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## **Teaching Vertebrate Pest Control: A Challenge to Wildlife Professionals**

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Vertebrate pest control deals with wild animals that create health hazards, damage resources, or become a general nuisance. Some people prefer the terms "wildlife damage control" or "animal damage control" because they focus on controlling damage rather than controlling animals. This is an important principle. Vertebrate animals that cause damage often have many positive values. In dealing with these situations our objective should always be to reduce or prevent damage; this does not necessarily require the killing of animals. I use the term "vertebrate pest control" because I believe it is less ambiguous than "damage control." When I call an animal a "pest," I do so realizing this is a subjective term, and another person may have a different opinion.

### **A Neglected Area**

The ecology and control of vertebrate pests remains one of the most neglected fields within the academic discipline of wildlife biology, despite a growing public interest in recent years. The number of teachers and researchers who have expertise or interest in vertebrate control is relatively small. A recent survey of more than 450 university and college wildlife faculty members in the United States and Canada found only 41 with an emphasis in this area versus 114 who indicated expertise in endangered species (Blaskiewicz and Kenny 1978). This is not to say there is too much emphasis in endangered species; rather, vertebrate pest control is far under-represented in wildlife curricula, given the need and significance of the problem to agriculture, wildlife management, public health, urban areas, and natural resources conservation.

Students in wildlife biology, agriculture, and related areas are expressing greater interest in vertebrate pest problems and are seeking training in this field (Howard 1974). This is particularly the case in land-grant universities. Some schools offer a major or an emphasis in "pest management" but completely neglect vertebrate animals. There are relatively few undergraduate courses in vertebrate pest control, although more are taught today than 15 years ago. Although various universities have one or more vertebrate pest control courses, few offer undergraduate or graduate training with emphasis in this area. Those that do include the University of California at Davis, Bowling Green State University in Ohio, and Colorado State University.

Vertebrate pest control has been neglected for a number of reasons, including:

1. The view that control of vertebrate pests and pest damage does not require any particular training. Actually, vertebrate control is applied ecology and frequently deals with fundamental, yet challenging, aspects of population regulation and animal behavior (Howard 1962). At times, vertebrate control activities necessarily involve reducing pest populations to more manageable levels. But

both the public and many wildlife professionals have done a disservice to this field by equating it with the indiscriminate killing of wildlife.

2. The low job demand for persons trained in this area. In the past, government (city, county, state, and federal) has dominated operational work in much of this field. Government tends to hire beginning-level biologists who receive on-the-job training to become vertebrate pest specialists. Because of government domination in field rodent and predator control, for example, private enterprise has never gained a large foothold. Private pest control companies conduct rodent control, and to a lesser degree, bird control in and around structures. A major part of their business, however, is insect control, so they often hire entomologists and train them to do vertebrate control. The same situation is true for the public health field, where most sanitarians employed are trained in vector control, thus favoring the entomology student.
3. Lack of recognition by administrators and others who make curriculum decisions of the need to teach vertebrate pest control. Wildlife faculty generally have shown little interest in vertebrate control. Zoologists have often felt that involvement with such applied research problems was detrimental to their careers (Howard 1962). By default, entomologists and others not trained in wildlife biology often have been forced to deal with vertebrate pest control problems in addition to their own areas of specialization (Stone and Hood 1979).
4. Reluctance by college advisors to encourage students to enter vertebrate pest control (Eadie et al. 1961). Possibly this is because advisors themselves have not felt competent or comfortable with the subject matter. Wildlife faculty generally are accustomed to management for production of game and desirable nongame animals, rather than control of vertebrate pests or pest damage (Swanson 1970). Students may feel this subject area carries a stigma because it sometimes involves working with species that are not well-liked (e.g., Norway rats), or because the field itself has been held in poor esteem by "environmentalists" and others. This is unfortunate; every wildlife manager, sanitarian, entomologist, and agricultural pest control specialist should have at least one good course in vertebrate pest control.
5. Difficulty in obtaining research funds, which often complement teaching efforts and faculty development, for vertebrate pest studies. At the federal level, vertebrate pest responsibilities lie in the U.S. Fish and Wildlife Service of the Department of the Interior (USDI) rather than in the Department of Agriculture, which supports a good deal of research in colleges of agriculture. Although the Fish and Wildlife Service has done excellent animal damage control research, funds have not been adequate to allow research except within a few high-priority areas. In general, wildlife damage control research within governmental agencies is "grossly inadequate, and for most practical purposes, nonexistent" (Miller 1982). Grants from USDI to support vertebrate pest research within universities and colleges have not been abundant. Even in instances where funds could be obtained, vertebrate pest research often has not been prestigious or even popular with faculty colleagues or administrators.

