

# CHAPTER 5

## OTHER VERTEBRATE PESTS

### LEARNING OBJECTIVES

After completely studying this chapter, you should:

- Be able to identify common vertebrate pests.
- Be able to discuss the habitats, habits, and life cycles of vertebrates that may be pests.
- Be able to describe public health concerns associated with vertebrate pests.
- Be able to describe situations in which vertebrates are considered pests.
- Know what precautions to take when working with vertebrate pests.

Vertebrates become pests when they damage crops, gardens, landscape plants, or lawns (e.g., **deer, rabbits, and moles**). They may also become pests when they wander into residential areas from nearby wild areas or parks and adapt to living near people—next to or sometimes inside buildings (e.g., **bats, snakes, skunks, raccoons, and opossums**). Vertebrates may also pose a public health hazard because they help spread certain diseases (e.g., rabies and Lyme disease).

Whatever the pests, sometimes they must be controlled. Because some are often game animals or are otherwise protected, many control actions will be non-lethal.

### BATS

Bats are unique in the animal kingdom—they are the only true flying mammals. A thin membrane of skin stretches from the long, modified front legs to the back legs and then to the tail. The greatly elongated bones in the bat's "fingers" support the wings.

Bats in the United States are almost always beneficial. Many bats feed on insects and can consume up to half their body weight in insects in one feeding. Occasionally, however, they become a nuisance inside buildings or pose a public health problem.

The bats that most often become a problem around people are those that live in colonies or groups, such as little brown bats and big brown bats. These species sometimes hibernate or roost inside buildings.

Roosting and hibernating sites may occur in building attics, wall and ceiling voids, belfries, chimney voids, unused furnaces, and the like. The bats' droppings and urine can cause a foul odor and stains in walls and ceilings. Their squeaking and scrambling noises can be intolerable to residents of the building.



Figure 5.1. Little brown bat, *Myotis lucifugus*

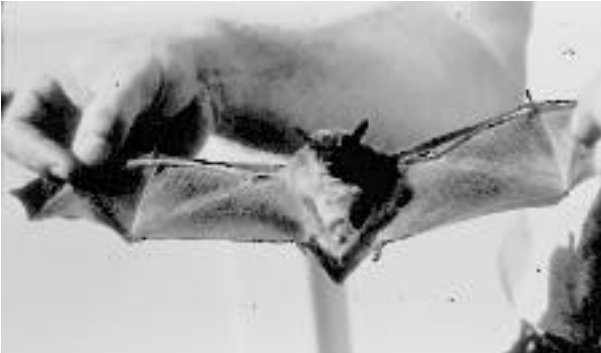


Figure 5.2. Big brown bat, *Eptesicus fuscus*

## Bats and Disease

Bats are associated with a few diseases that affect people. Rabies and histoplasmosis are the most serious. Rabies is a dangerous, fatal disease. However, the bat's role in transmission has been greatly exaggerated. Though bats are confirmed carriers of the disease, only a few human fatalities have been attributed to bat bites. Nevertheless, care must be exercised when handling bats and bat bites should be considered potential rabies exposure.

- Bats may try to bite when handled and should be picked up with heavy gloves or forceps.
- If a bat has bitten someone, it should be captured without crushing its head. Refrigerate it (don't freeze it). Take it to the local health department for testing.

The incidence of histoplasmosis (discussed in detail in the chapter on birds) being transmitted from bat droppings to humans is not thought to be high.

- When working in a bat roosting site with lots of accumulated droppings, wear a respirator and protective clothing, and follow the safety procedures outlined in the chapter on birds.

## Habits of Bats

During warm weather, bats feed on flying insects in late afternoon, evening, and early morning. They are not normally active in bright daylight. If you see a bat at this time, it has either been disturbed from its daytime resting place or may be sick. When not in flight, bats rest in dark hiding and roosting sites (e.g., caves, buildings, and hollow trees). Bats can enter these places of refuge through holes as small as 3/8 inch in diameter.

Bats capture flying insects by echolocation—they emit high-frequency sounds inaudible to humans and similar to sonar. They also make audible squeaking sounds to communicate with other bats.

In much of the country, bats migrate or hibernate when the weather turns cold. Sometimes they hibernate in hanging clusters inside buildings. Depending on the species and the geographic location, they breed from late spring to midsummer. Young bats grow rapidly and can fly three to seven weeks after birth.

## Inspection

Look for two things:

- Entry and exit points of the bats.
- The location of the roost.

Entry and exit points. A building in poor repair will have seemingly unlimited entry points.

- Look for loose flashing, vents, shingles, or siding that bats can squeeze through or under.
- Look for damage and openings under eaves and soffits, at cornices, louvers, and doors; by chimneys and windows; and anywhere pipes or wiring enter.
- Notice droppings under openings, smudges around holes, and odors.
- Bats can be observed at twilight from spring through autumn as they leave the building to feed. The best time to observe the bats and pinpoint major exit and entry points is usually from just before to an hour after sunset.
- Station one or more observers on each side of the building, looking up toward the roof.
- Listen for squeaking at the exits just prior to flight.
- If the night is chilly or rainy, the bats may not come out.

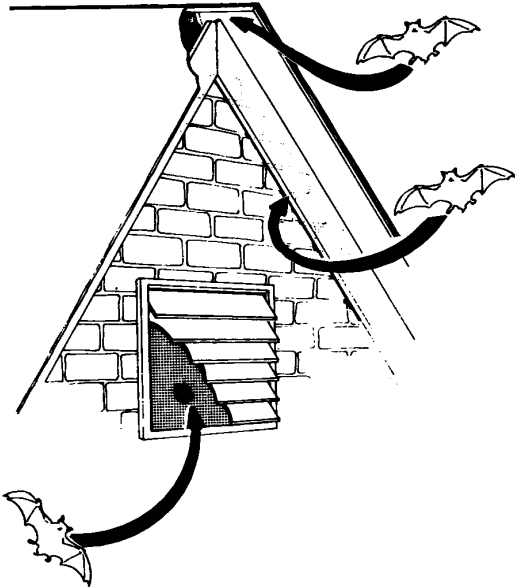


Figure 5.3. Common entry points for bats in a building

### Location of roost

- Look in attics and unused rooms during daylight.
- Check inside louver vents.
- Bang on the walls and listen for squeaks and scratches as roosting bats are disturbed.
- Check behind shutters.
- Look for bat droppings. They will be found below roosting bats. Their droppings look like mouse droppings. However, bat droppings contain wings, legs, and other body parts of insects not found in mouse droppings. Bat droppings often accumulate to a depth of several inches or more.
- Smell for bats in large roosts. Roosting sites have a very pungent and penetrating odor, musky and sweet, that comes from rotting droppings and bat urine.

### Control and Management of Bats

Chemical control is no longer an option for eliminating bats. No pesticides are currently registered for bat control by the EPA. The best way to get rid of bats roosting in a building is through bat-proofing.

#### Exclusion

**Bat-proofing.** Making a building bat-proof means sealing or screening all of the openings that bats use to enter. It can be a difficult job because, in many cases, all upper openings 3/8 inch and larger must be sealed. But this is the only permanent method of ridding a building of bats.

