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A SURVEY COMPARISON OF PEST CONTROL AND NUISANCE WILDLIFE CONTROL OPERATORS IN KENTUCKY

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A variety of factors including increased urbanization decreased funding for governmental animal damage programs, and increases in some urban wildlife populations have resulted in a greater demand for urban nuisance wildlife control. Historically, this demand was met by Cooperative Extension Service (San Julian 1987), state fish and wildlife agency, or federal wildlife damage control employees (Bollengier 1981) These agencies provided educational materials, consultations, an-or physically removed animals. Recently, there is an increased demand for physical animal removal evidenced by increasing numbers of private Pest control operators (PCO), companies that do general pest or insect control work, specializing in the removal of urban nuisance wildlife (Braband and Clark 1992). These individuals or companies are referred to as nuisance wildlife control operators (NWCO). A third group of companies, nuisance wildlife and pest control companies (NWPCO) do not specialize in nuisance wildlife control but will respond to customer complaints that involve at least one wildlife species excluding domestic cats (*Felis domesticus*), house mice (*Mus musculus*) or rats (*Rattus* spp.).

Previous animal damage survey research focused on the magnitude and distribution of wildlife damage, stakeholders' tolerance levels, and management preferences for solving human wildlife conflicts (Pomerantz et al. 1986). Much of this research has been directed towards rural landowner attitudes concerning deer (*Odocoileus* spp.), goose (*Branta* spp.), beaver for (*Castor canadensis*), black bear (*Ursus americanus*) or coyote (*Canis latrans*) damage (reviewed by Craven et al. 1992). Little detailed information exists about the urban nuisance wildlife control industry. One recent study (Associated Market Research 1991) examined the extent of PCO involvement in nuisance wildlife control but did not obtain detailed information about specific attributes of the NWCO business. These results may be unreliable because of a low (18%) response rate. My objectives were to determine 1) the status of the nuisance wildlife control industry in Kentucky, 2) the technical training of NWCO, and 3) the techniques used by NWCO LA prevent, control, or manage urban nuisance wildlife.

Thomas Grider, Department of Rural Sociology, University of Kentucky assisted with survey design. Michael Lacki provided statistical advice and reviewed an earlier draft of this manuscript. This research was funded by the Kentucky Agricultural Experiment Station.

METHODS

An 8 page, 28 question telephone survey was designed to assess the status of urban nuisance wildlife control. The questionnaires were designed to provide information on: 1) the general nature of the pest control industry in Kentucky, 2) level of education and specific wildlife related training recommended by NWCO for certification or licensing, and 3) the views and experiences of NWCO on controlling nuisance wildlife.

Names and telephone numbers of private PCO companies in Kentucky were obtained by searching the yellow pages of all telephone directories in the commonwealth of Kentucky. Additional companies were identified through 1) the Kentucky apartment of Fish and Wildlife Resources nuisance wildlife control permit holder listing, 2) referrals from PCO, and 3) personal knowledge of NWCO companies operating in the state. The entire population of pest control companies (N = 191) were contacted for this study. Once this list was obtained, branch offices were eliminated because questionnaires were answered by the main office. Prior to calling pest control companies, 1 received training in interview questioning skills from the University of Kentucky School of Survey Research to maintain consistency in questioning individuals interviewed for this study.

The questionnaire was pretested on 5% (N= 10) of the sample population during late April 1992 to ensure clarity and nonbias of questions and to maintain objective questions. At least 20 attempts were made to contact the owner or manager of a company. PCO were telephoned between May and September 1992.

Table 1. Primary control methods used by nuisance wildlife control operators (NWCO, n=23) and nuisance pest control operators (NWPCO, n=77) in Kentucky.

