

Mammal Pests

Introduction

This section contains methods used to control field rodents and rabbits and is a guide for agricultural commissioner personnel engaged in this work. Most pest mammals are discussed with specific control options. Rodenticides are often recommended. Before rodenticides are used, acceptance tests should be made to indicate the degree of bait acceptance that can be expected. If bait acceptance is good, most of the bait will be quickly consumed by rodents during a 24-hour period. If acceptance is poor, toxic bait should not be used. Too frequent application of acute toxic baits, like zinc phosphide, may cause bait and poison shyness. Unlike insecticides, which are generally applied to the crop itself, rodent baits are commonly placed in rodent burrows or applied to trails or areas where rodents naturally feed. Rodent baits should not be applied in any manner that will contaminate food or feed crops. This would include any application method which would cause the bait to lodge in food plants. Fumigants are applied directly into the rodent burrow and are sealed in by covering the burrow opening with a shovelful of dirt.

Identifying Rodents Causing Damage to Crops

One of the keys to controlling rodent damage in crops is prompt and accurate determination of which species is causing the damage. To make a positive species identification, survey the area of reported damage and look for signs of rodent activity such as: trails, runs, tracks and tail marks, droppings, burrows, nests and food caches. Also look for cuttings of grass or plant material in trails, runs or near burrow entrances. If trees or shrubs are being girdled note the size of the tooth marks and location of damage. The size of the incisor marks and location of damage may assist in identifying the rodent.

Snap traps of an appropriate size are one method used to identify the smaller rodent species damaging a crop. Traps can also assist in determining population densities, obtaining reproductive data, and censusing a rodent population in an area before and after a control program to evaluate the control results. Trap line procedures used in crops are discussed below.

Trapping Precautions

This section is based on the document Hantavirus Infection - California: Recommendations for Risk Reduction (Division of Communicable Disease Control, California Department of Health Services, August 20, 1993) and the report Hantavirus Infection - Southwest: Recommendations for Risk Reduction (CDC, MMWR July 30, 1993;Vol. 42:No. RR-11). Further detailed information is obtainable at the [Center for Disease Control](#).

Wild rodents can be reservoir hosts of diseases transmissible to humans, including a frequently lethal strain of Hantavirus. Precautions should be taken when trapping small rodents. If possible, snap (kill) trap methods should be employed. Protective clothing should be worn while trapping, including rubber or plastic gloves and coveralls (or other work clothing). Never eat, drink, or smoke while trapping. Wear insect repellent, as necessary, in areas with mosquito, flea, and tick problems. Before removing a rodent carcass from a trap, spray the carcass and trap with a general-purpose household disinfectant. Soak the carcass thoroughly and then place it in a plastic bag. To do this, pick-up the carcass and remove it from the

trap using an inverted plastic bag; place the carcass and bag into a second bag and seal. Dispose of the double bagged carcass as permitted by local regulations. Clean traps, surfaces, or other materials that have been contaminated in disinfectant before reusing. Remove gloves and dispose of these in the trash; thoroughly wash hands with soap and water.

If live trapping of rodents is necessary, special precautions should be considered. Persons involved with extensive handling of rodents should have a baseline serum sample drawn (store at -20°C), preferably at the time of employment. Workers who develop a febrile or respiratory illness within 45 days of the last exposure should seek medical attention immediately and inform the attending physician of the potential occupational risk of rodent-borne infection (e.g., hantavirus pulmonary syndrome, plague, etc.). In addition to the protective measures described for snap trapping, workers should wear a half-mask air-purifying (or negative-pressure) respirator with a high-efficiency particulate air (HEPA) filter or a powered air-purifying respirator (PAPR) with HEPA filters when handling live rodents, including removing them from traps. Respirators (including positive-pressure types) are not considered protective if facial hair interferes with the face seal, since proper fit cannot be assured. Respirator practices should follow a comprehensive user program, be supervised by a knowledgeable person, and be in compliance with Cal/OSHA regulations.

MEADOW VOLES, DEER MICE, HOUSE MICE.