Complicating the process is the fact that you have to be certain there are no bats inside before sealing the build-

ing. Otherwise, you will have created a bigger problem by trapping the bats inside.

June and July are peak months for bat complaints in much of the country. Unfortunately, this is the worst time of the year for control. At this time, bats are rearing young in their colonies. The young can not fly and stay in the roost. Bat-proofing during this period will trap the young bats inside. They will die and rot and cause odor problems. They may also crawl and flutter into living areas.

The best time of year to bat-proof a building is either in late fall after bats have left for hibernation or in late winter and early spring before the bats arrive. If bat-proofing must be done in summer, it should be done after mid-August.

- Seal all but one or two principal openings.
- Wait three to four days for the bats to adjust to using the remaining openings.
- Then seal those openings some evening just after the bats have left for their nightly feeding.
- “Bat valves” can also be used. These are placed over the remaining openings and allow the bats to leave but not to return.

Standard bat-proofing materials include ¼-inch hardware cloth, screening, sheet metal, caulking, expanding polyurethane foam, steel wool, and duct tape—the same things used for rodent proofing. Old, deteriorated buildings often have more openings than can be sealed economically. Large sections of plastic bird netting can be draped over the roof areas of old buildings to keep out bats at a reasonable cost.

#### Repellents

If bat-proofing is not possible or bats need to be forced out of a building before it is bat-proofed, the bats can sometimes be repelled from their roost. At this time, only one chemical is registered as a bat repellent. Naphthalene crystals or flakes can be spread on attic floors or placed in voids. The crystals are most effective in confined air spaces. Three to 5 pounds will treat an average attic.

Though naphthalene may repel the bats, it vaporizes and disappears in a few weeks and the bats often return. Many humans dislike the smell of naphthalene as much as bats do; some people are very sensitive to the smell of naphthalene and should avoid all contact.

- Bright lights have had some success in repelling bats.
- On commercial buildings, floodlights can be pointed at the bats’ entry points to keep them from entering. (Of course, the bright lights may attract insects, too, which are the bats’ food.)
- Attics can be illuminated with four or more bulbs. Ensure that all corners of the attic are illuminated.
- Drafts of cool air from fans and air-conditioners have, on occasion, kept bats from roosting in a poorly sealed attic.
- Ultrasonic devices do not repel bats.

**A single bat.** When a single bat finds its way into a home, office, or store, it will usually find its way out again. When it does not, capture the bat with an insect net, a coffee can, or even with a gloved hand. The bat can be released or destroyed. A glue board attached to a broom handle can be used to reach a bat high in a corner or at the apex of an attic.

## MOLES

Moles (*Scalopus* spp.) are not rodents but relatives of the insectivores (insect eaters) such as shrews and hedgehogs. In their search for food, moles burrow in lawns, meadows, stream banks, and open woodlots, creating elaborate underground tunnels. They feed mainly on earthworms and insect larvae (grubs). Only rarely seen above ground, moles are 4 to 9 inches long, including the tail, with long dark gray or brown fur. Eyes are tiny, like a pinhead, and the tail and feet are usually pink. They have no visible ears. There are seven species in the United States.

As they burrow, they sometimes damage plants, but the major problem with moles is the mounds and ridges that disfigure lawns. As they tunnel just below the surface, moles raise the sod up with their front digging feet, looking for food or new tunneling sites. They can push up surface tunnels at the rate of a foot per minute if the soil is loose. They prefer loose, moist soil shaded by vegetation.

## Control and Management of Moles

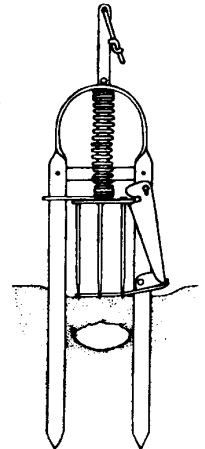
Though time consuming, using traps is the most effective method of control. Killing moles with fumigants or poison baits is not effective.

To find out which parts of the surface tunnels are active and which are abandoned, tramp down mole tunnels in several places over the yard and mark flattened sections with a peg or wire flag. If the tunnel has been pushed back up the next day or so, a trap should be set in that place.



**Figure 5.4.** Eastern mole, *Scalopus aquaticus*  
(Illinois Natural History Survey)

Three types of traps are in general use: harpoon traps, scissor traps, and chokers. A harpoon trap consists of two prongs that straddle the tunnel and a set of spring-driven spikes. The spikes are raised above the tunnel and caught in the trigger release. When the mole triggers the trap, the prongs are released and driven through the sod, impaling and killing the mole.



**Figure 5.5.** A harpoon trap properly set in a surface runway (ridge). A narrow portion of the runway (1 to 1½ inch) is collapsed halfway down, the trap is inserted so that the support prongs straddle the runway, and the trigger rests lightly on top of it. Plastic pails can be placed over traps to prevent animals or children from tampering with them.

A choker trap consists of a cast metal frame with two spring-retractable loops. Two slits are cut in the tunnel and the loops placed inside. Scissor traps are similar to choker traps except prongs rather than loops are used. When moles trigger these traps, they are immediately crushed.

- When using traps, place a plastic pail with a warning sign over each trap.
- An average set will require three to five traps per acre.
- Check the traps every couple of days.
- After no results for three to four days, move the traps to new locations.

## SKUNKS, RACCOONS, AND OPOSSUMS

These three vertebrates are considered together because they are similar pests with similar management and control recommendations. Management of these animals almost always involves exclusion and/or live trapping.

### Skunks

The skunk commonly found in Michigan is the striped skunk (*Mephitis mephitis*). The striped skunk is about the size of a large house cat and typically has two broad, white stripes running from the back of the head to the large, bushy tail.

Skunks are nocturnal. They do not hibernate but may sleep through cold weather periods. They usually live in underground burrows, hollow logs, or rock piles. They may decide to live under houses, decks, sheds, cabins, or storage buildings.

Of course, the main problem with skunks is their odor. They become pests when they change their dietary selections from rodents, insects, and wild fruit to garden crops, garbage, and lawn insects, and locate their habitat

closer to humans. Another major problem in some areas of the country is the transmission of rabies.



Figure 5.6. Striped skunk, *Mephitis mephitis*

## Raccoons

Raccoons are common throughout North America. They are easy to recognize with their black face mask and black-, brown-, and white-ringed bushy tail. They have long, thick fur, a pointed muzzle, and pointed ears. Their feet are well adapted to climbing. They are large animals, weighing between 10 and 25 pounds.

Their senses of hearing, sight, and touch are well developed; those of taste and smell are not. They are commonly found near streams, lakes, and swamps, and they often do quite well in suburban areas and even in city parks. Raccoons den inside hollow trees or logs, rock crevices, deserted buildings, culverts, storm sewers, chimneys, attics, sheds, and crawlspaces. More than one den may be used.

Raccoons are mostly active at night, though they may be seen at dawn or dusk and sometimes even in the middle of the day. Winter months are spent in the den, but they do not hibernate. They may become active during warm spells.

