

ANTS

Integrated Pest Management for Home Gardeners and Landscape Professionals

Ants are among the most prevalent pests in households. They are also found in restaurants, hospitals, offices, warehouses, and other buildings where they can find food and water. On outdoor (and sometimes indoor) plants, ants protect and care for honeydew-producing insects such as aphids, soft scales, whiteflies, and mealybugs, increasing damage from these pests. Ants also perform many useful functions in the environment, such as feeding on other pests (e.g., fleas, caterpillars, termites), dead insects, and decomposing tissue from dead animals.

There are over 12,000 species of ants throughout the world. In California, there are about 200 species but fewer than a dozen are important pests (Table 1). The most common ant occurring in and around the house and garden in California is the Argentine ant, *Linepithema humile* (formerly *Iridomyrmex humilis*). Other common ant pests include the pharaoh ant (*Monomorium pharaonis*), the odorous house ant (*Tapinoma sessile*), the thief ant (*Solenopsis molesta*), and the southern fire ant (*Solenopsis xyloni*). The velvety tree ant, *Lioetopum occidentale*, nests in old wood and is a common outdoor species in landscapes. Less common, but of great importance, is the red imported fire ant, *Solenopsis invicta*, which has recently gained a foothold in southern California. In some areas, the spread of the fire ant has been slowed by competition from the Argentine ant. Carpenter ants, *Camponotus* spp., also invade buildings in California. Although they do not eat wood as termites do, they hollow it out to nest and may cause considerable damage. For more information on carpenter ants, see *Pest Notes: Carpenter Ants*, listed in Suggested Reading. For color photographs and additional information on identifying the different ant species, see *A Key to the Most Common*

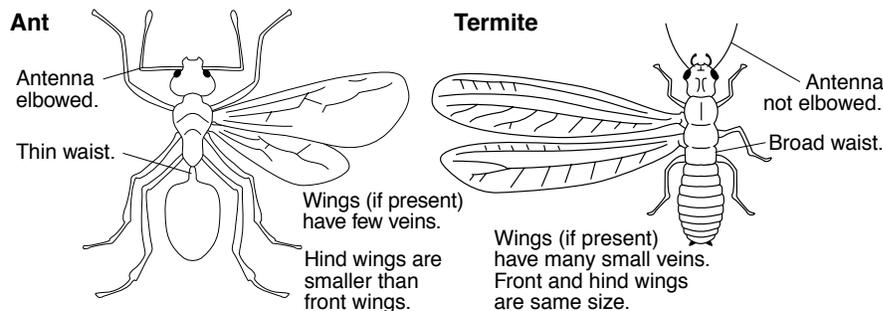


Figure 1. Distinguishing features of ants and termites.

and/or Economically Important Ants of California, listed in "Suggested Reading," or the online *Key to Identifying Common Household Ants* at www.ipm.ucdavis.edu/TOOLS/ANTKEY.

IDENTIFICATION

Ants belong to the insect order Hymenoptera and are close relatives of bees and wasps. They are familiar insects that are easily recognized, especially in their common wingless adult forms, known as workers. However, winged forms of ants, which leave the nest in large numbers in warm weather to mate and establish new colonies, are often mistaken for winged termites, which also leave their nests to mate. Ants and termites can be distinguished by three main characteristics illustrated in Figure 1.

- The ant's body is constricted, giving it the appearance of having a thin waist; the termite's body is not constricted.
- The ant's hind wings are smaller than its front wings; the termite's front and hind wings are about the same size. (Shortly after their flights, both ants and termites lose their wings, so wings may not always be present.)

- Winged female and worker ants have elbowed antennae; the termite's antennae are not elbowed.

Ants undergo complete metamorphosis, passing through egg, larval, pupal, and adult stages. Larvae are immobile and wormlike and do not resemble adults. Ants, like many other hymenopterans, are social insects with duties divided among different types, or castes, of adult individuals. Queens conduct the reproductive functions of a colony and are larger than other ants; they lay eggs and sometimes participate in the feeding and grooming of larvae. Female workers, who are sterile, gather food, feed and care for the larvae, build tunnels, and defend the colony; these workers make up the bulk of the colony. Males do not participate in colony activities; their sole purpose is to mate with the queens. Few in number, males are fed and cared for by workers.

