



House Mice are Serious Pests

The house mouse (Figure 1) is a troublesome pest and a frequently encountered rodent in the United States. Adult house mice are small ($\frac{1}{2}$ -1 ounce), grayish brown rodents measuring about 5-6 inches in length including the tail. They have a pointed snout, black slightly bulging eyes, almost hairless ears and tail, and the tail is marked with scaly ring marks. The belly has lighter colored fur compared with the rest of the body, but it is not white. House mice breed rapidly, eat many kinds of food (Figure 2), need little or no water, and adapt quickly to different and changing environments.

In homes house mice feed on human food (Figure 3), pet food, and trash. They contaminate food, food preparation surfaces and other areas of the home with their droppings and urine (Figures 4 and 5). Mice burrow into furniture, and chew on electrical wires and wooden beams causing structural damage to buildings. House mice can also spread disease-causing pathogens and parasites to humans and pets. This includes certain viruses, fungal pathogens, the bacterium *Salmonella* (a common cause of food poisoning), mites, tapeworms, and ticks. House mice have not been found to carry hantavirus. However, their urine contains allergens that circulate in the air and can be asthma triggers for sensitive individuals. For all these reasons, house mice should not be tolerated inside homes.

Purpose of This Guide

This guide will help property managers understand how house mice become pests in multifamily housing and how to eliminate infestations using an integrated pest management (IPM) approach.

IPM is a systematic strategy for eliminating pests that focuses on eliminating the root causes of an infestation, rather than applying a short-term fix.

Information in this bulletin describes:

- Why house mice are serious pests and what property managers can do to improve pest management practices.
- How to work with staff and residents to eliminate mice.
- The signs that indicate a mouse infestation.
- How to exclude mice from buildings.
- How to avoid inviting mice indoors.
- Working with a pest management company to eliminate mice.
- The tools and methods used to control mice including snap traps, glue boards, rodenticides and how to dispose of dead mice.

Mice in Multifamily Housing

If buildings have gaps around doorways, wall-penetrating conduits or under roof lines, it is easy for mice to invade. Adult mice can get through a dime-sized gap, and young mice can squeeze through smaller spaces.



Figure 1. An adult house mouse. Photo: Shutterstock

Homes often provide ideal temperatures, plentiful food and nesting materials, and protection from outdoor predators. Mice are often drawn to buildings by warmth and food odors coming from apartments and homes.

House mice have some limitations to their vision but can detect movement from 45 feet away. They have excellent hearing, smell, and taste. Additionally, house mice have developed an extremely acute sense of touch that allows them to memorize a detailed map of their environment. They are light, strong for their size, and very agile. House mice can run up vertical walls at high speed. They can use wires and utility cables to travel around, jump 12 inches in one leap, and survive an 8-foot fall.



Figure 2. House mice reproduce rapidly and consume a wide variety of different foods. Photo: Shutterstock



Figure 3. House mice eat human food and contaminate food and kitchen surfaces with urine and feces. Photo: Shutterstock

Once indoors, house mice establish a home base close to food and harborage opportunities that provide shelter and warmth. Inside buildings mice are commonly found in wall voids, basements, and in kitchens under the stove, the sink, and other appliances. Larger populations will expand into any room in a house or building.

Signs of a Mouse Infestation

Droppings: House mouse droppings are between $\frac{1}{8}$ and $\frac{1}{4}$ of an inch long, similar in size and shape to rice grains. They defecate at or near where they feed and near, but not in their nest. They urinate continuously producing thousands of microdroplets of urine each day. The urine fluoresces and can be seen using a black light (UV) in an otherwise dark room. However, it is important to be aware that many substances fluoresce under UV light including some cleaning solutions.



Figure 4. Droppings within the kitchen stove (left). **Figure 5.** Droppings in wall insulation (right). Mice leave droppings where they hide, and where they travel. Photos: Susannah Reese, StopPests

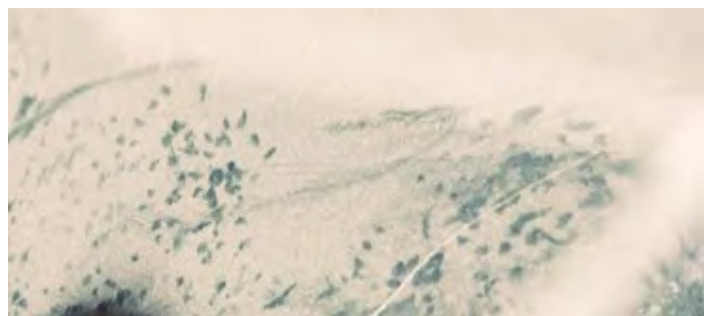


Figure 6. Rodent footprints and tail swish marks. Photo: Shutterstock

Droppings can tell us where the mice are hiding and where they usually travel. This can help you determine which entry points need sealing up, food supplies that may be contaminated, and the best locations to place traps to catch indoor mice.

