

# Integrated Pest Management for Community Gardens

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Coordinator

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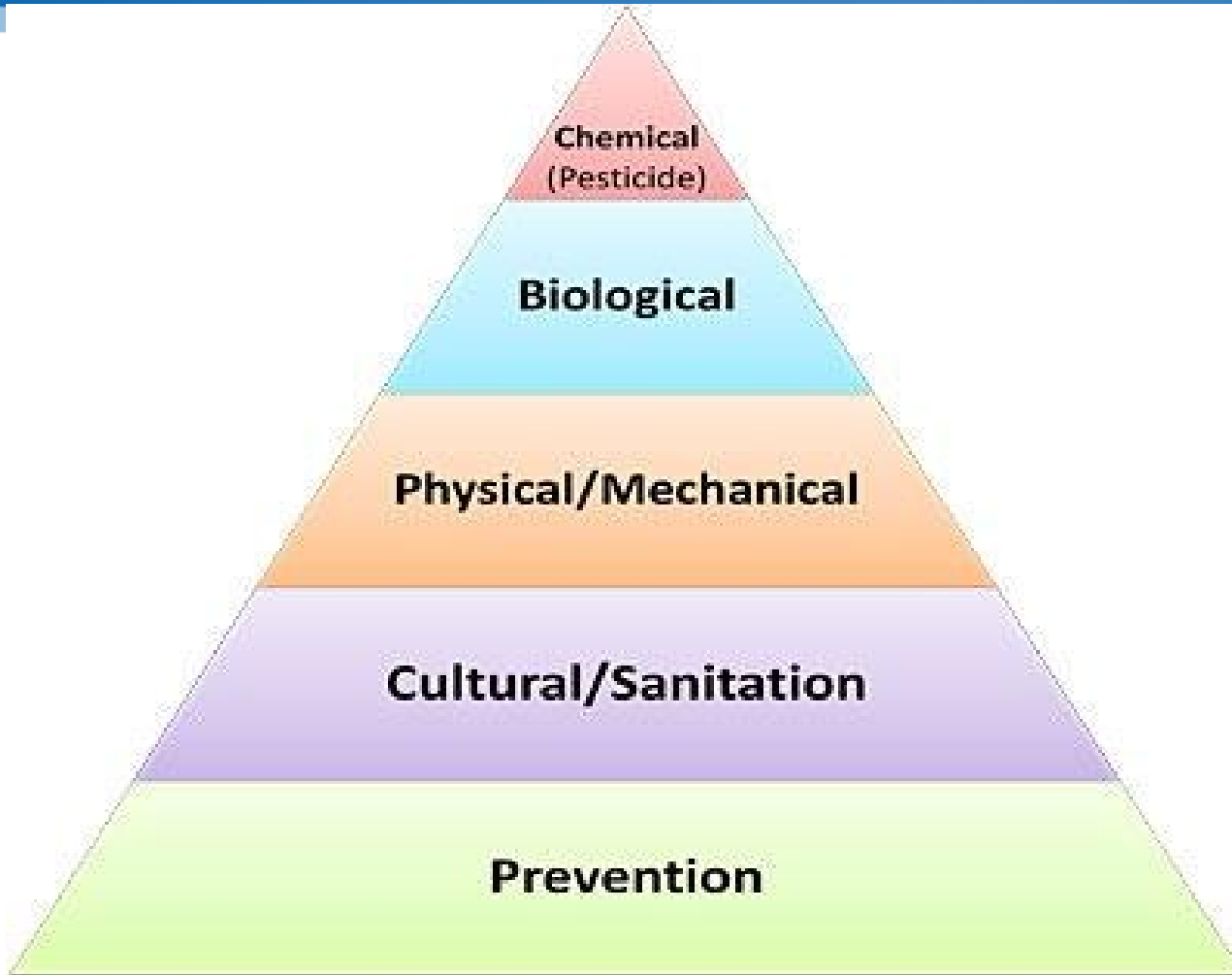


# What is Integrated Pest Management (IPM)?

- **Definition:** IPM is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties.



