

An integrated approach to managing burrowing rodents

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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.
- 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.



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.



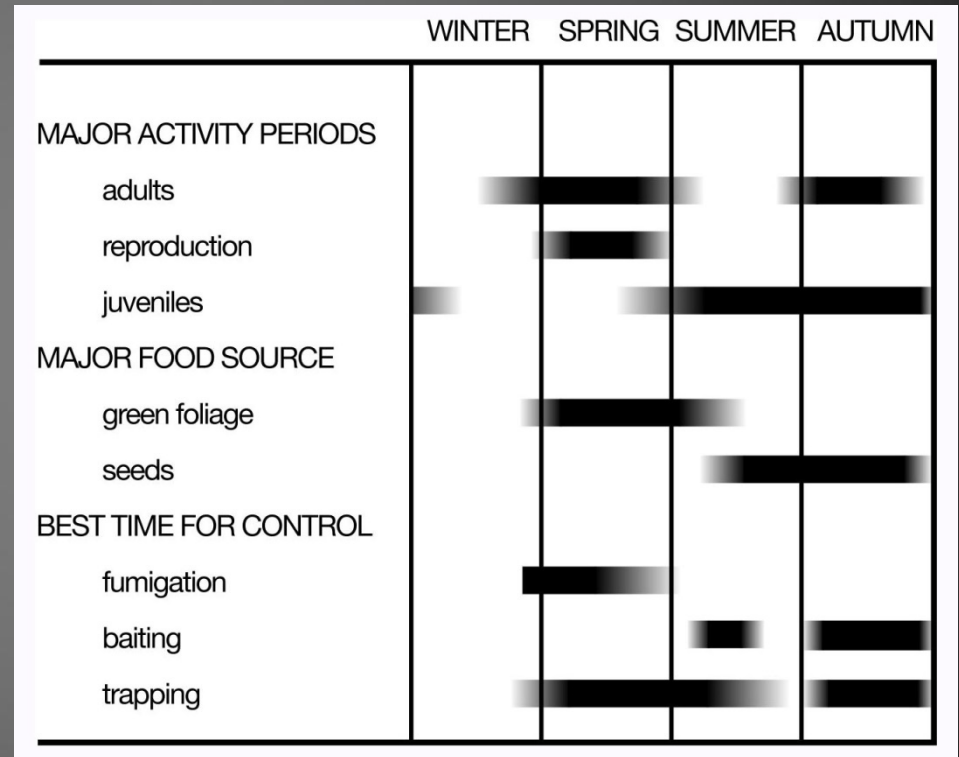
Current Control Strategies

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



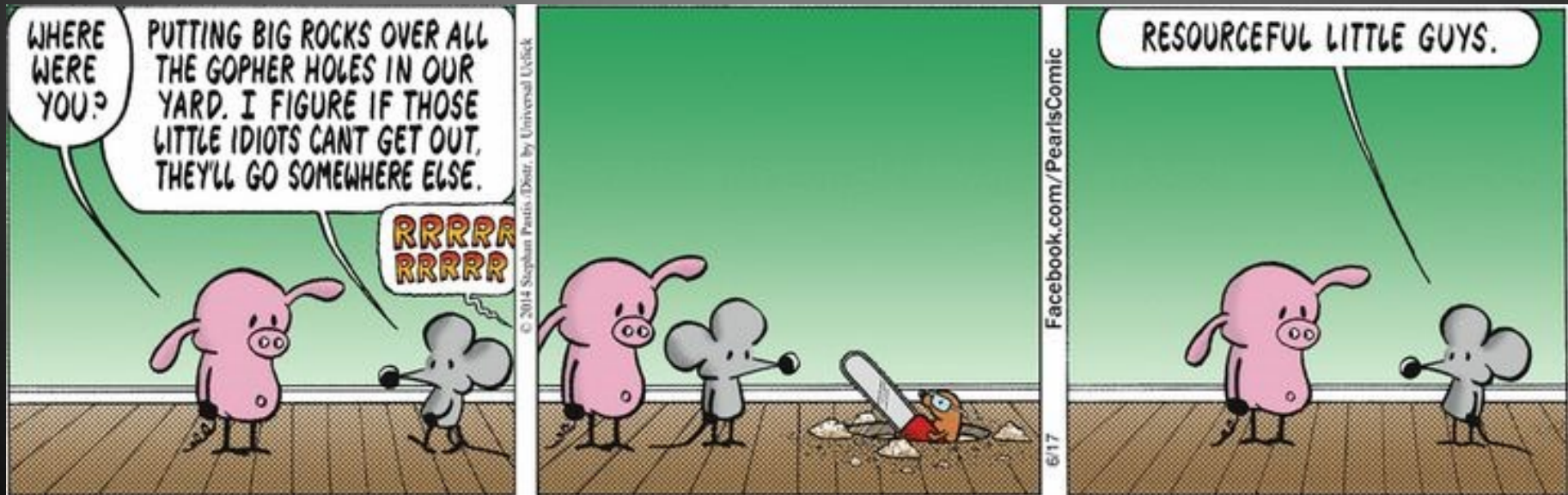
Importance of Biology/Ecology

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



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

- Natural predators have been used to control vertebrate pests.
- Owl boxes have shown some success 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