Tracks: Footprints may be found in house dust, spilt flour, or other powdery substances (Figure 6).

Teeth marks and chewing: Small holes in food packaging, chew marks on belongings and edges of baseboards and walls are all signs of mouse activity. Check food packaging in storage cupboards for spills and holes. Look for holes into protective voids which have tooth marks and/or fine hairs around the edges. House mice passing through entry points leave hairs attached to the edges of the openings. The hair is quickly lost so finding gaps with hairs attached indicates a current infestation as opposed to a historical one.

Sound: Listen for quiet scampering and scratching in wall voids and above ceilings, or occasional squeaks that are inconsistent and more common at night. If sounds are consistent or predictable this indicates a mechanical or structural issue unrelated to wildlife.

Nests and stash piles: House mice build nests in undisturbed, enclosed spaces (Figure 7). They shred fabric, paper, cardboard, furniture stuffing, wool, building insulation, and plant material to form loose ball-shaped nests 4-6 inches in diameter. Chewed paper or cloth is often found in infested homes, although the actual nests may be very difficult to locate, even for pest management professionals. House mice will also hoard food in stash sites within their limited range of travel (Figure 8). So, finding piles of cached pet food, human food scraps, and other edibles is quite common when an infested home is undergoing a deep clean and clutter removal.

Pantry pests including several small beetle and moth species may be traced back to a house mouse food stash, nest, or dead mouse carcass.



Figure 7. Mice nesting in insulation (left). Photo: NYS IPM Program.
Figure 8. A stash of rodenticide pellets (right). Photo: Phil Coles

Smudge marks (rub marks): These marks occur along frequently used travel routes on baseboards, pipes, and other conduits. They darken over time as oil and dirt rubs off the rodent's body as mice move along the same routes of travel repeatedly (Figure 9). Smudge marks contain chemicals mice use to communicate and should be removed by cleaning with soap and water.



Figure 9. Rub marks can tell us where mice travel. They entered this apartment through this hole from the wall void. Photo: Susannah Reese, StopPests

Shredded materials: House mice will use insulation materials to nest within. They will also move insulation materials to nest sites. Finding wall void and attic insulation pulled out or in unexpected places can be an indicator of mouse activity. Mice will remove the fabric insulation found in modern stoves as this is ideal nesting material (Figure 10).



Figure 10. Stove insulation is pulled out for nesting material under a stove. This is a common place to find nests, there's food and warmth. Photo: Susannah Reese, StopPests

Odor: House mice have a musky ammonia smell that is often more noticeable in enclosed areas like pantries,

cabinets, and drawers. The urine smell is often stronger along baseboards and walls that they move along depositing microdroplets of urine as they go. Extremely pungent odors of decay can result from dead mice as their bodies decompose.

MYTH: “Clean and tidy apartments and homes will not have mice.” Unfortunately, this is simply not true. Once multi-unit buildings have a significant number of units infested, you can expect to receive reports of mouse sightings from even the cleanest and tidiest apartments. Similarly, many clean and tidy single-family homes find themselves with uninvited four-legged visitors from time to time.

Key Pest Management Elements for Managers to Understand

Inspection and Monitoring: Tenants and staff should be familiar with the signs of mice and report findings to management. Reporting is a critically important component of house mouse management in any property. There are effective electronic monitoring systems, and these are best utilized in basement, attic, and crawlspace areas where they will not be disturbed by the everyday activities of residents or pets. Glue boards can be useful in certain situations, but they rarely catch adult mice, and should not be used where children or pets can access them. The physical inspection of properties is the most effective method of detecting a mouse infestation. Therefore, to control mice throughout buildings, it is important to do a whole building inspection. This involves a physical inspection of all common rooms, offices, storage areas, boiler rooms, and each unit/apartment. Within each unit, the kitchen, dining areas, and bathrooms must be checked. However, even thorough inspections and monitoring may not reveal all the mice.