# What is Integrated Pest Management (IPM)?



[https://www.pesticide.org/five\\_steps\\_of\\_ipm](https://www.pesticide.org/five_steps_of_ipm)



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# Why IPM is Important in Community Gardens

- **Protects People's Health**  
Reduces exposure to harmful chemical pesticides for gardeners, families, and children.
- **Environmentally Friendly**  
Protects pollinators like bees and butterflies and prevents soil and water contamination.
- **Promotes Biodiversity**  
Encourages beneficial insects (ladybugs, predatory beetles) that naturally control pests.
- **Cost-Effective**  
Prevents pest problems before they become severe, saving money over time.
- **Community Safety**  
Community gardens are shared spaces — IPM minimizes risks to everyone involved.



Photo: Meredith French, MGASDC





# Core Principles of IPM

1. Pest identification
2. Monitoring and assessing pest numbers and damage
3. Guidelines for when management action is needed
4. Preventing pest problems
5. Using a combination of biological, cultural, physical/mechanical and chemical management tools
6. After action is taken, assessing the effect of pest management



# Step 1: Pest Identification

- Correct ID matters: different pests = different control methods, and different tolerance levels
- Using field guides, photos, or extension service resources
- Common garden pests (aphids, mealybug, caterpillars, whitefly)



Photos: Jack Kelly Clark, UC IPM Program





# Help with ID?

- Use your phone!
  - Google image search is a good place to start.
  - Check and double check your results at:
    - UC IPM
    - [bugguide.net](http://bugguide.net) (Online knowledge photo gallery and forum, Iowa State University)
    - [inaturalist.org](http://inaturalist.org) (self-identification online database)

Google





# Steps in Diagnosing Plant Problems

- What is the plant?
- How has it been cared for, soil type, chemical applications?
- What symptoms and signs can you see?
- Microscopic Exam?
- Do you need more tests?





# Symptoms of Viral Infection

- None/Symptomless
- Mosaic or Mottle
  - Leaf Spots
- Stunting/Yield Loss
  - Deformation
  - Death



UC Statewide IPM Project  
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# Causes of Diseases - Abiotic Agents

- Abiotic factors - noninfectious source such as environmental stress, nutrient deficiency, mechanical damage, air pollution.



Photo: Penn State Extension (Oidema), UC IPM (Zinc deficiency and round up damage)



# Causes of Disease - Biotic Agents

- living organisms that can multiply and spread, such as viroids, viruses, bacteria, fungi, and nematodes



Tomato leaf curl

Scorch

HLB

Downy Mildew (fungi)

phytophthora; root rot



# Is it an Insect or is it a Pathogen?



# Step 2: Monitoring

- Check plants at least once a week
- Look for signs of damage: chewed leaves, sticky residue, discoloration
- Have students help with a pest log/garden journal





# Step 3: Establish Thresholds

- Establish thresholds by regularly monitoring plants in a consistent and systematic manner.
- Keep good records and judge the acceptability of the fruit or vegetable in comparison with records of pest monitoring and management action.
- Experiment over time to develop thresholds appropriate for your situation. Be flexible in adjusting thresholds and adapt monitoring and management methods as appropriate.





# Step 3: Establish Thresholds

Thresholds should be quantitative or numerical to be useful. For example, thresholds could be based on the

- average number of pests per trap each week
- percent of leaves or plants found to be damaged or infested during visual inspection
- number of pests dislodged per beat or shake sample





