Burrowing rodent management in San Joaquin Valley almond orchards

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Species Identification (Ground Squirrels)

- Gray-brown fur with semi-bushy tail.
- Are social.
- Damage includes girdling of vines and 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 and vines below ground.
- Mounds can also kill plants, can create weed seed-beds, and can increase erosion.

Species Identification (Meadow Voles)

- Have dark grayish brown fur and are 4-6 inches in length.
- Populations tend to cycle, exhibiting irruptive growth patterns.

Species Identification (Meadow Voles)

- Dig shallow burrows and leave well-worn trails. Fecal pellets are often present.
- Primary damage caused by girdling of stems, consumption of vegetation, and gnawing of cables, pipes, etc.

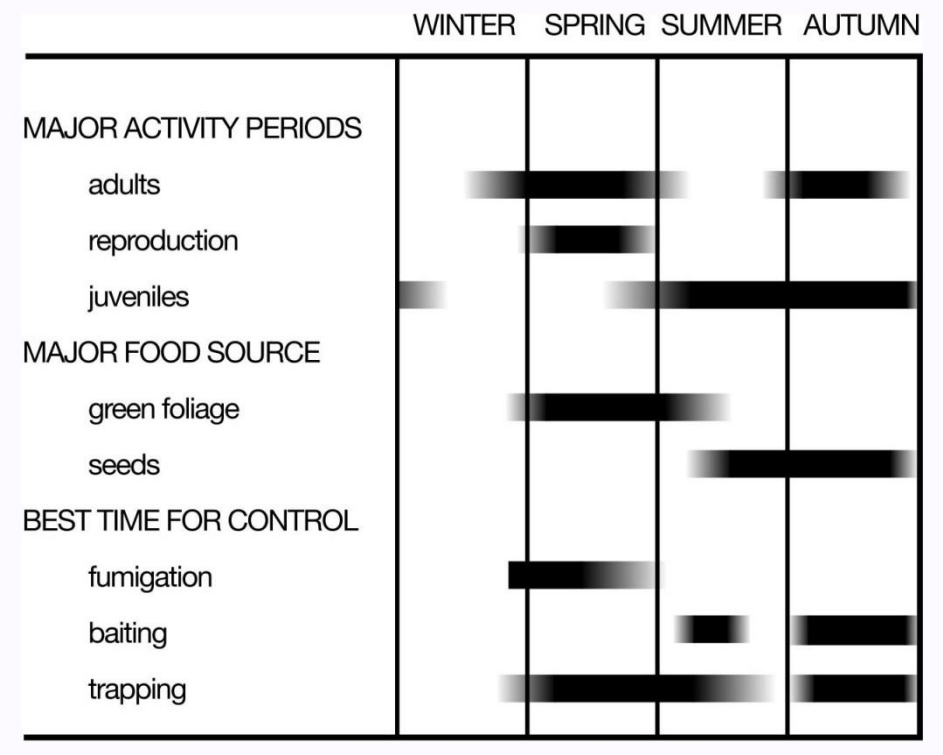
Current Control Strategies

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

Importance of Biology/Ecology

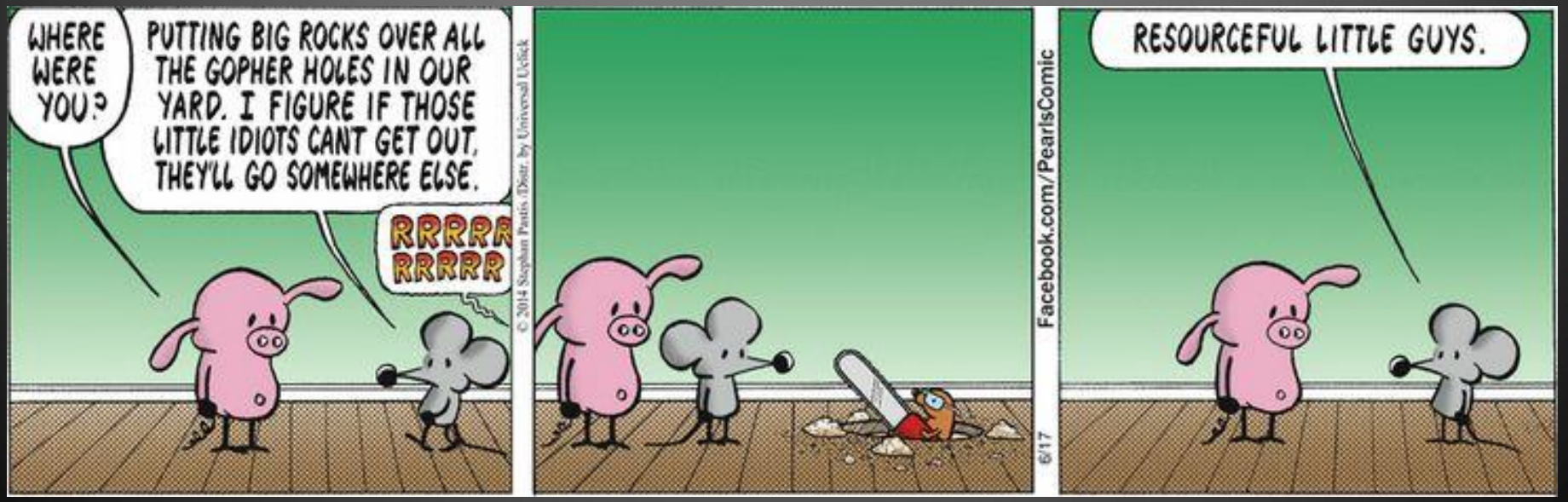
