12-2001

COOPERATIVE FOREST WILDLIFE RESEARCH - ILLINOIS DEER INVESTIGATIONS

Alan Woolf
Southern Illinois University Carbondale

Kevin Clarke
Southern Illinois University Carbondale

Charles D. Harden
Southern Illinois University Carbondale

W-87-R-23

COOPERATIVE FOREST WILDLIFE RESEARCH - ILLINOIS DEER INVESTIGATIONS

FINAL REPORT

Federal Aid Project W-87-R-23

Submitted by:

Cooperative Wildlife Research Laboratory, SIUC

Presented to:

Division of Wildlife Resources
Illinois Department of Natural Resources

Principal Investigator

Alan Woolf

Graduate Research Assistants/Staff

Kevin Clarke (Graduate Research Assistant)
Charles D. Harden (Graduate Research Assistant)

December 2001

TABLE OF CONTENTS

FINAL REPORT

STATE OF ILLINOIS

W-87-R -23

Project Period: 1 July 1998 through 31 December 2001

Project: Cooperative Forest Wildlife Research - Illinois Deer Investigations

Prepared by Alan Woolf
Cooperative Wildlife Research Laboratory
Southern Illinois University at Carbondale

NEED: The widespread distribution and abundance of white-tailed deer in Illinois has created new management challenges and problems. There is a recognized need for management to become more proactive and less reactive. Increasingly, more segments of the public are scrutinizing the ability of managers to achieve deer management goals. As deer population levels approach stability in many areas, more hunters criticize perceived population fluctuations. In addition, the increased harvest pressure which has been necessary to control herd growth has precipitated complaints of a declining age structure within the herd. The challenges associated with stabilizing a population without overharvesting, in the face of increasing numbers of deer hunters, are certainly greater now than they have ever been. This necessitates the use of more sophisticated methodologies for monitoring and evaluating population performance and predicting the effects of alternative management options. Further, the problem is compounded by ex-urban development and privatization which may affect available habitat, ability to harvest deer, and deer-human negative interactions.

OBJECTIVES:

1. To examine pregnancy rates, numbers of lactating does (particularly yearlings) at check stations, and factors affecting the harvest of fawns in representative Illinois counties and their implications for deer management.

2. To upgrade the existing Illinois Deer Harvest Analysis and Modeling Program (IDHAMP) to make it compatible with newer (and future) computer operating systems.

3. To assess the impact of "Quality Deer Management" strategies upon population size, sex ratios, and age structure of Illinois deer.

4. To quantify the extent of human development and privatization in rural areas of Illinois and predict impact on management options and deer-human interactions.

EXECUTIVE SUMMARY

In the Executive Summary for the Segment 22 Annual Performance Report (Woolf and Roseberry 2000), we noted that the amended grant agreement was not approved by U.S. Fish and Wildlife Service staff until 4 October 1999 and activities planned for Segment 22 were curtailed and/or suspended pending approval to preclude incurring unauthorized expenses. This delay prevented the anticipated progress and completion of tasks scheduled for Segment 22, which in turn prevented timely completion of the project during Segment 23. We asked for and received a no-cost time extension of 6 months (through December 2001) to allow for thorough analyses of data and presentation of results upon completion of other tasks.

Study 1 (which addressed Objective 1) was completed in Segment 21 and a Completion Report provided. Study 3 was discontinued in the amended Grant Proposal. The following Executive Summary highlights activities and findings for each job in remaining Studies 2, 4, and 5.

Study 2. Population Modeling of the Illinois Deer Herd: Updating the Illinois Deer Harvest Analysis and Modeling Program (IDHAMP)

Job 2.1. Determination of appropriate format.—The objective is to determine the appropriate format/programming language that (1) will allow IDHAMP to operate in the newer operating systems, and (2) will remain compatible with evolving systems. This job was completed and reported in Segment 21.

Job 2.2. Translation of IDHAMP into the updated format.—The objective is to convert IDHAMP into a Windows/Windows NT-based program. Limited progress has been made, but no payments have been authorized to, or requested by the contractor during Segment 23. All available harvest data sets have been compiled and converted into the new format.

Job 2.3. Analyze and Report.—The objective is to prepare products from Jobs 2.1 and 2.2, with appropriate documentation, and provide to Illinois Department of Natural Resources

(IDNR) personnel. Work on this job has been limited to meetings with IDNR staff to review project status, and the preparation of data products. Illinois Department of Natural Resources personnel have been provided with archived copies of all completed data sets in the new format on CD-R disk.

