

NEW CONTROL MEASURES FOR MEADOWS VOLES AND POCKET GOPHERS

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ABSTRACT

Rodents, particularly meadow voles and pocket gophers, cause significant damage in California's alfalfa fields. Left uncontrolled, these pests can be a serious threat to farming operations. Fortunately, there are tools that are effective. Meadow voles have been especially troublesome in alfalfa because there were no rodenticides registered for in-crop use. In late 2003, zinc phosphide will be registered for use in alfalfa crops. Other methods such as traps and fumigation can also be useful under certain situations.

Key Words: meadow vole, pocket gopher, rodent control, baits, traps

INTRODUCTION

Some wildlife species are welcomed and even encouraged in alfalfa. However, they can cause problems that must be addressed. Rodents and rabbits are pests of alfalfa when they eat the above- and below-ground parts of the crop. Their burrowing and mounding disrupts harvesting and water management, and can damage equipment. Mounds cover and kill nearby plants and open the stand for weed invasion. Burrowing can damage structures, roads, and pathways.

Population control. When rodent control is necessary, develop an integrated approach based on knowledge of the animal's ecology and behavior as well as information on all available control techniques. Using an integrated pest management (IPM) program will result in an environmentally and economically acceptable approach that will significantly reduce damage to alfalfa.

Some people want to start control efforts whenever pests occur. While this is appropriate for certain situations, a good IPM program is based on monitoring the pest to determine when control is necessary. When the population density reaches the threshold level—the level at which control is economically justified—control should be undertaken. Threshold levels for rodents and other vertebrate pests of alfalfa crops are not generally established. Because of the nature of rodent damage (killing plants, interfering with harvest and water management) and the fact that they remain in the general area for life, the tolerance level is very low; in some cases zero.

The timing of a control program and the methods and materials to use depend on (1) the pest species, (2) how the area is managed, (3) the availability of equipment and labor and (4) other sites and situation specific factors.

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Legal restraints. The California Fish and Game Code classifies meadow voles, pocket gophers and ground squirrels as non-game mammals. If you find them injuring or threatening your crops or other property, you may control them at any time. Jackrabbits are game mammals. If they injure growing crops or other property, the owner or tenant of the premises may take them at any time. Cottontail and Brush rabbits are also game mammals. They may be taken by the owner or tenant of the land, or by any other person authorized in writing by such owner or tenant, when the rabbits are damaging crops or forage. Any person other than the owner or tenant of the land must be carrying written authority from the owner or tenant at the time rabbits are transported from the property. The rabbit meat or fur cannot be sold. While not the topic of this presentation, waterfowl sometimes cause damage in alfalfa fields. They are classified as migratory game birds and are protected by the Migratory Bird Treaty Act, and by Fish and Game hunting regulations. Check with the local Fish and Game warden or Agricultural Commissioner if you are having problems with waterfowl such as coots or geese.

Endangered Species Guidelines. In some areas of California, federally- and state- protected endangered species live in and around alfalfa crops. The species likely to be of concern are the San Joaquin kit fox, several species of kangaroo rats, and, where burrow fumigants are used, the blunt-nosed leopard lizard. Special guidelines apply to the use of toxic baits and fumigants for vertebrate pest control in these areas. Your county agricultural commissioner has the latest detailed maps that show the ranges of endangered species and the latest information on restrictions that apply to pest control activities in those areas. You can get additional information on endangered species regulations from the California Department of Pesticide Regulations Web site (<http://www.cdpr.ca.gov/docs/es/index.htm>).

MEADOW VOLES

Meadow voles (*Microtus californicus*), also known as meadow or field mice, damage alfalfa by feeding on alfalfa roots and stems. They are small rodents with heavy bodies, short legs and tails, and small, rounded ears. Their coarse fur is blackish brown to grayish brown in color. When full grown, they are 4 to 5 inches long.

Meadow voles are active all year and are normally found in areas with dense ground cover. They dig short, shallow burrows and make underground nests of grass, stems, and leaves. The peak breeding period is spring with a second, smaller breeding period in fall. Litters average four young. Meadow vole numbers fluctuate from year to year; under favorable conditions, their populations increase rapidly and become very dense.

Preventing meadow vole damage usually requires a management program that keeps down the population in the area. If appropriate, the first step is to remove or reduce the vegetative cover surrounding the alfalfa field, making the area less suitable to voles. Removing cover also makes detecting voles and other rodents easier. Since this is not always practical or desirable, a program to control the vole population may be necessary. Because the damage voles do to alfalfa can be quite severe, and because of their rapid reproductive rate, initiating a program of habitat modification and/or

population reduction before their numbers explode is important.

