



Los Angeles County Department of Agricultural Commissioner/Weights and Measures

PEST MANAGEMENT DIVISION  
**PEST INFORMATION SERIES**



## Ground Squirrels

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### Identification

There are five species of ground squirrel that are native to California. Of our native ground squirrels, the Mohave and the San Joaquin Antelope Squirrel are designated as threatened species by the California Department of Fish and Game. The ground squirrel that is most likely to be encountered in Los Angeles County is the California ground squirrel which is also known as the Beechy ground squirrel.

The California ground squirrel can be identified by physical as well as behavioral characteristics. Adult ground squirrels can reach an overall length of 18-20 inches with the body slightly longer than the tail. California ground squirrels are gray with lighter flecks distributed over the surface of the back and sides. The nape of the neck has a pair of dark triangular patches that extend just beyond the shoulders. A noticeable white fringe adorns the sides and tip of the tail.



*Spermophilus beecheyi*

It also has internal cheek pouches that it uses to gather food. When frightened they always seek shelter in an underground burrow.

## Biology and Behavior

All ground squirrels are active only during day time hours and are “fair weather” animals. They can often be found basking in the morning or afternoon sun during the spring and summer, only going below ground to avoid the intense heat of midday. During midwinter, those squirrels which do not remain underground all together make their appearance only late in the forenoon on bright sunny days. Ground squirrels have two periods of dormancy during the year. A winter hibernation and in the hottest time of summer a period of inactivity known as estivation. Although they climb trees for fruits and nuts, they are primarily ground living foragers.

Ground squirrels live communally in burrows, which have open entrances about 4 inches in diameter. The burrows may be 5 to 30 feet in length and may go 2 to 4 feet or more below the soil surface. Generally, there is more than one entrance to a burrow system. These colonies may include several dozen animals in many burrows and more than one animal may live in a burrow.

Ground squirrels breed once per year, averaging seven to eight young per litter, but can range from 1 to 15. Here in Los Angeles County, breeding begins in December and young are born 25 to 30 days later. Young usually remain in the burrow for six weeks. The young grow rapidly and in June begin to scatter out to occupy new territory or old unoccupied burrows. Ground squirrels have a home range of less than 150 yards across, but have been known to travel up to 5 miles to establish new colonies.

Ground squirrels may live five years or more in the wild. Outbreaks of naturally occurring diseases periodically reduce squirrel numbers in some areas. Predators include the coyote, badger, weasel, bobcat, red-tailed hawk, golden eagle, rattlesnake, and gopher snake.

The ground squirrel's diet varies depending on the time of year. After emerging from hibernation they feed primarily on green grasses and herbaceous plants. As annual plants begin to dry and produce seed, squirrels switch to seeds, grains, and nuts and begin to store food. Although they are primarily plant eaters, ground squirrels will eat the eggs of ground nesting birds.

## Damage

Ground squirrel feeding activity damages many fruit and nut trees as well as vegetables and ornamental plants. They may damage young trees, shrubs and vines by gnawing bark, girdling trunks, eating twigs and leaves, and burrowing around roots. Ground squirrels will chew on plastic sprinkler heads and irrigation pipe. They also feed on the eggs of ground nesting birds, such as pheasant and quail. In one study, the California Department of Fish

and Game concluded that 30% of unsuccessful quail nests resulted from ground squirrel depredation. In agricultural settings, studies have found that 20 squirrels consume as much green forage as one sheep and that 200 consume as much as one steer. Their extensive burrows damage landscaping and undermine structures, roads, dams and slopes contributing to erosion. When populations become unnaturally high, their burrowing and feeding activities may serve to degrade an area's biodiversity, sometimes leaving it a pockmarked moonscape.



## Legal Status

**Ground squirrels** are classified as nongame mammals by the California Fish and Game code (except for the Mojave and San Joaquin antelope squirrel, which are threatened species). Nongame mammals which are found to be injuring crops or other property may be controlled at any time or in any manner that is legal and humane by the owner or tenant of the property. They may also be controlled by federal, state or county officers or employees while acting in their official capacities.

## Diseases

Ground squirrels are associated with the spread of Rocky Mountain spotted fever, rat bite fever, tularemia, Chagas' disease, adiospiromycosis and encephalomyocarditis. The disease they are most often associated with, however is sylvatic (bubonic) plague.

Circumstantial evidence points to ground squirrels as the host to plague-infected fleas in over half of the reported cases of human plague in California in the last 40 years. Plague is not a disease native to California, it was brought here to San Francisco by infected rats in 1899. The first ground squirrel to be confirmed as plague-infected was in 1908 in Contra Costa county. It has since spread to all of California. Ground squirrels do not "reservoir" the disease, a reservoir is an animal that has the disease, but may not show any symptoms and are usually not harmed by the infection. It is suspected that native mice and their fleas act as the reservoir for the plague bacteria from which the disease periodically spreads to other rodents. The disease is spread when a flea feeds on an infected animal and then feeds on a human. Since ground squirrels are themselves susceptible to plague, caution should always be exercised around occupied or vacant burrows as infected fleas may exist for months in the burrow entrance. Insecticides are routinely used, especially in "high risk" areas as a preventative measure in recreational areas in the Angeles National Forest to protect both human and squirrel populations from the disease.