Mice often reside in wall voids, and interior spaces above ceilings and below floors, and may rarely venture out into the open. Complete building assessments should include the setting, collecting, and review of traps. Traps are best placed in kitchen and utility closets against a wall inside a cabinet, under a sink, or between the refrigerator and cupboards.

Traps should **not** be accessible to children or pets. Traps should also be dated and can be left in place for days or weeks depending upon the situation. Trap catch counts can then be used to see how widespread an infestation is and how high the populations are. Ideally, all units should be inspected at least one or two times a year if there is no history of mice, and quarterly if there is a history of mice in a unit.

Record keeping: Keep and review records of inspections, monitoring, and trapping with the help of your contracted pest management service provider. Ensure corrective maintenance issues identified by pest management technicians are completed promptly and hold pest management service providers accountable if mouse infestations do not decline over time.

House mouse movement into buildings is often seasonal or can be an ongoing battle. Mice can enter through open patio doorways and windows, even using upper floor entry points. Sealing up entry points and trapping should however reduce or eliminate indoor populations over time. Review your building records periodically with your pest management technicians. These professionals should provide possible reasons for control failure and identify potential ingress points. Good records are useful in the event legal action is taken by tenants. They serve as proof that pest control efforts have occurred.

Focus units: Prioritize highly infested areas, as they are often the source of mice that spread into surrounding units. Have your pest management technicians invest additional time in the most heavily infested units. These are your focus units. Keep records with a Focus Unit Tracking Log like the one found at www.stoppests.org/what-is-ipm/using-ipm/focus-units/ipm-log/. Ask your pest control technicians to visit focus units every one to two weeks for inspection and control services until there is no evidence of mouse activity.

Sanitation and repairs: While poor sanitation does not necessarily lead to mice entering buildings in the first place, it contributes to on-going infestations. Similarly, excessive clutter can make inspections difficult or

impossible. It may be necessary for property managers to seek housekeeping assistance for residents. Consider lease enforcement of sanitation standards as a last resort. Repairs and maintenance should be done regardless of sanitation levels.

Working with Residents

We highly encourage property managers to explain to residents how they themselves play an important role in pest management.

Inform: Notify residents about common pests and reporting procedures both verbally and using printed IPM information during the resident intake process. When residents sign the lease/contract, property managers should clearly explain resident responsibilities regarding sanitation standards, and why they are so important. Stoppests.org has resources for residents, including a video “The Tenant’s Role in IPM” in English and Spanish that helps to communicate the IPM message. Check out the sources at www.stoppests.org/working-with-residents/. It is very important to let the residents know that they will not be punished for reporting pests, and prompt reporting is important and appreciated by management staff.

Housekeeping: Address housekeeping issues identified during pest inspections. Let residents know that limiting access to food and water (Figure 11) is an important part of pest management and cleaning up mouse droppings and areas with concentrated urine reduces allergens that are asthma triggers for sensitive individuals.

How to clean up:

- Wear rubber, latex, or vinyl gloves when cleaning house mouse urine and droppings.
- Spray the urine and droppings with a solution of 1 part bleach to 10 parts water and leave soaking for 5 minutes. **Bleach can fade colors and destroy certain surfaces.**
- Use a paper towel to pick up the urine and droppings and dispose of the waste in the garbage.

Clutter: Encourage residents to reduce clutter in their homes and avoid clutter buildup in common areas and offices. Excessive clutter (Figure 12) makes it difficult for pest management technicians and housing staff conducting visits to see what pests are present.



Figure 11. Residents should store their food in airtight containers. Mice cannot eat or contaminate this food. Photo: NYS IPM Program

