
THE ALMOND CONFERENCE
2025
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1
CULTIVATING A HEALTHIER
FUTURE

RODENT CONTROL IN THE FACE OF CHANGING REGULATIONS

Gabriele Ludwig, Almond Board of California

Roger Baldwin, UC Davis

Elana Varner, Department of Pesticide Regulation

ALMOND CONFERENCE 2025

Burrowing rodent management in almond orchards

Roger A. Baldwin
Professor of Cooperative Extension
Department of Wildlife, Fish, & Conservation Biology
University of California, Davis

UC CE University of California Cooperative Extension

UCDAVIS COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

Species Identification (Ground Squirrels)

- Gray-brown fur with semi-bushy tail.
- Are social.
- Damage includes girdling of trees, chewing of irrigation lines, and abundant burrow openings.

Species Identification (Ground Squirrels)

- Squirrels are active throughout the day and are frequently visible.

- They prefer to burrow next to buildings, on field edges, and alongside fencerows and roadsides.

Species Identification (Pocket Gophers)

- Burrowing rodent about 6-8 in long; rarely seen above ground.

- Gopher mounds are plugged and often fan-shaped.

Species Identification (Pocket Gophers)

- They feed on taproots weakening and/or killing plants.
- Then can girdle trees below ground.
- Mounds can create weed seed-beds and can increase erosion.

Species Identification (Roof Rats)

- Roof rats have large ears and long hairless tail.
- Arboreal and live in burrows and canopy nests.

Species Identification (Roof Rats)

Damage

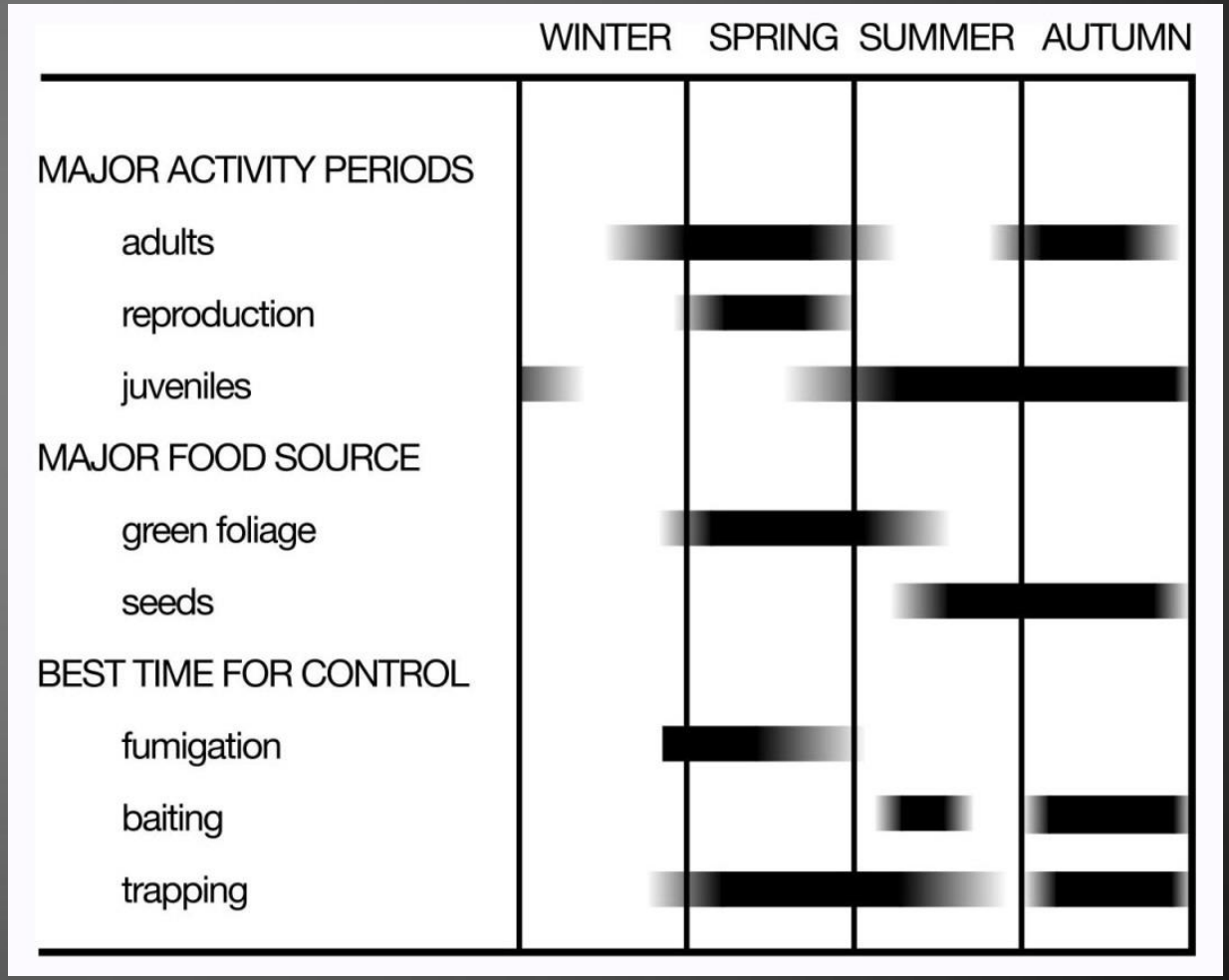
Current Control Strategies

- Currently, we focus on an integrated approach that utilizes a number of strategies and tools to control vertebrate pests.

