

Non-Chemical Rodent Control¹

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Rats and mice often enter homes, farm buildings, and warehouses in search of food and shelter. The most common rodent pests in Florida are the commensal rats and mice. These are Old World rodents that have adapted to live with man. They include the Roof Rat, Norway Rat, and House Mouse (Figure 2). These commensal rodents have been carried by man 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, Lymphocytic choriomeningitis, and Hanta virus.

In most cases of rodent infestation, the pest animals can be controlled without having to resort to the use of poisons. The practices of 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 poisons) need only be used in cases of large or inaccessible infestations. The



Figure 1. Young rat; feet large, head large. Credits: World Health Organization

trapping of rodent pests is often preferable to the use of poisons. Traps prevent rodents from dying in inaccessible places and causing an odor problem. There is no chance of an accidental poisoning or secondary poisoning of nontarget wildlife, pets, or

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Figure 2. House mouse; feet small, head small. Credits: James Castner, University of Florida

children with the use of traps. Secondary poisoning of pets or wildlife can result from eating poisoned rodents. Traps can be used in situations where poisons are not allowed or recommended, such as in food handling establishments.

Rodent Ecology "*Know Your Opposition*"

The house mouse is the most common commensal rodent invading houses in Florida. It is primarily nocturnal and secretive. The presence of mice is usually indicated by sightings, damage from gnawing into food containers, or presence of droppings (Figure 3). In the wild, house mice feed primarily on seeds. In the home, they prefer grain products, bird seed, and dry pet food. Peanut butter or gum drops stuck to the trigger, rolled oats or bird seed sprinkled on the trap are good baits. House mice are inquisitive and actively explore anything new. They tend to nibble on many small meals a night. House mice are good climbers. They have a small home range and usually stay within 10 to 30 feet of their nest. Therefore traps for mice should be set 6 to 10 feet apart. Nests are usually in structural voids, in undisturbed stored products or debris, or in burrows outdoors. When food is abundant, nesting material, such as a cotton ball, attached to the trigger can act as an effective lure. Mice and rats are very nervous about moving in the open. The more cover they have, the more comfortable they are. They would prefer running behind an object or along the baseboard of a wall than to run across an open space.

The roof rat or black rat is the most common rat encountered in Florida. These rats are excellent climbers and often nest in attics, wall voids, hollow trees, and in palm thatch. They prefer to travel off the



Figure 3. House mouse droppings. Credits: W. H. Kern, Jr., University of Florida

ground and enter houses from nearby trees or along powerlines. Roof rats prefer fruit (they are sometimes called citrus rats), but will eat any type of human, pet, or livestock food. Peanut butter, pieces of fruit or nut meats are the best baits. Rats are usually fearful of new items in their environment and avoid them for several days. This means that traps should be left in place for at least one week before they are moved to a new location. The presence of roof rats can be determined by gnawing damage, the presence of droppings (Figure 4), 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 over 50 yard to reach food or water. Concentrating traps along rat runways or favorite routes of travel is most effective.

The Norway rat is uncommon in Florida, but can occur anywhere in the state. Rats occurring in sewers 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 and can enter houses 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 of new



Figure 4. Roof rat droppings. Credits: W. H. Kern, Jr., University of Florida

objects and has a very large home range, over 50 yards in radius. The Norway rat is very aggressive and will drive roof rats out of an area. However, both species of rats can be found in the same building, with roof rats in the attic and Norway rats in the basement.