Raccoons feed on animals and plants. In the spring and summer, they feed on crayfish, mussels, frogs, and fish. In the fall, they switch to fruits, seeds, nuts, and grains. They also eat mice, squirrels, and birds, and are quite happy knocking over a garbage can. Raccoons, too, can transmit rabies.



Figure 5.7. Raccoon, *Procyon lotor*

## Opossums

Opossums, which are related to kangaroos, are the only North American marsupial. The opossum is a whitish or grayish animal the size of a house cat with a naked, ratlike tail. Its face is long and pointed with rounded, hairless ears. It grows up to 40 inches long and will weigh up to 14 pounds. The average is 6 to 7 pounds for males and 4 pounds for females. Its tracks look as if they were made by little human or monkey hands.

Opossums prefer to live near streams or swamps. They den in the burrows of other large animals, and in tree cavities, in brush piles, and under sheds and buildings. Occasionally, they move into attics and garages.

They eat nearly everything, from insects to carrion, fruits to grains, garbage to pet food. Opossums are active at night. Their mating season is January to July, and they may raise two to three litters per year. Most young die in their first year. Those that survive may live up to 7 years.

Opossums move slowly. Their top speed is about 7 miles per hour. When threatened, opossums climb trees or go down into burrows. If cornered, they may growl, hiss, bite, screech, and exude a smelly green fluid from their rear end. If these defenses aren't successful, they may play dead. They have the reputation of being stupid, but scientists consider them to be smarter than domestic dogs.

The main complaint against opossums is that they get into garbage, bird feeders, or pet food left outside.



Figure 5.8. Opossum, *Didelphis marsupialis*

## Control and Management of Skunks, Raccoons, and Opossums

### Exclusion

These animals can be prevented from entering buildings by repairing breaks in foundations and screening crawlspace vents with hardware cloth.

- If the animal is currently living under the building, seal all openings but one, then sprinkle a tracking patch of talc at the opening.
- Examine the area after dark. If tracks show that the animal has left, close this last opening immediately.

- Seal attic openings.
- Cap chimneys with a wire cage or other animal-proof cover.

When excluding animals in spring or early summer, be aware that young may also be present. Be sure that all animals have been removed before sealing the building. Otherwise, a serious odor problem from a dead animal could result.

These animals can also be prevented from climbing over wire mesh fences by installing a tightly stretched electric fence wire near the top of the fence 3 inches out from the mesh.

## Trapping

**Live Traps.** The best way to remove animals from around buildings is to trap them. Know your state and local regulations before releasing a trapped animal. Some areas prohibit releasing a trapped animal, especially skunks and raccoons, because they may carry rabies. State fish and game laws may also regulate the capture and release of some of these animals.

- If the animal must be killed, follow all appropriate regulations.
- If the animal is to be released, do it far away from human dwellings. Try to use what you have learned about the biology of the animal to find a suitable habitat. The release site for these large animals should be at least 10 miles away.
- Remember to check state and local regulations.
- Set traps as close to the den as possible or place them where damage is occurring—e.g., at corners of gardens or breaks in stone walls, or along obvious animal trails.
- Set multiple traps in a number of locations.
- These animals are active at night, so check traps at least every morning; preferably twice a day.
- Check traps often to spot and release non-target animals.
- There is obviously a special problem when trapping skunks. Skunks don't like to "shoot" if they can't see their target, so cover all but the trap entrance with burlap or canvas before placing the trap, or use a commercially sold skunk trap. Approach the trap slowly and transport it gently.

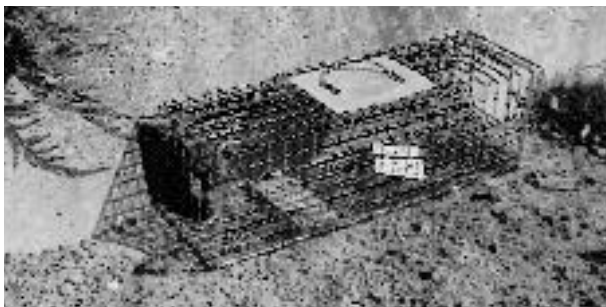


Figure 5.9. One type of live trap

To release a trapped skunk, stand more than 20 feet away and release the trap door using a string or fishing line.

Effective baits for each animal are:

**Skunk:** Chicken parts and entrails, fresh fish, cat food, sardines, eggs.

**Raccoon:** Chicken parts and entrails, corn, fresh fish, sardines, cat food.

**Opossum:** Apple slices, chicken parts and entrails, fresh fish, sardines, cat food.

Leghold traps and body-gripping traps might be considered in more rural areas. Leghold traps may be set in dirt holes about 8 inches deep along fences or trail ways. The leghold trap can also be buried as a cubby set—a small enclosure made of rocks, logs, or a box. The trap is set at the entrance to the cubby so that the animal will place its foot on the trap. Place bait in the dirt hole or cubby to attract the animal. Skunks will discharge scent when caught in a leghold trap so it is especially important to ensure the trap is not near any structures. Animals caught in leghold traps may be disposed of humanely by a veterinarian or a wildlife official.

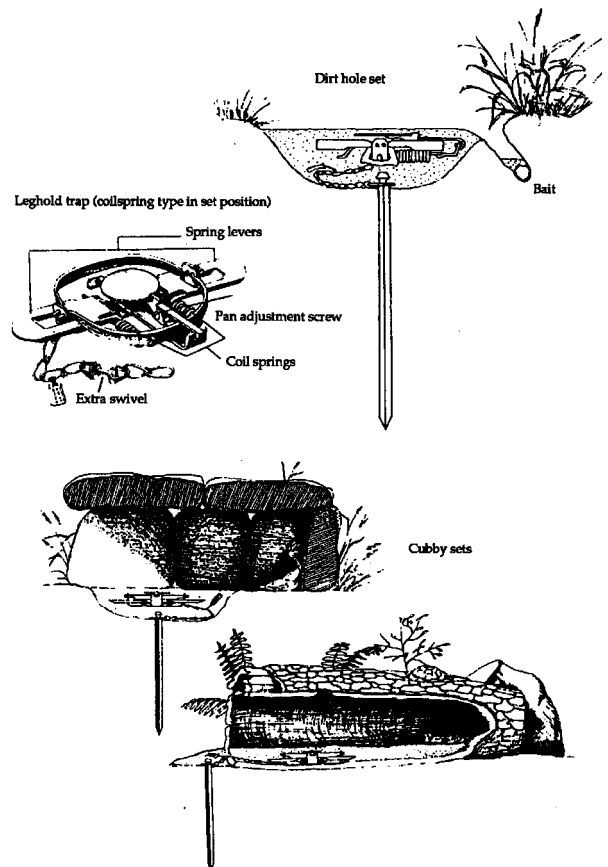


Figure 5.10. Leghold trap and dirt and cubby sets

A body-gripping trap will kill the animal instantly. Place bait behind the trap in such a way that the animal must pass through the trap to get it. To reduce chances of catching pets, set the trap above ground on a running pole or place it in a specially designed dog-proof box. Leghold and body-gripping traps are not recommended if non-target animals are at risk.

