



Green Bulletin

A newsletter for landscape and structural pest management professionals

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Managing California Ground Squirrels in Urban Environments

With the passing of AB 1322 in 2023 and the recent passing of AB 2552 in September 2024, the options for managing California ground squirrels (Figure 1) using lethal methods in urban areas will be more limited. See “What is the Poison-Free Wildlife Act” on page 4 for details. Despite these changes, there are still some viable options available for managing California ground squirrels.

Fumigants

Fumigation can be challenging in urban areas due to the risk of toxic gases leaking into buildings through burrows (Figure 2). However, some burrow fumigants can be used effectively if applied at a safe distance from structures. Be sure to consult the fumigant label for specific usage criteria. Fumigants are lethal to any animal residing within the burrow.

Beginning July 2023, the California Department of Pesticide Regulation (CDPR) has two new fumigation categories available for Qualified Applicator License (QAL) and Qualified Applicator Certificate (QAC) holders. One of these categories, Category M, is required for those who will perform pest control using a pesticide labelled as a fumigant to fumigate pest burrows in sites including, but not limited to: fields, rights-of-way, ditches, landscaping, and equipment yards.



M Program
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Figure 1. California ground squirrel.

Jack Kelly Clark, UC IPM

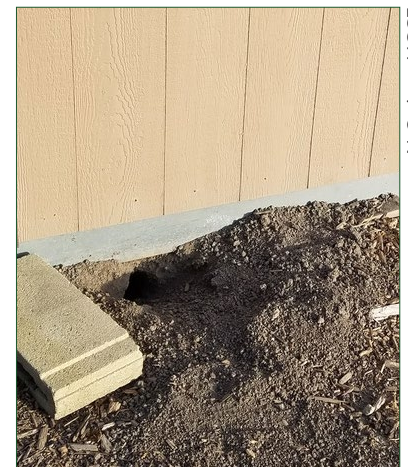


Figure 2. Ground squirrel burrow under a building.

N Quinn, UCCE

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There are four types of fumigants available for California ground squirrels.

■ Carbon Monoxide Pest Control Devices

Carbon monoxide (CO) devices are effective but can be costly. These devices cannot be used within 50 feet of inhabited structures. This distance varies depending on the species. Although carbon monoxide is not registered as a pesticide, there are still regulations that must be followed, such as using protective eyewear. Applicators do not need Category M since CO is not registered as a pesticide. In addition, records must be kept for two years for review by CDPR or County Agricultural Commissioners if an employee operates a carbon monoxide pest control device to perform pest control for hire or for a local government, including a city, county, city and county, school district, park district, authority, or any other political subdivision of the state. These records must include date of use, operator's name, address of treatment location, site where the device was used, and duration of device operation for each treatment.

■ Carbon Dioxide

Carbon dioxide is approved for use on California ground squirrels without proximity restrictions to buildings. However, it cannot be applied to burrows or dens known to house non-target animals.

■ Gas Cartridges

Gas cartridges, made from sodium or potassium nitrate and charcoal (sometimes with sulphur), can

be used without a pesticide applicator license. When ignited, they produce carbon monoxide and, if sulphur is present, sulphur dioxide. Use caution with gas cartridges as they pose a fire risk, especially in dry conditions.

■ Aluminum Phosphide

Highly effective (97–100% control in moist soil), aluminum phosphide is a cost-effective choice for controlling ground squirrels. It requires a restricted-use permit and can only be applied by a Qualified Applicator or under supervision. Use is limited to burrow systems located more than 100 feet from buildings and people.

Trapping

Trapping can effectively control small to moderate populations of California ground squirrels. For larger populations, consider alternative methods.

- Kill Traps: These include box, tunnel, Conibear traps and the Goodnature® A18 trap. The benefit of kill traps is that the trapper is not responsible for euthanizing live animals.
- Live Trapping: While effective, live trapping requires euthanizing captured squirrels on-site, as relocating them is prohibited under the California Fish and Game Code (Figure 3).

To safely handle carcasses, place the squirrel back in its burrow and cover the opening with soil, or double-bag and dispose of it in a secured garbage

Table 1. Effectiveness of Fumigation Methods.