- Understanding the biology and ecology of vertebrate pests will guide management decisions.
- Example:

  - 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		?		
Vole	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

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- Examples:
  - destroy old burrows
  - flood irrigation

Control Options—Habitat Modification

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

Control Options—Exclusion

Voles

- Tree protectors can eliminate damage caused by voles

Control Options—Repellents

Protec-T registered for use against pocket gophers in SDI

- ~41% reduction in gophers
- perhaps effective in reducing damage

Control Options—Trapping

Ground squirrels

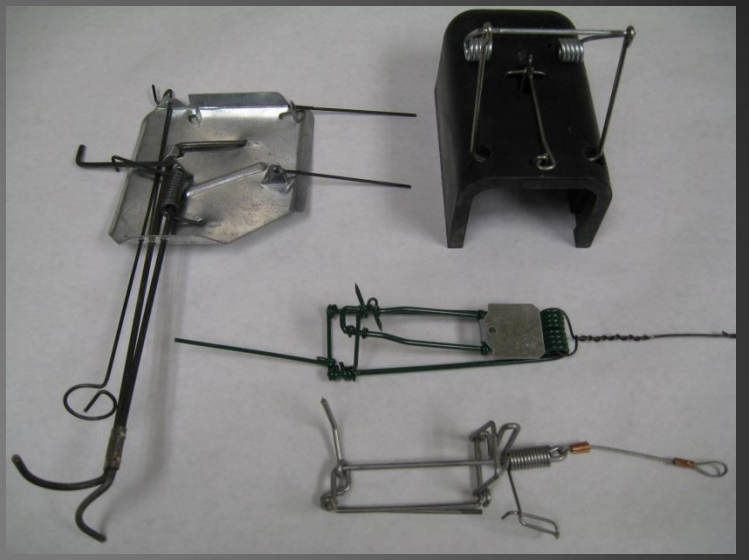
- Body-gripping traps, tube traps, and box-type squeeze traps are common kill traps.
- Wire cage traps are common live traps.
- Live traps require euthanizing target animals.

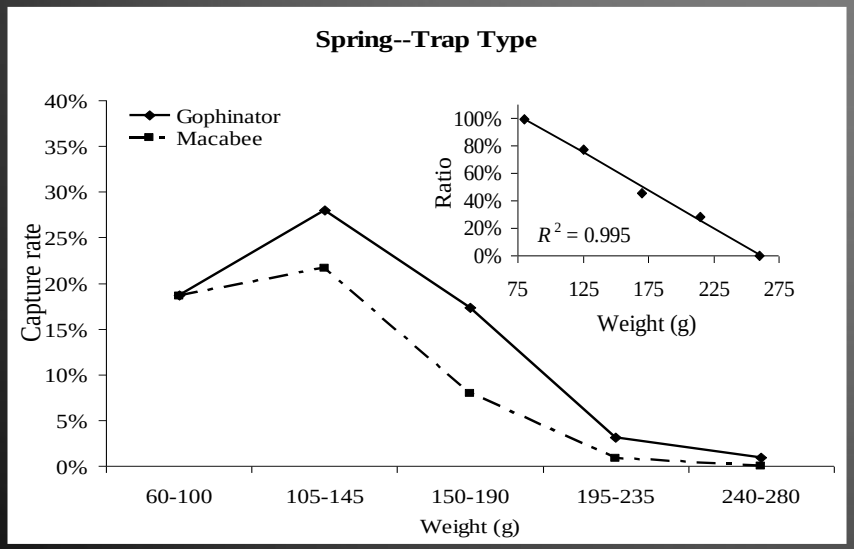
Control Options—Trapping

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.

