Integrated Pest Management (IPM) for Wildlife Pests in the Garden

UC Master Gardeners of Monterey & Santa Cruz
March 2019

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Agriculture and Natural Resources

UCCE Master Gardener Program
Monterey and Santa Cruz Counties

What You'll Learn Today

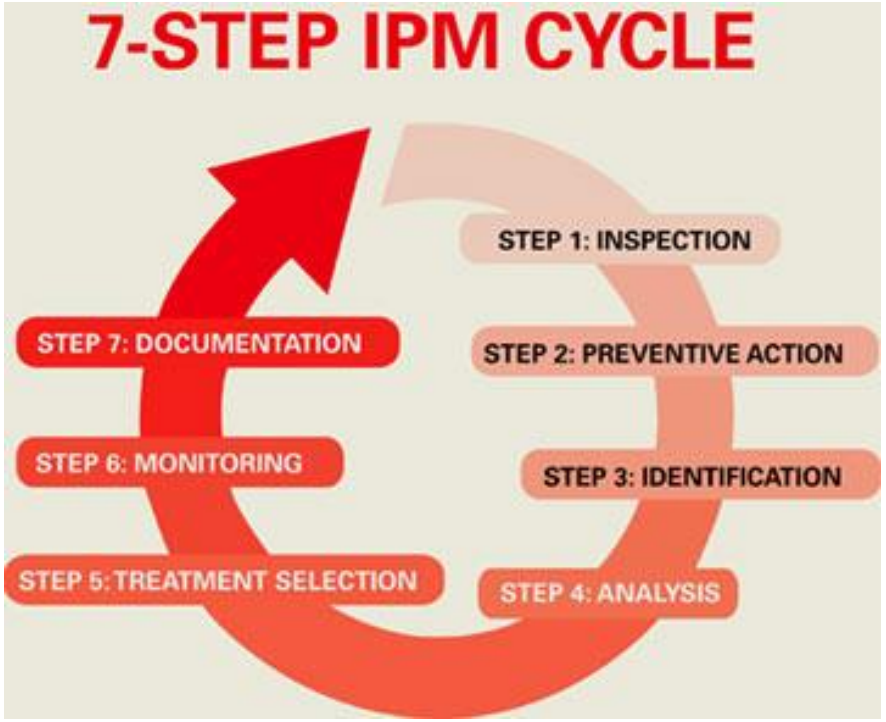
- **IPM principles**
- Systematic approach to any "pest" –
  insect, vertebrate, weed or disease
- How to diagnose a problem
- Common wildlife pests in our area
- Management strategies
- Where to get help
- Field studies in the garden?

What is IPM?

Integrated pest management (IPM) is an **eco-system based strategy** of pest control that focuses on **natural control factors** through **a combination of techniques** that are **minimally disruptive**, using chemicals only as a last resort.

IPM Process

1. Inspect regularly
2. Prevent problems before they're problems
3. Identify the pests
4. Analyze the situation
5. Determine and apply the least toxic strategy
6. Monitor success over time
7. Document



Inspect The Garden

Weekly at a minimum!

Hand watering is a good way to keep an eye on your plants' health.

Look for pest damage of all kinds. What do YOU see in your gardens?

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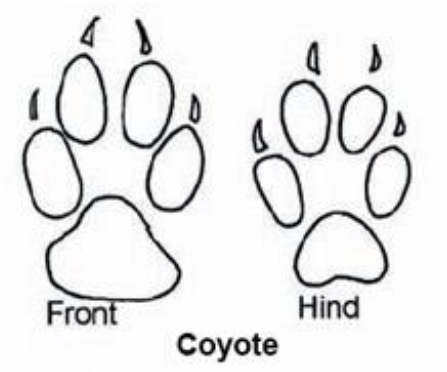
Identify the Pest

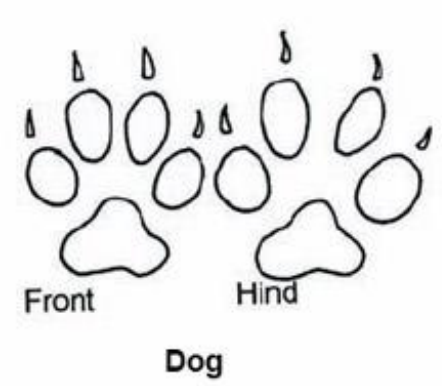
Look for clues

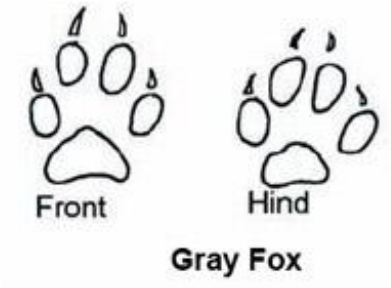
- Feeding damage
- Part of plant affected?
- Disturbed soil
- Holes in the ground
- Footprints
- Others?

Learn about the Pest

- Species
- Biology
- Geographic range
- Behavior
- Lifecycle
- Habitat
- Diet







University of California IPM Information

http://ipm.ucanr.edu/PMG/menu.house.html

- Search by different vertebrate pests
- Download **Pest Notes** and **Quick Tips**

