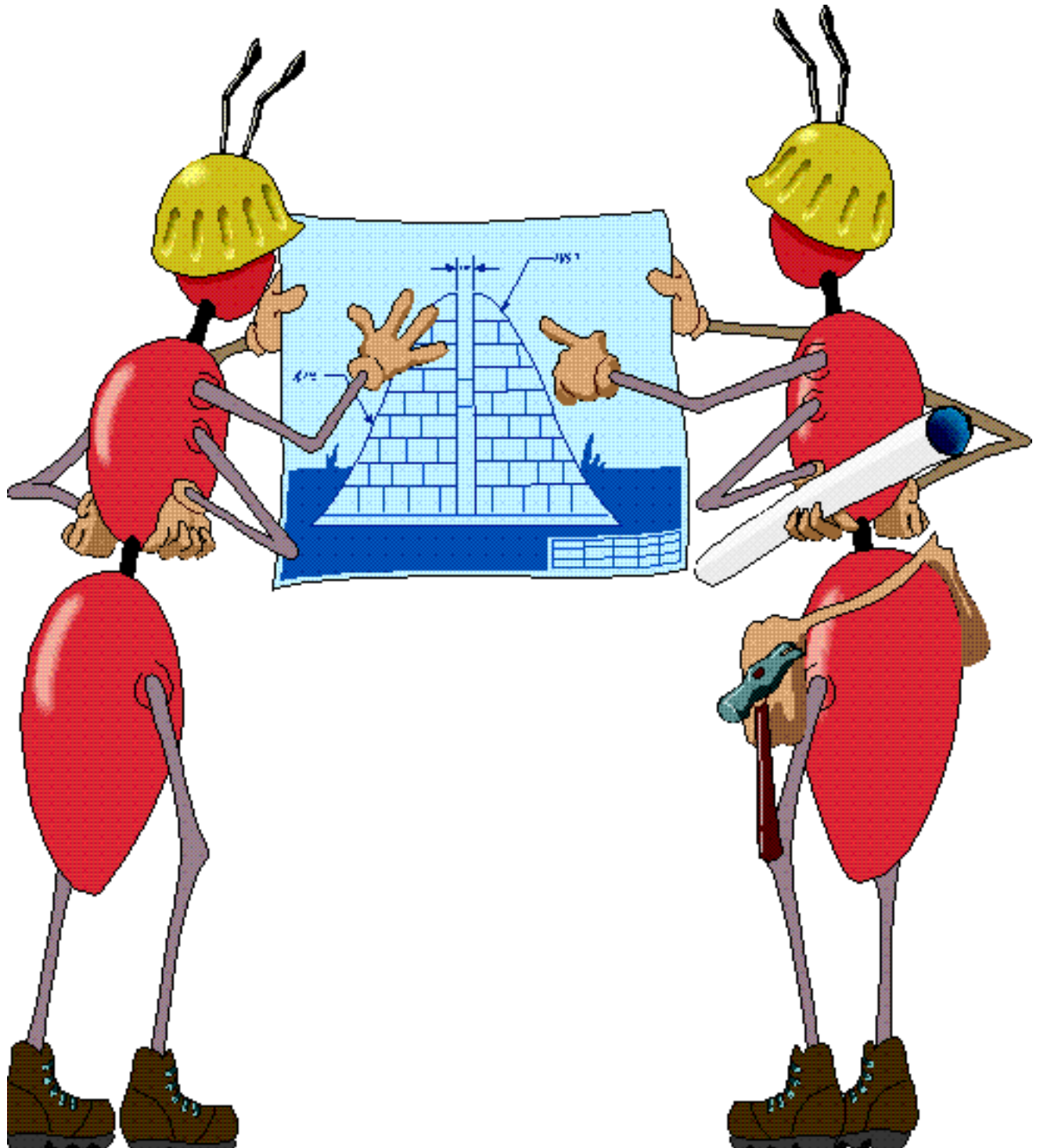
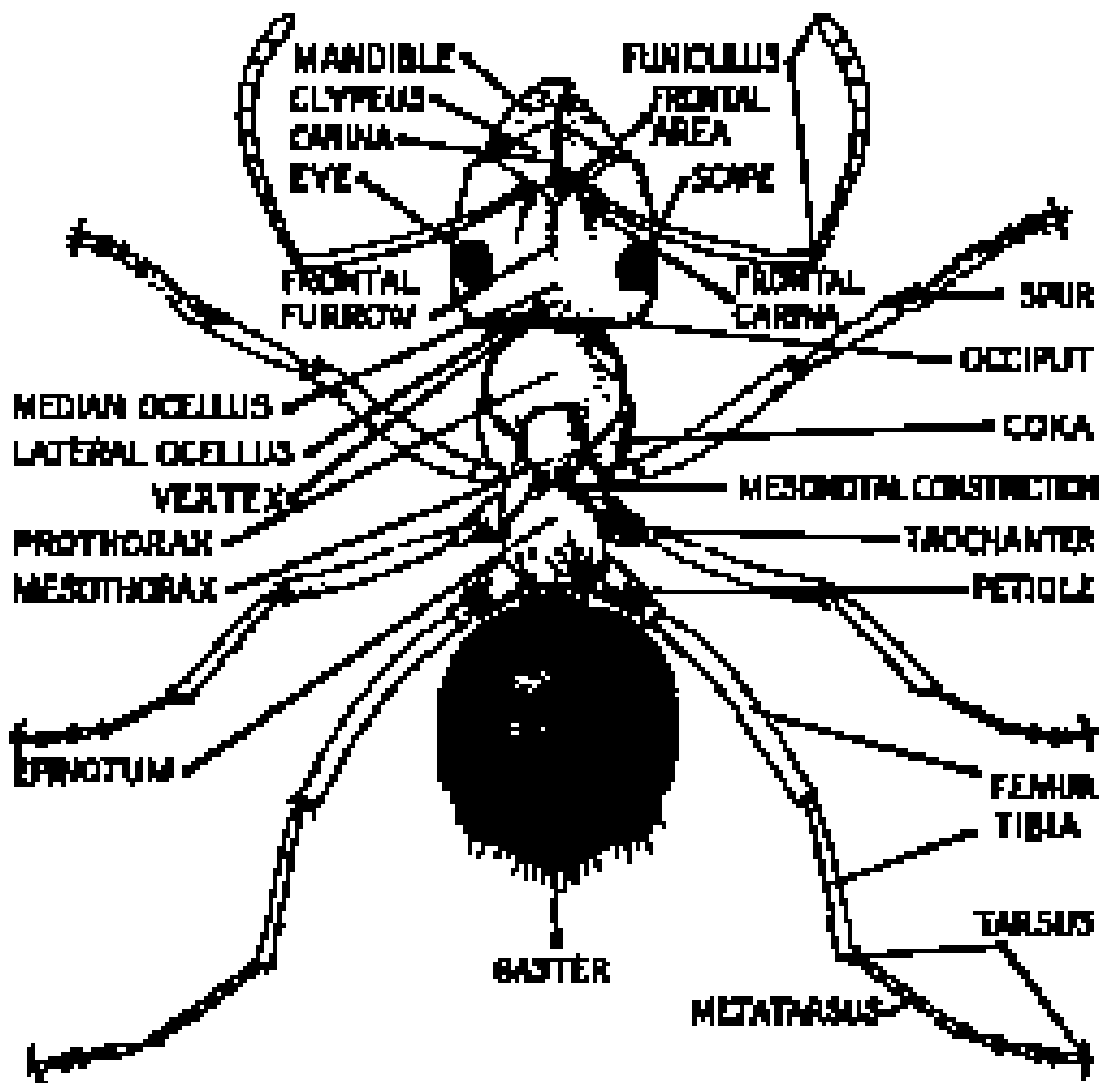


