

Controlling Rats Around Structures



Montana Department of Agriculture
302 North Roberts
Helena, MT 59601

Montana has two rat species that invade structures. The Bushy-tailed wood rat (*Neotoma cinerea*), more commonly known as the packrat, and the Norway rat (*Rattus norvegicus*), also known as the brown rat. This guide describes rat behavior, the damage they cause, and effective control techniques.

LIFE HISTORY

Bushy-tailed wood rat

The bushy-tailed wood rat occurs statewide (except for the northeast corner) and is native to Montana. The rodent makes its presence known by the large piles of material it can collect or by the disappearance of items. It can grow to a total length (body and tail) of about 14 inches and weighs about 11 ounces. It has grayish fur, wide whiskers, and a fluffy tail, but not as fluffy as a tree squirrel's (Fig. 1). Feet, ear, and belly coloration can vary from white, pinkish, or buff. The back fur of juvenile packrats may have a bluish tint.



Figure 1. Bushy-tailed wood rat. Photo: Ken Cole/USGS.

Packrats occur throughout Montana except for the northeast corner. Their preferred nesting sites are in rocky areas, outbuildings, and badlands where plenty of branches, leaves, and other organic debris are available.

Some packrats even nest in the forks of trees well off the ground.

Packrat reproduction under natural conditions is not completely known. But researchers believe that mating occurs a few times a year (late January to July) with litters of one-six pups born usually between March and June with some as late as August.

Packrats feed primarily on vegetation and will spend a great deal of time gathering leaves, woody plants, and pine needles to store for winter.

Packrats will defecate and urinate in the same location repeatedly resulting in piles of oblong droppings and surfaces stained black/brown from urine.

As their common name suggests (i.e. packrat), bushy-tailed wood rats collect a wide variety of objects. They are active at night and do not hibernate.

Norway Rat

The Norway rat, also known as the brown rat, is a stocky rodent about 16 inches long (body and tail) and weighing 12 to 16 oz (See cover photo). Unlike roof rats (*Rattus rattus*), the tails of Norway rats are shorter than the length of their body. Norway rats can exhibit a variety of colorations from brown-grayish fur to almost black on the back with gray to white coloration on the underbelly and pink toes. Norway rats are not native to Montana and are typically found in our urban centers.

Norway rats are highly adaptable, able to live in the wild or in highly urbanized areas. Dens can occur in underground burrows or in attics.

Peak reproductive times are spring and fall. Twenty-two days after mating, females give birth to eight to nine pups. Pups reach maturity in eight to 12 weeks.

Norway rats are omnivores capable of eating plants, insects, and even small vertebrates, such as pigeons. The nutritional requirements of Norway rats actually mirrors human diets which explains why they thrive in areas where they have access to human food wastes.

DAMAGE

Rat activity can damage structures, consume and contaminate food sources, and spread disease. In structures, rats can gnaw wires and degrade insulation. They will tear into bags of dog food, bird feed, and grains. Their excrement can contaminate surfaces and food stores. They can also carry ticks and fleas capable of biting humans and transmitting disease.

RECOGNIZING RAT INFESTATIONS

The cryptic behavior of rats can allow small infestations of rats to go unnoticed for some time. Careful attention to your property can help you react quickly before the problem gets out of hand. Early signs of rat presence include:

- pets showing more interest in parts of the property,
- appearance of burrows,
- discovery of droppings,
- disturbance of food items, and

- hearing new noises in walls, attics, or crawl spaces.

Look for signs of rodent activity in areas where it is dark and cluttered. Investigate openings that are ½-inch or larger that will allow rats to enter. Smudge marks, hair and gnaw marks will signify the opening is active. Do not secure any openings until you have read the exclusion advice below. While most rat activity will be near ground level, keep in mind that they are capable climbers.

CONTROLLING RATS

Management of rats requires a multifaceted approach to obtain desired control as there are no silver bullets. The more tools and techniques you can employ the better your results will be.

