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RESEARCH PRIORITIES IN WILDLIFE DAMAGE MANAGEMENT

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Abstract: Based on a survey of 97 wildlife damage management professionals (60% response rate of 161 mailed questionnaires), field, research, and administrative personnel felt that the top 3 current wildlife damage management (WDM) research needs were: development of more effective and efficient techniques of damage assessment, effectiveness of education and conflict resolution programs on WDM issues, and repellent/aversive techniques. Respondents indicated that human dimensions research related to effectiveness of public education and conflict resolution would be the highest future research need. Large and small mammals were identified as key species groups needing research with preventive methods and aversive agents as practices needing research. Respondents also identified deer (*Odocoileus* spp.), elk (*Cervus elaphus*), pronghorn (*Antilocapra americana*), sheep (*Ovis* spp.), and ground nesting birds as prey species that should receive research focus. Coyotes (*Canis latrans*) were the prevalent predator species identified with high research needs.

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Key words: assessment, conflict resolution, predation, prey, research needs, rural, techniques, universities, urban, wildlife damage management.

Wildlife damage management (WDM) research has been conducted by a diversity of investigators throughout the history of human-wildlife interactions. Clearly, one might question the scientific rigor and validity of early investigations; however, motivation for early research efforts is probably indisputable. Early investigative efforts were most likely conducted to try to find a technique or tool to either prevent damage, control the problem animal, or reduce damage or threat to health and well-being to tolerable levels so that humans and wildlife species could co-exist. Research methodology has progressed significantly over the years and is expected to evolve scientifically and socially. However, for most professional managers, researchers, and educators experienced in WDM the motivation for research has not changed significantly. Those involved in WDM recognize that methods used must become more environmentally and socially acceptable, as well as economically practical, than past methods. This paper presents a cross-section of perspectives obtained from a 60% response to a national survey of wildlife damage program managers (state and federal), researchers, educators, and private practitioners. The purpose of this paper is to present both field and administrative impressions on current and future research needs in the WDM field.

METHODS

In late November, 1994, questionnaires were forwarded to 161 WDM professionals across the contiguous United States. The sampling frame consisted of personnel from 2 federal agencies, the Animal and Plant Health Inspection Service - Animal Damage Control (APHIS-ADC) State offices, and State Extension Wildlife specialists linked to State Cooperative Research, Education, and Extension Service (CSREES),

of United States Department of Agriculture (USDA). In addition, attendee mailing lists of the most recently held Vertebrate Pest Conference in California, Great Plains Wildlife Damage Control Workshop, and Eastern Wildlife Damage Management Conference were sampled. Twenty names were selected from each of these lists at random. To avoid duplicate names from conference attendee lists and agency mailing lists, non-duplicative additional names were drawn from attendee lists until 20 attendees from each conference list were obtained. Respondents were requested to return the survey by or before 20 December 1994.

The final questionnaire was forwarded to the professionals described with a brief description of why the information was being solicited, where the information would be presented, and a general description of the survey population. The questionnaire consisted of 10 questions related to WDM, 5 of which required narrative responses, 4 yes/no questions of which 2 requested narrative reasons, and 5 which requested ranking of either WDM techniques or wildlife species based on the needs for research. Of the 161 questionnaires forwarded, 97 respondents returned filled out questionnaires (60% response rate). There was no effort made to contact non-respondents, and because of the quick response requested and the time anticipated it would take to fill out the questionnaire, a significantly larger return rate was not anticipated.

Appreciation is extended to Dr. Richard Curnow, Director of the Denver Wildlife Research Unit (DWRC), Dr. Greg Yarrow, Extension Wildlife Specialist, South Carolina Cooperative Extension Service, Mr. Thurman W. Booth, Jr., Arkansas State Director APHIS-ADC, Dr. Jim Armstrong, Extension Wildlife Specialist, Alabama CES, and to Dr. Russ Reidinger, Initiatives Director, Lincoln University, Jefferson City, Mis-

souri for quick review, suggestions, and recommendations on a draft questionnaire.