Figure 5. Norway rat droppings. Credits: W. H. Kern, Jr., University of Florida

Sanitation and Exclusion

Proper sanitation will do a great deal to control rodent pests. All animals have three requirements for life; food, water, and cover. Removal of any one will force an animal to leave. The removal of debris such as, piles of waste lumber or trash, used feed sacks,

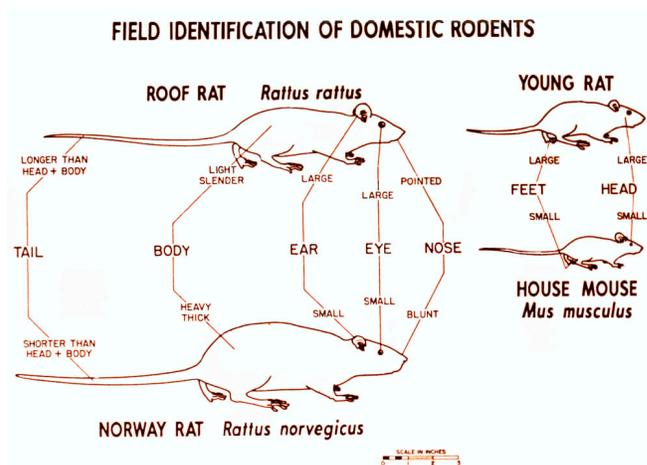


Figure 6. Comparison of Roof rat and Norway rat.

abandoned large appliances, and trimming the dead fronds from palm trees will substantially reduce the harborage for rodent pests. Stacked firewood stored for long periods provides good harborage for all three commensal rodents. Storage of pet food and seeds, such as wild bird seed, in rodent proof containers of glass or metal, will eliminate these food sources. Collect and remove fallen fruit from backyard trees and orchards. Keeping lids on trash cans and closing dumpsters at night will also make an area less attractive to rats and mice. The drainage holes in dumpsters should be covered with hardware cloth to keep rodents out. Trim tree branches at least 6 feet from the roof.

Exclusion is also called rodent-proofing. This involves making your home a fortress that rodents can not breach. Rodents can squeeze through any opening that their head can fit through. That is a 1/4 inch opening for mice and a 1/2 inch opening for young rats. Young rats and mice are the dispersing individuals, so these are the ones most likely to invade new areas, like your home. Any opening that a pencil can fit through will admit a mouse. Below is a list of recommended materials for excluding rats and mice.

1. 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, 1/4 inch or smaller mesh.
2. Cement mortar with a 1 part cement: 3 part sand mix or richer.
 3. Concrete with a 1 part cement: 2 part gravel: 4 part sand mix or richer. Broken glass added to mortar or concrete will deter rodents from tunneling through a patched hole before the material hardens.
 4. Brick, concrete block, tile, or glass will exclude rodents if in good repair.
 5. Wood will exclude rodents if no gnawing edges are present.

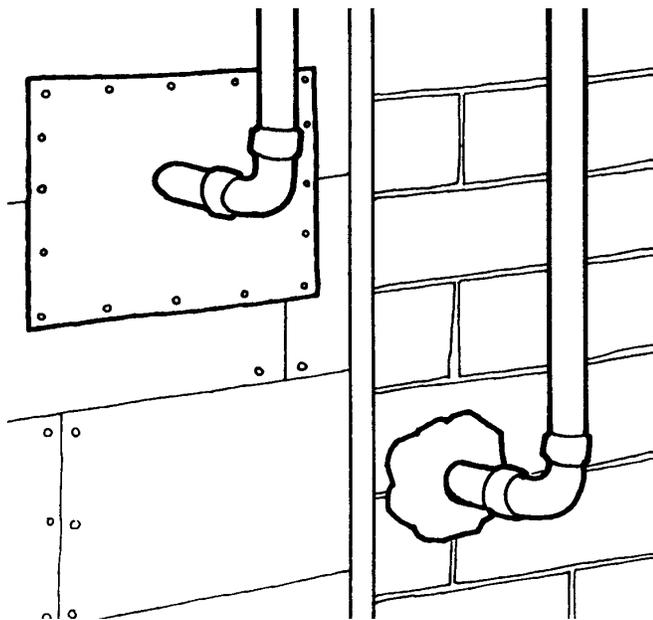


Figure 7. Rodentproofing openings around pipes with sheet metal (left) and concrete (right).

