WILDLIFE DAMAGE CONTROL IN EASTERN CITIES AND SUBURBS

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INTRODUCTION

The topics covered in this paper are based mainly on experiences with people seeking help from the University of Maryland and the National Institute for Urban Wildlife. Although most residents of cities and suburbs enjoy and appreciate wildlife, we are frequently reminded that some do not, other people only tolerate and enjoy selected animal species, provided that these animals "behave" - they don't make noise, keep their distance, don't damage ornamentals, and are not messy. Some people are so intolerant of wildlife that they even complain about frog choruses from nearby ponds. Response to wildlife varies such that one resident may detest squirrels and seek to destroy all that visit his property, while his neighbor, on the other hand, enjoys having them in his yard and may even provide them with food and nesting shelters.

Urbanites confronted with wildlife problems often lack the knowledge or capability to solve these problems themselves, and may be repelled by the idea of killing animals. Rural residents, on the other hand, tend to view nuisance animals more pragmatically and often handle the matter themselves. They also tend to accept the killing of nuisance animals as a valid control method. People seeking help from the University of Maryland or the National Institute for Urban Wildlife are probably more urban-oriented than those contacting the Maryland Wildlife Administration. This may explain why the former two institutions view gray squirrels as the major urban nuisance species, while the latter agency sees raccoons as the major culprits. Other forms of nuisance wildlife include waterfowl, other squirrel species, rabbits, woodchucks, deer, beaver, bats, skunks, snakes, and moles. The extent of animal nuisance control requests in the East is considerable. For example, County Extension agents in Georgia alone handle approximately 60,000 vertebrate wildlife damage questions per year - most of which are received from urban communities (Jackson 1980).

KINDS OF ANIMAL DAMAGE OCCURRING IN CITIES AND SUBURBS OF THE NORTHEAST

Urban communities usually begin their existence with a dearth of wildlife because the original forest, grassland or marsh is removed almost always before construction of homes begins. As the occupants of these new homes become settled, they plant lawn grasses, flowers, trees and shrubs. New habitats develop, which, with the passage of time, may evolve into urban forests or savannas with large trees. Applications of water and fertilizers promote luxuriant plant growth. Buildings themselves may be built in a manner providing habitat for some animals (Geis 1974). Food becomes available from garbage cans, pet food placed out of doors, wild bird feeders, and garden plants. Dense evergreen thickets, refuse dumps, stone walls, ditches, and brush piles provide a variety of habitats. Thus, as urban communities mature, they provide increasingly better habitat for a variety of animals. Under such conditions, urban gray squirrel populations, for example, may exceed those of more remote or extensive forests (Flyger 1974). Densities of over 12 per acre have been recorded in a small Washington, D.C. park (Manski et al. 1981).

Such high densities of tree squirrels where people live are bound to create problems. The most numerous complaints that we hear are: squirrels (1) damage lawns and gardens by digging holes, digging up flower beds, eating flowers and plants; (2) damage ornamental trees by peeling bark, eating buds, and excessively trimming small branches; (3) eat fruits such as apples, berries, nuts, corn, etc.; (4) consume foods intended for birds - especially sunflower seeds; (5) enter homes where they are surprisingly destructive (gnawing furniture and window frames); (6) gnaw electrical wires and lead telephone cables. Power outages are a frequent occurrence in the Baltimore-Washington area.

Raccoons also have become abundant in wooded communities - especially where these neighborhoods are connected by wooded corridors along streams and rivers or adjacent to parks and urban forests. Such wooded corridors provide travel lanes permitting raccoons to disperse into smaller but scattered suitable habitats. Availability of food, especially from careless handling of garbage, is an added attraction. Communities not accessible to such corridors, forested areas, or rural lands may support fewer raccoons than those with connecting corridors. Heavily traveled streets seem to be partial barriers to raccoon dispersal. We are now investigating this aspect of raccoon ecology.

Gray squirrels are not so dependent on corridors, and therefore can be found in smaller wooded sectors even when surrounded by inner city buildings and busy streets. Gray squirrels are therefore even more

successful as inner city inhabitants than are raccoons, and can exist in street-side rows of trees or even a backyard with 2 or 3 mature trees. In some situations, as in city parks, squirrels may depend on handouts of food by the public, and their numbers could probably be lowered by reducing such feeding practices. Both squirrels and raccoons are subject to considerable traffic-caused mortality, and the disposal of their carcasses is a minor problem.