Snap-trapping enables an individual to detect or confirm the presence of mice in crops or adjacent uncultivated grassy area. One hundred baited (wet oatmeal or peanut butter) mouse snap-traps are set approximately 10 feet apart in a transect line across the area to be sampled. The traps are set at locations which will increase likelihood of success (runways or burrows) and are serviced and reset daily for two or three days. Traps should be set at right angles to runways or burrow openings to increase the frequency of catch. The number of mice caught per 100-trap-nights will serve as a population index. A 10% mouse catch per 100-trap-nights provides evidence that some type of control action should be considered. In some situations, action may be implemented when fewer mice are present depending on their propensity for increasing in numbers and causing damage.

NORWAY RATS

Fifty rat traps baited with peanut butter or nut meats, are set approximately 20 feet apart in a transect line across the area to be sampled. In crops such as rice, corn, or melons, traps may be set along drainage canals or roadside areas. Trap placement should be in locations which will increase likelihood of success (runways or burrows) and are serviced and reset daily for two or three days. Frequency of trap catch is greater when traps are set at right angles to the runways. The numbers of rats caught per 50-trap-nights will serve as a population index.

ROOF RATS, NORWAY RATS, WOOD RATS.

Citrus, avocados, olives and nuts are tree crops that may be damaged by rats. It is important to identify the species of rat causing the problem prior to control actions. Set rat traps baited with fruit or nut meats in pairs at the base of each tree suspected of being damaged. If damage is occurring in trees or vines, set traps in these areas as well.

The roof rat is somewhat smaller than the Norway rat. The body is slender and the snout is pointed. The roof rat has a tail longer than its body and head combined, and its ears are large and prominent. The larger Norway rat has a heavyset body with a blunt snout. The tail is shorter than the body and head combined,

and the ears are small and close set.

Tree crop damage may occasionally be caused by native wood rats. Although size and body shape may vary among the many species in western North America, wood rats generally have a bushy or tufted tail and the underparts and feet are lighter than the upper body.

Safety Precautions for Rodenticide Use

The safe handling, storage and use of rodenticides is the responsibility of the applicator. The applicator shall follow all label instructions at all times.

1. All bags, sacks or other containers should have the product label attached. All containers of bait other than the original labeled container (service container) shall be labeled with the precautionary statement that applies (i.e. danger, warning or caution), the name of the toxicant and name and address of responsible party. This includes bait stations.
2. Toxic baits and concentrates shall be stored in an adequately locked space at all times when not in use. Such space shall be entirely separate from where food or drink for humans or domestic animals is kept stored.
3. All persons handling toxic baits or concentrates should be advised as to:
 - The characteristics of these materials.
 - The necessity of using adequate protective clothing and devices such as gloves and/or bait spoons for dispensing baits.
 - The necessity for keeping all skin abrasions and cuts adequately protected.
 - The possibility of inadvertent poisoning of wildlife and domestic animals by improper bait exposure.
 - The symptoms of poisoning and recommended first aid if such symptoms occur.
4. To prevent the accidental bait spillage, containers should be so designed and in such repair that leakage or spillage does not occur.
5. Toxic bait accidentally spilled should be immediately and thoroughly cleaned up.
6. Do not leave containers of bait unattended or where it can be obtained by children, irresponsible persons or animals.
7. Unused bait should be disposed of according to label directions.
8. Dispose of empty bait containers according to label directions.
9. Wash hands with soap and water after handling poison baits and before eating or smoking.

Guidelines for Baiting Field Rodents

Pre-Treatment

1. Annual rodent control plans shall be reviewed by the California Department of Fish and Game regarding hazards to threatened and endangered species as specified in the "Joint Policy Statement of the California Department of Food and Agriculture, California Department of Fish and Game and the California Agricultural Commissioners Association Regarding Threatened and Endangered Species."
2. Actual damage or threat of damage must be sufficient to warrant application of rodent baits. As a safeguard to humans and domestic animals, alternative methods such as fumigants or anticoagulant baits in bait stations should be considered around inhabited buildings, suburban areas and domestic animals.
3. Baiting should not be done unless tests indicate satisfactory bait acceptance occurs in areas to be treated.
4. Bait should be chosen on the basis of selectivity as well as acceptance value.
5. When county agricultural commissioners anticipate control programs involving other than established practices the California Department of Food and Agriculture should be advised.