Study 4. Deer Management - White-tailed Deer Harvest Strategies

Job 4.1. Literature Review and Agency Survey.—The objective is to review alternative harvest strategies, including Quality Deer Management (QDM), that have been implemented in other states, and document their strengths, weaknesses, and public acceptance. A self-administered, mail out questionnaire was sent to deer biologists in 32 states east of the Rocky Mountains and 29 (91%) responded. Sixteen (55%) states implement some form of QDM by use of antler restrictions to regulate yearling deer harvest.

Job 4.2. Harvest Strategies and Probable Impacts.—The objective is to test alternative harvest strategies by modeling and simulation to predict their probable impacts on herd density and composition; harvest levels and composition; and hunter opportunity, success, and satisfaction. A deterministic simulation model was created to predict the impacts of QDM strategies on Illinois deer herds, harvests, and hunter satisfaction. Simulation results suggested that QDM would not be an appropriate statewide management option because of the minor changes it would produce. Existing low yearling harvests (~50% of the total antlered harvest) and effective use of antlerless harvests to maintain the state deer population at "cultural carrying capacity" combine to create a statewide situation in Illinois that satisfies both population and harvest goals advocated by QDM proponents.

Job 4.3. Analyze and Report.—The objective is to analyze results and prepare reports for Jobs 4.1-4.3 in a timely manner. Data for this job were summarized in a thesis appended as a job completion report.

Study 5. Impacts of Ex-Urban Development and Privatization on Deer Herd Management

Job 5.1. Human Development and Privatization.—The objective is to quantify the extent of human development and privatization in rural areas of Illinois. Rural development maps were obtained or created for all 98 Illinois counties that have shotgun deer seasons. We identified 472,408 rural structures and buffered each with a 274 m zone representing the area within which hunting is prohibited without the occupant's permission. The potential exclusion zone represented 31.3% (range 20 - 48%) of Illinois rural land area.

Job 5.2. Identifying Areas of Potential Conflict.—The objective is to identify sites of potential human/deer conflict and areas where ex-urban development and/or privatization may have greatest impact on deer populations. Landscape analysis revealed that harvest efficiency was reduced when the number of ex-urban structures increased. Human development influenced county land composition. Although the distribution of ex-urban development was uneven throughout the state, the area of potential conflict was large and virtually statewide. Results indicated that human development affected both harvest efficiency and hunter distribution; findings that portend emerging problems both in deer harvest management, and the more general issue of human-wildlife interactions.

Job 5.3. Effects on Hunter Distribution and Behavior.—The objective is to assess the effect of ex-urban development on hunter distribution in a select area of Illinois and develop models that can predict the impacts of rural development on hunter behavior statewide. Hunter distribution was mapped by helicopter survey of 14 sample blocks (21%) of Jackson County. We observed 191 hunters; 18% were in the restriction zones which represented 36.8% of available county area and 33% of forest cover. Mean distance of hunters to nearest structure (582 m) was greater than random locations revealing that hunter distribution was influenced by structures and their restriction zones. Hunters at 5 southern Illinois and 11 central Illinois county check stations were asked to identify sections where they harvested their deer. These analyses revealed a similar pattern and validated aerial survey findings.

Job 5.4. Analysis and Report.—The objective is to summarize information and propose management strategies to IDNR describing potential impacts of ex-urban development on herd density and hunter opportunity, success, and satisfaction. Findings are reported in a thesis appended to this project final report.

STUDY 2. POPULATION MODELING OF THE ILLINOIS DEER HERD: UPDATING THE ILLINOIS DEER HARVEST ANALYSIS AND MODELING PROGRAM (IDHAMP)

JOB 2.1: DETERMINATION OF APPROPRIATE FORMAT

Objective: To determine the appropriate format/programming language that (1) will allow IDHAMP to operate in the newer operating systems, and (2) will remain compatible with evolving systems.

This job is COMPLETE and was reported in Segment 21

JOB 2.2: TRANSLATION OF IDHAMP INTO THE UPDATED FORMAT

Objective: To convert IDHAMP into a Windows/Windows NT-based program.

The delayed initiation of Segment 22 had a marked effect on this job, as it occurred at a time when the contractor was able to work intensively on the project. The contractor, chosen by SIUC staff for his experience and expertise in computer modeling of deer harvest and population information, is employed on a full time basis with the fish and wildlife agency of the State of Texas. As such, he must balance the work for this project against the competing priorities of his job, making it difficult to make up lost time. Limited progress has been made, but no payments were authorized to, or requested by, the contractor during Segment 23. Substantial progress was made in compiling and editing harvest data sets, and all were converted to the new format for incorporation into the new program. All data, after editing, were archived on CD-R disks, with copies retained by SIU, IDNR, and the contractor.