	METHOD OF CONTROL (Percent of companies using a particular control method)													
	% of Companies[a]		Live-trap Release		Exclusion		Repellent		Poison		Lethal		Other	
Animal	NWCO	NWPCO	NWCO	NWPCO	NWCO	NWPCO	NWCO	NWPCO	NWCO	NWPCO	NWCO	NWPCO	NWCO	NWPCO
Bats	43.4	61.0	15.4	0	53.8	67.2	7.7[b]	9.8[b]	7.7	16.4[b]	0	0	15.4	6.6
Snakes	65.2	50.6	8.7	0	17.4	7.8	13.0	27.5	0	7.8[b]	0	0	60.9	56.9
Birds	78.3	77.9	0	0	37.0	37.9	25.9	36.8	3.8	25.3	0	0	33.3	0
Mole	47.8	41.6	0	0	0	0	0	0	23.1[b]	78.4[b]	61.5	16.2	15.4	5.4
Tree Squirrel	78.3	45.5	60.0	39.5	16.0	53.5	4.0[b]	4.7[b]	3.6[b]	2.3[b]	8.0	0	4.0	0
Chipmunk	34.8	16.9	58.3	46.7	8.3	20.0	0	6.7[b]	16.7	13.3	8.3	13.3	8.3	0
Woodchuck	91.3	32.5	60.0	69.2	0	7.7	0	0	0	23.1[b]	20.0	0	70.0	0
Muskrat	52.2	2.6	42.9	0	0	0	0	0	0	33.3[b]	42.9	33.3	14.2	33.4
Skunk	95.7	29.9	67.9	50.0	7.1	26.9	0	7.7[b]	3.6[b]	7.7[b]	7.1	0	14.3	7.7
Small Carnivore	91.3	26.0	60.0	76.2	3.3	19.0	0	4.8	6.7[b]	0[b]	6.7	0	23.3	0
Deer	13.0	0	66.7	—	0	—	33.3	—	0	—	0	—	3.0	—

[a]The percent of companies handling customer complaints for a particular listed animal.
[b]Indicates an illegal control method for the species listed

A student's test using unequal sample size and variance was used to determine differences in the amount of time NWCO and PCO were in business. Chi-square goodness of fit tests and z test for proportion were used to determine differences in education and training between groups (Steel and Torrie 1980).

RESULTS

The entire population of pest control companies 191) was contacted for the survey. Usable questionnaires were obtained from 172 (90.1% response rate) of 191 companies contacted. Response rates of 90% or more minimize the effects of nonresponse bias (Houseman 1953); therefore, nonresponse bias was not considered a problem for this survey.

Three distinct types of PCOs, based upon what type of pest control work the company provided, were identified from the respondents. The largest group was classified as general PCO doing some nuisance wildlife control (NWPCO) (N = 77, 44.7%). NWPCO do not specialize in nuisance wildlife control but respond to customer complaints that involved at least one wildlife species (Table 1). NWPCO are most likely to control bats (Chiroptera), snakes (Serpentes), or birds (Aves) (Table 1). The other groups consisted of general pest or insect control companies (N = 72, 41.9%) that did no nuisance wildlife control (PCO) and NWCO (N = 23, 13.4%). NWCO are most likely to control snake, bird, squirrel (*Sciurus* spp.), woodchuck (*Marmota monax*), skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), opossum (*Didelphis virginianus*), and other small carnivore problems. NWCO reported raccoon (28.5%) and tree squirrel (25%) problems generate most of their calls which is consistent with findings from other studies (Craven 1992, Curtis et al. 1993). Other species that generate NWCO business include skunks (14.3%), opossum (10.7%), beaver (7.1%), birds (7.1%), and other mammals (7.1%).

The pest control industry in Kentucky employs over 1400 individuals (mean = 8.1 employees per business). Three and one-half percent of these individuals work as NWCO. NWCO have been in business fewer ($t = 5.14$, 177 df, $P \leq 0.01$) years (3.18 ± 2.5) than PCO (19.5 ± 14.8). Four percent of NWCO contacted in this study were located in large metropolitan areas, 39% in cities with populations from 500,000 to 1 million, 22% in cities with populations from 100,000 to 500,000 and 35% in 7 different communities with more than 10,000 people and less than 60,000 people. Forty three percent of the NWCO consider the business as a full-time endeavor; whereas, 56.5% of the NWCO only work in nuisance wildlife control part-time. Six (46%) of the part-time NWCO are located in small communities; whereas, five (38%) are located in medium sized cities.