# Step 3: Establish Thresholds



Photo 1: [NapaCounty.gov](http://NapaCounty.gov); photo 2: UC IPM



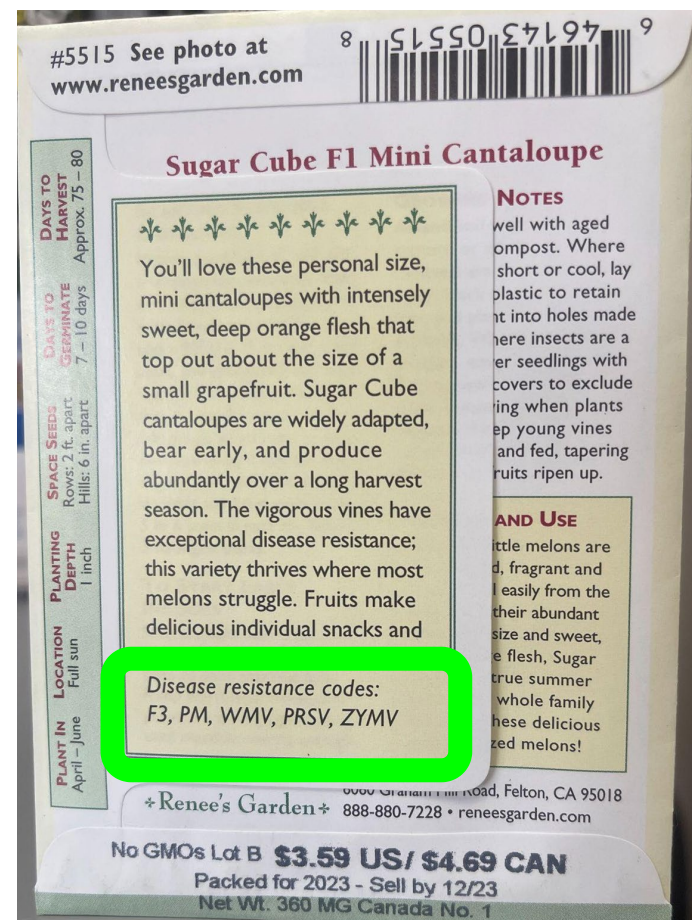
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# Step 4: Prevention

- Choose pest-resistant plant varieties
  - look for resistance codes on plant tags and seed packets.
- Some common codes are:
  - A | Anthracnose | Fungus
  - BMV | Bean Mosaic Virus (Bean)
  - CMV | Cucumber Mosaic Virus (Cucurbitaceae)
  - DM | Downy Mildew | Water Mold
  - F | Fusarium Wilt | Fungus
  - LMV | Lettuce Mosaic Virus (Lettuce)
  - N | Roundworm | Nematode | *Meloidogyne arenaria*, *M. incognita*, *M. javanica* (Tomato)
  - PM | Powdery Mildew | Fungus
  - R | Common Rust | Fungus
  - TMV | Tobacco Mosaic Virus (Solanaceae)
  - V | Verticillium Wilt | Fungal | *Verticillium albo-atrum* and other *V. spp.* (Potato, Tomato)





# Step 4: Prevention Continued

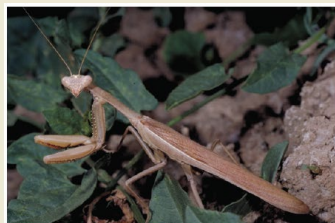


**Lady beetles, or lady bugs, and their larvae** are commonly seen predators of aphids and other small insects. Shown here is the adult (left), larva (center), and cluster of eggs (right) of the convergent lady beetle.

Photo: UC IPM



**Pirate bugs** attack mites and any tiny insect, especially thrips.



**Praying mantids** eat anything they can catch, including pests and other natural enemies.



**Spiders**, including this crab spider, attack all types of insects.



**Western predatory mites** attack pest mites.

## Encourage beneficial insects, and know how to ID all life stages



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# Step 4: Prevention Continued

- Maintain healthy soil and proper watering
- Keep gardens weed-free and debris-free



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# Step 5: Control Methods



**Cultural controls** – Crop rotation, plant spacing



**Mechanical controls** – Handpicking, barriers, traps



**Biological controls** – Ladybugs, lacewings



**Chemical controls** – Only if necessary, lowest toxicity, follow rules



# Step 5: Cultural Control



**Cultural controls** – Crop rotation, plant spacing, don't overwater, don't over fertilize, proper pruning.

Sanitation, sanitation, sanitation.

Put the right plant, in the right place!





