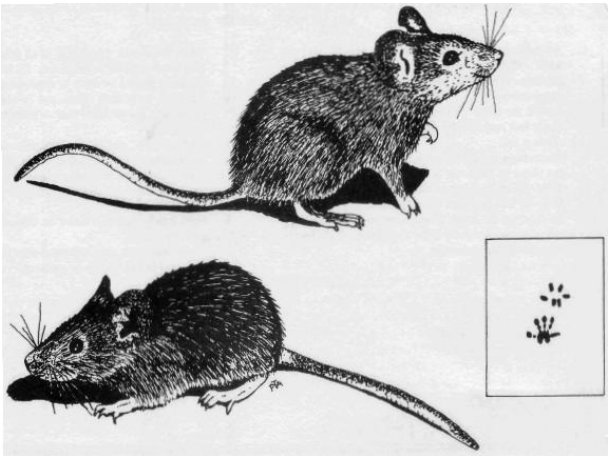
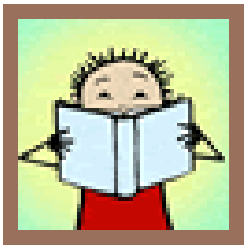
BIOLOGY, LEGAL STATUS, CONTROL MATERIALS, AND DIRECTIONS FOR USE

House Mice

Mus musculus

Family: Muridae





Introduction: House mice are not native to North America but are classed as an invasive species imported on early settler and trade ships. Worldwide house mice are some of the most troublesome and damaging rodents. In Australia they are a preoccupation of the agricultural community costing millions of dollars in damage. Population explosions can see as many as 1000 mice per hectare. The West coast of the United States is no exception, although, as yet, not to the same epic proportions seen in Australia. House mice transmit parasites and diseases to other animals (including people), consume and contaminate food, and damage structures and property as a result of their gnawing activities. They are resilient and thrive under a wide variety of climates and conditions. They are well adapted to living in close contact with humans and thrive in the conditions that man provides, particularly where hygiene and housekeeping standards are low. House mice are much more common in residences and commercial structures than rats (Brooks 1973). It is important that mouse infestations are controlled.

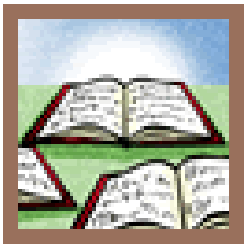
Identification: House mice are small and agile rodents with a slightly pointed nose, and small black protruding eyes. They are usually a uniform grey/ grayish brown color, and sometimes the lower half of their bodies may be a slightly lighter shade. They have slender bodies, 5 to 7 inches long, and weigh ½ to 1 ounce. They have rather large sparsely haired ears for their body size, and a semi hairless tail which is

about as long as the entire body and head.

House mice nibble on many foodstuffs, discard partially eaten items and create a mess with droppings, urine, and hairs. They will nest build. Outside house mice living in fields may dig up and feed on newly planted grain, or cause damage by eating crops before harvest. Because of the similarities with deer mice and meadow voles; correct identification before embarking on any pest control plan will ensure efficient control.

Visual sightings of mice are of limited value in accurately estimating the population present. Search premises thoroughly when looking for mice, in structures, attics, basements, around foundations, crawl spaces, and behind and under stored materials.

It may be possible to detect house mice presence using non toxic tracking dust or alternatively flour or talcum powder at 20 – 30 foot intervals throughout a structure (Salmon, Whisson, Marsh, 2006)



Legal Status: House mice are classified as nongame mammals by the California Fish and Game Code. House Mice threatening or injuring growing crops or other property of which you are the owner or tenant, you may control them using any legal means. They may also be taken by Department of Food and Agriculture, federal state, and county officers or employees, when acting in their official capacities.

Damage: House mice will contaminate the environments in which they live. House mice are omnivorous; they consume and contaminate stored grain and cereal products as well as fruit, vegetables, cheese, meat, and hay. They are often a pest in poultry facilities where they consume the chicken feed, and can damage electrical equipment.

House mice carry a wide range of diseases which can be passed on to humans. House mice and their ectoparasites are involved in the transmission of diseases: salmonella food poisoning by infected rodent feces on suitable foods; rickettsialpox by the bite of the house mouse mite; and lymphocytic choriomeningitis, a virus infection of house mice, may be transmitted to man by means of food or dust contaminated with respiratory droplets or powdered feces of infected animals.

