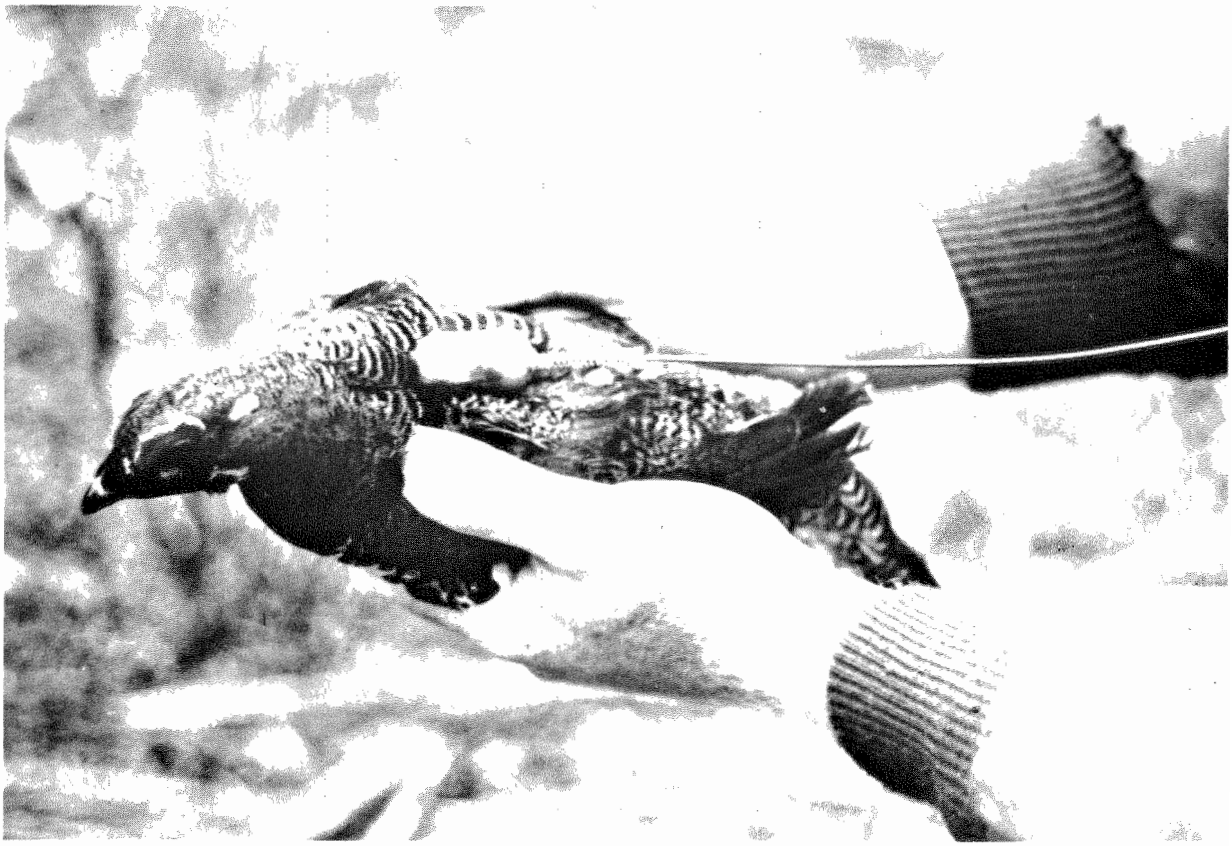
Ruffed grouse and spruce grouse occur throughout Maine's forests. These forests include a great diversity of vegetation types resulting from geographic variability and past timber cuttings. This project is designed to describe the forest environments used by both species to evaluate the potential for modification of spruce and ruffed grouse habitats by future industrial forest management.

Project Status:

Field work was begun in May 1981 and continued until December. Forty-six spruce grouse were captured and banded in two study areas on industry-owned conifer forests in western Hancock County. Seven birds (1M,6F) were radio-tagged for periods of 4 to 170 days. Summer densities of adult (and yearling) spruce grouse were calculated to be 15 and 16.5 birds/100 ha. Two nests and 9 spruce grouse broods were located. Mean brood size declined from 3.1 in June (N=4), to 1.9 in July (N=9), to 0.66 in August (N=3). Habitat parameters were quantified at 50 bird locations. Variables measured in each 250-m^2 plot centered at the bird location include tree species composition, stem density, diameter distribution, mean tree height, percent canopy coverage, vertical vegetation profile, and ground flora composition. Few ruffed grouse were found in the spruce grouse habitat during the summer. Six ruffed grouse were seen compared to 185 spruce grouse. Similar data were collected for ruffed grouse.

Future Plans:

Field work will begin in April and female spruce grouse will be radio-tagged prior to the nesting season. Efforts will be made to capture and radio-tag ruffed grouse found in close proximity to the spruce grouse. The borders of the study area will be enlarged to include more potential ruffed grouse habitat. Habitat sampling will be continued at spruce grouse and ruffed grouse locations.



NUTRITIONAL AND THERMODYNAMIC ASPECTS OF THE ECOLOGY OF BLACK DUCKS WINTERING IN MAINE

Investigator: D. G. Jorde

Advisors: R. B. Owen, Jr., Chairman
J. R. Gilbert
J. R. Longcore
M. R. Stokes
M. A. Vietti

Cooperators/
Project Support: Maine Department of Inland Fisheries and Wildlife
U.S. Fish and Wildlife Service, Migratory Bird and Habitat Research Laboratory
School of Forest Resources--Hatch Act Funds

Objectives:

(1) To determine if the microclimates of roost sites influence black duck use and energetics.
(2) To examine the nutrient content and true metabolizable energy of food selected by wintering and staging black ducks.
(3) To determine the relationship between specific dynamic effect and thermoregulation.
(4) To develop an energy budget and energetics model of wintering and staging black ducks.