Fumigation Type	% Reduction in Ground Squirrels	Conditions	Source
Carbon monoxide (PERC)	100%	Moist soil	Baldwin et al. 2017
Carbon monoxide (PERC)	66%	Dry soil	Baldwin et al. 2017
Carbon monoxide (Cheetah)	-15% (squirrel populations increased)	Not stated	Meinerz et al. 2018
Gas cartridges	62-86%	Moist soil	Baldwin and Holtz 2010
Aluminum phosphide	97-100%	Moist soil	Baldwin and Holtz 2010
Carbon dioxide	84.3-93.6%	Not stated	Donahue et al. 2018

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Ground Squirrel Management *continued from p. 2*

container. Be aware that some city ordinances prohibit this practice so it is important to check your local municipal code for guidance.

Toxic Baits

Zinc phosphide is permitted in limited urban areas (lawns, ornamentals, golf courses, and parks). It is a restricted use material that can only be applied by a licensed pest management professional.

While zinc phosphide can be highly effective and a cheaper option compared to FGARs, efficacy of zinc phosphide is less predictable given its distinctive odour and taste that rodents do not always find palatable; if rodents do not consume the bait, it obviously will not work.

Some labels suggest that zinc phosphide should only be applied once per year, some recommend that applications be separated by 30 days. These recommendations are suggested to limit bait shyness and keep the product effective. Non-toxic pre-baiting prior to an application of zinc phosphide is strongly recommended by most rodenticide labels to overcome some of the issues with bait shyness. Because of its acute toxic nature and a lack of an antidote, zinc phosphide is unlikely to be used around homes. Zinc phosphide can be used in a bait station but again not in all areas, and not in all places. It is important to consult the label.

Due to its mode of action, zinc phosphide should not be applied when precipitation, fog, or morning dew are expected. Zinc phosphide should not be applied on top of snow, ice, or wet ground. Do not irrigate for 48 hours after application.

Additional Methods

Other methods such as shooting, repellents, burrow modifications, habitat changes, biological control, and exclusion can also be considered but may have limitations in urban areas.



Figure 3. Live trap set next to a ground squirrel burrow.

For comprehensive details on these options, visit the *Ground Squirrel Best Management Practices* website at www.groundsquirrelbmp.com/.

This article provides a summary of effective control methods for urban California ground squirrel management. Remember to check all labels and follow local regulations to ensure safe and legal use of each control method.

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Always read and carefully follow all precautions and safety instructions provided on the pesticide container label, as well as any other regulations regarding the use of pesticides. Not following label directions, even if they conflict with information provided herein, is a violation of state and federal law.

No endorsements of named products are intended, nor is criticism implied of products not mentioned.

Limits on Outdoor Neonicotinoid Pesticides

Starting January 1, 2025, neonicotinoid pesticides (imidacloprid, acetamiprid, clothianidin, dinotefuran, and thiamethoxam) used for non-agricultural outdoor purposes in California will only be available for sale at licensed pest control dealers and their possession and use will be limited to certified pesticide applicators. The sale of outdoor neonicotinoid products in retail nurseries and garden centers and the possession or use of these pesticides by unlicensed applicators will no longer be allowed.

Currently, almost 150 pesticide products containing one of these ingredients are registered in California for use on ornamental plants. The California Department of Pesticide Regulation (CDPR) is reevaluating these pesticides in terms of their effects on pollinators, aquatic insects, and human health.

Neonicotinoids have been linked to the decline in honey bee and other pollinator populations. To

address these concerns, the California legislature recently put into law AB 363 limiting the outdoor use of neonicotinoid pesticides. The European Union, Canada, Maine, New Jersey, and several other states have already banned or restricted these pesticides for non-agricultural uses. Limiting lawn and garden neonicotinoid uses to trained professionals is intended to eliminate significant pollution from these pesticides in urban and suburban areas, protecting pollinators, aquatic organisms, and human health.

The new law does not apply to indoor neonicotinoid pesticide products like ant baits, or veterinary products, such as flea and tick treatments for pets.

For more information about this law, see CDPR's announcement www.cdpr.ca.gov/docs/registration/canot/2024/ca2024-18.pdf.



What is the Poison-Free Wildlife Act?