The highest level of education attained by respondents did not differ among groups ($X^2 = 10.83$, 6 df, $P > 0.05$). Most employees (overall mean 69.8%) were high school graduates (Fig. 1). Although only a minority of respondents had specialized in service training or university level courses in wildlife management (provided by a university, cooperative extension service, fish and wildlife agency, or company), a greater proportion of NWCO ($z = 5.80$, $P \leq 0.05$) than NWPCO had this type of education (Fig. 2). There were no differences in the proportions of NWCO or NWPCO with specialized inservice training or university level courses in wildlife identification ($z = 1.21$, $P > 0.05$), trapper education ($z = 2.03$, $P > 0.05$), or animal damage management ($z = 0.32$, $P > 0.05$) (Fig. 2). As expected, more ($z = 5.80$, $P \leq 0.05$) NWPCO were certified to use restricted use chemicals and received training in pesticide usage ($z = 5.61$, $P \leq 0.05$) and entomology ($z = 4.07$, $P \leq 0.05$) compared to NWCO (Fig. 2). Most respondents obtained information on controlling nuisance wildlife from the Kentucky Department of Fish and Wildlife Resources (KOFWR) or by reading magazines (Fig. 3). Many respondents (39.3%) have not had any inservice training or university level courses on bat identification. Other respondents indicated they received training in bat identification from a university (32.1%), company (17.9%), or by reading a book (10.7%).

The majority of PCO (71.0%), NWPCO (76.4%), and NWCO (78.3%) refer customers to other agencies or companies for problems they cannot handle. NWCO refer more customers to KDFWR ($X^2 = 33.45$, 4 df, $P \leq 0.01$) than NWPCO and PCO (Fig. 4). All groups provide free advice to customers on solving nuisance wildlife problems. Significantly more (95.7%) NWCO ($z = 4.82$, $P \leq 0.05$) provide advice to customers compared to NWPCO (61.8%) or PCO (42.9%).

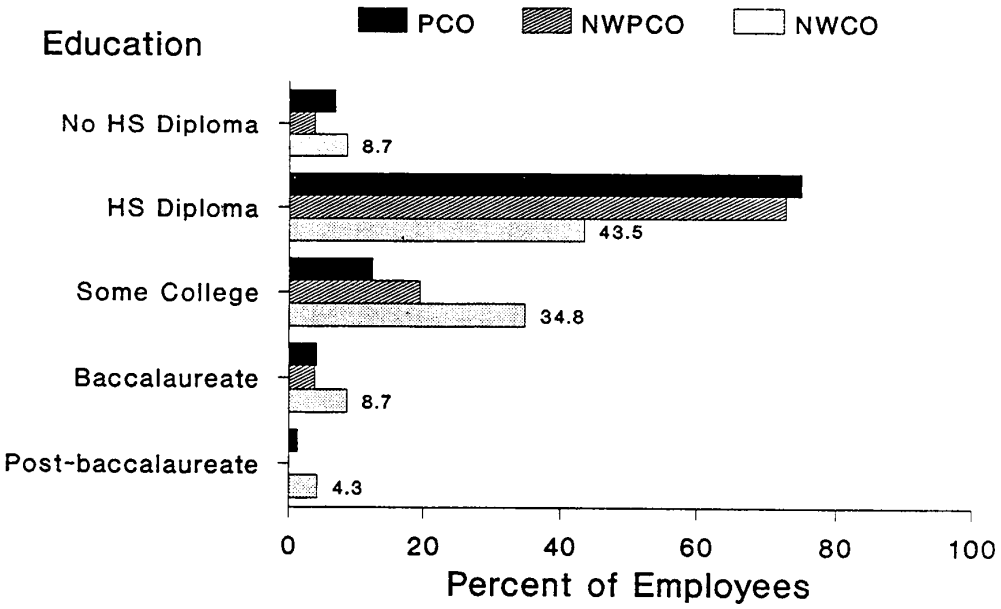

Fig. 1. Highest average level of education obtained by Kentucky pest control operators (PCO) doing no nuisance wildlife control (N = 72), pest control operators doing some nuisance wildlife control (NWPCO, N = 77), and pest control operators specializing as nuisance wildlife control operators (NWCO, N = 23) responding to a telephone survey during the summer 1992.