# Step 5: Mechanical Control

**Mechanical controls** – Handpicking, barriers, blunder traps, high pressure hose (water wand), insect vacuums.



# Step 5: Biological Control



**Green lacewing adults** (left) feed on nectar and pollen, with only certain species also eating insects. Their **larvae** (center) feed on mites and soft-bodied insects, especially aphids. **Eggs** (right) are laid on slender stalks in groups or individually.



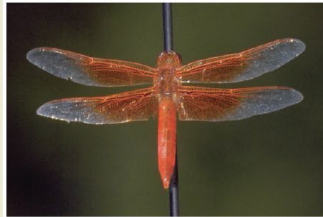
**Predaceous ground beetle adults** (left) hunt soil-dwelling insects such as cutworms and root maggots. Some also feed on snails and slugs. Their **larvae** (right) live on soil and in litter, feeding on almost any invertebrate.



**Assassin bugs** attack mostly small to medium-sized insects.



**Damsel bugs** feed on a wide variety of small insects.



**Dragonflies** eat other flying insects such as moths, midges, and mosquitoes, capturing them in mid-air.



**Syrphid fly (flower fly, hover fly) adults** (left) eat pollen and nectar. Their **larvae** (right) mostly eat aphids but also other soft-bodied insects like psyllids.



**Predatory wasps**, such as this paper wasp, prey on caterpillars and other insects.



**Sixspotted thrips** mostly feed on mites.



**Soldier beetle adults** mostly eat aphids. Their larvae are soil-dwelling and often feed on small insects.

Photo: UC IPM



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# Step 5: Biological Control Cont.

## Parasites and Parasitoids

A parasite is an organism that lives and feeds in or on a host. Unlike true parasites (fleas and ticks for example), parasitoids kill their hosts. Nearly all insect pests have at least one parasitoid that attacks them. Most parasitoids are wasps or flies and are often very small.



### Stink bug egg parasitoid

Some parasitoids attack insect eggs, such as this *Trissolcus* wasp.



### Parasitized scales on twig

The blackish scale insects on the twig at left are discolored because they have been parasitized, and wasp larvae are developing within.



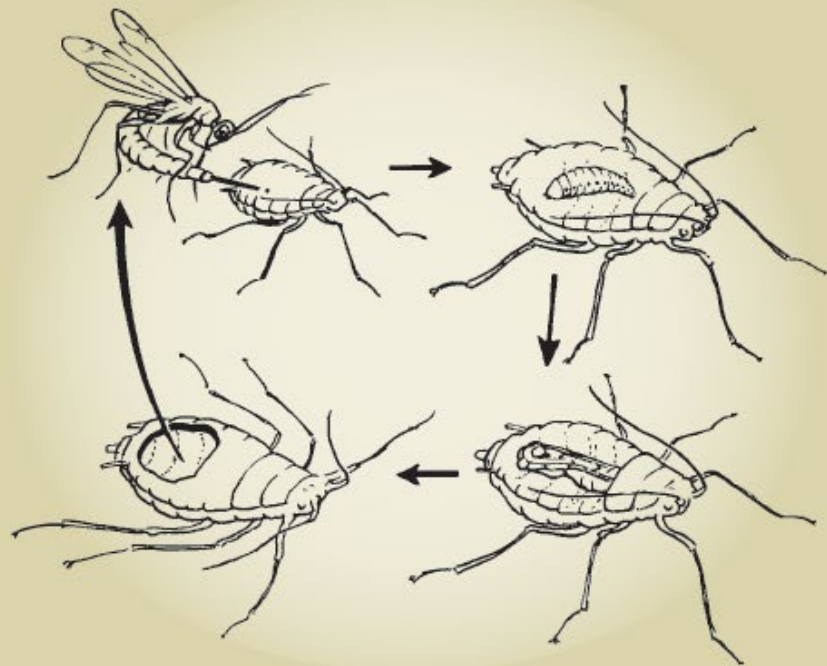
### Caterpillar parasitoid

Caterpillar parasitoids include the *Hyposoter exiguae* wasp.