Importance of Biology/Ecology

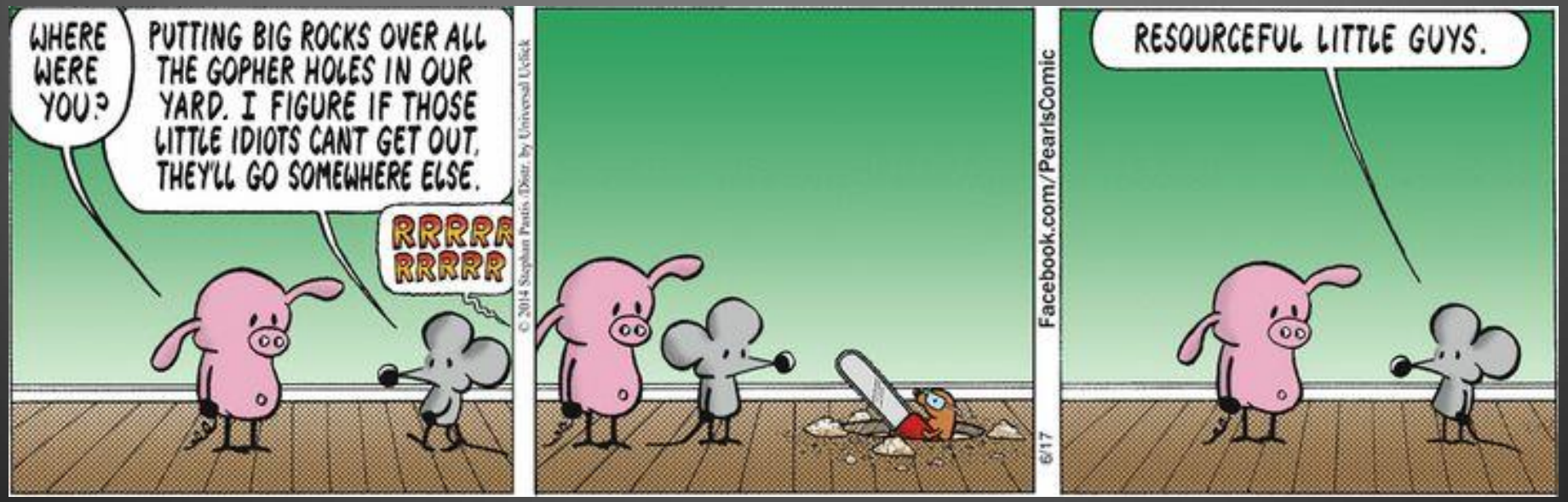
- Understanding the biology and ecology of vertebrate pests will guide management decisions.
- Example:

  - CA ground squirrel



What Control Options are Available?

	Habitat modification	Baiting	Burrow fumigation	Trapping	Exclusion	Repellent	Frightening	Shooting
Ground squirrel	X	X	X	X				X
Pocket gopher	X	X	X	X		?		
Rats	X	X	X	X				

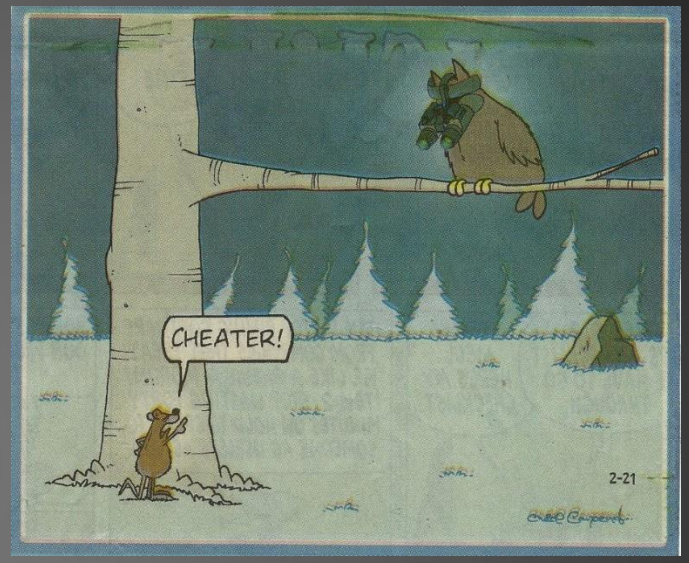


Control Options—Biocontrol

- Natural predators have been used to control vertebrate pests.

Control Options—Biocontrol

- Owl boxes have provided some benefits for gophers; raptor perches appear ineffective for ground squirrels.



Control Options—Habitat Modification

- Involves altering habitat to reduce the desirability for pests.
- Examples:
  - destroy old burrows

Control Options—Habitat Modification

- Involves altering habitat to reduce the desirability for pests.
- Examples:
  - destroy old burrows
  - flood irrigation

Control Options—Trapping

Ground squirrels

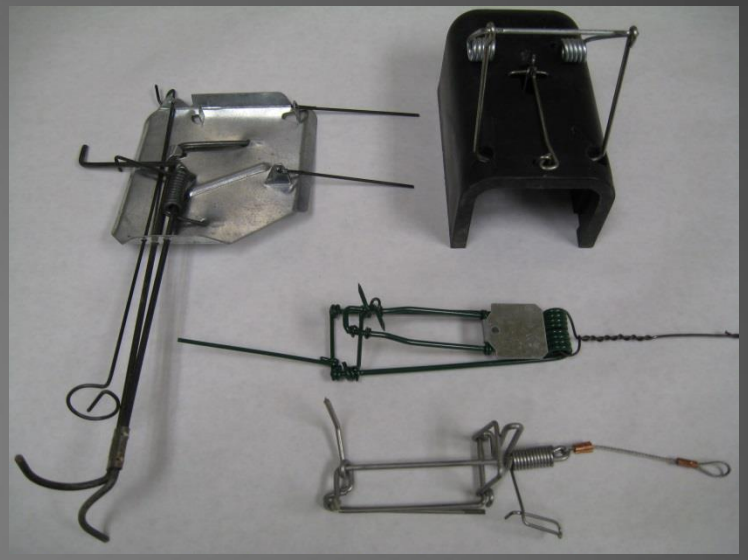
- Body-gripping traps, tube traps, and box-type squeeze traps are common kill traps.
- Wire cage traps are common live traps.
- Live traps require euthanizing target animals.

