

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.



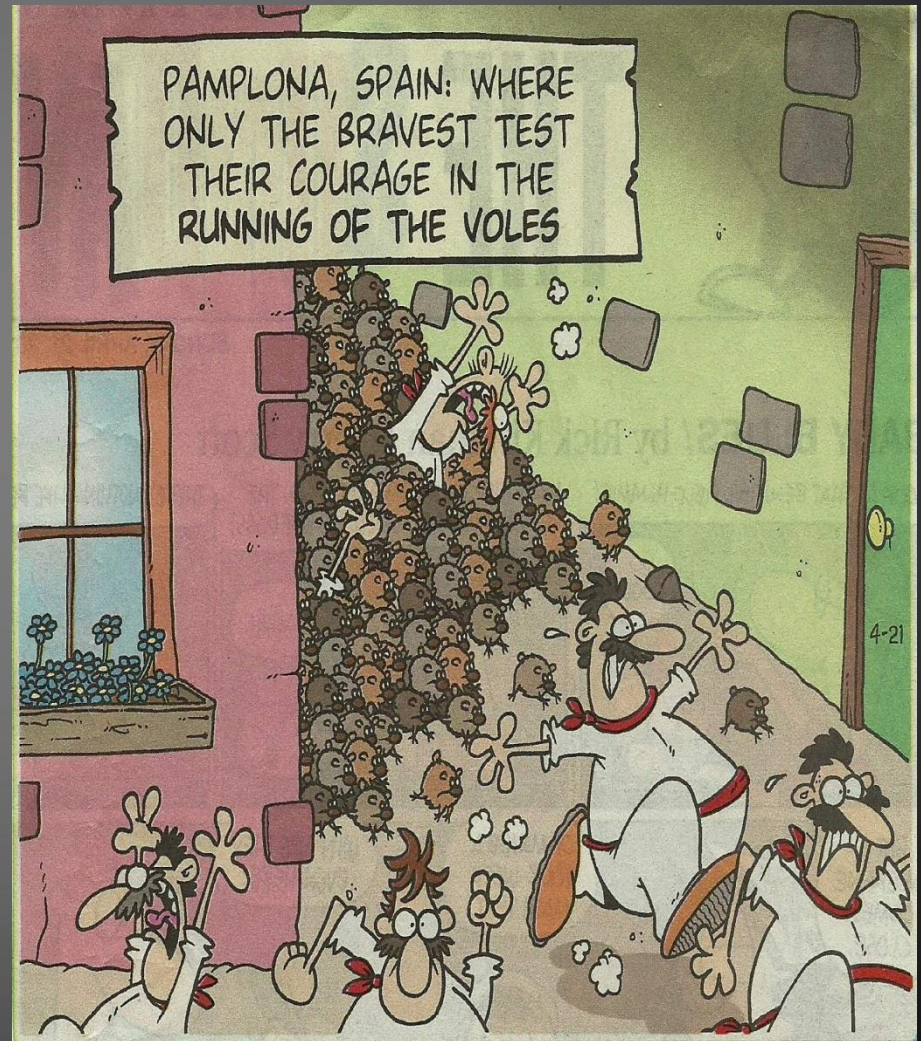
Species Identification (Pocket Gophers)

- 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.