Raccoons have taken advantage of the food available in garbage cans, pet feeders, picnic areas, and around homes - thus permitting higher energy support for these animals in urban situations. Urban raccoon densities can be surprisingly high, for example, the next door neighbor of the senior author counted as many as 21 raccoons at one time in his yard in the summer of 1968. Such high densities are conducive to the spread of diseases among individuals, and during October 1968, the senior author found 14 dead or dying raccoons within 500 yards of his home. Canine distemper virus was isolated from one of the raccoons by the Wildlife Disease Laboratory at the Patuxent Wildlife Research Center. The raccoon densities built up again and in 1980, 12 raccoons were captured in 3 nights with 5 traps from the author's yard. Within the past year, rabies has spread into the Washington, D.C. and nearby Maryland and Virginia suburbs.

Excessive raccoon densities, coupled with this species' inquisitive nature, climbing ability and broad appetite lead to conflicts with suburbanites. Some of the complaints received are: raccoons (1) enter homes and buildings, frightening the occupants or damaging the interior; (2) strew the contents of garbage cans over people's yards; (3) alarm the public over the possibility of rabies.

Although raccoons are not as widespread in cities and suburbs as are squirrels, the advent of rabies has caused people to become more aware of the former species. Newspapers, magazines and television coverage have alarmed residents so much that people have become fearful of raccoons and to a lesser extent, other mammals. As a result, residents are less tolerant of the presence of raccoons than they had been before the recurrence of rabies, and now just the sight of a raccoon in someone's yard may be cause for a call either demanding help or asking for advice. One overzealous Maryland Health Department official went so far as to advise people to stay out of the woods. Policemen or others with the authority and capability of killing raccoons are now destroying most of the animals that they find.

OTHER COMMON URBAN WILDLIFE PROBLEMS

Deer and beaver have made spectacular comebacks during the past half century. In some states such as Maryland, Delaware, and New Jersey these animals were extirpated (or almost so). In Maryland, for example, 5 deer were shot in 1928 - the first open season of this century. Beaver did not exist at all. In 1982, the legal deer harvest for the state was over 16,000. Deer are now present in all 23 counties of the state as well as Baltimore City.

Deer utilize stream corridors and adjacent forests to invade deeply into urban areas where they sometimes enter yards and gardens to browse on ornamental trees and shrubs. They have a strong preference for azaleas and garden vegetables. They also dash out onto roads, colliding with automobiles to the extent that statewide, the annual number of reported deer-automobile collisions every year in Maryland exceeds 1,000.

Beaver reappeared in the early 1940's and became troublesome shortly after World War II in the coal region of Western Maryland. Those animals, which caused flooding of roads and mines, were trapped and released in other parts of the western counties. Gradually, as beaver populations increased and flooded more roads and mines, animals were moved farther eastward. Today beaver are found in all 23 counties of the state, as well as Baltimore City, and the Maryland Wildlife Administration has no more areas in which to dump nuisance animals. With such phenomenal increases both deer and beaver generate problems.

Beaver become nuisances by damming small streams and flooding adjacent lands - including roads and yards, or snipping stems from ornamental trees and shrubs. They also girdle and kill large trees along stream and river banks. An official of a Virginia suburb of Washington, D.C. (Fairfax County) stated several years ago that beaver were the greatest wildlife problem in his County. Today, because of the rabies pandemic, raccoons would top the list.

Bats and flying squirrels are abundant in urban situations - much more so than residents realize. Few people have ever seen flying squirrels but these nocturnal creatures are among the most numerous of our native mammals in the Northeast and Atlantic States. Flying squirrels may enter attics and scamper about at night - disturbing the residents below. In recent years, these small inoffensive mammals have been found to harbor epidemic typhus in the Northeast (Bozeman et al. 1975) and although this seems of little or no public health importance, this fact may be of concern to some people.

Bats are better known (than flying squirrels) because of their visibility when flying and their tendency to roost in or on buildings, but their numbers are also not appreciated. Bats, when found to be roosting behind window shutters, in attics, between walls of buildings, or among the roof beams of garages, may upset the residents who either fear rabies or consider these animals to be disgusting and repulsive. Bats are rarely harmful unless colonies in buildings are large enough for feces to accumulate.

