

# Identification and selection of tools to manage ground squirrels

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**COLLEGE OF AGRICULTURAL  
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# Species Identification (Ground Squirrels)

- Gray-brown fur with semi-bushy tail.
- Are social.
- Damage includes girdling of trees, consumption of forbs and grasses, chewing of irrigation lines, and abundant burrow openings.
- Forage loss of ~24 lbs/acre per ground squirrel



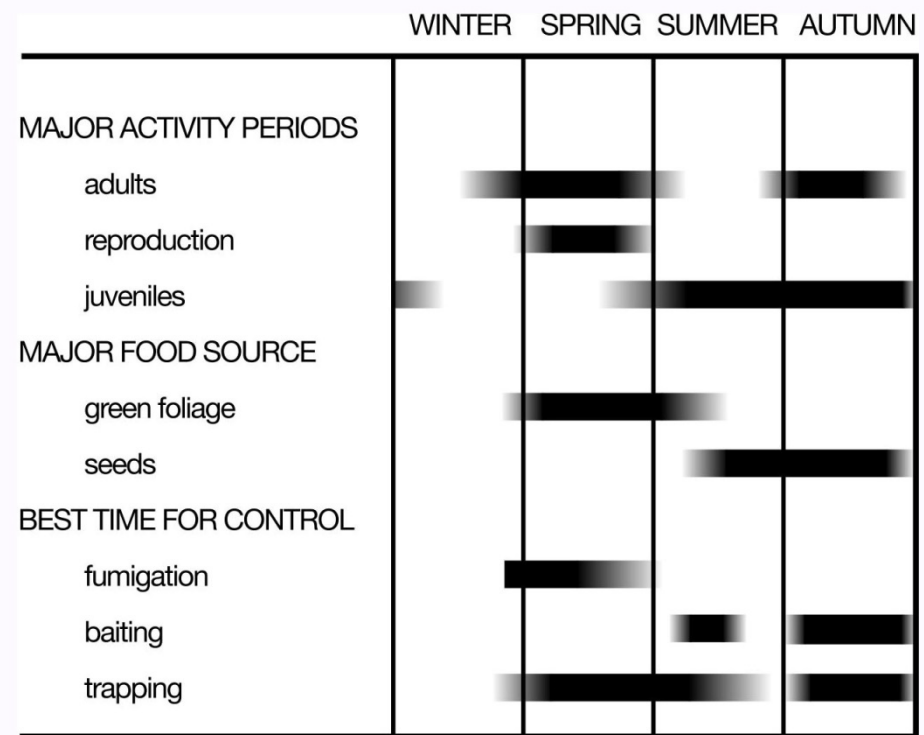
# Species Identification (Ground Squirrels)

- 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.



# Importance of Biology/Ecology

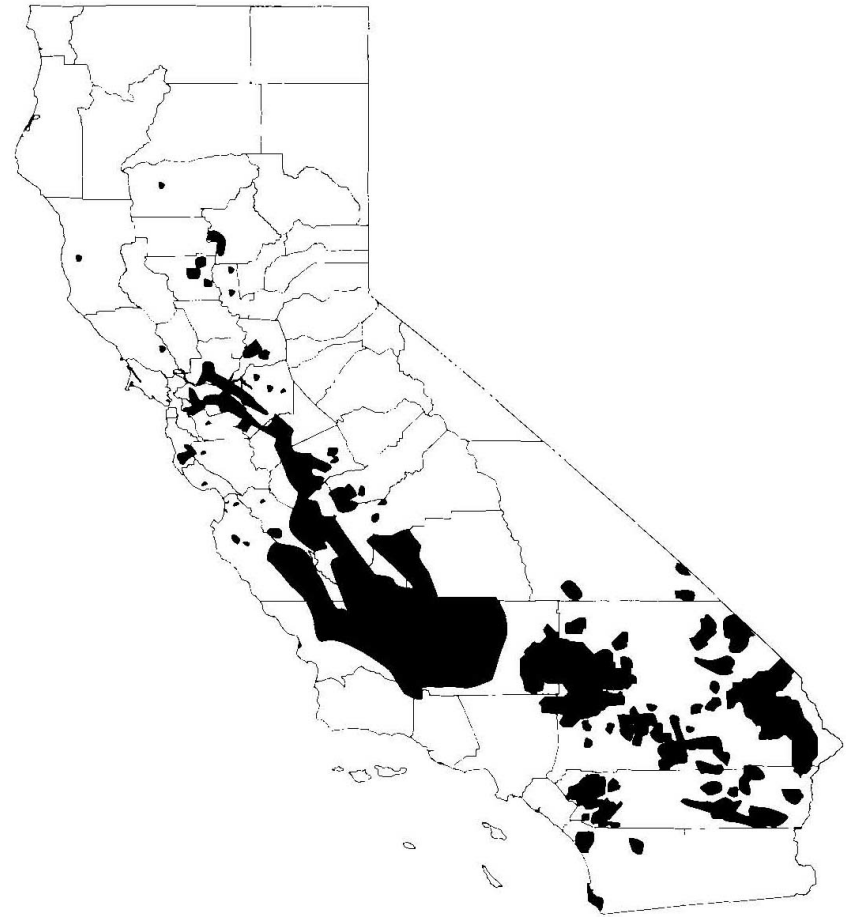
- Understanding the biology and ecology of vertebrate pests will guide management decisions.
- Example:
  - California ground squirrel