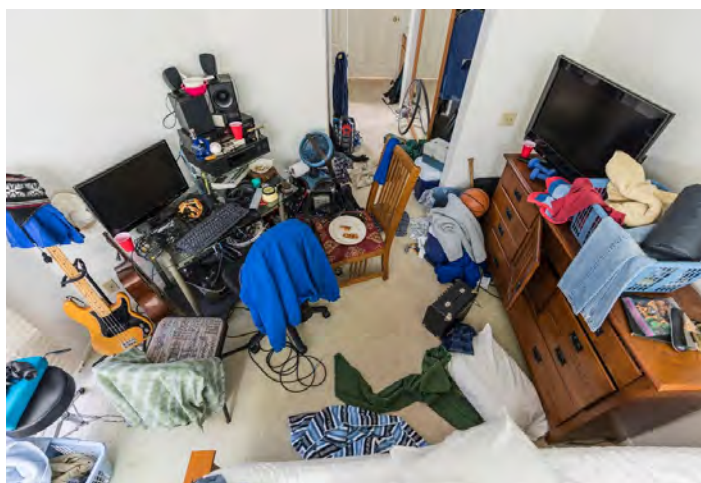


Figure 12. Cluttered areas can provide harborage for mice and other pests. Inspecting for pests is also far more difficult. Photo: Shutterstock

Asthma: Be aware of residents who have asthma, or other respiratory impairments. Many communities have health educators who conduct in-home asthma assessment and education that includes information about reducing asthma triggers. You can find asthma resources by checking with your health department, regional hospitals, the American Lung Association <http://www.lung.org>, and the Asthma Community Network <http://www.asthmacommunitynetwork.org>.

Encourage residents to adopt the following good habits:

- Clean up spilled food and drink daily.

- Avoid leaving dirty dishes out overnight.
- Avoid leaving pet food out overnight. Move uneaten pet food into a sealed container at the end of the day.
- Bag kitchen garbage securely and discard in outside dumpsters or garbage chutes at the end of each day.
- Store edibles, such as cereal, crackers, cookies, cakes, muffins, sugar, and bread, in airtight sealed containers or keep in the refrigerator.
- Report leaky pipes and dripping faucets.
- Report gaps and holes in walls where pipes and electrical conduits pass through, especially in kitchen and bathroom areas. Maintenance staff should seal around wall penetrations, sinks and cabinetry when possible.



Figure 14. Seal around conduits penetrating walls. Fill gaps with rodent-proof mesh material, then seal with a siliconized acrylic latex or polyurethane sealant. Photo: Lynn Ketchum, Oregon State University



Figure 15. Poorly maintained trash chutes attract pests, providing a plentiful food supply and access to all floors of a multistory building. Photo: Dawn H. Gouge, University of Arizona

Staff roles

Make sure staff are familiar with the signs of mouse activity. Maintenance staff are often in homes making repairs in the places where you might find mouse activity. Develop a protocol for maintenance staff to report sightings or evidence of a mouse infestation.

We highly encourage property managers to explain to staff how they play an important role in pest management.

- **Consider having a staff member accompany pest management technicians to facilitate access to units.** This person can also report maintenance needs, help the residents understand their role, and help residents understand pest management related preparation and after-treatment instructions.



Figure 13. Sealing exterior and interior gaps provides multiple layers of exclusion. Photo: Shutterstock

- **Encourage staff to address pest related issues promptly,** especially fixing leaky pipes, dripping faucets, and sealing gaps (Figure 13) and holes (Figure 14) that mice use for travel and harborage.
- **Ask staff to inspect, clean, and monitor trash chutes regularly,** and have your pest management contractors also inspect these areas (Figure 15).
- **Use unit turnover as a good time for maintenance staff to look for mice,** clean up nests and droppings, and correct any pest conducive conditions in units, including water leaks, openings around pipes and wall penetrations, and cabinet related openings to voids.

Understanding the Contractor's Role and Providing Oversight

Property managers should understand what good pest management service entails and be familiar with the best

practices for mouse management. Communicate with procurement officers and make sure you understand the “scope of work” that the company has been contracted to undertake. It is important to note that pest management practices, equipment, and tools change constantly and significantly over time. As such, contract specifics must be revised regularly to incorporate the changes.

We encourage property managers to communicate regularly with their pest management company. Ask as many questions as you need to completely understand the pest issues in your property.