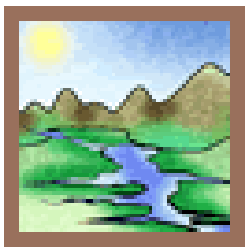
House mice will inevitably cause physical property damage whenever present in and about buildings. This may be costly and potentially dangerous creating fire or safety hazards. The damage is seen in the form nest building and gnawing of structures, electrical wire insulation, rubber insulation, stored items in basements, attics, garages i.e. paintings, books, clothing, furniture, family heirlooms.

House mice damage can be identified by referencing: feces/droppings, gnawing, markings or smudges

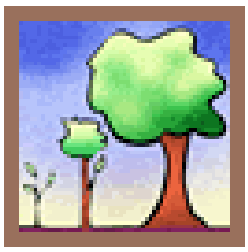
against solid structure (wood beams), nests, odor, sounds, track, visual sighting.

Range: House mice are found throughout the entire United States and are considered the most common mammal in cities, except for humans (Brooks 1973).

House Mice

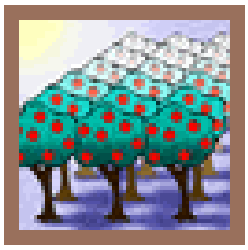


Habitat: Occasionally found in fields, but usually in buildings. House mice build nests in boxes and crates as well as stationary objects, enhancing their rapid distribution along transportation routes.



Biology: House mice live in a wide variety of man-made structures as well as in open fields. Mice living in the open may move into buildings when weather becomes severe. House mice soon become accustomed to ordinary noises and, as a result, may be active in areas near people, animals, or machines.

House mice have poor vision but a keen sense of smell, taste, hearing and touch. The long whiskers on the nose and above the eyes serve the sense of touch. Mice normally make their runways close to walls, using their whiskers as feelers. House mice eat the same foods as man, showing a preference for foods high in protein or carbohydrates. Different environments offer varied diets and sometimes mice will feed upon such things as live insects, starch in clothing, and glue in bookbinding's. They require very little water and can live for many months on a dry grain diet. Because of their small size, they must feed several times during a 24-hour period. This means they will be active during the day as well as the night. Their range is normally 10 to 30 feet from the nest. The nest is lined with soft material such as cotton or paper and may be built in walls, cabinets, upholstered furniture or other convenient space. The usual length of life is about one year. During this time, a female house mouse will raise an average of 30 to 35 young; sexual maturity is attained at 1-1/2 months; gestation period is 18-21 days; and several litters (up to 8 per year) of 3 to 11, usually 5 or 6, young are raised. The young are born blind.



Damage Prevention and Control Methods: Controlling house mice differs substantially from controlling rats. Essentially house mice are smaller, have a smaller home range, reproduce faster than rats, and in many cases are less susceptible to rodenticides. Any control program should integrate three components: sanitation measures and habitat modification, structure proofing and exclusion, and population control.

Exclusion: Physical barriers can prevent mice from gaining entry to structures where food and shelter are available. "Rodent proofing" is an important and often neglected aspect of rodent control. It is a relatively permanent form of control which can prevent damage from occurring.

To exclude mice, seal all holes and openings larger than 1/4-inch across. Rodent proofing should be done with heavy materials that will resist rodent gnawing. These include concrete mortar, galvanized sheet metal, and heavy-gauge hardware cloth.

Habitat Modification and Sanitation: Sanitation, which includes good housekeeping practices, proper storage and handling of food, feed and garbage, is stressed as a method of rodent control. Unfortunately, even the best sanitation will not eliminate house mice. It will, however, aid in control by permitting easier detection of mouse sign, increasing effectiveness of traps and baits by reducing competing food items, and by preventing mice from flourishing and reaching high populations.

Although house mice are less dependent upon humans for their existence than are Norway rats, they are much more adaptable to living with people. They require very little space and only small amounts of food to exist. Mice have been known to inhabit buildings even before construction has been complete, living off the crumbs and scraps of worker lunches. In offices, mice may live behind cabinets or furniture and feed on scraps or crumbs from lunches and snacks and on food kept in desks. In homes, they may find ample food in kitchens, and in the garage, they will eat sacked or spilled pet food, grass seed, or insects such as cockroaches. Thus, no matter how good the sanitation, most buildings in which food is stored, prepared, or consumed will support at least a few mice. For this reason, a constant watch must be kept for mice which may invade the premises.