Scope:

This study will focus on winter survival of black ducks by examining several aspects of metabolism: the relationship between thermoregulation and the microclimates of roost sites, true metabolizable energy and nutrient content of winter foods, and specific dynamic effect (heat of digestion).

Project Status:

The first field season was conducted from December through March. Seven radio-marked birds (6F,1M) were monitored to determine habitat use and roost fidelity, and to delineate roost sites for microclimate studies. Eight black ducks were equipped with experimental harness-mount back tags (yellow) for behavior and movement studies.

During a 14 week period, 26 hours of time budget observations of 180 black ducks were recorded at roost and foraging sites. Age, sex, weight, and structural measurements of 317 ducks, which were captured in bait traps, were recorded; 115 birds were recaptured at least once and additional weights obtained.

Equipment and techniques for measuring microclimate were evaluated in the field and preliminary feeding trials were conducted in the laboratory.

Blood samples from 81 black ducks were collected for environmental contaminants and body condition studies being conducted at Patuxent Wildlife Research Center, Laurel, Maryland.

Future Plans:

Complete analysis of first field season data. Continue with microclimate, habitat selection, and behavioral studies in the field. Commence physiological and nutritional studies in the laboratory. Begin developing a computer simulated energetics model of wintering and staging black ducks.

THE USE AND IMPORTANCE OF TRADITIONAL SITES FOR COMMON LOONS

Investigator: P. I. V. Strong

Advisors: J. A. Sherburne, Chairman
W. E. Glanz
J. B. Dimond
M. L. Hunter, Jr.
J. A. Bissonette

Cooperators/
Project Support: Maine Department of Inland Fisheries and Wildlife
Maine Cooperative Wildlife Research Unit
Maine Audubon Society
National Park Service--Acadia National Park
Mr. Frank Voight

Objectives:
(1) To determine the degree of fidelity to traditional nesting, staging, and wintering areas and the relationships to nest success, chick survival, and human disturbance.
(2) To devise a method of capturing and marking common loons.

Scope:

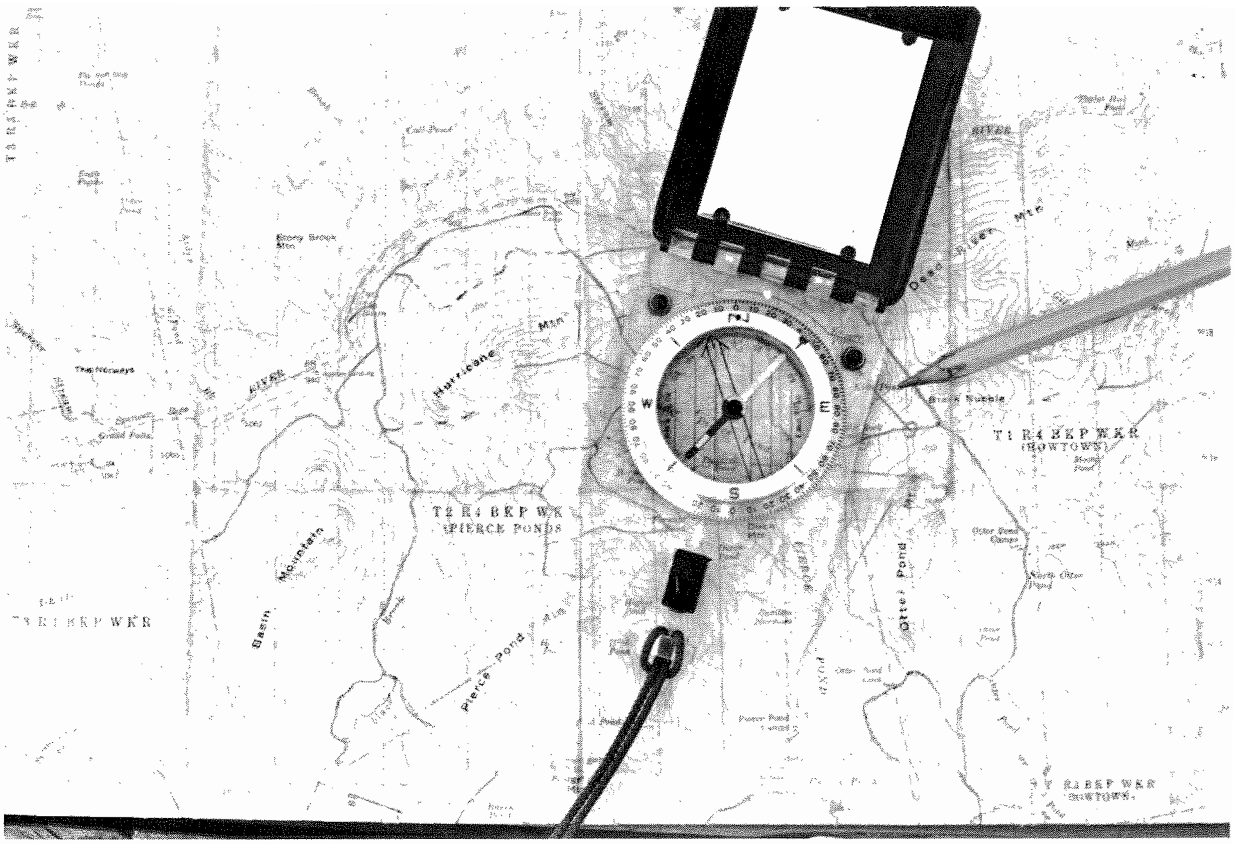
Capture and marking techniques will be used to identify territorial pairs of common loons. Data on reproductive success of individual pairs and their use of particular sites over 3 breeding seasons will be used to determine the degree of fidelity to the sites. We will alter shoreline characteristics of an experimental group of breeding pairs and monitor resultant movements and reproductive success. Heavily used fall and wintering areas will be identified for continuous and/or traditional use.