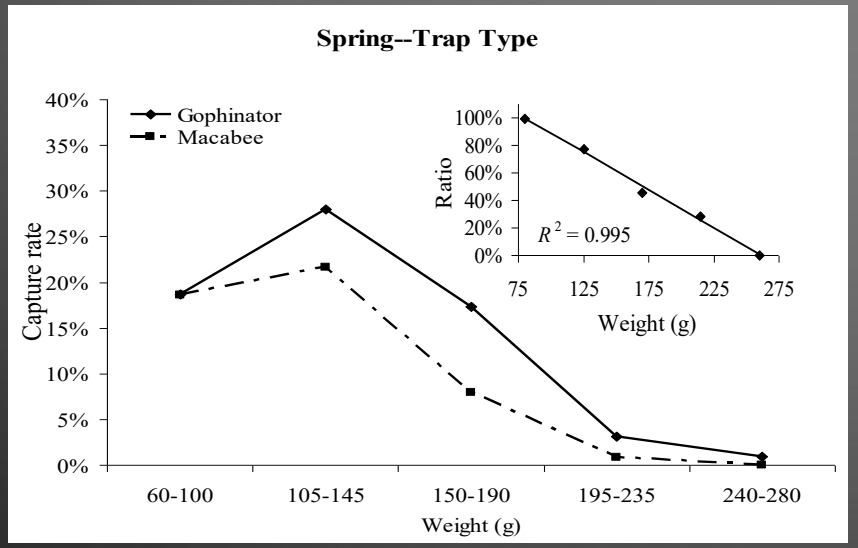
Control Options—Trapping

Control Options—Trapping

Pocket gophers

- Gophinator trap was more effective.
- Covered sets yielded slightly higher capture rates in spring-summer, but not autumn.
- Efficacy was offset by setting time.
- We did not observe a difference in the number of captures across attractants.
- Human scent had no effect.

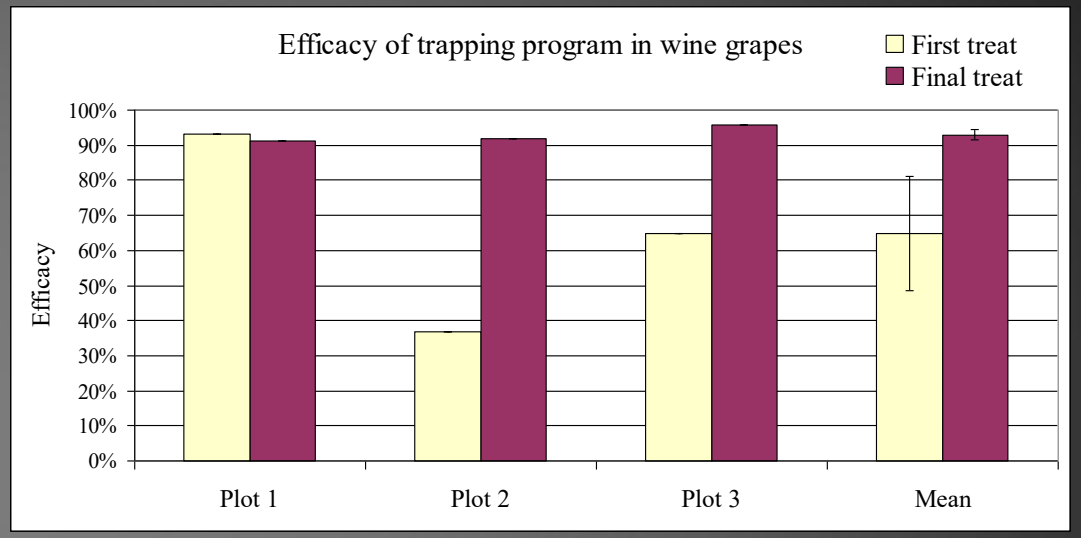


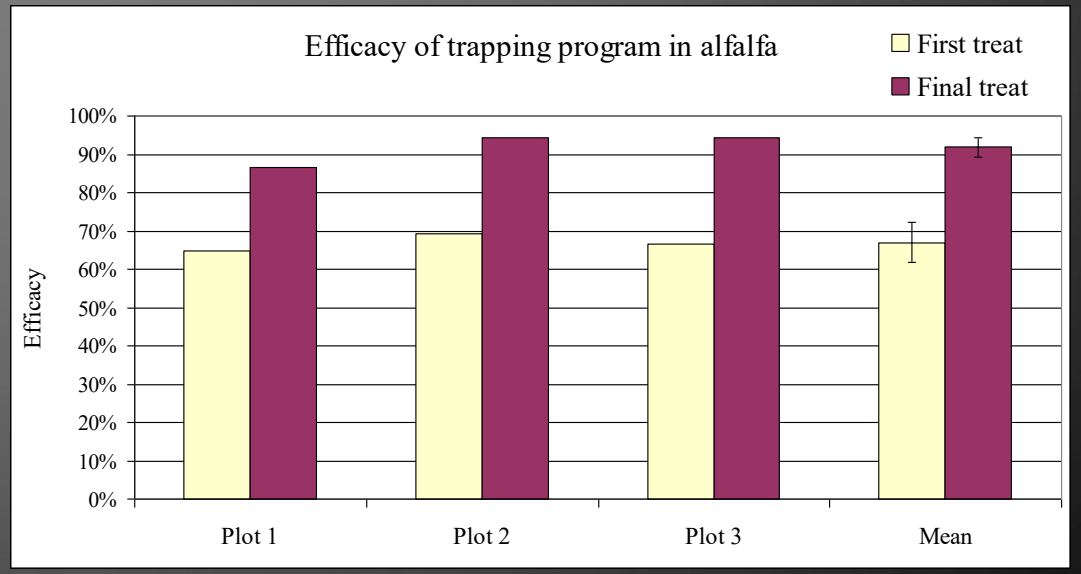


Control Options—Trapping

Pocket gophers

- Exhibited high efficacy in wine grapes after two treatments.
- Exhibited high efficacy in alfalfa after two treatments.