DAMAGE

Inside buildings, household ants feed on sugars, syrups, honey, fruit juice, fats, and meat. Long trails of thousands of ants may lead from nests to food sources, causing considerable concern among building occupants. Outdoors they are attracted to honeydew, produced by soft scales, mealybugs, and aphids. This liquid excrement contains

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sugars, and other nutrients. Frequently outbreaks of scales and aphids occur when ants tend them for honeydew because the ants protect scales and aphids from their natural enemies. Ants can bite with their pincerlike jaws, although most species rarely do. The velvety tree ant, however, is an aggressive biter. A few ants sting, including native fire ants and harvester ants (not pictured), which are primarily outdoor species, and are the most common stinging ants in California. An aggressive stinging ant, the red imported fire ant (*S. invicta*), has recently been found in various southern California counties. If you suspect a fire ant infestation, report it to your county agricultural commissioner. For more information on red imported fire ants, see *Pest Notes: Red Imported Fire Ant*, listed in Suggested Reading.

LIFE CYCLE AND HABITS

Ants usually nest in soil; nest sites vary with species but are often found next to buildings, along sidewalks, or in close proximity to food sources such as trees or plants that harbor honeydew-producing insects. They also construct nests under boards, stones, tree stumps or plants, and sometimes under buildings or other protected places. In temperate climates the pharaoh ant nests indoors preferring warm, moist

locations, often in wall voids, under flooring, or near hot water pipes or heating systems but is also found nesting outdoors in warmer parts of California. See Table 1 for nesting sites of other species. Ant food includes fruits, seeds, nuts, fatty substances, dead or live insects, dead animals, and sweets. Food preferences vary among ant species.

Ants often enter buildings seeking food and water, warmth and shelter, or a refuge from dry, hot weather or flooded conditions. They may appear suddenly in buildings if other food sources become unavailable or weather conditions change.

A new colony is typically established by a single newly mated queen. After weeks or months of confinement underground, she lays her first eggs (Fig. 2). After the eggs hatch, she feeds the white, legless larvae with her own metabolized wing muscles and fat bodies until they pupate. Several weeks later, the pupae transform into sterile female adult workers, and the first workers dig their way out of the nest to collect food for themselves, for the queen (who continues to lay eggs), and for subsequent broods of larvae. As numbers increase, new chambers and galleries

are added to the nest. After a few years, the colony begins to produce winged male and female ants, which leave the nest to mate and form new colonies.

Argentine ants differ from most other ant species in California in that their nests are often shallow, extending just below the soil surface. However, under dry conditions they will nest deeper in the soil. In addition, Argentine ant colonies are not separate but linked to form one large supercolony with multiple queens. When newly mated queens disperse to found new colonies, they are accompanied by workers rather than going out on their own as most other species do.

MANAGEMENT

Ant management requires diligent efforts and the combined use of mechanical, cultural, sanitation, and often chemical methods of control. It is unrealistic and impractical to attempt to totally eliminate ants from an outdoor area. Focus your management efforts on excluding ants from buildings or valuable plants and eliminating their food and water sources. Reducing outdoor sources of ants near buildings may reduce the likelihood of ants coming indoors. Remember that ants play a beneficial role in the garden in some cases. Become aware of the seasonal cycle of ants in your area and be prepared for annual invasions by caulking and baiting before the influx. Different species of ants respond to management practices differently. For management information specific to a particular species, see the online *Key to Identifying Common Household Ants* at www.ipm.ucdavis.edu/TOOLS/ANTKEY.