## Management

California ground squirrels do very well in areas disturbed or altered by man which border a natural setting. In fact, in these areas, ground squirrel populations may increase to many times the level it would be in a truly natural environment. It is in these settings that control frequently becomes necessary.

As with any pest problem, it is extremely important to know what species of squirrel is causing the damage **before** you initiate a control program.

It is also important to remember that no one method may eliminate the pest problem, the best control plans should always use a combination of techniques. One final consideration is that unless major changes occur to the existing environment (for example, a vacant lot is developed into a shopping center) the pest problem will eventually return, so any pest management plan must include a regular monitoring component.

The strategy that will work best for your particular situation will depend on several factors. One will be the size of the area to be managed and the amount of animals that are living there. Other considerations are the amount of damage you are willing to tolerate and the rate that re-infestation is likely to occur. For instance, if you live next to the foothills or a large vacant lot, your likelihood of eventual re-infestation is reasonably high. In situations where constant maintenance may be required over a large area or where ground squirrels may pose a human health threat, a contract with a licensed private pest control operator or county agricultural commissioner's office may be a cost effective alternative to doing the work yourself. Further advice about your particular squirrel control problem can be obtained by calling the Pest Management Division of the LA County Agricultural Commissioners/Weights and Measures Department at (626) 575-5462.

### Trapping

If you have only a few ground squirrels, trapping may be an effective way to control them. However, this also will place you in close contact with rodents and their diseases so you should use caution if you use this technique. There are two basic types of traps that are generally used for this type of control work, the cage or live trap and the box type.

Live traps are effective, but present the problems of how to humanely kill the live animal and where to dispose of them. It is also illegal abandon any animal (Penal Code Section 597s) and because they have the potential to carry diseases and are agricultural pests, they cannot be released into the wild without written permission of the California Department of Fish and Game (Fish and Game Code Section 671.6a (2),(3)).

Box traps are easy to use and work best if you pre-bait them without setting them for a few days to get the squirrels used to feeding from them. They work best if placed on level ground near burrow openings or runways. Traps should be secured in some way such as with a stake and a length of wire or rope to prevent a predator from finding a dead animal in the trap and taking off with it. The baits that are attractive to ground squirrels include

walnuts, almonds, pecans, peanuts, orange slices, oats, barley and melon rinds. Baits should be attached to the trigger or placed behind it.

Box traps can be purchased from local garden centers, trapping supply catalogs or from the Agricultural Commissioners office at cost. A multiple catch trap can be made by removing the back panels from two traps and securing them to a board back to back leaving a small open space between them as a baiting area and then placing a small strip of hardware cloth to connect the traps and protect the bait.

Box traps are “set” by depressing the spring on the top of the trap flat and placing the cross bar over the top then engaging the trigger. By moving the trigger up or down the cross bar you can adjust the sensitivity or how easily the trigger will set off the trap. Dead rodents should be removed from the trap using gloves and by reaching through an inverted plastic bag.

It may take several days for squirrels to become accustomed to the trap and enter it, so don't be discouraged if you aren't successful the first time you place traps. If, however, a week or more has gone by without catching or if you suddenly stop catching and still see squirrels you may need to relocate your trap, change bait or try some other method.

## Toxicants

This method works best when large numbers of ground squirrels are present, particularly if large areas are involved. There are several different products available, but most fit into two categories: fumigants and baits.

## Fumigants

Fumigants generate poisonous gases that kill ground squirrels quickly before they can detect them and leave the burrow. They do not persist in the environment and some are better than 90% effective with one application. Unfortunately, the two most effective fumigants aluminum phosphide and acrolein, are restricted use pesticides and are only available for use by certified applicators.

Gas cartridges are available from local garden and hardware stores as well as from the Agricultural Commissioners office at cost. These are relatively safe and easy to use and when used in the spring or other times of the year when there is high soil moisture can be very effective. Care should be taken to not fumigate under any structures and due to the fact that these cartridges can flare up producing a flame. It is important not to use these where a fire hazard exists.



To use a gas cartridge seal all burrow entrances except one then use a nail or other sharp implement to punch holes in one end of the cartridge and stir the contents to loosen them. In one of the holes insert the fuse, then place into the burrow and light the fuse. Once the contents has ignited use a shovel handle or long stick to insert the cartridge deeper into the burrow and immediately close the burrow with tightly packed earth. Watch for escaping gas from other burrows and seal

them with soil. Large burrow systems may require the use of two or more cartridges in order to create enough gas to give control. After 24 hours re-treat any opened burrows. One final word of caution about fumigation, remember that many non target animals such as burrowing owls use abandoned ground squirrel burrows, so make sure before you treat that you are treating active ground squirrel burrow systems.