RESULTS

It should be noted that even though 60% of the respondents returned a completed questionnaire, some respondents did not answer all questions. It should also be noted that as expected with narrative responses, some investigator interpretation and grouping of the responses was necessary. The questions with a summary of responses follows.

Table 1 summarizes the responses to question 1 on the survey regarding what were felt to be the top 3 current (1994-1999) research needs in WDM, and to question 2 on the top 5 current WDM techniques that need additional research. While some research needs and techniques were clearly supported more than others, several items received strong support, specifically: more effective damage assessment techniques; increased development of effective repellent and aversive agents; increased education, conflict resolution, and

public policy education about WDM; more efficient, humane, and durable traps, snares, and baiting technologies; and more effective exclusion devices and technologies.

Questions 3 and 4 asked respondents to rank from 1 to 5 groups of wildlife species and practices that needed additional research. Table 2 provides a summary of these responses. Species groups receiving the most support for additional research were: large mammals, small mammals, blackbirds, and cowbirds (*Molothrus sp.*). Practices and tools ranked highest included: preventive methods, aversive agents/repellents, behavior/physiology, and traps. In addition to those noted in Table 2, other practices/tools listed as needing WDM research included: education, public relations and conflict resolution, potential for human infection via wildlife disease transmission, use of night vision devices, alternative nest success reduction for urban geese/waterfowl, agricultural crop resistance to wildlife damage, and a broader array of acceptable and effective technologies for population control.

Table 3 summarizes the top 3 future research needs

Table 1. Response frequencies from a survey of professionals regarding wildlife damage management (WDM) research and management techniques.

Question 1 — Top 3 current WDM research needs	<i>n</i>
a. More effective and efficient techniques of damage assessment	36
b. Increased education and conflict resolution on WDM issues	35
c. More effective repellent techniques - chemical, auditory, mechanical, etc.	34
Others listed prominently:	
d. Nonlethal methods	31
e. Effective population control techniques	29
f. Effective urban goose and waterfowl population control	28
g. Urban deer damage management	25
h. Blackbird roosts, population and damage reduction including toxicants	21
i. Immunocontraception/reproductive inhibitors and delivery	17
 Question 2 — Top 5 current WDM management technique research needs	 <i>n</i>
a. Increased development and use of effective repellents/aversive agents	55
b. More efficient, humane, and durable trapping, snaring, and baiting techniques	50
c. More efficient exclusion/prevention techniques and tools	43
d. Blackbird and cowbird population (toxicants and contact materials)	34
e. Hazing/scaring technique effectiveness (waterfowl, blackbirds, etc.)	33
Others listed prominently:	
f. Species-selective immunocontraception/reproductive inhibitors	24
g. Improved knowledge of relocation impacts and euthanasia techniques	21
h. Habitat modification, education/policy perception, values/attitudes	20 ^a

^a Each of these 3 techniques had 20 responses

Table 2. Summary of response frequencies from survey of wildlife damage management professionals on wildlife species and practices that need research.

Question 3 — Species needing new research	Rated highest	n
Large mammals (deer, bear, elk, antelope, etc.)	33	82
Small mammals (skunk, coyote, fox, raccoon, etc.)	25	85
Blackbirds, crows, cowbirds, etc.	20	70
Rodents (rats, beaver, nutria, rabbits, etc.)	9	78
Predatory birds (cormorants, herons, hawks, etc.)	6	65
Commensal birds (pigeons, starlings, sparrows, etc.)	5	69
Others identified (geese/waterfowl, gulls, armadillo, exotics)	11	20

Question 4 - Practices/tools needing research	Rated highest	n
Preventive (fencing, auditory, visual, or habitat modification)	41	95
Aversive agents/repellents	26	83
Behavior/physiology	17	76
Leghold or lethal traps	10	49
Toxicants	10	50
Live trapping and snaring	4	57
Shooting	1	34
Denning	0	32

in WDM beyond 1999 requested by question 5 of the survey identifying: public education/conflict resolution related to the need and efficiency of WDM for reducing economic losses, threats to public health, and productivity; development of improved capabilities to efficiently and effectively assess wildlife damage; and development of species-specific nonlethal preventive or lethal control methods for some species as most important.