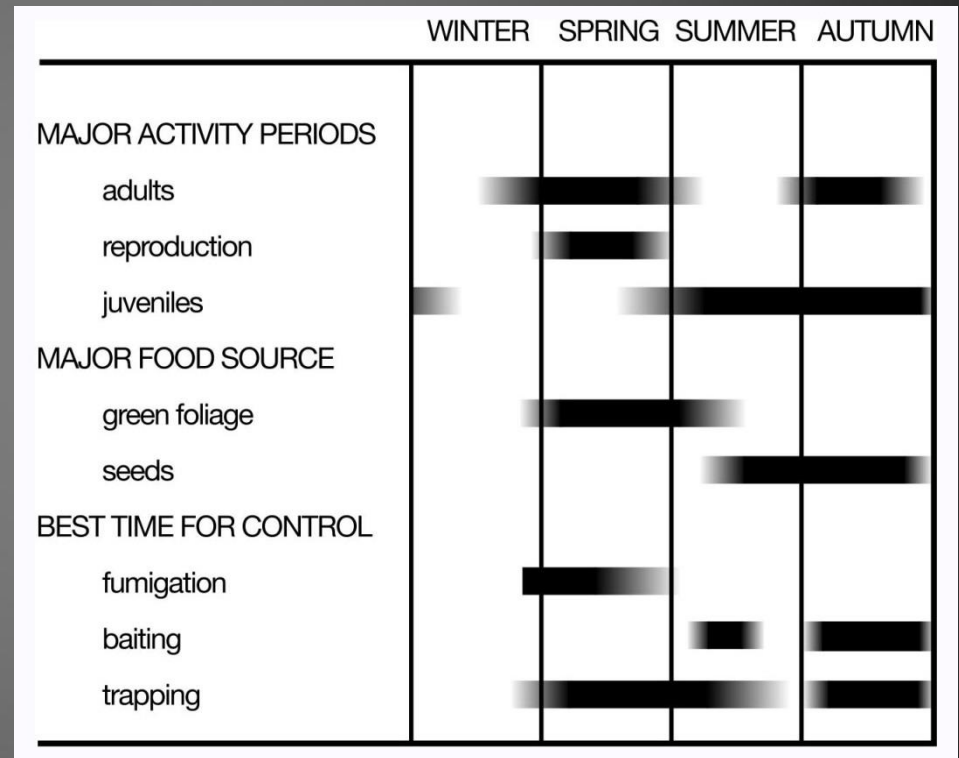
Current Control Strategies

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



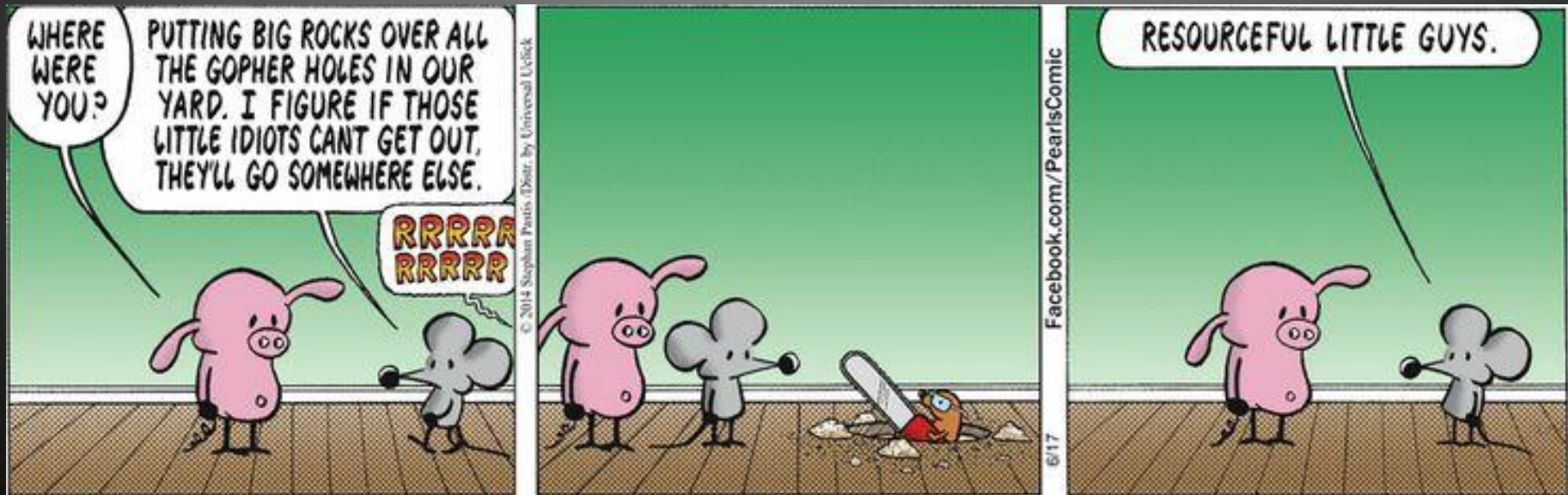
Importance of Biology/Ecology

- 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			



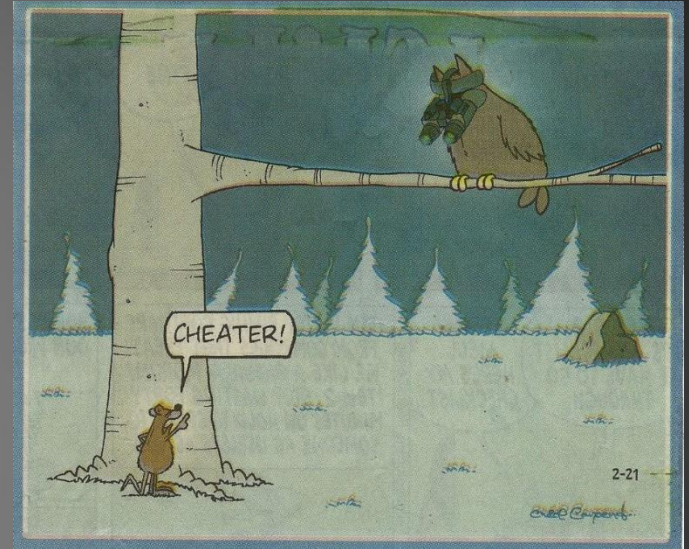
Control Options—Biocontrol

- 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.



