

IPM for Rodents in Schools

INTRODUCTION

Rats and mice often enter schools and warehouses in search of food and shelter. The most common rodent pests are the commensal rats and mice. These are Old World rodents that have adapted to live with humans. They include the roof rat, Norway rat, and house mouse. These commensal rodents have been carried by humans to every corner of the Earth. Rats and mice consume or contaminate large quantities of food and damage structures, stored clothing, and documents. They also serve as reservoirs or vectors of numerous diseases, such as rat bite fever, leptospirosis (Weil's disease), murine typhus, rickettsial pox, plague, trichinosis, typhoid, dysentery, salmonellosis, hymenolepis, tapeworms, and lymphocytic choriomeningitis (Mallis, 1997).

In most cases of rodent infestation, the pest animals can be managed without having to resort to the use of poisons. Practicing good sanitation and exclusion will prevent most problems. If rodents do find their way indoors, small populations can be easily eliminated with various nontoxic methods. Rodenticides (rodent baits) need only be used in cases of large or inaccessible infestations. Trapping rodent pests is often preferable to using baits. Traps prevent rodents from dying in inaccessible places and causing odor problems. Traps also can be used in situations where baits are not allowed.

RODENT ECOLOGY

The **house mouse** is the most common commensal rodent invading schools. It is primarily nocturnal and secretive. The presence of mice is usually indicated by sightings, damage caused by gnawing into food containers, or presence of droppings. In the wild, house mice feed primarily on seeds. In the school, they prefer grain products, bird seed, and dry pet food. They tend to nibble on many small meals each night. House mice are inquisitive and actively explore anything new. They also are good climbers. However, they have a small home range and usually stay within 10 to 30 feet of their nest. Nests usually are built in structural voids, undisturbed stored products or debris, or in outdoor burrows. Mice and rats are very nervous about moving in the open. The more cover they have, the more comfortable they are. They would rather run behind an object or along the baseboard of a wall than across an open space.

The **roof rat** or **black rat** is more commonly encountered in buildings in the south, but is sometimes found in Pennsylvania. These rats are excellent climbers and often nest in attics, wall voids, and hollow trees. They prefer to travel off the ground and enter houses from nearby trees or along power lines. Roof rats prefer fruit, but will eat any type of human, pet, or livestock food. Rats usually fear new items in their environment and avoid them for several days. This means that traps should be left in place for at least 1 week before they are moved to a new location. The presence of roof rats can be determined by gnawing damage, the presence of droppings, sightings, sounds of scratching, squeaking, or gnawing in walls or ceilings, and characteristic dark, greasy rub marks along frequented paths along walls and on rafters. Rats have large home ranges and may travel more than 50 yards to reach food or water. Concentrating traps along rat runways or favorite routes of travel is most effective.

Rats occupying buildings and sewers in Pennsylvania are generally **Norway rats**. These rats are strong burrowers, but can also climb well. They are excellent swimmers and can swim under water for up to 30 seconds. They can enter buildings by coming up toilet pipes. These rats usually dig burrows along building foundations and under debris piles. They have a strong preference for meat and fish, but will do well on any type of human or pet food. Raw or cooked meat and fish, especially sardines, are excellent baits, but peanut butter also works well. Like the roof rat, the Norway rat is cautious around new objects and has a very large home range, more than 50 yards in radius. The Norway rat is very aggressive and will drive roof rats out of an area. However, both species of rats may be found in the same building, with roof rats in the attic and Norway rats in the basement.

SANITATION AND EXCLUSION

Proper sanitation will do a great deal to manage rodent pests. All animals have three requirements for life: food, water, and cover. Removing any one of these will force an animal to leave. Removing debris, such as piles of waste lumber or trash, used feed sacks, and abandoned large appliances, will substantially reduce the harborage for rodent pests. Trim trees, vines, bushes, grass, and weeds at least 12 to 18 inches from all buildings to decrease cover for rodent runways and prevent hidden access

to buildings. Stacked firewood stored for long periods provides good harborage for all three commensal rodents. Store pet food and seeds, such as wild bird seed, in rodent-proof glass or metal containers to eliminate rodent access to these food sources. Collect and remove fallen fruit from backyard trees and orchards. Keep lids on trash cans and close dumpsters at night to make an area less attractive to rats and mice. The drainage holes in dumpsters should be covered with hardware cloth to keep rodents out.

Exclusion is also called *rodent-proofing*. This involves making your structure a fortress that rodents cannot breach. Rodents can squeeze through any opening that their head can fit through. A $\frac{1}{4}$ -inch opening can admit mice, and a $\frac{1}{2}$ -inch opening can give access to rats. Young rats and mice are the dispersing individuals, so these are the ones most likely to invade new areas, like schools. Any opening that a pencil can fit through will admit a mouse.

Below is a list of recommended materials for excluding rats and mice.

- Galvanized, stainless, or other non-rusting metal.
- Sheet metal, 24 gauge or heavier.
- Expanded metal, 28 gauge or heavier.
- Perforated metal, 24 gauge or heavier.
- Hardware cloth, 19 gauge or heavier, $\frac{1}{4}$ -inch or smaller mesh.
- Cement mortar with a 1 part cement: 3 parts sand mix or richer.
- Concrete with a 1 part cement: 2 parts gravel: 4 parts sand mix or richer. Broken glass added to mortar or concrete will deter rodents from tunneling through a patched hole before the material hardens.
- Brick, concrete block, tile, or glass will exclude rodents if in good repair.
- Wood will exclude rodents if no gnawing edges are present.