Habitat Modification. When practical, habitat modification is particularly effective in deterring voles. Once they are established in the field however, habitat modification is not applicable since the alfalfa provides an excellent vole habitat. Weeds, heavy mulch, and dense vegetative cover encourage meadow voles by providing food and protection from predators and other environmental stresses. Clearing grassy and weedy areas adjacent to alfalfa fields can be helpful in preventing damage because it will reduce the base area from which voles invade. Weed-free strips can serve as buffers around areas to be protected. The wider the cleared strip, the less apt meadow voles will be to cross and become established in alfalfa. A minimum width of 15 feet is recommended, but even that might not be enough when vole numbers are high.

Trapping. Trapping is a common detection tool used to confirm that the burrows or runways observed are from voles. When vole numbers are low or when the population is concentrated in a small area, trapping may be an effective control method although this is rarely the case in alfalfa fields. The simple, wooden mousetrap is used. Peanut butter, oatmeal, or apple slices make excellent baits for meadow voles. Often, no bait is needed because voles will trigger the trap as they pass over it. Trap placement is crucial. Meadow voles seldom stray from their usual travel routes, so set traps along these routes. Look for nests, burrows, and runways in grass or mulch in or near the alfalfa. Place traps at right angles to and flush with the ground in these runways. Traps must be set in sufficient numbers to detect the presence and degree of vole infestation. A trap line of 50-100 traps should be used. Examine traps daily. Remove and bury dead voles or place them in plastic bags in the trash. Do not handle dead voles without rubber gloves.

Toxic Bait. When meadow voles are numerous or when damage occurs over large areas you may need to use toxic bait to achieve adequate control. When you use toxic baits, take care to ensure the safety of children, pets, and non-target animals. Do this by following product label instructions carefully.

Single-feeding baits. Baits that require only one feeding to be lethal are called single-feeding baits. They are particularly useful where vole populations are spread over large areas. Zinc phosphide is expected to receive a 24(c) registration for meadow vole control in alfalfa crops in California by late 2003. Place bait in runways or next to burrows where voles will find it, or broadcast in the area where voles are found. Always follow label instructions. When using zinc phosphide, be aware that voles that feed on the bait but do not die may become bait shy. When this happens, they remember that the bait made them sick and will likely not eat it again. For this reason, zinc phosphide should not be used in the same field more than once in a 6 month to 1 year period.

Zinc phosphide bait is rapid acting. You may find dead voles within 12 hours of baiting. When practical (e.g. dead voles in the open such as along roads) dispose of dead voles by burying them or placing them in plastic bags and putting them in the trash. Do not handle them with your bare hands. Because zinc phosphide does not accumulate in the tissue of the voles, predators or scavengers such as dogs and cats are not likely to be affected by eating the poisoned rodents. However, children, as well as pets, birds, and other animals, can be affected by the bait, so store it out of reach and use it carefully in a way that will minimize their access to it.

Zinc phosphide is a Restricted Use Material. You must obtain a permit from the local County Agricultural Commissioner to buy and use it. Follow label instructions carefully. Your Ag. Commissioner sells or can direct you to one that sells zinc phosphide bait registered for use in alfalfa.

Multiple-feeding baits. Anticoagulant baits are registered for meadow vole control but not for use in alfalfa. Use in areas adjacent to the alfalfa field or during crop dormancy or where contact with the alfalfa plant will not occur. Anticoagulant baits are slow acting and must be consumed over a period of days to be effective. Whole grain baits are commonly recommended, but pelleted baits are also available. Moisture-resistant paraffin block baits are useful around ditches and other areas where high moisture may cause other types of baits to spoil.

Because voles must feed on anticoagulant baits over a period of days, the bait must be available until the population is controlled. As with trapping, bait placement is very important. Place it in runways or next to burrows so voles will find it during their normal travel. If the rodenticide label allows it to be broadcast, be sure to spread it evenly over an infested area. If you use this technique, use multiple broadcasts according to the label instructions. Read the label carefully. These baits are toxic to other animals so take care and keep non-target animals from eating the bait. No anticoagulants are registered for in-crop use at this time.

Some anticoagulant paraffin bait blocks are registered for voles. Place them in runways or near burrow openings or both. Keep replacing them as they are eaten and remove those that remain when feeding stops. Bait blocks should not be used where children or pets might pick them up.