Traps

There are several main types of rodent traps; snap traps, multicatch traps, single catch live traps, electrocuting traps (Figure 19), and glue board traps. Snap traps (Figure 20) include the classic rodent traps with wood, plastic or metal base, chocker loop traps and 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. Traps can be isolated from

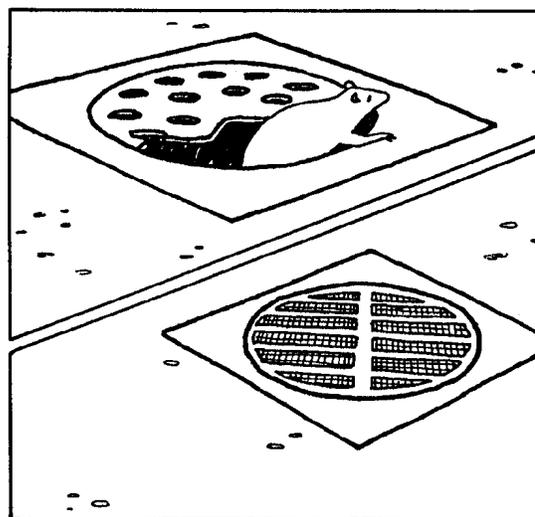


Figure 8. Rodentproofing drains with 1/4" hardware cloth.

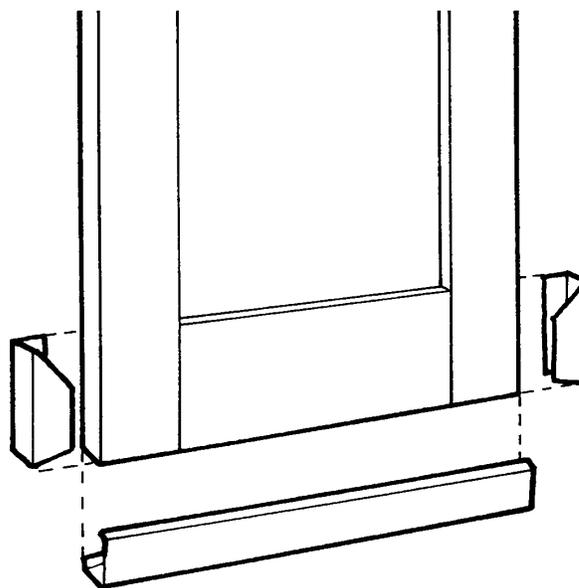


Figure 9. Rodentproofing a door, placing sheet metal channel at bottom and cuffs at sides, over channel.

children and pets by using trap stations made from wood or cardboard boxes. There are 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 type since it can also be baited. Older snap traps with other types of triggers can be modified to produce an expanded trigger (Figure 25).

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

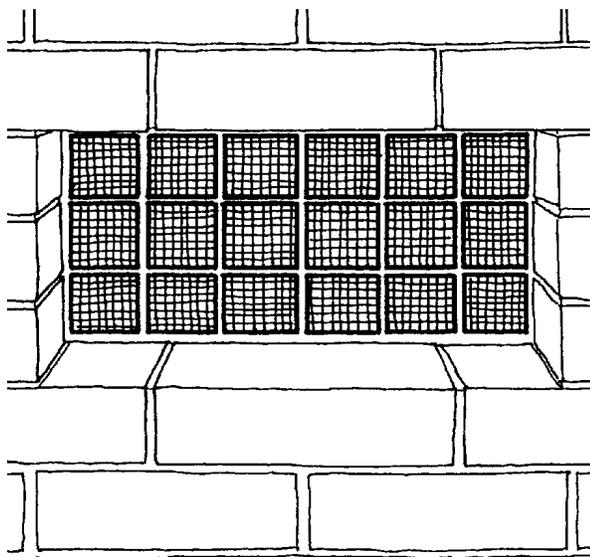


Figure 10. Rodentproofing a vent with 1/4" hardware cloth.

