

Managing Burrowing Mammals

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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.



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, particularly below ground.
- Mounds can also kill plants and can create weed seed-beds.



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.



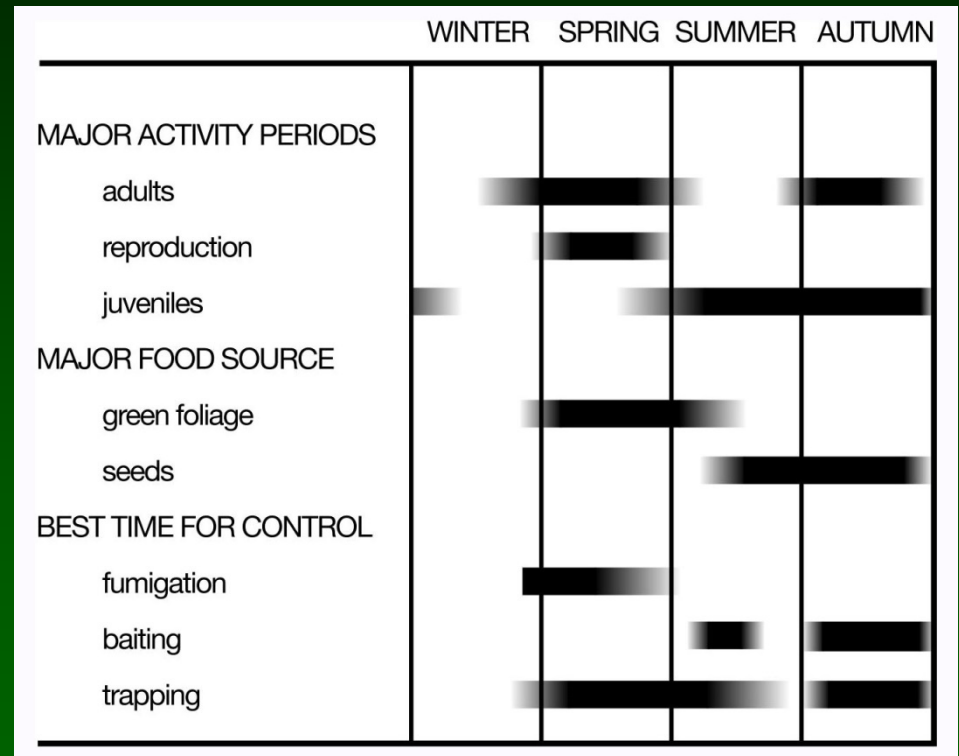
Current Control Strategies

- 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:
 - California ground squirrel

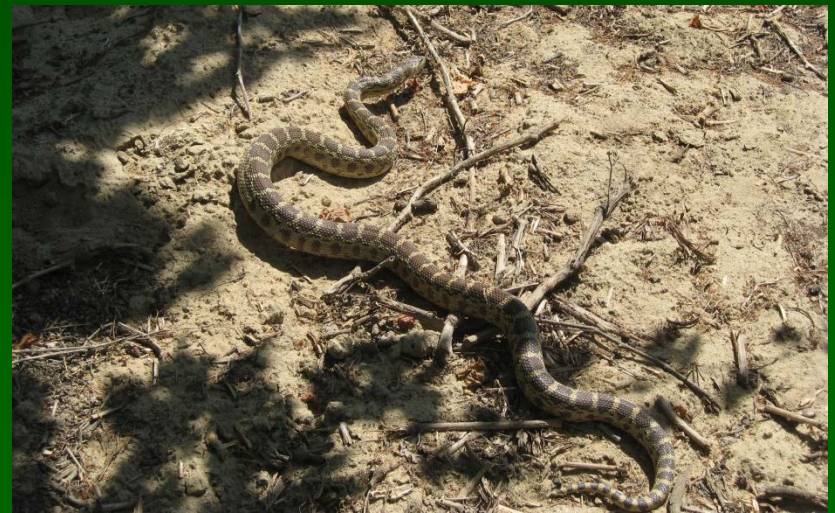


What Control Options are Available?

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

Control Options—Biocontrol

- Natural predators have been used to control vertebrate pests.
- Owl boxes are inconclusive at best.
- Gopher snakes kill a few gophers but are unlikely to control populations.