Question 6 asked respondents to identify whether research was more urgently needed in urban or rural areas to develop conflict resolution techniques for addressing WDM issues. Seventy-five (74%) of the respondents stated that the greatest need was in urban areas, while 26 of the respondents felt the greatest need was in rural areas. Some respondents answered both yes and no, and some did not respond to the question. Reasons listed by respondents were varied but included in order of listing: urban areas have more people, thus more human-wildlife interaction; urban area problems create higher visibility and more controversies than rural problems; education needs about WDM are greater in urban areas; the scope and extent of economic damage is greater in dealing with rural WDM problems.

Table 4 summarizes the question 7 responses to the

question, "Should research be conducted to develop better techniques for wildlife damage assessment?" Seventy-five (84%) of the respondents answered yes, 14 respondents answered no, and some did not answer the question either way. Respondents were also asked to rank groups of species that better assessment techniques were needed on. Table 4 provides a summary of results noting that predatory mammals, large mammals, and bird damage are areas of greatest concern.

Table 5 summarizes responses to question 8, which asked, "Is additional research needed to address the impacts of predators on other wildlife species people manage for and care about?" Sixty-five (73%) of the respondents answered yes, 24 respondents replied no, and some checked yes and no. The highest rated groups of prey species of concern included: deer (*Odocoileus* spp.), elk (*Cervus elaphus*), antelope (*Antilocapra americana*), and sheep (*Ovis* spp.); ground nesting birds/waterfowl (Anatidae), turkey (*Meleagris* spp.), and quail and pheasants (Phasianidae); domestic livestock and pets; threatened and endangered species; and neotropical birds and songbirds. Predator species of concern ranked highly included: coyote (*Canis latrans*), small mammal predators, large carnivores, fox (*Vulpes* spp. and *Urocyon* spp.), and raptors.

Eighty-four (88%) of the respondents indicated a de-

Table 3. Response frequency from a survey of WDM professionals regarding future research needs.

Question 5 — Top 3 future needs	n
a. Public education/conflict resolution related to WDM	40
b. Improved technologies in damage assessment	33
c. Species-specific preventive/nonlethal and lethal control methods	30
Others listed prominently:	
d. Human-wildlife/predator interactions	23
e. Urban deer damage control/management	22
f. Cost-effective immunocontraception techniques	20

Table 4. Summary of response frequencies regarding species needing better techniques for damage assessment.

Question 7 — Species ranked 1-5	Rated 1	n
Predatory mammals	24	74
Large mammals	23	74
Other birds	21	72
Predatory birds	18	68
Rodents	9	73
Others identified (blackbirds, cowbirds, waterfowl, exotics, armadillo, beaver)	12	—

sire for more WDM research to be conducted at universities with a wildlife program in response to question 9. Those who answered yes were asked to list 3 specific ways to stimulate more WDM research at these universities. Fifty-one respondents indicated that development of specific funding needs would help in obtaining research funds. The development of closer coordination between WDM agency professionals and university wildlife faculty to improve consultation about WDM research needs was stressed by 25 respondents. Twenty-four respondents suggested that teaching a WDM course by resident or adjunct faculty would stimulate funding requests for WDM research. Other responses included: cooperative WDM/DWRC units being developed; development of a cooperative student intern program work/study; shifting a portion of Pittman-Roberston (P-R) funds to support WDM in cooperation with state wildlife agencies; and industry/farm organization support to fund justified WDM research at universities.

From those 11 respondents who answered no, their reasons were as follows: many university wildlife faculty lack WDM experience and have not conducted WDM research, thus lack credibility with those who would provide funds; long-term WDM research needed is difficult to accomplish with any continuity when done by graduate students; many universities overhead requirements make WDM projects with limited funding cost-prohibitive; some questioned that WDM protocol quality would not likely be followed; and some stated that most

faculty and students do not seem to be interested in WDM research.

