

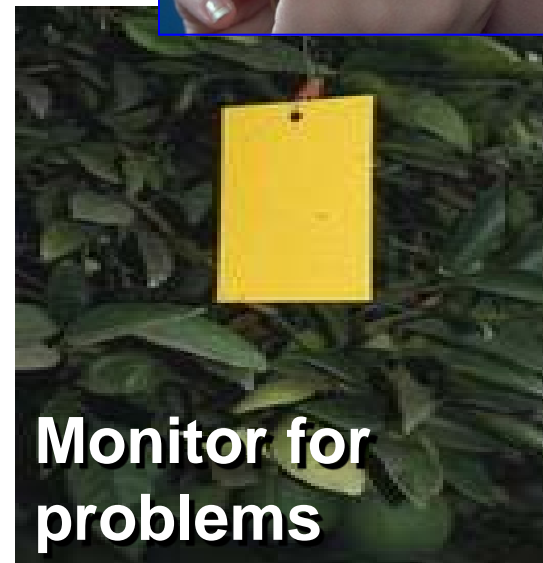
Introduction to IPM

- Types of pests
- Importance of pest identification
- Information resources



What is the idea behind IPM?

- **Ecologically-based approach**
- **Prevents problems**
- **Based on knowledge of pest, biology, and habitat**
- **Don't spray just because you see a pest**
- **Uses least-toxic methods to protect people and environment**



IPM tools and techniques

Combine practices for long-term management

- ✓ Prevention
- ✓ Cultural practices
- ✓ Physical/mechanical
- ✓ Biological control
- ✓ Pesticides, if needed
 - Monitor to detect and assess problems
 - Use least-toxic materials