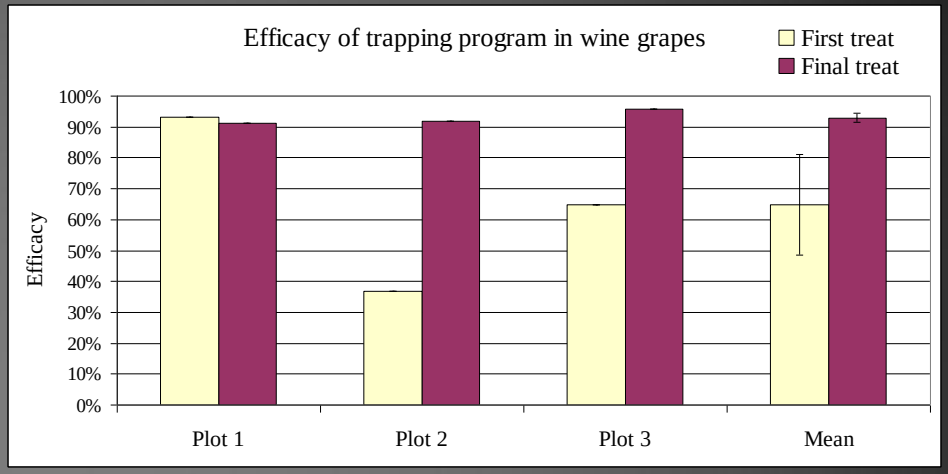


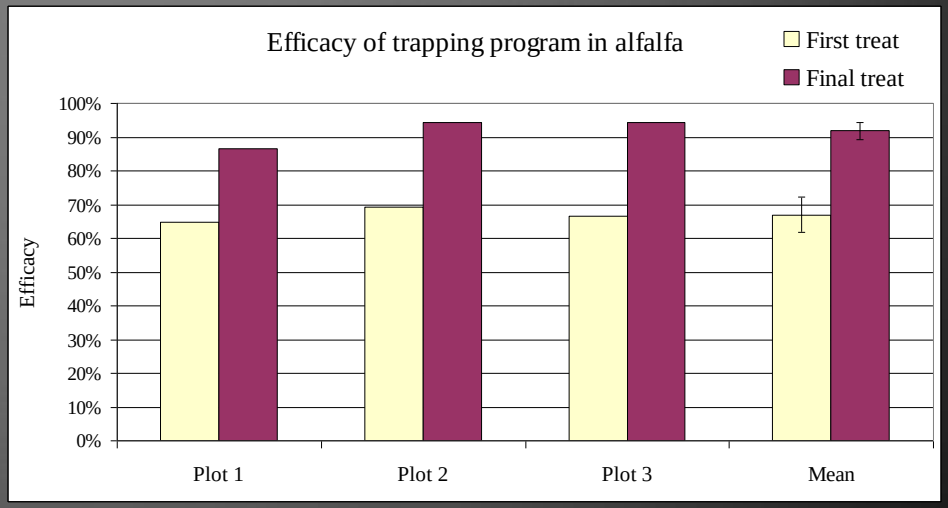


Control Options—Trapping

Pocket gophers

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





Control Options—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	X	
Pocket gophers	X	X	X
Voles	X	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

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 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.
- Caution must be used to prevent fires.

Aluminum phosphide

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

Control Options—Fumigation

Control Options—Fumigation

Species	Device	Authors	# of fields	Efficacy
Pocket gopher	PERC	Orloff	3	56%
Pocket gopher	PERC	Baldwin & Orloff	3	62%
Pocket gopher	PERC	Baldwin & Orloff	2	68%
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 recently approved for use.

Ground Squirrel BMP website

GROUND SQUIRREL **BMPs**

Biology | Identification | Management | Regulations | Resources | FAQs | Search

Ground squirrel management for California

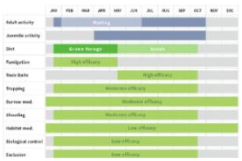
Adult CA ground squirrel in an agricultural field

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

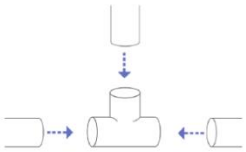
What is IPM?