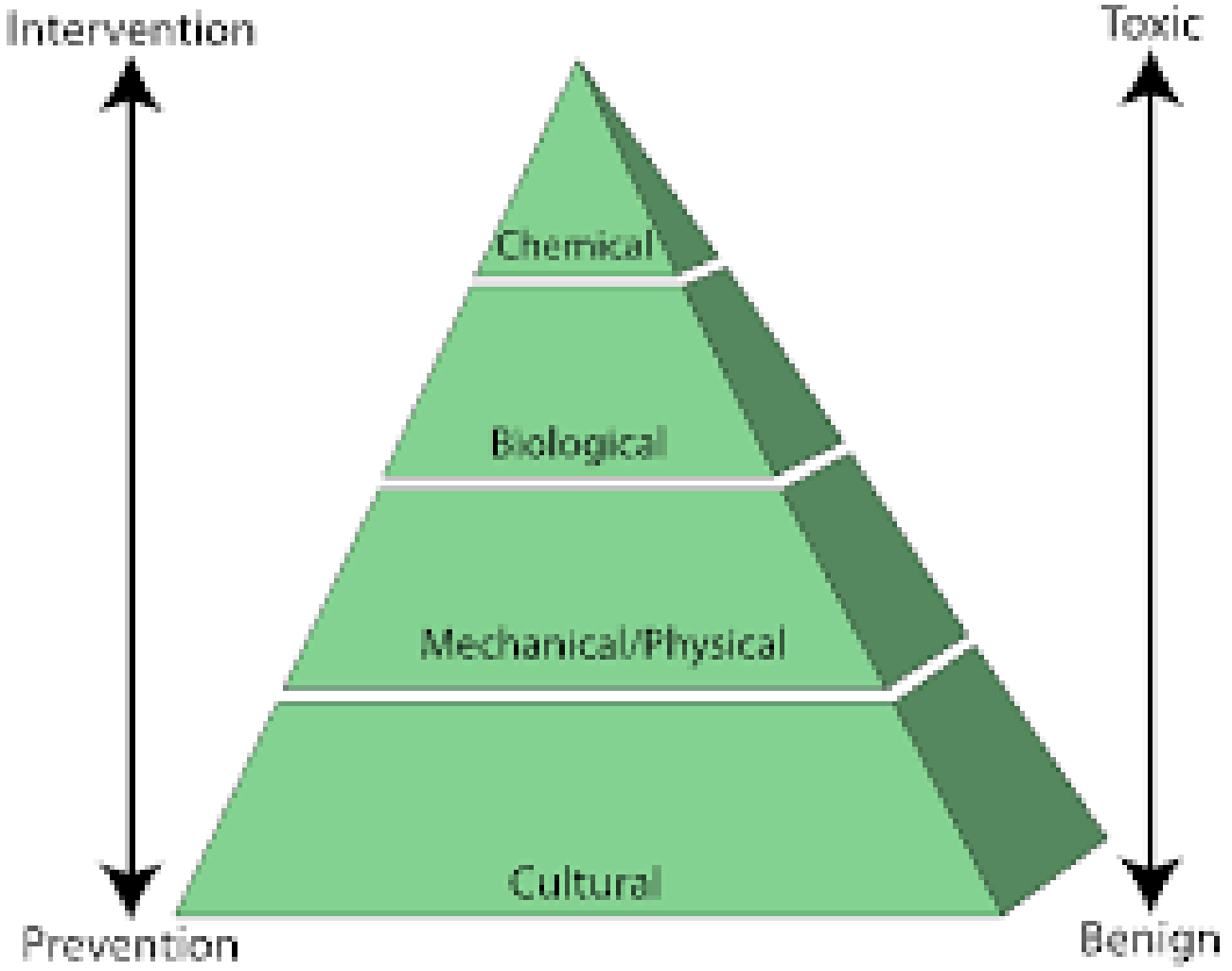
Many other sources on the web.
Focus on educational sites with .edu

Consider Your Tolerance Level

- How much damage is really being done?
- Are permanent plants being destroyed?
- Define your economic and aesthetic limits.
- Can you share? Plant more?

Methods of Control

In order of environmental impact



Cultural Controls

Changing the habitat - or your own practices - to reduce pests' impact.

- Growing plants they don't eat
- Providing alternative food sources in another location
- Creating a buffer of unsuitable habitat
- Sanitation practices
- Disrupting burrows

Physical Controls

- **Exclusion**
  - Fencing/Netting
  - Underground wire
  - Tree baffles, collars
  - Fruit bags
- **Trapping**
- **Frightening**

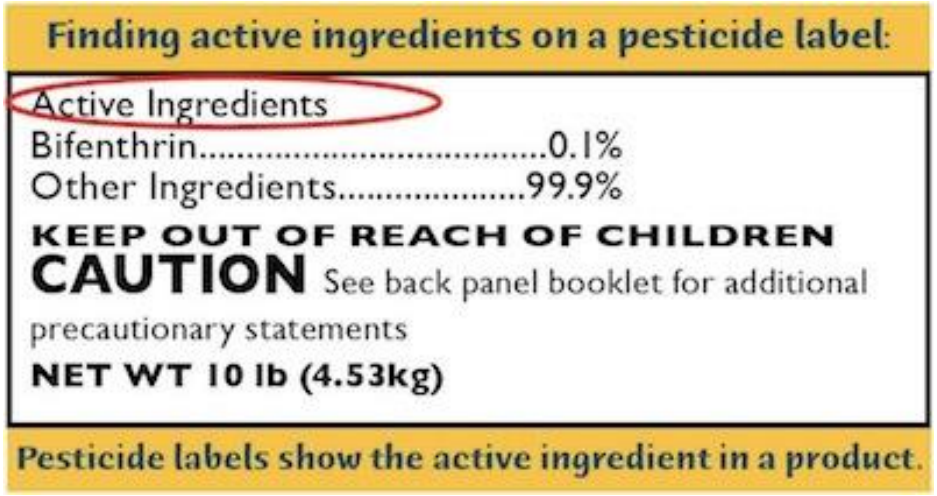
Biological Controls

Natural Enemies

- Birds of prey
- Snakes
- Cats
- Dogs
- Coyotes
- Mountain lions!

