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University of Wyoming Extension

Wyoming Integrated Pest Management (IPM) Standard Operating Procedure (SOP) for

MICE

IN SCHOOLS AND OTHER FACILITIES

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www.uwyo.edu/ipm

WHY CONTROL MICE IN SCHOOLS

Mice are pests throughout the entire year in Wyoming, and diseases can be transmitted through:

- Breathing dust contaminated with mouse urine or droppings (asthma)
- Eating or drinking food or water contaminated by mouse feces

DIRECT CONTACT WITH INFECTED MICE OR THEIR URINE AND DROPPINGS

- Contact through the skin or mucous membranes (such as inside the nose) with water or soil contaminated with urine from infected animals
- Handling infected animal carcasses
- Bite of an infected flea or tick
- Bite wounds

Deer mice are the primary carriers of the hantavirus in Wyoming and can carry ticks infected with Lyme disease.

HANTAVIRUS PULMONARY SYNDROME

How the disease spreads

- Breathing in dust that is contaminated with rodent urine or droppings
- Direct contact with rodents or their urine and droppings
- Bite wounds, although this does not happen frequently

There have been deaths in Wyoming from hantavirus. No specific antiviral therapy is available. Rodent control remains the primary prevention strategy.

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For more information about cleaning up school areas where deer mice have been present, see the Centers for Disease Control and Prevention website (www.cdc.gov/rodents/) for information about how to prevent hantavirus exposure.

A map showing the cases of hantavirus by state can be viewed at http://www.cdc.gov/hantavirus/surveillance/state-of-exposure.html

Integrated pest management (IPM) is the most effective long-term control for mice in schools and other facilities.

WARNING

The droppings of the deer mouse have been associated with an often-fatal illness in humans called hantavirus. Never vacuum or sweep mouse droppings; thoroughly wet the area with disinfectant, wear disposable gloves, then carefully wipe up the droppings with a wet cloth.

PEST IDENTIFICATION

House mice and deer mice can transmit diseases; **deer mice are the carriers of hantavirus**.

HOUSE MOUSE

The house mouse *Mus musculus L* (Image 1) is a small, gray or brown rodent that has a slightly pointed nose, black, somewhat protruding eyes, large, sparsely haired ears, and nearly hairless tails with obvious scale rings. They weigh about 1/2 ounce and usually are light brownish to gray. An adult is about 5 to 7 inches long, including the 3- to 4-inch tail. House mouse feces look like black or brown small grains of rice.