Monitoring and Inspection

Monitor for ants near attractive food sources or areas of moisture. Ants may invade kitchens, bathrooms, offices, or bedrooms. Inspect under sinks, in cupboards, along pipes, and along electrical wires. Look for large trails of ants or for just a few stragglers. Straggling ants are scouts randomly searching for food or nesting sites. When you spot ant trails, try to follow the ants to where they are entering the building and to the nest if possible. Look for holes or

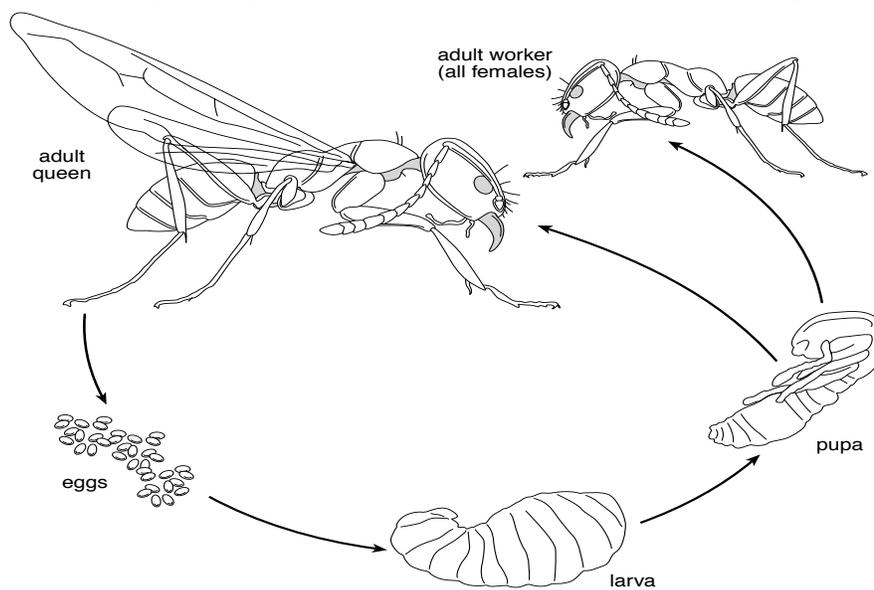
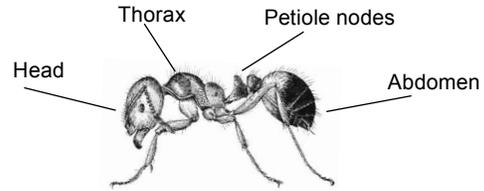
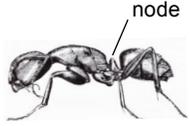
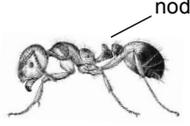
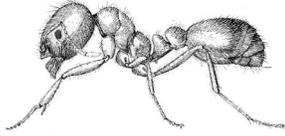


Figure 2. Life cycle of the Argentine ant.

Table 1. Identifying Features of Common Household Ants.

Effective management approaches vary with ant species. Use behavioral characteristics such as food and nesting preferences along with physical characteristics to identify ants. A first step in identifying ants is to use a magnifier to determine if they have one or two nodes at the petiole of their abdomen. Locate the petiole, the first portion of the abdomen, and count the number of nodes present.