Chemical Controls

- Repellants
- Baits
- Fumigation



- Read the label!
- Learn its impacts
- Choose the least toxic
- Wear protective clothing
- Use as directed
- Dispose of properly

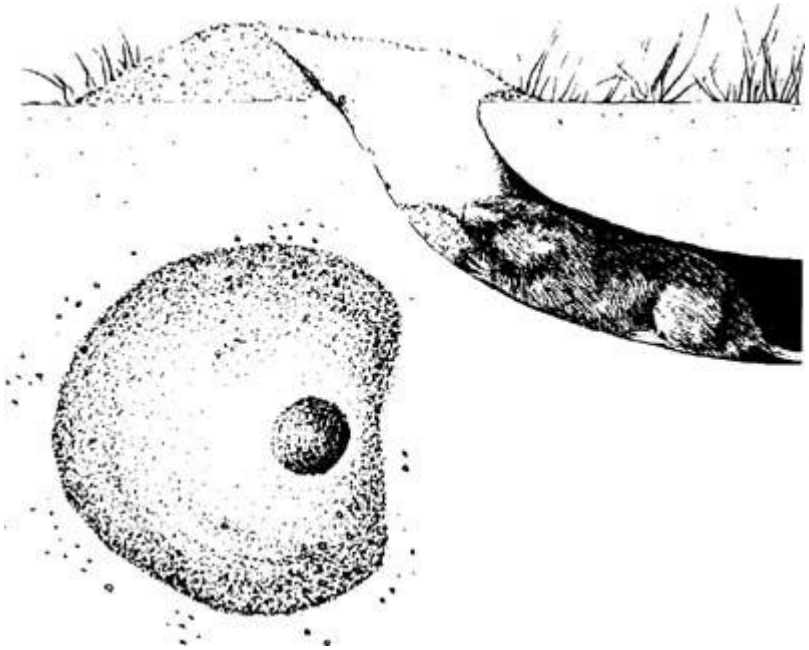
Burrowing Mammals

	Type	Damage	Management
	Gopher	Eats roots or takes whole plant	Trap, exclude, bait
	Mole	Eats grubs, disturbs soil surface	Trap, bait, ignore
	Vole (aka field mouse)	Eats flowers, leaves and fruit	Trap, exclude, bait
	Ground Squirrel	Eats plants above and below ground	Trap, exclude, bait

Gopher - Identify the Damage

Mounds

- Crescent or fan shaped mounds
- Hole is capped with soil



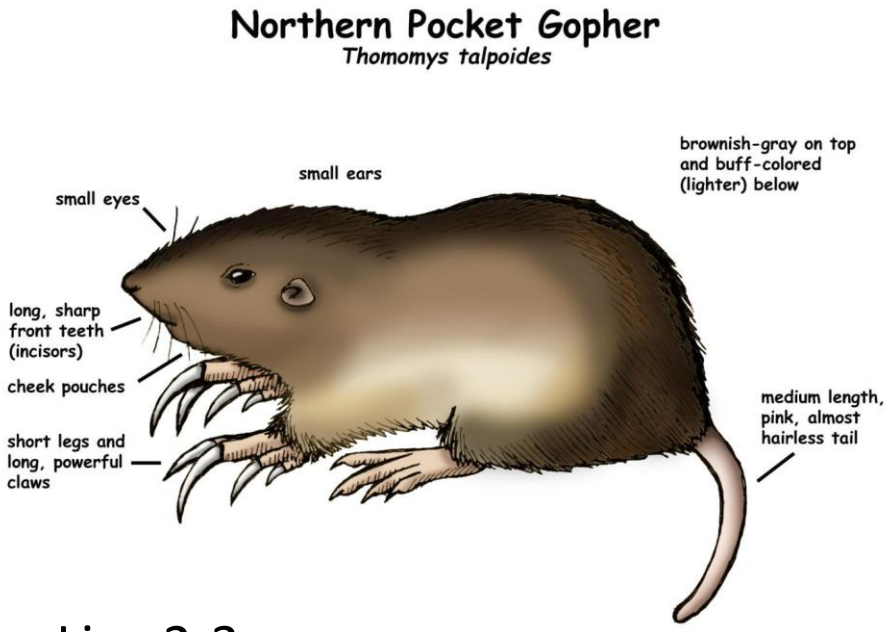
Plant Damage

- Plant missing
- Plant wilted, root gone

Gopher – Know Your Pest

Lifestyle

- Solitary, territorial
- Active spring and fall, morning and evening
- Re-use gopher runs



Pocket Gopher Fun Facts

- Eats 60% of body weight/day
- Range: up to 700 yards
- Navigate backwards in tunnels using their tails
- Breed in spring, 3-4 pups/year
- Live 2-3 years
- Naturally hemophiliac
- Gets moisture from food
- Nests up to 6’ deep

More info at
http://ipm.ucanr.edu/PMG/PESTNOTES/pn7433.html

Gopher Management

Low Impact Management

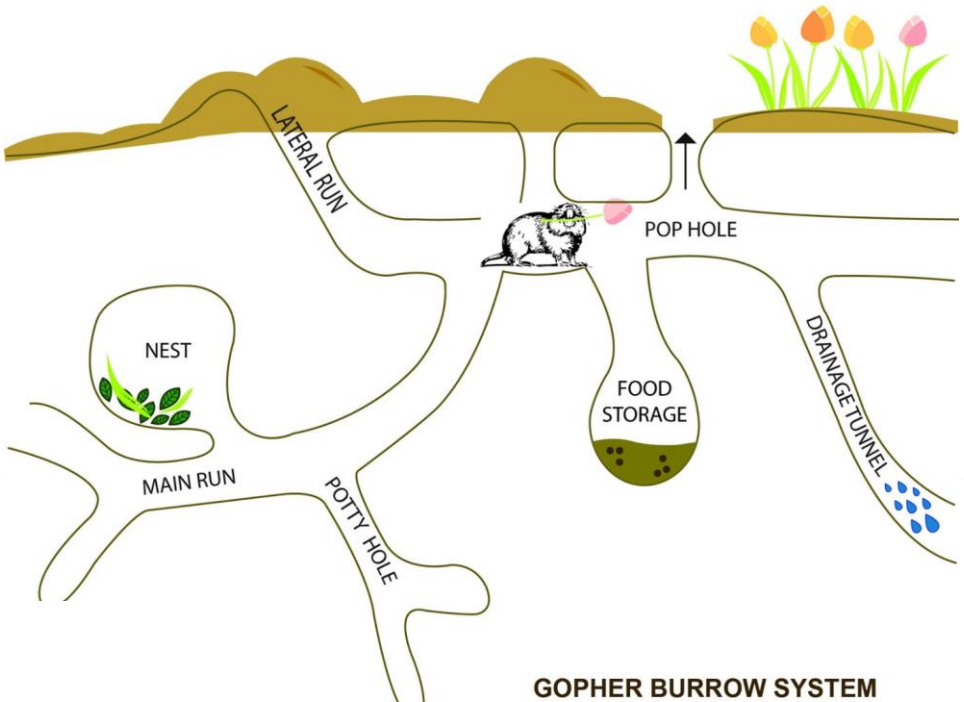
- Cultural – gopher resistant plants?
- Physical Exclusion – underwire beds, baskets, underground fence
- Traps – cinch, box, pincher
- Biological Control - owls, snakes, cats, dogs, and coyotes