Treatment

1. The county agricultural commissioner or his staff should be aware of the conditions at the site of application and in a position to direct and control the manner in which the application is made.
2. Toxic baits used in control operations shall be artificially colored or dyed.
3. Quantities of toxic bait exposed shall be regulated so that residual bait will be low to minimize a hazard to nontarget species.
4. Property owners or tenants shall be advised to dispose of rodent carcasses on the ground surface immediately adjacent to inhabited areas. A shovel should be used to minimize possible contact with ectoparasites and diseases.
5. There are no specific statutory provisions requiring the posting of warning signs for rodent control. However, when premises are posted in accordance with county policy, they are to be posted as prescribed by the California Penal Code, Section 596 - ("signs located at intervals of distance not greater than one-third of a mile apart and in any case not less than three such signs having words with letters at least one inch high reading "WARNING - POISON BAIT PLACED OUT ON THESE PREMISES").
6. All accidentally spilled grain bait shall be cleaned up immediately.
7. Discarded or used containers shall be disposed of in accordance with California laws and regulations pertaining to disposal of pesticide containers.

Post-Treatment

An annual written evaluation should be made of representative areas describing the degree of control and any observed effects on nontarget wildlife.

Guidelines for Applying Rodent Baits by Aircraft

FOR CONTROL OF GROUND SQUIRRELS

Pre-Treatment

1. Actual damage or threat of damage should be sufficient to warrant aerial application of rodent baits. Alternative methods shall always be considered.
2. Conduct bait acceptance prior to treatment to ensure the squirrels will take the bait offered. Use untreated oats as the prebait acceptance material. No baiting should be implemented unless tests indicate satisfactory bait acceptance occurs in representative areas.
3. The pilot should be thoroughly familiar with the application site. Maps (topographic/aerial) identifying boundaries and sensitive areas shall be provided to the pilot prior to application. All licenses required for aerial application of bait should be current and in order – ([Pest Control Aircraft Pilot's Certificate](#)).
4. Property lines and boundaries must be identifiable from the air.
5. The aircraft shall be calibrated with nontoxic oats.
6. A written, general evaluation should be made of several representative areas describing damage or threat of damage, bait acceptance and the presence of nontarget wildlife which might be threatened by the treatment.

Treatment

1. Several people are necessary and required to monitor and manage the aerial application. One person should oversee bait handling and record keeping at the landing strip; another person should monitor the operation in each area under treatment.
2. As a rule of thumb, aerial baiting should not occur on the same parcel of land more often than once every two years with the same toxicant.
3. Provisions shall be made to eliminate spillage of bait at the loading site. Unless automatic loading equipment is utilized, a ground cloth or canvas should be used.
4. No treatment should be made when wind velocity impairs effective bait placement.
5. No treatment should be made when fields are muddy, have standing water, or when rain is expected within 24 hours.
6. Treated bait should not be applied near farm buildings, or over domestic or livestock water supplies.
7. Ground-to-air communication should be in use during treatment.
8. The aircraft bait hopper should be:

- Thoroughly cleaned before the first baiting of the program, after final baiting of the program, and if baiting hopper has been used for other pesticides during the program.
 - Emptied of bait at the end of each day's operation and bait stored in locked container.
9. The rate of application shall be monitored daily by measuring bait dispersal in the treated areas.
 10. All accidentally spilled grain bait shall be cleaned up immediately.

Post-Treatment

A written evaluation should be made of representative areas describing the degree of control and any observed effects on nontarget wildlife.

Guidelines for Applying Rodent Baits by Aircraft

FOR CONTROL OF MEADOW VOLES

Pre-Treatment

1. Actual damage or threat of damage must be sufficient to warrant aerial application of rodent baits. Damage may be substantiated by snap traps. Normally a 10% meadow mouse catch per 100 trap nights warrants control of the mouse population. Alternative methods shall always be considered.
2. No baiting should be implemented unless tests indicate satisfactory bait acceptance occurs in representative areas.
3. The pilot should be thoroughly familiar with the property(ies) to be treated.
4. The aircraft should be calibrated with nontoxic baits under the supervision of the agricultural commissioner or his staff.
5. A written general evaluation shall be made of several representative areas describing damage or threat of damage, bait acceptance and the presence of nontarget wildlife.

Treatment

1. Provisions shall be made to eliminate spillage of bait at the loading site. Unless automatic loading equipment is utilized, a ground cloth or canvas should be used.
2. No treatment should be made when wind velocity impairs effective bait placement.
3. No treatment should be made when fields are muddy, have standing water, or when rain is expected within 24 hours.
4. Treated bait should not be applied near farm buildings or over water supplies.
5. An automatic flagman or a ground flagman should be used during treatment.
6. Ground-to-air communication should be in use during treatment.
7. The aircraft bait hopper should be:
 - Thoroughly cleaned before the first baiting of the program, after final baiting of the program, and during if hopper has been used for other pesticides during the program.
 - Emptied of bait at the end of each day's operation and bait stored in locked container.
8. The rate of application should be monitored daily by measuring bait dispersal in the treated area.