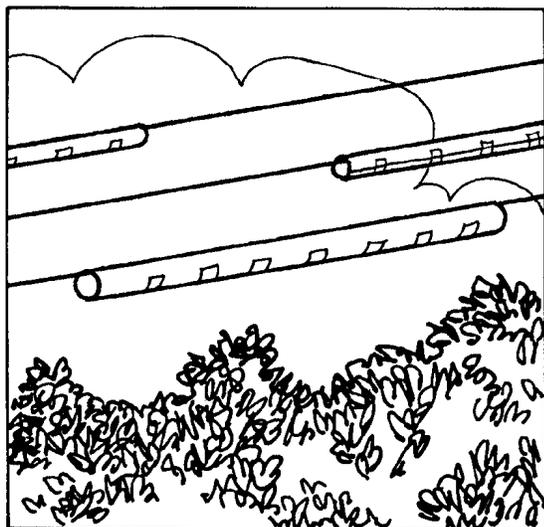


Figure 11. Rodentproofing phone lines and communication cables. Contact your power company for assistance with any power lines. Never work on live power lines yourself. Use 18-24 inch sections of plastic shower curtain rode covers. The tubes role when the rodents try to walk over it.

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 and traps should be set along walls (Figure 24 & 26), especially where objects such as a box or appliance will guide

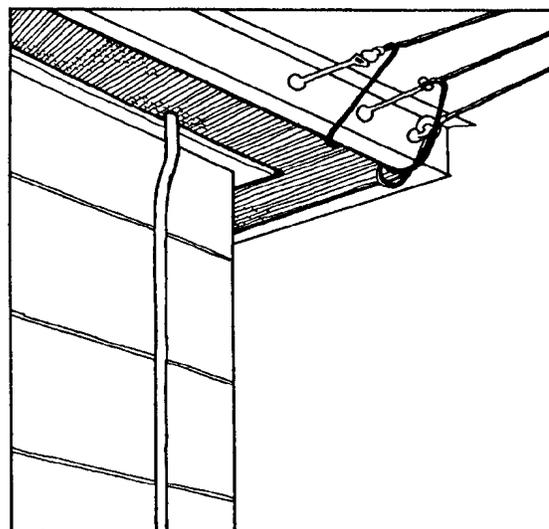


Figure 12. Rodentproofing openings where wires enter buildings.

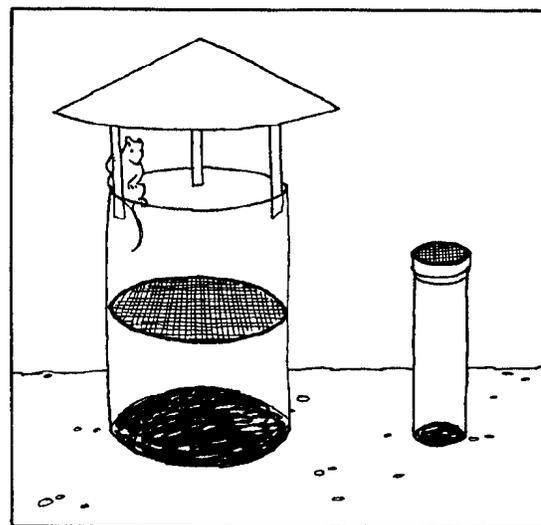


Figure 13. Rodentproofing air vents and chimneys using 1/4" hardware cloth.

them into the trap. The type of bait used depends on the species of rodent pest. Roof rats prefer to travel above the ground and are easier to trap along these precarious pathways than on the ground (Figure 21).