JOB 2.3: ANALYZE AND REPORT

Objective: To prepare products from Jobs 2.1 and 2.2, with appropriate documentation, and provide to IDNR personnel.

Agency staff have been kept apprised of contractor delays. Illinois Department of Natural Resources staff have received copies of all converted data sets on CD-R disks. No usable products are yet available from Study 2, but no charges have been accrued by Study 2 since

Segment 22. Illinois Department of Natural Resources staff will continue to work with the contractor to construct the updated IDHAMP program, and a continuing Study will remain (with no associated budget) in subsequent segments of the continuing white-tailed deer research project (W87R). At such time as usable modeling/data analyses tools are developed by the contractor, we will consider amending the project if it is determined that funds are necessary to produce a final product.

STUDY 4. DEER MANAGEMENT - WHITE-TAILED DEER HARVEST STRATEGIES

JOB 4.1: LITERATURE REVIEW AND AGENCY SURVEY

Objective: To review alternative harvest strategies, including QDM, that have been implemented in other states, and document their strengths, weaknesses, and public acceptance.

INTRODUCTION

The purpose of this job is to investigate harvest strategies that are implemented in other states, with an emphasis on QDM strategies. Harvest strategies include methods of regulating harvests (permit systems), population goals, and any harvest restrictions related to QDM that are intended to protect yearling males from harvest. The social, biological, and ecological strengths and weaknesses will be determined for each of the harvest strategies examined.

METHODS

A self-administered, mail-out questionnaire developed to obtain harvest strategy information was sent to the state deer biologists for all states east of the Rocky Mountains with the exceptions of Delaware, Illinois, New Hampshire, Rhode Island, and Washington D.C., (n = 32). The questionnaire addressed issues of hunter satisfaction and public acceptance related to harvest strategies along with information about population level goals, methods used to achieve goals, and harvest restrictions related to QDM.

RESULTS

A final response rate of 91% (29 of 32) was achieved for the questionnaire. Results show varying population level goals from state to state for agricultural regions with a combination of either-sex permits/seasons, antlerless permits, and doe days (antlerless seasons) used to accomplish goals. Sixteen of 29 states (55%) implement QDM through the use of antler restrictions to regulate yearling male harvest. Antler restrictions included a non-spike rule, 3-point rule (3 points on 1 side), 4-point rule (4 points on 1 side), 4 points total, 6 points total, and minimum antler main beam spread and main beam length.

JOB 4.2: HARVEST STRATEGIES AND PROBABLE IMPACTS

Objective: To test alternative harvest strategies by modeling and simulation to predict their probable impacts on herd density and composition; harvest levels and composition; and hunter opportunity, success, and satisfaction.

A thesis by Clarke (2001) in lieu of a final report for this job is attached. Following is the abstract of Clarke's (2001) thesis:

There are a variety of approaches for managing white-tailed deer (*Odocoileus virginianus*). Quality Deer Management (QDM) is a strategy that attempts to balance sex ratios and age structures for populations with disproportionately higher numbers of females than males and relatively few adult males (≥2 years old); a result of hunter selection toward males and high yearling male harvests. The 2 primary approaches for QDM are to (1) increase the proportion of females in the harvest, and (2) restrict harvest of yearling males to allow them to reach adult age classes. Hunter interest for QDM in Illinois has created the need to investigate the effects of strategies that protect yearlings from harvest. My objectives were to determine what QDM strategies are currently practiced in other states and determine the impacts of those strategies on the herd and harvest, as well as hunter satisfaction. Quality Deer Management strategies were determined primarily through the use of a self-administered questionnaire sent to deer biologists for states east of the Rocky Mountains (n = 32). I used a deterministic simulation model to predict the impacts of QDM strategies on herds and harvests, and made inferences as to their effects on hunter satisfaction. I based the harvest model on Illinois' current permit system and predicted harvests using current sex- and age-specific permit success rates. Strategies modeled included a 3-point rule (minimum of 3 points on 1 side), a 4-point rule, and a 13-inch main beam inside spread restriction. All strategies were modeled with both a low buck harvest scenario (representing current statewide population and harvest conditions in Illinois) and a high buck harvest scenario (representing a hypothetical population with a 90% yearling male harvest). Both scenarios were modeled with adult male permit success increased 50 and 100% to demonstrate possible effects of changes in hunter selectivity toward adult males associated with