Photo: UC IPM



# Aphid parasitoid life cycle



The adult female wasp lays an egg inside an aphid; the egg hatches into a larva that feeds on the aphid from the inside. After killing the aphid, the wasp larva pupates then emerges as an adult wasp.



## **Mummy and healthy aphid**

Parasitized aphids die and turn into crusty "mummies" that can be black or beige. The hole in the mummy at left indicates a parasitoid has emerged. The aphid in the middle is healthy.

# More on Chemical Control

- What is a Pesticide?

The word “Pesticide” comes from:

“Pestis” which means “plague” or “pest”  
“-cide” which meaning “to kill” or “to cut down”

Pesticide = A thing that kills pests





# So... what is a “Pest”?

Pests also include organisms that impact human or animal health.

Pests may transmit disease or may be just a nuisance.

Pests are living organisms that damage or interfere with desirable plants or damage homes or other structures.



Photo: Leah Taylor



# A Pest can be a...

Plant (weed)

Vertebrate (bird, rodent, or other mammal)

Invertebrate (insect, tick, mite, or snail)

Nematode (microscopic wireworm)

Pathogen (bacteria, virus, or fungus) that causes disease

Other unwanted organism that may harm water quality, animal life, or other parts of the ecosystem



All photos: UC IPM



# Pesticide Definition:

This includes a wide range of materials, such as insecticides, herbicides, fungicides, rodenticides, and other pesticides, even dish soap.

If a substance is intended to, or used to, manage pests, it's considered a pesticide.

A pesticide is any substance or mixture used to control, prevent, kill, suppress, or repel pests.



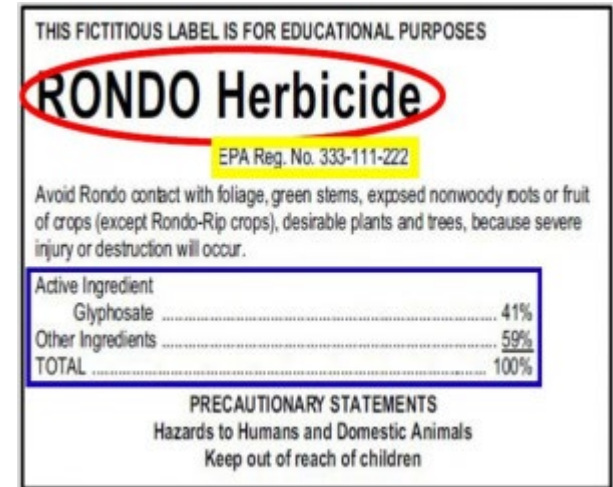
# Reading a Pesticide Label:

Reading the pesticide label is critical before using a pesticide in the garden.

Pesticide labels contain important information that should be read, understood, and followed before applying a pesticide.

Pesticide labels include the

- trade name,
- active ingredients,
- signal word,
- instructions for use, disposal, and safety.



<https://pesticidewardship.org/homeowner/how-to-read-the-label/>



# Reading a Pesticide Label: Active Ingredient

- The active ingredient is the material that kills or otherwise affects the target pest.
- Active ingredients are required to be listed on a pesticide label.
- Inert (or “other”) ingredients are added to the formulation to help the active ingredient work better but may not appear on the label.



# Reading a Pesticide Label: Trade Name

- The trade name is the brand name the manufacturer gives to the product, such as Sluggo or Sevin Insect Killer.
- Trade names of individual products often change and don't reliably indicate the ingredients. Always check the label

before purchase to be certain it is the pesticide you want

Common name (Example trade name)	Mode of Action <sup>1</sup>	Selectivity <sup>2</sup> (affected groups)	Predatory Mites <sup>3</sup>	General Predators <sup>4</sup>
abamectin (Agri-Mek)	6	moderate (mites, leafminers)	H	L



# Reading a Pesticide Label: Signal Words

- Signal words indicate the short-term (acute) toxicity of the product to humans and other mammals. They are based on the overall oral, dermal, or inhalation toxicity and skin or eye irritation of the pesticide's active and inert ingredients.
- Signal words are CAUTION, WARNING, or DANGER (in order of increasing toxicity).
- Pesticide labels must list the appropriate signal word, although products with very low acute toxicity may not have a signal word.



