UC Cooperative Extension
University of California
Agriculture & Natural Resources

Integrated Pest Management: Strategies for Burrowing Rodents


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Burrowing rodents are ecologically important, but are also pests

Illustration: Tim Gunther

Ecosystem services

- Soil aeration
- Soil fertility

Pest behavior

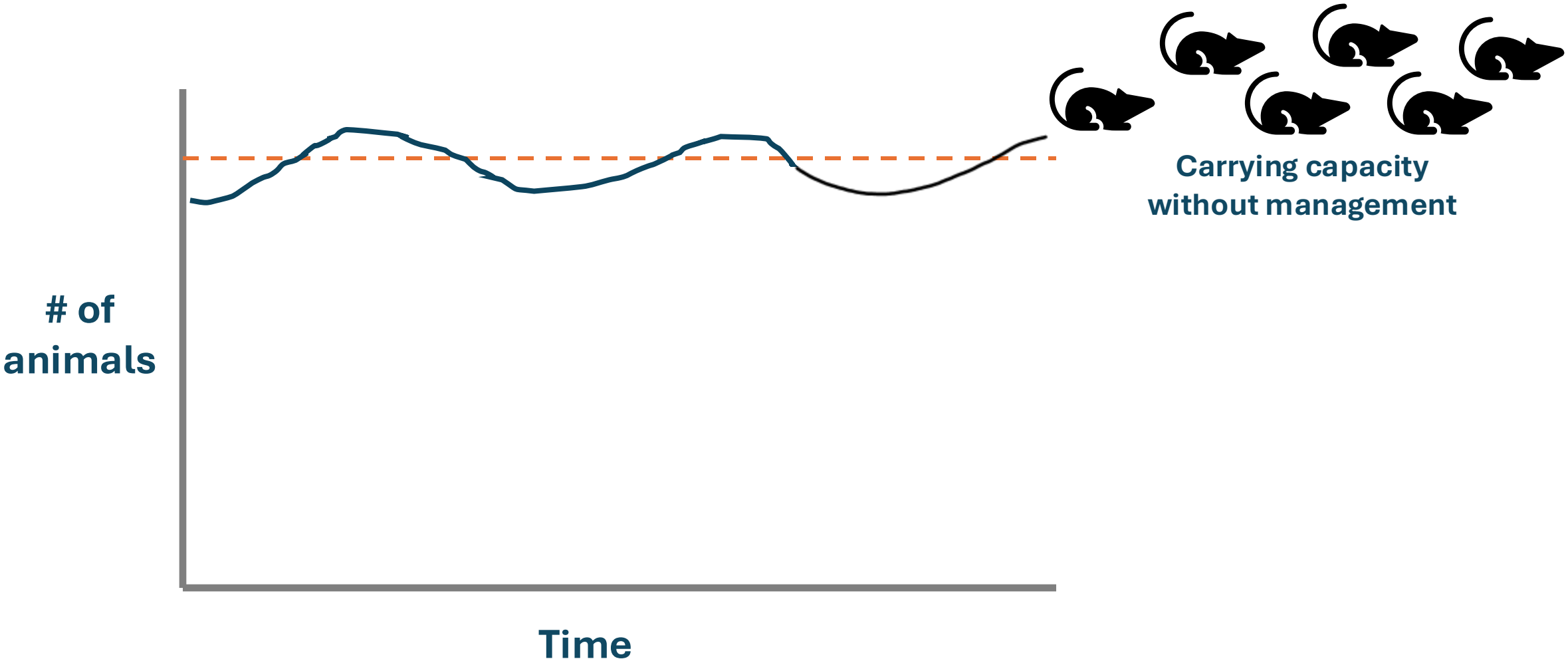
- Artificially inflated populations
- Damage crops and infrastructure
- Burrows can be hazardous

Integrated Pest Management (IPM)