implementation of QDM. Antler restrictions produced 12–54% more adult males, 8-54% higher adult male harvests, and 5-38% lower antlered harvests than a non-QDM strategy when modeled with current Illinois conditions. Restrictions produced 216–777% more adult males, 142-537% higher adult male harvests, and 13-57% lower antlered harvests when modeled with hypothetical conditions. Minimum levels of compliance necessary to ensure antler restrictions reduced yearling male harvests were higher for restrictions that protected the greatest numbers of yearlings. Regarding changes in hunter selectivity, QDM produced fewer adult males than a non-QDM strategy when adult male permit success was increased 50% with the 4-point rule, and when increased 100% with both the 4-point rule and the spread restriction under current Illinois conditions. However, antler restrictions led to greater numbers of adult males in the population and harvest for simulations with the hypothetical population regardless of increased success for adult males. Therefore, results indicated that QDM would be most effective in areas with high initial male harvest rates and relatively few adult males in the population.

JOB 4.3: ANALYZE AND REPORT

Objective: To analyze results and prepare reports for Jobs 3.1 and 3.2 in a timely manner.

Work toward meeting the objective of this job was accomplished with preparation of this final performance report and the appended thesis.

STUDY 5. IMPACTS OF EX-URBAN DEVELOPMENT AND PRIVATIZATION ON DEER HERD MANAGEMENT

JOB 5.1: HUMAN DEVELOPMENT AND PRIVATIZATION

Objective: Quantify the extent of human development and privatization in rural areas of Illinois.

JOB 5.2: IDENTIFYING AREAS OF POTENTIAL CONFLICT

Objective: Identify sites of potential human/deer conflict and areas where ex-urban development and/or privatization may have greatest impact on deer populations.

JOB 5.3: EFFECTS ON HUNTER DISTRIBUTION AND BEHAVIOR

Objective: Assess the effect of ex-urban development on hunter distribution in a select area of Illinois and develop models that can predict the impacts of rural development on hunter behavior statewide.

Jobs 5.1, 5.2, and 5.3 the objectives included were collectively studied and reported by Harden (2002) in a thesis that is appended to this final report. Following is the abstract from Harden's (2002) thesis:

Harvest efficiency for white-tailed deer is primarily dependent upon the density and distribution of hunters. Therefore, factors affecting hunter distribution will likely influence harvest efficiency. Previous research has suggested that presence of human habitations may influence the distribution of hunters. To test this assumption, I compiled rural structure maps for 98 of 102 Illinois counties. Based on the Illinois law which prohibits hunting within 274 m of any structure without the occupant's permission, all lands within this distance to rural structures were considered a potential hunter restriction zone. Land cover and deer habitat composition were determined at the individual structure locations, within the above restriction zone, and within each county. These data were then compared to variations in harvest efficiency using stepwise regression models. The influence of this zone on individual hunter distribution was evaluated through hunter surveys at both check stations and from the air. The distribution of hunters in relation to landscape and human development variables was assessed using logistic

regression. Over 4 million hectares (30%) of the rural Illinois landscape falls within the potential hunter restriction zone. The composition of the restriction zone differed from the remainder of counties for all landscape and habitat types assessed. Variables associated with the convergence of human development and deer habitat explained a major proportion of the variation in harvest efficiency. As rural development increased and protected more deer habitat, harvest efficiency decreased. Thus, when human development occupies deer habitat it restricts traditional deer management with hunting. The presence of human developments reduced the use of surrounding areas by hunters thus lowering hunting pressure in the hypothesized "restriction zone". Thus, increases in human development will make it more difficult for successful deer management with traditional methods. By using the models developed here, managers can identify areas of conflict where non-traditional deer management would be most effective.

JOB 5.4 ANALYSIS AND REPORT

Objective: Summarize information and propose management strategies to IDNR describing potential impacts of ex-urban development on herd density and hunter opportunity, success, and satisfaction.

This job has been accomplished with this final performance report and the appended thesis.

LITERATURE CITED

Harden, C. D. 2002. Impacts of human development on deer herd management in the ex-urban landscape. Thesis, Southern Illinois University, Carbondale, Illinois, USA.

Woolf, A., and J. L. Roseberry. 2000. Cooperative Forest Wildlife Research - Illinois Deer Investigations. Illinois Department of Natural Resources, Annual Report, Federal Aid Project W-87-R-22, Springfield, Illinois, USA.

Attachment: Thesis (Clarke, K. G. 2001)

Attachment: Thesis (Harden, C. D. 2002)