## Baits

Poisoned baits are the most commonly used measure to control ground squirrels in Los Angeles County. However, due to a change in US EPA labeling requirements, poison baits distributed by the County Agricultural Commissioner offices are no longer available for sale to the general public. These materials are now restricted to use by certified applicators only. For a limited time, garden supply and hardware stores may still have baits available. Other control measures sold by the Agricultural Commissioners office will still be available to the public at cost.

**Remember that many rat control products are not allowed to be used for squirrel control and to use them for squirrels is a violation of federal and state law and may result in death or injury to humans, pets or wildlife.**

Anticoagulant poisons interfere with the blood clotting ability of the squirrel, eventually leading to death. They are only effective when consumed over several feedings for at least 5 consecutive days. Effectiveness is greatly reduced if 48 or more hours pass between feedings. It is important that a constant supply of bait be available during the time of baiting and should only be discontinued when feeding stops. These characteristics, as well as an effective antidote (Vitamin K-1) make the use of anticoagulant baits relatively safe. In Los Angeles County, they can be effective all year long, but are generally considered less effective in the spring when the bait has to “compete” with the lush spring growth.

The bait is composed of the anticoagulant material applied to grain. The grain baits are dyed a color, and are somewhat disfigured by being crushed or “crimped”. This makes them less attractive to seed eating birds. The bright color, usually blue, also prevents possible accidental human consumption and reduces the hazard of baits being used to feed livestock.

Anticoagulant baits can be used in two ways: in bait stations, or by repeated scattering or “broadcasting” the bait. Bait stations are small structures which the ground squirrel must enter to eat the bait. Stations contain enough bait for repeated feedings and help keep children and pets from reaching the bait. Bait stations are the preferred baiting method around homes and other areas where children, pets, and poultry are present. Bait stations can be either purchased ready made from anywhere the bait is sold or they can be made at home using readily available materials.

There are several design considerations for constructing a bait station for ground squirrel . Entrance holes should be about 4 inches across to allow access by ground squirrels, but not by larger animals. A lip or some other device should be used to prevent bait from spilling from the station when squirrels exit. The station should be lockable or otherwise made difficult for children to open, and should be secured so that it cannot be turned over or easily removed.

Place bait stations containing 1 to 5 pounds of bait in areas frequented by ground squirrels (near runways or burrows). If more than one station is needed, space them at intervals of 100 to 200 feet. Initially, inspect bait stations daily and add bait as needed. Increase the amount of bait if all is eaten overnight. Fresh bait is important; replace moldy or old bait.

It may take a number of days for ground squirrels to become accustomed to the bait station and enter it. Anticoagulant bait generally takes about 2 to 4 weeks or more to be effective. Continue baiting until all feeding stops and no ground squirrels are observed. Unused bait should be picked up and disposed of upon completion of the control program.

Repeated broadcast baiting (not using a bait station) with anticoagulant bait can be effective in controlling ground squirrels. If broadcasting is not specified on the product label, broadcasting cannot be used.

Using gloves, scatter a handful of bait (about 10 placements per pound) evenly over 40 to 50 square feet near active burrows or runways. Re-treat the same location three to four times every other day to provide an uninterrupted supply of bait. Scattering bait takes advantage of natural foraging habits. Never pile bait on the ground: it increases the hazards to livestock and other animals which can easily pick up the concentrated bait. Bait should never be placed in or immediately in front of burrows; ground squirrels do not feed there and are likely to shove the bait out to the surface.

## Natural Control

Ground squirrels have a number of natural enemies that are mentioned in this bulletin under the "Biology and Behavior" section that feed on and place pressures on squirrel populations. However, experience has shown that in many environments that have been altered by humans, natural predation does not control the squirrel population to levels that will prevent unacceptably high human health risks or damage to property.

## Habitat Modification

Ground squirrels prefer open areas, but do need some cover to survive. Removing brush, brush piles, and debris will make an area less desirable to ground squirrels, it will also make detection of squirrels and their burrows easier to find and aid in monitoring the population.

## Exclusion

Squirrels in general are good climbers and can be difficult to exclude. Dogs may prevent ground squirrels from entering small areas, but they cannot control squirrel populations.

## Monitoring

Once you have controlled your squirrel problem you must routinely check on the area to see if re-invasion has occurred. If not checked regularly, squirrels can re-invade your property and do a lot of damage in a short period of time.

## Warning On The Use Of Chemicals

Pesticides are poisons. Always read and follow all precautions and safety recommendations given on the container label. Store all chemicals in the original labeled containers in a locked cabinet or shed, away from food or feeds, and out of reach of children, unauthorized persons, pets and livestock.