TRAPS

There are four main types of rodent traps: snap traps, multicatch traps, single-catch live traps, and glue boards. (Some people consider live trapping the least humane method of killing rodents, claiming psychological stress on the animal. The most humane method of killing them would be rodenticides, followed by snap traps, glue boards, and live traps).

Snap traps include both the classic rodent traps with the wood base and the newer metal clothespin traps. They are designed to kill the trapped animal quickly and humanely.

Snap traps should not be set where children or pets will come in contact with them. They have three different types of triggers: wood/prebaited, metal for holding bait, and expanded trigger, which is used in runways. The expanded trigger is the most versatile, since it also can be baited. Older snap traps with other types of triggers can be modified to produce an expanded trigger.

Traps should be placed where rodents are likely to be. Rodents are creatures of habit and prefer to follow the same runways they usually use. It is important to identify these runways and place traps there. Runways can be identified by sprinkling a fine layer of flour or baby powder in suspected areas and looking for tracks. This is a safe diagnostic method for determining rodent activity, but should not be confused with the use of rodenticide tracking powders, which require a restricted-use pesticide license. Rodents often run along edges, so traps should be set along walls, especially where objects such as a box or appliance will guide them into the trap. Traps for mice should be set 6 to 10 feet apart. Roof rats prefer to travel above the ground and are easier to trap along these precarious pathways than on the ground.

The type of bait used depends on the species of rodent pest. Peanut butter, pieces of fruit or nut meats are the best baits for roof rats. Peanut butter or gum drops stuck to the trigger or rolled oats or bird seed sprinkled on the trap are good baits for house mice. When food is abundant, nesting material, such as a cotton ball, tied to the trigger can act as an effective lure.

Multicatch traps are designed to repeatedly catch mice and reset themselves for another capture. These traps have the ability to capture several mice with one setting, and the scent from the captured mice entices others to the trap. However, these traps are expensive. Also, the captured mice are still alive and must be dealt with. Methods of dealing with the captive rodents include submerging the entire trap in a bucket of water and drowning them, using drowning attachments available for some traps, placing glue boards in the holding compartment of the trap, or finding someone with a pet snake that eats mice. Releasing captured rodents outside is not a solution, since they will quickly find a way back into the structure. Trap-wise rodents also are more difficult to trap than naive ones. Like any other trap, multicatch traps must be checked regularly to prevent the captured rodents from starving or dying of thirst and creating an odor problem. Available multicatch traps include the Kness “Ketch-All” Automatic Mouse Trap, the Victor Tin Cat Repeating Mouse Trap, and the “Mini-Mouser.”

Single-catch live traps are rodent-sized cage traps of various styles. These traps capture the rat or mouse alive and unharmed, but you have to deal with the captured rodent. Rodents should not be released, because they will return to buildings. Rodents caught in these traps are best dispatched by submerging the entire trap in a bucket of water. These traps should be placed against walls or in runways. The most effective bait for mice with this type of trap is rolled oats (uncooked oatmeal) sprinkled inside the trap, with a fine trail leading out. Rat-sized live traps are produced by Havahart, Kness Manufacturing, Mustang Live-catch Traps, Safeguard Live Animal Traps, Sherman Live Traps, and Tomahawk Live Traps. Mouse-sized live traps are produced by Havahart, Sherman Live Traps, Tomahawk Live Traps, and Trap-Ease Mouse Live Trap.

Glue boards are used just like snap traps. While both rat- and mouse-sized glue boards are made, these traps are most effective against juvenile mice. Rats are often strong enough to pull themselves free from glue boards. Glue boards should not be set in wet or dusty areas, because these conditions render the traps ineffective. Wet feet and fur will not stick to the glue, and dust coats the glue until it is no longer sticky. These traps also should not be set where children or pets will come into contact with them. Glue boards are not hazardous to children or pets, but an encounter will create a frustrating mess. If that happens, clean up hands with room-temperature cooking oil and

clean surfaces with paint thinner or mineral spirits. The best glue boards have at least a $\frac{1}{8}$ - to $\frac{1}{4}$ -inch layer of glue. Do not set glue boards near open flames or above carpets. Glue boards should be secured with a tack or small nail, wire, or double-sided tape if they are placed on ledges, pipes, or rafters over food preparation surfaces or carpets.

ULTRASOUND DEVICES

The principle behind ultrasonic devices is to create a loud noise above the range of human hearing (above 18 to 20 kHz) that is unpleasant to pest species. The problems with ultrasound devices are numerous. Animals can adapt to most situations, and in a short time they become accustomed to the sound. If the original attractant, such as food, is still present, the rodents will return. The short wavelengths of ultrasound are easily reflected, creating sound shadows. The rodents simply shift their activity to these low-noise shadows.

Ultrasonic devices will not drive rodents from structures if food, water, and shelter are available. However, they may have a part to play in rodent integrated pest management. Ultrasonic devices may increase trapping effectiveness by altering the normal movement patterns of individual rodents. Traps set in the sound-shadow areas will become more effective since the rodents will be concentrated in these areas. The high cost of the units must be weighed against the increase in trapping effectiveness to determine if they are cost-effective.