Finally, question 10 asked respondents to acknowledge their current area(s) of work related to WDM and to check those applicable. These results are noted in Table 5, which indicated respondents checked technical assistance, education and federal agency most often. However, research, operational, and state agency were checked frequently indicating the diversity of respondent responsibilities.

It must be recognized as previously noted that for the diversity of narrative answers considerable summarization of responses was necessary to try to accommodate the varied responses. It should also be noted that no attempt was made to segregate raw data by responses from different regions of the country, by agency employment, or profession. The significance of information obtained from this questionnaire must be evaluated from the context of the purpose — “to obtain the respondents perspective of current and future needs in WDM research.”

DISCUSSION

Clearly, the complexity of work in WDM rivals, if not exceeds that of any other defined area of wildlife management. Berryman (1992) discussed the complexities of WDM at length, and Miller (1987b) noted that “wildlife damage management is as complex, challenging, scientific, productive,

Table 5. Response frequency of predator and prey species needing additional research.

Question 8 — Additional research needed to address impacts of predators on species people manage for and care about	n
Prey Species	
Deer, elk, antelope and sheep	48
Ground nesting birds (waterfowl, turkey, quail, etc.)	45
Domestic livestock and pets	32
Threatened and endangered species	29
Neotropical birds and songbirds	26
Aquaculture fish species (catfish, trout, salmon, minnows)	19
Predator Species	
Coyote	52
Small mammal predators	37
Large carnivores (wolves, cougar, bear)	32
Fox	27
Raptors (hawks, owls, ravens, crows)	23
Cormorants, gulls, herons	16

Table 6. Response frequency of current area of work related to wildlife damage management (WDM).**Question 10 — Check all WDM related work applicable**

Work Areas	<i>n</i>
Technical assistance	55
Operational	36
Research	38
Education	55
Federal agency	54
State agency	18
Private Operator	4
Other	26 ^a

^aOther: 16 university extension, 3 administration, 2 advisor, 2 non-governmental organizations, and 1 each policy, teaching, and wildlife diseases.

enjoyable and requires as much or more accountability and responsibility as any other scientific natural resource discipline." Hodgdon (1991) noted that "wildlife damage management must be considered an important component of every wildlife management plan, program and activity. We must fulfill the role of expert and guide public thinking and decision makers toward management programs that are ecologically sound, sustainable, and in the best interests of the majority of the people and wildlife."

Previous investigation of research needs in WDM have been conducted by numerous investigators for a number of different objectives and from a diversity of groups of people (see Packham and Connolly 1992, McAnich 1987, Miller 1987a, Slate 1987, Besser 1962, and others). From an agency perspective, since the 1985 transfer of Animal Damage Control responsibilities from the Fish and Wildlife Service, U.S. Department of the Interior to the Animal Plant Health Inspection Service, U.S. Department of Agriculture, numerous examinations of WDM research and management needs have been conducted (U.S. Dep. Agric. 1989, 1991). Numerous investigators have conducted informative surveys of a variety of groups including professionals, private landowners, urban communities and others to determine a diversity of needs from damage assessment, to specific landowner damage thresholds, to professionalism. All of these investigations have provided additional insight into WDM. Some have focused on just agency personnel who work exclusively in WDM. Others have surveyed advisory groups, agricultural producers, urban groups, and conservation groups obtaining useful information. One of the most recent and most comprehensive national surveys was made of APHIS-ADC personnel in 1990 as reported by Packham and Connolly (1992).

Miller (1987a) discussed summaries of research needs identified in 1985 by a group of 25 professionals representing a diversity of agencies. This group met for 3 days and identified 69 specific research needs through prioritization by the group, and provided a list of 9 major concerns summarized by the group that needed to be addressed from their perspective. It is likely that if the respondents to this questionnaire were to meet and come up with a list of concerns, they would not be

significantly different except for new and expanded technologies developed since that time.