Contracted services should include:

- **Inspection of all units once or twice a year** if there is no history of mice, and quarterly if there has been a history of mice during the past year. Mouse service scheduling should be assessment-based, and not complaint-based or calendar-based, and it is not a one-size-fits-all service. The fact is that many residents will not report any pests at all. Heavily infested units should be serviced every one to two weeks until the infestation has been resolved. Inspections for mice may take considerable time! Pest management technicians should spend more than a minute or two in each unit or home visited.
- **Service tickets should indicate which units the pest management technicians visited, what traps were used, and any pest-conducive conditions noted during the visit.** Take the time to read through and understand the service you are getting. Pay attention to how much time the technicians spend per unit. If technicians are trying to get through too many units per day, then the quality of the service will be affected.
- **Pest management technicians should conduct follow-up inspections after a first house mouse service visit.** Follow-up visits should **not** depend on ongoing resident reports. Light infestations may be monitored and serviced monthly, heavy infestations should be treated every one to two weeks until there are no mice caught on traps and no new mouse signs evident.
- **Clean-out treatments** may be needed when a heavily infested unit is identified. Pest management

technicians use this tactic to rapidly knock down high populations. Clean-out protocols vary but may include flushing out mice, removing droppings and nests, accessing behind appliances, and sealing cracks and crevices. Pest control contractors may charge extra for a clean-out service. Be aware of what your contract includes.

What You Need to Understand About Controlling Mouse Infestations

You may not use all the methods covered in this section, but it is important to understand the options available, and appreciate the benefits and limitations of each. You will also be better able to provide knowledgeable oversight of contractors and staff.

Exclusion:

The single most important thing you can do to control mice in multifamily housing is to stop them from ever coming into buildings in the first place.



Figure 16. The gap around the wire passing through the door frame needs to be filled. Photo: Shujuan Li, University of Arizona

House mice enter buildings in several ways. Occasionally they are introduced as stowaways in shipments of food or other items, but often, house mice enter buildings from outdoors. House mice will search for a way in through gaps in the exterior envelop of a building. In temperate climates, mice often try to get indoors during fall and winter months. They travel along the edges of

buildings until they detect warmth or the smell of food. They then find or make a hole large enough to squeeze through. Sometimes they stay in wall voids, basements, and attic areas, but sometimes they enter room interiors through interior openings, like those found around pipes, and conduits.

Sealing interior and exterior openings provides multiple layers of exclusion (Figures 9, 13, 14, and 16).

Effective exclusion includes:

- Seal gaps of 1/8-inch or less with siliconized acrylic latex or polyurethane sealant products that stretch and contract as gaps and cracks in buildings expand and contract with changing temperatures and ground movement. When filling larger gaps, steel wool or foam fillers are not recommended beyond serving as a quick, temporary fix. The gaps should be filled with good quality concrete, or stuffed with a metal mesh material like Xcluder® cloth or Stuf-Fit copper mesh then sealed with a siliconized acrylic latex or polyurethane sealant (Figures 13 and 14).
- Seal around water, gas, electric, and other pipes and conduits going through walls (Figures 13, 14, and 16). Make sure escutcheons plates and pipe collars are not loose or have gaps around (Figure 17).



Figure 17. Deny access to wall voids by ensuring collars and escutcheon plates fit around pipes and conduits. This shows a perfectly installed escutcheon plate around a gas line installed during unit turnover. Photo: Susannah Reese, StopPests

- Look for light “leaks” around doorways as indicators of “open” doors for house mice (Figure 18). Use

correctly installed door sweeps to make all external doors mouse-proof. High-quality, brush (e.g., Sealeze®) or baffle (e.g., Xcluder®) style door sweeps close the gap between the threshold and the door base.



Figure 18. Light “leaks” around doorways are indicators of “open” doors for house mice. Photo: Shujuan Li, University of Arizona

- Maintain and repair all ventilation screens and louvers used in attic spaces, and furnace closets. All gaps around the frames of screens and louvers should also be kept tightly sealed. Consider the use of exclusion mesh carefully when covering intake and exhaust roof vents (Figure 19). Soffit intake vents are very common and in good repair should already exclude mice. Box, mushroom, ridge, and off ridge exhaust vents may have openings large enough to allow mouse entry into attic areas and may need exclusion mesh covers (Figure 19).



Figure 19. Exterior mesh on attic vents prevent entry for pests. Photo: Shutterstock

- Gable and cupola vents with louvers often need exclusion mesh fitted on the interior side facing the

attic void. Roof turbine, hard-wired or solar powered attic vents in good working order should not need additional exclusion mesh.

- Ensure that pest-proofing practices are an integral part of the planning and contract process for building construction and renovation.