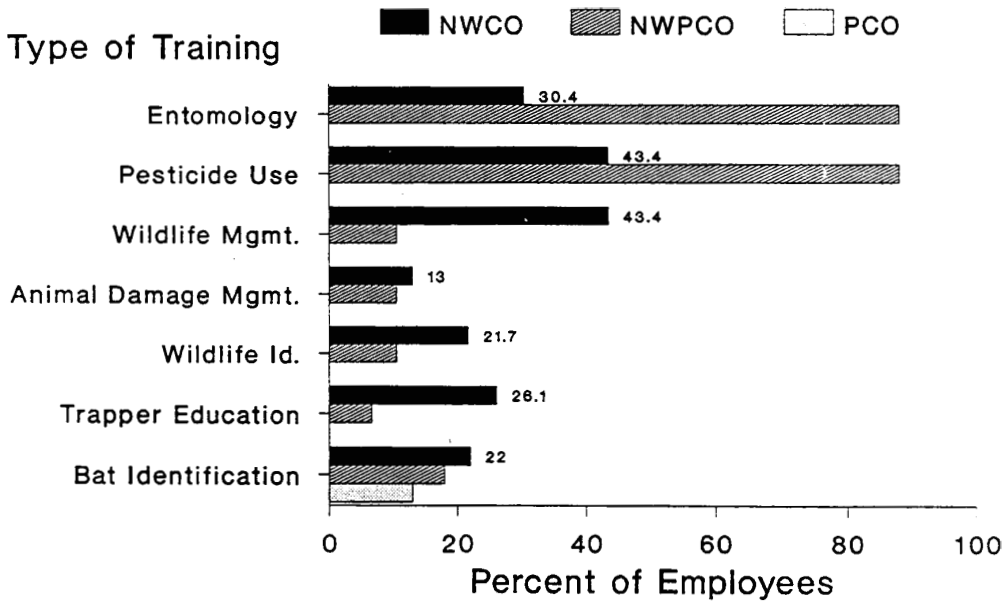

Fig 2. Wildlife biology, entomology, pest control inservice training or attendance at a university level course (provided by cooperative extension service, state wildlife agency, or private company) and bat identification skills acquired by Kentucky pest control operators (PCO, N = 72) which do no nuisance wildlife control work; those companies doing some nuisance wildlife control (NWPCO, N = 77) and pest control operators specializing as nuisance wildlife control operators (NWCO, N = 23) that responded to a telephone survey during the summer 1992.