<p>One-node ant</p> 	<p>Two-node ant</p> 
<p>Argentine ant (<i>Linepithema humile</i>)</p> <p>Food: sweets, sometimes proteins. Nest: outdoors in shallow mounds.</p> <p>1/8 inch, dull brown</p> 	<p>Pavement ant (<i>Tetramorium caespitum</i>)</p> <p>Food: sweets, proteins, grease. Nest: in lawns or under stones, boards; build mounds along sidewalks, foundations, and near water.</p> <p>3/16 inch, dark brown to black</p> 
<p>Carpenter ant (<i>Camponotus</i> spp.)</p> <p>Food: sweets. Nest: in tree stumps, firewood, fence posts, hollow doors or window frames; deposit sawdustlike frass outside of nests.</p> <p>Large, 1/4 to 1/2 inch, black or bicolored red or black</p> 	<p>Pharaoh ant (<i>Monomorium pharaonis</i>)</p> <p>Food: fats, proteins, sweets. Nest: in wall or cabinet voids, behind baseboards, or insulation or outdoors in debris.</p> <p>1/16 inch, yellow or honey-colored to orange</p> 
<p>Odorous house ant (<i>Tapinoma sessile</i>)</p> <p>Food: sweets, sometimes proteins. Nest: in shallow mounds in soil or debris, or indoors in wall voids, around water pipes or heaters.</p> <p>1/8 inch, dark brown to shiny black; very strong odor when crushed</p> 	<p>Red imported fire ant (<i>Solenopsis invicta</i>)</p> <p>Food: sweets, proteins. Nest: in mounds with multiple openings in soil or lawns and sometimes in buildings behind wall voids.</p> <p>1/16 to 1/5 inch, reddish with dark brown abdomen</p> 
<p>Velvety tree ant (<i>Liometopum occidentale</i>)</p> <p>Food: sweets and insects. Nest: in dead wood such as old tree limbs, stumps, and logs.</p> <p>1/8 to 1/4 inch, brownish-back head, red thorax, and velvety black abdomen; very distinct odor when crushed</p> 	<p>Southern fire ant (<i>Solenopsis xyloni</i>)</p> <p>Food: proteins and sweets. Nest: in small mounds with flattened irregular craters in wood, under rocks.</p> <p>1/8 to 1/4 inch, amber head and thorax with black abdomen, body covered with golden hairs</p> 
<p>Thief ant (<i>Solenopsis molesta</i>)</p> <p>Food: greasy and fatty foods, sometimes sweets. Steal food and ant larvae from other ant nests. Nest: outdoors in soil, under rocks or decaying wood or indoors behind wallboards or baseboards.</p> <p>1/32 inch, yellow to light brown</p> 	

cracks in foundations or walls that provide entry points to buildings.

Exclusion and Sanitation

To keep ants out of buildings, caulk cracks and crevices around foundations that provide entry from outside. Some caulking products available to professionals contain silica aerogel for long-term control combined with pyrethrins for more immediate effects. Ants prefer to 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. Store attractive food items such as sugar, syrup, honey, and pet food in closed containers that have been washed to remove residues from outer surfaces. Rinse out empty soft drink containers or remove them from the building. Thoroughly clean up grease and spills. Remove garbage from buildings daily and change liners frequently. Look for indoor nesting sites, such as potted plants. If ants are found in potted plants, remove the containers from the building, then place the pots for 20 minutes or more in a solution of insecticidal soap and water at a rate of one to two tablespoons of insecticidal soap per quart of water. Submerge so the surface of the soil is just covered by the water-soap solution.

Outdoor ant nests may be associated with plants that support large populations of honeydew-producing insects such as aphids, soft scales, mealybugs or whiteflies. Avoid planting such trees and shrubs next to buildings, or manage honeydew producing insects. Keep plants, grass, and mulch several inches away from the foundation of buildings because they provide nesting sites for ants.

Management on Trees and Shrubs

When numerous ants are found on plants, they are probably attracted to the sweet honeydew deposited on the plants by honeydew-producing insects such as aphids or soft scales. Ants may also be attracted up into trees or shrubs

by ripening or rotten sweet fruit or floral nectar. These ants can be kept out by banding tree trunks with sticky substances such as Tanglefoot. Trim branches to keep them from touching structures or plants so that ants are forced to climb up the trunk to reach the foliage. Protect young or sensitive trees from possible injury by wrapping the trunk with a collar of heavy paper, duct tape, or fabric tree wrap and coating this with the sticky material. Check the sticky material every 1 or 2 weeks and stir it with a stick to prevent the material from getting clogged with debris and dead ants, which will allow ants to cross. Ant stakes with bait can also be used around trees. In landscapes, some mulches can repel ants and discourage nesting. For example, aromatic pencil cedar mulch repels Argentine ants, whereas pine straw provides an ideal nesting site. Be aware that not all types of cedar chips repel ants: the effectiveness of red cedar chips found in California has not been verified.