Gopher Trapping Tips

Find the Run

- Probe between 2 mounds to feel run
- Use post hold digger to get to run
- Set & stake traps both directions
- Cover and check every 12 hours

How to find the tunnel



How to set a cinch trap

Traps

- Macbee
- Cinch
- Box
- **Gophinator**

How to set a gophinator

Gopher Management

High Impact Management

- Bait –anti-coagulant, multiple dose
  Warfarin, Diaphacione, Chlorophacione
- Bait –anti-coagulant, single dose
  Brodifacoum, Bromad[illegible]e, Dif[illegible]alone, Difenacoum
- Bait – non-ant[illegible]oag[illegible]lar[illegible] single dose
  Bromethalin, Cholecal[illegible]rol, Zi[illegible]osphide, Strychnine

Not recommended due to risk of secondary poisoning

Other Methods, Not Recommended

- Gassers, car exhaust
- Explosives
- Guns
- Chewing Gum, laxatives
- Vibrators, noise producers, repellents

Rodenticide Fact Sheet
http://saferodentcontrol.org/site/wp-content/uploads/2013/04/rodenticides.pdf

Mole - Identify the Damage

Mounds & Runs

- Volcano shaped mounds
- Raised track disturbs soil from their surface tunnels

Plant Damage

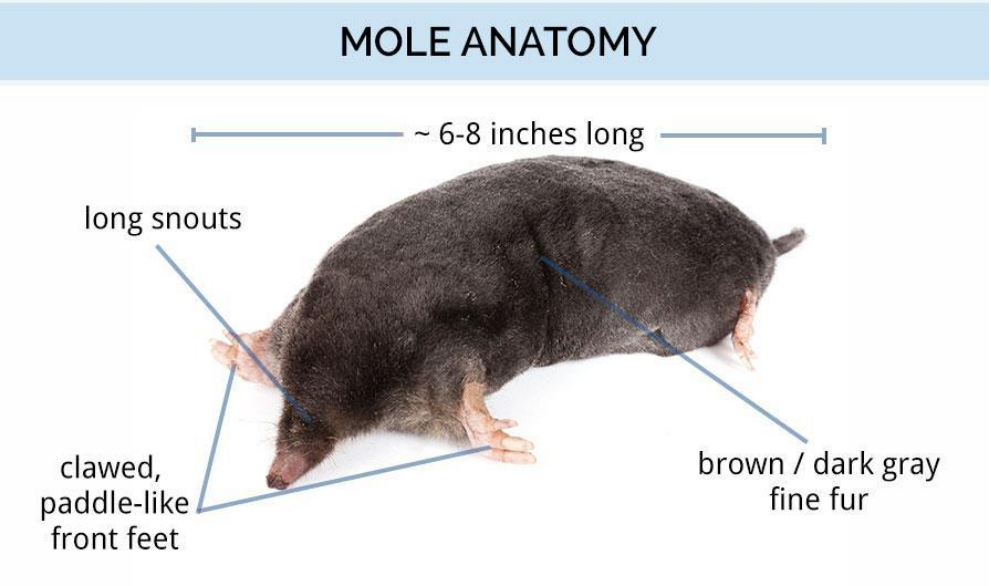
- Cosmetic:

  Soil disturbed

Mole - Know Your Pest

Lifestyle

- Solitary, territorial
- Active year round
- Feeding paths just under soil surface
- Not an herbivore
- Not a rodent

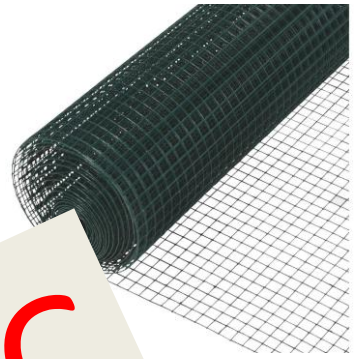


Mole Gopher Fun Facts

- Eat invertebrates; insects and grubs
- Territory up to ***2.5 acres*** (!)
- Active after rain or watering
- Lives for 6 years, produce 2-7 pups
- Blind and have 6 fingers
- Velvety fur allows them to move forward or back in tunnels

More info at
http://ipm.ucanr.edu/PMG/PESTNOTES/pn74115.html

Mole Management



Low Impact Management

- Physical Exclusion – underground fences
- Repellents– castor oil spray, vibrator
- Traps – cinch trap in the dee
  surface tunnel “harp
- Biological Cont s, dogs,
  and co
- C ively

DAMAGE COSMETIC

Vole- Identify the Damage

Holes & Runs

- Multiple connected burrows with open 2” holes
- Mouse-like creatures running around on the surface
- Worn tracks with droppings leading from holes

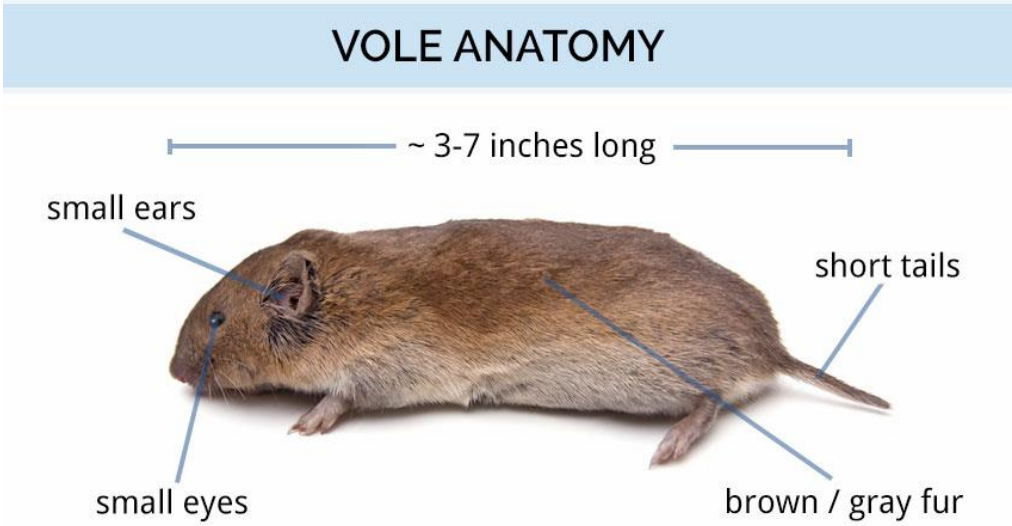
Plant Damage

- Eaten plants, roots, tubers – below and above ground
- Stripped bark at ground level
- Lawn damage