Exclusion

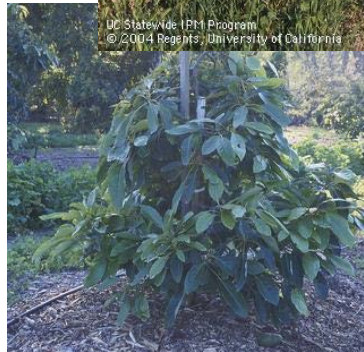


Competitive plants



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Lady beetle larva



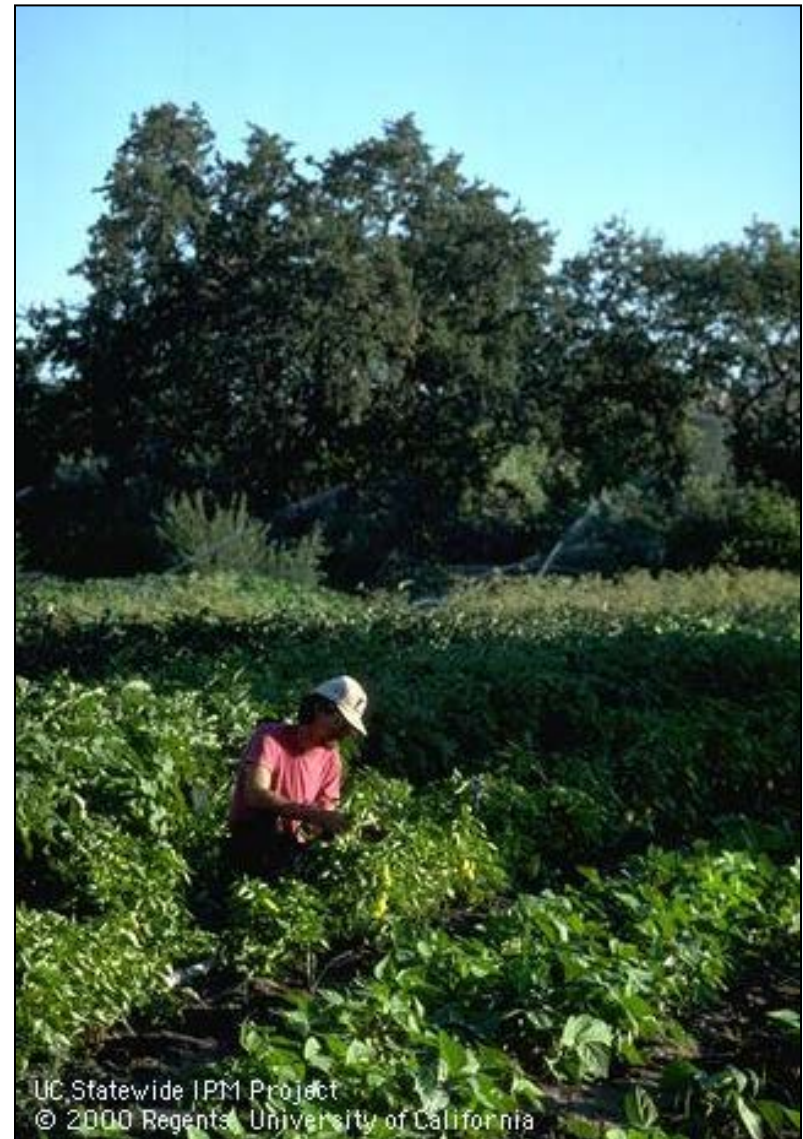
Mulch



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Why choose *IPM*?

- Provides long-term solutions
- Manages potential problems before they get out of hand
- Eliminates unnecessary pesticide use
- Good for health and the environment
- Gives you choices that rarely require pesticides



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Types of Pests



Insects/mites



Pathogens



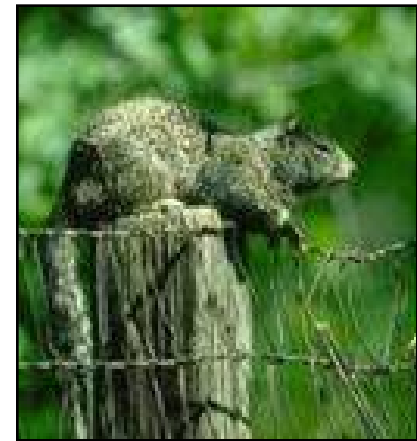
Weeds



Molluscs



Nematodes



Vertebrates

Insects and Mites

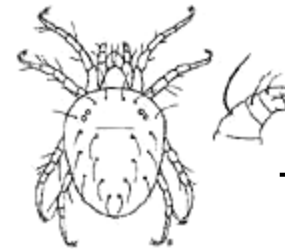
Insects

Head, thorax, and abdomen
3 pairs of legs



Mouthparts

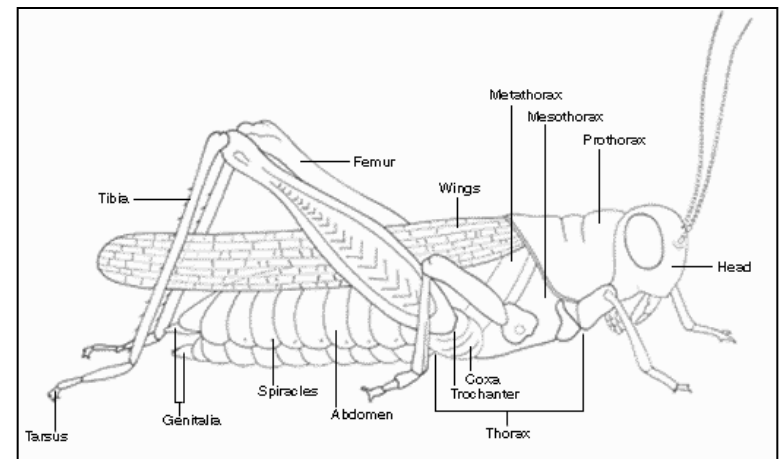
- **chewing** (beetles, caterpillars)
- **piercing-sucking** (aphids, bugs)
- **sponging** (flies)
- **siphoning** (moths)
- **rasping-sucking** (thrips)
- **cutting-sponging** (biting flies)
- **chewing-lapping** (wasps)