Image 1 House mouse *(photo courtesy George Shuklin)*

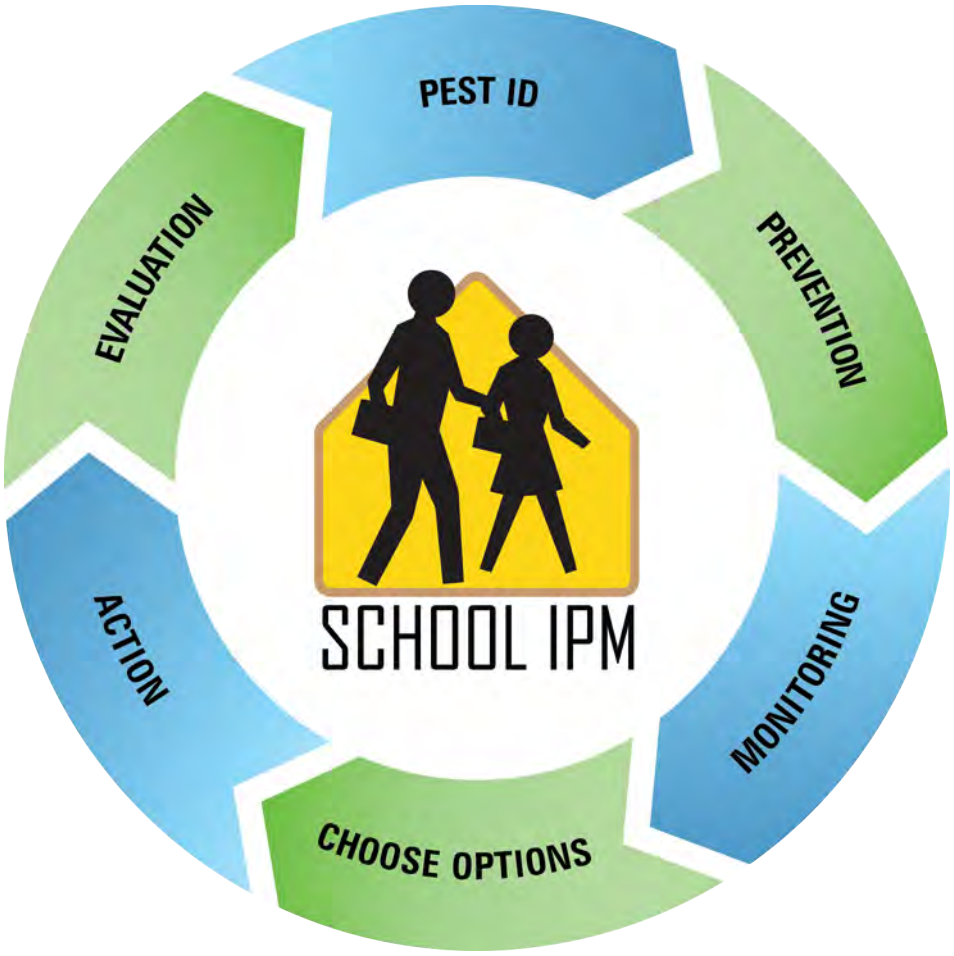
DEER MOUSE

The deer mouse *Peromyscus maniculatus* Wagner (Image 2) is similar in size to the house mouse. They measure approximately 5 to 7 inches including the tail. In color, the back and upper tail of the deer mouse ranges from gray to dark brown, depending on age. Deer mice have white underbelly and feet. Their bicolored tail is a good feature to use to distinguish them from house mice; house mice have almost furless tails. The head has a pointed nose with large, black eyes. The ears are large, round, and are covered with fine hairs. Their forelimbs are shorter than their hind limbs. Deer mice droppings are similar to the house mouse droppings, ¼-inch long and dark in color.

Image 2 Deer mouse *(photo courtesy RodentFancy.com)*

KEY COMPONENTS OF IPM IN SCHOOLS

There are 11 components of IPM in schools. Six are cyclic action steps that occur continuously in order. Following these steps continually makes pest control straightforward and effective.



There are 11 components of IPM. Six of these are cyclic action steps that occur continuously in order and are in blue.

***Pest Identification* Step 1**

***Prevention* Step 2**

Maps
Recordkeeping
Set Action Thresholds

***Monitoring* Step 3**

***Analyze and Choose Options* Step 4**

Notification

***Implementation/Action* Step 5**

***Evaluating* Step 6**

Educating

HOUSE MOUSE

House mice, introduced from the Asian continent, are adaptable to a variety of conditions and usually live in proximity to humans, in or around buildings or fields. They live in hidden locations near food sources and construct nests from various soft materials.

These rodents are omnivorous eating practically any type of food humans eat. They can generally get all the water they need from food; if dependent on dry food, they need some free water.

Although typically active at night, house mice are moderately active during the day. House mice are good jumpers, climbers, and swimmers, and generally attempt to maintain whisker contact with vertical surfaces. Mice have excellent senses of taste, hearing, smell, and touch.

House mice can transmit diseases and can damage food and food packaging. Their dander, feces, and urine can trigger asthma and aggravate allergies. The house mouse can transmit parasites to humans including ringworm, mites, tapeworm, and ticks. Some of the diseases the house mouse carries can be deadly; for example, leptospirosis, murine typhus, rickettsialpox, tularemia, lymphocytic choriomeningitis, and potentially bubonic plague.

DEER MOUSE

The deer mouse is a native rodent, similar to deer in that they are agile and very proficient jumpers and runners. They have good eyesight and hearing because of their large eyes and ears. They are nocturnal and most active at night. They are omnivorous and can eat a wide range of animal and vegetable foods.