Baits

Baits are insecticides mixed with materials that attract worker ants looking for food. They are a key tool for managing ants and the only type of insecticide recommended in most situations. Ants are attracted to the bait and recruit other workers to it. Workers carry small portions of the bait back to the nest where it is transferred mouth-to-mouth to other workers, larvae, and queens and other reproductive forms to kill the entire colony. Bait products must be slow-acting so that the foraging ants have time to make their way back to the nest and feed other members of the colony before they are killed. When properly used, baits are more effective and safer than sprays.

Baits are available in several different forms. For residential users, the most readily available forms are solids or liquids that are prepackaged into ant stakes or small plastic bait station containers. These products are easy to use and are quite safe if kept away from children or pets. Some products dry up rapidly and must be frequently replaced to control a large population.

A few boric acid products are liquids that are poured into containers or applied as drops on cards.

Reusable bait stations, which are primarily available to pest control professionals, are more useful than prepackaged baits for difficult ant problems. Reusable stations can be opened, checked and refilled as needed. This is particularly important for liquid baits, which may be rapidly consumed or dry out. Some of these stations have removable cups that can be filled with two or more types of baits to offer ants a choice. Bait stations protect baits from photodegradation and disturbance by children. Some types of bait stations can be permanently installed into the ground or attached to outside walls or pavement in areas around schools or other buildings where ants are a frequent problem. They may be hidden in mulch so they are not immediately visible to children or pets.

Gel formulations of pesticide baits are packaged in small tubes. They are applied in small cracks and crevices where ants are entering. Gel products are now available to home users as well as professionals.

Ant baits contain either carbohydrates (e.g., sugars), proteins, or oils, or some combination of these as attractants along with an active ingredient (toxicant). Different attractants are more effective against different species of ants and at different times of the year. In the case of Argentine ants, sweet baits are attractive year-round. Protein baits are attractive primarily in the spring because they are brought back to the colony to feed the developing brood. In the case of fire ants, they prefer baits containing oils. Offering a small quantity of each kind of bait and observing which one the ants prefer is a good way to determine what to use. Look for the active ingredient listed on the label of bait products. Some examples of active ingredients include hydramethylnon, fipronil, arsenic trioxide, boric acid (borax), avermectin B (abamectin), and n-ethyl perfluorooctane-sulfonamide (sulfluramid). Table 2 lists some common ant bait products organized by

active ingredient. Bait products are constantly being improved. Look out for new active ingredients and improvements to current products. Avoid products packaged as granules that contain the active ingredients cyfluthrin or permethrin. Although these products may be mistaken for baits, they are actually contact insecticides that rapidly kill foragers and do not control the colony. Likewise, bait stations with propoxur are not very effective because the active ingredient is too fast-acting.

To improve bait effectiveness, be sure to remove any particles of food or other attractive material from cracks around sinks, pantries, and other ant-infested areas. For the most effective and economical control, use baits only when

What To Do If You Have An Ant Emergency

- Determine what the ants are attracted to and remove the food source.
- Vacuum trails, wipe them with soapy water, or spray with window cleaner.
- Locate entry points and caulk openings or plug with petroleum jelly.
- Put out bait stations or apply gel bait at entry points.
- Baits take time to work so continue to clean up trails.
- Indoor sprays are not usually necessary.

there is an ant problem. Treatments made in late winter and early spring when ant populations are just beginning to grow will be most effective. Ant preferences can change throughout the year; to increase your success rate, set out different formulations of various bait products in a single baiting station,

giving ants a choice. Do not use any insecticide sprays while you are using baits. Check and refresh bait stations regularly. Baits can dry up or become rancid and unattractive over time.

Use baits primarily outdoors. Use indoors only if there is a serious infesta-

Table 2. Common Ant Bait Products Available in 2004. Effectiveness varies.