Control Options—Trapping

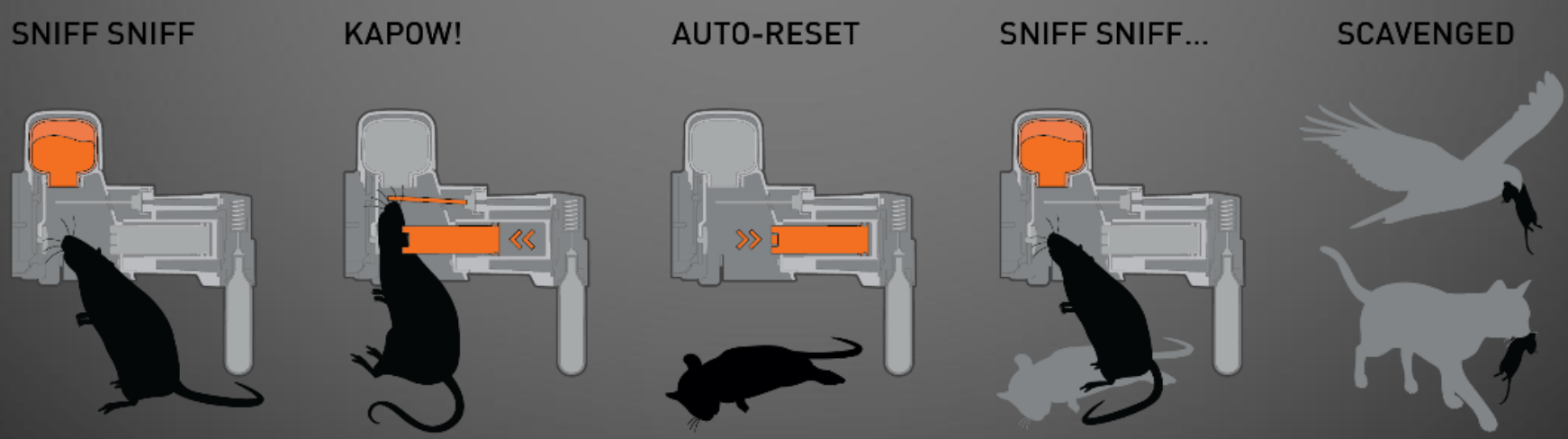
Rats

- Snap traps can be effective.

Control Options—Trapping

Rats

- Snap traps can be effective.
- Repeating traps now available



Control Options—Baiting

- Involves use of poison baits to control vertebrate pests.
- Essentially all restricted-use products except for a few homeowner options for gophers.

	Anticoagulants	Zinc phosphide	Strychnine
Ground squirrels	?	X	
Pocket gophers	?	X	X
Roof rats	?	X	

Control Options—Baiting

Anticoagulants

- used for spot treatments, broadcast, or in bait stations

- require multiple feedings

Control Options—Baiting

Zinc phosphide

- is an acute toxin

- potential bait shyness

- can be used for spot treatments and broadcast baiting

- not to be used in or around buildings

Control Options—Baiting

Roof rats

- Study showed 0.005% diphacinone grain effective against roof rats in almonds (90%) and in citrus (73%).
- Must be used in elevated bait station.

Control Options—Baiting

Pocket gophers

- Strychnine works best.
- Use probe to find tunnel.
- Dispense bait in tunnel.

Control Options—Fumigation

- Involves use of poison gas in burrows to control vertebrate pests.
- Works best when soil moisture is high (late winter early spring for gophers and rats and after ground squirrels emerge in spring).
- Fumigants should not be used around buildings.

Control Options—Fumigation

Gas cartridges

- Effective for ground squirrels (75% control).
- Not effective for gophers; unknown for rats.

Aluminum phosphide

- Highly effective for both ground squirrels (97-100%) and gophers (90-100%).
- Unknown effectiveness for rats.
- Is a restricted use pesticide.

New Fumigation Category

Non-Soil Fumigation (Category M)

Category Description

Non-Soil Fumigation (Category M)

1) Perform pest control using a pesticide labeled as a fumigant to:
    a. Fumigate enclosed areas including: tarpaulin-covered structures and commodities, vaults, chambers, greenhouses, vans, boxcars, ships, planes, and vehicles, containing:
        i. Agricultural commodities for post-harvest fumigation; or
        ii. Nonfood/nonfeed materials including but not limited to: pallets; dunnage; furniture; burlap bags; planting medium, including potting soil and potting mix; and wine barrels and corks.
    b. Fumigate pest burrows in sites including, but not limited to: fields, rights-of-way, ditches, landscaping, and equipment yards.
    c. Fumigate sewer lines, in-service utility poles, or other fumigations not covered by Category L – Soil Fumigation [6530(l)].
2) This category does not include structural pest control required to be licensed under Chapter 14 (commencing with Section 8500) of Division 3 of the Business and Professions Code.

PAC's will need to complete a 45-question test called, "Burrowing Vertebrate Fumigation Category".