Project Status:

Initial research ideas were submitted to the advisory committee and potential study areas were selected. Preparations were made for the first field season.

Future Plans:

Field work will begin in May 1982. Initial emphasis will be on capture of individual loons in territorial pairs. Territories and nest sites of loons on several lakes in northern Maine will be identified and reproductive success monitored. Heavily used staging and wintering areas will be identified during fall migration and winter.



Stony Brook Mtn
The Narrows
Hurricane Mtn
T2 R4 BKP WKR
PIERCE PONDS
Basin Mountain
Pierce Pond Mtn
Otter Pond
Black Nubble
T1 R4 BKP WKR
(BOWTOWN)

EARTHWORM BIOMASS AVAILABLE TO WOODCOCK IN RELATION TO FOREST VEGETATION, SOIL CHARACTERISTICS, AND LAND-USE PRACTICES IN MAINE

Investigator: W. J. Galbraith

Advisors: R. B. Owen, Jr., Chairman
M. W. Coulter
G. L. Jacobson
R. A. Struchtemeyer

Cooperators/
Project Support: Maine Department of Inland Fisheries and Wildlife
U.S. Fish and Wildlife Service, Accelerated Research Program for Migratory Shore and Upland Game Birds

Objectives:
(1) Examine the effects of forest vegetation, soil characteristics, and history of agriculture on earthworm biomass available to woodcock in Maine.
(2) Develop a preliminary classification scheme to evaluate habitat potential for producing earthworms.

Scope:

Earthworms will be examined at various sites in central and eastern Maine to identify key habitat characteristics affecting the availability of this primary food item to woodcock. Study sites will be selected to represent various combinations of soil, vegetation, and historic land-use characteristics. Habitat characteristics will be analyzed to identify significant determinants of earthworm biomass. Key characteristics will be incorporated into a preliminary classification scheme to evaluate local habitat potential to provide adequate food for woodcock. Site characteristics to be examined include soil type, texture, pH, temperature, moisture content and percent organic matter, forest type, stand age, and history of agriculture.

Project Status:

A research proposal has been drafted and is being reviewed. General study areas representing agricultural and non-agricultural areas of similar soil and forest types have been selected. Specific sampling sites representative of various soil types, vegetation, and historic land-use combinations currently are being identified.

Future Plans:

Sample sites will be located and characterized by soil type, vegetation and land-use pattern during May 1982. Earthworms and soil samples will be collected during 3 seasonal periods; late May-mid-June, mid-July-early August, and mid-September-early October, 1982. Laboratory analyses of earthworm biomass and soil samples will begin during interims between sampling periods. Data analyses and course requirements should be completed by spring, 1983, with completion of thesis in August, 1983.

COMPLETED THESES AND REPORTS

RIGHT-OF-WAY HABITAT UTILIZATION BY WILDLIFE ALONG INTERSTATE 95 IN NORTHERN MAINE

Investigator: R. C. Burke

Supervisor: J. A. Sherburne

Cooperators/ Project Support: Maine Department of Transportation
Maine Cooperative Wildlife Research Unit

Objective: To determine the utilization of habitat created by highway construction during the post-construction phase of study on:

(1) Abundance and activity of songbirds.
(2) Abundance and species composition of small mammals.
(3) Abundance and movement of medium and large-sized mammals.

Project Status:

The project has been completed. A summary of results is given below.

Abstract:

The impact of the construction and presence of I-95 on birds and mammals in adjacent forest ecosystems was examined from 1975 to 1981. The baseline data generated imply that the effect on breeding birds, and small, medium and large mammal populations has been limited to immediate loss of habitat. Some species have adapted to or taken advantage of habitats created by the construction if I-95. Relationships between resident wildlife and the new habitat (ROW) created by highway construction were examined during the final year of the post-construction phase of the study. In this way, we addressed the question of which species use and benefit from highway construction.

MOVEMENTS AND SEASONAL HABITAT UTILIZATION OF BOBCATS IN EASTERN MAINE

Investigator: D. W. May

Advisors: M. W. Coulter, Chairman
J. R. Gilbert
G. L. Jacobson
J. A. Sherburne

Cooperators/
Project Support: Maine Department of Inland Fisheries and Wildlife
Maine Cooperative Wildlife Research Unit

Objectives:
(1) To determine which habitat types are selected for home range.
(2) To determine whether bobcats selectively utilize some habitat types more than others within the home range.
(3) To determine movement patterns in relation to habitat utilization.

Project Status:

All requirements for the degree of Master of Science (Wildlife Management) were completed in 1981. An abstract of the thesis follows:

Abstract:

Bobcat habitat utilization was investigated from October 1979 to January 1981 in eastern Maine. Four bobcats were relocated 712 times using radio-telemetry. In addition, 44 km of bobcat trails were followed on snow. Food habits were determined from the examination of 168 scats, 5 kills and 13 feeding sites.

