The good and the bad in the garden – and the IPM approach
First off…What is IPM?

(Integrated Pest Management)

- Ecosystem-based strategy
- Focuses on long-term prevention of pests or their damage
- Requires regular monitoring of pests and the ecosystem
- Uses a combination of complimentary, environmentally-sound techniques
Why choose IPM?

• Provide long-term solutions
• Manage potential problems before they get out of hand
• Gives you choices that rarely require pesticides
• Eliminate unnecessary pesticide use
• Good for health and the environment
What is a pest?

Organisms that are annoying us or damaging our plants or structures

Very personal:
- Roof Rats?
- Cockroaches?
- Spiders?
- Earwigs?

Level of pests: A few aphids do little damage to trees and shrubs. Do they need to be controlled? Aesthetic threshold versus economic thresholds.
Plant damage in the landscape can have many causes – Is it really a pest or something else??

- **Living Pests**
  - Insects and other invertebrates
  - Rodents and other vertebrates
  - Disease-causing microbes
  - Snails and slugs
  - Weeds

- **Nonliving Abiotic factors**
  - Over- or under-watering
  - Nutrient deficiencies
  - Mineral toxicities
  - Fertilizer damage
  - Herbicide damage
  - Mechanical injury
Look-alike damage from different causes

- Fertilizer burn
- Herbicide (glyphosate) damage
- Damage due to fungal disease--Pythium blight
- Leaf curling due to aphids
- Peach Leaf Curl disease
- Leaf curling due to 2,4-D
Components of an IPM Program

- Pest Identification and knowledge
- Monitoring to detect and assess problems

Combine practices for long-term management

- Prevention
- Physical/mechanical
- Cultural practices
- Biological control
- Pesticides, only if needed
The First Step: identify problems accurately

- Proper ID is key for choosing the most effective management method.
- Learn signs of damage, pest life cycle, and biology.
- Is the pest even a problem?
- There is help! Call the UC Master Gardeners!

Gopher vs. Voles
Home, Garden, Turf & Landscape Pests

Agricultural Pests

Natural Environment Pests

Exotic & Invasive Pests
Home, garden, turf, & landscape pests

University of California's official guidelines for managing pests with environmentally sound methods.
(More...)

Search home & landscape:

Pests of homes and structures

- **Household**: pests of homes, structures, people and pets
  - Pests that sting, bite, or injure
  - Wood-destroying, food, fabric, and nuisance pests
  - Invertebrate pests: birds, mammals, and reptiles

Pests in gardens and landscapes

*Choose a plant to find the most likely source of your pest problem*

- **Flowers**
- **Fruit trees, nuts, berries, and grapevines**
- **Lawns and turf**, including comprehensive lawn guide
- **Trees and shrubs**, including roses and other ornamentals
- **Vegetables and melons**

Some common pests and methods

- **Birds, mammals, and reptiles**: vertebrate pests
- **Insects, mites, mollusks, and nematodes**: invertebrate pests
- **Plant diseases**
- **Weeds**
- **Management methods**, including pesticides and biological control

Pesticide information

- **Hiring a pest control company**
# How to Manage Pests

## Pests in Gardens and Landscapes—Ornamental Trees and Shrubs

The table below lists common, scientific, and family names for ornamental trees and shrubs included in this Web site. Click to link to information about pests commonly found on that plant.

Click on a table heading to sort the column ↑. Tip: Sort multiple columns simultaneously by holding down the shift key and clicking a third column heading.