# Assessing Options

- Are endangered species potentially present in your area? Consult CDPR PRESCRIBE website or your county Ag Commissioner to find out.



<https://www.cdpr.ca.gov/docs/endspec/prescint.htm>

# What Control Options are Available?

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	Habitat modification	Baiting	Burrow fumigation	Trapping	Exclusion	Repellent	Frightening	Shooting
Ground squirrel	X	X	X	X				X

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# Control Options—Biocontrol

- Natural predators have been used to control vertebrate pests.
- Owl boxes are not appropriate for ground squirrels.
- Raptor perches appear ineffective.



# Control Options—Habitat Modification

- Involves altering habitat to reduce the desirability for pests.
- Example:
  - remove brush piles to control ground squirrels





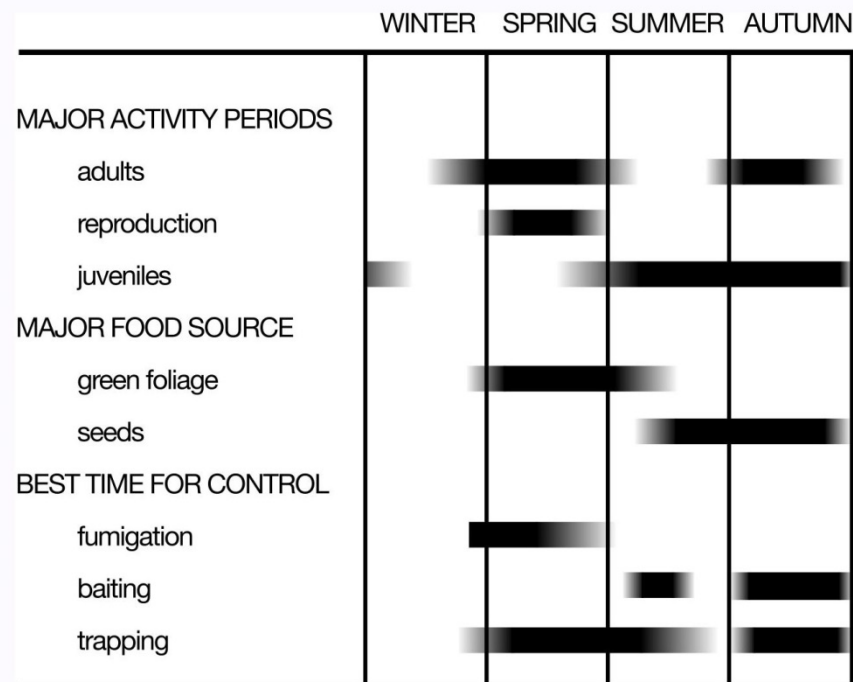
# Control Options—Habitat Modification

- Involves altering habitat to reduce the desirability for pests.
- Example:
  - remove brush piles to control ground squirrels
  - destroy old burrows



# Control Options—Trapping

- Control of small populations of ground squirrels is possible with traps
- Trapping for ground squirrels is effective year round except during middle of summer and can be a good follow up to alternative control methods.



# Control Options—Trapping

- Body-gripping traps, tube traps, and box-type squeeze traps are common kill traps.
- Wire cage traps are common live traps.
- Live traps require euthanization of vertebrate pests.





# Control Options—Trapping

- Conibear traps can be placed at burrow entrances.
- Conibear traps can also be placed inside boxes to bait ground squirrels in while excluding larger animals.





# Control Options—Trapping

- Gopher box traps can be used in tandem when set along runways.
- Tube traps can be set along runways, as well.
- Live traps are also effective. However, they require euthanizing captured animals.