Where possible, store bulk foods in rodent-proof containers or rooms. Stack boxed foods in orderly rows on pallets in a way that allows for thorough inspection for evidence of mice. In such storage areas, keep stored materials away from walls. A 12-inch white band painted on the floor next to the wall serves as a reminder to keep items away from walls. It will allow you to detect rodent droppings or other signs easily. Sweep floors frequently to permit ready detection of fresh droppings.

When storing food or feed on pallets, keep in mind that mice can jump up more than 12 inches from a flat surface. They are also good climbers and can walk up surfaces such as wood or concrete (unless they have a slick finish). Mice can live for a considerable period of time within a pallet of feed and only rarely come down to the floor.

Regular removal of debris and control of weeds from around structures will reduce the amount of shelter available to rodents. In some instances, a strip of heavy gravel placed adjacent to building foundations or other structures will reduce rodent burrowing in these locations. In any event, keeping the periphery of

buildings and other structures clean of weeds and debris (including stacked lumber, firewood, and other stored materials) will discourage rodent activity and will allow easier detection of sign.

Frightening: This is not considered a practicable solution for house mouse control. Various commercial ultrasonic devices claim success at controlling house mice but no scientific research exists to support their effectiveness in controlling mice. What is known about ultrasound is that it is very directional and therefore does not travel well around corners; it also loses its intensity rapidly as it leaves its source. Testing has shown that house mice may be driven away for a few days but return and resume normal activity.

Fumigants: None registered and not a recommended method of house mice control.

Repellents: House mice like all rodents find some types of taste and odors objectionable. However, chemical repellants are not a practicable solution for mouse infestations. Moth balls (naphthalene) or household ammonia (bleach) may have a short term effect although they are not registered as repellents with the EPA. A number of repellents are available which claim to prevent gnawing by mice or other rodents but their effectiveness is questionable.

Trapping: Trapping can be an effective method of controlling mice, but it requires more labor than most other methods. Trapping is recommended where poisons are unadvisable or when mice need to be removed from inhabited buildings. It is the preferred method to try first in homes, garages, and other small structures where there may be only a few mice present.

Trapping has several advantages: 1) it does not rely on rodenticides; 2) it permits the user to view the results; and 3) it allows for disposal of the trapped mice, thereby eliminating odor problems from decomposing carcasses which may occur when poisoning is done within buildings.

The simple, inexpensive, wood based snap trap is available in most hardware and farm supply stores. Traps should be baited with a small piece of nutmeat, chocolate candy, dried fruit, or bacon, tied or glued securely to the trigger. Peanut butter or marshmallows also may be used as bait. Food baits that become stale lose their effectiveness. Set traps close to walls, behind objects, in dark places, and in locations where mouse activity is seen. Place the traps so that when mice follow their natural course of travel (usually close to a wall) they will pass directly over the trigger. Set traps so that the trigger is sensitive and will spring easily. When traps are set in runways or in travel routes, effectiveness can be increased by enlarging the trigger. This can be done with a square of cardboard, metal or screen wire that fits just inside the wire deadfall. Some traps are already equipped with this type of trigger.

Use enough traps to make the campaign short and decisive. Mice seldom venture far from their shelter and food supply, so traps should be spaced no more than about six feet apart in areas where mice are active. Although mice are not nearly as afraid of new objects as rats, leaving the traps baited but unset until the bait is taken at least once will reduce the chance of mice escaping the trap and becoming trap-shy.

A variety of different mouse traps designed as lethal traps and also non lethal are available in most retail stores. The efficacy of these traps is dependent largely upon their placement. Use as many traps as practicable so that trapping time will be short. As many as a dozen or more traps may be necessary for a heavily infested home or other building structure. Mice rarely travel far from their shelter and food supply.

Dispose of dead mice by burying or placing them in plastic bags in the trash. When handling any rodent carcass always wear waterproof gloves to protect yourself from disease. Do not touch them with bare hands and wash thoroughly after handling traps.