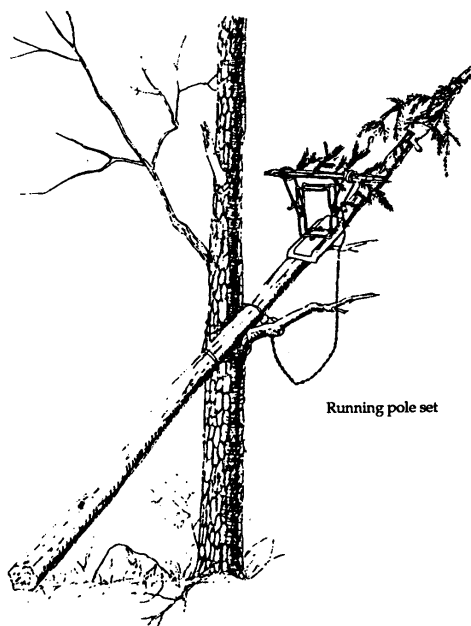
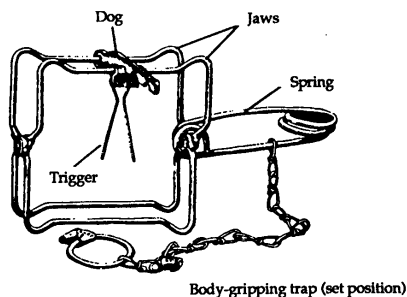


Figure 5.11. Body-gripping trap and running pole set

## Shooting

Shooting is one possible means of controlling these animals. Use a shotgun with No. 6 shot or a .22-caliber rifle. Expect a scent discharge when shooting skunks. Check local regulations before discharging any firearm. Shooting is not recommended in more populated areas.

## Prevention through Habitat Modification

The best preventive measure for skunks, raccoons, and opossums is to establish a good level of sanitation in a neighborhood. Remind clients that released vertebrates must fight their way into new territory to establish themselves and that overcrowded habitat results in increased risk of disease and marginal resting sites. Prevention is the most humane way of managing vertebrate pests.

## RABBITS

Rabbits mean different things to different people. For hunters, the rabbit is an abundant sporting and game animal. However, vegetable and flower gardeners, farmers, and homeowners who are suffering damage may have very little to say in favor of them. They can do considerable damage to flowers, vegetables, trees, and shrubs any time of the year and in places ranging from suburban yards to rural fields and tree plantations. Control is often necessary to reduce damage, but complete extermination is not necessary, desirable, or possible.

Cottontail rabbits in North America do not dig burrows as the European rabbit does. Cottontails use natural cavities or burrows excavated by woodchucks or other animals. Most rabbits live only 12 to 15 months; probably one rabbit in 100 lives to see its third fall. Yet they make the most of the time available to them. In northern regions, there are usually two to three litters per year with five to six young per litter.

Rabbits eat flowers and vegetables in spring and summer. In fall and winter, they damage and kill valuable woody plants. Rabbits will devour a wide variety of flowers. The one most commonly damaged is the tulip; they especially like the first shoots that appear in spring. In vegetable gardens, cottontails eat not only carrots down to ground level but also peas, beans, and beets. Only a few crops—corn, squash, cucumbers, tomatoes, potatoes, and some peppers—seem to be immune from rabbit problems.

Equally annoying, and much more serious, is the damage rabbits do to woody plants by gnawing on bark or clipping off branches, stems, and buds. In winter, when the ground is covered with snow for long periods, rabbits often severely damage expensive home landscape plants, orchards, forest plantations, and park trees and shrubs. Some young plants are clipped off at snow height, and large trees and shrubs may be completely girdled.

Rabbit damage can be identified by the characteristic appearance of gnawing on older woody growth and the clean-cut, angled clipping of young stems. Distinctive round droppings in the immediate area are also a sign of their presence.



Figure 5.12. Eastern cottontail rabbit, *Sylvilagus floridanus*  
(G.L. Twiest, Mammal Images Library of the American Society of Mammalogists)

## Control and Management of Rabbits

### Exclusion

One of the best ways to protect a backyard garden or berry patch is to put up a fence. It does not have to be tall or especially sturdy. A fence of 2-foot chicken wire (1 inch or less mesh) with the bottom tight to the ground or buried a few inches is sufficient.

Cylinders of ¼-inch mesh hardware cloth will protect valuable young trees or other landscape plants. The cylinders should extend higher than a rabbit's reach while standing on the expected snow depth, and stand 1 to 2 inches out from the tree trunk. Commercial tree guards or tree wrap are other alternatives.

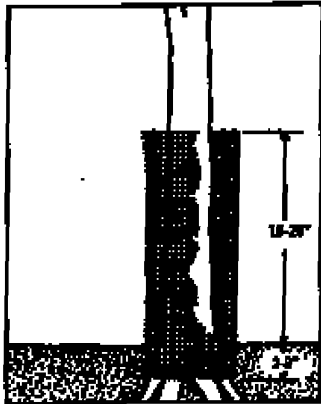


Figure 5.13. A cylinder of hardware cloth or other wire mesh can protect trees from rabbit damage.

A dome or cage of chicken wire secured over a small flowerbed will allow vulnerable plants such as tulips to get a good start before they are left unprotected.

### Habitat Modification

Habitat modification may be especially effective in suburban areas where fewer suitable habitats are available.

- In suburban areas, remove brush piles, weed patches, dumps, stone piles, and other debris where rabbits live and hide.
- Controlling vegetation along ditch banks or fencerows will eliminate rabbits in agricultural settings, but this will likely have detrimental effects on other species, such as pheasants.

Always weigh the consequences before carrying out any form of habitat management.

### Repellents

Several chemical repellents discourage rabbit browsing. Always follow the label directions. Remember that some repellents are poisonous and require safe storage and use. For best results, use repellents and other damage control methods at the first sign of damage.

Most repellents can be applied, like paint, with a brush or sprayer. Many commercially available repellents contain the fungicide thiram and can be purchased in a ready-to-use form.

Most repellents are not designed to be used on plants or plant parts destined for human consumption. Most rabbit repellents are **contact** or **taste repellents**. Taste repellents protect only the parts of the plant they contact—new growth that emerges after application is not protected. Heavy rains may necessitate reapplication of some repellents.

Mothballs (naphthalene) are an example of an **area** or **odor repellent** that repels by creating a noxious odor around the plants to be protected. Taste repellents are usually more effective than odor repellents. The degree of efficacy, however, is highly variable, depending on the behavior, the number of rabbits, and availability of alternative foods. When rabbits are abundant and hungry, use other control techniques along with chemical repellents.

### Trapping

Trapping is the best way to remove rabbits in cities, parks, and suburban areas, though rabbits may be difficult to catch. Several styles of commercial live traps are available. Handmade box traps are also frequently used. Place traps where rabbits feed or rest. Keep traps near cover—rabbits are not likely to cross large open areas to reach them. Check traps daily to replenish bait or remove the catch. In winter, dry baits such as corn cobs and dried apples can be used. Dried leafy alfalfa and clover are also good cold-weather baits. Fresh apples and green vegetables can be used in warmer months. A commercial wire trap can be made more effective (especially in winter) by covering it with canvas or some other dark material. Be sure the cover does not interfere with the trap's mechanism. Move traps if they fail to make a catch within a week.