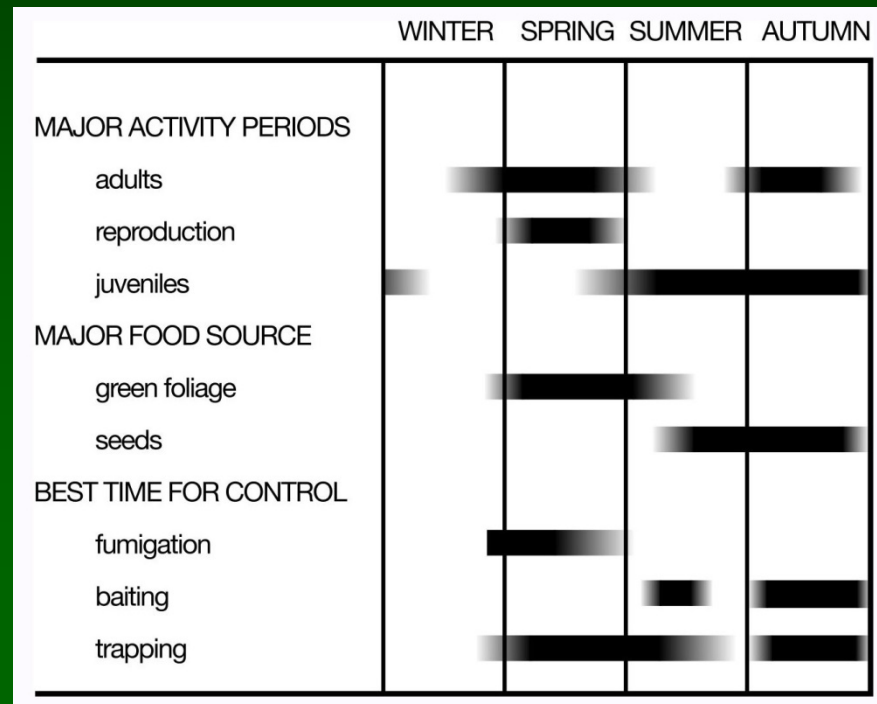
Control Options—Habitat Modification

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



Control Options—Trapping

- Control of small populations of California 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

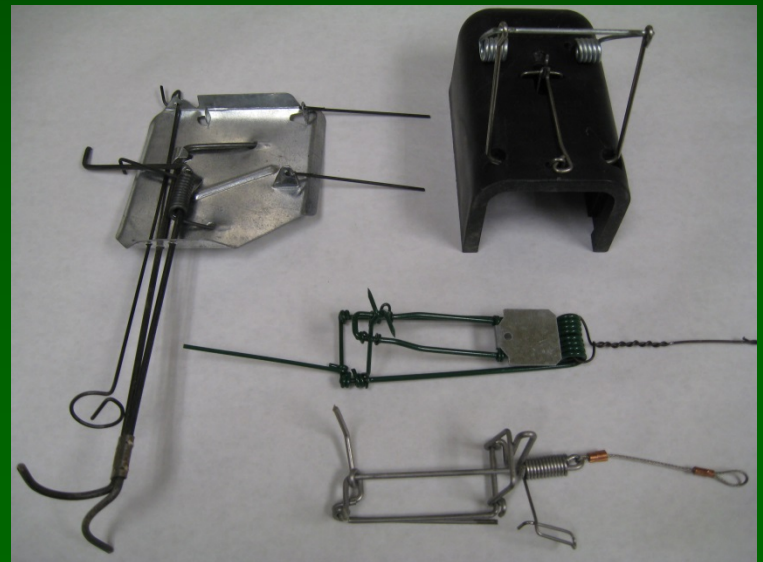
- Body-gripping traps, tube traps, and box-type squeeze traps are common kill traps.
- Wire cage traps are common live traps.
- Live traps require euthanizing target animals.