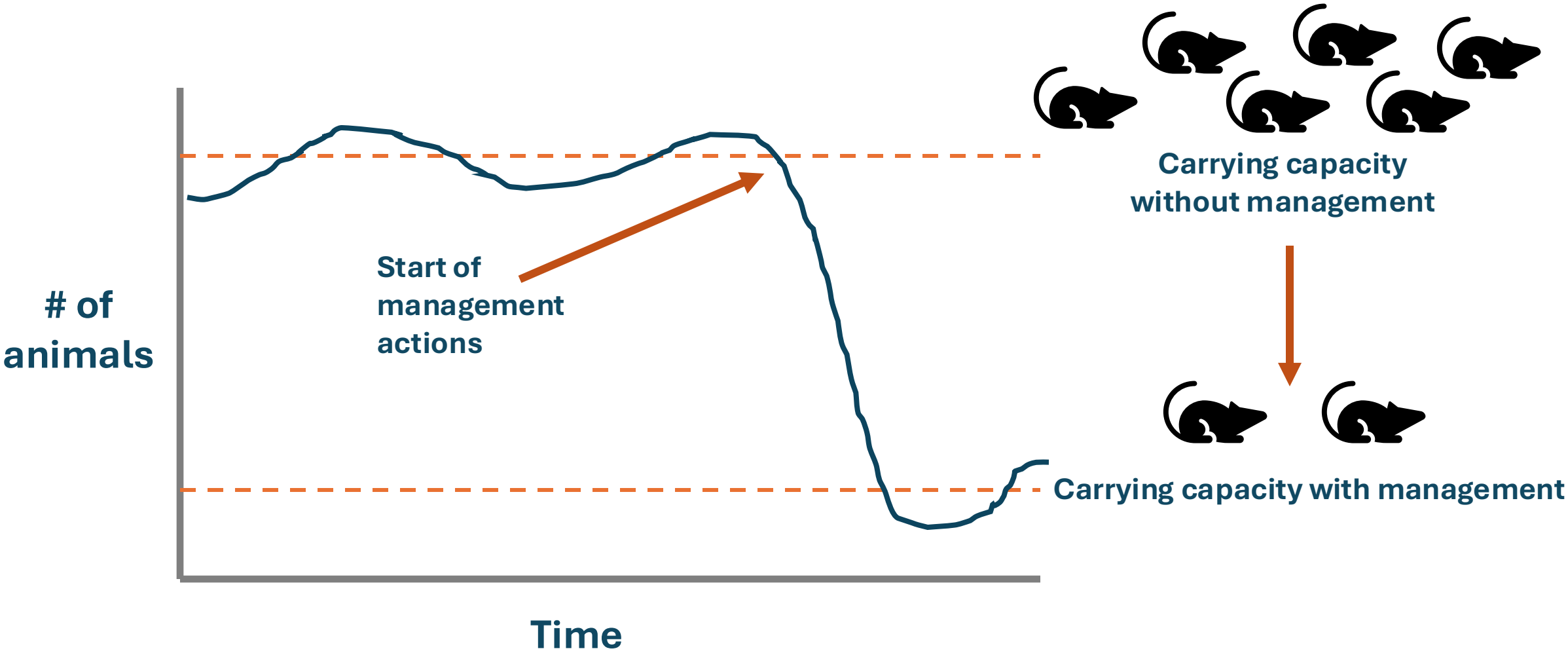
- Science-based
- Combines tools and strategies
- Prevent and/or manage pest problems at acceptable levels
- Considers risk to people and the environment