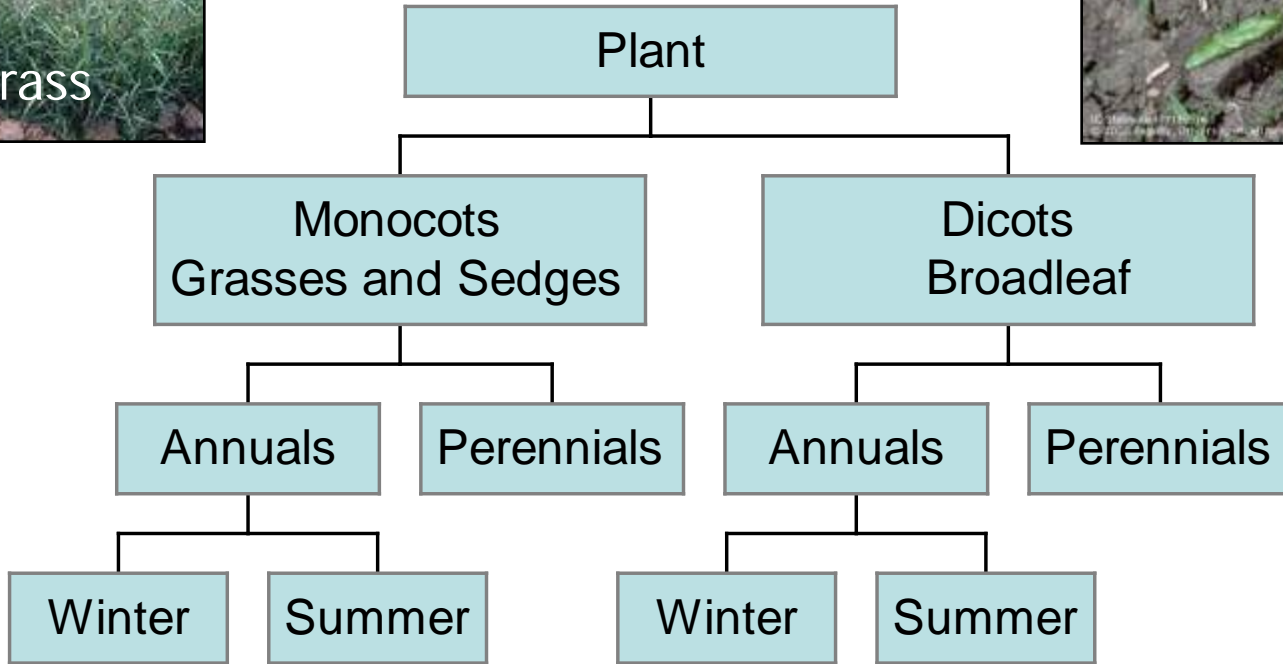
Mites

Two body parts
4 pairs of legs

piercing-sucking



Weed Classifications



Annual bluegrass



Crabgrass



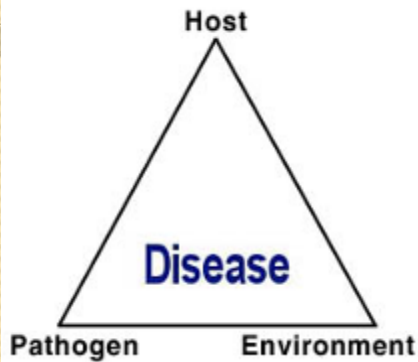
Mallow



Spotted spurge

Pathogens and Nematodes

- Virus
- Bacteria
- Water molds



Old model



Almond Alternaria Leaf Spot



Female root-knot nematode next to root gall

time



New model



Verticillium Wilt



Adult root lesion nematodes inside root

Vertebrates



Ground squirrels



Birds



Rabbits



Gophers



Voles

Snails and Slugs



Adult brown garden snail



Estivate in hot weather



Gray garden slug



Importance of Pest Identification

- Have to identify the problem before it can be solved.
- Requires correlating pests to damage.
 - Damage from insects, diseases, weeds, etc., vs.
 - Damage from equipment, nutrition, water mgt., etc.