Figure 20. These three trash cans do not have enough capacity for this building and garbage containing food scraps will attract rodents close to the building. Photo: Susannah Reese, StopPests



Figure 21. Waste management is an important component in rodent management. Dumpsters should have enough capacity to contain all waste and be placed at least 50 feet from buildings. Photo: Shutterstock

Sanitation and waste management:

- Do not allow trash to accumulate along exterior walls or close to buildings, this can attract house mice as well as roof and/or Norway rats if they are in your area (Figure 20).
- Do not allow contractors to throw food or food containers into crawl spaces and wall voids during construction or renovation of buildings.
- Position trash receptacles and dumpsters at least 50 feet away from buildings (Figure 21).
- Keep trash chutes, common area trash cans and external dumpsters clean, with lids closed (especially at night). Figure 21 shows well managed dumpsters, but Figure 22 shows a large capacity dumpster with sliding door open, and a buildup of garbage on the ground. Dumpsters should be power washed once they have a buildup of dirt and garbage sticking to interior or exterior sides. Most dumpsters have drainage holes which can be screened with exclusion mesh.



Figure 22. This dumpster is open, and the area around needs to be regularly cleared of garbage. Photo: Susannah Reese, StopPests

- Clear away tall weeds close to buildings since weeds and seeds serve as food and shelter for mice during warm weather.
- Encourage residents to clean up food spills daily, and wash dishes daily avoiding leaving them overnight in the sink. Ask residents to use trash can liners or plastic bags in kitchen trash cans and take out trash before bedtime each day.

- All pet food, bird seed and human food should be stored off the floor, in the refrigerator, freezer, or in airtight containers. If pets free feed during the day, encourage residents to pick up and store in an airtight container or refrigerate food overnight. Remind all building users that mice can chew through zip-lock bags.
- If areas of a mouse infested building are rarely accessed, consider these undisturbed places highly likely to be supporting growing populations. When inspections for indoor house mice are undertaken, make sure that rarely accessed areas, commonly locked rooms, and harder-to-reach spaces are checked. These areas include the tops of kitchen cabinets, above dropped ceiling tiles, storage areas, and basements. Finding mouse droppings (Figure 23) does not always mean a current infestation, so cleaning up droppings and monitoring the areas for current activity is essential.



Figure 23. House mouse droppings and urine. Note the unsealed holes around the pipe penetrations. Photo: Dawn H. Gouge, University of Arizona

- Once inside, house mice will nest in warm, undisturbed, protected spaces, close to food. Unless resources dwindle, they typically travel 10 to 30 feet from their nest, or only as far as they need to acquire food and nesting resources. Adult females have 5-10 litters per year, and usually between 6 and 8 pups each time. Mouse populations increase rapidly over time, so as soon as a mouse is reported, a management plan should be put into action.

Traps, glue boards, and rodenticides:

Traps are often the most effective lethal method of controlling mice in indoor locations. However, they must be positioned, baited, and set with great care.

Traps come in many forms. Most people are familiar with bar snap traps (Figure 24), but there are also clam snap traps and hidden snap traps that hide caught mice from view. All use bait to lure a mouse, a pressure sensitive bait plate and a bar or clam that snaps down hard on the mouse as it touches the bait. There are single use and reusable snap traps, and multi-catch traps available.



Figure 24. In locations inaccessible to residents and pets snap traps can be placed along a wall where the mice regularly travel. Placing multiple traps is the best strategy. Photo: NYS IPM Program

Using snap traps in secured bait stations renders them inaccessible to children and pets. If traps are set in inaccessible areas like basements or above ceiling tiles many pest management technicians will not use bait station boxes. If this is the case with your own pest management service contractor, it is important to communicate where the traps are located to maintenance staff who may be required to work in the locations for other reasons.

Snap traps are cheap, easy, and effective. Newer style traps tend to be easier to set, clean, and empty. They can be used to eliminate mice quickly if deployed correctly, in sufficient numbers and checked regularly.

Glue board traps (Figure 25) for rodents are not the same as sticky monitoring traps for general pest monitoring. Rodent glue boards catch live mice which can be heard squeaking in distress for prolonged periods of time. This can upset residents, and residential buildings rarely have a person onsite 24/7 willing to dispatch and dispose of a mouse stuck on a glue board. They should never be accessible to children or pets and like snap traps, can be placed in secure bait boxes. There are situations in which they may be used by pest management technicians for sound reasons, but generally only catch juvenile mice. Juvenile mice do not travel far from nests so when caught, they indicate there is a nest nearby.