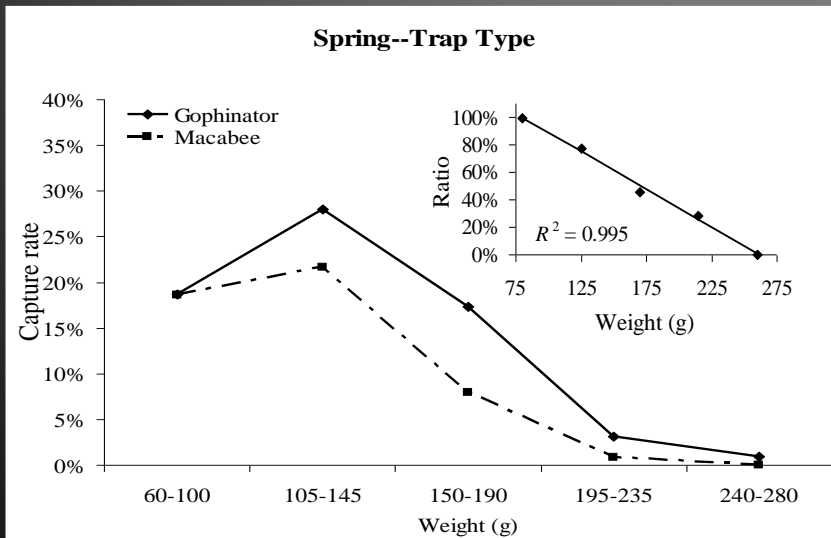
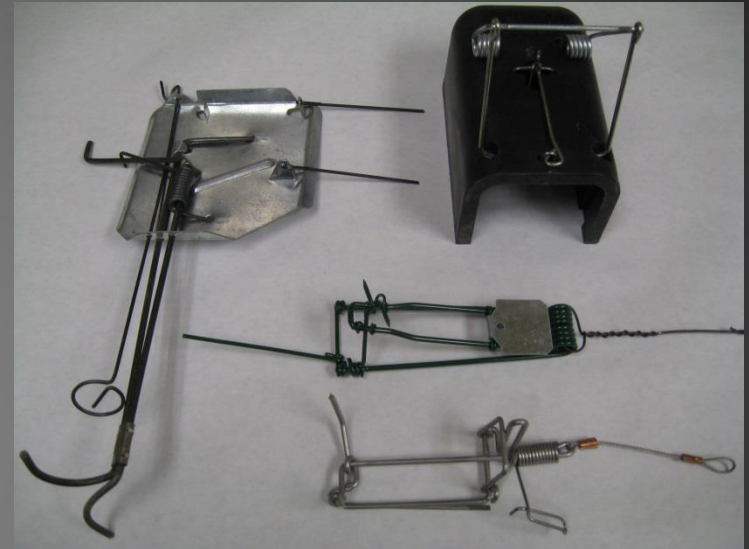
Control Options—Trapping



Control Options—Trapping

Pocket gophers

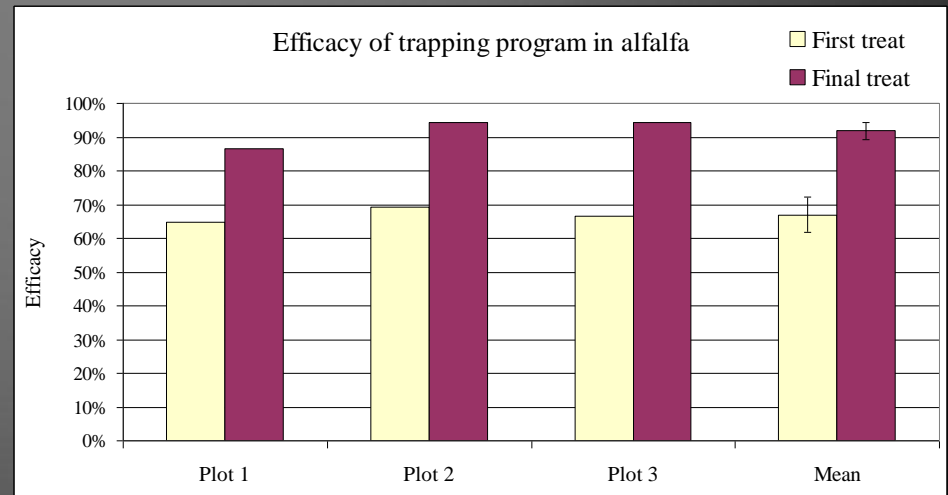
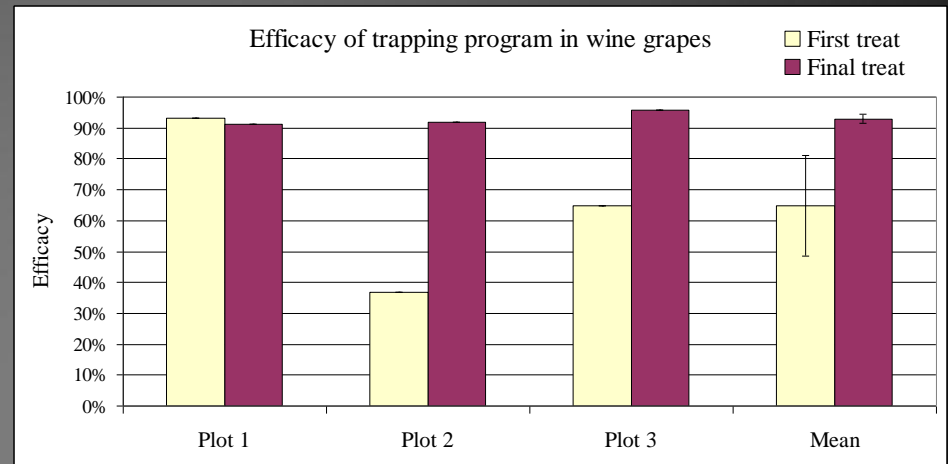
- Gophinator trap was more effective.
- Covered sets yielded slightly higher capture rates in spring-summer, but not autumn.
- Efficacy was offset by setting time.
- We did not observe a difference in the number of captures across attractants.
- Human scent had no effect.