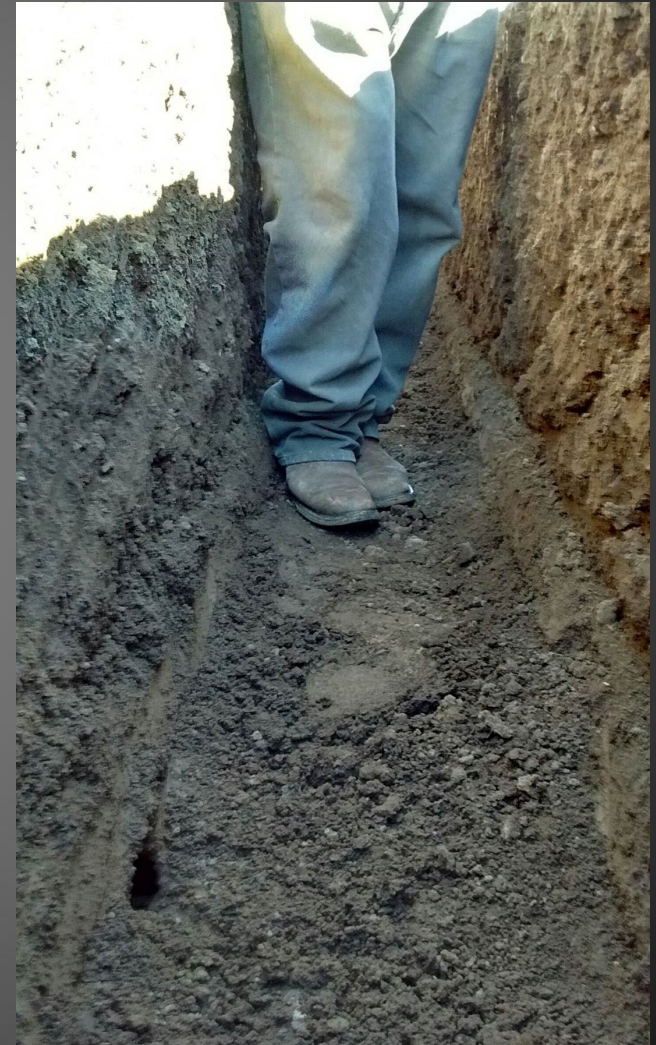
- Involves altering habitat to reduce the desirability for pests.
- Examples:
 - destroy old burrows
 - flood irrigation
 - remove or reduce cover for voles



Control Options—Exclusion

Exclusion

- most fencing ineffective; vole fencing provides some relief



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.



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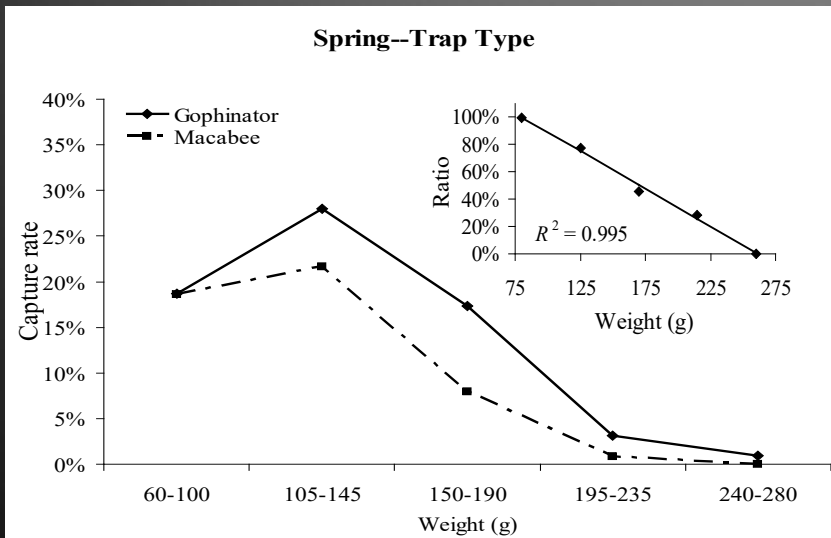
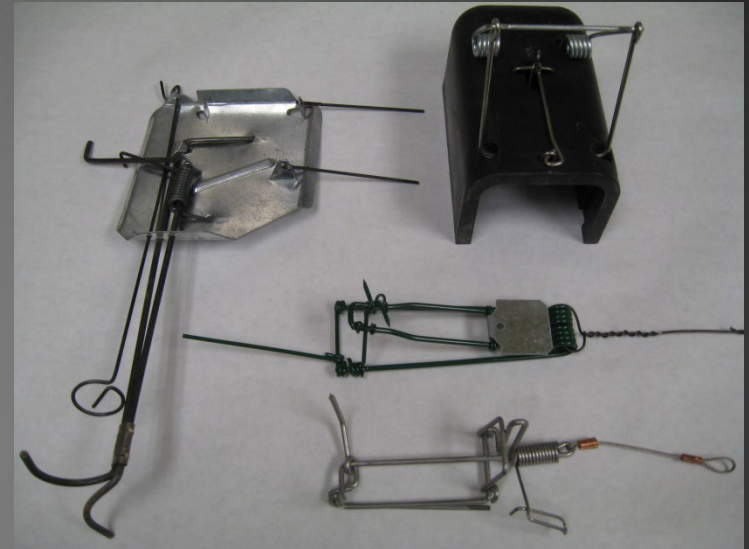
Control Options—Trapping