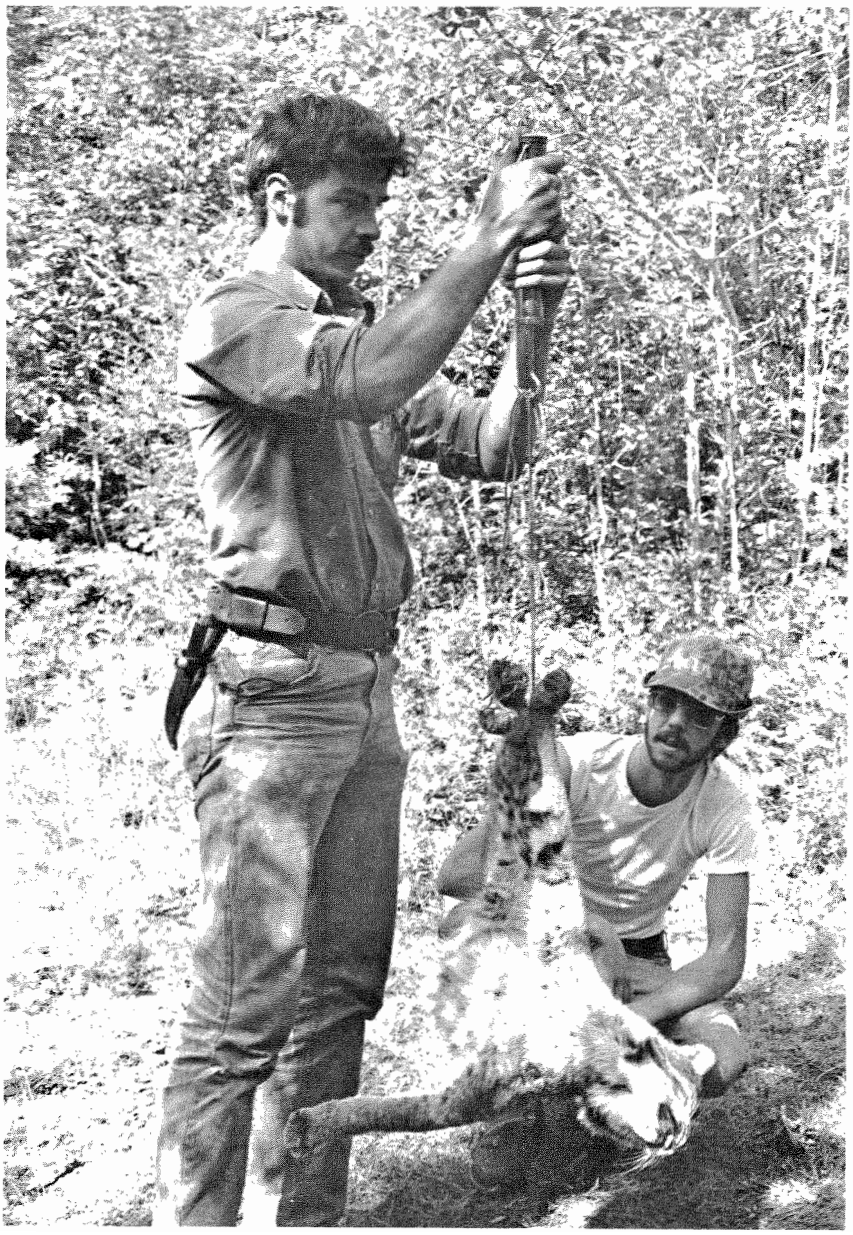
The bobcats in this study used all 6 of the habitat types on the study area. Only large expanses of open land appeared to be entirely unsuitable as bobcat habitat. Belts of vegetation situated between tracts of blueberry land were important as travel corridors, particularly for 1 collared female.

Small (<50 ha) areas were used intensively by female bobcats during summer. These areas were characterized by variable-aged vegetation which resulted in an understory of interspesed patches of dense cover and openings. The intensively used areas had larger trees and a less dense understory than adjacent areas.

Two instrumented individuals, 1 situated in the spruce-fir zone and the other situated in an area of intolerant hardwoods, showed different habitat use patterns during summer. Apparently, factors other than overstory cover influenced summer habitat utilization. During winter, however, snow tracked bobcats showed a selection for softwood cover.

The 2 female bobcats had a mean annual home range of 23 km^2, however home range size fluctuated by month and by season. Winter ranges were 30% larger than summer ranges, with a high degree of seasonal overlap. Smallest areas were occupied during late May and early June and larger areas were used as the summer progressed.

Snowshoe hare were common on the study area and represented 80% of the bobcat diet. Percentages of hare, birds and small mammals in the diet increased during summer, while deer and porcupine were absent from summer scats.



HABITAT UTILIZATION, HOME RANGES AND FOOD HABITS OF COYOTES IN EASTERN MAINE

Investigator: S. L. Caturano

Advisors: J. A. Sherburne, Chairman
M. W. Coulter
J. R. Gilbert
M. L. McCormack

Cooperators/
Project Support: Maine Department of Inland Fisheries and Wildlife
Maine Cooperative Wildlife Research Unit

Objectives:
(1) To determine habitat use by coyotes in relation to available habitat in portions of Washington and Hancock counties.
(2) To determine changes in movement and activity patterns in relation to habitat utilization.
(3) To assess seasonal changes in food habits.

Project Status:

All requirements for the degree of Master of Science (Wildlife Management) except final draft of the thesis have been completed. An abstract of the thesis follows:

Abstract:

Among 7 radio-collared coyotes *(Canis latrans)* in eastern Maine, 2 breeding pairs showed home ranges averaging 50 km^2 ± 4 (SE) over a 12 month period. Pairbonds were maintained throughout the year. Marked changes occurred in home range size and in use patterns during the 4 biological seasons associated with the annual reproductive cycle: pair-bonding and breeding;gestation; nursing; pup-raising; and independence. Home range sizes generally increased from pair-bonding through the independence period. The range of 1 other group of 3 coyotes (1 adult and 2 juveniles) averaged 11 km^2 ± 2 (SE) from the latter part of the pup-raising season until the juveniles dispersed in late January. Core areas of intensive use (50% of all relocations) inhabited from season to season were similar in diversity of vegetative cover to that of the total ranges. Radio relocations were recorded in forested cover, primarily softwoods, year-round. Non-forested blueberry barrens were frequented when fruits were ripe during late summer. Higher levels of coyote activity were recorded in the early morning (0400-0800), and late afternoon and evening hours (1600-2400). Snowshoe hare (*Lepus americanus)* were a staple food source throughout the year. White-tailed deer *(Odocoileus virginianus)* were commonly found in winter and spring scats and fruits, while blueberries (*Vaccinium* spp.) were utilized heavily in the late summer and early fall when ripe. Mice (*Peromyscus* spp., *Zapus hudsonius)* and voles (*Clethrionomys gapperi*, *Microtus* spp.) were increasingly more evident in the summer and fall scats.