Multicatch traps (Figure 27) are designed to repeatedly catch a rodent and reset themselves for another capture. Advantages of these traps are the ability to capture several rats or mice with one setting and the scent from the captured mice entices others to the trap. The disadvantages are that the captured mice or rats are alive and must be dealt with and these traps can be expensive. Methods for dealing with the



Figure 14. Use steel wool, copper scouring pads, or hardware cloth to prevent rodents from climbing up the inside of the cover for the air conditioning lines from the outside unit. Credits: W. H. Kern, Jr., University of Florida

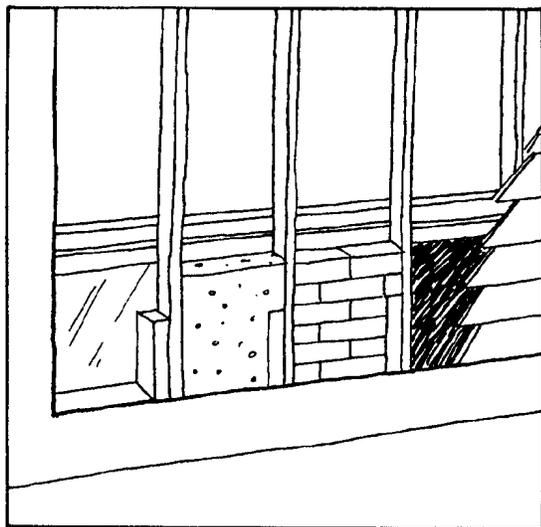


Figure 15. Blocking end spaces of wall void using sheet metal, concrete, brick, or wood.

captive rodents includes euthanasia with CO₂ in a CO₂ chamber, using drowning attachments available for some traps, or finding someone with a pet snake that eats mice or rats. The release of exotic rodents outside is illegal in Florida and is not a solution, since they will quickly find a way back into your home or someone else's. Trap-wise rodents are also more difficult to trap than naive ones. Multicatch traps

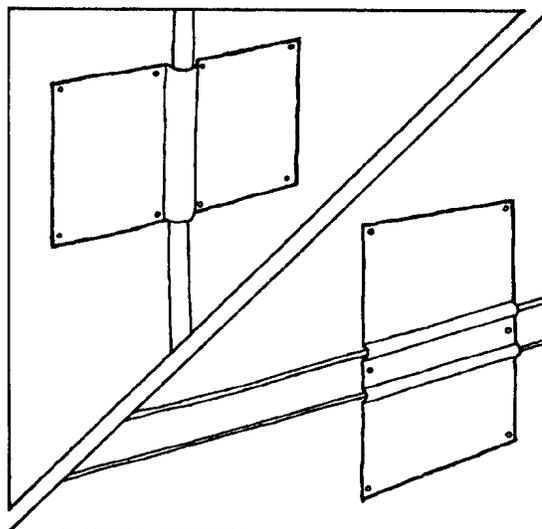


Figure 16. Rat guard over pipes and utility wires against a wall.

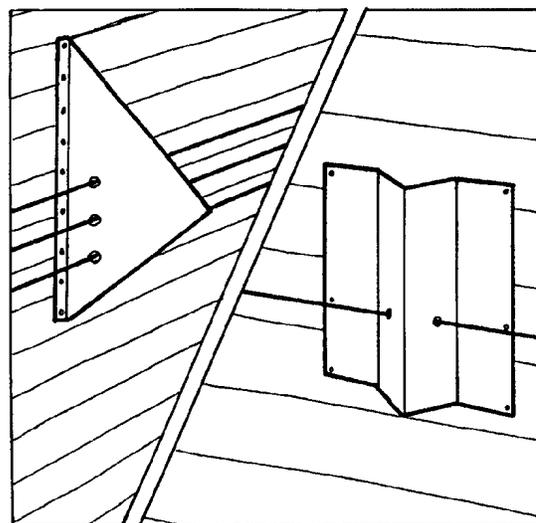


Figure 17. Rat guards for utility wires near a wall.

must be checked on a regular basis like any other trap to prevent the capture rodents from starving or dying of thirst and creating an odor problem. Several makes and models of multicatch traps are available.

Single catch live traps (Figure 28) are rodent-sized cage traps of various styles. These traps capture the rat or mouse alive and unharmed, but again you have to deal with the captured rodent.