Release rabbits in rural areas several miles from where they were trapped if local regulations allow relocation. Do not release them where they may create a problem for someone else.

## Shooting

Shooting may be done in rural areas during the legal hunting season if it can be done safely and if local regulations allow it.

## WHITE-TAILED DEER

The white-tailed deer (*Odocoileus virginianus*) is an important game animal that is found throughout much of North America. The deer population in Michigan is an important economic and aesthetic resource. Each year the positive economic value of deer is realized through license fees, hunter and vacationer expenditures for food, transportation, and equipment, etc. Despite their economic and aesthetic values, deer also have a variety of negative economic impacts—they damage crops and personal property, cause automobile accidents, and harbor diseases common to humans and livestock.

Unlike moles, rats, and other species implicated in damage, deer cannot be casually eliminated when in conflict with humans. Control methods are built around effective deer herd management. Deer are protected year round in Michigan except during the legal hunting season. In cases where deer are causing persistent or severe damage, special permits may be issued to shoot deer at other times.

Deer damage a wide variety of row crops, forage crops, vegetables, fruit trees, nursery stock, and ornamentals as well as stacked hay. Ornamental trees or nursery stock may be permanently disfigured by deer browsing. Besides damage to vegetation, deer collisions with vehicles pose a serious risk, and deer have been implicated in the distribution and transmission of Lyme disease.

Damage identification is not difficult. White-tailed deer lack upper incisors and leave a jagged or torn surface on twigs and stems that they browse. Rabbits and rodents, however, leave a clean-cut surface. In addition, deer tracks are very distinctive. The height of damage from the ground up (up to 6 feet) often rules out any mammal other than deer. Deer are often observed in the act of causing damage.



Figure 5.14. White-tailed deer, *Odocoileus virginianus*  
(G.L. Twiest, Mammal Images Library of the American Society of Mammalogists)

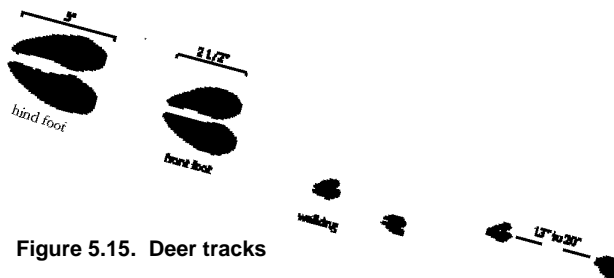


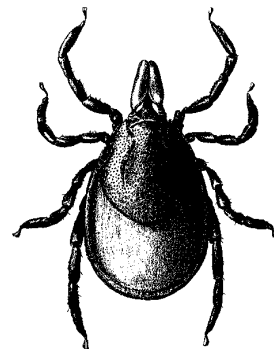
Figure 5.15. Deer tracks

## Lyme Disease

Reducing the deer population through hunting is one way to manage the spread of Lyme disease. Lyme disease is caused by a spiral-shaped bacterium transmitted by the deer tick (*Ixodes scapularis*). The body of the adult female deer tick is brick red with black legs and has a black shield (scutum) in the front. The adult deer tick is usually about the size of a sesame seed.

Ticks feed on the blood of their hosts. Deer ticks feed on deer and other mammals including humans. Unlike humans and dogs, deer are unaffected by Lyme disease. The deer tick bite is painless and may go unnoticed. Once attached and feeding, the tick cannot detach itself until feeding stops. The first indication of a potential infection may be the discovery of an attached tick. ***Disease transmission does not occur for an estimated 10 to 12 hours after feeding begins. If the tick is located and removed within that time, no infection will occur.***

Usually, within 7 days (from 3 to 32 days) after disease transmission, a rash appears (in 60 to 75 percent of all cases). The rash looks like a red, expanding ring with a clear center. This center often is the site of the bite. The rash may burn or itch. Technically, this rash is called erythema cronicum migrans (ECM); it is not uncommon to find ECM at multiple sites. It disappears within three weeks but can recur.



Other skin symptoms may be hives, redness of cheeks under eyes, and swelling of eyelids with reddening of the whites of the eyes. Flu-like symptoms may accompany the skin symptoms—e.g., high fever, headache, stiff neck, fatigue, sore throat, and swollen glands.

Regular inspection, location, and early removal of ticks prevents disease transmission. To remove feeding ticks, dab them with alcohol. If feeding has just started, and mouthparts are not cemented in, ticks sometimes pull their mouthparts out.

If they do not release in a few minutes, ***take tweezers, grasp the tick at the skin level and pull steadily*** until the tick is removed. Grasping the tick at the back end, or

heating it, can force disease organisms into the wound. Place the tick in alcohol or otherwise keep it for identification. ***If the mouthparts are left in the skin, they will not transmit the disease, but the wound should be treated with an antiseptic to prevent secondary infection.*** If the tick is identified as a deer tick, see a physician. Note the date of removal to calculate the time of symptoms onset.

## Prevention of Lyme Disease

For those working in tick-infested areas, the following precautions will help prevent transmission of the disease:

- Wear long pants tucked into socks while working or hiking in tick habitat (wear light-colored clothing so that ticks can be more easily detected).
- Use insect repellents on clothes and skin. Do not use formulations with over 20 to 30 percent active ingredient directly on skin.
- Use permethrin formulations that are labeled for use as a repellent on clothes. They withstand washing and remain effective.
- Schedule regular body inspections for ticks at noon and at bedtime.
- Nymphal deer ticks are smaller than adults but can be seen with close inspection. ***Ninety percent of the human Lyme disease cases are the result of nymphal tick feeding.***

## Control and Management of Deer

### Exclusion

Fencing may be the only effective way to minimize deer damage, especially in areas where the deer population is large and/or the crops are particularly valuable. Several fencing designs are available to meet specific needs. **Temporary electric fences** are a simple, effective way to protect garden and field crops during snow-free periods. **Permanent high-tensile electric fences** provide year-round protection from deer and are best suited to high-value specialty or orchard crops. **Permanent woven-wire fences** provide the ultimate deer barrier. They require little maintenance but are very expensive to build.

Fencing in general is expensive. Gather as much information as you can in determining what type of fence to build. Some factors to consider are the history of past deer numbers and the extent of damage, **deer pressure**—i.e., the number of deer and their level of dependence on agricultural crops—the value of the crop, and the field size. With this information a cost-benefit analysis should be prepared to determine the cost-effectiveness of fencing and the type of fence to install. Weigh the value of the crop to be protected against the acreage involved, costs of fence construction and maintenance, and the life expectancy of the fence.

**Temporary Electric Fencing.** Temporary electric fences provide inexpensive protection for many crops during periods without snow. They are easy to construct,

they do not require rigid corners, and materials are readily available. Install fences at the first sign of damage to prevent deer from establishing feeding patterns on the crops. Weekly inspection and maintenance are required. Various types of temporary electric fences are described below.