Habitat Modification

Habitat modification involves making the area less hospitable to rats by reducing their access to food, water, and shelter. People avoid this control method from the mistaken notion that habitat modification only works if done completely. Fortunately, small changes can have a big impact on rat presence. So, do not think that any effort is too small to matter. Total elimination of rats through sanitation alone, however, is almost impossible, as rats can survive on a diversity of foods. On the other hand, any neglect of sanitation will cause even the most aggressive control efforts to fail, due to their rapid reproductive rates.

Reduce Availability of Food & Water. Bird feeders and stored pet food are common food sources for rats. Store bird seed and pet food in tight-fitting bins. Modify bird feeders to reduce spillage of seed. A publication

detailing how to modify your bird feeders can be downloaded from <https://bit.ly/modifybirdfeeder>.

Avoid feeding pets outdoors. If indoor feeding is not practical, then provide pets only with enough food to be consumed in one meal. Secure trash cans and dumpsters.

Grade roads to prevent water pooling. Ensure that roofs (particularly flat ones) drain properly. Do not allow downspouts to empty close to structures.

Reduce Clutter. Rats rely on debris to give them cover while moving around the area. Do not allow wood, old vehicles, etc. to collect near structures. Establish a vegetation-free zone (3 feet or wider) around the perimeter of buildings. Trim overhanging branches and do not allow shrubs to reach eave height.

Rodent-resistant construction. Hardening your buildings against rodent entry is the most cost-effective way to prevent damage by rats. Rodents are attracted to buildings when they detect openings and escaping heat. Secure all openings larger than 3/16 of an inch. Typically, gaps less than 1/2 inch wide may be secured with a silicone-based sealant. Wider openings will require a backing to help hold the sealant in place. Two products that are flexible enough to squeeze into odd-shaped areas and will not rust like steel wool include Xcluder™ and Stuf-Fit. Complete the job with the appropriate type of sealant to prevent air movement. Expandable foam products are great ways to stop air flow but cannot stop rats or even some insects. When using expandable foam, be sure to secure the outside with aluminum flashing, wood, or other durable material.

Larger openings can be secured with wood, aluminum flashing, concrete or 1/4-inch wire mesh. Doors, windows and screens should fit tightly. Cover the edges of doors and windows with metal to prevent gnawing. Latex, plastic, rubber, wood less than 1/2 inch thick, or other soft materials are unsuitable for plugging openings used by rats.

Exclusion Safety

Think carefully before securing openings larger than 1/2 inch in diameter or larger. Could they lead to a void occupied by bees, bats or larger animals? If you are unsure, take the time to check. The last thing you want to do is to trap bees or animals like bats, birds, or squirrels inside the structure. Inspect the opening repeatedly for several days. Do you see any insects? Are there any droppings? Do you see any brown smudge marks left on the edges of the hole that could signify that an animal was squeezing through? Consider crumpling up some newspaper and using it as a cork for the hole. Monitor the paper for at least five days of continuously good weather. Animals often will be able to push or chew through the paper. At the end of the time period, if the paper is undisturbed, you can be reasonably confident that the hole is inactive and may be secured.

Prevent rats from burrowing around outbuildings and along foundations by placing 3 inches of 3/4 inch crushed rock around the perimeter or install 1/4-inch hardware cloth (Fig. 2).

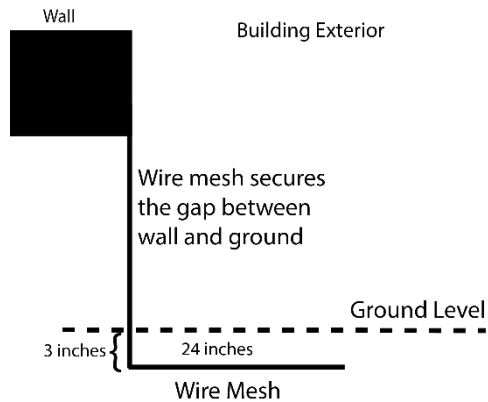


Figure 2. A diagram showing how to install the 1/4-inch hardware cloth to prevent rodent burrowing. Image: Stephen M. Vantassel/MDA.