Legend:  ▲ = Ascending, ▼ = Descending, ✿ = Unsorted

**Common name index—see also cultural tips**

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<thead>
<tr>
<th>Common name</th>
<th>Scientific name</th>
<th>Family</th>
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</thead>
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<td>Abelia</td>
<td><em>Abelia</em> spp.</td>
<td>Caprifoliaceae (Honeysuckle family)</td>
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<td>Angelica</td>
<td><em>Fatsia japonica = Aralia sieboldii</em></td>
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<tr>
<td>Arelia</td>
<td><em>Fatsia japonica = Aralia sieboldii</em></td>
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<td><em>Araucaria</em> spp.</td>
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<td><em>Platycladus orientalis</em></td>
<td>Cupressaceae (Cypress family)</td>
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<td><em>Syzygium paniculatum</em></td>
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<td>Australian willow</td>
<td><em>Geijera parviflora</em></td>
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<tr>
<td>Bamboo</td>
<td><em>Bambusa</em> spp.</td>
<td>Poaceae (Grass family)</td>
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</tbody>
</table>
Azalea—*Rhododendron* spp.  
*Family Ericaceae (Heath family)*

**Plant Identification**  
Azaleas can be evergreen or deciduous flowering shrubs with a wide range of colors. Their size varies by species; both large and small shrubs are found.

**Optimum conditions for growth**  
Azaleas generally grow best in filtered shade and consistently moist soils; some plants can tolerate Southern California conditions. They prefer to grow in acid soils with high organic content and excellent drainage. Mulches around plants help to conserve moisture and keep roots cool.

**Pests and disorders of *Rhododendron* spp.**

<table>
<thead>
<tr>
<th>Invertebrates</th>
<th>Diseases</th>
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<td>- Spirea aphid</td>
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<td>- <strong>Black vine weevil</strong>, obscure root weevil, and woods weevil</td>
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<td>- <strong>Foliage-feeding caterpillars</strong></td>
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<td>- Azalea leafminer</td>
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<td>- <strong>Scales</strong></td>
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<td>- Azalea bark scale</td>
<td>- Iron deficiency</td>
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<td>- <strong>Spider mites</strong></td>
<td>- Manganese deficiency</td>
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<td>- Southern red mite</td>
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<td>- Two spotted spider mite</td>
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<td>- <strong>Thrips</strong></td>
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<tr>
<td>- Greenhouse thrips</td>
<td>- Poor water management</td>
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<td>- <strong>True bugs</strong></td>
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<tr>
<td>- Azalea whitefly</td>
<td>- ****</td>
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<tr>
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<td>- <em>Rhododendron</em> whitefly</td>
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</tr>
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</table>

**Flowering azalea plant**
How to Manage Pests

Pests in Gardens and Landscapes

Mealybugs

Most adult female mealybugs are wingless, soft-bodied, grayish insects about 0.05 to 0.2 inch long. They are usually elongate and segmented, and may have wax filaments radiating from the body, especially at the tail. Most females can move slowly and are covered with whitish, mealy or cottony wax. There are several different species.

Identification of species | Life cycle

Damage

Mealybugs tend to congregate in large numbers, forming white, cottony masses on plants. High populations slow plant growth and cause premature leaf or fruit drop and twig dieback. Honeydew production and black sooty mold are the primary damage caused by most mealybugs.

Solutions

Provide proper cultural control so that plants are vigorous and can tolerate moderate mealybug feeding without being damaged. Naturally occurring predators and parasites provide good control of many mealybug species, unless these beneficials are disrupted. Mealybugs are difficult to control with insecticides and systemic materials may be required. Insecticidal soap, narrow-range oil, or a forceful stream of water can be applied to reduce exposed populations with minimal harm to natural enemies that may migrate in later. Manage ants that tend mealybugs.
The 5 most common garden pests
Slugs & snails

- Adult brown garden snails lay an average of 80 spherical, pearly white eggs at a time into a hole in the soil.
- They can lay eggs up to 6 times a year.
Management

- Eliminate, as much as possible, all places where they can hide during the day.
- Boards, stones, debris, weedy areas around tree trunks, leafy branches growing close to the ground, and dense ground covers such as ivy are ideal sheltering spots.
- Switching from sprinkler irrigation to drip irrigation will reduce humidity and moist surfaces, making the habitat less favorable for these pests.
Plant Selection

- Plant selection can greatly affect how difficult your battle with snails and slugs will be.
- Snails and slugs favor seedlings and plants with succulent foliage, you will need to protect these vigilantly.
Snail resistant plants?