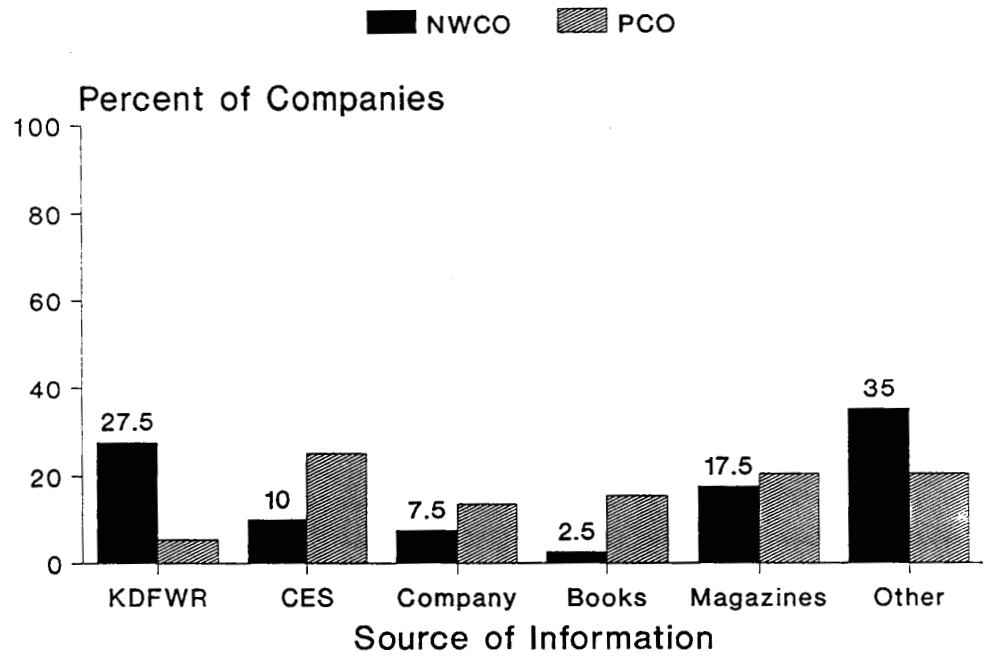

Fig. 3. Primary sources or suppliers of nuisance wildlife control information (Kentucky Department of Fish and Wildlife Resources (KDFWR), Cooperative Extension Service (CES), Pest Control Company, Books, Magazines, and Other Sources which includes USDA-APHIS-ADC, professional journals, Kentucky Department of Agriculture, Television, Radio and Zoos) to nuisance wildlife control operators (NWCO, N = 23) and nuisance wildlife and pest control operators (NWPCO, N = 77) in Kentucky, 1992.

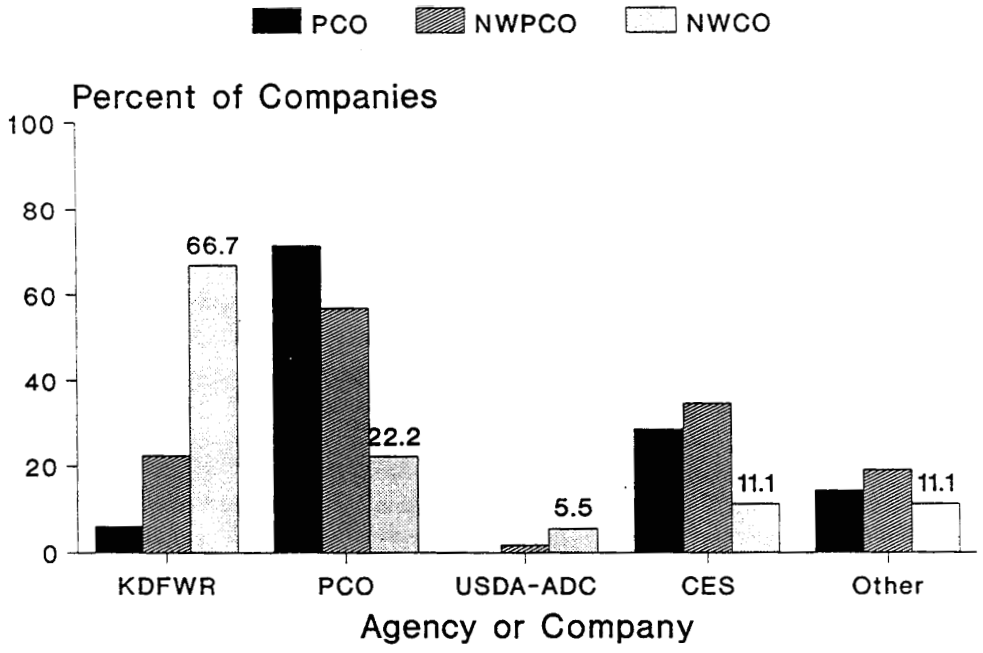

Fig. 4. Referrals of problems, that individual pest control operators could not solve, to the Kentucky Department of Fish and Wildlife Resources (KDFWR), Pest Control Companies (PCO), USDA-APHIS-ADC (USDA-ADC), the Cooperative Extension Service (CES), and other companies or agencies which include Humane Societies, Zoos, and Beekeepers by PCO doing no nuisance wildlife work (N = 73), PCO doing some nuisance wildlife control work (NWPCO, N = 77), and PCO specializing in nuisance wildlife control work (NWCO, N = 23).

Overall, NWCO reported their primary method of controlling nuisance wildlife was the use of live-trapping and releasing off-site (91.3%), followed by exclusion (8.7%). This is different from NPCO who prefer to use exclusion (42.5%), live-trapping and release off-site (37%), poisons (16.5%), and repellents (4.1%) as their primary control methods. Control methods used for specific animals or animal groups varied by species (Table 1).