Trapping—Overview

Pocket gophers

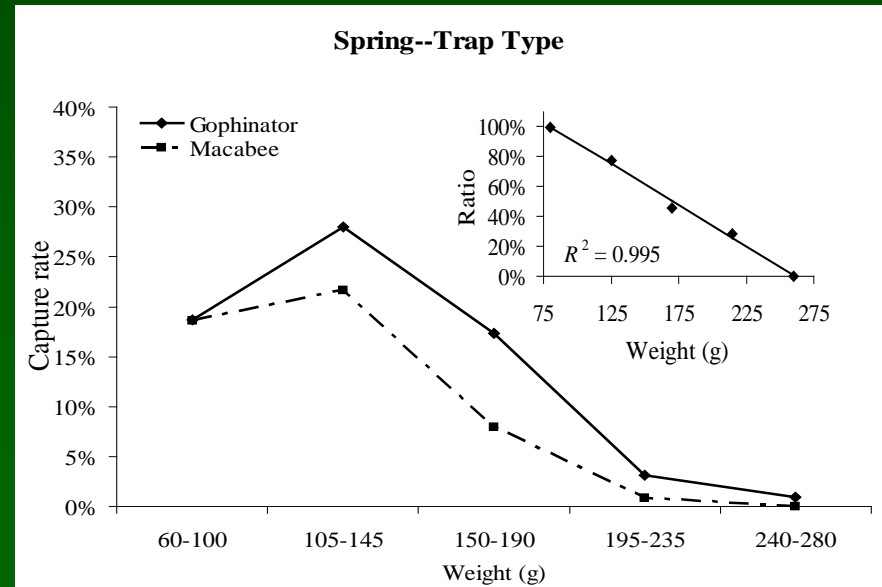
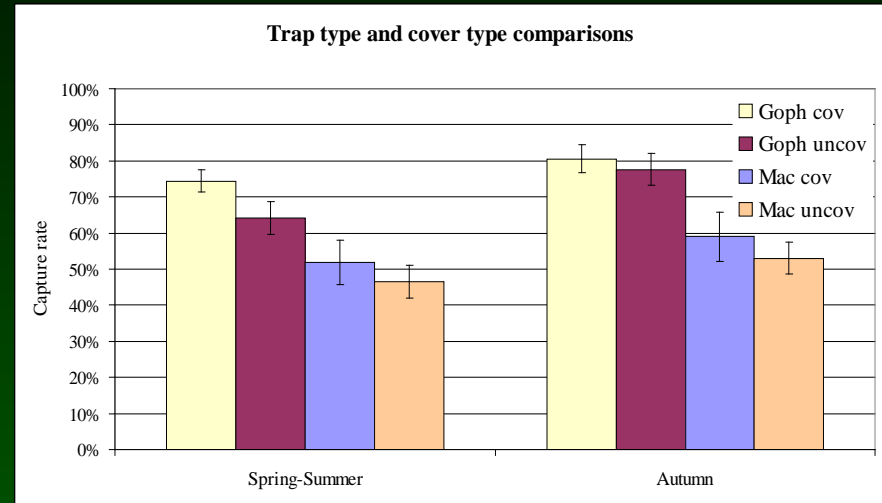
- Has many positive attributes including:
 - knowledge that you've removed the target animal.
 - no use of toxic chemicals.
 - available for use in organic setting.
 - can be efficient and economical once user becomes proficient at trapping.
- Two main kinds of traps: pincers and squeeze-type box traps.



Trapping—Options

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.



Trapping—Efficacy

Pocket gophers

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

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Control Options—Trapping

Voles

- Use of snap traps can be effective for small populations.



Photo courtesy of Steven Albano

Control Options—Baiting

- Involves use of poison baits to control vertebrate pests.
- There are restricted use and non-restricted use baits but typically most are now restricted use unless using in your yard or garden.