Big-eyed bug—
beneficial insect

False chinch bug—
sporadic, minor pest

Lygus bug—major
pest



Herbicide damage vs. grub damage



Mower damage

Diagnosing Problems

- Just because you see a pest doesn't mean it caused the damage.
- Not all damage needs to be treated.
- Pests may no longer be present.
- Pest may be difficult to find
- Irrigation problems and nutritional deficiencies



Katydid damage



Stink bug damage



Belowground damage from root-knot nematode



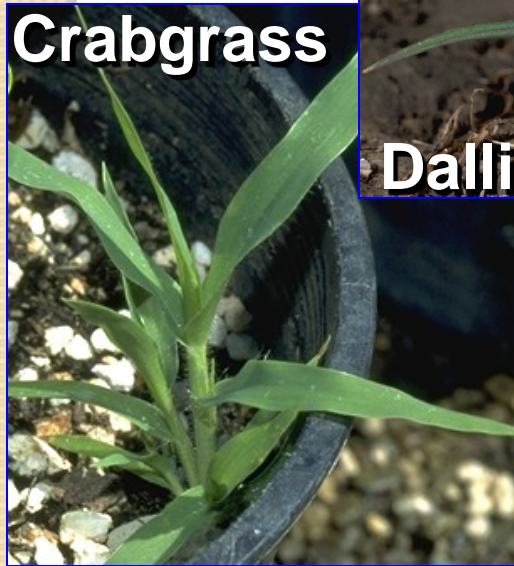
Damping off from fungi, primarily weather-related

Identify your pest

- Identify your pest
- Understand its life cycle



Crabgrass



Lady beetle larva



Syrphid fly larva

Beneficial insects

Resources to help you identify pests

Science-based

www.ipm.ucanr.edu

Weed photo gallery

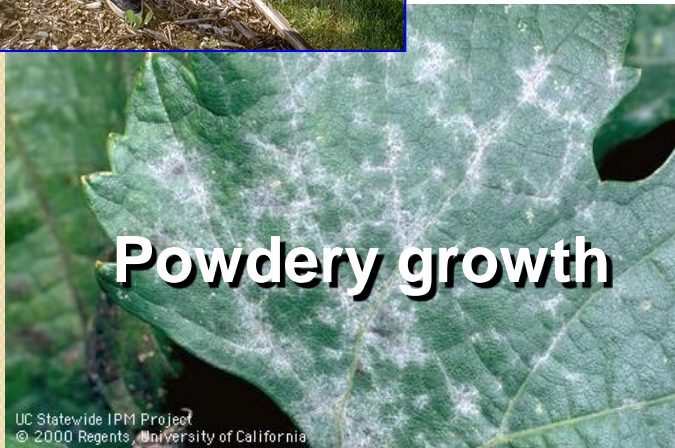
Pest management guidelines (PMGs)

UC IPM Publications



Be on the lookout

- Monitor regularly



Mice droppings

Rat droppings



Monitoring



Reduce problems with cultural controls

- **Select well-adapted and pest-resistant plant species**
- **Provide adequate water**



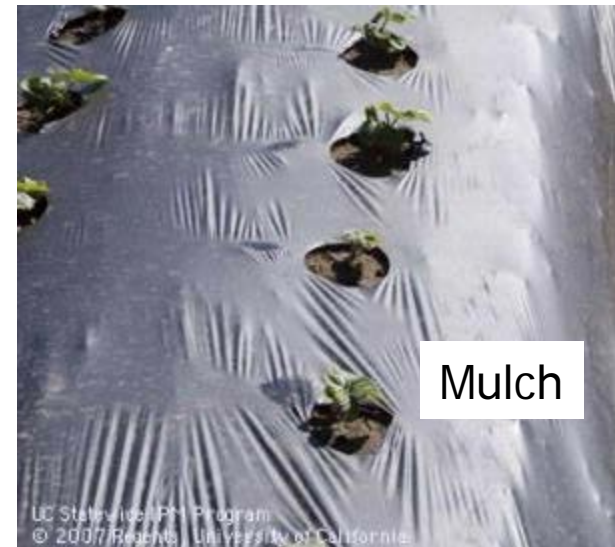
Drip irrigation reduces weeds



The San Andreas strawberry cultivar (left) is resistant to Fusarium wilt, while the Albion cultivar (right) is susceptible