There was no difference in attitudes about NWCO being certified or licensed by a government agency and specialized training to obtain that license. The majority of NWCO (86%) and NWPCO (87%) felt NWCO should be certified and the following specialized training should be required for certification: inservice training from the Cooperative Extension Service (NWPCO = 97%, NWCO = 87%), a trapper education course (NWPCO = 85%, NWCO = 87%), a course on the identification of endangered and threatened wildlife species (NWPCO = 84%, NWCO = 87%), and continuing education courses to maintain certification (NWPCO = 91%, NWCO = 83%). Fewer (26%) NWCO ($z = 5.39$ $P \leq 0.05$) compared to NWPCO (81%) felt testing was necessary to obtain certification. NWCO and NWPCO approval of lethal control varied by animal species or group (Fig. 5).

DISCUSSION

The results of this study show nuisance wildlife control is an emerging pest control business in urban areas throughout Kentucky which is consistent with research findings from New York (Curtis et al. 1995) and Michigan (Braband and Clark 1992). NWCO have been in business for a shorter period of time when compared to general pest control companies. This information is consistent with findings by Curtis et al. (1995) and indicates NWCO are new business enterprises filling a need that may have been supplied by government agencies in the past. PCO also perceive nuisance wildlife control as a growing field (Associated Market Research 1991). Further evidence of a growing industry is the formation of the National Urban Wildlife Management Association in 1992.

While the largest concentration of NWCO are located in urban or metropolitan areas, NWCO can also be found in smaller communities. These individuals or companies may not be a full-time PCO or NWCO and the data would indicate a minimum population of 10,000 may be necessary to support at least one NWCO. Curtis et al. (1995) found a similar situation in New York and hypothesized full-time commercial NWCO are associated with metropolitan areas and part-time or hobby operators, in concert with rural landowners solving problems on their own, satisfy the demand in urban areas.

As the industry expands, technical knowledge and education will need to be required by these individuals or companies to obtain or increase their professionalism. Thus, while most NWCO contacted in this study do not have extensive inservice training in wildlife management, trapper education or animal damage management, they support NWCO being certified concomitant with necessary educational requirements. Clark (1992) found similar results. He observed 73% of NWCO do not have to pass a test to obtain a permit, yet 76% support testing to obtain a permit and 71% support certification for NWCO. These results suggest NWCO are eager for training and desire some industry self-regulation measures.

The discrepancy between NWCO and NWPCO in taking an examination to be certified may be explained by legal requirements to obtain a pest control license in Kentucky. NWPCO must take an examination to receive their license and complete a required number of continuing education units to maintain that license. There are no testing or educational requirements to become a NWCO in Kentucky which is similar to other states in that the only legal requirement to control nuisance wildlife is a permit. This permit is available at minimal cost from the KOFWR. I found 70% of NWCO were in possession of the required permit when surveyed. However, none of the NWPCO had the necessary permit. This concurs with (Clark 1992) who found many NWCO trappers operate without a permit. By providing the necessary education, pest control companies would become aware of the legal requirements for controlling nuisance wildlife.

The idea of obtaining a license or certification to be a NWCO is important, as 90% of states require a permit to capture nuisance wildlife, but only a few states require testing as part of this process (Clark 1992). Craven (1992) found 56% of the states require persons performing wildlife relocations must have a permit or license; whereas, 28% of the states allow anyone to capture nuisance wildlife.

Furthermore, the need for education, training, and testing becomes apparent when I examined the techniques NWCO are using for managing nuisance wildlife problems. Overall, nuisance wildlife control operators reported their primary method of controlling nuisance wildlife was the use of live-trapping and releasing off-site. Other studies (Associated Market Research 1991, Braband and Clark 1992, Curtis et al. 1995) have shown live-trapping nuisance wildlife is the preferred management option. This emphasizes the need for educating NWCO and the general public given the possible detrimental effects of relocation and questionable success of translocation that has been documented for many wildlife species (Griffith et al. 1989). Most translocations in the past were conducted by professionally trained wildlife biologists. What are the chances for successful translocations by NWCO with little education in wildlife biology and management?