	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

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

1st 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
- is restricted-use material



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
- is restricted use material



Control Options—Baiting

Pocket gophers

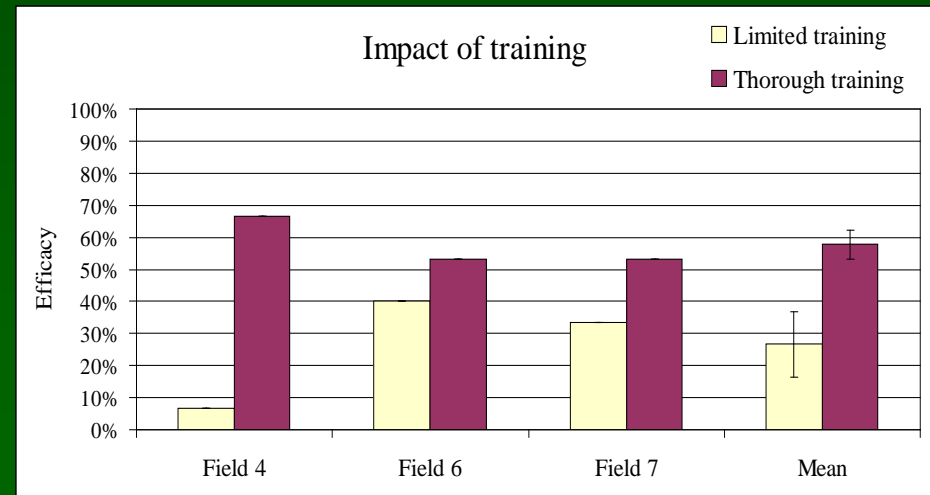
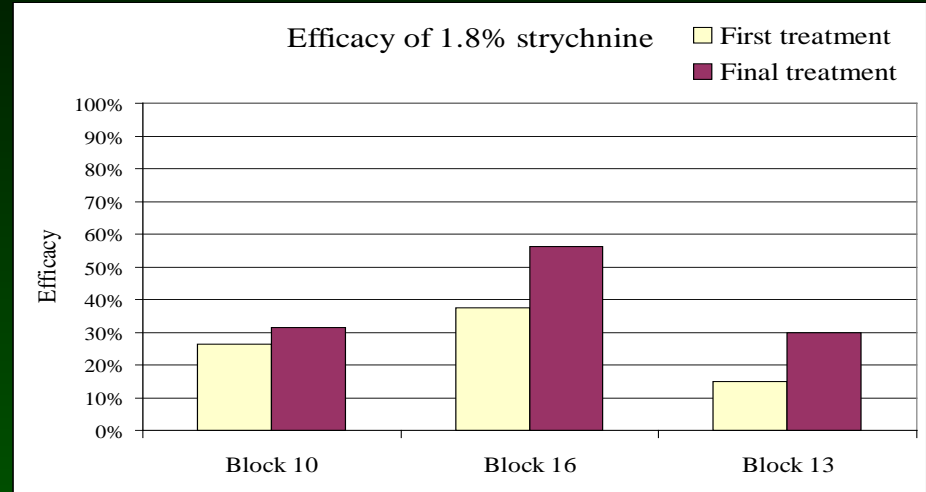
- Strychnine works best.
- Use probe to find tunnel.
- Dispense bait in tunnel.



Control Options—Baiting

Pocket gopher

- efficacy for pocket gopher baits varies across studies.
- study with 1.8% strychnine indicated low efficacy.
- potential reasons could include poor applicator training.



Gopher Rodenticide Trials

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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 California 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.



Control Options—Fumigation

Recent changes

- Buffer zones extended from 15 to 100 feet.
- Application sites now are to be posted.
- Fumigation Management Plan is still required.
- Contact local Ag Comm. office for details.



Control Options—Fumigation

Carbon monoxide producing machines



Control Options—Fumigation

- Steve Orloff and I have already begun to collect efficacy data.
- PERC appears to be moderately effective, while the Cheetah was completely ineffective.

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Control Options—Comparisons

- Trapping and aluminum phosphide were most effective for gophers.
- Aluminum phosphide was much cheaper to apply.
- PERC may not have same restrictions as other pesticides.

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Control Options—Shooting

- Shooting can be effective for controlling ground squirrels although it is labor intensive.
- Increasing restrictions on use of lead bullets.



Control Options—Other Strategies

Gas Explosive Device

- Involves combustion of propane and oxygen.
- Kills animal through concussive force and will destroy burrow system.
- May not be overly effective and has potential hazards.



A photograph of a squirrel sitting on the ground in a natural, outdoor setting. The squirrel is facing left and has its paws near its mouth. To its right is a large white PVC pipe. A speech bubble is positioned above the squirrel, containing the word "Questions?". The background shows dry grass and a clear sky.

Questions?