Alaska Department of Fish & Game
Division of Wildlife Conservation

Federal Aid in Wildlife Restoration
Research Progress Report

1 July 1993 - 30 June 1994

Development and Testing of a General Predator-Prey Computer Model for Use in Making Management Decisions

by

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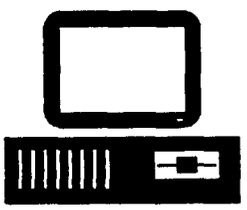

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Study 1.46

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PROGRESS REPORT (RESEARCH)

State: Alaska

Cooperator: Layne Adams, National Park Service, Anchorage

Project No.: W-24-2 Project Title: Wildlife Research and Management

Study No.: 1.46 Study Title: Development and Testing of a General Predator-Prey Computer Model for Use in Making Management Decisions

Period Covered: 1 July 1993-30 June 1994

BACKGROUND

In 1991, a comprehensive wolf management planning process stimulated increased public involvement in management of Alaska's big game species. Public requests to intensively manage for sustained high harvests of moose, caribou, and sheep from manipulated predator-prey systems were countered by public requests for lower, "natural" yields of big game from unmanipulated predator-prey systems. Those conflicting public values placed additional responsibilities on managers to more clearly predict consequences of proposed management programs.

In response to past controversy over predator-prey management, biologists in Alaska, other northern states, and the Yukon have conducted significant research into the general behavior of large ungulate-large carnivore ecological systems. Those advances in large prey-predator ecological research, and the wide availability and use of personal computers, have created an opportunity to develop additional tools for management decisions.

Many of the predator-prey relationships investigated in intensive predator-prey studies have proven to be consistent throughout Alaska and northern Canada (McNay 1993). Those relationships can be combined to model wolf predation rates, wolf population response to changing ungulate densities, and conversely, ungulate population responses to changing wolf densities. Predation rates by bears on ungulates, while not as predictable as those by wolves, can be estimated from predation rates observed in studies of systems similar to those being modeled. In addition, responses of ungulate populations to extreme weather can be modeled using data describing thresholds of critical weather such as described for moose by Coady (1974). Historical weather records could be used to produce probability estimates for the occurrence of severe weather events.

STUDY OBJECTIVES

To develop a computer model to assist Alaskan wildlife managers in making annual management decisions regarding big game predator-prey systems, and to verify the effectiveness and sensitivity of that model by modeling predator-prey systems that have been intensively studied and/or manipulated.

1. Review literature of predator-prey studies to identify basic relationships of Alaskan predator-prey systems.

2. Construct a general predator-prey model using Lotus 1-2-3 software.

3. Write a manual describing model function and basis for model assumptions, including guidelines for model use.

4. Compile and analyze predator-prey data for western Unit 20B for the period 1984-89. Prepare a report describing predator-prey dynamics in western Unit 20B.

5. Validate and refine model functions to simulate known dynamics of intensively studied predator-prey systems.

6. Train area biologists using the model to apply it to current management problems.

7. Write final report and prepare presentations for public and scientific meetings.

SUMMARY OF RESULTS

A prototype of a general predator-prey model using Lotus 1-2-3 software was completed. The model uses inputs estimated from routine survey and inventory activities, or extrapolated from intensive predator-prey studies. The model will be useful to management biologists to estimate 1) trends in ungulate and wolf population size, 2) annual allowable ungulate harvests to meet management objectives, 3) efficacy of proposed predator reduction programs, 4) potential interactive effects of severe weather and predation on ungulate populations, and 5) population dynamics of ungulate-predator systems containing more than one ungulate prey species and predator species.

During July and August 1993, an initial draft of the user's manual was prepared and a progress report detailing work accomplished during the 1 July 1992-30 June 1993 period was completed and submitted (McNay 1993). The principle investigator was assigned to other projects beginning in September 1993 and did not make further progress on refinement of the prototype model or on the draft user's manual. A revised Study Plan was submitted in June 1994, and the completion date of this project was changed to September 30, 1995. A final report will be submitted at that time.

LITERATURE CITED

Coady, J.W. 1974. Influence of snow on behavior of moose. Nat. Can. 101:417-436.

McNay, M.E. 1993. Development and testing of a general predator-prey computer model for use in making management decisions. Alaska Dep. Fish and Game. Fed. Aid Wildl. Restor. Progress Rep. Proj. W-24-1. Juneau. 26pp.

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