Of specific concern for state wildlife agencies is determining policies on relocating nuisance wildlife based on the following questions: 1) What is the survival rate of animals released into habitats where populations may already be at carrying capacity? 2) What type of habitat do these animals select when released? Do they return to the original capture

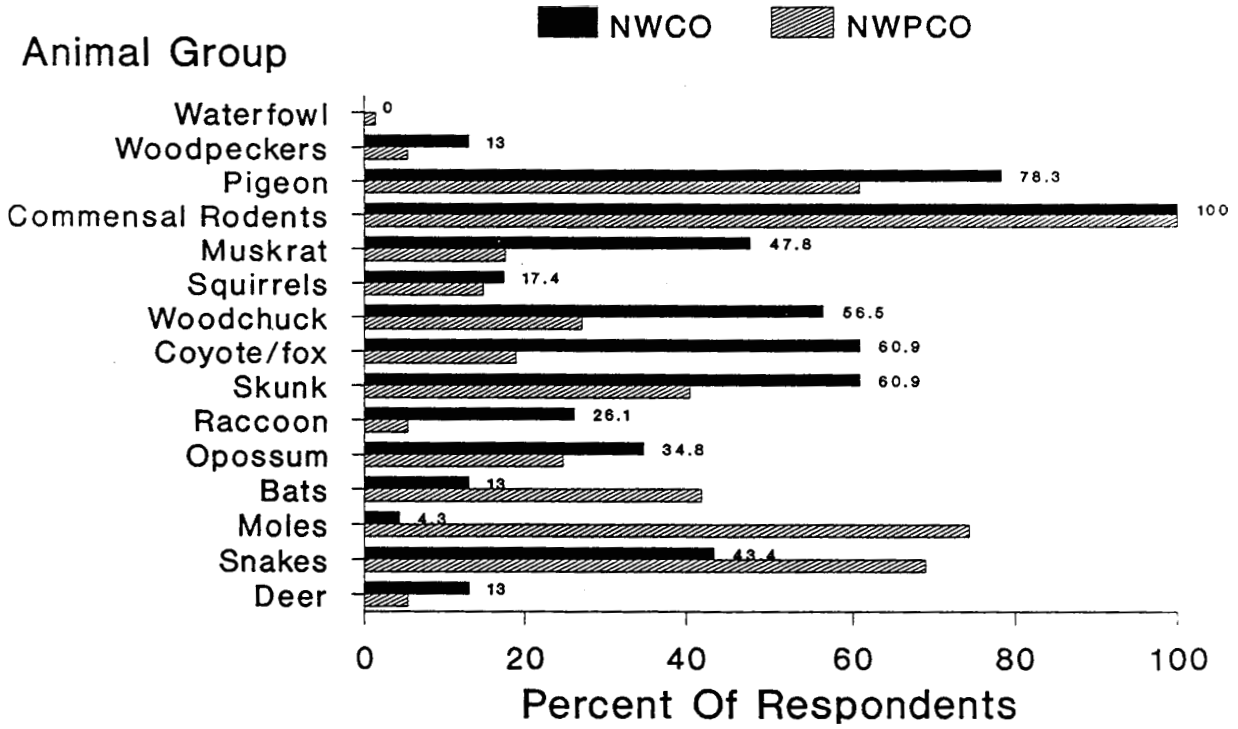

Fig. 5. Kentucky nuisance wildlife control operators (NWCO, N = 23) and nuisance wildlife and pest control operators (NWPCO, N = 77) attitudes on the use of lethal control for various species of wildlife.

site thereby continuing to be a nuisance? 3) What is the potential for widespread disease transmission by these animals?

Griffith et al. (1989) conducted three surveys to ascertain factors associated with successful wildlife translocations. They observed animals relocated into excellent habitat exhibited survival rates of 84% compared to those released into good (69%) or poor habitat (38%). They also found reintroduction of omnivores were least successful (38%) compared to carnivores (48%), and herbivores (77%). They reported a successful translocation program is dependent upon large founder populations, high habitat quality, and the ability of the wildlife to produce an increased number or size of clutches.

A recent study on relocating urban raccoons, one of the primary wildlife species controlled by nuisance wildlife control operators (Braband and Clark 1992, Craven 1992, this study) raised serious questions about the survival and movements of relocated urban raccoons (Rosatte and MacInnes 1989). They found 50% of relocated animals succumbed within 3 months of release. In addition, other study animals could not be located or were losing weight when they should be storing fat for the winter denning period. The authors concluded the mortality rate may have been 75% during the first year. Other studies have also observed exceptionally high mortality rates for raccoons released into unfamiliar territory (Frampton and Webb 1974, Wright 1978). The humaneness of relocating these animals must be questioned. Would it be more humane to euthanize the problem animals when captured, or subject them to disorientation, starvation, and mortality by a variety of factors?