All accidentally spilled grain bait should be cleaned up immediately.

Post-Treatment

A written evaluation should be made of representative areas describing the degree of control and any observed effects on nontarget wildlife.

Guidelines for Applying Rodent Baits by Aircraft

FOR CONTROL OF FOREST RODENTS

Pre-Treatment

1. Actual damage or threat of damage must be sufficient to warrant aerial application of rodent baits.
2. No baiting should be implemented unless tests indicate satisfactory bait acceptance occurs in representative areas.
3. The pilot should be thoroughly familiar with the property(ies) to be treated.
4. The aircraft should be properly calibrated prior to bait application.
5. A written general evaluation should be made of representative areas describing damage or threat of damage, bait acceptance and presence of nontarget wildlife

Treatment

1. Helicopters are generally used rather than fixed wing aircraft for forest rodent control.
2. Provisions should be made to eliminate spillage of bait at the loading site. Unless automatic loading equipment is utilized, a ground cloth or canvas should be used.
3. No treatment should be made when wind velocity impairs effective bait placement.
4. Treated bait should not be applied near farm buildings or over water supplies.
5. The aircraft bait hopper should be:
 - Thoroughly cleaned before the first baiting of the program, after final baiting of the program, and if baiting hopper has been used for other pesticides during the program.
 - Emptied of bait at the end of each day's operation and bait stored in locked container.
6. The rate of application should be monitored occasionally by measuring bait dispersal in the treated area.
7. All accidentally spilled grain bait should be cleaned up immediately.

Post-Treatment

A good practice is to provide a written evaluation of representative areas describing the degree of control and any observed effects on nontarget wildlife for all application sites.

Calibration of Bait Broadcasting Equipment Including Aircraft

Calibration

Accurate calibration of aircraft or other broadcasters is essential for safe, successful and economical rodent control. Dispersing less than the actual amount of bait desired may lead to only partial control; conversely, rates higher than necessary are wasteful and may create unnecessary hazards.

The use of placebo bait, containing all the ingredients except the toxicant for calibration is recommended since clean grain and placebo bait may differ in rate of flow from certain hoppers. Toxic grain, because of the potential hazards, should never be used in calibration.

Two methods have been used to calibrate aircraft; the first (and more reliable) requires that a weighed amount (preferably 75 lbs. or more) of placebo bait be loaded in the hopper. With the gate pre-adjusted to the approximate opening, the pilot flies a swath one mile long at the speed and height to be used during the control operation. The grain bait remaining in the hopper is then weighed to determine the amount applied. The distance flown, multiplied by the swath width, can be converted to swath-acres, enabling the calculation of pounds per swath-acre. In the event the first trial fails to produce the desired rate, the gate must be readjusted and swath applied repeatedly until the proper rate is achieved.

Rate of application can also be determined by the average number of kernels of grain deposited per square foot. Then of course, the number of kernels per pound of bait must be known. To establish the number of kernels per square foot, a trial swath at least 100 yards in length is applied over a paved runway or other smooth surface. Individual square-foot counts are made with a steel tape (100 ft.) and a square-foot counting frame. The edges of the swath are determined by the presence of the furthest kernel found from the transect, ignoring the occasional kernel that may land way outside the general swath area. The tape is laid at right angles across the swath to determine the exact width and act as a guide baseline for counting the number of bait kernels per square foot. In practice, the counting frame is placed alongside the tape at the swath edge, the number of kernels within the frame are counted and recorded, and the frame is moved to every alternate foot and the count repeated until the opposite edge of the swath is reached. Bait counts should be taken across the swath in at least three places, each some 20 yards from the previous transect. The mean number of kernels per square foot is then calculated for all of the counts. This technique is valuable for checking the rate during the actual application where the swath transects an area reasonably smooth for bait counting.

REFERENCES AND ADDITIONAL READING

A Guide For Aerial Baiting of Ground Squirrels. Rex E. Marsh, Department of Animal Physiology, University of California, Davis (1967).