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 CO2 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

www.groundsquirrelbmp.com is a UC peer-reviewed publication made possible by support from the Vertebrate Pest Control Research Advisory Committee
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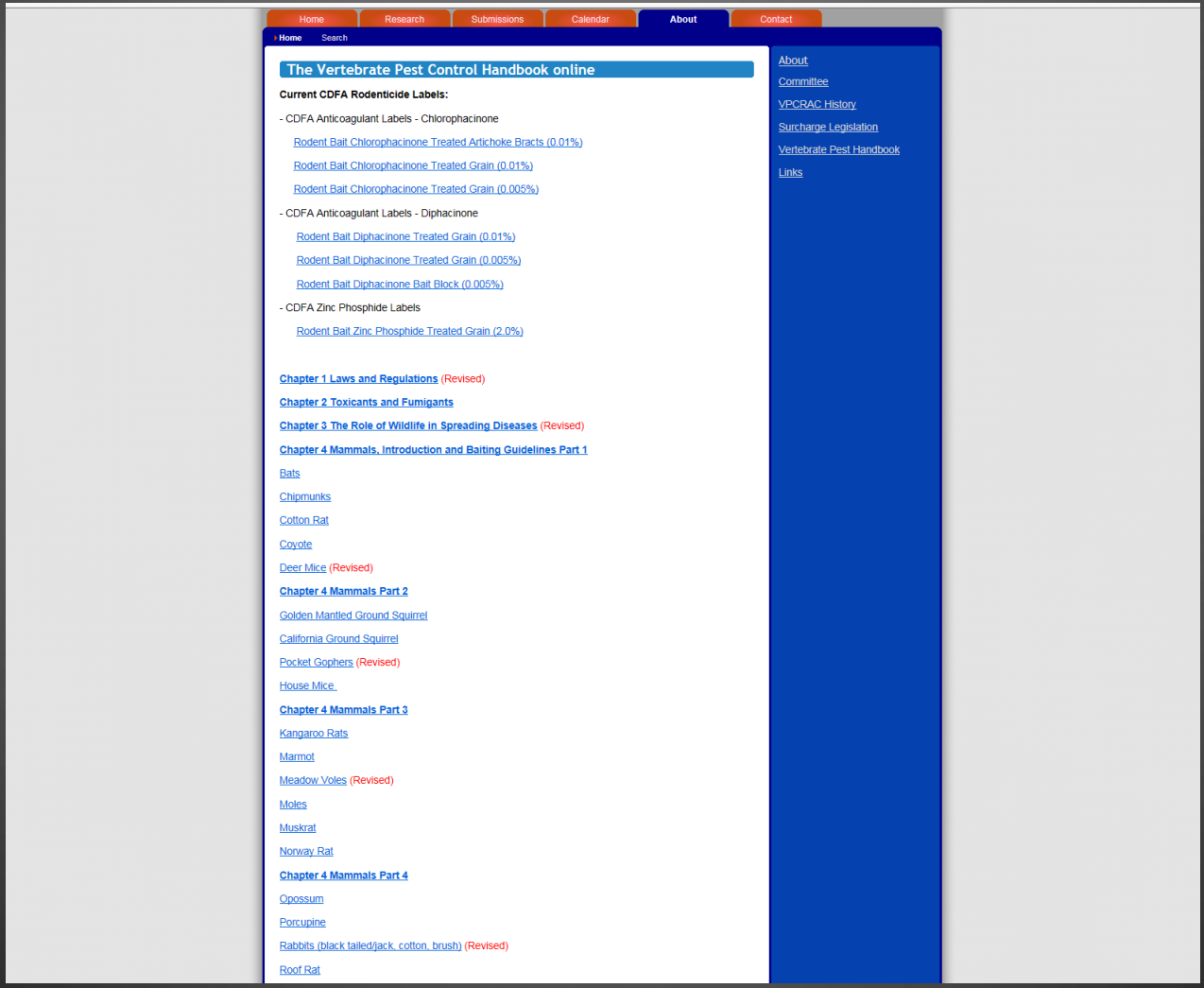
http://www.groundsquirrelbmp.com

Vertebrate Pest Control Handbook

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

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