Perhaps as a result of this lack of emphasis, no adequate college textbook in vertebrate pest control is available. Instructors teaching such courses have had to prepare their own materials and to rely on proceedings of vertebrate pest symposia. In general, written information in this field is widely scattered among various

journals and other publications. Since control recommendations for particular species vary according to locality and situation, and because methods change as new techniques are developed, a text containing specific methodologies quickly would become outdated. However, a good textbook dealing with general principles of vertebrate control and giving specific damage situations as examples would be a significant contribution.

At the 1962 conference, Walter E. Howard described the need for improving the status of vertebrate pest control (Howard 1962). Some progress has been made since then. In the United States, four regularly-scheduled conferences now provide opportunities for professionals in vertebrate control to interact and share information. The Vertebrate Pest Conference in California, the Great Plains Wildlife Damage Control Workshop in the Midwest, the Bird Control Seminar in Ohio, and the Pine and Meadow Vole Symposium on the East Coast have started since 1960. All four conferences publish proceedings that are valuable sources of information on various aspects of vertebrate control. In addition, since 1976 the American Society for Testing and Materials has sponsored symposia on Vertebrate Pest Control and Management Materials, held in conjunction with the Vertebrate Pest Conference. Papers from these symposia are published as a series of special technical publications (ASTM 1977, 1979, 1981). The amount of published information in vertebrate control represents a significant improvement over that available 20 years ago. This information provides the foundation for a strong and growing educational program.

An organization for professionals working in vertebrate pest control, the National Animal Damage Control Association, was founded in 1979. Its goals include development of public awareness and understanding of the purposes, principles, and parameters of animal damage control, and the development of education and information programs designed to develop knowledge and stimulate public and private decision-making regarding animal damage control.

### **What Should Be Taught?**

Vertebrate pest problems are diverse. Seldom are two situations alike. Furthermore, pest control methods and techniques are subject to change. Thus, a course that emphasizes rigid rules or set solutions to particular problems will not be broadly useful. To be most valuable, a course should teach general principles and approaches and use specific problem situations as examples of how to apply these principles. I suggest that a course might include:

*Animal Populations.* Factors that regulate populations; density-dependent and density-independent controls; cyclic and irruptive populations; adaptations that favor success in man-modified or disturbed habitats.

*Economics of Damage.* Evaluation and quantification of damage; an overview of damage assessment work in the U.S.; cost of damage versus cost of control; the utility of economic threshold models and simulation modeling.

*Wildlife and Human Values.* Human perceptions of pest damage and nuisance pests; positive and negative values of "pests"; political and sociological aspects of vertebrate pest control; human relations skills necessary for successful pest control projects.

*Public Health.* Wildlife as reservoirs and vectors of disease; epidemiology of diseases that affect humans and wildlife; disease control methods.

*Identification of Problems.* Recognition of pest sign and typical damage; using evidence from the damage site to identify the species responsible.

*Control Methodology.* Categories of control methods: exclusion, repellents, population reduction, etc.; selection of the proper method(s) for a particular species and situation; increasing control selectivity through timing, control technique, and user expertise.

*Biological and Related Controls.* The limited potential of diseases and predators as control agents; habitat manipulation and its relative lack of species-selectivity; behavioral modification techniques; cultural and agricultural practices.

*Laws and Regulations.* Federal, state, and local statutes affecting wildlife; government regulatory agencies and authorities; pesticide use restrictions.

*Toxicology.* Commonly-used toxicants and repellents, their modes of action, common formulations and potential hazards; variation in intra- and inter-species response to a given compound; dose-response curves; LD<sub>50</sub> values; primary and secondary poisoning; chemosterilants.

*History of Vertebrate Control.* Historical needs for vertebrate control; the evolution of vertebrate control programs; present needs and responsibilities for vertebrate control.