Glue board traps are not usually baited. The adhesive surface will catch lizards and other non-target animals, and should not be used outdoors.



Figure 25. This juvenile mouse was caught on a glue board. This helps inform us there is a nest nearby, but we must consider what the resident will do with a trapped animal in distress. Will they be able to handle the animal safely and dispatch the mouse humanely? Photo: Susannah Reese, StopPests

Electronic high-voltage shock traps work by luring mice into a chamber then delivering a quick, fatal electric shock. These traps are typically designed with no-touch, no-see disposal, and are engineered to prevent humans or pets from being accidentally shocked. Electronic traps have a light or other signal that indicates when a mouse has been caught. The traps are battery-powered and generally used inside places with relatively few mice evident.

Additionally, there are live, catch and release traps although pest management contractors rarely use these. For external use only there are carbon dioxide powered

lethal traps that dispense a rodent lure, electronically sense a rodent in a trap, and triggers an internal guillotine to kill the rodent.

VERY IMPORTANT: Communicate clearly to pest management professionals and residents that snap traps and glue boards must be inaccessible to children and pets. Placing traps inside locked bait stations prevents accidents.

The use of peanut butter as a bait is not recommended since people with nut allergies can have severe reactions.

Irrespective of which kind of trap the pest management technicians are using, trap placement is critically important. Traps are usually placed where there are obvious signs of mouse activity. Chocolate spread, pancake syrup, or nesting materials like cotton balls, and short pieces of dental floss are all good lures with which to bait traps. In general traps will be less effective in cluttered homes, and in homes where food is accessible in multiple locations, all the time.

Rodenticide baits are designed to kill rodent mammals and come in different forms that affect rodents in different ways. Some rodenticides stop normal blood clotting (anticoagulants) like bromadiolone, chlorophacinone, and brodifacoum. Some affect the nervous system like bromethalin, and strychnine, and some alter the blood calcium balance like cholecalciferol. A few products contain compounds that turn into toxic gases in the presence of water. Products containing zinc phosphide generate phosphine gas. baits are also designed to be highly attractive to rodents and are often formulated with grains, fish oil, molasses, fruits, vegetables, meat extracts and peanut butter to make them attractive and palatable. Unfortunately, this also makes them attractive to children and pets.

VERY IMPORTANT: Discourage residents from using rodenticides by rapidly responding to rodent reports in and around buildings.

Baits are rarely justifiable as an indoor control option in multifamily housing. Remind residents that house mice collect food including rodenticide bait and store it in stash piles (Figure 8) within their home range. So even when

baits are placed in a bait box initially, the mice will relocate bait elsewhere.

Rodenticide baits are sometimes used in external, locked bait stations, and can be useful when outdoor control of mouse populations is necessary. However, unmaintained bait stations become pest harborage opportunities if they are never removed (which is a common occurrence, see Figure 26).



Figure 26. External bait stations must be serviced regularly and removed by the pest management technician once they are no longer needed. The bait box seen here has not been serviced in a long time. Photo: Susannah Reese, StopPests

Not all rodent baits contain a toxicant. Some are very useful monitoring baits used to confirm active rodent infestations.

Be wary of tracking powder. The term “tracking powder” is sometimes used to refer to a non-toxic powder used to track rodent trails. However, it is more commonly used to describe a highly toxic restricted-use powder form of rodenticide that can only be applied by certified pesticide applicators. The rodenticide tracking powders are picked up on rodent fur as they pass through treated areas and can be carried across counters and floors, and ventilation can stir them into the air, exposing residents including children and pets. Additionally, the next contractor who accesses the treated area may come in contact with the toxic powder without knowing what it is. For these reasons we do not recommend the use of toxic tracking powders in residential buildings.

MYTH: “You can repel mice using plug-in ultrasonic devices purchased in stores or from websites.” Unfortunately, this is simply not true. Many of these devices have been tested by unbiased scientists, and none have been found to be effective.

Ultrasonic devices can negatively impact pets.

Disposing of Dead Mice

Make sure staff have the necessary personal protective gear, and procedural knowledge to safely dispose of dead mice and clean up areas contaminated with urine and droppings. There may be occasions when pest management technicians cannot visit the same day a dead rodent is found, and not all contracts cover rodent cleanup as part of the service they provide.