In addition to high mortality rates, several studies (Frampton and Webb 1974, Wright 1978, Rosatte and MacInnes 1989, for example) have documented exceptional movements by relocated raccoons. The major concern with these large exploratory movements following relocation is the potential for infectious disease transmission. Threats to the safety and health of pets and humans represent a serious problem (Flyger et al. 1983, Jenkins and Winkler 1983, Almeida 1987); however, the transmission of infectious disease to resident wildlife is also a concern (Rosatte and MacInnes 1989). A major epizootic of raccoon rabies in the mid-Atlantic states was attributed to the translocation of raccoons from Florida to Virginia (Nettles et al. 1979, Smith et al. 1984, Jenkins and Winkler 1987). Rosatte and MacInnes (1989) reported an outbreak of skunk rabies in Ontario was attributed to translocated animals from Mississippi. The problem with relocating wildlife is an animal may be incubating an infectious disease without exhibiting clinical symptoms (MacInnes 1987). For these reasons, the state of New York will not allow raccoons to be released more than 10 miles from the original capture site to limit the potential spread of rabies (Craven 1992).

Another potential problem with relocating these animals is finding suitable habitats and areas in which to release

nuisance wildlife. Managers of public lands are concerned these areas may become a "dumping ground" for nuisance wildlife when demand for areas in which animals can be released is less than supply (Craven 1992). For these and other possible reasons, 12 states require euthanization for at least 1 species of wildlife and 9 states prohibit the relocation of at least 1 species of nuisance wildlife (Craven 1992).

Often, capturing and translocating an animal is treating a symptom and not the cause of the problem. Removing the animal without removing the attractant does not solve the problem. Greater efforts should be directed to eliminating the attractant, not the animal. Data from this study show habitat modification or exclusion were not preferred control options for most species except bats or birds. This is not surprising because 38% of nuisance wildlife control operators do not consider repair or exclusion as part of their job (Associated Market Research 1991). In addition, only 34.8% of the nuisance wildlife control operators and 55.4% of the nuisance wildlife and pest control operators contacted for this survey guaranteed their work.

An additional item pointing towards the need for education and training of NWCO becomes apparent when I examined the use of illegal control methods by NWCO and NWPCO. The use of illegal toxicants varied by group (Table 1). For example, toxicants were used to illegally control bats, squirrels, skunks, and small carnivores. No toxicants are registered in Kentucky for use on these species.

The preferred management methods NWCO or NWPCO use to control nuisance wildlife appear to be dictated by what technology is available for controlling various pests (Table 1), customer attitudes concerning lethal control and humane treatment of wildlife (Braband and Clark 1992), the level of education and training in wildlife management of NWCO and NWPCO, whether or not the work is guaranteed, and individual NWCO and NWPCO personal attitudes about the use of lethal control (this study).

As this industry develops, educational programs on wildlife management and animal damage control, presented by wildlife professionals not making a living as an NWCO, will be necessary in the future. use live-trapping and releasing is the preferred control method for many nuisance wildlife species, more research is needed to obtain information on the survival, movements, habitat selection, and disease transmission by relocated animals. This knowledge will assist the wildlife profession and state wildlife agencies in formulating public-policy decisions related to the nuisance wildlife control industry.

This paper describes the education and training level of nuisance wildlife control operators (NWCO), pest control operators conducting some nuisance wildlife control (NWPCO), and pest control operators not involved in nuisance wildlife control (PCO). NWCO are new wildlife enterprises and have been in business for 3.18 $\pm$ 2.5 years. The majority of respondents were high school graduates with little training in traditional wildlife management fields. Most respondents felt NWCO should be certified and the following special need training should be required for this certification: inservice training, a trapper education course, a course on the identification of endangered and threatened wildlife species and continuing education courses to maintain certification. A minority of NWCO felt college level education in wildlife management or testing was necessary to obtain certification. Most companies give customers advice on solving nuisance wildlife problems and refer customers to other agencies or companies for problems they can not handle. The primary method of controlling nuisance wildlife was the use of live-trapping and releasing off-site. Animal specific control methods and attitudes concerning lethal control are also discussed.

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