OF ME. WILDLIFE

SUMMER HOME RANGE USE BY ADULT MARTEN IN NORTHWESTERN MAINE

Investigator: K. M. Wynne

Advisors: J. A. Sherburne, Chairman
M. W. Coulter
J. B. Dimond
J. R. Gilbert

Cooperators/
Project Support: U.S. Army Corps of Engineers
Maine Cooperative Wildlife Research Unit

Objectives:
(1) To examine marten home range size, composition, and utilization with emphasis on habitat use by females.
(2) To examine seasonal changes in habitat use by females.
(3) To describe natal dens and female activity patterns associated with their use.

Project Status:

All requirements for the degree of Master of Science (Wildlife Management) were completed in 1981. An abstract of the thesis follows:

Abstract:

Home range and habitat utilization data for adult marten were gathered from May to September 1980 in northwestern Maine. Analysis of 455 radio-locations of 3 post-lactating females and 2 adult males showed that overall summer ranges averaged 2.9 km^2 for females and 5.6 km^2 for males, with females showing prefential use of softwood stands. The frequency distribution of activity radii differed during this period for females but not for males, while use of habitats did not change. Thirty-eight resting sites and dens were located; 6 of 21 sites used by females were identified as natal dens. All resting sites used by males were in tree canopies, commonly in "witches brooms." Den characteristics are discussed in relation to the presence and development of kits.

BEHAVIORAL AND PHYSIOLOGICAL RESPONSES OF WINTERING BLACK DUCKS TO CHANGING WEATHER AND HABITAT CONDITIONS ALONG THE MAINE COAST

Investigator: J. J. Albright

Advisors: R. B. Owen, Jr., Chairman
J. R. Longcore
J. H. Dearborn

Cooperators/
Project Support: Maine Department of Inland Fisheries and Wildlife
U.S. Fish and Wildlife Service, Migratory Bird and Habitat Research Laboratory
School of Forest Resources--Hatch Act Funds

Objectives:
(1) To quantify individual and flock behavior of wintering black ducks relative to tidal regimes, time of day, and changing weather and habitat conditions.
(2) To document and describe habitat use by wintering black ducks relative to habitat quality and availability, and changing weather and ice conditions.
(3) To investigate the relative fitness, by sex and age groups, of wintering black ducks in response to time, weather, and habitat availability, with special emphasis on females.

Project Status:

All requirements for the degree of Master of Science (Wildlife Management) were completed in 1982. An abstract of the thesis follows:

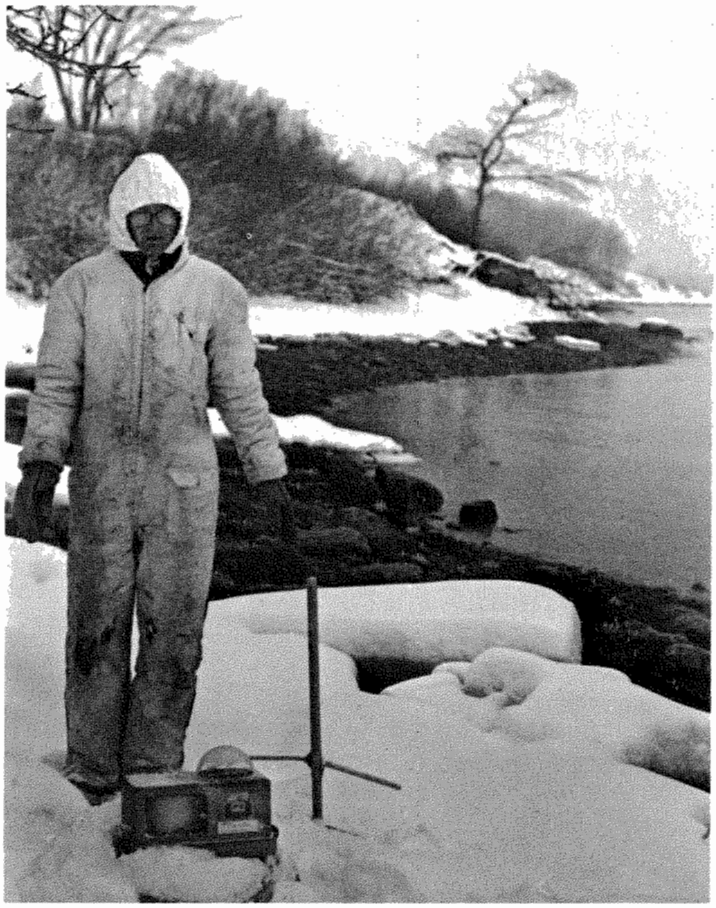
Abstract:

Black duck body condition and behavior, relative to the effects of temperature, wind chill, and the availability of ice-free foraging habitat were studied during 3 winters (January-March), 1979-1981, in mid-coastal Maine. Female body condition depended on temperature, wind chill, and foraging habitat availability. Juvenile females were more adversely affected than adult females. Males (juvenile and adult) were affected less by weather effects than were adult females. These results suggest that the timing of extreme cold and ice formation influence the sex and age composition and relative condition of black duck flocks.

Tide height was the most important factor affecting feeding and resting behavior. Time-activity and energy budgets were thus calculated for a 12.4 h tide cycle. Nocturnal activity occurred regularly as an adaptation to tidal regimes. Temperature effects modified behavior within the tide cycle and resting was the predominant behavior for all temperatures. During extreme cold and extensive ice cover, black ducks rested more, and curtailed activity, including feeding. Birds, however, continued flight activity during adverse weather; as ice covered foraging areas, ducks were forced to fly to search for an increasingly patchy food resource. Energy costs associated with activity decreased with decreasing temperature, but total daily energy requirements increased, a reflection of increased costs of thermoregulation. Daily energy

requirements for female black ducks ranged from 150 kcal/bird/day at 5°C to 240 kcal/bird/day at -20°C.