Control Options—Trapping

Pocket gophers

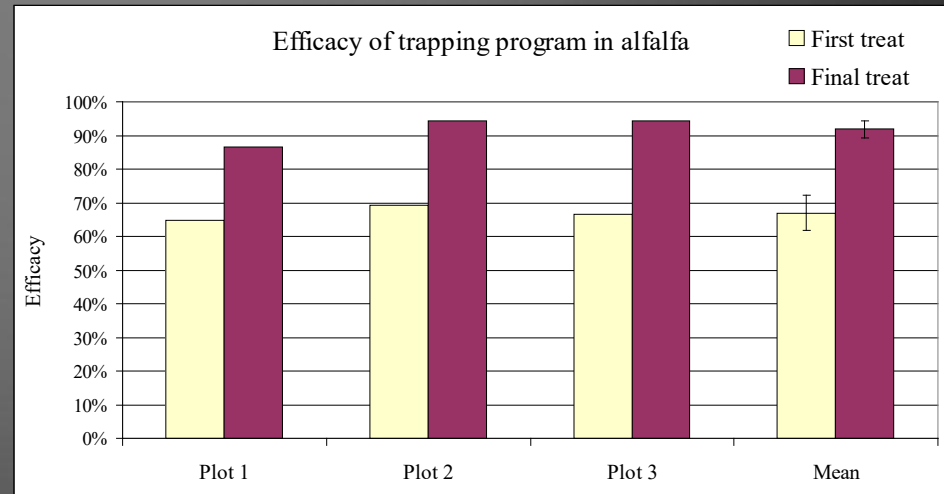
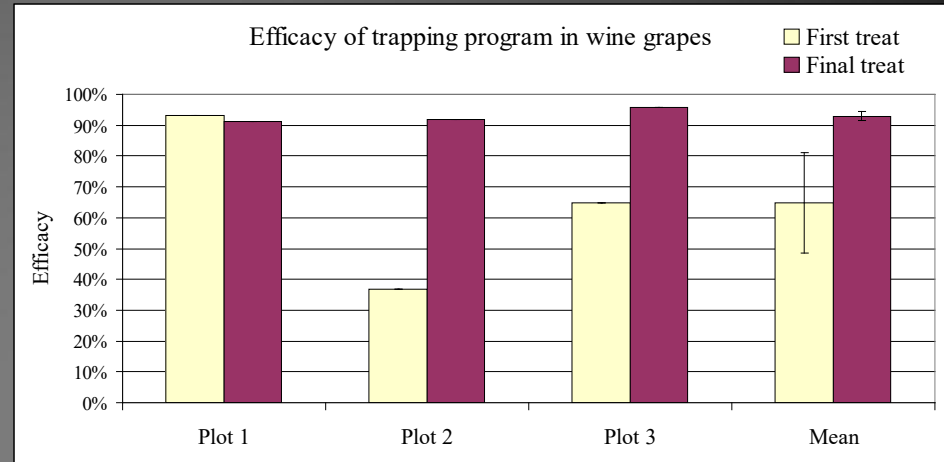
- Gophinator trap was more effective.
- Covered sets yielded slightly higher capture rates in spring-summer, but not autumn.
- Efficacy was offset by setting time.
- We did not observe a difference in the number of captures across attractants.
- Human scent had no effect.



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	
Pocket gophers	?	X	X
Voies	?	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 (62–86% 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.