Moles frequently are troublesome in suburban gardens and lawns - especially next to woodlands. Subsurface mole tunnels are considered unsightly by fastidious

gardeners. Moles also tunnel through flower beds, destroying roots and bulbs.

Voles, on occasion, may girdle small trees or consume garden plants. White-footed mice enter buildings where they may be confused with house mice. Rabbits damage young trees and shrubs and consume garden plants.

Blackbirds, starlings, house sparrows, pigeons, and sometimes other species incur the wrath of residents in urban communities by defacing buildings or trees with feces or nesting material, making noise, or by competing with more desirable birds, such as bluebirds, for food and shelter.

Other vertebrate species including reptiles and amphibians, may become nuisances in urban and suburban areas. Table 1 lists these animals, the types of problems they cause and their relative importance. In addition, the most commonly recommended methods for handling nuisance situations are given. However, problems frequently are more complicated than they may appear in this paper - especially in a simplified table, so we make no claim that the Table 1 is complete or always gives the best solution.

CONTROL OF SQUIRRELS AND RACCOONS

A homeowner with a wildlife problem has 4 alternatives. These are: (1) accept the damage; (2) remove the offending individual animals; (3) eliminate the animals' habitat so that the offending species can no longer exist in the area; (4) alter the situation so that the potential for damage is eliminated or reduced.

Many wildlife problems can be handled by the persons experiencing these problems if given satisfactory advice. For example, the following advice is given for dealing with tree squirrel problems. (1) Squirrels can be discouraged from digging up flower bulbs, by laying 1" or ½" wire mesh over the bulbs and covering this with ½" of soil. Plants will grow through the wire mesh but squirrels will be unable to dig through the wire to reach the bulbs. As for digging up lawns, we offer no easy solution except to remove the offending animals by trapping. Mothballs and squirrel repellents in outdoor situations are useless. (2) Damage to trees is hard to control except by removal of offending animals. If trees are scattered enough that squirrels cannot jump from one to another, they can be kept away by banding or girdling the tree trunks with a 3' wide thin sheet of aluminum flashing. The lower edge of the girdle should be 4' above the ground, to prevent squirrels from climbing the tree. (3) Squirrels can be prevented from eating bird seed by using squirrel-proof feeders. Several commercial types are available. Food also can be placed in inaccessible spots, but this may be difficult to achieve because squirrels are adept at finding ways of reaching food under many circumstances. Again, removal of offending individuals may be necessary. (4) Squirrels in attics are frequent problems. If the attic is a relatively small space, 4 or 5 lbs. of paradichlorobenzene can be spread over the floor of the attic. Large attic spaces are hard to fumigate sufficiently because, to be effective, so much of the offensive substance must be used, that fumes may descend into the living quarters below. In large attics, removal of offending animals may be the only solution. After squirrels have been removed by trapping or fumigation, the access holes must be closed with strong enough wire mesh to prevent reentry. Squirrels can gnaw through ordinary hardware cloth of the kind commonly used in doors and windows. Heavy ½" wire mesh is the most effective and practical material to use in sealing attics. This size screen also will keep out flying squirrels. (5) Telephone and electric power companies incur millions of dollars in damage to wires, transformers and lead cables every year from gnawing by squirrels. Why squirrels do this is a mystery, and we have no solutions to offer. Telephone companies are switching to other types of cables which are less attractive to squirrels.

People with raccoon problems are usually told to eliminate offending animals. This can be done by: (1) trapping and removing animals by the resident, (2) contacting a pest control operator (PCO), (3) contacting a fur trapper. The names, addresses and phone numbers of several interested trappers may be given. We suggest sources of traps, tell how and where to set traps, and what to do with the animals after they are caught. People with raccoon problems also may be told how to make garbage and pet foods unavailable to these animals. Often the presence of food is the attractant bringing nuisance animals to this spot in the beginning.

Our advice to homeowners is given over the phone and in sufficient detail to be as helpful as the situation demands. It is often necessary to give more detail than included above. We tell people experiencing problems when a solution may be difficult or almost impossible. We suggest that captured animals be killed, but urban dwellers rarely will do this. They prefer releasing animals elsewhere - often, passing their troubles on to someone else.