Vole – Know Your Pest

Lifestyle

- Gregarious, social
- Active day/night all year
- Appear above and below ground
- Eat grasses, plants and tree roots



Common Name: Field Mouse

Vole Fun Facts

- Rapid population changes – up to 1000's per acre
- Connected burrows with runways
- Burrow openings 1.5-2 inches
- Poor climbers
- Run along edges of buildings

More info at
http://ipm.ucanr.edu/PMG/PESTNOTES/pn7439.html

Vole Management

Low Impact Management

- Habitat modification– reduce vegetative cover (grass)
- Physical Exclusion – ¼” mesh fence, 12” above ground, 10” below, wrap tree trunks
- Traps – cinch trap in in the deep tunnel
- Traps – wooden mouse traps on surface – 10-50
- Biological Control – owls, snakes, cats, dogs, and coyotes

Higher Impact Management

- Bait – multiple feeding anticoagulant

Ground Squirrel - Identify the Damage

Holes & Runs

- Multiple connected burrows with large, open 3-4” holes in dry, open spaces
- Active, squirrel like critters with fluffy tails, retreat to burrows

Plant Damage

- Eats plants, roots, tubers – below and above ground
- Stripped bark at ground level
- May undermine tree roots
- May gnaw watering systems

Ground Squirrel - Know Your Pest

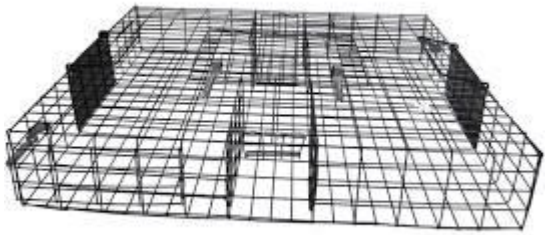
Keystone
Species
in
California
Grasslands

More info at
http://http://ipm.ucanr.edu/PMG/PESTNOTES/pn7438.html

Ground Squirrel - Management

Low Impact Management

- Habitat modification– cultivate to destroy burrows. Repellents don't work
- Physical Exclusion – difficult and expensive
- Traps – box traps, repeating live traps, or Conibear 110 near burrow opening
- Biological Control – owls & hawks, snakes, cats, dogs, and coyotes. Dogs may dissuade



Higher Impact Management

- Bait – multiple feeding anticoagulant, best used in summer & fall
- Fumigation

Quiz - Gopher or Ground Squirrel?

	Gophers	Ground Squirrels
Social	Solitary, territorial	Colonial, gregarious
Habitat	Soft, moist soil, tunnels may be re-inhabited	Dry open fields, networked burrows
Diet	Feed below ground, Plants, roots	Feed above ground, Leafy green plants, nuts, roots and fruit
Indicators	Distinctive crescent shaped mounds	Open, 4” hole at soil surface, multiple openings
Active	Evening and morning, spring and fall	Daytime, year around

Deer in your Garden?

Their natural habitat

In your garden

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Deer Behavior-Know your Pest

- Travel in familial groups for generations
- Range of 3-5 miles, bed down within 1 mile of water
- Eat 5 pounds of vegetation per day
  - 90% leaves and stems of woody and herbaceous plants, vines, fruits, berries, acorns, nuts and garden vegetables
  - 10% grass
- Drink 2-4 quarts of water per day
- Feed in early morning or late evening
- Heavy feeding in spring and summer-metabolism slows in late fall and winter

Identify Deer Damage

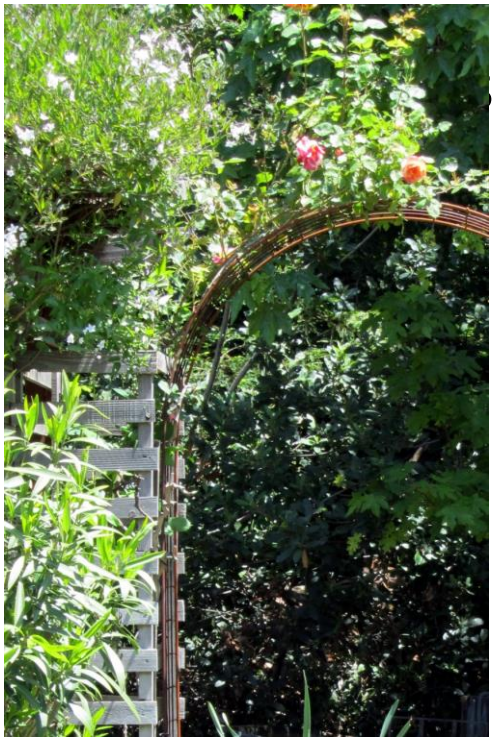
- Ragged torn vegetation from tearing action
- Trampled vegetation
- Plants pulled out of the ground
- Produce munched to the ground
- Rub marks on tree trunks

Physical Controls-Frighten Them Away

- Dog in the yard
- Mountain Lion-primary predator
- Starling devices-deer will habituate
  - Water cannons
  - Motion activated lights and sounds

Physical Controls-Placement Up High, Out of Reach

- Roses on arbor
- Pots on Decks
- Hanging baskets



Tree Tips

- Choose tree with tall trunk
- Prune lower branches
- Wrap trunk
- Cages

Physical Controls-Fences

- Effective but costly
- Need to be 7-8 feet high
- Tight to the ground
- Double fencing on slanted fencing on hillsides