Deer mice populations don't thrive well in simplified habitats such as are found in agricultural fields. They prefer the more complex communities of native prairie and roadside ditches. Their presence in schools is likely to be less than the house mouse. Deer mice are active year-round and do not hibernate. The nests of the deer mice are typically lined with soft insulating material ranging from grass to various artificial fibers.

THREE MAJOR PARTS OF MOUSE PREVENTION

1. Exclusion

Mice can fit through crevices as small as ¼-inch wide. The best way to control mice is to keep them out of the buildings in the first place. Keep exterior doors closed when not in use, especially at night. Check for daylight under exterior doors. **Door sweeps should make full contact without any gaps.** Seal cracks and holes inside and outside buildings to prevent entry and travel routes by mice. Copper mesh wool, which is difficult for mice to chew through and will not stain siding, can be stuffed into gaps around pipes and held in place with caulking. Use metal lath, cement, hardware cloth, or metal sheeting to fix large holes. Concrete repair products can be dispensed with a caulking gun to repair some holes and depressions around doorways.

Additional important provisions:

- Trim bushes and vegetation away from buildings
- Place exterior trash cans and dumpsters away from building entrances
- Maintain 2 feet of gravel or concrete barrier between building and lawn, tight dumpster lids, and tight window and door seals

2. Sanitation

Eliminate possible food sources for mice by not leaving any potential food or water source available to them.

Make sure to:

- Eliminate food crumbs
- Store food items in sealed containers
- Thoroughly clean food preparation areas, including hard-to-reach areas
- Use liners for waste containers and empty at the end of the day so food is not left in the building overnight
- Ensure equipment is clean and well-maintained (including floor drains and vents)
- Repair water leaks in plumbing and gutters
- Eliminate standing water and any sources of moisture
- Clean areas that have mice urine, droppings, or rub marks, with soapy water
- Vacuum debris from cracks and seal
- Prevent weed or tree seeds from accumulating on property

3. Eliminate Mouse Shelter

Eliminate places for mice to hide or nest by cleaning up clutter. Clutter also hinders effective monitoring.

Reduce harborage:

- Seal cracks, gaps, or holes inside to remove hiding places
- Reduce stacks of old paper
- Store boxes off the floor and away from wall
- Remove any piles of leaves or trash
- Ensure stacks of lumber are not touching the ground
- Prevent or remove weeds

MAPS

Maps help record and visualize where mice were caught and documents chronic or seasonal mouse activity areas. Mark locations on maps that correspond to numbers marked on individual traps and data sheets. Pest sightings and problem areas can also be highlighted on maps.

RECORDKEEPING

- Record trap captures daily.
- Use forms to record the trap number, date the trap was placed, who placed the trap, and room name or number. The same form is used when inspecting the traps to record the kind and number of mice.
- Keep images of mice problem spots and site-specific solutions.
- Records are essential in evaluating the success of pest management strategies.

- **Pest Control Action/Application Form (Excel spreadheet)**
- **Trap Data Sheet (Excel soreadsheet)**
- **72 Hour Notice for Pesticide Application (Excel spreadsheet)**
- **12 Hour Pesticide Application Sign (word doc)**

ACTION THRESHOLDS

An important component of IPM is to use thresholds to make treatment decisions. Thresholds are levels of pests that must be present before corrective action is taken. Since mice can cause disease and trigger asthma, **presence of a single mouse in a school usually means pest control action is needed**.

MONITORING

Inspecting areas for mice can be both scheduled and ongoing. When carrying out inspections, look for fecal pellets in mouse vulnerable areas (e.g., food service, behind machines, custodial closets, laundry rooms, vending areas, garages, under sinks, sill plates, crawlspaces, etc.). Mice defecate and urinate wherever they go, so droppings and urine will be spread across their foraging area. A black light flashlight is useful for inspecting because urine, both wet and dry, will fluoresce under ultraviolet light. Mice typically travel 30 feet or less from nesting sites, so an intensive search near droppings or other signs will often uncover the nest in wall voids, cardboard boxes, wooden or plastic pallets, heating units, vending machines, appliances, or kitchen equipment.