# Reading a Pesticide Label:

To read the whole label, you may need to peel open the attached packet.

- Directions for use: how and where the product can be used, target pests, and how much should be used.
- Precautionary statements: physical and chemical hazards, personal protective equipment requirements, and toxicity to honeybees, fish, birds, and other wildlife.
- Storage and disposal: storage requirements and how to safely dispose of empty pesticide containers. Pesticides should always be kept in their original containers.
- First aid instructions: specific directions on what to do in case of pesticide exposure.



# What Happens if you Don't Follow the Label?

- Plants may be injured (pesticide burn or drift).
- Product may not effectively manage the pest.
- Nontarget organisms may be harmed
  - (humans, wildlife, pollinators).
- Soil, air, or water may become polluted.



Photo: UC IPM





# Special Safety Considerations Community Gardens

Notification requirements for others

Storage and disposal regulations followed by all

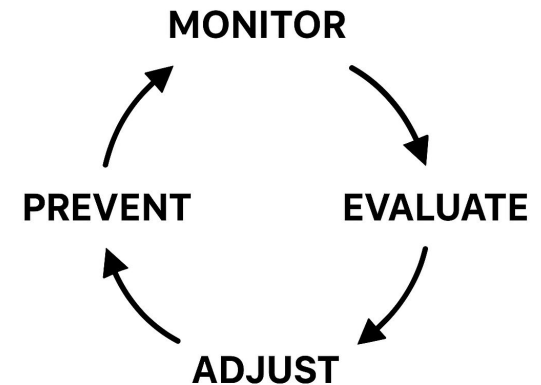
Know when to call a professional, and who's responsibility it is.





# Step 6: CHECK AND CHECK AGAIN

- Monitor pest levels after treatment
- Compare results to your thresholds
- Record observations and outcomes
- Adjust methods if problems persist
- Reassess prevention practices



# Pest Highlight: Gophers

- Pocket gophers are burrowing rodents that feed on plant roots
- Common in California gardens and urban agriculture sites
- Early management prevents major crop and infrastructure loss
- Follow UC's Integrated Pest Management (IPM) approach





Roger A. Baldwin, Assistant Cooperative Extension Specialist, UC Davis  
Used by permission

# Gophers: Identify and Monitor

## **Signs of Gopher Activity:**

Crescent- or fan-shaped soil mounds

Soil plug on one side of mound

Wilting plants from root damage

## **Monitoring Tips:**

Check gardens weekly

Focus on edges and borders

Act quickly when fresh mounds appear



# Gophers: Prevention and Exclusion

## Best Long-Term Strategy in Community Gardens

Line raised beds with hardware cloth (18–24 inches deep)