# Control Options—Baiting

- Involves use of poison baits to control vertebrate pests.
- Two main kinds:
  - anticoagulants
  - acute toxicant





# Control Options—Baiting

- Two kinds of anticoagulants:
  - first generation
  - second generation
- First generation options:
  - chlorophacinone
  - diphacinone
- Moratorium on use with exemption for production ag



# Legislative Changes: AB 1322 & 2552

- Moratorium on FGARs
  - Does not allow applications within “wildlife habitat areas”.
    - “Wildlife habitat area” means a park or wildlife refuge managed by a state agency, regional government, or quasi-government agency, or by a special district.”
    - Open to interpretation from any enforcement agency.
  - Exemptions for ag, human health and safety, water conveyance structures, and a few others





# Control Options—Baiting

## Anticoagulants

- used for spot treatments, broadcast, or in bait stations
- require multiple feedings



# Control Options—Baiting

## Bait station design

- Commercial
- Upside down T





# Control Options—Baiting

## Bait station design

- Commercial
- Upside down T
- Modifications to upside down T
- Use in K-rat territory



# 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.





# Weighing the Positive and Negative Attributes of Rodenticides

## 1<sup>st</sup> generation anticoagulants

### Positive attributes:

- lower primary nontarget risk
- antidote available
- good bait acceptance
- readily available

### Negative attributes:

- requires larger amount of bait
- some potential for secondary risk
- slower time to death than other toxicants



# Weighing the Positive and Negative Attributes of Rodenticides

## Zinc phosphide

### Positive attributes:

- short time from consumption to death provides quick control
- less expensive than anticoagulants
- essentially no secondary risk

### Negative attributes:

- acutely toxic; primary risks can be high for aboveground applications
- bait acceptance can be poor
- precipitation can influence efficacy
- no antidote



# Control Options—Fumigation

- Involves use of poison gas in burrows to control ground squirrels.
- Works best when soil moisture is high (after ground squirrels emerge in spring).
- Check for T&E species.
- Fumigants should not be used around buildings.

	WINTER	SPRING	SUMMER	AUTUMN
MAJOR ACTIVITY PERIODS				
adults				
reproduction				
juveniles				
MAJOR FOOD SOURCE				
green foliage				
seeds				
BEST TIME FOR CONTROL				
fumigation				
baiting				
trapping				





# Control Options—Fumigation

## Aluminum phosphide

- Tablets can be used for ground squirrels.
- Is a restricted use pesticide.
- Studies show 97–100% control for CA GS.





# 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

## Gas cartridges

- Studies show 62–86% control for CA GS.
- Caution must be used with gas cartridges to prevent fires.





# Control Options—Fumigation





# Control Options—Fumigation

Species	Device	Authors	# of fields	Efficacy
Belding's GS	PERC	Orloff	2	76%
California GS	PERC	Baldwin	2	66%
California GS	PERC	Baldwin	2	100%
California GS	Cheetah	Baldwin	3	-7%

# Control Options—Fumigation

## Carbon dioxide

- The Eliminator by IGI, LLC approved for use.



# Control Options—Shooting

- Shooting can be effective for controlling ground squirrels although it is labor intensive.
- Lead bullets are no longer allowed in California





# Control Options—Other Strategies

## Gas explosive device





# Future???



"Hold it, I wonder if I might try the warfarin again?"

# Ground Squirrel BMP website

<http://www.groundsquirrelbmp.com>



## Biology

### Identification

## Management

## Regulations

## Resources

## FAQs

Search



## Ground squirrel management for California

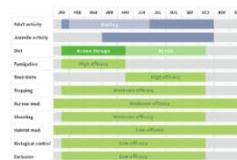


## What are BMPs?

**Best Management Practices (BMPs)** are the most efficient, cost effective, and environmentally-friendly management methods that can achieve successful ground squirrel management

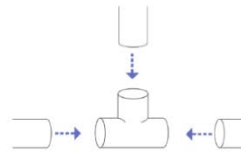
## What is IPM?

**Integrated Pest Management (IPM)** is a multi-faceted, long-term approach to pest management that minimizes risks to people and the environment



### Timing and Efficacy

**Compare management methods for:**  
California Ground Squirrel  
Belding's Ground Squirrel



### Step-by-Step Guides

**Visual how-to's for:**  
Bait Station Construction  
Calculating CO<sub>2</sub> Flow  
Spreader Calibration



## Protecting Wildlife

**Avoid harm to non-target wildlife:**  
Range Maps for Endangered Species  
Range Maps for Non-Pest Ground Squirrels  
Legislation and Best Baiting Practices