Other common examples of mice signs include:

- Tracks (in dust or soft, moist soil)
- Burrows next to walls around the exterior of structures
- Grease marks on surfaces next to runways (from oil and dirt on rodent fur)
- Musty mouse odors
- Gnawing damage or chewed paper

Building occupants can help by being alert for pest signs and reporting them via personal communication, the pest sighting log, or email.

Kitchens and storerooms can be monitored for mice by placing snap traps along walls and in corners or in a mouse monitoring box. Number each trap or monitoring box and note its location on a map and data sheet. These traps or boxes should be checked daily by staff and any dead mice removed promptly to maintain adequate health standards.

To monitor for mice under portables, put two traps along the middle of the side of the skirts underneath the portable. To accomplish this, each portable must have an access door that is easily opened and closes tightly.

Remember to inspect any outbuildings on the property. Exterior storage sheds (bike sheds, dumpster sheds, equipment sheds, etc.) should also be monitored for mice. This can be accomplished by installing trap monitoring boxes; one on each side of the shed or on 10-foot spacing.

- **Building Inspection Monitoring Data Sheet (Excel spreadsheet)**

ANALYZE AND CHOOSE OPTIONS

Trapping is an effective method for controlling mice in facilities. Trapping has several advantages as it doesn't rely on potentially hazardous rodenticides and it allows for disposing of trapped mice, thereby eliminating dead mouse odors that may result when poisoning is done within buildings.

Conventional snap-type traps are easy to use and available at most supermarkets and hardware stores. Multiple-catch mouse traps and glue traps are also available.

NOTIFICATION

Advanced notification of pest control practices can play an important role in an IPM program. Keeping occupants informed can encourage assistance in keeping the area clean, exterior doors closed, and pest sightings recorded. Communication with teachers and staff regarding pest control can lead to greater effectiveness.

IMPLEMENTATION/ACTION

- Place traps in areas where mouse activity is most apparent.
- Place six traps per mouse or problem area and up to 6 feet apart.
- When traps are placed, they are each assigned a unique number.
- If traps are in areas where they will not be left all day, set traps in the evening and collect them the following morning.

Traps should be oriented perpendicular to the wall with the trigger and bait against walls wherever you find evidence of mouse activity.

- Bait traps with peanut butter (if the location isn't a "peanut-free zone") or chocolate syrup.
- Set the triggers lightly so the traps will spring easily.
- Check traps daily.
- Record number and type of mice caught on data sheet next to the number that corresponds to the trap number.

Three examples of trap orientation to walls are shown in Images 3–5. Double traps can catch more mice and show from which direction mice are traveling.

Image 3

Image 4

Image 5

EVALUATING

The last, yet integral, step in IPM is to evaluate and record how well the method or actions worked and what happened.

Evaluation is built into on-going monitoring and recorded on the mouse trapping data sheet. Make notes regarding the following questions:

- Did actions have the desired effect?
- Was the pest prevented or managed to satisfaction?
- Was the method itself satisfactory?
- What else could prevent this pest situation in the future?

Documentation of the results of monitoring, control methods, and how well they worked is an essential component of IPM so we don't have to relearn how to deal with the same problems over and over. The evaluation also shows where there is need for improvement and helps fine-tune future actions.

EDUCATING

Communicate to building occupants they can help by being alert for indications mice are present and reporting them via the pest sighting log. Let students and staff members know to keep outside doors closed when not in use especially in the evening and at night.

- **Handout for occupants**
- **Pest sighting log (word doc) online**

MORE DETAILED MOUSE CONTROL INFORMATION

Corrigan, R. (2001) Rodent Control: A Practical Guide for Pest Management Professional. Cleveland, OH: GIE Media, ISBN: 1-883751-16-0

- **Mouse control video**

HELP PREVENT MOUSE INFESTATIONS

1. Exclusion

Keep outside doors closed when not in use especially in the evening and at night.

2. Sanitation

- Eliminate food crumbs
- Store food items (plants and seeds) in sealed containers

3. Harborage

- Eliminate places for mice to hide or nest
- Clean up clutter
- Reduce stacks of old paper and boxes
- Store boxes off the floor and away from wall

4. Report

Report indications mice are present to custodians, educators, or supervisors.