WHAT CAN BE DONE ABOUT URBAN WILDLIFE PROBLEMS

When an urban dweller encounters a wildlife problem, where can he turn for help? Does he call the police, county animal shelter, the Humane Society, the State Wildlife Department, the State University Extension Service, or a pest control operator (PCO)? Frequently, the caller must make several calls before reaching anyone who can help or give advice. There is no agency which always can be counted on for help. County animal shelters are mostly concerned with dogs, cats, raccoons, foxes, or large species - and only then if an animal has entered a home.

Individuals or urban organizations with wildlife problems often do not know where to turn for help or advice. They may contact someone professing to be a wildlife expert and follow his advice. Such advice may be misleading. For example, one Maryland

community wishing to reduce raccoon density, was told that trapping was the solution. The City Council of this well-wooded community assumed that 2 men with 50 traps could reduce their raccoon population by 70%. They had no idea of the number of raccoons that might be present nor of the difficulty in effectively trapping large numbers. The City Council was pressured to do something, and a trapping program could demonstrate to the public that something was being done - although not effectively. They were unaware that reducing raccoon abundance by trapping is usually impractical because of the prohibitive costs. Nor do habitat alterations seem to be practical. Making garbage and other foods unavailable can help reduce raccoons locally around homes. This, plus the trapping of offending individuals, is perhaps the most practical approach to raccoon control. Encouraging fur trappers might have practical benefits.

Humane societies are reluctant to suggest that animals be killed, yet at times this may be the only practical solution for reducing nuisance animals. These societies frequently recommend that captured animals be carried somewhere else and released - a counterproductive activity. Captured animals often are released in areas already saturated with that species. This practice can intensify intraspecific competition in release areas, and may help spread

Table 1. The nature and importance of common urban wildlife problems with suggested means of control by homeowners*.

Animal Category	Nature of Complaints	Usual Advice Offered by Telephone	Importance
Moles	Tunnels in lawns and gardens.	Kill with snap traps.	+
Bats	Roosting in or on houses.	Fumigate roosting space and seal entrance.	+ +
Raccoons	1. Raid garbage cans. 2. Enter chimneys and buildings. 3. Consume some bird feeds.	1. Live trap and remove. 2. Use raccoon-proof trash cans.	+ + + +
Skunks	Establish dens near homes or under porches.	Live trap and remove.	+
Tree Squirrels and Flying Squirrels	1. Enter attics. 2. Damage trees, other vegetation, and bulbs. 3. Eat bird seed (sunflower). 4. Gnaw lead telephone cables. 5. Dig holes in lawns.	1. Fumigate attic and close entrance. 2. Place wire mesh over flower bulbs or place metal sheath around tree trunks. 3. Use squirrel-proof bird feeders or use seeds not palatable to squirrels. 4. Live trap and remove.	+ + + +
Groundhogs	Burrow in gardens and eat garden and ornamental plants.	1. Trap and remove. 2. Fumigate burrow with car exhaust. 3. Flood animal out with water from garden hose and kill it as it emerges. 4. Dog.	+
Muskrats	Burrow into banks of streams and ponds, sometimes draining ponds.	1. Cover bank with wire mesh or large rocks (riprap). 2. Kill with appropriate traps.	+
Beavers	1. Flood land. 2. Damage and kill trees. 3. Eat ornamental shrubs.	1. Trap and remove. 2. Lower water level behind dam with drainage pipe.	+
Native Mice	1. Damage to gardens. 2. Enter buildings.	Kill with snap traps.	+
Rabbits	Damage garden plants.	1. Protect with rabbit-proof fence around valuable plants. 2. Live trap and remove.	+ +
White-tailed Deer	1. Damage garden plants. 2. Collisions with vehicles.	1. Use deer-proof fence. 2. Keep a dog.	+ + +
Waterfowl	1. Defecating on lawns and sidewalks. 2. Lower water quality of ponds.	1. Stop feeding waterfowl. 2. Erect low fence at water's edge.	+ + +
Pigeons	Roost and nest on buildings causing accumulation of feces.	1. Make building bird proof. 2. Live trap and remove. 3. Poison. 4. Destroy nests.	+ +
Starlings and Blackbirds	1. Roost and nest on or in buildings and trees. 2. Noise. 3. Filth accumulation.	1. Make buildings bird proof. 2. Thin out trees which provide night-time roosts, eliminate ledges. 3. Destroy nests. 4. Screen nest sites.	+ + +
House Sparrows	Nests in buildings and ivy-covered walls.	1. Destroy nests. 2. Screen nest sites, eliminate ledges. 3. Remove ivy.	+
Downy Woodpeckers	Drumming on buildings.	Remove or temporarily cover the drumming substrate with cloth, plastic, or wire mesh.	+
Snakes	1. Enter homes or garages. 2. Frighten people.	Reduce hiding places by filling in spaces of stone walls and foundations with mortar or cement.	+
Snapping Turtles	Eat fish, frogs, and ducklings in ponds.	Capture and remove.	+
Bullfrogs	Noise	Capture and remove.	+