Assembly Bill 2552, known as the Poison-Free Wildlife Act, brings significant changes for pest management professionals in California, particularly in the management of rats, mice, gophers, voles and ground squirrels. Signed in 2024, this law expands existing restrictions on anticoagulant rodenticides, specifically targeting both first-generation (FGARs) and second-generation anticoagulants (SGARs).

The bill bans chlorophacinone and warfarin in most settings, adding to the moratorium already in place for SGARs and diphacinone. Starting January 1, 2025, there will be limited uses of any FGAR or SGAR allowed in California.

The exceptions are as follows:

- Warehouses for food storage (human or animal)
- Agricultural sites, such as slaughterhouses or canneries

- Factories, breweries, or wineries
- Agricultural water storage or transportation infrastructure sites
- Sites essential for water supply and hydroelectric facilities

For pest management professionals, AB 2552 necessitates a shift away from anticoagulant rodenticide-based solutions. The toxic bait options left are bromethalin, cholecalciferol, strychnine and zinc phosphide. All these active ingredients are considered acute rodenticides.

For more information on how the use of these active ingredients can be combined with other non-chemical management options, please see the following *Pest Notes: Ground Squirrels, House Mouse, Moles, Pocket Gophers, Rats, and Voles* at ipm.ucanr.edu/PMG/PESTNOTES/index.html.

Invasive Fruit Flies: A Persistent Pest

Often hitchhiking on smuggled and illegally imported fruit, the continuous reintroduction of invasive fruit flies has threatened California's fruit trees and crops for decades. Invasive species like the Mediterranean fruit fly, Mexican fruit fly and Oriental fruit fly can cause extensive damage and threaten more than 300 types of fruits, nuts, and vegetables including citrus, grapes, figs, tomatoes, avocados, cucurbits, persimmons, walnuts, stone fruits, and pome fruits. The maggots feed upon the pulp of host fruits, tunneling through and reducing the whole to a juicy, inedible mass.

In the last two years, California has faced a surge of invasive fruit fly infestations, prompting widespread quarantines and eradication programs, including the first ever recorded quarantines of the Queensland and Tau fruit flies. These invasive pests don't just damage our produce, they can disrupt ecosystems and cause billions in economic losses. Though recent eradication efforts have been largely successful, the Mediterranean fruit fly was detected in Alameda County and the Oriental fruit fly in Orange County, prompting two additional invasive fruit fly quarantines in the fall of 2024.

Pest management professionals can help prevent the establishment of invasive fruit flies by following local quarantine guidelines, learning how to identify and report invasive fruit flies, implementing IPM strategies, and educating our communities.



Jack Kelly Clark, UC IPM

Identify Invasive Fruit Flies and the Signs of Infestation




All the invasive fruit fly species of most concern are small and in the family Tephritidae. Table 1 shows the most common invasive fruit flies. To learn more about the identification of invasive fruit flies, visit www.cdffa.ca.gov/plant/PDEP/treatment/index.html.

Residential landscapes and urban areas often feature fruit trees or gardens that are vulnerable to invasive fruit flies and should be routinely checked for signs of infestation.

When inspecting fruits and vegetables, look for external bruises or blemishes, as these can indicate that it is infested by fruit fly eggs or larvae. If you suspect

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Table 1. Three invasive fruit flies with identifying characteristics.

Mediterranean Fruit Fly	Oriental Fruit Fly	Mexican Fruit Fly
 <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">S Bauer, USDA-ARS, Bugwood.org</p>	 <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">V Wornoyaporn, IAEA</p>	 <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">JW Lotz, FL Ag Dept, Bugwood.org</p>
<p>Blackish body with silver markings on the thorax, and tan abdomen with dark stripes. The wings are clear with light brown bands and gray spots near the base.</p>	<p>Bright yellow body with a dark "T" shaped marking on the abdomen, and yellow legs. The wings are clear.</p>	<p>Pale orange-yellow body with two to three whitish stripes along the thorax. The wings are clear except for several yellow and brown stripes.</p>

Invasive Fruit Flies *continued from p. 5*

the presence of fruit flies, check for internal infestation by cutting the produce open and examining the inside for small, white or pale-yellow maggots. Regular fruit inspection is critical as you are far more likely to see maggots than fruit fly adults.

