State Agency and University Cooperative Wildlife Research: Mississippi's 37-year Success Story

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Abstract: Scientific knowledge provides an important basis for effective wildlife management decisions. Given frequent budget constraints that impact the ability of wildlife agencies to generate their own knowledge, using trained research scientists at a university is a cost-effective alternative. We describe the cooperative agreement between Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) and Mississippi State University (MSU) as a model of cost-effective partnership that blends science with management. Since 1976, our cooperation has produced 107 master of science theses, 19 doctor of philosophy dissertations, and 301 peer-reviewed publications which have contributed to the scientific literature while effectively addressing adaptive management needs of the agency. We describe the Deer Management Assistance Program as an example of the products produced through this cooperative venture. We also describe advances in waterfowl management that addressed regional and national issues.

Key Words: applied research, adaptive management, cooperative, state agency, university

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Scientific knowledge provides an important basis for effective conservation and ecosystem management decisions (Christensen et al. 1996, Paul and Cooper 2005). However, many wildlife management decisions are difficult because objectives are contentious, alternative management actions are limited, and resource response is uncertain (Lyons et al. 2008). Political debate over management of wildlife resources requires integrated research and management to address the uncertainty inherent in natural resource management (Lancia et al. 1996).

A perceived need for scientific information on various wildlife management issues during the mid-1970s led the Mississippi Game and Fish Commission, now the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP), to seek legislative authority to hire research biologists, as in the Missouri Department of Conservation model. After repeated failures to obtain a research staff though legislative avenues, MDWFP discussed its needs with the Mississippi State University (MSU) Department of Wildlife and Fisheries, now the Department of Wildlife, Fisheries, and Aquaculture. These discussions led to a unique research partnership between MDWFP and MSU (E. Cliburn, Mississippi Department of Wildlife, Fisheries, and Parks, personal communication) to address applied management issues occurring within an ecological context.

The goal of this paper is to provide an overview of the cooperative agreement between MDWFP and MSU as a model of cost-effective partnership that blends science with management of wildlife resources. We describe the agreement's specific components, expectations, and requirements. We review historical application of the agreement including accomplishments. We provide an example where our model facilitated research that produced an effective white-tailed deer (*Odocoileus virginianus*) management model with long-term monitoring that resulted in re-evaluation of knowledge that produced changes in applied management and regulations (i.e., adaptive management). We provide an example of how research effectively addressed regional resource issues that impacted continent-wide waterfowl management efforts. Lastly, we offer recommendations for state agencies interested in developing similar cooperative agreements.

Cooperative Agreement

The original cooperative agreement between MDWFP and MSU was unique within the Southeast at the time (E. Cliburn, Mississippi Department of Wildlife, Fisheries, and Parks, personal communication), although there are other examples of state wildlife agencies and universities with similar cooperative research agreements today. The original Mississippi agreement formally approved by the respective directors took effect on 1 July 1976 and was only two pages and general in nature. However, key concepts identified would facilitate further specific developments: sharing of staff and resources and regular communication. As a result of the agreement, MDWFP created a position of research coordinator, which would reside at MSU and interact daily with faculty and graduate students. Cooperative research projects were funded by MDWFP using Federal Aid in Wildlife Restoration (Pittman-

Robertson) funds through grants administered by the U.S. Fish and Wildlife Service (USFWS). Because of the uniqueness of the agreement, a Federal Aid Coordinator from Atlanta spent a week at the MDWFP Headquarters in Jackson developing reporting and accounting details with the cooperators (E. Cliburn, Mississippi Department of Wildlife, Fisheries, and Parks, personal communication). The agreement specified that the university would waive charges for resources such as faculty salary and all indirect costs; therefore the MDWFP was able to utilize this waiver as the requisite 25% state match. The MDWFP pays its share of the annual project cost to the university, then seeks reimbursement from the USFWS via semi-annual drawdowns. Because Federal Aid-eligible projects are 75% reimbursable, this process allowed the MDWFP to conduct research essentially free from net expenditures of limited state cash reserves. With the serious challenges currently facing some state agencies trying to produce match for unprecedented Wildlife Restoration apportionments, the cost effectiveness of this model is more attractive than ever. A second, almost identical cooperative agreement was signed 1 January 1998 and remains in effect today.

The MDWFP-MSU cooperative arrangement is a blend of the traditional science-management relationship and the more recent adaptive management approach. The traditional science-management relationship involves managers expressing an information need, scientists working separately to furnish results, and managers implementing the findings (Lancia et al. 1996). Adaptive management is an approach in which uncertainty about management decisions is reduced over time through comparison of outcomes predicted by competing models against observed values of those outcomes (Moore et al. 2011). Monitoring plays a central role in wildlife management because the systems we manage are dynamic and variable, and often we do not understand how they will respond to our decisions and actions (Lyons et al. 2008). The long-term and close working relationship between MDWFP and MSU allows for continuous re-evaluation of models and management outputs and, thus, meets one of the basic tenets of adaptive management (Lyons et al. 2008).