Population Reduction

Rat populations can be managed through the use of traps and toxicants.

Traps. Trapping is the preferred method for controlling rats in homes, schools, hospitals and other sensitive areas for several key reasons: 1) it is pesticide free; 2) it permits users to view their success; 3) it is versatile, as traps can be placed in a variety of areas and ways; and 4) it allows for disposal of trapped rats, thereby eliminating the potential for odors and flies from rat carcasses. In situations where children or pets may interfere with traps, place them out of reach or in homemade boxes with one-inch holes cut in them. Traps may also be placed in professionally manufactured bait stations.

Snap traps come in a variety of models and designs. All are effective in catching rats. Traps with expanded triggers, however, have a higher capture rate. (Fig. 3).



Figure 3. Expanded trigger (left) and traditional trigger (right) rat traps

Modify wooden-base snap traps before using them to increase striking power (Fig. 4). Rats are strong and escape snap traps, especially those with weak striker bars.



Figure 4. The left trap has a washer to under the spring tines to prevent them from embedding in the wooden base. This technique increases the trap's striking power (watch your fingers) and improves capture/kill rates.

Set triggers to the firm setting (if an option) so the traps will spring when the rat is fully engaged with the trap. Place traps with the narrow bait end perpendicular to the wall (Fig. 5). Traps positioned in this way can be baited or not. If you decide to bait, use peanut butter, caramel, chocolate, whole canary grass (*Phalaris canariensis*) seed, or nesting material, such as cotton balls and soft cloth.

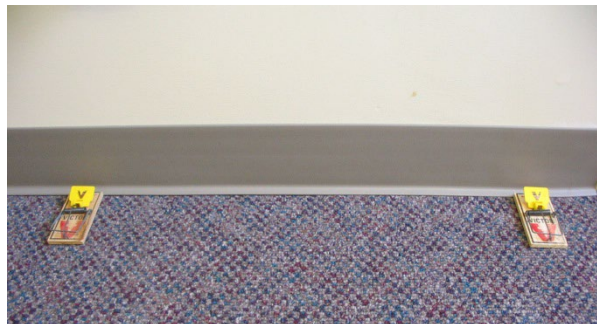


Figure 5. Traps set abutting wall.

Double setting (placing two traps close to each other) is recommended in situations with high rat activity. Be sure that at least one inch separates traps placed in a double set to prevent the firing of one trap from prematurely triggering the other.

If you must place traps with the long-edge against the wall, then be sure the triggers of the traps face outward as illustrated in Figure 6.

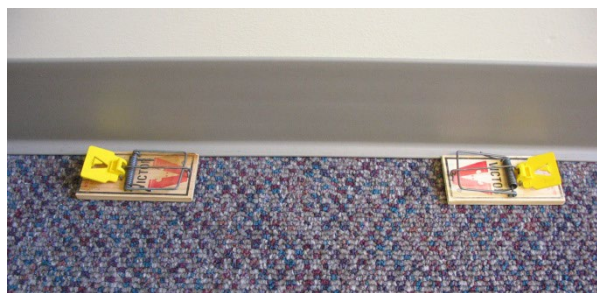


Figure 6. Traps set sideways against a wall.

Pre-baiting unset traps is strongly recommended. Pre-baiting conditions the rats to the bait and traps and allows you to assess activity levels. Place baited and unset traps in areas where rats are active. Do NOT over bait (Figs. 7-8). Check traps each morning as rats are most active during the evening. Rebait as needed. Add additional traps in areas where activity is high. After a few baiting cycles, set all the traps. Experience has shown that this method increases the speed of trapping programs. Don't be surprised if the traps are

untouched for up to 14 days. Rats are neophobic, meaning they are afraid of new things. Be patient. They will interact with the baited and unset traps when they are comfortable.



Figure 7. Top. Place bait in the cup identified by the red circle NOT over the entire yellow pan.



Figure 8. For cup-style snap traps, do not overfill as in the left trap. Fill the cup only halfway (right trap) so the rat pushes its nose into the trap to spring it.