* When trapping is recommended, detailed instructions are given for setting the traps.

diseases such as rabies among raccoons. Released animals may also return or cause problems elsewhere.

An example of the kind of advice given by such societies is illustrated by the following suggestions taken from a recent brochure intended for urban dwellers. (1) Rabbits can be discouraged by planting onions 1" apart as a garden border. (2) Deer may be repelled by hanging bundles of human hair tied in cheesecloth to the lower branches of fruit trees or from fence posts or by sprinkling human urine around the perimeter of an orchard or around the bases of trees. (3) Raccoons may be discouraged by planting a living fence of watermelon, pumpkin, cucumber or squash around the edges of corn rows or lighting the corn patch at night. (4) Squirrels can be repelled by tying bundles of dog hair in nylon stockings and hanging them from tomato stakes. Extra hair should be sprinkled around the base of the plants. (5) Moles, woodchucks and gophers can be discouraged by planting a living fence of daffodils or hyacinths. It might also help to drop a dead fish down the mole or gopher hole (Evergreen Wildlife Conservation Society 1982).

Wildlife departments are often reluctant or unable to help people with urban wildlife problems because these departments are supported mostly by hunters and trappers who demand that department funds be devoted to game species. The U.S. Fish and Wildlife Service, while cooperating in the preparation of animal control leaflets, is not staffed well enough to be of much direct assistance to handle problems with nuisance animals in cities. Assistance available from the U.S. Public Health Service is restricted mostly to health-related problems. PCO's can be helpful in some cases, but until recently they dealt mostly with insects or commensal rats and mice. These agents are not trained to handle wild animals, and have been hampered by a plethora of game laws, regulations and local ordinances.

Often by reaching the right person at a University or its Extension Service, sound advice can be had - but many University Extension Services have no wildlife specialists. Zoology departments often have no one knowledgeable about nuisance wildlife. Unless the University has a wildlife specialist, there may be no one there who can help.

Essentially, a designated agency responsible for giving advice on all urban wildlife problems is a rarity. Complaints are made to a variety of agencies with mixed satisfaction. The average urban resident does not know how to cope with a wildlife problem. He is cautious and apprehensive about confronting live mammals - even small ones, and does not know how to trap nuisance species. If he should capture a live animal in a trap, how would he dispose of it? Killing a trapped raccoon or squirrel, for example, is difficult and offensive to most people.

Game laws and regulations are intended for regulating the harvest of game species and protecting game from over-exploitation, or from killing and taking certain wildlife - including threatened or endangered species. To our knowledge, the reasonable control of urban vertebrates presently poses no threat to the existence of any species. The Maryland Wildlife Administration recognizes that wildlife sometimes creates problems in urban situations, and that controlling these animals poses no threat to the existence of those species elsewhere in the State. The Wildlife Administration has embarked on a program of training and licensing PCO's to control nuisance animals. Details of this program are given in another paper of this conference.

OTHER SUGGESTIONS AND CONSIDERATIONS

An important aspect of coping with nuisance wildlife in cities and suburbs is educating citizens. Wildlife has a great capacity for giving pleasure, and many of the complaints that we hear probably would not occur if the complainants had a greater appreciation of wildlife. On the other hand, control could often be simplified if people understood that sometimes the only way to control animal problems is by removing or killing of offending animals. Animals are killed quickly but if not done by humans, nature does it by means of diseases, parasites, intensive conflict, malnutrition, etc. Citizens should be taught that some urban habitats will produce an abundance of certain animals. For example, the parklike conditions of residential areas having huge oak trees are bound to have an abundance of squirrels.