One type of design—the **peanut butter fence**—lures the deer to the fence with the smell of peanut butter. The deer make nose-to-fence contact and receive an electric shock. Being shocked teaches the deer to avoid fenced areas. The peanut butter fence is effective for small gardens, nurseries, and orchards (up to 3 to 4 acres) subject to moderate deer pressure. The steps to building the peanut butter fence are described below (see Figure 5.15).

- Install wooden corner posts and string 17-gauge smooth wire around the corners, applying light tension.
- Set fiberglass grounding rods along the wire at 45-foot intervals. Attach the wire to insulators on the rods 2½ feet above ground level, and apply 50 pounds of tension.
- Use a 1:1 mixture of peanut butter and vegetable oil applied to 1- to 2-inch strips of cloth adhesive tape. Place the tapes at 3-foot intervals.
- Fold a 3- by 4-inch piece of aluminum foil over each tape.
- Connect the wire to the positive (+) post of a well grounded fence charger.

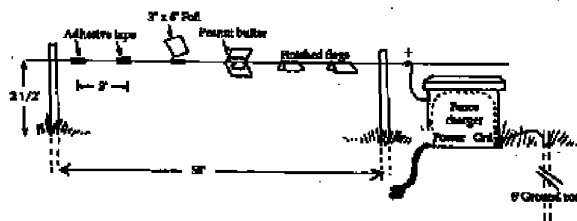


Figure 5.16. The peanut butter fence

Another type of temporary fence—the **polytape fence**—uses polytape or polywire strung in two strands between the posts and attached to the positive (+) post of a well-grounded fence charger. These fences can be used to protect up to 40 acres of vegetable and field crops under moderate deer pressure. Usually white or yellow tape is used for visibility. Peanut butter can be applied in places along the polytape to train deer to avoid the fence.

Temporary fences need to be inspected weekly for damage by deer and for vegetation interfering with grounding. Peanut butter must be reapplied monthly.

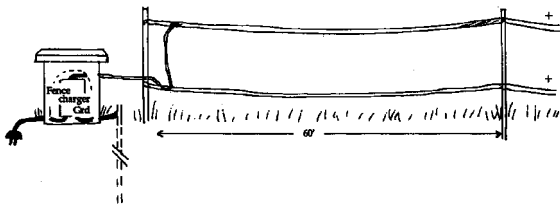


Figure 5.17. The polytape fence

**Permanent High-tensile Electric Fencing.** High-tensile fencing can provide year-round protection from deer damage. Many designs are available to meet specific needs. All require strict adherence to construction guidelines concerning rigid corner assemblies and fence configurations. Frequent inspection and maintenance are required. High-tensile fences can be expected to last 20 to 30 years. Types of high-tensile fences are described below.

The **offset or double fence** is mostly for gardens, truck farms, or nurseries up to about 40 acres that experience moderate deer pressure. Deer are repelled by the shock and the three-dimensional nature of the fence. Maintenance includes weekly fence and voltage checks.

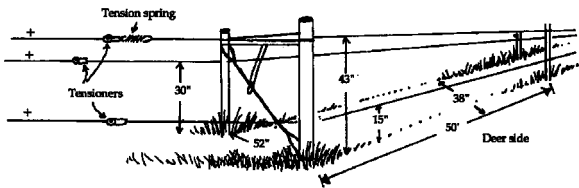


Figure 5.18. The offset or double fence

**Vertical deer fences** are effective at protecting large truck gardens, orchards, and other fields from moderate to high deer pressures. Because of the prescribed wire spacing, deer either attempt to go through the fence and are effectively shocked or are physically impeded by the barrier. Vertical fences use less ground space than three-dimensional fences but are probably less effective at inhibiting deer from jumping over fences.

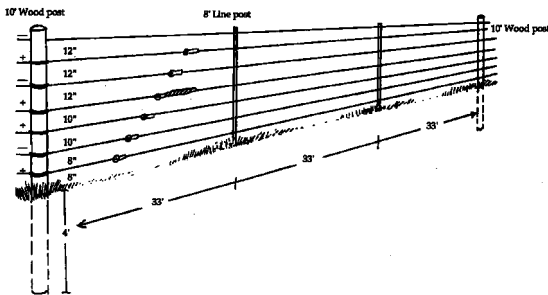


Figure 5.19. The seven-wire vertical deer fence

A wide variety of fence materials, wire spacings, and specific designs can be used. One variation, the **slanted seven-wire deer fence**, uses wooden braces set at angles so that the fence is slanting outward. In addition to the electric shock, the three-dimensional nature of this fence discourages deer from jumping over.

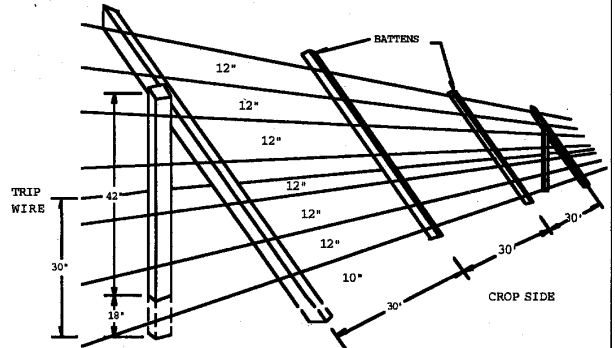


Figure 5.20. The slanted seven-wire deer fence

High-tensile electric fences are more easily repaired than conventional fences and may cost up to half as much as a woven-wire design. Disadvantages include the need for frequent monitoring and vegetation control to maintain shocking power.

**Permanent Woven-wire Fencing.** Woven-wire fences are used year round for protection of high-value crops subject to high deer pressures. These fences are expensive and difficult to construct but easy to maintain. Before high-tensile electric fencing, woven-wire fences were used most often to protect orchards or nurseries where the high crop value, the perennial nature of damage, acreage, and 20-year life span of the fences justified the cost. Materials used to build woven-wire fences include round fiberglass or treated wood posts, rolls of high-tensile woven wire, and gates. These fences may be constructed with or without volt chargers. For high-tensile woven-wire fences, use high-voltage, low-impedance chargers only (3,000 to 5,000 volts and current pulse duration of at most 1/1,000 second).

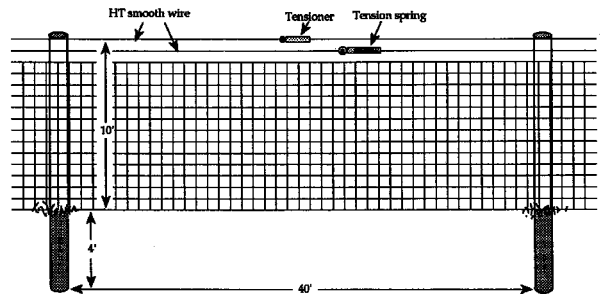


Figure 5.21. The deer-proof woven-wire fence

**Fence Maintenance.** There are many possible variations in the design of temporary, permanent, and woven-wire fencing. There are also commercial dealers who supply these fences. The most frequent reasons why fences fail to prevent deer damage include the selection of an unsuitable fence design, the failure to install fencing according to specifications, and inadequate maintenance. Below are some fence maintenance recommendations.