Wide Range of Fence Options

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Small Area Fencing and Barriers

- Wire cages
- Row covers in vegetable gardens

Large Area Fencing

Fence extensions deliver height at reduced cost

Fence fortress

Fencing on slopes

Double fence

4ft. high, 4ft. of separation

Slanted fence

Height and width defeat deer

Cultural Controls-Plant Selection

Plant what they don't like to eat

- **Pungent Plants**
- **Fuzzy Plants**
- **Poisonous Plants**
- **Fibrous, Spiky, Distasteful Plants**

Herbs
Lavenders
Scented geranium
Wooly Lamb's Ear
Brunnera
Digitalis
Oleander
Euphorbia
Cactus-succulents
Gravellia
Phormium

Deer Resistant Plants are Beautiful






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Deer Candy

Avoid Them or Protect Them

- Roses
- Hostas
- Tulips
- Petunias
- Hydrangeas
- Orchard fruits
- Garden vegetables
- Azalea
- Clematis
- And many more...

Refer to a Deer Resistant Plant List

- Inconsistencies from list to list--what works for some will not work for others
- No such thing as “deer proof”--only “deer resistant”
- What gets eaten often depends upon
  - The environment
  - Season
  - Presence of fawns which sample “everything”
  - Presence of predators which deter feeding

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More info at
http://ipm.ucanr.edu/PMG/PESTNOTES/pn74117.html

Chemical Controls-Odor Repellants

- Require frequent application after rain or irrigation
  - Sprays-Not Tonight Deer, Liquid Fence
  - Urine of dog, puma
  - Home remedies-found in the literature but not scientifically proven

Good Luck

Living in harmony with the deer

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Oh Rats!

They eat, gnaw and contaminate

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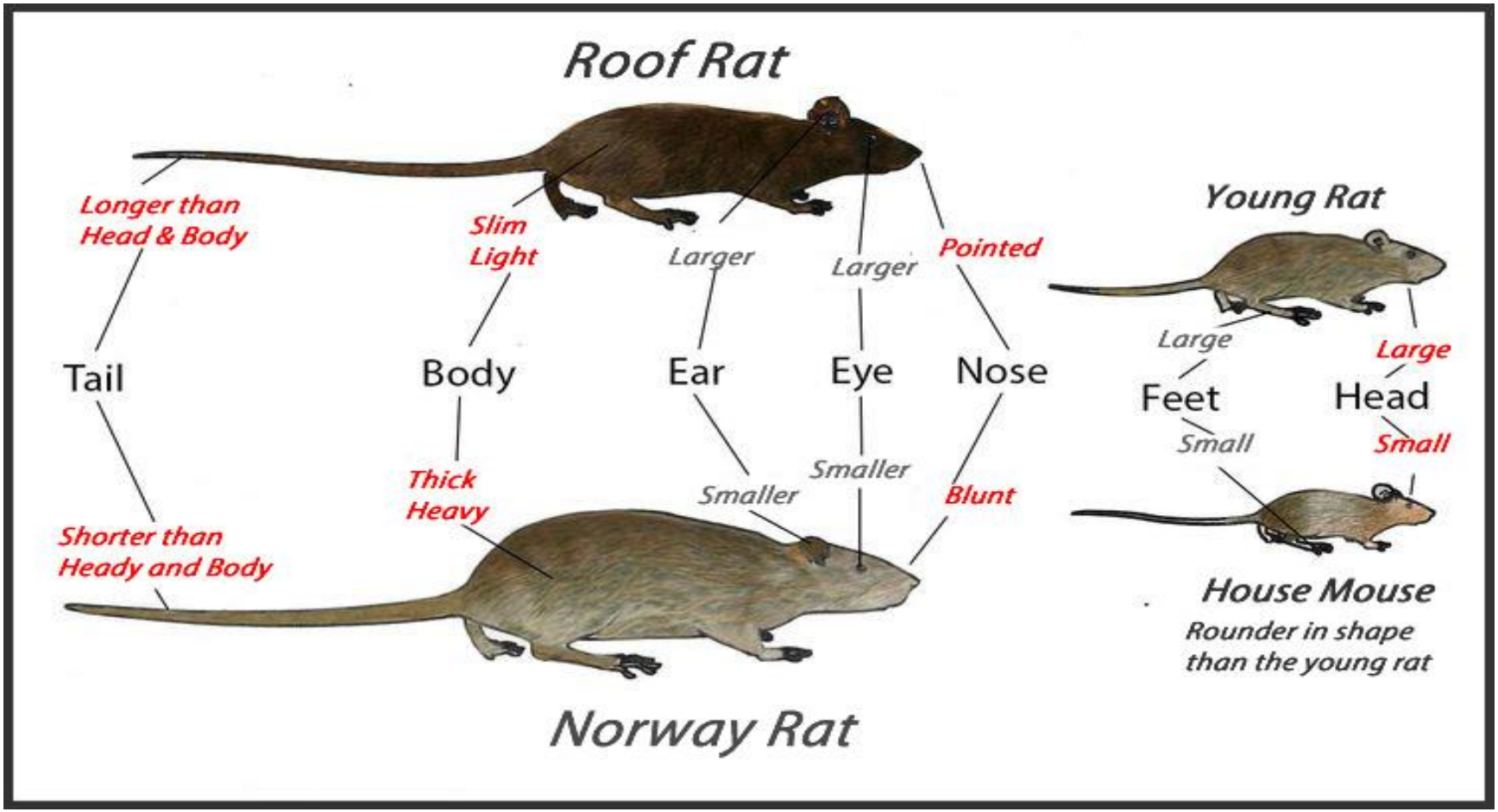
Know Your Rat



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What do roof rats eat?