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
Voies	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



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.

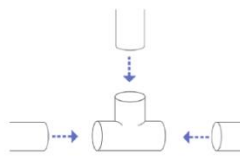
What is IPM?

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 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

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Updated Feb. 3, 2017

University of California

<http://www.groundsquirrelbmp.com>

Vertebrate Pest Control Handbook

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

The screenshot displays the homepage of the Vertebrate Pest Control Handbook online. The website has a blue header with navigation links: Home, Research, Submissions, Calendar, About, and Contact. Below the header, the main content area is titled "The Vertebrate Pest Control Handbook online". It lists "Current CDFA Rodenticide Labels" with links to various bait types and concentrations for Chlorophacinone, Diphacinone, and Zinc Phosphide. It also lists "Chapter 1 Laws and Regulations (Revised)", "Chapter 2 Toxicants and Fumigants", "Chapter 3 The Role of Wildlife in Spreading Diseases (Revised)", and "Chapter 4 Mammals, Introduction and Baiting Guidelines Part 1". A sidebar on the right contains links for "About", "Committee", "VPCRC History", "Surcharge Legislation", "Vertebrate Pest Handbook", and "Links".

Home Search

The Vertebrate Pest Control Handbook online

Current CDFA Rodenticide Labels:

- CDFA Anticoagulant Labels - Chlorophacinone
 - [Rodent Bait Chlorophacinone Treated Artichoke Bracts \(0.01%\)](#)
 - [Rodent Bait Chlorophacinone Treated Grain \(0.01%\)](#)
 - [Rodent Bait Chlorophacinone Treated Grain \(0.005%\)](#)
- CDFA Anticoagulant Labels - Diphacinone
 - [Rodent Bait Diphacinone Treated Grain \(0.01%\)](#)
 - [Rodent Bait Diphacinone Treated Grain \(0.005%\)](#)
 - [Rodent Bait Diphacinone Bait Block \(0.005%\)](#)
- CDFA Zinc Phosphide Labels
 - [Rodent Bait Zinc Phosphide Treated Grain \(2.0%\)](#)

[Chapter 1 Laws and Regulations \(Revised\)](#)

[Chapter 2 Toxicants and Fumigants](#)

[Chapter 3 The Role of Wildlife in Spreading Diseases \(Revised\)](#)

[Chapter 4 Mammals, Introduction and Baiting Guidelines Part 1](#)

[Bats](#)

[Chipmunks](#)

[Cotton Rat](#)

[Coyote](#)

[Deer Mice \(Revised\)](#)

[Chapter 4 Mammals Part 2](#)

[Golden Mantled Ground Squirrel](#)

[California Ground Squirrel](#)

[Pocket Gophers \(Revised\)](#)

[House Mice](#)

[Chapter 4 Mammals Part 3](#)

[Kangaroo Rats](#)

[Marmot](#)

[Meadow Voles \(Revised\)](#)

[Moles](#)

[Muskrat](#)

[Norway Rat](#)

[Chapter 4 Mammals Part 4](#)

[Opossum](#)

[Porcupine](#)

[Rabbits \(black tailed jack cotton brush\) \(Revised\)](#)

[Roof Rat](#)

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Questions?