Keep crop competitive with proper irrigation, fertilization

Manage pests with physical or mechanical methods



Remove pests with physical or mechanical methods

Reduce mites by washing off dusty leaves



Traps

Yellowjackets



Mice



Snails

Biological Control Arthropods

Controlling insects and mites
with:

- Pathogens
- Predators
- Parasites



Identification

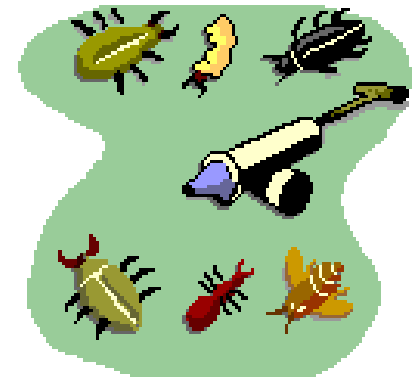
Good or Bad?

Many beneficial insects such as the syrphid fly larvae and the cecidomyid midge look like plant pests, but are actually effective predators of aphids.



Pesticide

Any chemical (natural or synthetic) that mitigates (kills, controls, repels) a pest (animal or plant, etc.).



If you use pesticides

- Choose the least-toxic effective material
- Use in combination with other methods
- Follow label directions carefully
- Consult UC IPM Pest Notes or PMGs



WEED MANAGEMENT IN LANDSCAPES

Integrated Pest Management in Landscapes, Ornamentals, and Home

WEED MANAGEMENT
BEFORE PLANTING
 The most effective approach to weed management is to prevent weeds from becoming established in the landscape. This can be done by using a pre-emergent herbicide or by using a mulch that blocks light to the soil. Weeds that are already established in the landscape should be removed before planting new plants.

WEED MANAGEMENT
AFTER PLANTING
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PEST NOTE
 University of California
 Agriculture and Natural Resources

YELLOWJACKETS AND OTHER SOCIAL WASPS

Integrated Pest Management in and around the Home

Only a few of the very large number of wasp species in California are social wasps. Some social wasps are predators for most of all of the year and provide a great benefit by killing large numbers of pest feeding insects and other insects. However, the yellowjackets (see the section on yellowjackets) are the most common and most annoying of the social wasps in California. Yellowjackets especially are a pest because they are very aggressive and will sting humans. One of the most troublesome of the social wasps in California is the yellowjacket. Yellowjackets especially are a pest because they are very aggressive and will sting humans. One of the most troublesome of the social wasps in California is the yellowjacket. Yellowjackets especially are a pest because they are very aggressive and will sting humans.



Figure 1. Western yellowjacket.

Yellowjackets are very aggressive and will sting humans. One of the most troublesome of the social wasps in California is the yellowjacket. Yellowjackets especially are a pest because they are very aggressive and will sting humans. One of the most troublesome of the social wasps in California is the yellowjacket. Yellowjackets especially are a pest because they are very aggressive and will sting humans.

PEST NOTES
 University of California
 Agriculture and Natural Resources

RATS

Integrated Pest Management in the Home and Landscape

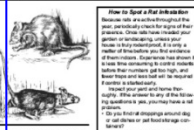


Figure 1. Norway rat.

One of the most troublesome pests in the home and landscape is the rat. Rats are very adaptable and can live in a wide variety of environments. They are also very intelligent and can learn to avoid traps and other control measures. Rats are also very destructive and can cause significant damage to property and health.

STINGING THE RAT
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PEST NOTES
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Herbicide

A chemical substance used to kill undesirable plants.

- Will kill any plant (not just weeds).
- Target broad range of or specific weeds.
- Preemergence and postemergence.
- Contact and systemic.