High densities of raccoons permit infectious agents such as rabies virus or canine distemper to be maintained at least temporarily in local populations. The former disease has the potential for transmission to dogs and cats - and thus to humans - or directly from raccoons to humans. Rabies is a frightening disease, but how great is the danger to humans? Human cases of rabies are exceedingly rare in the United States - not because of the effective vaccine for humans, but because today people have little contact with wild animals. A substantial proportion of dogs, which could be a link in the transmissions of the disease, are immunized. In Maryland, only a handful of people have suffered unprovoked attacks by rabid animals, and these people were vaccinated and did not develop rabies (with one exception - a Maryland woman bitten by a rabid bat in 1976). Yet, many rabid raccoons, plus beaver, bats, woodchucks, and other species have been diagnosed as rabid by local laboratories in the greater Washington, D.C. area. The chance of being attacked by a rabid raccoon or other animals is astronomically small, and should it occur, an excellent vaccine is available. The situation is similar to that of sharkbite, frightening, but exceedingly rare, yet ocean bathing continues.

We should learn to live with the fact that raccoons are abundant and will remain so, even when they have a high prevalence of rabies. Meaningful reductions of raccoons does not seem practical. The wisest procedure at present is immunization of cats and dogs

and being careful about contacts with wild mammals. Understanding the situation will reduce wasting time and effort on ineffective pursuits.

Wildlife provides enjoyment and enriches human experience, and it seems unreasonable to curtail outdoor activities because of a slight danger or minor economic loss. Lightning, bees or snakes are greater dangers than is rabies. Overzealous public health officials, plus sensation-seeking news reporters do not give the public the information and insights needed to judge the risk of contacting rabies by walking in the woods or enjoying the out of doors.

SUMMARY AND CONCLUSIONS

There are no easy solutions for some urban animal damage and nuisance problems. Some control over the kinds of birds and other wildlife that occupy urban areas and cause damage, can be attained through habitat management. Thus, by eliminating ledges, exposed beams, holes, etc., in the design and construction of buildings, some degree of control is exerted, especially for starlings, pigeons, and house sparrows. Vegetation or habitat management is perhaps the most important means for control of animal populations, but, as observed above, it is not practical or feasible to remove large portions of vegetation or urban parks or forests to reduce raccoon and squirrel habitat. A coordinated animal damage control program involving several approaches is needed.

Although many leaflets and bulletins on animal damage control have been published, few deal specifically with control operations in urban areas. Some methods, like shooting, which may be employed in rural areas, cannot be used in cities.

Therefore, we believe that a systematic program of research and experimentation is needed followed by the preparation of various publications designed for use by homeowners, professional wildlife managers, extension personnel, and commercial pest control operators in urban areas. Several types of publications should be considered. One type would be a series of leaflets of 1 to a few pages, giving explicit instructions with diagrams or sketches showing how to cope with specific problems, and suggesting how to get additional help when needed. Another might be based on a survey of state fish and wildlife agencies as well as extension services in which the approaches used successfully in one state or city could be followed by another state or city. One result of such a survey might reveal what agency or organization is generally best equipped to handle certain types of problems.

The National Institute for Urban Wildlife (formerly the Urban Wildlife Research Center) in Columbia, Maryland, has proposed the development of a manual on urban animal damage control. This manual would include "how-to-control" leaflets in looseleaf form so they could be taken out and reproduced by states and cities as the need arose. The results of a national survey showing who-does-what in the various states would be included as well as some information on animal damage control as a management measure.

A questionnaire distributed to the 50 states by the International Association of Fish and Wildlife Agencies for this Institute, demonstrated a need for such information, and that many states would purchase copies if available. The Institute was represented at the meeting of the International Association of Fish and Wildlife Agencies' Animal Damage Control Policy Committee in Kansas city, in March, 1983. The question was asked: "What percentage of the total time your department spends on animal damage control problems, is spent on urban problems?" Some committee members stated that as much as 75% of their time was spent on urban animal damage problems.

The need for better ways of solving these problems is apparent. Let's do something about it!

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