Successful trapping requires setting enough traps where rats are active. Inside structures,

concentrate your efforts in areas where you have seen rat droppings or other activity. Pay special attention to areas within 50 feet of food sources and warm spots, such as refrigerators, appliances with pilot lights, and water heaters. Place traps behind objects, in dark corners and in areas where droppings have been found. Concentrate traps in areas where rat activity is evident.

Glueboards. Sticky traps catch and hold rodents attempting to cross them, in much the same way that flypaper catches flies. Many users consider them to be a convenient alternative to snap traps. But they often only capture juveniles because the stronger and sometimes wiser adult rats either avoid them or free themselves from the glue.

If you choose to use glueboards, set them along walls or at pinch points where rats travel. Do not place them in corners as rats slow down at those locations. Some glueboards are scented with attractive odors, while others are unscented. Both are effective. Never place peanut butter directly on the glue, as the peanut oil will dissolve the glue, rendering it ineffective. Rather, place the peanut butter inside a plastic soda bottle cap and set it in the middle of the glueboard. Be aware that glueboards lose their effectiveness as dust collects on the surface. Extreme temperatures also can reduce the tackiness of glue boards. In freezing conditions, consider purchasing glueboards designed for cold conditions. Do not use glueboards where children, livestock, pets, or desirable wildlife can contact them. If a child or non-target animal gets caught, use vegetable oil to dissolve the glue. Use care to avoid being bitten by trapped animals.

Envelopment Traps. Cage traps (wire-mesh walls) and box traps (solid walls), commonly called “live traps” can be used to capture rats. Traps should be no smaller than 7 x 7 x 28 inches with mesh no larger than ½-inch weave. Cage traps are more effective in capturing rats than box traps. Check daily. Under no circumstances are rats to be transported to new locations and released.

Captive Bolt Traps. Inventors have created repeating traps that entice rats to poke their head into a chamber, where it is struck by a bolt. While rats do not appear to be bothered by the presence of dead rats at the trap site, typically scavengers will remove any dead rats they happen to encounter. Two brands are available, Goodnature® A18 and the Thanos MK47. More work needs to be done to determine best practices with these devices, particularly with bushy-tailed woodrats. The Vertebrate Pest Specialist welcomes any feedback from those who have had experience with either of these traps.

Rodenticides

Toxic bait rodenticides come in a variety of active ingredients and formulations. Some rodenticides are classified as Restricted Use Pesticides (RUP) and require a pesticide applicators license to purchase and use. Most, however, are unclassified and available for purchase by the public. In general, it is expertise that solves a rodent problem, not whether a rodenticide is an RUP or not. If you are not successful on your own, you may contact the Vertebrate Pest Specialist (contact info at the end of this document), a pest control operator, or obtain your own training and Pesticide Applicators License by contacting the Montana Department of

Agriculture at <https://agr.mt.gov/Pesticide-License-Program> or calling (406) 444-4900.

Whenever using pesticides, you must follow the label instructions. The label is the law. For vertebrate animals, (those with a spine), this means the rodenticide label must specifically list the species or animal group you want to control. For example, most rodenticides will list Norway rats on the label. However, only a few will list pack rats. If you have pack rats and want to use poison to control them, the label **MUST** specifically state that the poison may be used on packrats.

Anticoagulant rodenticides. Rodenticides are classified by their active ingredients. Anticoagulant rodenticides generally are considered safer than non-anticoagulant rodenticides because of their lower toxicity and known antidote, Vitamin K.

Anticoagulants cause death by preventing the blood's ability to clot. The active ingredients are used at very low levels, so bait shyness does not occur when using properly formulated baits.

First-generation anticoagulant rodenticides, using the active ingredient (FGAR):

- Chlorophacinone,
- Diphacinone, or
- Warfarin,

may be purchased without a pesticide license. FGARs require rats to feed for several days to obtain a lethal dose. Therefore, fresh bait must be made available to rats continuously for at least two weeks, or as long as feeding continues.