Install underground wire barriers before planting

Use wire baskets for high-value plants

Keep garden borders weed-free

Exclusion works best when installed **before infestation.**



# Gophers: Effective Control

## 1. Trapping (Preferred Method)

Place traps in main (or ALL) tunnels

Use two traps facing opposite directions

Check daily

## 2. Baiting (Use Carefully)

Place bait in main tunnel only

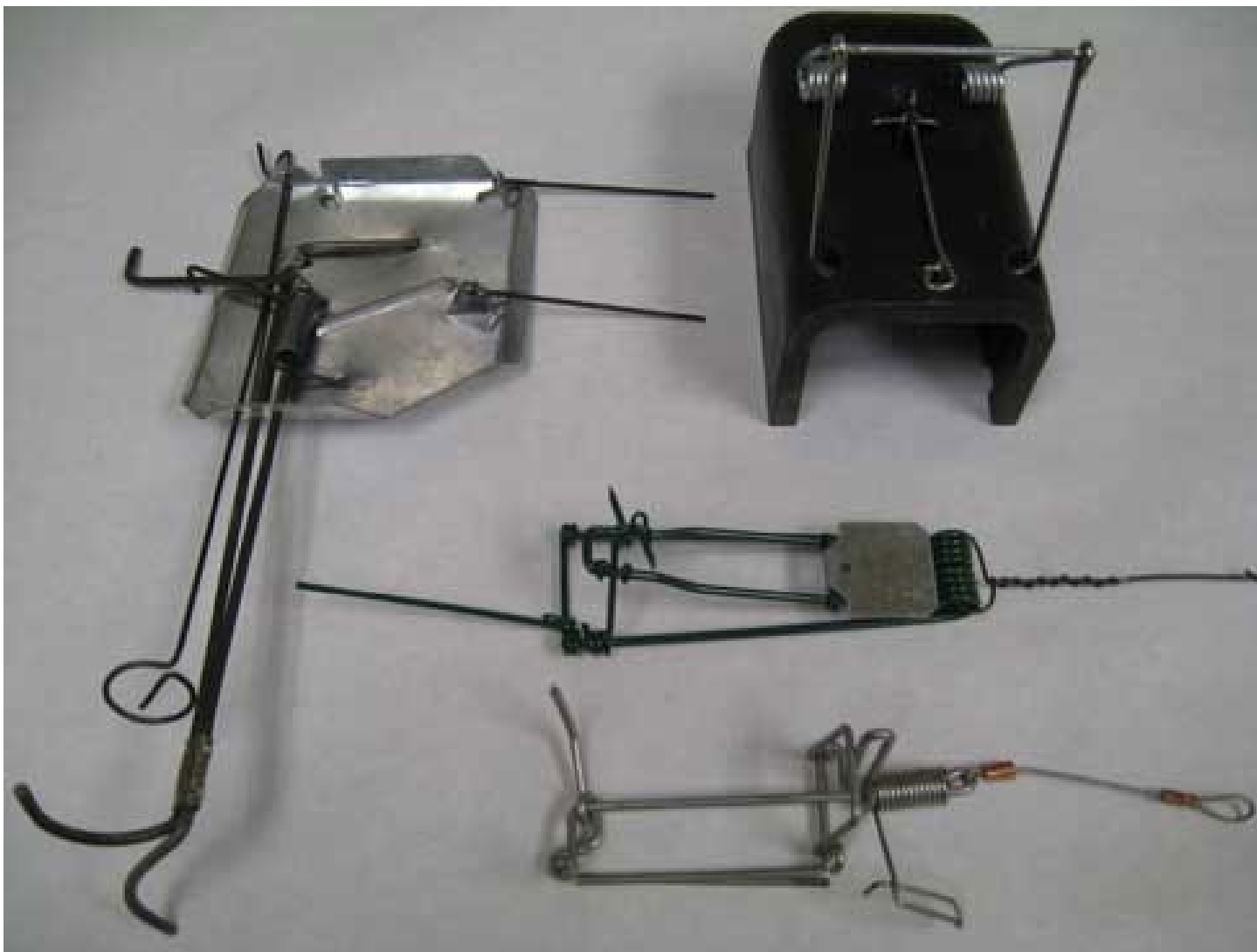
Follow all label directions

Be cautious in shared garden spaces (pets, children, wildlife)

Repellents and ultrasonic devices are generally ineffective.

UC Davis researchers have observed no such benefit of using both traps and baits simultaneously.





Types and brands of gopher traps include (clockwise from upper right) Victor Black Box, Macabee, Gophinator, and Cinch.

Credit: Roger A. Baldwin, UC IPM



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# Gophers: CG Best Practices

Coordinate control efforts across the entire garden

Monitor continuously after removal

Level old mounds to detect new activity

Combine exclusion + trapping for best results

**IPM = Monitor → Prevent → Control →  
Reassess**



# Pest Highlight: Rats

- Common species: Norway rats & roof rats
- Attracted to food, water, and shelter
- Damage crops, irrigation, structures, and spread disease
- Use an **Integrated Pest Management (IPM)** approach