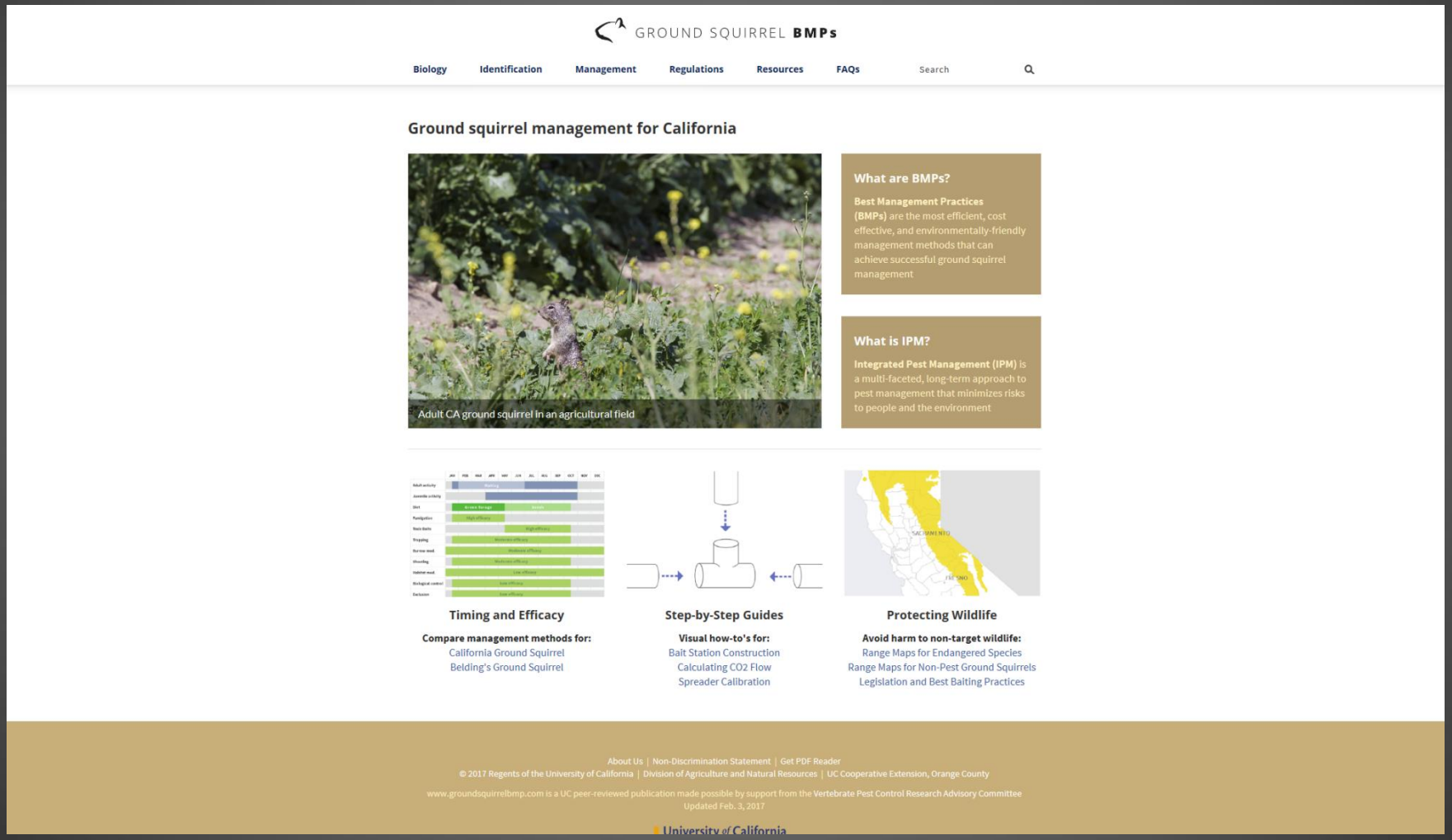
Control Options—Fumigation

Control Options—Fumigation

Carbon dioxide

- The Eliminator recently approved for use.