Second-generation anticoagulant rodenticides, using the active ingredient (SGAR):

- Brodifacoum,
- Bromadiolone,
- Difenacoum, or
- Difethialone,

may require a license to purchase.

Understanding Pesticides

Pesticides are chemicals registered by the EPA to control plants, insects, and vertebrate pests. Rodenticides are pesticides designed to kill rodents. Read labels carefully to ensure that the pesticide is appropriate to control the species for the site. Many rodenticides, for example, are not labelled for the control of bushy-tailed woodrats or use outside of a bait station. Other restrictions may apply. Target species are the organisms which we want the pesticide to affect. Non-target species are the organisms that we do not want the pesticide to affect. For example, if we use a pesticide to control rats, we don't want it to kill songbirds or pets. Restrictions on pesticide labels are designed to balance the need for control of the pest species with protection for non-targets.

Pesticides also have primary and secondary hazards. Primary hazards are the effects a creature experiences directly from the pesticide. For example, a rat that eats some toxicant and dies has suffered the primary hazard of the pesticide. Secondary hazards occur when the animal affected by the pesticide is consumed by another animal which suffers negative effects of the same pesticide. Secondary hazards are often associated with anticoagulant rodenticides, and particularly with SGARs as these toxicants persist in the livers of poisoned rodents longer than FGARs. Predators and scavengers that consume enough poisoned rats will often suffer illness and sometimes death through secondary poisoning.

Proper pesticide use requires careful balancing of control and risk. Always follow the label.

SGARs require rats to feed only once to receive a lethal dose. Unfortunately, due to the delayed effect of the toxicant, rats can continue to consume toxic bait for several days, thereby increasing the amount of poison in their bodies. Since SGARs present a significantly higher risk of secondary poisoning, it is best to try to achieve control using FGARs first. Second-generation anticoagulants are most useful in settings where rodent access to food cannot be sufficiently reduced (see Understanding Pesticides).

Rodenticide Myths. Ideas suggesting that poisoned rats go outside to seek water, or roam to the middle of the room are little more than hopeful speculation. Whether dead rats will cause an odor depends on the number killed, the location of their demise, relative humidity and airflow, and the sensitivity of the resident's nose. If the risk of bad odors is a significant concern, then reduce the rat population through trapping before using toxicants.

Non-anticoagulant rodenticides. A non-anticoagulant rodenticide (NA) uses the active ingredient,

- Bromethalin,
- Cholecalciferol, or
- Zinc Phosphide.

Non-anticoagulants kill rodents in ways other than bleeding and are more acutely toxic than anticoagulant rodenticides, and thus can provide quick knockdown of rat populations. No antidotes are available for NA baits, however, making their primary hazard high. Primary hazards can be reduced by using bait stations. Despite their primary hazard, non-

anticoagulant rodenticides may have lower secondary hazards than second-generation anticoagulants. Non-anticoagulants are available for purchase without a pesticide license.

Proper Use of Rodenticides

Use fresh bait. Remove bait that has become moldy or contaminated with foreign odors. Remove all uneaten bait at the end of a baiting program. Read the label for details regarding the proper disposal of toxic baits.

EPA regulations require that all rodenticides be applied in a manner to reduce access by non-target animals. Bait stations (bait boxes) are designed to protect bait from non-target access (Fig. 12).

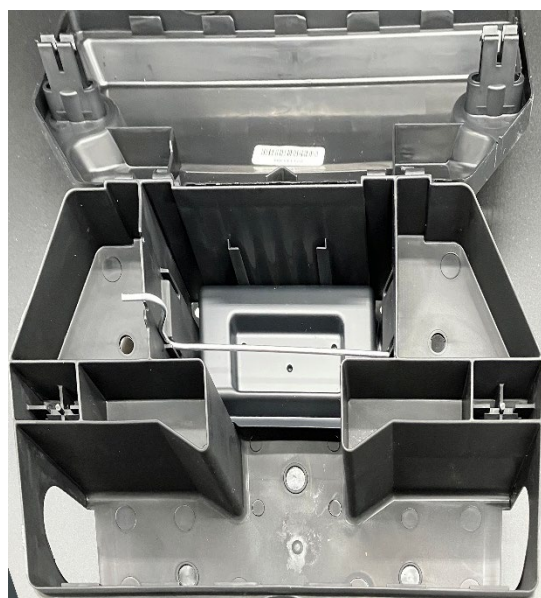


Figure 9. Inside of a rat-sized bait station showing bait area and entrances.