- Control vegetation near fences by mowing or applying herbicides to avoid excessive fence grounding by weeds.
- On slopes or highly erodible soils, maintain a good sod cover beneath fences to avoid fenceline erosion.
- Always keep the fence charger on. Check the fence voltage weekly with a voltmeter. Maintain at least 3,000 volts at the farthest distance from the fence charger on high-tensile, woven-wire fences. Disconnect the lower wires if they are covered by snow.
- In the fall and early summer, adjust the fence tension for high-tensile fences.
- Always remember to attach warning signs to electric fences.

**Tree Protectors.** Plastic tree wraps or woven-wire cylinders can be used to protect young trees from deer and rabbits. Four-foot woven-wire cylinders can keep deer from rubbing tree trunks with their antlers.

## Repellents

Repellents are best suited for use in orchards and gardens, and on ornamental plants. High cost, limitations on use, and variable effectiveness make most repellents impractical on row crops, pastures, or other large areas. Success with repellents is measured in the reduction, not total elimination, of damage.

Repellents are described by mode of action as “contact” or “area.” Contact repellents, which are applied directly to the plants, repel by taste. They are most effective when applied to trees and shrubs during the late fall and winter when the plants are not actively growing. New growth that appears in the spring will not be protected by the repellent. Contact repellents, in general, should not be used on plant parts destined for human consumption.

Area repellents are applied near the plants to be protected and repel by odor alone. They are usually less effective than contact repellents but can be used in perimeter applications and some situations where contact repellents cannot.

During the winter or dormant season, apply contact repellents on a dry day when temperatures are above freezing. Treat young trees completely. It will be more economical to treat only the terminal growth of older trees. Be sure to treat to a height of 6 feet above the expected maximum snow depth. During the growing season, apply contact repellents at about half the concentration recommended for winter use.

The effectiveness of repellents will depend on several factors. Rainfall will dissipate some repellents, so reapplication may be necessary after a rain. Some repellents do not weather well even in the absence of rainfall. The deer’s hunger and the availability of other food will have a great effect on success. In times of food stress, deer are more likely to ignore both taste and odor repellents.

Several repellents are available and sold under a variety of trade names. Taste repellents often contain **capsaicin** (the “hot” in hot peppers) or **thiram** (a fungicide). Odor repellents may contain **egg solids** and may be combined with taste repellents such as capsaicin. When using a commercial preparation, follow the manufacturer’s instructions. One of the few repellents registered for use on edible crops contains **ammonium soaps** of high fatty acids as the active ingredients. Most repellents—such as thiram, for example—are primarily used on dormant trees and shrubs. Others, such as many capsaicin formulations, may **not** be applied to fruit-bearing plants after fruit set or to vegetable plants after the edible parts develop. Repellents may be applied by spraying, brushing, or dipping, depending on the label instructions.

**Human hair in bags** is an odor repellent that costs very little but has not consistently repelled deer. Place two handfuls of hair in fine-mesh bags (onion bags, nylon stockings). Where severe damage occurs, hang hair bags on the outer branches of each tree with no more than 3 feet between bags. For larger areas, hang several bags, 3 feet apart, from a fence or cord around the area. Attach the bags early in spring and replace them monthly throughout the growing season. Hair can be obtained from local barber shops or salons.

Ordinary **bars of soap** can be applied in the same manner as hair bags to reduce deer damage. Drill a hole in each bar and suspend it with a twist tie or soft cord. Each bar appears to protect a radius of about 1 yard. Any inexpensive brand of bar soap will work.

## Live Capture

In special cases, such as city parks, refuges, or suburban neighborhoods, it may be necessary or desirable to capture deer alive and move them to other areas. Deer can be captured safely with rocket nets, drop-door box traps, or tranquilizer guns, but these techniques are expensive and time-consuming, and they require the expertise of a professional wildlife biologist.

Live capture and relocation is seldom a practical alternative unless delicate public relations problems mandate live removal as the only choice. In addition to high costs, the survival of relocated deer is usually low.

## Shooting

Effective use of the legal deer season is probably the best way to control deer populations. Shooting permits may be issued for the removal of problem deer where they are causing damage during non-hunting season periods.

# SNAKES

Most snakes are non-poisonous, harmless, and beneficial. But few people want them in their homes. In general, poisonous snakes have a large triangular head, a pit between the eye and nostril, and vertical and elliptical pupils. They may also have rattles on their tail, noticeable fangs, and a single row of scales between the vent (anal opening) and the tip of the tail. When unsure, assume that the snake may be poisonous and protect yourself accordingly. The only poisonous snake found in Michigan is the eastern massasauga rattlesnake (*Sistrurus catenatus*) Encountering other poisonous snakes in Michigan is highly unlikely.

Snakes are predators. Depending on the species, their diet may include insects, rodents, frogs, birds, worms, and toads. Snakes hibernate in dens during the winter, sometimes under houses. At certain times of the year, they may enter buildings for warmth, shade, or moisture, or in search of prey. When managing a snake problem, keep in mind that the snake may be a protected species in Michigan.



Figure 5.22. Garter snake, *Thamnophis sirtalis*

## Control and Management of Snakes

If snakes are a regular problem, the best solution is to eliminate snake hiding places.

- Clean up brush piles, woodpiles, rock piles, and other debris.
- Keep shrubbery away from foundations.
- Cut high grass.

Often, snake problems follow rodent problems. Eliminate the rodents—the snakes' food—and the snakes will move elsewhere.

- Eliminate rodent food and harborage.
- Mow grass short to expose rodent runs.

Snakes often enter structures through broken block foundations, cracked mortar, and damaged vents. These should be repaired, sealed, or blocked with ½-inch hardware cloth.

In a rattlesnake-infested area, a snake-proof fence can be installed around a backyard or play area.

- Bury galvanized 36-inch-wide, ¼-inch-mesh hardware cloth 6 inches in the ground and slant outward at a 30 degree angle.
- Keep all vegetation away from the fence.

**Snake removal.** If a snake gets into a house or other building, several methods are available to remove it:

- Place damp burlap sacks on the floor and cover them with dry sacks. Check them every few hours to see if the snake has crawled underneath. The snake and bags can be lifted with a shovel and taken outside. The snake can be killed or released.
- Rat glue boards will capture all but the largest snakes. The glue boards should be tied down or attached to a plywood base. Place the glue boards along wall and floor junctions. Captured snakes may be killed or released. To release, pour vegetable oil over the snake and glue to loosen it.
- Expanded trigger rat traps set in pairs along wall and floor junctions can kill smaller snakes.

## SUMMARY

Almost any vertebrate animal may become a pest by wandering where it is not wanted. Sometimes it will leave by itself; at other times, it will need to be controlled. There are many non-lethal alternatives to managing vertebrate pests. During the non-hunting season, exclusion is the preferred method to control deer. Live trapping is the most common solution for vertebrates such as raccoons, skunks, and opossums. Be aware of state or local laws regarding the release of trapped animals in other areas. There may be concerns about the spread of disease (rabies, in particular). In these cases, the trapped animal must be killed or turned over to wildlife officials.