Precautions when handling dead house mice:

- Wearing disposable gloves spray the dead mouse and trap with disinfectant until wet. Household disinfectants will suffice, and a 10% solution of bleach diluted in water is a good choice. However, surrounding carpet and furnishings may be damaged by bleach and other disinfectants.
- With a hand inside a disposable plastic bag, pick up the rodent and the trap if one is present, and invert the bag over the rodent and seal or tie the bag with the rodent and trap inside.
- Place the bag in a second plastic bag and dispose in an external dumpster.
- Spray the area where the trap or the dead mouse was lying with disinfectant that will not damage the surface, and carefully follow the directions of use for the specific disinfectant used.
- Dispose of gloves in the trash. Then wash hands with soap and water.

Cleaning up small amounts of house mouse urine, droppings and nesting materials:

- **Do not sweep up or vacuum areas contaminated with dry urine, fecal matter, stash piles, or nesting materials. This can cause urine residues to become airborne and inhaled by building occupants.**

- Wearing disposable gloves, spray urine, droppings, nesting materials and affected areas with a disinfectant that will not damage the surface. Follow the directions of use for the specific disinfectant used.
- Use wet disposable towels to wipe up the disinfected droppings and nesting materials.
- Place materials and used towels into a plastic bag and tie the bag. Place inside a second bag and place in an external dumpster.
- Mop or sponge the area with water.
- Dispose of gloves in the trash. Then wash hands with soap and water.

VERY IMPORTANT: Employees wishing to maximize personal protection in certain situations (e.g., removing a buildup of rodent feces in an enclosed space) should wear coveralls and a respirator with a HEPA P100 filter.

Important Final Reminders:

- Do not blame residents.
- Be aware of which units have been identified as mouse infested focus units to be prioritized. Failure to adequately address these infestations every one to two weeks can result in control failure and the mouse populations spreading within the building.
- Make sure your pest management technician is not just relying on rodenticides. Rodenticides are not ideal tools to use for indoor mouse control. If used as a sole means to eradicate an infestation, rodenticides will fail to sustainably resolve the problem.
- Be aware of which residents refuse entry to pest management technicians, which units are inaccessible for some reason, and those that cannot be serviced because of a resident illness. Have a plan for monitoring and servicing these units as soon as it is possible to do so. Do not allow missed units to support mouse populations in a building.
- Ensure follow-up services are automatically scheduled appropriately until infestations are completely eliminated. Do not rely on resident complaints.
- Address structural deficiencies when a pest management technician, resident or staff member identifies a repair need.

- Ensure trash chute and basement areas are well maintained, monitored, and serviced. Poorly managed trash chutes, compactors, and trash rooms can be the source of large populations of mice. Pay particular attention to sanitation, monitoring, and servicing of these areas.

VERY IMPORTANT: Discourage residents from using rodenticides by rapidly responding to rodent reports in and around buildings.

Additional Information and Literature Available on the Web

Stock, T., Corrigan, R. and Gouge, D.H. 2015. Integrated Pest Management of the House Mouse in Schools. EM9062. Oregon State University, Extension Service. https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/em9062_1.pdf

Geiger, C.A. and Cox, C. 2012. Pest Prevention by Design – Authoritative guidelines for designing pests out of structures. https://sfenvironment.org/sites/default/files/fliers/files/final_ppbd_guidelines_12-5-12.pdf

Sked S., Abbar, S., Cooper, R., Corrigan, R., Pan, X., Ranabhat, S., Wang, C. 2021. Monitoring and controlling house mouse, *Mus musculus domesticus*, infestations in low-income multi-family dwellings. *Animals*. 11:648.

Acknowledgements

This guide was written by Susannah Reese (StopPests in Housing), Dawn H. Gouge PhD (University of Arizona), Tim Stock MSc (Oregon State University), Robert Corrigan PhD (Corrigan Consulting), Shujuan Li PhD & Shakunthala Nair PhD (University of Arizona), and reviewed by Deborah J. Young PhD. October 2021. The Northeastern IPM Center receives support from the U.S. Department of Housing and Urban Development's Office of Lead Hazard Control and Healthy Homes through the U.S. Department of Agriculture, NIFA agreement #2016-4866825905. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of the U.S. Department of Agriculture or those of other funders.