- Many plants resist snail and slug damage including: begonias, California poppy, fuchias, geraniums, impatiens, lantana, nasturtiums, and purple robe cup flower
- Many plants with stiff leaves and highly scented foliage such as lavender, rosemary, and sage.
- Most ornamental, woody plants, and ornamental grasses also aren’t seriously affected.
Trapping

- You can trap snails and slugs beneath boards or flower pots that you position throughout the garden and landscape.
- Inverted melon rinds also make good traps.
Trapping

- Beer-baited traps buried at ground level to catch and drown slugs and snails that fall into them. Because it is the fermented part of the product that attracts these pests, you also can use a sugar-water and yeast mixture instead of beer.
- Midnight snail raids
Copper barriers

- It is believed that the copper reacts with the slime that snails and slugs secrete, causing a disruption in their nervous system similar to an electric shock.
- When erecting vertical copper screens, it is best to use ones that are at least 4 inches tall.
Chemical Baits

- Metaldehyde Baits (most common on store shelves)
  - Contain the active ingredient metaldehyde
  - Metaldehyde baits are particularly poisonous to dogs and cats, and the pelleted form is especially attractive to dogs.

- Iron phosphate baits
  - Safe for use around children, domestic animals, birds, fish, and other wildlife
  - These are a good choice for an integrated pest management program in your garden.
Aphids

- Damage is primarily aesthetic – aphids typically don’t kill plants and trees
- Aphids produce honeydew which attracts sooty mold
- Leaf curling or distortion
- Many different species and colors

Sooty Mold
Aphids typically don’t kill plants; often short term problems in mild weather
Most species host specific: choose plants without problems. Flowering plums, crape myrtle, roses, tulip trees, apples and vegetables are aphid prone.
Love lush vegetation: limit fertilization and irrigation, try pruning
Natural enemies are abundant
Keep ants out of trees
Look for aphid mummies
To reduce aphid populations:

- Manage ants to improve biological control
- Prune out infested leaves and stems
- Hose aphids off sturdy plants with water
- Cover seedlings or use reflective aluminum mulches
- Less toxic pesticides such as insecticidal oils and soaps

Can you live with them and do nothing?
Ant management can improve biological control of aphids
Ants

Common Ant Species occurring in and around the house and garden in California

- 200 species of Ants in California
- Less than a dozen species are important pests!

1. Argentine Ants
2. Pharaoh Ant
3. Odorous House Ant
4. Thief Ant
5. Carpenter Ant
6. Velvety Tree Ant
7. Southern Fire Ant
8. Red Imported Fire Ant
Ants or Termites? Make sure you know what you are dealing with.

**Ant**
- Antenna: Elbowed
- Thin waist
- Wings (if present): Have few veins. Hind wings are smaller than

**Termite**
- Antenna: Not elbowed
- Broad waist
- Wings (if present): Have many small veins. Front and hind wings are

**Diagram:**
- Carpenter ant
- Drywood termite
- Dampwood termite
Mechanical & Cultural Practices
Outdoors Reduce Ant Populations

- Avoid planting trees and shrubs that attract honeydew producing insects.
- Band the trunks of trees and shrubs that produce fruit or floral nectar with a sticky substance such as Tanglefoot on a protective collar, to keep ants off.
- Trim branches to keep them from touching structures.
- Keep plants, grass, mulch and firewood several inches from building foundations as these make great nesting spots.
Exclude Ants From Buildings!

- Ants make trails along structural elements, such as wires and pipes, and frequently use them to enter and travel within a structure to their destination.

- Indoors, eliminate cracks and crevices wherever possible, especially in kitchens and other food preparation and storage areas.