**CHAPTER**  
**5**

# Review Questions

## Chapter 5: Other Vertebrate Pests

- Which of the following is true about bats?
  - They are usually beneficial to the environment.
  - Most feed on animal blood.
  - Many feed on insects.
  - A and C
- Two diseases associated with bats are:
  - Rabies and histoplasmosis.
  - Histoplasmosis and cryptococcosis.
  - Rabies and cryptococcosis.
  - Leptospirosis and histoplasmosis.
  - Rabies and leptospirosis.
- When bat-proofing, seal all upper openings that bats use that are:
  - 1/8 inch or larger.
  - 3/8 inch or larger.
  - 5/8 inch or larger.
  - 1 inch or larger.
  - 1 1/2 inches or larger.
- List some areas you would inspect on a building to find bat exit and entry points.
- The best time to control bats is in:
  - Midsummer and late winter.
  - Late fall and late winter.
  - Early fall and midsummer.
  - Early fall and early winter.
- Young bats begin to fly and leave the roost in June and July.
  - True
  - False
- Which may be used to repel bats?
  - Ultrasonic devices
  - Bright lights
  - Naphthalene flakes
  - Sticky repellents
  - B & C
- Always wear a respirator while working in a bat roost.
  - True
  - False
- List some materials needed for bat-proofing.
- Which of the following is true about moles?
  - Trapping is the most effective control measure.
  - Poison bait is the most effective control measure.
  - Moles feed on grass roots.
  - A and C
- What is the procedure for trapping moles?
- Control of skunks, raccoons, and opossums almost always involves exclusion or live trapping.
  - True
  - False
- Which is true about skunks?
  - Mostly active during the day
  - Hibernate in winter
  - May live under houses
  - May transmit rabies
  - C & D
- Which is NOT true about opossums?
  - May hiss, growl and bite if cornered
  - Less intelligent than skunks and raccoons
  - Sometimes play dead
  - Mostly active at night
  - A & B

15. Describe the procedure for excluding a skunk or raccoon living under a building.
16. Which of the following statements is true concerning trapping skunks, raccoons, or opossums?
- Trapped animals should always be released at least 10 miles away.
  - Traps should be checked every 48 hours.
  - Set only one trap at a time.
  - All of the above
17. To release a trapped skunk, open the door, then run away quickly.
- True
  - False
18. Which is NOT true about cottontail rabbits in North America?
- They usually live only 12 to 15 months.
  - They dig their own burrows.
  - They produce two to three litters per year in northern regions.
  - They live in natural cavities and other animal burrows.
  - A&C
19. Which is NOT characteristic of damage caused by rabbits?
- Young tulip shoots eaten as they emerge in spring.
  - Young landscape plants clipped off at snow height in winter.
  - Carrots, peas, and beets eaten down to ground level.
  - Gnawing on bark and clipping off branches of woody plants.
  - Peppers, squash, and tomatoes eaten in home gardens.
20. What are the specifications for building a fence to exclude rabbits from a backyard garden? How may young trees and other plants be protected from rabbits?
21. Odor repellents such as naphthalene are usually more effective at discouraging rabbit browsing than taste repellents.
- True
  - False
22. Live trapping is the best way to remove rabbits in cities, parks, and suburban areas.
- True
  - False
23. Which is NOT a problem associated with deer?
- Spread of Lyme disease
  - Collisions with motor vehicles
  - Spread of rabies
  - Damage to ornamental plants
  - Damage to row crops
24. The critical time period for removing a tick before transmission of Lyme disease is:
- 10 to 12 hours.
  - 24 hours.
  - Three days.
  - One week.
25. What is the procedure for removing a feeding tick?
26. What precautions can be taken to prevent tick bites?
27. What are the factors to consider when deciding on the type of fence to build when excluding deer?

28. Which is true concerning temporary electric fencing to control deer damage?
- They are recommended for providing year-round protection for high-value crops.
  - They should be inspected weekly.
  - Two types are the peanut butter fence and the polytape fence.
  - B & C
  - All of the above.
29. Which is true concerning permanent high-tensile electric fencing?
- They are recommended for providing year-round protection for high-value crops.
  - They should be inspected weekly.
  - Two types are the peanut butter fence and the polytape fence.
  - They are more expensive than permanent woven-wire fencing.
  - A & B
- 30-35. Match the following to the appropriate description:
- The peanut butter fence
  - The polytape fence
  - The offset or double fence
  - The seven-wire vertical fence
  - The slanted woven-wire fence
  - The permanent woven-wire fence
- Choose the best type of fence to exclude deer, considering factors such as cost-effectiveness, desires of the client, deer pressure, and size of the area to be protected, for the following situations:**
- \_\_\_ 30. A small garden (3 acres) subject to moderate deer pressure; deer need to be excluded in spring and summer only.
- \_\_\_ 31. A 30-acre nursery subject to moderate deer pressure; three-dimensional to prevent deer from jumping.
- \_\_\_ 32. A 40-acre orchard subject to high deer pressure; year-round protection and easy maintenance are desired.
- \_\_\_ 33. Twenty acres of vegetable crops subject to moderate deer pressure; year-round protection and prevention of jumping not required.
- \_\_\_ 34. A 40-acre orchard subject to moderate to high deer pressure; year-round protection required, deer jumping not a concern.
- \_\_\_ 35. A 30-acre nursery subject to moderate to high deer pressure; year-round protection and prevention of jumping are desired.
36. What are the recommendations for maintaining temporary, permanent, and woven-wire fencing?
37. Four-foot woven-wire cylinders can keep deer from rubbing tree trunks with their antlers.
- True
  - False
38. Which is true about deer repellents?
- Best suited for use on row crops, pastures and other large areas.
  - Area repellents repel deer by taste alone.
  - Best suited for use in orchards, gardens, and on ornamental plants.
  - Success with repellents is measured in total elimination of damage.
  - C & D
39. Describe how contact repellents should be applied in the winter.
40. The effectiveness of deer repellents will depend on factors such as the deer's hunger and food availability, the amount of rainfall, and the weathering ability of the repellent used.
- True
  - False

41. Which is NOT true concerning repellents?
- A. During the growing season, contact repellents should be applied at about half the concentration recommended for winter use.
  - B. In general, contact repellents should not be used on plant parts destined for human consumption.
  - C. If contact repellents are applied in winter, new growth in the spring will also be protected.
  - D. Repellents may be applied by spraying, brushing, or dipping, depending on the label directions. Capsaicin formulations may not be applied to fruit-bearing plants after fruit set or to vegetable plants after the edible parts develop.
  - E. Odor repellents containing egg solids may be combined with taste repellents such as capsaicin.
42. Name two taste repellents and describe how they are used.
43. Name two relatively inexpensive types of odor repellents and describe how they are used.
44. Which of the following are acceptable snake control methods?
- A. Clean up brush piles.
  - B. Use poison snake baits.
  - C. Eliminate rodent food and harborage.
  - D. A & C
45. Inside a home, a snake can be captured by using:
- A. Damp burlap bags.
  - B. Rat glue boards.
  - C. Rat trigger traps.
  - D. A & B
  - E. All of the above