The native rodents, cotton mice (Figure 29) and eastern wood rat, that occasionally invade rural and suburban homes can be released back in the woods with little chance of them returning indoors. They can

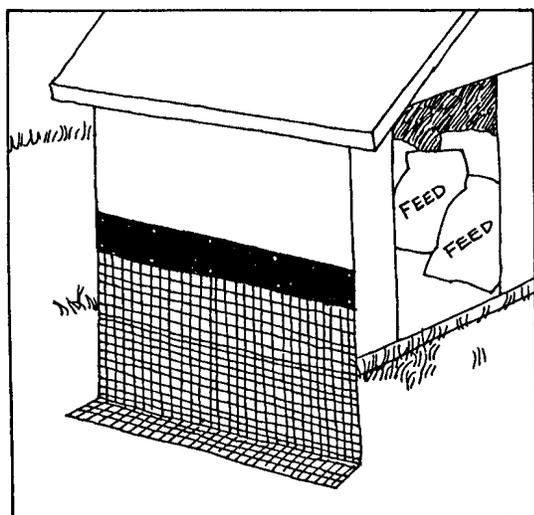


Figure 18. Hardware cloth curtain wall on a storage building. Top edge covered with strip of sheet metal.



Figure 19. Electrocuting trap.



Figure 20. Snap traps are humane, effective, and inexpensive. Many are designed to act as runway traps with expanded triggers and they can also be baited like traditional traps.

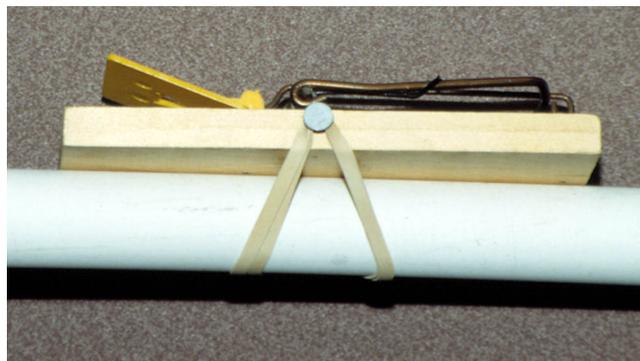


Figure 21. Securing snap trap placement on pipes, rafters or conduit using heavy duty rubber bands. Credits: W. H. Kern, Jr., University of Florida



Figure 22. Securing snap trap placement on rafters or fence boards using a nail through a pre-drilled hole. Credits: W. H. Kern, Jr., University of Florida

be recognized by their fine brown fur, white belly, large eyes, very large ears, and bicolored tail (brown on top to white on the bottom).

Live traps should be used in areas of Florida known to be occupied by endangered native rodent species, especially on barrier islands and the Florida Keys, to confirm the species of invading rodent and prevent the accidental killing of an endangered species.

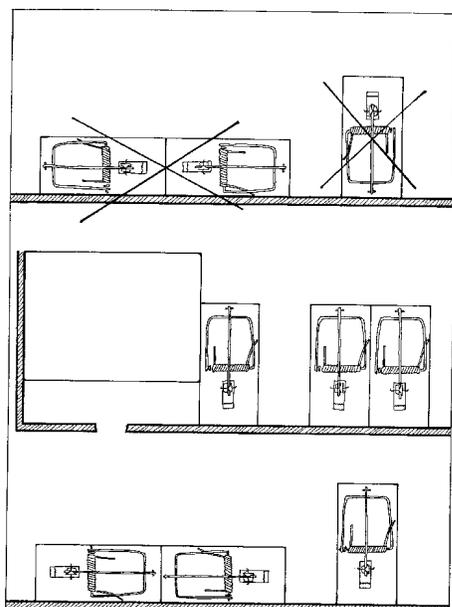


Figure 24. (Top) Improper placement of snap traps. (Middle) Proper placement of double traps and use of structure to guide rodents into traps. (Bottom) Proper placement.