Specific research projects are developed through an interactive process with a five year planning window. Individual MDWFP biologists and programs (e.g., White-tailed Deer Program, Wild Turkey Program, etc.) submit informational needs, which are then prioritized by all wildlife technical staff biologists. The ranked list is made available to MSU research faculty, who discuss details with program coordinators and biologists to obtain additional background. About one month later, the MDWFP wildlife technical staff meets with interested faculty who briefly present orally to the group with discussion and in short written format their concept to address a particular information need. The MDWFP technical staff then ranks these concept papers and faculty with the highest ranking concepts are asked to submit a full proposal. Following full proposal review, the research coordinator makes recommendations to MDWFP executive leadership to determine when and how successful proposals will be funded within the next five-year planning window (e.g., a project might be approved for funding but not until the third fiscal year of the window). Some flexibility remains with the MDWFP to adjust future plans as emergencies arise, but generally there is a firm commitment to this planning process.

A regular communication process is facilitated by the agency's onsite research coordinator to ensure continuous interaction between agency and university. The research coordinator ensures all coordination, planning, accounting, implementation, and reporting efforts remain focused and moving forward. MDWFP program coordinators (e.g., white-tailed deer coordinator, wild turkey coordinator, etc.) work closely with MSU faculty to discuss emerging management needs and issues and to design appropriate research projects, and they may participate as a committee member on a master of science thesis or as a guest at committee meetings. Program biologists typically work in the field with the graduate student's research team, providing additional opportunity for input. To ensure involvement of the entire wildlife technical staff, MSU hosts an annual research meeting in which graduate students present and discuss specific findings. Finally, all MDWFP biologists are invited to attend thesis/dissertation defense presentations. These consistent interactions among biologists, faculty, and graduate students ensure research relevance, improve biologists' scientific buy-in, and improve agency and university relationships. A secondary benefit to the MDWFP of closely working with graduate students is the opportunity to evaluate their potential as employees and to facilitate recruitment of highly qualified personnel. Additionally, the research coordinator is invited to participate in faculty interviews with opportunities to provide input so as to minimize the potential for a university/agency gap as described by Sands et al. (2012).

Federal Aid remains the primary funding source; however, MDWFP has added other sources over time to creatively fund research through waterfowl stamps, the State Wildlife Grants Program, and the cooperative agreements with the U.S. Geological Survey Cooperative Research Unit. University faculty have historically leveraged and supplemented state funding through other grant avenues and non-governmental organizations (e.g., Ducks Unlimited, Delta Waterfowl, National Council on Air and Stream Improvement, National Wild Turkey Federation, etc.) to increase project operational budgets.

Remaining mission-focused is integral to fiscal accountability. Given frequent budget constraints that impact the ability of some

wildlife agencies to generate their own knowledge, using trained research scientists at a university is a cost-effective alternative. There are many research projects that would be worthwhile endeavors at various levels, but developing meaningful answers to management needs that solve real-world issues remains the core focus of the cooperative agreement. In light of challenges facing all state agencies with increased operational costs and increasingly tighter budgets, justifying allocating funds to research versus agency operational expenses is a real issue. Agency administrators must know with absolute certainty that a project will effectively address an important information need that will aid in resolving challenging issues.

Accomplishments

Since 1976, we have completed, or are currently conducting, 113 projects that addressed management needs and/or issues with nearly every species of big game, small game, waterfowl, furbearers, and nuisance wildlife in Mississippi (Table 1). Projects have also been conducted on non-game and/or protected species such as small mammals, neotropical migratory birds, Louisiana black bear (*Ursus americanus luteolus*), red-cockaded woodpeckers (*Picoides borealis*), and American alligator (*Alligator mississippiensis*). Multiple human dimensions and wildlife habitat projects have also been conducted. Altogether, cooperative research projects and the resulting 301 peer-reviewed publications have significantly contributed to the body of wildlife science and management literature. Additionally, numerous former MSU graduate students have been hired by the MDWFP as a result of the positive interactions during research projects.

Development of the Deer Management Assistance Program (DMAP) as a project between MDWFP and MSU exemplifies the best aspects of the cooperative agreement. It is most fitting to use this as an example because the need for information and programs on white-tailed deer was "the driving force" behind the first cooperative agreement (E. Cliburn, Mississippi Department of Wildlife, Fisheries, and Parks, personal communication). The goal of this early cooperative project was the development of a management model for white-tailed deer on private lands that would collect biological data from harvested deer, involve sportsmen in management decisions, reduce deer densities, and improve deer herd quality (Guynn et al. 1983). DMAP expanded from a research project during 1977–1981 to a regional project in 1981 and ultimately to a statewide program. At its apex in the mid-1990s, biologists interacted with ≥1,200 private cooperators/hunting clubs managing over 3 million acres. Demand for DMAP has decreased since then because of the effectiveness of educating participants and the liberalization of harvest opportunities statewide. Presently, ≥600 cooperators participate impacting 2.5 million acres annually. DMAP has successfully changed attitudes toward managing deer in Mississippi and ushered in the era of quality deer management (C. M. Dacus, Mississippi Department of Wildlife, Fisheries, and Parks, personal communication).