Image: University of Wyoming

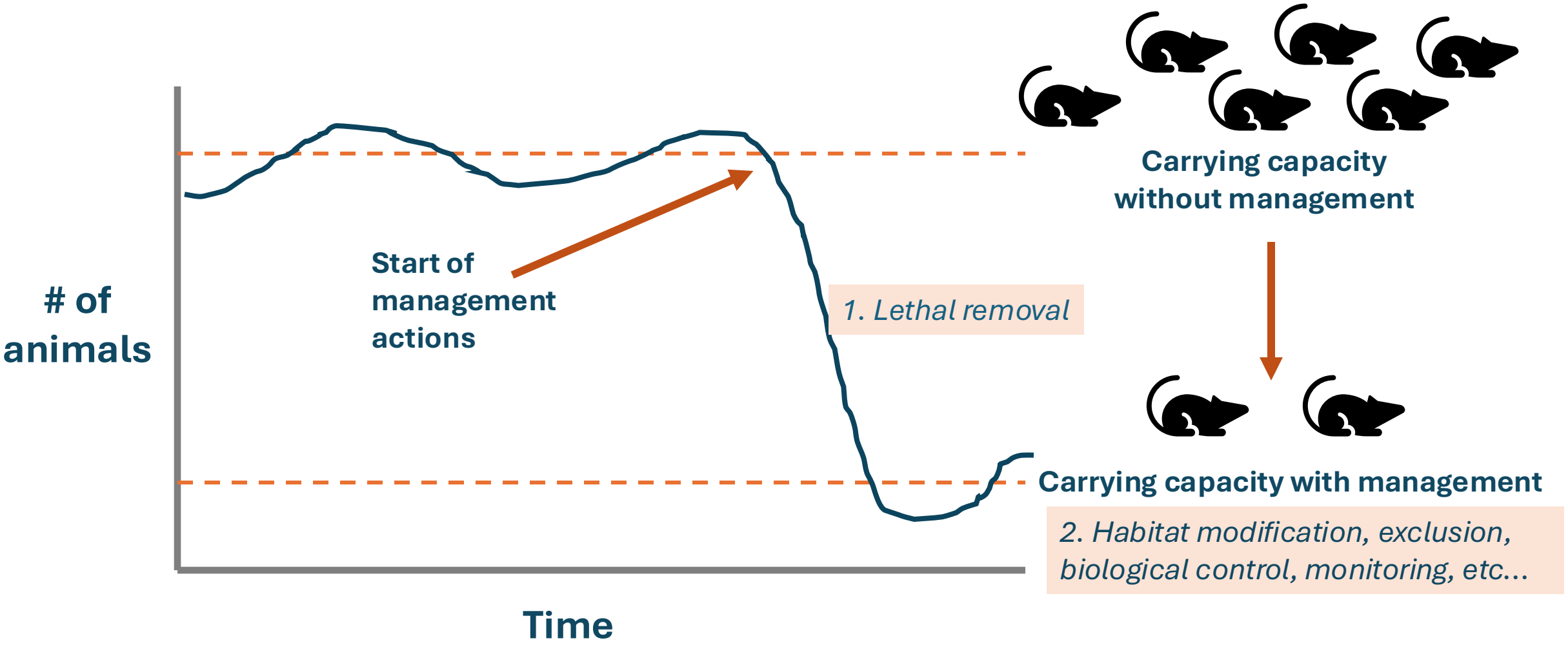
Management with IPM



Management with IPM

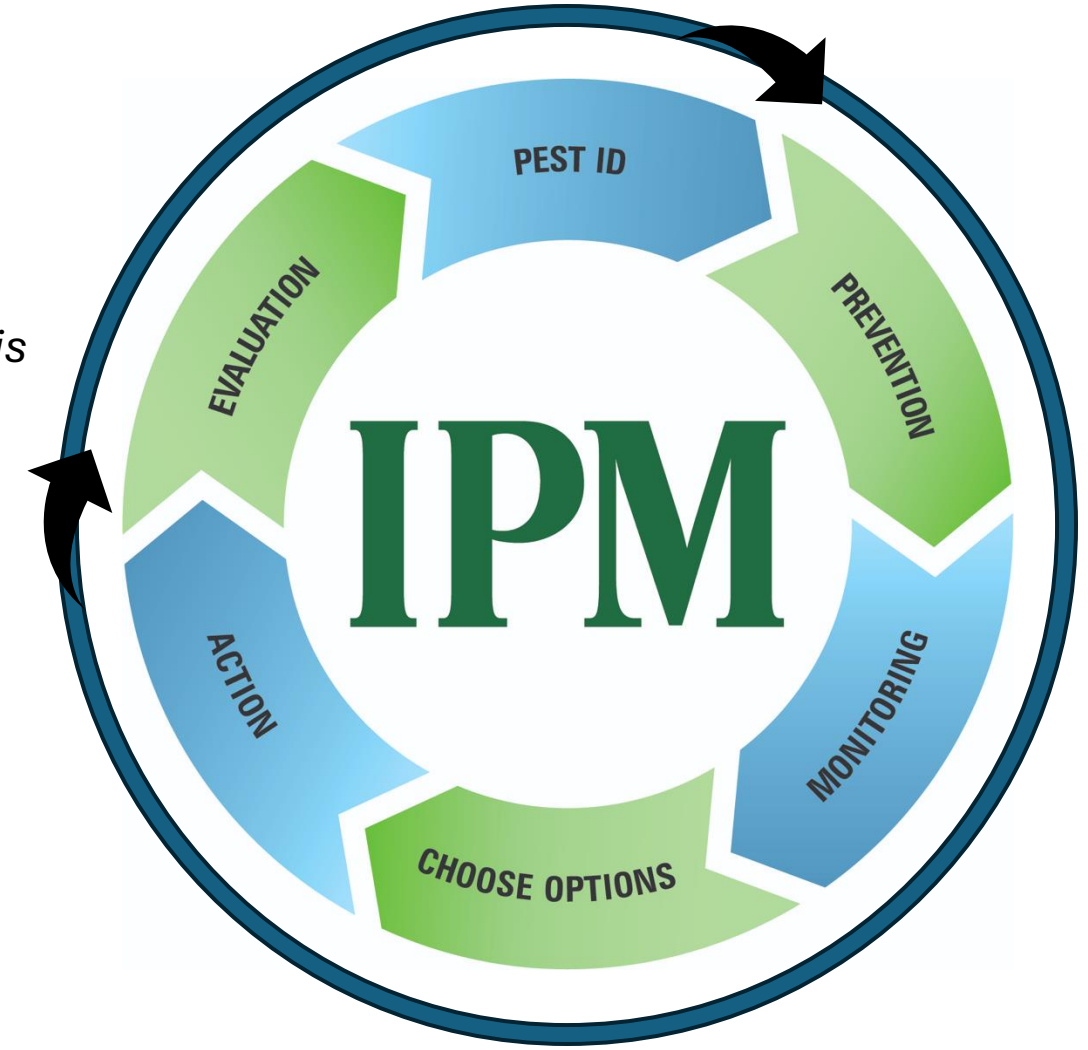


Management with IPM



1. What is causing damage?
Identify pest, often by type of damage caused

3. Did it work?
- *Adapt management strategies*
- *Cost-benefit analysis*
- *Keep records*



2. Management
- *Prevention is often most effective*
- *Monitoring– act before problem becomes unmanageable*