California Detection and Quarantine Procedures

The California Department of Food and Agriculture (CDFA) in cooperation with County Agricultural Commissioners (CAC), deploys and maintains over 63,000 detection traps statewide just for exotic fruit flies. When an invasive fruit fly species is detected in California, agriculture officials will use a multi-tiered IPM based approach to eradicate the infestation and prevent spread to new areas.

- Properties within 200 meters of a confirmed fruit fly find are treated with an organic formulation of spinosad to reduce the density of the population.
- Host trees within 100 meters of known larval sites are stripped of all fruit, then the fruit is bagged in plastic bags and transported to a landfill for burial.
- Sterile males are released (Mediterranean fruit fly, Mexican fruit fly, melon fly). Flooding infested areas with sterile flies that mate with wild flies prevents offspring production and eradicates the wild population.
- Trapping and monitoring within and around the quarantine area is increased, including the use of traps that combine a fruit fly male attractant with an insecticide to reduce male fly populations, limiting the mating opportunities for females.

For specific treatment information visit www.cdfa.ca.gov/plant/PDEP/treatment/index.html.

Stay Informed, Educate Customers, and Report Suspicious Pests

Landscapers and home gardeners located within a quarantine area can help prevent the spread of invasive fruit flies by following these guidelines:

- Do not move any fruits or vegetables from the property. Consume or process (juice, cook, freeze) fruits and vegetables on site.



A trap used for the detection and monitoring of invasive fruit flies.

- Dispose of any fallen or unwanted fruit or vegetables by double bagging in plastic bags and placing them in the garbage bin, not green waste.
- Buy plants from a reputable nursery; do not smuggle or illegally import plants, fruits, or vegetables.
- Cooperate with CDFA and CAC officials and allow them access to inspect plants.
- Report suspicious pests and maggots inside of your fruit to your local county agricultural commissioner's office or to CDFA's pest hotline at 1-800-491-1899.

Backyard trees and urban areas are common places where invasive fruit flies can breed. By raising awareness about simple practices like pruning trees, disposing of fruit waste, and other low impact IPM control methods, risk of invasive fruit fly infestations can be significantly reduced. Educating your customers about these methods and the state's quarantine process will help to stop the spread and support the broader fight to protect California's agriculture.

CDFA has educational brochures and information on quarantine updates, and additional resources available at www.cdfa.ca.gov/plant/fruitfly/.

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UC IPM Invasive Species Educators

Upcoming Meetings and Workshops

Pest Insights Webinar

December 17, 2024 | 9:00am - 11:15am

Dark rover ant management and biting mites.

ucanr.edu/sites/pestinsight/

NorCal Trade Show

February 6, 2025

San Mateo, CA

The UC IPM Urban & Community team will have a booth and present on weeds at the NorCal Landscape and Nursery Show.

norcaltradeshow.org/

11th International IPM Symposium

March 3-6, 2025

San Diego, CA

Top IPM professionals from industry and academia.

ipmsymposium.org/2025/

West Coast Rodent Academy

March 12-14, 2025

Irvine, CA

The University of California Cooperative Extension and the Pest Control Operators of California host a 3-day workshop on urban rodent management.

ucanr.edu/sites/wcra/

UCR Urban Pest Management Conference

March 25, 2025

Riverside, CA

The UPMC is for professionals in the pest control management industry and the public interested in urban pests.

urbanpest.ucr.edu/event-list/2025/03/25/

ucr-upmc-2025

Ask the Expert!

Q: It's hard to keep track of quarantine areas for invasive fruit flies and other invasive pests. Where do I go for current information?

A: The California Department of Food and Agriculture (CDFA) lists current quarantine information for the invasive fruit flies of concern, as well as quarantine information for other invasive pests such as the Asian citrus psyllid and the associated disease Huanglongbing. Some of the invasive fruit flies under quarantine include guava fruit fly, Mexican fruit fly, and Mediterranean fruit fly (spotlighted in this issue).

The CDFA website supplies real-time quarantine maps for invasive pests currently found in California. The quarantine section of the CDFA website is

www.cdfa.ca.gov/plant/PE/InteriorExclusion/quarantine.html.



CDFA's Mediterranean fruit fly quarantine boundary map, as of November 8, 2024.

For more information about managing pests, contact your University of California Cooperative Extension office, or visit the UC IPM website at ipm.ucanr.edu.

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