Untreated

Treated with
preemergence herbicide

Ali Harivandi
University of California



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Postemergence contact herbicide

Insecticide

A chemical substance used to kill undesirable insects.

- Contact—taken in directly through the surface of the pest.
- Stomach—ingested by the pest.
- Systemic—translocated through the plant.
- Fumigant—uptake by the pest through its breathing apparatus.



Admire[®] 2 Flowable Insecticide

For control of certain insects infesting various crops.

ACTIVE INGREDIENT:
Imidacloprid, 1-[(6-Chloro-3-pyridinyl)methyl]-N-nitro-2-imidazolidinimine..... 21.4%

OTHER INGREDIENTS:..... 78.6%
100.0%

EPA Reg. No. 264 - 758 EPA Est. No. 3125-MO-001

Contains 2 pounds of imidacloprid per gallon. **SHAKE WELL BEFORE USING**

**STOP - Read the label before use
KEEP OUT OF REACH OF CHILDREN
CAUTION**

For **MEDICAL** And **TRANSPORTATION** Emergencies **ONLY** Call 24 Hours A Day 1-800-334-7577
For **PRODUCT USE** Information Call 1-866-99BAYER (1-866-992-2937)

Fungicide

A chemical substance used to kill undesirable fungi.

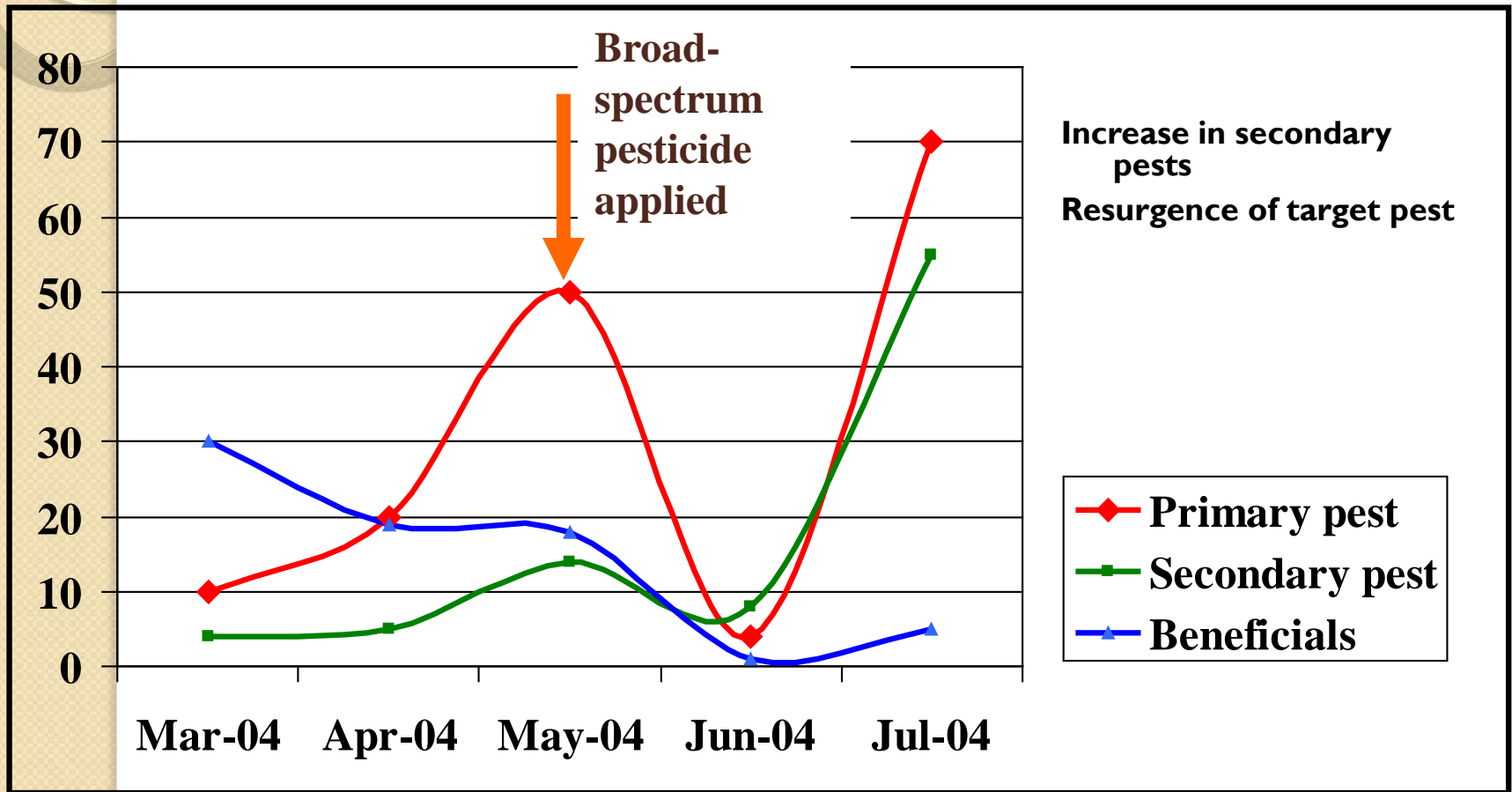


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Powdery mildew on grape



Impacts on Beneficial Organisms



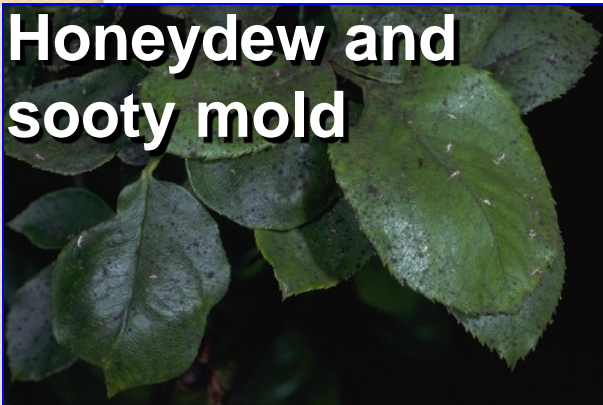
IPM for aphids

1. Identify the pest

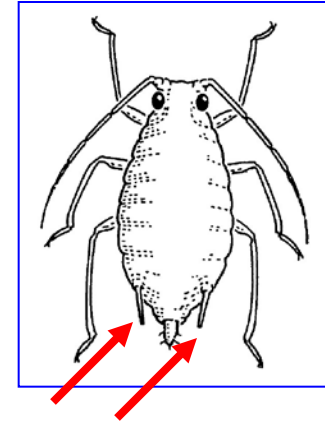
Curled leaves



Honeydew and sooty mold



Many different aphid species



2. Determine if this pest is a problem you can't tolerate

- High number of aphids?