- Keep ants out of buildings by caulking cracks and crevices around foundations that provide entry from outside.
Chemical Strategies for Managing Ants  - Baits are The Tool -

Baits work better than sprays or granular pesticides because:

- They are a sweet or protein attractant mixed with a pesticide. Worker scouts recruit other workers to it!
- Sprays and granular formulations only kill the ants that come in contact with the pesticide
- Baits may kill the entire colony because the workers take it back as food!
Using Baits Effectively

- **Only use baits when there is a problem.** Don’t attract ants *into* an area.
- **Use primarily outdoors.** Outdoor baits attract ants *out* of buildings.
- Place bait stations where ants can easily find them – near nests, on ant trails, and beneath plants.
- **Avoid placing baits where children and pets have access!**
- Do **NOT** use pesticides sprays - they interrupt your IPM program (the workers taking bait to the colony).
- **Offer several different active ingredients** in bait stations and monitor which ones the ants take.
Whiteflies

- Whiteflies usually occur in groups on the undersides of leaves.
- They derive their name from the mealy, white wax covering the adult’s wings and body.
- Adults are tiny insects with yellowish bodies and whitish wings.
Damage Caused by Whiteflies

- Cause loss of plant fluids
  - resulting in leaves that discolor, shrivel, and drop prematurely.
  - Can stunt plant growth.

- Secret sticky “honeydew” that promotes growth of Sooty Mold fungus and attracts Ants.

- Unsightly and a Nuisance.
Favorite Flowering Plants of Whiteflies

Hibiscus, Geranium, Fuchsia, Begonia – susceptible to several whitefly species.
Favorite Ornamental Plants of Giant Whitefly

- Buxus japonica (Boxwood),
- Canna sp.
- Citrus
- Lantana
- Nandina domestica (Heavenly bamboo)
- Osteospermum (Freeway daisy)
- Many tropical Plants – Bird of Paradise & Banana
Biological Controls

- In many situations, natural enemies of whiteflies will provide adequate control.

- Pesticides, dusty conditions, and Ants (attracted to honeydew) will disrupt the activity of natural enemies.

- Outbreaks in whitefly populations occur in situations where natural enemies are disrupted.
Cultural Controls

- Keep plants free of dust and Ants to encourage natural enemies.

- Keep plants healthy for better resistance to low populations of whiteflies.

- Avoid or remove plants that repeatedly host high populations of whiteflies.
Alternatives for Plant Selection

Plants that are **less susceptible** to Whitefly.

African boxwood, English Daisy, Camellia, Rose, and Yellow Hibiscus!
Mechanical Controls

- Remove infested leaves from plants.
- Hose down plants ("syringing") with water spray.
- Yellow sticky traps attract adults (one trap/two large plants)
- Aluminum foil or reflective mulches repel whiteflies.
Chemical Controls

- Avoiding the use of insecticides that kill natural enemies is a very important aspect of whitefly management.

- Products containing carbaryl, pyrethroids, diazinon, or imidacloprid can be particularly disruptive to natural enemies.

http://www.portofsandiego.org/sandiego_environment/how_you_can_protect_the_bay
Chemical Controls

- Use only when populations are very high!

- Use only narrow-range insecticidal soaps or oils (Neem) that minimize impact on natural enemies!

- Insecticides kill only by direct contact with nymphs!
  - Coverage must be thorough.

- Use only when plants are not water-stressed and when temperatures are below 80°F.
Earwigs

- Earwigs feed most actively at night and seek out dark, cool, moist places to hide during the day.
- Common hiding places are under loose clods of soil, boards, dense growth of vines or weeds, or even within fruit damaged by other pests such as snails, birds, or cutworms.
Damage

- European earwigs can cause substantial damage to seedling plants and soft fruit as well as to sweet corn.
- Damaged seedlings may be missing all or parts of their leaves and stem.
- Leaves on older plants, including fruit trees, have numerous irregular holes or are chewed around the edges.
Earwig Damage

- Soft fruit such as apricots or strawberries may be attacked.
- Hard fruit such as apples will not be harmed. On stone fruit, look for shallow gouges or holes that extend deeply into the fruit.
Beneficial role

- The European earwig can be considered an important predator of some fruit pests, with aphids, pear psylla, mites and insect eggs (including those of codling moth) forming a significant part of the diet.
Trapping – Using Oil

- Traps can easily be hidden near shrubbery and ground cover plantings, or against fences.
- A **low-sided can**, such as a cat food or tuna fish can, with 1/2-inch of oil in the bottom makes an excellent trap.
- Fish oil (e.g., tuna fish oil) is very attractive to earwigs or vegetable oil with a drop of bacon grease can be used.
Trapping