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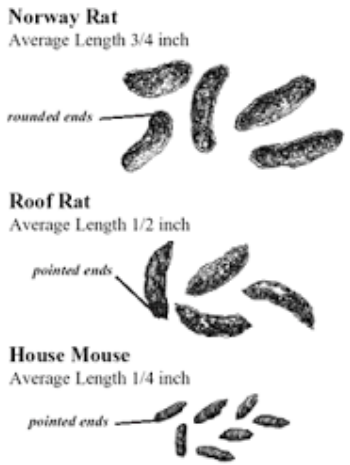
Signs of Rat Infestation

- Droppings
  - -Norway rat larger and rounded
  - -Roof rat smaller and pointed
- Remnants of nests in wood piles, drawers, cars
- Burrows among damaged plants, under compost piles, along foundations
- Chew marks on fruits, vegetables, nuts, compost bins, structures, wires



Nesting Behaviors

- Homes and garages
- Sheds
- Woodpiles
- Under compost piles
- Norway rats **burrow** near or under structures-lower levels of the home
- Roof rats **nest** in trees and among plants- upper levels of the home

Feeding Behaviors

- Venture out at night to feed
- Norway rats feed within 100 ft. feet of their burrow
- Roof rats feed within 300 ft. from their nest
- Forage together in teams
- Hoard food in their nest, wall spaces, under cabinets
- Walk along established paths, ledges, fence tops, wires and beams to feed

Rat Control

Cultural and Environmental Methods

- Tight lids on garbage cans
- Remove outdoor pet food and bird seed
- Remove vines/ivy from buildings
- Thin or eliminate dense vegetation around the house- 2 Ft. clearance
- Trim tree branches 3 Ft. from roof
- Seal cracks and openings in buildings-rats squeeze through a 5/8” opening

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Welcome Natural Predators

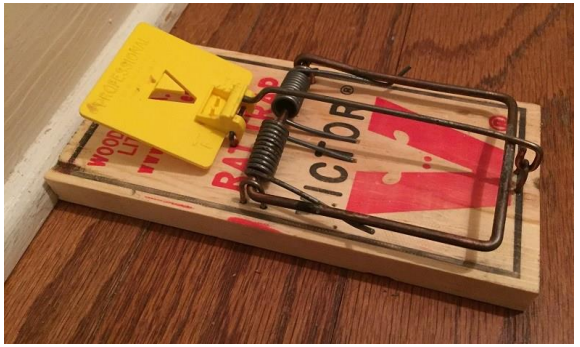
Lots of them!

- Owls
- Hawks
- Eagles
- Cats
- Mountain lions
- Coyotes
- Foxes
- Snakes

Physical Controls- Trapping

Spring Traps

- Economical-can be used again and again
- Humane-usually kill immediately
- Safe bait using nuts, dried fruit, kibble pet food, bacon
- Place perpendicular to wall with bait plate against the wall in their runway



Electric Shock Traps

- Expensive-can be used multiple times
- Quick humane kill
- Easy to set
- Can dispose of rat without touching it
- Place parallel with so rat enters box

Rat Traps With Consequences

- Live Traps
  - Catch and release- replaces the problem elsewhere
  - Live catches need to be dispatched
- Glue Traps
  - Death prolonged from dehydration/starvation or mutilation
  - May trap non-targeted species

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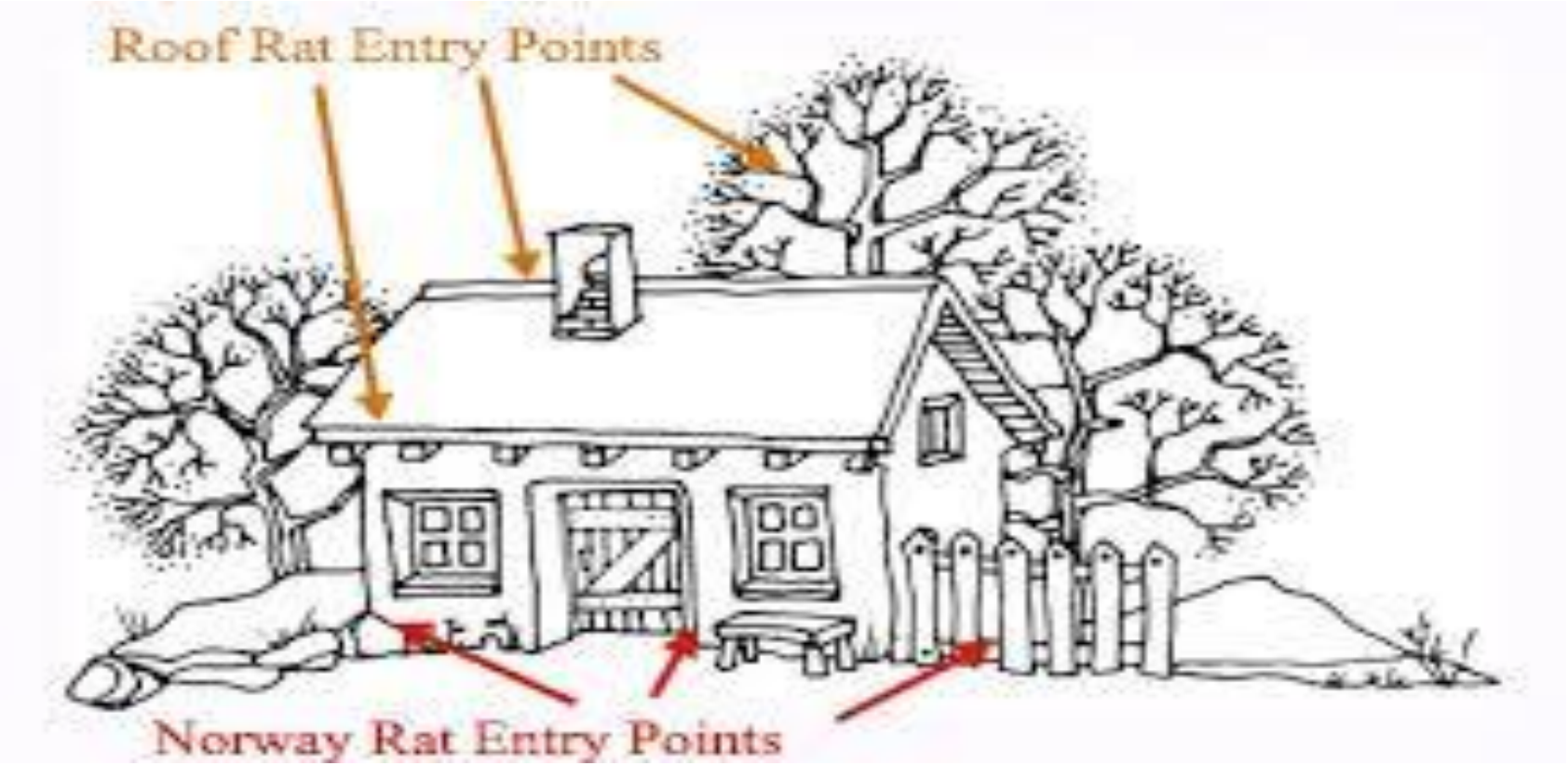
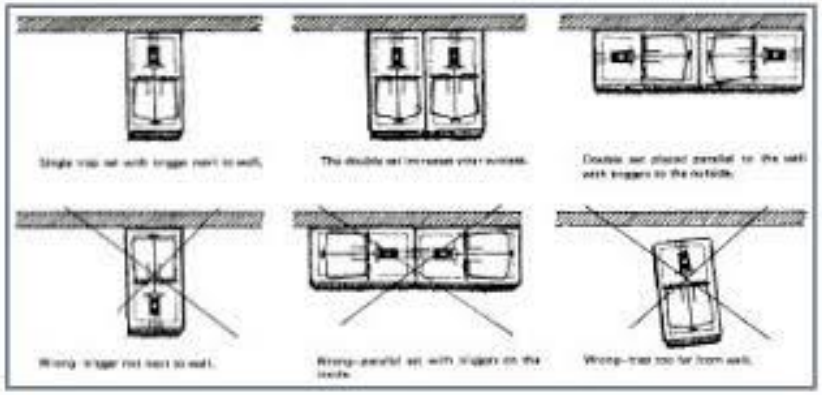
Different Trap Locations for Different Rats