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

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

<http://www.groundsquirrelbmp.com>



Biology Identification Management Regulations Resources FAQs Search

Ground squirrel management for California



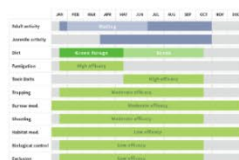
Adult CA ground squirrel in an agricultural field

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

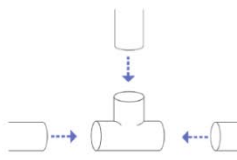
What is IPM?

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

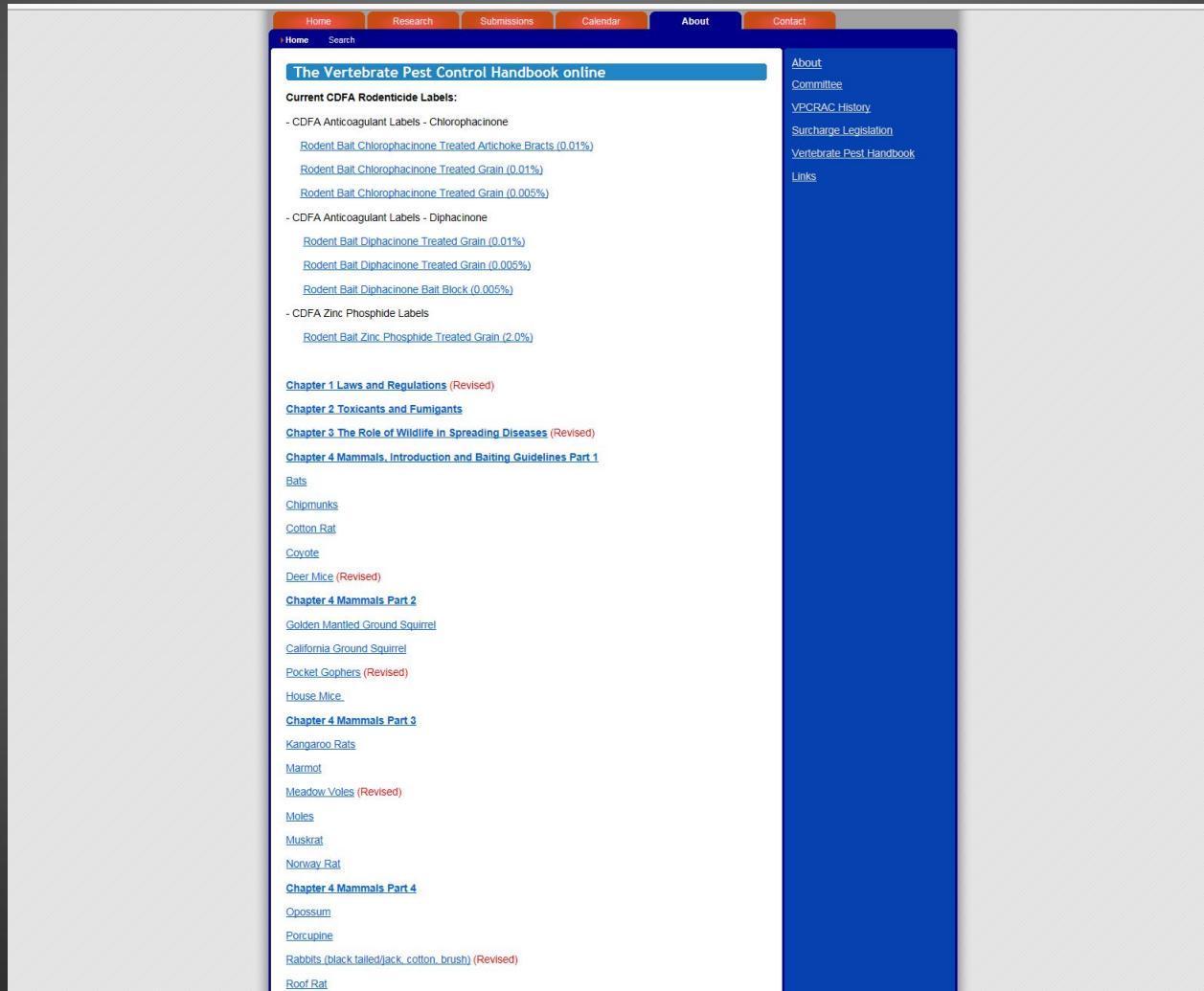


Protecting Wildlife

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

Vertebrate Pest Control Handbook

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



A photograph of a squirrel sitting on the ground next to a white PVC pipe. The squirrel is facing left, holding a small object in its paws. A speech bubble is positioned above the squirrel, containing the word "Questions?". The background shows dry grass and a large rock.

Questions?