Of necessity, course content must be adjusted for the level of understanding students have at the outset. Required prerequisite or concurrent courses in subjects related to the above areas (e.g. general biology, entomology, mammalogy, ornithology, population biology, or animal behavior) can enhance the course's effectiveness. A laboratory session can allow students to see damage first hand and to visit with persons experienced in various aspects of vertebrate control. It can also provide students the opportunity to conduct laboratory trials (e.g. feeding preference studies), to get hands-on experience with control tools and methods, or to use computers to simulate pest populations under various control regimes.

Classes may be able to observe or participate in actual control operations being conducted locally by governmental organizations or private pest control operators. Students interested in vertebrate pest control as a career may wish to serve an internship with a pest control operator. Whatever curricula or activities may be included, students should be made aware that there are no perfect solutions; any biological, political, or economic solution to a given vertebrate pest problem will have trade-offs that will be undesirable to some people (Howard 1980).

### **Who Should Teach It?**

Since vertebrate pest control is actually applied ecology (Howard 1966), it should be taught by a vertebrate ecologist interested in, and experienced with, the subject. Vertebrate control requires primarily an ecological, not chemical, approach (Eadie et al. 1961). Such an approach should not exclude the human dimensions—political, sociological, psychological, and economic—of vertebrate pest problems. Ideally, the instructor should have had practical field experience with animal damage problems and solutions and should be able to understand these problems from the point of view of the person who is sustaining the damage to his crop, livestock, home, or other resource. Since vertebrate pest problems involve a wide range of wildlife species, wildlife biologists should have the best background for teaching this subject. Although within wildlife biology vertebrate control is still regarded as the poor stepchild, it must, in my opinion, receive more emphasis.

Where an entire course in vertebrate pest control cannot be justified, it is possible to recognize this area within existing classes. Students may have interest in writing a term paper on such topics as predator control, use of steel traps, urban wildlife problems, or commensal rodents. Some of the more controversial topics may be good subjects for a student debate. Classes in wildlife management techniques can include techniques used in damage control. Independent study options provide additional opportunities for both students and faculty to increase their understanding of particular topics. Graduate students can find a wealth of areas related to vertebrate pests that would make suitable thesis topics.

### **Toward the Future**

As human population increases, increased demands are placed on the world's resources. Vertebrate pest problems can be expected to increase in intensity and diversity as human needs for agriculture and housing become more acute.

Another trend, concurrent with increasing urbanization, is a reduced understanding of wildlife and the principles of wildlife management. For example, 75 percent of the public in a recent survey did not know coyotes are not an endangered species (Kellert 1981). This lack of understanding can weaken wildlife management when public policy decisions are involved. The public is not likely to understand or support vertebrate pest control programs if they do not recognize that vertebrate damage affects them. The 97.3 percent of the U.S. citizens who do not live on farms have no apparent reason to be concerned about coyote predation on sheep and calves, rat and mouse damage to insulated farm buildings, or startling consumption of livestock feed. They have no recognized monetary investment in that crop, no labor, no pride, no interest—their ox is not being gored. Many adults and children in the U.S. do not know or care where food and fiber come from as long as they are attractively packaged and affordable (Miller 1982).

Few people realize the economic costs of vertebrate damage. Documentation of losses to agriculture and other resources is grossly inadequate. What documentation exists is not widely used. There is little doubt that these losses are substantial. For example, a conservative estimate of vertebrate pest damage to agriculture in California is \$100-million annually. The use of control measures prevents an estimated additional annual loss of about \$500-million (Howard 1979).

To have progressive, safe, effective, and well-supported programs in vertebrate pest control (and in wildlife management, in general) we need better education in this area. A current bumper sticker reads "Education Expensive? Try Ignorance." If we do not increase our understanding of vertebrate pest problems through all available means, we will find ourselves repeating past mistakes, such as using bounty systems for predator control. We, as professionals, must take advantage of this opportunity by training students and educating the public. We must keep open minds, realizing that the term "pest" is a subjective definition; there are no "good" or "bad" animals, but each person's judgment of a species' value depends upon his relationship with it (Howard 1974).

Persons trained in vertebrate pest control, as well as in the more traditional aspects of wildlife biology, will have a broad, realistic understanding of applied ecology. They also will be in demand for jobs requiring this expertise. Continued improvement in the status of vertebrate pest control will benefit the entire field of wildlife and natural resources management.

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