- *Actions species specific and may change by season*

Image: University of Wyoming

3. Did it work?

- *Adapt management strategies*
- *Cost-benefit analysis*
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2. Management

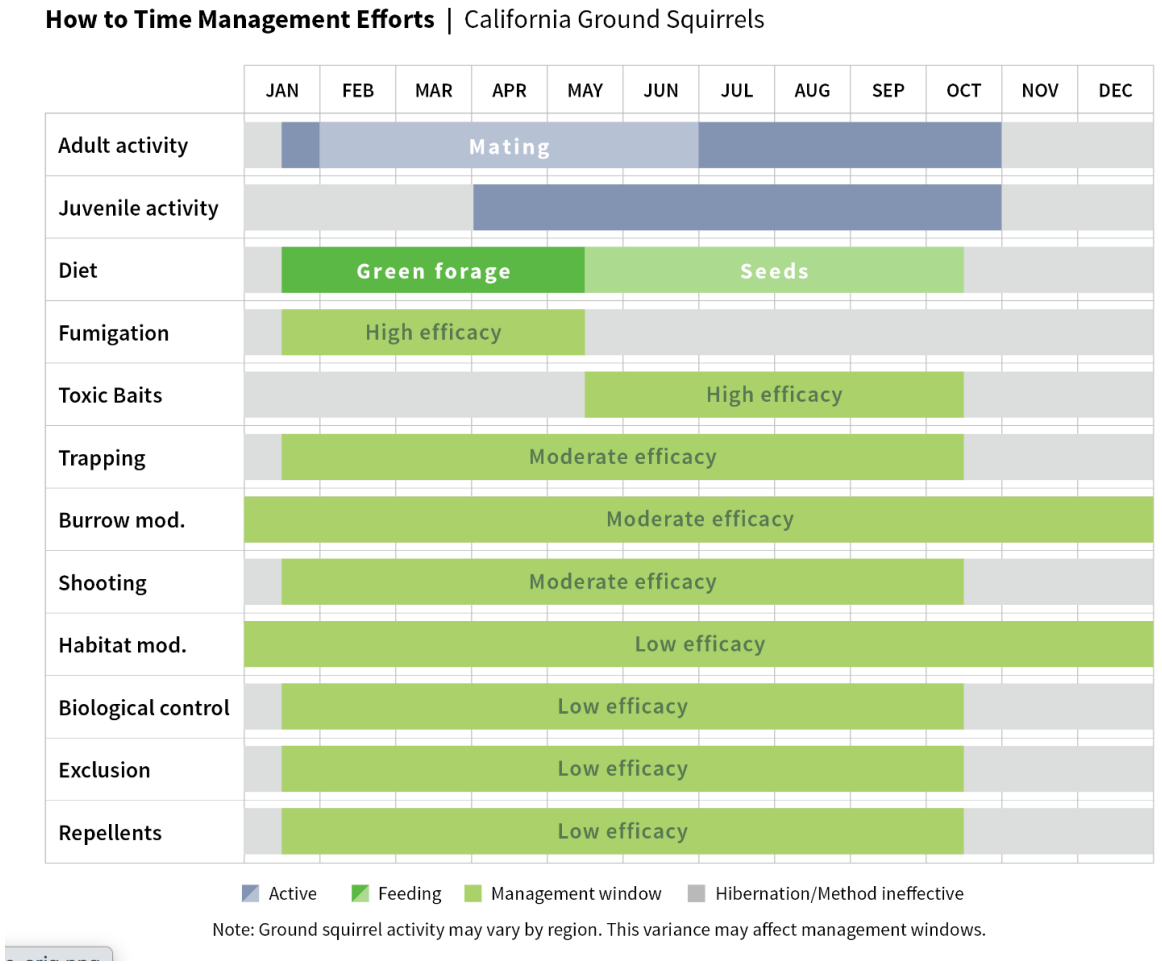
- *Prevention is often most effective*
- *Monitoring– act before problem becomes unmanageable*
- *Actions species specific and may change by season*