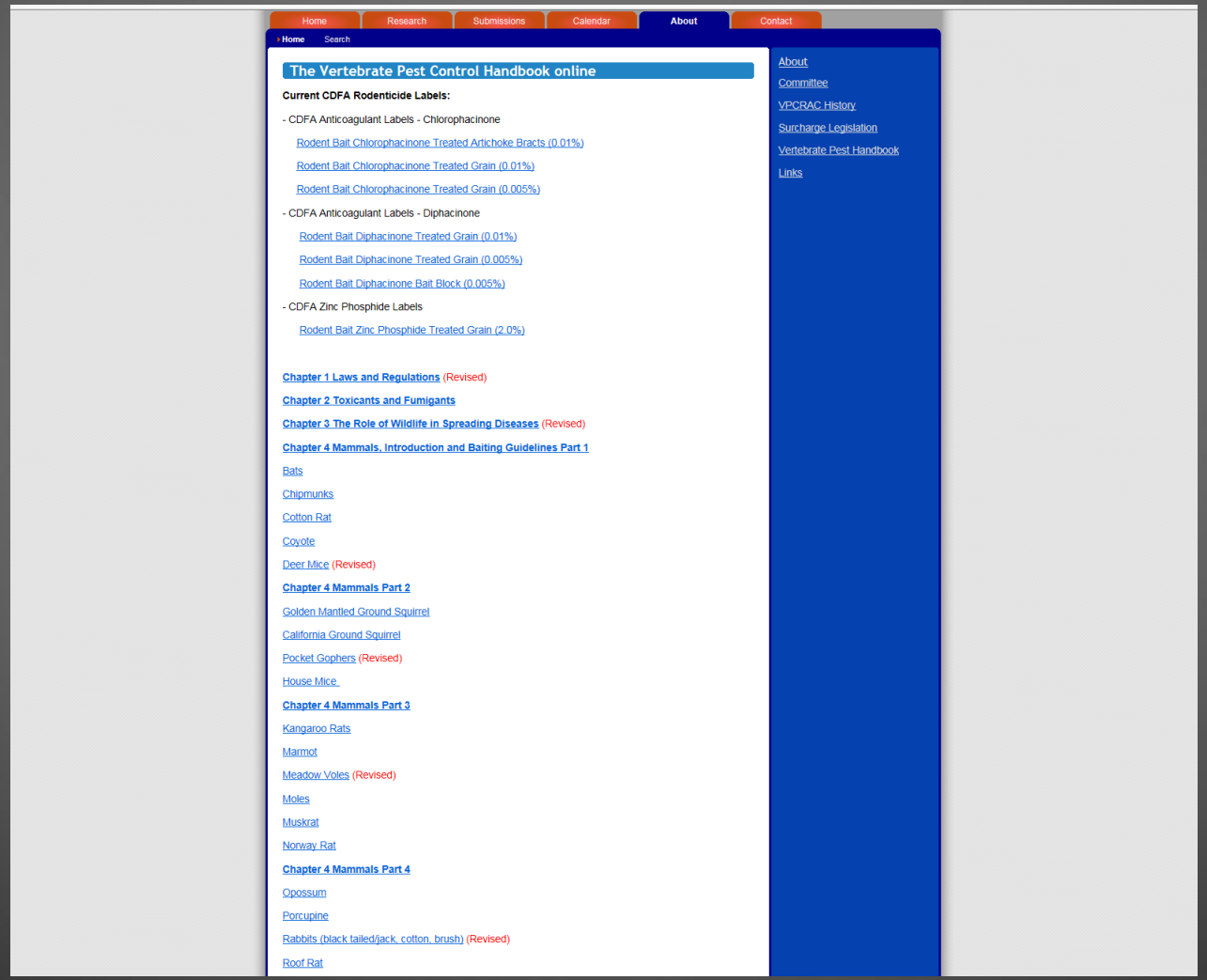
Ground Squirrel BMP website



http://www.groundsquirrelbmp.com

Vertebrate Pest Control Handbook

http://vpcrac.org/about/vertebrate-pest-handbook/



Roof Rat Publication

University of California
Agriculture and Natural Resources

ANR Publication 8513 | December 2014
http://anrcatalog.ucanr.edu

UC PEER REVIEWED

Managing Roof Rats and Deer Mice in Nut and Fruit Orchards

NIAMH QUINN, University of California Cooperative Extension advisor, South Coast Research and Extension Center, Irvine; and ROGER A. BALDWIN, UCCE wildlife specialist, UC Davis.

Abstract

Effective rodent management is critical for the control of damage from these agricultural pests to nut and fruit trees in California and the rest of the United States. As yet, no one has developed an effective management plan for roof rats (*Rattus rattus*) and deer mice (*Peromyscus* spp.) in California orchards. In this publication, we describe an effective management plan using 0.005% diphacinone-treated oats placed in elevated bait stations. In particular, we look at the specific types of damage that rodents cause in orchards—information you need to know in order to implement an effective baiting program—and we give a cost estimate for a baiting program. The elevated baiting program that we propose should provide effective and cost-effective control for roof rats and deer mice in nut and tree fruit orchards, while posing little risk to the natural environment.

Invasive, non-native vertebrate species cause an estimated $39 billion in damage in the United States each year (Pimentel 2011). Rats (*Rattus* spp.) are extremely common invasive pests found throughout most of the United States in both urban and agricultural areas and are thought to be among the main causes of damage. In fact, one report puts the annual costs of damage caused by rats at $19 billion (Pimentel, Zuniga, and Morrison 2005).

More specifically, rats and mice are known to cause considerable damage in nut and fruit trees in the United States (Kern 2012; Pearson, Gorenzel, and Salmon 2000; Tobin, Koehler, and Sugihara 1997). In nut crops, damage to developing macadamia nuts from invasive rats has been estimated to be between 5 and 10% (Tobin, Koehler, and Sugihara 1997). Native rodent species can also cause a lot of damage, with estimates for damage from deer mice (*P.* spp.) of $20.64 per acre ($51 per hectare) in some almond orchards in Fresno County, California (Pearson, Gorenzel, and Salmon 2000).

Clearly, effective rodent control is critical for the prevention of damage to agricultural crops. Worldwide, rodenticide baits are the mostly commonly preferred means for rat and mouse control, given their low cost and high efficacy (Stenseth et al. 2003). In California, past and present control strategies have focused on flooding burrow systems (F. Rinder, Fresno County Agricultural Commissioner's office, pers. comm.), since few baiting options are available for these species. Flooding burrows, though, this is an inefficient use of time and resources. The development, efficacy verification, and registration of a baiting material and strategy for rat and deer mouse control in California orchards would be of great use.

https://anrcatalog.ucanr.edu/pdf/8513.pdf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Questions?
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RECONYX

DPR Anticoagulant Rodenticide Draft Mitigations

December 2025

Overview

- Overview of Anticoagulant Rodenticides (ARs)
- High level proposed mitigation
- Current AR restrictions based on legislative action
- Details of draft proposal
- Comment Period
- Next Steps

Anticoagulant Rodenticides

Anticoagulant rodenticides prevent blood from clotting, leading to uncontrolled hemorrhaging and toxicosis.

- Second-generation anticoagulant rodenticides (SGARs)
  - **Brodifacoum**
  - **Bromadiolone**
  - **Difenacoum**
  - **Difethialone**
- First-generation anticoagulant rodenticides (FGARs)
  - Chlorophacinone
  - **Diphacinone**
  - Warfarin

***Bolded pesticides are under formal DPR reevaluation**

The proposed mitigations would mitigate all FGARs and SGARs as a holistic approach.

Mitigation: Reduce impacts to wildlife and maintain necessary uses of ARs

Reduce repeat exposure of non-target wildlife for all ARs

- Reduce overall amount in the environment
- Reduce how long they are available in the environment

Educate users on sustainable rodent management

- Education
- Sustainable Rodent Management Plan

How are we proposing to do this?