Trap Location For Norway Rats

On the ground

- Close to walls
- Behind objects along a wall
- Dark corners
- Where you find droppings
- Out of reach of children and pets



Trap Location for Roof Rats

Up Off the ground

- On roofs
- On ledges
- Overhead beams
- Fence tops-tie on
- On pipes-tie on
- Out of reach of children and pets

Trap Baits-Non-toxic

nuts

berries

dried fruit

peanut butter

bacon

gumdrops

What About Toxic Baits?

- Slow death over time
- Rats leave bait box and die elsewhere
- Rats my die in inaccessible area and smell as they rot
- Poison baits are toxic to non targeted species-pets and wildlife

Tree Squirrels – Identify Damage

- Bite marks on fruit
- Fruit, nuts disappearing
- Seedlings eaten, gone
- Gnawed bark
- Digging to bury nuts
- Chewing into buildings
- Diseases

Squirrels – Know Your Pest

4 kinds in California

- Eastern Fox Squirrel (or red squirrel)
- Eastern Gray Squirrel
- Western Gray Squirrel
- Douglas Squirrel

Tree Squirrels – Know Your Pest

- Live in trees; forage on ground
- Active year round
- Nest in tree holes or build tree nests
- Breed in late winter/spring; 1-2 litters of 3-5 young

More info at
http://ipm.ucanr.edu/PMG/PESTNOTES/pn74122.html

Tree Squirrels – Controls

Physical -

- Exclusion is best –
  - will chew through plastic net if motivated
  - wire screen
  - tree bands
- Trapping - only Eastern fox sq. can be killed w/o permit; if live trapped, can't be released.

Biological – dogs (ha!), coyotes, raccoons (little impact)

Chemical – some repellents, but not very effective

Live with them!

Birds – Identify the Damage

- Seeds not sprouting
- Seedlings disappearing
- Ragged holes in fruit
- Fruit missing
- Bird or squirrel?

- MONITOR!

Birds – Know Your Pest

- Need to identify species?
- Each has different tastes
- They also eat insects and snails/slugs; weight pros and cons
- Most are protected from harm

More info at
http://ipm.ucanr.edu/PMG/PESTNOTES/pn74152.html

Birds - Cultural Controls

- Not so many for birds.
- Grow other food sources like native berry plants. (Timing)
- Grow enough to share.
- Plan ahead. Think about exclusion before you plant.

Birds – Physical Controls

Keep them out:

- Frame and netting over seed beds and crops
- Inverted wire baskets on individual plants
- Grid of string
- Paper bags over fruit/veges

Birds – Physical Controls

Scare them away:

- Scarecrows
- Shiny things
- Moving things
- Balloons with eyes
- Noisemakers
- Best used only when most needed
- Move OFTEN!

Birds – Chemical Controls

Methyl anthranilate spray:

- From concord grapes
- Tastes bad
- Studies differ on efficacy
- Foliar burns on blueberries
- More study needed

What doesn't work:

- Mothballs
- Pepper spray
- Decoys

Stumped? Ask a Master Gardener

Ask the UC Master Gardener Hotline

http://mbmg.ucanr.edu/hotline/

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APPENDIX

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Reference Links

- UC IPM Website – Vertebrate Pests
  http://ipm.ucanr.edu/PMG/menu.vertebrate.html

- Deer: http://ipm.ucanr.edu/PMG/PESTNOTES/pn74117.html
- Gophers: http://ipm.ucanr.edu/PMG/PESTNOTES/pn7433.html
- Moles: http://ipm.ucanr.edu/PMG/PESTNOTES/pn74115.html
- Ground Squirrels: http://ipm.ucanr.edu/PMG/PESTNOTES/pn7438.html
- Tree Squirrels: http://ipm.ucanr.edu/PMG/PESTNOTES/pn74122.html
- Birds: http://ipm.ucanr.edu/PMG/PESTNOTES/pn74152.html
- Rats: http://ipm.ucanr.edu/PMG/PESTNOTES/pn74106.html

Handouts for this Class

Deer Resistant Plant List:

https://docs.google.com/document/d/1oDzqtEkdhdLUA9nVErTuzxba_aY5ZDmMUa4dP9-BSVg/edit?usp=sharing

Help Us Better Serve You!

Our follow-up survey provides us the tools we need to grow and improve the quality of our program.

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