Active ingredient	Example product name	Formulation: application/bait
Arsenic trioxide	Grant's Kills Ants*	Solid: bait discs/sugar
Avermectin B (Abamectin)	381B Advance Select Granular Ant Bait	Solid: scatter or use bait station/protein
Borate-based products	Drax Ant Kil Gel ¹ Advance liquid ant bait ¹ Terro Ant Killer II Liquid Ant Baits* ²	Gel: apply in cracks/sugar Liquid: bait station/sugar Liquid: bait containers/sugar
Fipronil	Combat ant killing gel* Combat Quick Kill* Maxforce FC Ant Killer Bait Gel Maxforce FC Ant Bait Stations	Gel: apply in cracks/protein Solid: bait discs/protein Gel: apply in cracks/sugar Solid: bait discs/protein
Hydramethylnon	Combat Source Kill* Maxforce Ant Killer Bait Stations Maxforce granular insect bait	Solid: bait discs/protein Solid: bait discs/protein Solid: scatter or use bait station/protein
Sulfluramid (N-ethyl Perfluorooctane-sulfonamide)	Advance Dual Choice ant bait stations FMC FluorGuard Ant Control Baits Hotshot MaxAttrax ant bait* Raid Double Control Ant Baits* Zep ant bait stations*	Solid: bait discs/protein or sugar Solid: bait discs/protein or sugar Solid: bait discs/protein or sugar Solid: bait discs/protein or sugar Solid: bait discs/protein or sugar

*Available for nonprofessionals in retail outlets

¹Orthoboric acid

²Sodium tetraborate decahydrate (borax)

tion and you can't find the spot where they are entering the building, otherwise you could actually attract ants indoors. Outdoor baits draw ants out of buildings. Place bait stations where ants can easily find them, but avoid placing them in areas that are accessible to small children and pets. Place baits near nests, on ant trails beneath plants, or along edges where ants travel. Space them every 10 to 20 feet outside around the foundation and at nest openings if they can be found. Effectiveness of baits will vary with ant species, bait material, and availability of alternative food. To achieve wide distribution of the bait so the entire colony will be killed, the bait toxicant must be slow acting. Control with baits is not immediate and may take several weeks or more to be complete.

For more information contact the University of California Cooperative Extension or agricultural commissioner's office in your county. See your telephone book for addresses and phone numbers.

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To simplify information, trade names of products have been used. No endorsement of named products is intended, nor is criticism implied of similar products that are not mentioned.

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Indoor Treatments

If ants can be thoroughly washed away and excluded from an area, an insecticide is probably not necessary. Vacuuming up ant trails or sponging or mopping them with soapy water may be as effective as an insecticide spray in temporarily removing foraging ants in a building because it removes the ant's scent trail, especially if thorough cleaning is done at the entry points. Some soap products such as window cleaners can kill ants on contact but leave no residual toxicity. Certain plant-based oils are also applied for this purpose, but their odor can be offensive.

Outdoor Treatments

A common method used to prevent ants from coming indoors is to apply a perimeter treatment of residual sprays around the foundation. Commonly used insecticides include the pyrethroids bifenthrin and lambda-cyhalothrin. Both are available in retail products, but products available to professionals provide a longer residual control than home-use products. Spraying around the foundation will not provide long-term control because it kills only foraging ants without killing the colony. Perimeter treatments may appear to knock down the population, but ants will quickly build back up and invade again. To try to achieve long-term control, some pest control companies offer monthly perimeter spray

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WARNING ON THE USE OF CHEMICALS

Pesticides are poisonous. Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in the original labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, pets, and livestock.

Confine chemicals to the property being treated. Avoid drift onto neighboring properties, especially gardens containing fruits or vegetables ready to be picked.

Do not place containers containing pesticide in the trash or pour pesticides down sink or toilet. Either use the pesticide according to the label or take unwanted pesticides to a Household Hazardous Waste Collection site. Contact your county agricultural commissioner for additional information on safe container disposal and for the location of the Household Hazardous Waste Collection site nearest you. Dispose of empty containers by following label directions. Never reuse or burn the containers or dispose of them in such a manner that they may contaminate water supplies or natural waterways.

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