- No natural enemies?
- Know facts about biology

IPM for aphids

3. Identify the conditions that cause aphids to thrive

- New lush plant growth
- Destruction of natural enemies by pesticides



How can you change these conditions?

- Protection by ants



Lacewing
larva



Parasites



Syrphid larva

- Avoid overfertilizing plants
- Avoid pesticides that kill natural enemies
- Keep ants off plants

IPM for aphids

4. Consider other methods

- Prune out infested leaves and stems
- Examine plants for natural enemies



Lady beetle



Baiting for ants



Aphid mummies

APHIDS

Integrated Pest Management for Home Gardeners and Landscape Professionals

Aphids are small, soft-bodied insects with long, slender mouth parts that they use to pierce stems, leaves, and other tender plant parts and suck out plant fluids. Almost every plant has one or more aphid species that occasionally feed on it. Many aphid species are difficult to distinguish, however, identification to species is not necessary to control them in most situations.

IDENTIFICATION
Aphids may be green, yellow, brown, red, or black depending on the species and the plants they feed on. A few species appear waxy or woolly due to the secretion of a waxy white protective substance over their body surface. All are small, pear-shaped insects with long legs and antennae (Fig. 1). Most species have a pair of tubular structures called cornicles projecting backwards out of the hind end of their bodies. The presence of cornicles distinguishes aphids from all other insects.