Natural Control. Predators, especially barn owls and hawks eat meadow voles. Unfortunately, predators are unable to keep vole populations below damaging levels in most cases. Barn owls nest boxes are being promoted by some to assist in the meadow vole control efforts. Unfortunately, there is no evidence that these predators will control rodents in the alfalfa, even when artificial nest boxes are in place.

Monitoring Guidelines. To detect the presence of voles, look for fresh trails in the grass, as well as burrows, droppings, and evidence of feeding. Routine monitoring of the alfalfa field and surrounding area is important. Pay particular attention to adjacent areas that have heavy vegetation because voles can build up in these areas and invade the alfalfa.

POCKET GOPHERS

Pocket gophers (*Thomomys* spp.) are stout bodied, short-legged rodents, well adapted for burrowing. Their common name is derived from the fur-lined external cheek pouches, or pockets, used to carry food and nesting materials. The pocket gopher's lips close behind its four large incisor teeth, keeping dirt out of its mouth when it is using its teeth for digging. They live by themselves in an extensive underground burrow system that can cover an area of several hundred square feet. These burrows are about 2 inches in diameter, usually located from 6 to 12 inches below ground. They eat a wide variety

of roots, bulbs, tubers, grasses, and seeds, and sometimes even the bark of trees. Their feeding and burrowing can damage alfalfa and surrounding areas. In addition, they may damage plastic irrigation lines and their tunnels can divert and carry off irrigation water, lead to soil erosion and cause some structures to fail.

Pocket gophers seldom travel aboveground. They are sometimes seen above ground feeding, pushing dirt out of their burrow system, or moving to a new area. The mounds of fresh soil that are the result of burrow excavation indicate their presence. Their mounds are usually crescent shaped and are located at the ends of short lateral tunnels branching from a main burrow system. One gopher may create several mounds in a day. Generally, a group of mounds is evidence of 1 gopher.

Because of the nature of pocket gopher damage, a successful control program depends on early detection and prompt measures to prevent damage. Most people control gophers in alfalfa by baiting using mechanical baiting probes, hand probes or a tractor-drawn baiting device. Trapping is sometimes used although it is usually too labor intensive to be effective over large areas. Recently, fumigation for pocket gopher control has gained popularity and is something to consider if the gopher problem is severe and the other methods do not seem to be working. A program incorporating these methods should result in significant reduction in pocket gopher damage in the area.

Baiting. Strychnine-treated bait is the most common type used for pocket gopher control. When used in alfalfa, this is a Restricted Use Material. This bait is usually effective with one application. Baits containing anticoagulants are available in some areas. They require multiple treatments or one larger treatment to be effective. All gopher bait is poisonous and should be used with caution. Because gopher bait is placed underground, it is considered safe to use because it is not exposed to most other animals, or to children. However, dogs and other animals can dig up gophers and might be exposed to bait in this way. Always read and follow product label instructions carefully.

Hand baiting. Simple hand probes or hand probe dispensers are used for baiting pocket gophers (see trapping section for probe description). To be effective, baits must be placed in the underground tunnel. After locating the main gopher burrow with a probe, enlarge the opening by rotating the probe or inserting a larger rod or stick. Then place the bait carefully in the opening, taking care not to spill any on the ground. A funnel is useful to prevent spillage. Close the probe hole with sod, rock, or some other material to exclude light and prevent dirt from falling on the bait. Tamp or rake down existing mounds so you can distinguish new activity. If gopher mounding activity continues for more than 2 days after strychnine bait or 7 to 10 days after anticoagulant baits have been used, you will need to repeat your control efforts.

Mechanical baiting. The mechanical bait applicator offers a good way of controlling gophers over large areas with a once-over operation. This tractor-drawn device constructs an artificial underground burrow and deposits poison grain bait in it at regular intervals and quantities. The artificial burrow should be used only where gophers are active and should not be used as a prophylactic to prevent gophers from invading an area. The artificial burrow will intercept the natural gopher burrow systems in the treated area. Gophers readily explore these artificial tunnels and will consume the bait. In alfalfa, the

machine will cut the plants and leave a slight ridge. Soil moisture is critical when you use the machine. If the soil is too wet, the tractor bog down; too dry and the artificial burrows will collapse. The strychnine bait used in this machine is usually a higher strength than those used for hand baiting. Recently, the availability of strychnine bait, especially at the higher strengths has been very limited.