Choose the bait station tier (Table 1) needed to protect the bait from non-target animals in your area. Bait stations provide rats with a dark space where they feel safe and able to eat enough bait. Bait stations should have at least two openings, about 2½ inches in diameter, and should be large enough to

accommodate a feeding rat. Place bait boxes next to walls (with the openings close to the wall) or in other places where rats are active. If not already marked, clearly label all bait boxes "Caution - Rat Bait." Establish bait stations in and around the perimeters of buildings where it is impossible to exclude rodents. Place fresh bait in these stations to control invading rats before breeding populations become established as instructed by the label.

Table 1. Rodenticide Bait Stations Tier System.				
Bait Station Capabilities	Tier 1	Tier 2	Tier 3	Tier 4
Resistant to Children	Yes	Yes	Yes	No
Resistant to Dogs	Yes	Yes	No	No
Resistant to Outdoor Weather	Yes	No	No	No
Resistant to Indoor Conditions	Yes	Yes	Yes	Yes

Proper placement of bait stations is essential for successful control. Place stations where rat activity is evident (e.g. droppings) or as close as possible to those locations (preferably within 10 feet). For rats living in wall spaces, place stations where rats can exit the walls such as along pipes, above drop ceilings, in attics, and on foundation sill plates. Consider placing stations inside wall voids if other access points are not available. Use of bait in food preparation areas is not advised and likely illegal. All rodenticides used in these areas should be placed in tamper-resistant stations and should be placed in secure areas, out of the reach of unauthorized people.

Check bait stations every few days at the beginning of your control program to ensure

that an adequate supply of bait remains available. Ensuring an adequate supply of bait in the station is critical for success with all rodenticides, particularly anticoagulants.

Sometimes rats avoid or become resistant to a particular toxicant. Bait spoilage, poor placement, or the availability of other food sources are the usual causes of bait avoidance behavior. Correcting those issues will usually resolve the problem. If it doesn't, then consider switching to a toxicant with a different formulation. If control is still not being achieved, switch to a different active ingredient.

Use of Toxicants. Toxicants are an important tool in the management of rodent pests. But despite their value, all rodenticides present some degree of hazard to humans, livestock, pets and other non-target animals. To reduce the negative consequences of toxicants, be sure to:

1. Read the toxicant label thoroughly before purchasing and using the product. Make sure that the product permits use for the species and sites you wish to manage.
2. Carefully follow all product label recommendations. The label is the law.
3. Use FGARs whenever conditions permit.
4. Use block or sachet rodenticide formulations to reduce the risk of rats translocating loose bait to unsecured areas.
5. Place baits where only the target rodents can access them.
 - a. Use bait stations suitable for the environmental conditions (Table 1). For example, outdoor bait stations are stronger and more durable to resist

access by wildlife and damage by the elements.

- b. Make sure all bait containers and bait stations are clearly labelled with appropriate warnings.
 - c. Store unused pesticides in their original labelled container in a cool, dry and locked cabinet or room out of the reach of children or animals.
 - d. Consider using rodenticides mixed with the bittering agent denatonium benzoate (Bitrex®) to reduce the chances a pet or child will consume the bait.
6. Pick up all accessible dead rats during a poisoning program.

25b Rodenticides. 25b rodenticides are made from products that the Environmental Protection Agency considers “minimal risk” and thus do not undergo the rigorous testing requirements of Schedule 3 rodenticides (i.e. those with an EPA Reg. No.). Those interested in using these products to control rodents should experiment with the products to determine if they work to resolve their particular problem before placing full reliance on the products for long-term control and/or regular use. The Vertebrate Pest Specialist welcomes comments from users about their experience with 25b rodenticides.