Generally adult aphids are wingless, but most species do occur in winged forms, especially when populations are high or during spring and fall. The ability to produce winged individuals provides the pest with a way to disperse to other plants when the quality of the food source deteriorates.

Although they may be found singly, aphids often feed in dense groups on leaves or stems, leaflet underpages, plant legs, and certain other insects that might be confused with them, most aphids do not move rapidly when disturbed.

LIFE CYCLE
Aphids have many generations a year (Fig. 2). Most aphids in California's

mild climate reproduce asexually throughout most or all of the year with adults females giving birth to live offspring (often as many as 12 per day) without mating. Young aphids are called nymphs. They reach adulthood in about four to six weeks before becoming adults. There is no diapause; some species winter and produce eggs to fall or winter, which provide them a more lengthy stage to survive harsh weather. In some cases, their eggs are laid on an alternative host, usually a perennial plant, for winter survival.

When the weather is warm, many species of aphids can develop from one generation to the next in as little as 7 to 8 days. Because each adult aphid can produce up to 10 offspring in a matter of a week, aphid populations can increase with great speed.

DAMAGE
Low to moderate numbers of leaf-feeding aphids are usually not damage-

Figure 1. A wingless aphid.

Figure 2. General life cycle of aphids. Asexual reproduction occurs during most of the summer cycle. Aphids also reproduce asexually in a greenhouse of several individuals that produce overwintering eggs as shown in the winter cycle.

PEST NOTES
University of California
Division of Agriculture and Natural Resources

Publication 7404
Revised May 2000

Integrate methods with a pesticide. Choose least-toxic materials such as oils and soaps.

IPM for weeds

1. Identify the pest

- **Know which weeds are invading**
- **Use tools on the UC IPM web site**



2. Determine if the weed is a problem

- **Early emerging**
- **Perennial weeds**

IPM for weeds

3. Identify the conditions that cause weeds to establish and grow

- Sources of weed seeds or propagules
- Unplanted areas
- Letting weeds go to seed



How can you change these conditions?

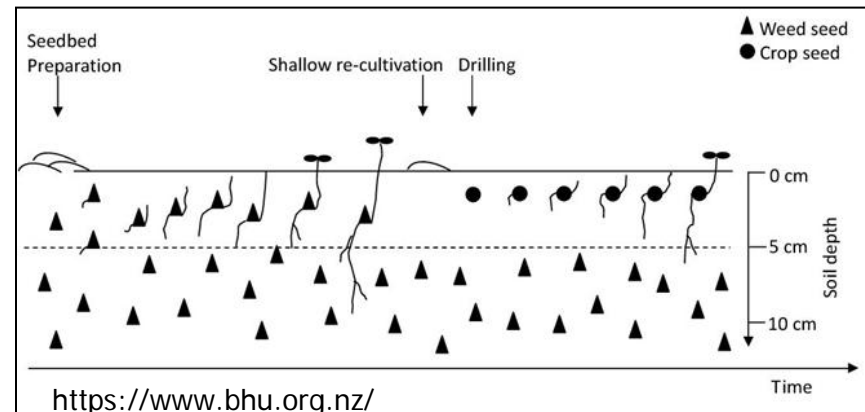
- Manage weedy areas around growing area
- Don't bring in seeds or propagules
- Plant dense plantings
 - Select competitive plants
 - Transplant instead of direct seed
- Install low-output irrigation systems
- Water, fertilize, prune properly
- Use mulch

IPM for weeds

4. Consider other methods

- Hand pull, shallow cultivation, hoeing
- Remove weeds when small and before they set seed
- Solarize new planting beds
- Use herbicides

Use water/wait/cultivate method to deplete seed bank



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UC IPM

Statewide Integrated Pest Management Program

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- Pest Notes: [Opossum and Whiteflies revised, Wild Pigs added](#)
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