It is critical, however, that in identifying and responding to these research needs that we acknowledge not only those needs identified by professionals, but the needs identified by both rural and private landowners. As noted by Conover (1994) in a survey of grass-roots leaders of the agricultural community about wildlife damage, 89% of the respondents reported wildlife damage to their farm and ranch operations, and 53% reported that losses exceeded their threshold of tolerance.

Perceptions of the diverse group of professionals responding to this questionnaire clearly indicate that additional research is desired for both current and future needs. These professionals' perceptions of research needs are likely influenced by both provincial and demographic demands. They demonstrated via their responses a need for expanded research at universities (88%), and that 76% perceive an increased need for WDM research on urban problems. They also perceive a need for increased research on better assessment techniques for wildlife damage. In addition, the majority of these respondents (73%) perceive a need for more research to address impacts of predators on other wildlife species.

Clearly, there is recognition by wildlife professionals that predators play a valuable role in wildlife communities. However, we must also be cognizant of the role of juxtaposition and availability of habitat that impacts predator/prey relationships and balances, as noted by O'Gara (1982). In a recent progress report from the Delta Waterfowl Foundation, Lloyd Jones (1994) indicated that comparison of nesting success in 2 similar 4,049 ha (10,000 ac) study areas, 1 with, and 1 without small mammal predator removal resulted in 71% nesting success where predators were removed, compared to 14% success in the area without predator removal. This study is being continued and expanded in 1995. The impact of predation on some wildlife species is of concern to wildlife managers and to private landowners alike. For example, Greenwood et al. (1995) reported that during 1982-85, predators destroyed an estimated 72% of 4 common dabbling duck species nests during a study in the prairie pothole region of Canada. Beasom (1974), Connolly (1978), Stout (1982) and numerous others

have reported the impacts of predation on deer and other big game species of interest to managers.

This questionnaire was not intended to try to discern differences in responses based on the area of work or employer. However, it is noteworthy that 38 respondents were involved in WDM research, 55 provided technical assistance, 55 provided education, 54 worked for federal agencies, and that 18 worked for state fish and wildlife agencies.

RECOMMENDATIONS

The perceived need for WDM research by the diversity of professional wildlife respondents to this questionnaire is of importance to agencies responsible for wildlife management and to those who work and conduct research in the WDM area. The responses should also be of interest to universities with wildlife programs and to those who conduct both basic and applied wildlife research. Agencies with management responsibility for wildlife enhancement on private lands should plan for addressing the likelihood of increasing wildlife damage in the future. It will be critical to conduct research needed to help managers prevent or reduce wildlife damage to tolerable levels. Society often displays a complex mixture of attitudes and values on the tradeoffs about wildlife management and WDM. Clearly, there is a need to address research toward the human dimensions and perceptions of the public about WDM. Research needs identified by this questionnaire should be examined carefully and consideration given to address these needs. Also, WDM researchers and educators should consider which, if any of these findings need to be incorporated into their justifications for research funding and education programs.

SUMMARY

The research needs identified were obtained from professionals across the contiguous U.S. who have both professional expertise and years of experience in the fields of WDM research, technical assistance, operational programs, education, wildlife management, private businesses, administration, policy, diseases, and with nongovernmental organizations. These identified research needs should not be considered as all inclusive, nor significantly comprehensive. They should, however, be reasonably representative of WDM research needs considered important by professionals in the field who work with different clientele and attempt to acknowledge the needs of people and wildlife.

Wildlife and natural resource managers of today and in the future will continue to be challenged by people who do not support management and use of wildlife for human benefit. Many of them disagree with taking of wildlife, particularly those species that some have classified as "charismatic megafauna", for any purpose. As wildlife professionals, we must be responsive to private landowners' and managers' needs to both manage and improve wildlife habitats while effectively addressing wildlife damage problems in rural and urban areas. To accomplish these lofty and worthwhile objectives we will need more interdisciplinary research to address and resolve WDM problems, ensure wildlife abundance and sustainability, and provide the desired public benefits wildlife professionals

are charged to sustain. It is a tremendous challenge, but I am confident we will succeed.

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