The conclusion of this study is that weather severity in winter is an important factor affecting the behavior and physical condition of northern-wintering black ducks, and likely contributes to reduced survival. Management procedures including identification and preservation of critical wintering habitat, reduction of disturbance factors such as hunting and shellfishing activities, and the viability of artificial feeding programs in winter are discussed.



FEEDING ECOLOGY OF SEMIPALMATED SANDPIPERS, SEMIPALMATED PLOVERS, BLACK-BELLIED PLOVERS, AND SHORT-BILLED DOWITCHERS ON COASTAL STAGING AREAS IN EASTERN MAINE

Investigator: M. A. McCollough

Advisors: T. A. May, Chairman
R. B. Owen, Jr.
M. W. Coulter
R. L. Vadas

Cooperators/
Project Support: Maine Department of Inland Fisheries and Wildlife
U.S. Fish and Wildlife Service, Migratory Bird and Habitat Research Laboratory

Objectives:

(1) Document species composition, age composition, and seasonal abundance of migratory shorebirds in eastern Maine.
(2) Describe the diets of semipalmated sandpipers, semipalmated plovers, black-bellied plovers, and short-billed dowitchers, compare dietary overlap between species, and examine prey utilization and availability on intertidal feeding areas.
(3) Document invertebrate population response to shorebird predation.
(4) Investigate functional response (foraging rate, capture rate, and foraging efficiency) of shorebirds to spatial variations in the density of their prey.
(5) Determine whether these birds aggregate in areas where prey density is highest or feeding is most efficient (numeric response).
(6) Investigate the relationship between the amount of body fat and length of migratory pause by semipalmated sandpipers.

Project Status:

All requirements for the degree of Master of Science (Wildlife Management) were completed in December 1981). An abstract of the thesis follows:

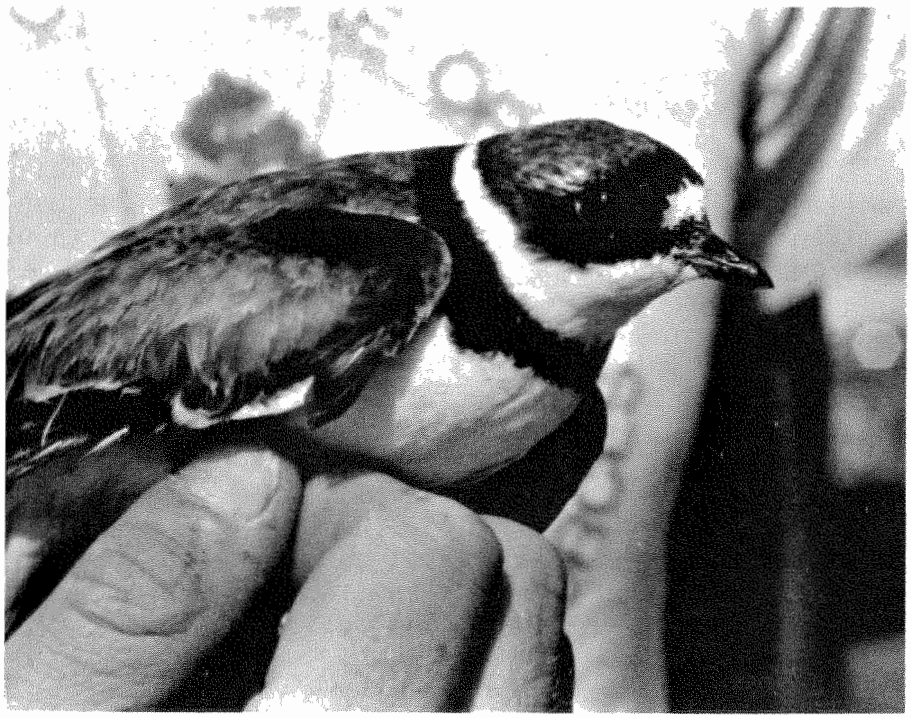
Abstract:

The feeding ecology of semipalmated sandpipers *(Calidaris pusillia)*, short-billed dowitchers *(Limnodromus griseus)*, semipalmated plovers *(Charadrius semipalmatus)* and black-bellied plovers *(Pluvialis squatorola)* was studied on coastal staging areas in eastern Maine during their southward migration, July-September, 1980. Marine oligochaetes, polychaete worms *(Nereis virens* and *Clymanella torquata)* and amphipods (primarily *(Corophium volutator)* were the major prey items of semipalmated sandpipers and short-billed dowitchers. Semipalmated plovers and black-bellied plovers ate mostly polychaete worms, gastropods *(Littorina* spp. and *Hydrobia* spp.), isopods *(Chiridotea coeca)*, and amphipods *(Gammarus oceanicus* and *Corophium volutator)*. Shorebird diets varied between feeding

areas and generally overlapped broadly by prey taxon taken.

Only semipalmated plovers showed a significant numerical response to the density of their major prey on study plots. Shorebird foraging rates (pecks and probes per min) were not correlated with prey density. Short-billed dowitchers, semipalmated plovers, and black-bellied plovers captured more prey on areas where their prey were most numerous. These observations were consistent with the hypothesis that shorebirds would be most abundant in areas of high prey density because the number of prey captured is greatest in such areas.