Propose regulations that:

- Classify all ARs **restricted materials.**
- Limit **where** ARs can be used to those that protect public health, agriculture, and water.
- Limit applications to a maximum of **35 consecutive days** at most sites with a maximum of 105 days annually per site for any AR.
- Require **training** on sustainable rodent management that incudes rodent biology and choosing the right tool for managing rodents.
- Require developing and maintaining a **sustainable rodent management plan** that addresses how the businesses or operators will approach rodent management decision making.

What is a Site?

Existing product labels specify the sites where a product can be used

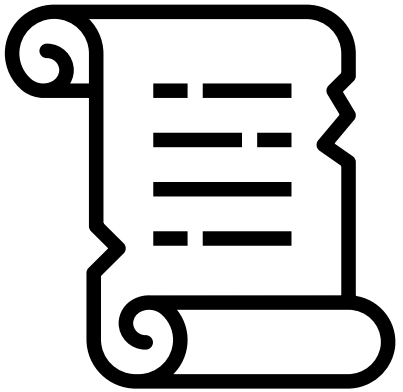
Proposed regulations would further restrict sites where ARs could be used

- Restricts use in and around man-made structures to within 50 ft of listed structures
- Specifies when use would be exempted from regulations and, in some cases, the sites where they would be exempt.

Legislation

Section 12978.7 of the California Food and Agricultural Code (FAC) contain use restrictions, considerations for reevaluation and concurrence requirements with the California Department of Fish and Wildlife (CDFW).

- 2020: **AB1788 -** Prohibits use of SGARs except at certain sites
- 2023: **AB1322 -** Prohibits use of diphacinone (FGAR) except at certain sites
- 2024: **AB 2552 -** Prohibits use of remaining FGARs (chlorophacinone and warfarin) except at certain sites



Current vs Proposed Restrictions

Current restrictions (FAC § 12978.7):

- Applications are only allowed by exempted users or at exempted use sites

Proposed restrictions:

- Specifies manmade structures where ARs can be used, via site definitions in statute
- Limits duration of use
- Requires applicator training and development of a Sustainable Rodent Management plan

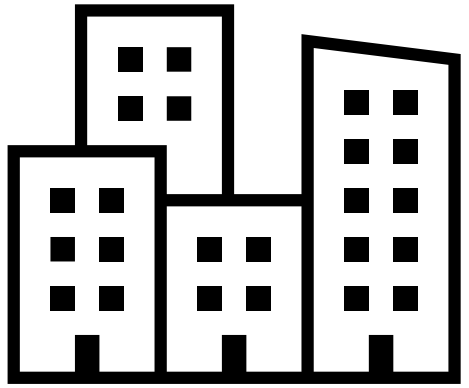
Allowed Use at Manmade Structures

Use at man-made sites is only allowed in listed sites

- Sites picked to protect public health
- Subject to the use duration restriction

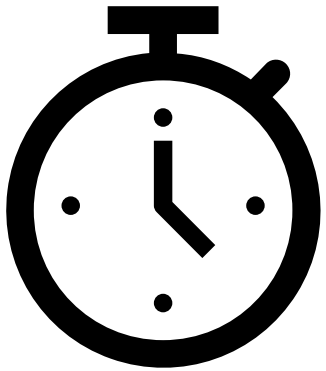
Use for public health, water supply, agriculture, protecting endangered species, and research that meet statutory definitions

- Exempt from duration restriction as specified



Limitation on Duration of Baiting

- **35 consecutive day** limit of any AR per application
- 2 additional 35-day applications permitted per year, for a cumulative annual total of **105 days** per site.



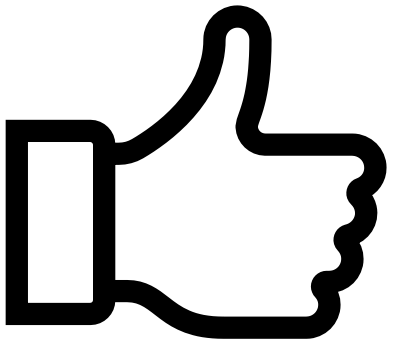
Basis:

- Registrant submitted data indicate that this timeframe is efficacious
- Studies have shown a 70% reduction in rodent populations in 35 days

Proposed Exemptions

The following uses **would be exempt** from the manmade structures and duration restrictions:

- Public health
  - As declared by State Public Health Officer
  - Use by vector control
- Nonnative invasive species eradication on offshore islands
- CDFW invasive rodent population eradication to protect endangered species/habitats
- To protect water and hydroelectric infrastructure
- FGAR use in agriculture
- Research for continuous evaluation



Holistic rodent management

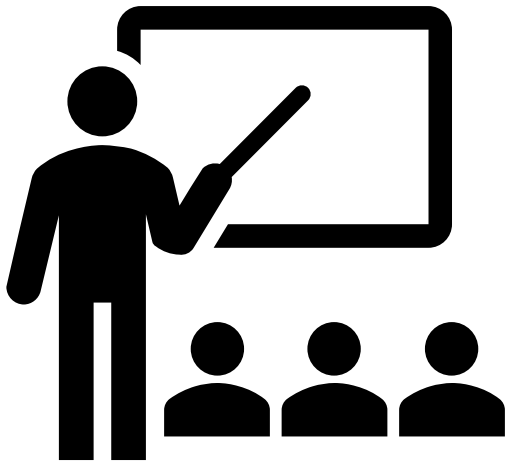
- Reduced use is critical to protecting non-target wildlife and will help ensure effective pest management critical to addressing rodent management more holistically.

- To support this, the draft mitigation includes a training requirement for AR applicators and development of a Sustainable Rodent Management plan for businesses and private applicators.

Sustainable Rodent Management Training

- **Proposed use requirement**: To use ARs individuals must take annual training to increase awareness and adoption of integrated pest management (IPM) practices, with record retention for two years.

- The course would include **Integrated Pest Management and Sustainable Pest Management principles** (as defined in the FAC sections 11401.7 and 11412).