Image: University of Wyoming

Identification is the first step!

Management differs by species:

- Biology
- Food sources
- Resources
- Lifecycle
- Population trends
- Nature of damage/economic significance
- Classification and regulation by state and federal wildlife agencies



Three most common burrowing rodent pests

Botta's pocket gophers

Thomomys spp.

California Vole

Microtus spp.

California ground squirrels

Otospermophilus spp.

Photos: Wikimedia

Identification based on damage

Gophers

Voles (meadow mice)

California ground squirrels

Photo credit: Wikimedia and UC IPM

Legal status of gophers, voles, and CA ground squirrels:

California Fish and Game Code: Non-game mammals, which if found to be injuring crops or property may be controlled by the landowner in any legal manner.

Pocket gophers

Identification:

- Grayish brown fur, 6-8 inches, continuous growing teeth, cheek pouches, almost entirely underground
- Crescent shaped mounds of dirt pushed on top of the soil from constructing burrows

Life Cycle:

- Peak breeding in late winter and early spring
- Management starting in late fall continuing through spring is ideal

Photo credit: Wikimedia and UC IPM

Pocket gophers

Damage:

- Feeds on tap roots, girdles trees and vines below ground, weakens or kills plants
- Mounds can kill seedlings, encourage weeds, pose dangers to farm equipment and people
- Tunnels can interfere with irrigation by channeling water.
- Can chew drip irrigation lines, primarily below ground

Gophers

Similar species

Moles:

Circular/volcano shaped mounds.

Mounds can pose same risks

Diet of invertebrates; feeding does not damage plants

Photo credit: Wikimedia and UC IPM

Voles (Meadow mice)

Identification:

- Mouse-like, dark greyish-brown, 4-6 inches
- Shallow open burrows 1.5 inches in diameter, well worn trails in grass, fecal pellets present at active sites
- Old gopher burrows can cave in-- look for trails!

Life Cycle:

- Peak breeding in spring but can reproduce any time of year.
- Population outbreaks every 4-6 years-- growth can be exponential, many overlapping generations (3 weeks to maturity)

Photo credit: Wikimedia and UC IPM

Voles (Meadow mice)

Damage:

- Girdles trees and vines primarily above ground, weakens or kills plants.
- Chews irrigation lines, electrical, and pipes
- Difficult to distinguish from gopher damage, above/below ground is not 100% reliable distinction

Voles (Meadow mice)

Emerging patterns & future research:
With the move towards permanent cover and no-till, voles can destroy quite mature vines in an outbreak.

Damage occurs in fall/winter but often not noticed until the following spring when damaged vines are not vigorous.