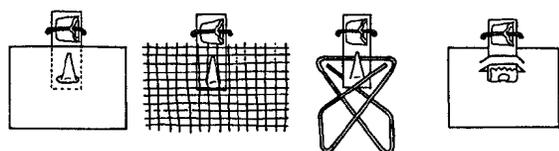


Figure 25. Methods of converting metal bait-triggers to expanded triggers for runway sets.



Figure 26. Snap trap by the wall. Credits: Florida Cooperative Extension Service, University of Florida

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 and mouse sized live traps are produced by several manufacturers.



Figure 27. Multicatch mouse traps. Credits: W. H. Kern, Jr., University of Florida



Figure 28. Single catch live traps. Credits: W. H. Kern, Jr., University of Florida



Figure 29. The native Cotton Mouse (*Peromyscus gossypinus*). Note white belly and bi-colored tail. Credits: James Castner, University of Florida

Glue boards are used just like snap traps. While both rat and mouse sized glue boards are made, these traps are most effective against mice. Rats are often strong enough to pull themselves free from glue traps. 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 till it is no longer sticky. These traps also should not be set where children or pets will contact them. Glue boards are not hazardous to children or pets, but the encounter will create a frustrating mess. 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 1/8 to 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.

Shooting

Shooting rodent pests is not an efficient method of control. If you choose to use this method, observe the following safety rules. Remember that discharging a firearm within city limits is illegal, as is the use of a firearm by a minor without adult supervision. A .22 cal. bullet can travel over a mile and can easily penetrate corrugated metal walls and roofs, so always be sure of your backstop when using this weapon or any firearm. The use of shot cartridges is safer than using solid bullets, since each of the smaller pellets possess less energy and it is easier to hit your target with a pattern of shot than a single bullet. When using any projectile weapon, always wear eye protection such as shooting glasses or goggles.

Rats are strongly nocturnal, so the best hunting is at dusk and after dark. A red or amber filter over your flash light will aid you in seeing your targets without alarming them. Rodents, like most nocturnal mammals do not see in color and do not seem to see in the red or amber wavelengths.

Predators

Predators are nature's method of controlling rodent populations. There are many native and domestic predators that feed on rats and mice. Snakes such as black racers, yellow, black, or gray rat snakes, corn snakes (red rat snakes), king snakes, Florida pine snakes (gopher snakes), and coachwhips are non-poisonous native reptiles that feed primarily on rodents and may help control outdoor infestations. Hawks and owls, especially Barn Owls, eat large

numbers of rats and mice. Nest boxes of the proper proportion will encourage Barn Owls and Screech owls to nest in your area and raise their young. Hawk and owl parents kill many more rodents when they are feeding their hungry broods. Foxes, bobcats, striped and spotted skunks, weasels, and mink will all eat plenty of rodent pests, but these wild predators avoid people. Domestic cats, dogs, and ferrets help in controlling rodents in some situations.

In general, dogs and cats are most effective at preventing an infestation than eliminating a current population. This is because they are better able to catch and kill an invading rodent that does not know any escape routes, than an established animal that knows numerous escape points. Cats are very effective predators of mice, but usually will not attack an adult rat. They will also kill birds at bird feeders, wild rodents, baby rabbits, and any small animals in your yard, so these factors must also be considered. To prevent cats from becoming a pest themselves, be sure to have any cat that goes outside spayed or neutered. This service is required and provided by most county humane societies at the time of adoption.

Pet ferrets will kill rats and mice indoors but should never be released outside. The establishment of wild ferret populations could decimate our native wildlife. Many people propose the mongoose for rodent control, but the importing, possession, or release of any mongoose is strictly illegal because of the ecological damage they can do. The mongoose has repeatedly shown a preference for native birds and mammals over commensal rodent pests.

Ultrasound Devices

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

Ultrasonic devices will not drive rodents from your home if food, water, and shelter are available. However, ultrasonic devices 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 considered against the increase in trapping effectiveness to determine if they are cost effective.

Ultrasonic devices can be heard by dogs, cats, hamsters, gerbils, and other pet mammals. They have been shown to cause hearing loss in dogs and should not be used around pets.