Training Implementation Options

Outside of rulemaking, DPR is considering whether the training will:

- DPR provided or DPR approved
- Count towards DPR and SPCB licensure (CE credits)

DPR asked for public feedback on which of these options may be the best fit for implementing this training and proposed topics to include in the required training outline detailed in the regulation.

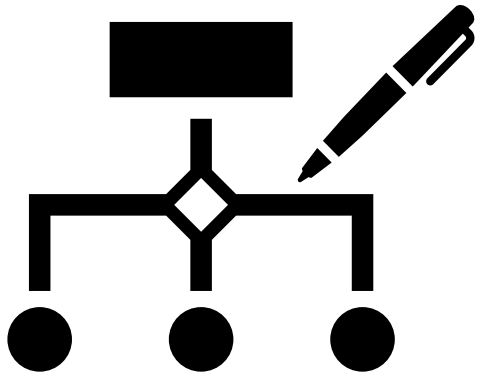
Sustainable Rodent Management Plan

Each business would be required to write, implement and retain records of a Sustainable Rodent Management plan.

- **General and is not required to be site-specific**
- Used as a **decision-making tool**, not a prescribed set of actions for every specific scenario.

Sustainable Rodent Management recordkeeping requirement:

- **Site-specific use records** kept at a central business location that tracks the dates ARs are deployed and collected by site to support compliance with the 35-day limit.



Thank you

California Department of Fish and Wildlife (CDFW)

California Department of Food and Agriculture (CDFA)

Structural Pest Control Board (SPCB)

California Department of Public Health (CDPH)

Where DPR asked for feedback specifically

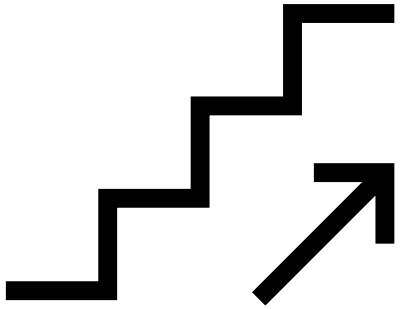
- Does the rulemaking text capture the intent of mitigation?
- Refinements to exempted sites
- Training topics and implementation options
- Site-specific use duration recordkeeping
- 12-month delay between effective date and training requirements

Next steps

- Draft proposed regulatory text are available on our website (www.cdpr.ca.gov).

- 45-day informal comment period
  - DPR's Public Comment Portal closed November 8, 2025.

  - Please submit clarifying questions to: Rodenticide.Comments@cdpr.ca.gov



Questions?

Northern spotted owl | Dave Roelofs, BLM

THE ALMOND CONFERENCE 2025

EPA & Rodenticides

GABRIELE LUDWIG, PH.D.
DIRECTOR, ENV. POLICY
ALMOND BOARD OF CALIFORNIA

12/12/25

CULTIVATING A HEALTHIER FUTURE

EPA & RODENTICIDES

- Reregistration Process – every 15 years review registered pesticides
- Endangered Species Act: Pesticide Registrations need to come into compliance with ESA consultation requirement
- Lawsuits: set deadlines for Biological Evaluations, etc.

➔ EPA is reviewing all 11 rodenticides together.

  - First-generation anticoagulants: warfarin, chlorophacinone, and **diphacinone.**
  - Second-generation anticoagulants: brodifacoum, bromadiolone, difenacoum, and difethialone.
  - Non-anticoagulants: bromethalin, cholecalciferol, strychnine and **zinc phosphide**.

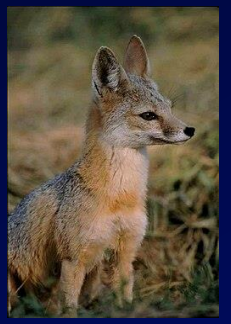
- Main Concerns:
  - Non-target species exposures
  - In homes: kids and pet exposures

Current Status

- EPA Efforts:
  - 2008 registration review (round 1) completed
  - 2022 Proposed Interim Decision (round 2)
    - All now Restricted Use Pesticides
      - except limited volume sales of 2 AIs for home uses
  - 2023 Draft Biological Evaluation
    - Assess for possible impacts on all Endangered Species
  - 2024 Final Biological Evaluation
    - Will have no effect on 88% of listed species and 95% of critical habitats
    - Have a likelihood of future Jeopardy/Adverse Modification for less than 5% of listed species and less than 1% of critical habitats
  - 2024 Rodenticide Strategy (ESA)
    - Included possible mitigation measures

Next:

- F&WS reviewing and to release a Biological Opinion
- 2026 finalize mitigations for individual rodenticides?



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RODENTICIDE ESA STRATEGY: POSSIBLE MITIGATION MEASURES

Table 5-1. Summary of Recommended Mitigation Measures[40]

Mitigation Measures	Primary	Secondary
1. Restrict the use of bait stations to only those that exclude listed species by size or behavior.	Yes	NA
3. Prohibition of broadcast and below-ground in-burrow application within and beyond the range and/or CH for species that have the potential to consume rodenticides via secondary consumption.	NA	Yes
4. Restricting bait station placement to within five feet of man-made structures in areas with listed mammals that are small enough to enter bait stations.	Yes	NA
6. Mandatory or advisory post-application follow-up statements for carcass search, collection, and disposal within the species' range and/or designated critical habitat.[41]	NA	Yes
7. Post-application follow-up statements for bait-spill or bait kick-out.	Yes	NA
8. Prohibiting use in areas or at times of the year when listed secondary consumers might be exposed.	NA	Yes
9. Covering the burrow hole after applications made in fields and other non-structural use sites for appropriate species that live in closed burrow systems.	Yes	NA
11. Mandatory or Advisory reporting of dead or dying non-target animals to the Agency's website as soon as possible.	Yes	Yes

- Not clear yet which of these mitigation measures will be applied to which rodenticide and use scenarios.

THANK YOU!

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