Birth Control for Norway Rats

Senestech, Inc. sells two products that prevent Norway rats from reproducing. ContraPest® (EPA Reg. No. 91601-1) and 25b product, Evolve®. Both require rats to continuously feed on the product to prevent pregnancy. The benefit of these products lies in their low toxicity risk to non-targets when used according to the label. The downside of their

use is that while they prevent increased numbers of Norway rats, the population does not decrease in the short term. Therefore, the manufacturer suggests using birth control in combination with toxic baits or as a secondary treatment following an initial knockdown with toxic baits.

Repellents

A variety of chemicals are touted to be noxious to rats. While research has confirmed the efficacy of some ingredients in laboratory conditions, proof of their effectiveness in real-world settings is usually lacking. Readers choosing to try repellents should consider the following: 1. Make sure the product is registered to use in Montana. 2. Follow label directions carefully, and 3. Check the manufacturer’s return policy in case the product does not fulfill your expectations.

Confirming A Product is State Legal

All pesticides (which include repellents) must be registered by the Montana Department of Agriculture. Do not assume online products are registered in Montana. To check a product’s registration, visit <https://www.npirs.org/state/> to see if it is registered in Montana. You can search on the products EPA Reg. No., by the brand, or manufacturer name.

Electronic devices. Ultrasonic sounds (those above the range humans can hear) are frequently marketed as an effective way to frighten rats from a structure. Ultrasound, however, has numerous limitations. First, multiple units need to be used to cover three-dimensional space. Second, the sound does not penetrate walls, turn corners, or extend for any great distance. Researchers have found little evidence that electronic, sound, magnetic, or vibrating devices can evict established rodents from buildings or

otherwise provide adequate control. Electronic devices, audible or ultrasonic, are not recommended for the management of rodents.

Biological Controls

Owls, weasels, foxes, and other native predators kill rodents, and their presence should be encouraged. However, they will not provide sufficient control to prevent or eliminate rodents in and around structures. The same can be said of house cats. The fact is rats often live quite well in close association with cats and other pets, even consuming pet food. Effective control of rats requires diligent management of habitat, food, water, and access.

DISEASE SAFETY

Rats, like all animals, are associated with many diseases that can afflict humans and livestock. Rats spread diseases in two primary ways. First, they spread disease agents through their feces and urine. Second, they can spread disease through their feet and hair. Since rats walk through contaminated areas, they can move disease agents by walking and shedding hair.

Always wear protective gloves when handling carcasses and equipment used to manage rodents. Wash your hands thoroughly before eating, drinking, using your phone, or smoking.

Clean up Procedures. If you are dealing with a site that has been heavily contaminated by rodents, follow CDC guidelines for hantavirus. Though rats are not a key source of hantavirus, mice may have been present.

For more information on rodent diseases visit the Centers for Disease Control web site—<http://www.cdc.gov> or contact your local Health Department.

DEPARTMENT SERVICES

As with most programs, rodent control will be most effective when all affected landowners work together. The Montana Department of Agriculture vertebrate pest specialist program will work with county commissioners, extension agents and landowners to establish a program suited to local and county needs. Field demonstrations are provided to inform landowners how, when and where to control rats and other field rodent pests. Interested individuals should contact the Montana Department of Agriculture.

In Lewistown:

Stephen M. Vantassel, ACE

Vertebrate Pest Specialist

Phone (406) 431-7720 svantassel@mt.gov

Additional printed information on the control of ground squirrels and other vertebrates is available from the Montana Department of Agriculture website

<https://agr.mt.gov/Vertebrate-Pests>

MONTANA POISON CONTROL
(Emergencies) 1-800-222-1222

MONTANA DEPARTMENT OF PUBLIC HEALTH & HUMAN SERVICES
Injury Prevention Program
1-406-444-4126
<https://dphhs.mt.gov/>

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CREDITS

Cover. George Shuklin, with Stephen M. Vantassel

Fig. 1. Ken Cole/USGS

Fig. 2-9. Stephen M. Vantassel; Montana Department of Agriculture