Trapping. Successful trapping or hand baiting depends on accurately locating the gopher's active tunnel system which is usually 6 and 12 inches deep. The crescent-shaped mounds visible aboveground are connected to this burrow by lateral tunnels. Because the lateral tunnels are plugged by the gopher, trapping and baiting in them is not as successful. Two common traps are the two-pronged pincher trap and the squeeze-type box trap. These traps are triggered when the gopher pushes against a flat vertical pan or wire trigger.

To locate the main burrow, use 1/4" diameter probe. Gopher probes are commercially available or can be constructed from a pipe, wooden dowel, or stick. Look for the freshest mounds because they indicate an area of recent gopher activity. You will usually see a small circle or depression on the mound representing the plugged lateral tunnel. This plug is generally bordered on one side by soil, making the mound crescent shaped. Begin probing 8 to 12 inches from the plug side of the mound. When the probe penetrates the gopher's burrow, it should drop suddenly about 2 inches. Often, the main burrow will go between two mounds. To locate the gopher's main burrow you will probably have to probe repeatedly, but your skill will improve with experience. Several types and brands of gopher traps are available.

After you have located the main tunnel, open it with a shovel or garden trowel and set traps in pairs facing opposite directions. This placement will intercept a gopher coming from either end of the burrow. The box type is easier for most trappers to set but requires more excavation. Box traps are especially useful when the gopher's main burrow is small (less than 3 inches in diameter) because small burrows must be enlarged to accommodate wire pincher traps. All traps should be wired to stakes so you won't lose track of them. After setting the traps, exclude light from the burrow by covering the opening with dirt clods, sod, cardboard, or some other material. Fine soil can be sifted around the edges to ensure a light-tight seal. If light enters, the gopher may plug the burrow with soil, filling the traps and making them ineffective. Check traps often and reset them when necessary. If no gopher is caught within 3 days, reset the traps in a different location. Remove and bury dead gophers or place them in plastic bags in the trash. Do not handle without rubber gloves. Human odor on traps has no apparent affect on trapping success.

Fumigation. Fumigation is not usually considered effective for pocket gopher control although aluminum phosphide (a Restricted Use Material) does work if used properly. Aluminum phosphide tablets react with the moisture in the air to evolve phosphine gas. To use, probe for a main tunnel. Once found, enlarge the probe hole by using a bigger rod (some growers use a 3/4" PVC pipe) and place the tablets down into the burrow system. Cover the probe hole with soil or close it by healing the ground. Knock down all mounds in the area. Re-inspect after 48 hours. If new mounds are being formed, re-

treat the active burrows. While phosphine gas is toxic to all animals, it does not build up in the tissues of the gopher so there is minimal hazard if another animal eats a poisoned gopher. If using a fumigant, be sure not to use it under or near buildings. Read and follow the label carefully. Fumigation with smoke or gas cartridges is usually not effective because gophers quickly seal off their burrow when they detect smoke or gas.

Natural Control. Predators, especially barn owls, hawks, dogs and cats, eat pocket gophers. In most cases they are unable to keep pocket gopher populations below the levels that cause problems in alfalfa and landscaped areas. There is considerable interest in providing artificial nest boxes to encourage barn owls to live near alfalfa fields. Because barn owls often bring prey back to their nest (and regurgitate bones of those eaten elsewhere), growers notice evidence of feeding on gophers. There is no information on where these gophers were taken, however. We do know that owls forage some distance from their nests, often in open grasslands or alfalfa where hunting is probably easier than in alfalfa.

Other Control Methods. Pocket gophers can easily withstand normal irrigation but flooding can sometimes force them out of their burrows. When this happens, they are vulnerable to capture. A new device on the market is an exploding gun that pumps propane and oxygen into the tunnel system and ignites the mixture with a spark. While some growers are using this device, little information is available on its effectiveness for pocket gopher control. Repellents are not effective in protecting vines from pocket gophers. Frightening gophers with sound, vibration, electromagnetic radiation, or other means has not proven effective in driving them from an area or preventing their damage.

Monitoring Guidelines. Once pocket gopher damage has been controlled, a system should be established to monitor the area for gopher re-infestation. Level or stamp down all existing mounds after the control program and clean away weeds and debris so fresh mounds can be seen easily. A monitoring program is important because pocket gophers may move in from other areas and a recurrence of damage can occur within a short time. They probably do this by using the tunnel systems left by other gophers. Experience has shown that it is easier, less expensive and less time consuming to control gophers before they build up to the point where they do excessive damage.