Changes in the June-September density of potential invertebrate shorebird prey ranged from a 39% increase for *Corophium volutator* to a 84% decrease for *Gammarus oceanicus*. Some invertebrate taxa *(Nereis virens*, marine oligochaetes, *Hydrobia* spp., *Littorina* spp., and *Gammarus oceanicus* exhibited a density-dependent change in density. These changes were assumed to have been in response to numerical and functional behavior of shorebirds. Results of exclosure experiments to prohibit shorebird feeding were too variable to make valid conclusions about invertebrate population changes in the absence of shorebird predation. Evidence from this study indicates that invertebrate prey are plentiful in eastern Maine throughout the migratory season. The transitory nature of shorebird migration was apparently short enough to inhibit a large-scale depletion of intertidal invertebrates.



REPRODUCTIVE BIOENERGETICS OF FEMALE RUDDY DUCKS IN MANITOBA

Investigator: M. W. Tome

Advisors: R. B. Owen, Jr., Chairman
J. R. Longcore
T. A. May
M. R. Stokes

Cooperators/ Project Support: The North American Wildlife Foundation--Delta Waterfowl Research Station

Objectives:
(1) To interpret body composition changes of female ruddy ducks during the breeding season.
(2) To analyze food habits of breeding female ruddy ducks.
(3) To investigate food availability and usage.
(4) To measure feeding rates of breeding female ruddy ducks.
(5) To determine incidence of renesting and the renesting interval.

Project Status:

All requirements for the degree of Master of Science (Wildlife Management) were completed in 1981. An abstract of the thesis follows:

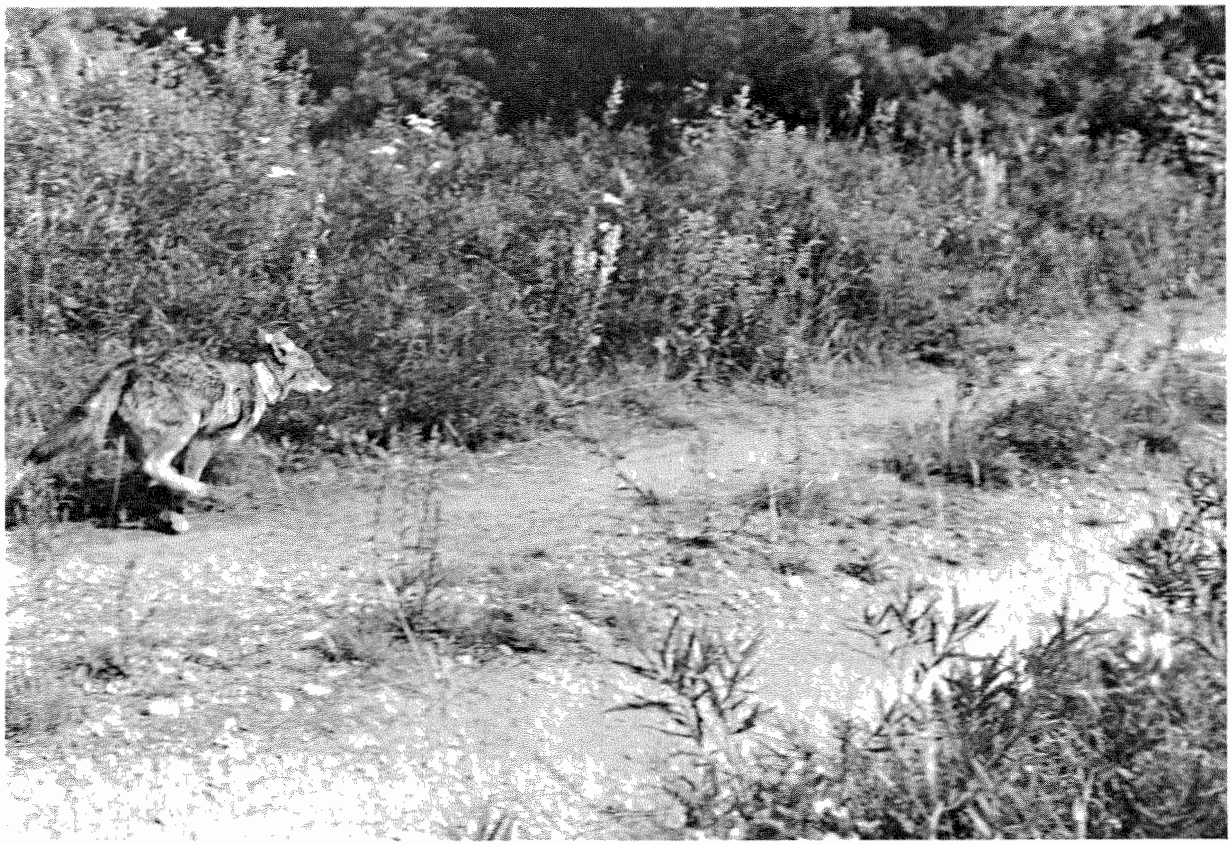
Abstract:

The primary objectives of this study were to investigate the reproductive strategy of female ruddy ducks *(Oxyura jamaicensis)* by (1) analyzing the carcass component dynamics; (2) determining the feeding ecology; and (3) comparing the reproductive bioenergetics of ruddy ducks with those of other Anatids.

Pectoral muscle weight decreased significantly between prelaying and laying while liver weights peaked during laying and subsequently declined significantly until early incubation. Maximum weights of oviduct and ovary also occurred during laying. Weights of gizzard and leg muscle, and lengths of small and large intestine did not vary significantly during the breeding period. Wet body weight and oven-dry body weight increased significantly between arrival and laying, then declined significantly until late incubation. Total lipid content increased 61% between arrival and laying, then declined 27% until early incubation and an additional 72% between early incubation and brood rearing. Protein content peaked during laying and decreased 14% between laying and early incubation. Endogenous lipid and protein supplied 38 and 18% of the requirements of egg formation, respectively. Maximum ash weights were observed during prelaying and laying, presumably reflecting deposition of medullary bone to supplement egg shell formation.

Foods of female ruddy ducks consisted primarily of chironomids. No significant differences in food usage were observed among reproductive classes and invertebrates were consumed in proportion to their availability. Feeding rates of 2 females were 1400 and 5089 chironomids/h.