- Other common types of traps are a rolled-up newspaper, corrugated cardboard, bamboo tube, or short piece of hose.
- Place these traps on the soil near plants just before dark and shake accumulated earwigs out into a pail of soapy water in the morning.
Sanitation and Other Controls

- Complement the trapping program by removing refuge sites for earwigs, such as ivy, weeds, piles of rubbish, or leaves.
- Never allow heavy ground cover such as ivy to grow near vegetable gardens.
- Watch out for mulches; they often harbor earwigs.
Sanitation and Control

- For fruit trees, keep weeds, brush, and suckers away from the base of trees throughout the year because they provide refuge for earwigs.
- Monitor populations with folded newspapers or burlap bags placed at the base of trees.
- On the lower trunks of older fruit trees, carefully scrape off all loose bark.
- Trunks can be treated with Tanglefoot, a sticky substance to prevent earwigs from climbing up the trunks to reach ripening stone fruit.
- Also, keeping fruit trees properly pruned, thinning heavy crops, and picking fruit as soon as it ripens will help keep earwigs from becoming pests.
The Good Guys
Most gardens contain far more good bugs, or beneficial insects, than pest insects.
Beneficial insects and other organisms that kill pests are called natural enemies.
In any pest management program, it is important to encourage these natural enemies by avoiding pesticides that kill them.
You also can encourage beneficial insects by choosing plants that provide them with pollen, nectar, and shelter and keeping ants out of pest-infested plants.
Learn to identify good bugs, both in their adult forms and immature (larval) stages.
Green Lacewings

- Larvae prey upon a wide variety of small insects including mealybugs, psyllids, thrips, mites, whiteflies, aphids, small caterpillars, leafhoppers, and insect eggs.
Syrphid Flies (Hover flies)

- Adults of this stingless fly hover around flowers, have black and yellow bands on their abdomen and are often confused with honeybees.
- Adult syrphid flies feed on pollen and nectar, while it is the larval stage that feeds on insects. Larvae of predaceous species feed on aphids and other soft-bodied insects.
Lady Beetles

- Most lady beetles, including this species, are predaceous as both larvae and adults.
- Young lady beetle larvae usually pierce and suck the contents from their prey.
- Older larvae and adults chew and consume their entire prey.
- Larvae are active, elongate, have long legs, and resemble tiny alligators.
Parasitic Wasps

- The female wasp lays an egg inside the insect. The developing offspring feeds grows inside the pest killing it and causing it to transform into a mummy.
- There are many different parasitic wasps that attack a variety of insects including: aphid, whitefly, mealy bug, caterpillars and scale
Tachinid flies

- Parasites of caterpillars (corn earworm, imported cabbage worm, cabbage loopers, cutworms, armyworms), stink bugs, squash bug nymphs, beetle and fly larvae, some true bugs, and beetles.
One more.. Spiders

- All spiders are predaceous; they eat mainly insects, other spiders, and related arthropods.
- Some species capture prey in webs. Others stalk insects across the ground or vegetation or lay in wait and pounce on them.
- About 50 families of spiders occur in the U.S.
Pesticide Management

- Broad-spectrum pesticides
  - Often kill a higher proportion of predators and parasites than of the pest species they are applied to control.
  - Many pesticides are persistent materials that leave residues that kill natural enemies that migrate in after spraying (residual toxicity).
- Residues often are toxic to natural enemies long after pests are no longer affected.
Summary: IPM strategy

- Less risk to health and the environment
- Fewer pest problems

Remember these steps:

1. Correctly identify the pest and determine if it is a problem.
2. Think about the ecosystem!
3. Identify conditions that favor the pest and change them if possible (prevention).
4. Integrate least toxic control methods.

Consult Pest Notes

www.ipm.ucdavis.edu
See our IPM display for landscape and household pests handouts
Questions?

UC Master Gardeners
209-953-6112
http://sjmastergardeners.ucdavis.edu