Damage:

- Girdles trees and vines primarily above ground, weakens or kills plants.
- Chews irrigation lines, electrical, and pipes
- Difficult to distinguish from gopher damage, above/below ground is not 100% reliable distinction

Similar species

Vole

Small eyes
Short tail
Small ears
Round snout

Mouse

Large eyes
Long tail
Large ears
Pointed snout
*may be indoors
or outdoors

Shrew

Small eyes
Short tail
Small ears
Very pointed snout

Mole

Pointy nose
Large hands
Eyes?

Photo credit: Fox Pest Control

Photo credit: Wikimedia and UC IPM

California Ground Squirrels

Identification:

- Gray/light brown, darker on mid-back, gray shoulders, 16-19 inches including bushy tail
- Larger open burrows 4-6 inches in diameter, multiple entrances, lives in colonies, used by many generations
- Avoids moist or densely vegetated areas

Life Cycle:

- Typically hibernate in winter, removal in spring before young emerge
- Feed on green vegetation in spring and switches to seeds and fruit in summer and fall

Photo credit: Wikimedia and UC IPM

ia Ground Squirrels

Damage:

- Consumes vegetation in rangeland, forage, fruit, and nut crops
- Could girdle trunks and branches
- Burrows pose hazards to equipment, people, livestock, and perennial plants; Can weaken levees and farm roads
- Burrows could divert water away from crops or damage roots

Similar species

Tree Squirrels

Ground Squirrels

***Tree Squirrels are not classified as pests, therefore have completely different management guidelines**

IPM management actions

	Habitat modification	Cultural practices	Biological control
Gophers	✓	✓	✓
Voles	✓	✓	✓
Ground squirrels	✓	✓	✓

IPM management actions

Habitat modification

- Gophers: Attracted to cover crops with tap roots
- Voles: Keep vegetation short and under-vine areas bare
- Gound squirrels: Remove brush piles

Cultural practices

- Voles & gophers: interrow cultivation can destroy burrows, may cause dispersal to nearby fields
- Ground squirrels: Deep ripping required to remove burrows, may reduce reinvasion after removal event

Biological control

- Raptor nest boxes are part of long-term ecological strategy
- Most raptors main diet is rodents!

IPM management actions

	Habitat modification	Cultural practices	Biological control	Exclusion	Trapping	Shooting	Repellents	Burrow fumigation
Gophers	✓	✓	✓	?	✓	–	?	✓
Voles	✓	✓	✓	✓	?	–	–	–
Ground squirrels	✓	✓	✓	–	✓	✓	–	✓

IPM management actions

Exclusion

- Voles: trunk protectors that extend several inches below ground
- Good for structural or small-scale farming

Trapping

- Gophers & ground squirrels: effective methods discussed today

Shooting

- Ground squirrels: when legal

Repellents

- None on the market known to be effective

Web resources

UC Cooperative Extension- IPM Pest notes

https://ipm.ucanr.edu/

Vertebrate Pest Control Handbook

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

Ground Squirrel Best Management Practices

http://www.groundsquirrelbmp.com

Up Next

NAPA COUNTY
PEST & DISEASE WORKSHOP:
FIELD RODENT CONTROL

Station A
Group 1

DECEMBER 5, 2025

UCCE CONFERENCE ROOM
1710 SOSCOL AVE., SUITE 4, NAPA

TIME	TITLE	SPEAKER	LOCATION
8:45 - 9 AM	Registration		
9 - 9:30 AM	Integrated pest management principles for burrowing rodents in production agriculture	Dr. Breanna Martinico, University of California Cooperative Extension (UCCE) Napa County	UCCE Conference Room
9:30 - 10 AM	Station A: Groups 1 and 2: Burrowing rodent trapping strategies	Dr. Roger Baldwin, UC Davis	UCCE Conference Room
10 - 10:15 AM	Break - A groups and B groups switch stations		
10:15 - 10:45 AM	Station B: Managing predatory birds for biocontrol of rodent pests: Group 1: Nest box overview Group 2: Barn owl interactive map	Mary Badger, UC Davis; Dr. Sarah MacDonald, UCCE Napa County	B1: Front parking lot B2: Suite 6 (the office adjacent to the main lobby doors)
10:45 - 11:15 AM	Rodenticide label review for burrowing rodents	Jesus de Haro, Napa County Ag Commissioner's Office	UCCE Conference Room
11:15 - 11:30 AM	Q&A and survey	All Speakers	UCCE Conference Room

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