Table 1. Accomplishments during 1976–2013 resulting from the cooperative research agreement between the Mississippi Department of Wildlife, Fisheries, and Parks and the Mississippi State University Department of Wildlife, Fisheries, and Aquaculture.

Focal species	Projects	Theses	Dissertations	Peer-reviewed publications
Bobwhite quail	31	25	6	71
White-tailed deer	31	28	4	31
Migratory birds[a]	14	12	3	63
Human dimensions	9	4	–	10
Wild turkey	8	20	1	38
Forest habitat	5	4	2	19
Nuisance wildlife[b]	5	1	–	1
Gamebird predators	4	9	1	44
Black bear	3	3	2	15
Small game[c]	3	1	–	9
Total	113	107	19	301

a. Includes mourning doves and waterfowl.
b. Includes furbearers, wild hogs, alligators, and wildlife health.
c. Includes squirrel and rabbit.

An important aspect of DMAP was the systematic collection of data on 35,000–40,000 deer each year that could be used by biologists to evaluate local management actions and by researchers to further evaluate management models, which fulfilled two basic tenets of the adaptive management model. Cooperative research projects evaluating DMAP data identified the need to alter management models. Research into antler characteristics associated with harvested deer (Strickland et al. 2001, Demarais et al. 2005) resulted in significant changes to how antler restrictions are incorporated into DMAP recommendations and statewide regulations. Reproductive data collected during spring herd health evaluations provided the biological justification for shifting the season framework to delay hunting season two weeks in the southeast section of Mississippi (C. M. Dacus, Mississippi Department of Wildlife, Fisheries, and Parks, personal communication).

Success with DMAP in Mississippi led other state agencies to adopt it as their private lands deer management model. Fourteen of the 17 state agencies participating in the Southeast Deer Study Group have adopted programs similar to DMAP and have met similar success working with 165,636 cooperating properties (South Carolina Department of Natural Resources 2013).

A second example of long-term, cooperative research success has advanced waterfowl conservation. Following enactment of the North American Waterfowl Management Plan (U.S. Fish and

Wildlife Service 1986), precise estimates of food abundance during the non-breeding season for migrating and wintering waterfowl were needed for habitat conservation planning and delivery by state, federal, and private-sector partners in conservation. Additionally, concerns surrounding decreased food abundance for wintering waterfowl due to changes in agricultural practices and efficiencies birthed long-term cooperative research with MSU to estimate waterfowl food availability in ricelands in Mississippi and throughout the Lower Mississippi Alluvial Valley (LMAV; Reinecke et al. 1989, Manley et al. 2004, Stafford et al. 2006). Subsequent investigations of forage availability were conducted in the LMAV in moist-soil (Kross et al. 2008, Hagy and Kaminski 2012) and bottomland hardwood forested wetlands (Straub 2012). Moreover, aerial survey techniques were developed and refined to estimate waterfowl abundance in Mississippi, and neighboring states in the LMAV now employ these strategies (Pearse et al. 2008, Pearse et al. 2012). These, and similar cooperative research efforts including other partners, yield science-based information for waterfowl and wetland conservationists working within the state, the southeast region, and nationally across the flyways (R.M. Kaminski, Mississippi State University, personal communication).

Conclusion and Recommendations

State agencies and universities can cooperate in many ways to conduct applied wildlife research that impacts conservation and management. Mississippi's example serves as a successful and cost-effective model that blends science with management. At the core of our partnership, interactive communication and cooperation are indispensable. We encourage other states interested in developing a similar model to consider the following recommendations. First, the state agency and university must identify personnel and faculty, respectively, and initiate communication on a mechanism to develop research opportunities. Secondly, the university must be willing to allow an agency liaison into their department (e.g., provision of office space, courtesy adjunct faculty appointment, etc.). Third, the agency must identify the funding mechanism that most appropriately balances their cash flow. We advocate that conducting appropriate wildlife research using Federal Aid in Wildlife Restoration funds is an eligible activity that can be conducted with essentially no agency money being permanently involved. Fourth, consistent communication and interaction between state biologists and university faculty, administrators, and graduate students is fundamental. We recognize that unique circumstances in each state likely exist and will require local customization of a cooperative model, but we encourage agencies and universities to creatively explore opportunities to partner science and management professionals for natural resource conservation.

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