# Pest Highlight: Rats



Roof Rat



Norway Rat



<b>Characteristic</b>	<b>Roof rat</b>	<b>Norway rat</b>
general appearance	sleek, agile	large, robust
color of belly	gray to white	mostly gray
body weight	5 to 10 ounces	7 to 18 ounces
tail	(when pulled over the back towards the head) extends at least to snout, uniformly dark with fine scales	(when pulled over the back towards the head) extends to the middle of the skull; dark above and pale below, scaly
head	pointed muzzle	blunt muzzle
ears	long enough to reach eyes when folded over	don't reach eyes when folded over



# Rats: Identify and Monitor

## Common Signs of Rats:

Droppings (capsule-shaped)

Gnaw marks on wood, irrigation lines, produce

Burrows along garden edges or compost areas

Noises or rub marks along fences and walls

## Monitoring Tips:

Inspect weekly

Focus on compost, sheds, and perimeter fencing

Act quickly at first signs



# Rats: Prevention is Key

## **Remove Food Sources**

Harvest produce promptly

Clean fallen fruit and debris

Use rodent-proof compost bins

## **Eliminate Shelter**

Remove dense vegetation and clutter

Elevate stored materials

Seal gaps in sheds and storage areas

## **Remove Water**

Fix leaking irrigation

Avoid standing water

Prevention is the foundation of long-term control.



# Rats: General Control

## 1. Trapping (Preferred in Community Gardens)

Snap traps in tamper-resistant boxes

Place along walls or runways

Check daily

## 2. Baiting (Use With Caution)

Follow all label directions

Use tamper-resistant bait stations

Be aware of risks to pets, wildlife, and children

Avoid over-reliance on poisons; combine with sanitation.



# Traps are the best bet

*Norway rats*, install traps close to walls, behind objects, in dark corners, and in places where rat signs (droppings, smudge marks, burrows, etc.) have been seen.

*Roof rats*, traps often need to be installed both on the ground and aboveground (e.g., ledges, shelves, branches, fences, pipes, or overhead beams). If possible, traps should be secured to the surface on which they are set; this helps focus the force of the “snap” for better success.



# Community Garden Best Practices

Coordinate efforts across all plots

Educate gardeners about sanitation rules

Monitor continuously after control

Keep written pest logs

**IPM = Sanitation + Exclusion + Trapping +  
Monitoring**



# Pest Highlight: Squirrels

Common pests: ground squirrels & tree squirrels

Feed on fruits, nuts, seeds, seedlings, and irrigation lines

Can undermine beds and create safety hazards (burrows)

Use an **Integrated Pest Management (IPM)** approach



# Squirrels: Identify and Monitor

## Common Signs:

Missing or partially eaten fruits and vegetables

Burrows (ground squirrels) in open areas or berms

Chew marks on drip irrigation

Active during daylight

## Monitoring Tips:

Walk garden weekly

Watch for new burrows or crop damage

Act early before populations increase



# Squirrel: Prevention and Exclusion

## Habitat Modification

Remove fallen fruit and excess seed

Manage weeds and dense vegetation

Reduce open food sources

## Physical Barriers

Install fencing buried 6–12 inches deep (for ground squirrels)

Use bird netting or crop cages over high-value plants

Protect irrigation lines

Prevention is key in shared garden spaces.



# Squirrel Control (when necessary)

## 1. Trapping

Live traps (tree squirrels, where legal)

Kill traps or burrow traps (ground squirrels)

Follow all local regulations

## 2. Baiting

Use only labeled products

Place in tamper-resistant bait stations

Be cautious of risks to pets, wildlife, and children

Repellents have limited effectiveness.



# Squirrels - Community Garden Best Practices

Coordinate management across all plots or as a garden in whole

Monitor continuously after control

Fill inactive burrows to detect new activity

Educate gardeners on sanitation practices

**IPM = Monitor → Prevent → Exclude → Control → Reassess**





# Local and Online Resources

County Cooperative Extension Office

University IPM programs (UC IPM, etc.)

Community garden consultant

Online pest ID guides



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# Summary

IPM = Prevent, Monitor, Identify, Control, Assess

Keep kids safe while protecting the garden

Simple steps, and consistency, can make a big difference





# Questions?

- Have you faced any challenges?
- Can you share solutions with each other?





# Contact me!

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