- Mouse droppings and/or chewed up material

- **This handout (word doc) is available on the website "Wyoming School IPM" (www.uwyo.edu/ipm)**

NOTICE OF PESTICIDE APPLICATION

For further information regarding this notice, please contact the school IPM coordinator:

Name: _____

Phone number: _____

The following pesticides will be used at *[insert name of school]*: _____

Pesticide common name	Pesticide trade name	EPA registration number
Pesticide common name	Pesticide trade name	EPA registration number

The Office of Pesticide Programs of the United States Environmental Protection Agency has stated: "Where possible, persons who potentially are sensitive, such as pregnant women, infants, and children, should avoid any unnecessary pesticide exposure."

Location of the pesticide application: _____

_____

_____

Reason for the pesticide application: _____

_____

_____

If an **indoor application** the date and time it is planned:

DATE _____ TIME _____

In the case of an **outdoor application**, three dates must be listed, in chronological order, on which the outdoor application may take place if the preceding date is canceled.

DATE _____ DATE _____ DATE _____

Description of the possible adverse effects of the pesticides as per the Material Safety Data Sheets for the pesticides to be used, if available:

_____

_____

_____

_____

Pesticide(s) product-label instructions and precautions related to public safety:

_____

_____

_____

_____

Not less than twelve (12) hours before application of pesticides within school buildings, signs shall be posted at main entrances to school buildings and at the entrances to the specific application area within buildings. If pesticide application is made outdoors to any area adjacent to a school building or on property used by the district for student activities or playgrounds, signs shall be posted immediately adjacent to the treated area and at the entrance to the district property. The signs shall remain posted for seventy-two (72) hours.

- **This SIGN template (word doc) is available on the website "Wyoming School IPM") (www.uwyo.edu/ipm)**

Building Inspection/Monitoring Data Sheet

Date:

Names:

Phone number:

Email:

Room number or location	Pests or problem	Stage of pest	Pattern of problem or number of pests	Repairs needed

Comments:

- **This form (Excel spreadsheet) is available on the website "Wyoming School IPM" (www.uwyo.edu/ipm)**

Pest Control Action/Application Form

Date:					
Name of applicator:					
License number:					
Phone number:					
Start time of application	**Location of application**	**Crop or site**	**Target pest (species)**	**Target pest (growth stage)**	**Type of control**
Size of area treated	**Product brand name or bio-control agent**	**Product formulation**	**Active ingredient**	**Percentage active ingredient**	**EPA reg. number**
Rate used	**Total amount product applied**	**Equipment used**	**List equipment settings**	**Nozzle type**	**Application pressure**
Wind speed	**Wind direction**	**Temperature**	**Approximate humidity**	**Results**	

General comments (e.g., source of bio-control agents, stage of host agents came from, and other factors)

Highlighted items are required for "RUP" applications

- **This form template (Excel spreadsheet) is available on the website "Wyoming School IPM)**
- **(www.uwyo.edu/ipm)**

PEST SIGHTING LOG

Date	Time	Pest sighted	Number of pests	Who reported	Action taken

- **This pest sighting form template (Excel spreadsheet) is available on the website "Wyoming School IPM" (www.uwyo.edu/ipm)**

Pesticide Application Notice

Distribution Date:

Date of Application:

Location of Application:

Pest to Be Controlled:

Name of Pesticide:

Type of Pesticide:

For More Information Contact:

The Wyoming Environmental Pesticide Control Act of 1973 requires notice be provided by school districts not less than seventy-two hours prior to pesticide application on school property and the district shall further notify students, teachers and staff.

Email records of the 72 hour notice may be one way of retaining this information.

- **This NOTIFICATION template (word doc) is available on the website "Wyoming School IPM" (www.uwyo.edu/ipm)**

Trap Data Sheet

Date:

Name:

Phone number:

Email:

Trap number	Name of pest	Number caught	Trap number	Name of pest	Number caught

Comments:

- **This data sheet template (word doc) is available on the website "Wyoming School IPM) (www.uwyo.edu/ipm)**

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