Energy expenditure resulting from activity during prelaying required the consumption of 1060 kJ/day. Accretion of protein and lipid during this period required an additional 73 kJ/day. Laying hens expended 1320 kJ/day to meet the demands of egg formation. Endogenous lipid and protein supplied 176 kJ/day of this requirement. Energy expenditure for activity during incubation averaged 430 kJ/day. This decrease in energy requirement was related to reduced activity while incubating the clutch (82% of the day). Endogenous stores supplied 55 kJ /day of this energy demand. The rate of chironomid consumption necessary to meet the energy demands of reproduction ranged between 5000 organisms/h spent feeding during prelaying and 8000 organisms/h feeding during incubation.



PUBLICATIONS/REPORTS/PAPERS

Bissonette, J. A. 1981. Behavioral consequences of density dependency. Talk presented to Environmental Series Seminar at Unity College, Maine.

Burke, R. C. 1982. Monitoring wildlife populations and activity along Interstate 95 in Northern Maine before, during and after construction. Paper presented to Transportation Research Board Annual Meeting, Washington, D.C.

Burke, R. C., and J. A. Sherburne 1982(in press). Monitoring wildlife populations and activity along Interstate 95 in Northern Maine before, during and after construction. Transportation Research Record Series.

Caturano, S., and D. Harrison. 1980. The coyote--a look at his lifestyle. Maine Fish and Wildlife 23(4):19-23.

Christensen, B. L. 1981. Reproductive ecology of and response to disturbance by common loons in Maine. M.S. Thesis, Univ. of Maine, Orono. 51pp.

Cioffi, P. J. 1981. Winter cover and browse selection by moose in Maine. M.S. Thesis, Univ. of Maine, Orono. 41pp.

Crawford, R., D. Jorde, and G. Krapu. 1982. Movements and feeding ecology of wintering mallards on the Platte River. Paper presented at the Workshop on The Ecology of Wintering Waterfowl, Puxico, Missouri.

Dunn, P. O., M. A. McCollough, and T. A. May. 1981. Length of stay and fat reserves of semipalmated sandpipers in eastern Maine. Paper presented at Wilson Ornithological Society Meeting, Sackville, N.B.

Ferguson, E. L., D. G. Jorde, and J. L. Sease. 1981. Use of 35 mm color aerial photography to acquire mallard sex ratio data. Photogram. Engr. and Remote Sens. 47:823-827.

Litvaitis, J. A. 1981. A comparison of coyote and bobcat food habits in the Wichita Mountains, Oklahoma. Proc. Okla. Acad. Sci. 61:81-82.

Major, J. T., and J. A. Sherburne. 1982. Predator and prey--how do they relate. Maine Fish and Wildlife Magazine 23(4):14-16.

Major, J. T. 1981. Furbearer research in western Maine. Talk presented to Northern Coastal Chapter of Maine Trappers Assoc., Belfast, Maine.

Major, J. T. 1981. Relationship of pine marten and other furbearers to forestry practices. Talk presented to Maine Chapter of Soc. of Amer. Foresters, Orono, Maine.

Major, J. T. 1981. Ecology and interrelationship of coyote, bobcat, and fox in western Maine. Talk presented to Wildlife Seminar Series, UMO, Orono.

Major, J. T. 1980. Ecology of furbearers in western Maine. Talk presented to Veazie, Maine Salmon Club.

Major, J. T. 1982. Ecology of predators and their prey in western Maine. Talk presented to Paul Bunyon Chapter of the Good Sam Club.

Major, J. T. 1982. Current research on furbearers in western Maine. Talk presented to University Administration and Support Personnel, UMO, Orono.

May, D. W. 1981. Movements and seasonal habitat utilization of bobcats in eastern Maine. M.S. Thesis, Univ. of Maine, Orono. 36pp.

McCollough, M. A. 1981. The feeding ecology of migratory semipalmated sandpipers, short-billed dowitchers, semipalmated plovers, and black-bellied plovers on staging areas in eastern Maine. M.S. Thesis, Univ. of Maine, Orono. 67pp.

Sherburne, J. A. 1981. Presented slide show and talk at Hampden Kiwanis Club on MCWRU research activities.

Sherburne, J. A. 1981. Predator habitat utilization studies, Dickey-Lincoln School Lakes Project, Maine. Final Report, U.S. Corps of Engineers, New England Division. 67pp.

Sherburne, J. A. 1981. Presented a talk to a Senior Citizens Group in Milo, Maine on the predator project.

Owen, R. B., C. S. Todd, F. J. Gramlich and M. A. McCollough. 1982. Ecology of bald eagles in Maine. Poster presented at the 38th Northeast Fish and Wildl. Conf., New Jersey.

Strong, P. I. V., and J. A. Bissonette. 1981. Management report: beaver-cottonwood interactions in Big Bend National Park, 1980-81. 60pp. Submitted to Res. Manage. Div., BBNP.

Strong, P. I. V. 1981. Characteristics of beaver dens in southwestern Texas. Paper presented at the Oklahoma Acad. of Sci., Phillips Univ., Enid, Oklahoma.

Tome, M. W. 1981. Reproductive bioenergetics of female ruddy ducks in Manitoba. M.S. Thesis, Univ. of Maine, Orono. 67pp.

Wynne, K. M. 1981. Summer home range use by adult marten in northwestern Maine. M.S. Thesis, Univ. of Maine, Orono. 19pp.

The Unit organized and conducted a Workshop on the winter requirements of white-tailed deer. The program was requested and supported by the Land Use Regulation Commission (LURC) of Maine. Speakers represented Provincial and State Agencies and Organizations. Participants from several Canadian Provinces and the Northeastern U.S. attended. The Proceedings will be published as a University of Maine Forestry Technical Note.