Glue boards: An alternative to traps are glue boards, which catch and hold mice attempting to cross them much the same way flypaper catches flies. Place glue boards wherever mice travel -- along walls or in

established pathways. Do not use glue boards where children, pets, or wildlife can contact them. Glue boards lose their effectiveness in dusty areas unless covered, and temperature extremes may affect the tackiness of some glue. They are considered less effective in capturing rats than mice. You can purchase ready-to-use glue boards, or you can buy glue to make your own boards or traps. Dispose of live trapped rodents in a humane manner.

Baits: Suggested baits for house mice include treated grains, pellets or meal. Sugar up to five percent by weight is sometimes added to improve bait acceptance.

Toxicants

Anticoagulants -- % on bait for:

CDFA Labels:

0.01% Chlorophacinone Treated Grain

0.01% Diphacinone Treated Grain

0.005% Diphacinone Rodent Bait Blocks

Broadcast baiting: Rarely used but may be used in some special situations where repeated applications of first generation anticoagulants can be made until control is achieved.

NOTE: House mice are naturally less susceptible to anticoagulants than rats and have different feeding patterns, thus first generation anticoagulant baits are sometimes prepared at double strength. Double strength baits increase the potential for hazards to pets and domestic animals and therefore, should be used with even greater caution than normal strength baits.

Fumigants

Practical use of fumigants for controlling house mice is limited to structure or containers (feed bins, railway cars, or other enclosed areas). Some fumigants are registered for rodent burrow use, however, house mouse burrows cannot be fumigated efficiently because they are small and difficult to locate.

Aluminum phosphide, is registered in California as a fumigant. Fumigants are hazardous materials and should be applied only by persons well trained in their use and who possess the necessary safety equipment and permits.

Directions for Use

Spot Baiting (zinc phosphide baits): Place tablespoon amounts (1/4 to 1/2 ounce) of bait in shallow containers spaced 8-12 feet apart. Place in dry locations such as in concealed places, in corners, or along walls, where house mice feed, drink, or frequent.

Bait placements should be inaccessible to children, pets or domestic animals. Bait should be picked up and disposed of upon completion of rodent control program.

Because of the potential of bait shyness, do not retreat with zinc phosphide bait for at least three months.

Anticoagulant Baits:

NOTE: A single feeding of second generation anticoagulant baits may be lethal to house mice. However, baits of first generation anticoagulants must be eaten over a period of several days to give adequate control.

Place tablespoon amounts (1/4 to 1/2 ounce) of bait in bait box or shallow container, preferably in protected feeder stations. Place bait stations at 8 to 12 feet intervals in dry locations such as in concealed places, in corners, or along walls where house mice feed, drink or frequent. Inspect stations daily and add bait as needed; increase the amount when bait in feeder is entirely consumed overnight. Replace moldy or old bait with fresh bait. An uninterrupted supply of bait should be maintained as long as any bait is taken which may be two to four weeks.

Where a continuous source of infestation is present, permanent bait stations should be established and the bait replenished as needed. Bait should be picked up and disposed of upon termination of control program.

Tracking Powders: Toxic dusts or powders have been successfully used for many years to control mice and rats. When mice walk over a patch of toxic powder, they pick up

some of it up on their feet and fur and later ingest it while grooming. Tracking powders are useful in controlling mice where food is plentiful and good bait acceptance is difficult to achieve. Mice are more likely to ingest a lethal amount of a poorly-accepted toxicant applied by this method than if it is mixed into a bait material. There is little likelihood of toxicant shyness developing when using tracking powders.

Because the amount of material a mouse may ingest while grooming is small, the concentration of active ingredient in tracking powders is considerably higher than in food baits which utilize the same toxicant. Therefore, these materials can be more hazardous than food baits. For the most part, tracking powders are used by professional pest control operators and others trained in rodent control. Tracking powders containing either single-dose poisons or anticoagulants are commercially available, although some are Restricted Use Pesticides.

Place tracking powders along runways, in walls, behind boards along walls, or on the floor of bait stations. Placement can be aided by using various types of sifters, shakers, or blowers. Dampness may cause the powder to cake and lessen its effectiveness. Care must be taken to place tracking powders only where they cannot contaminate food or animal feed, or where non-target animals cannot come into contact with them. Do not place tracking powders where mice can track the material onto food intended for use by man or domestic animals. Because of potential hazards to children and pets, tracking powders are not generally recommended for use in and around homes. Where possible, remove tracking powder after the rodent control program is completed. Tracking powders used in conjunction with baiting can provide very effective mouse control

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