CHAPTER 15

THE BEST CONTROL FOR ANTS



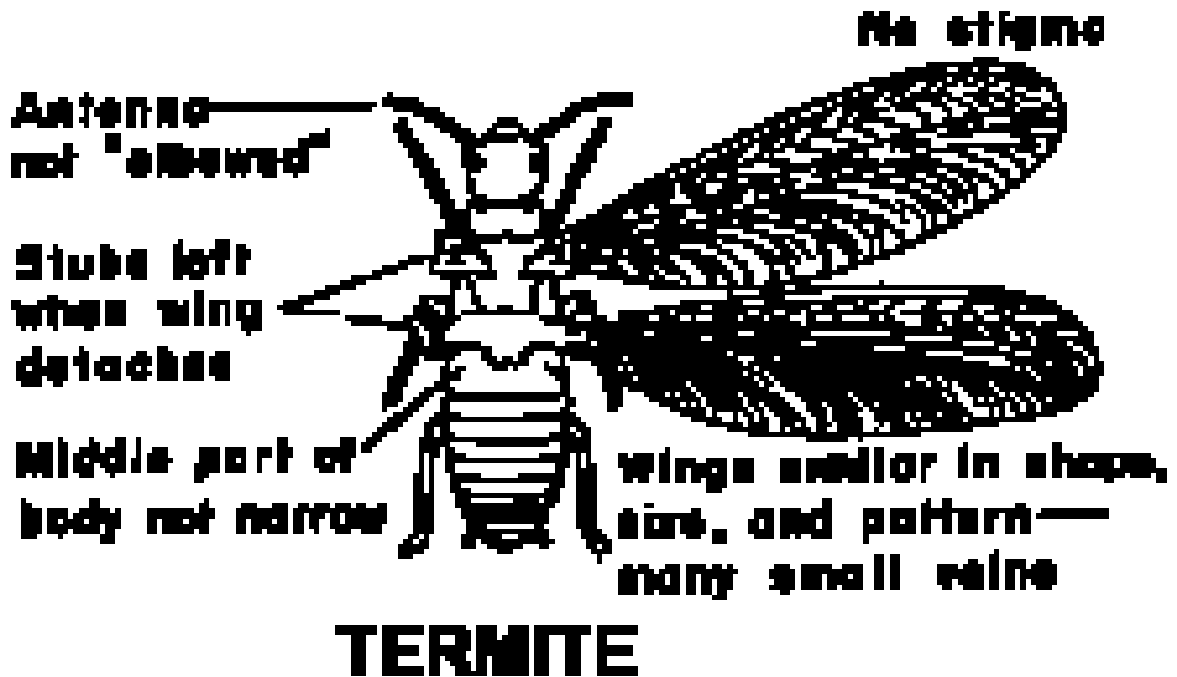
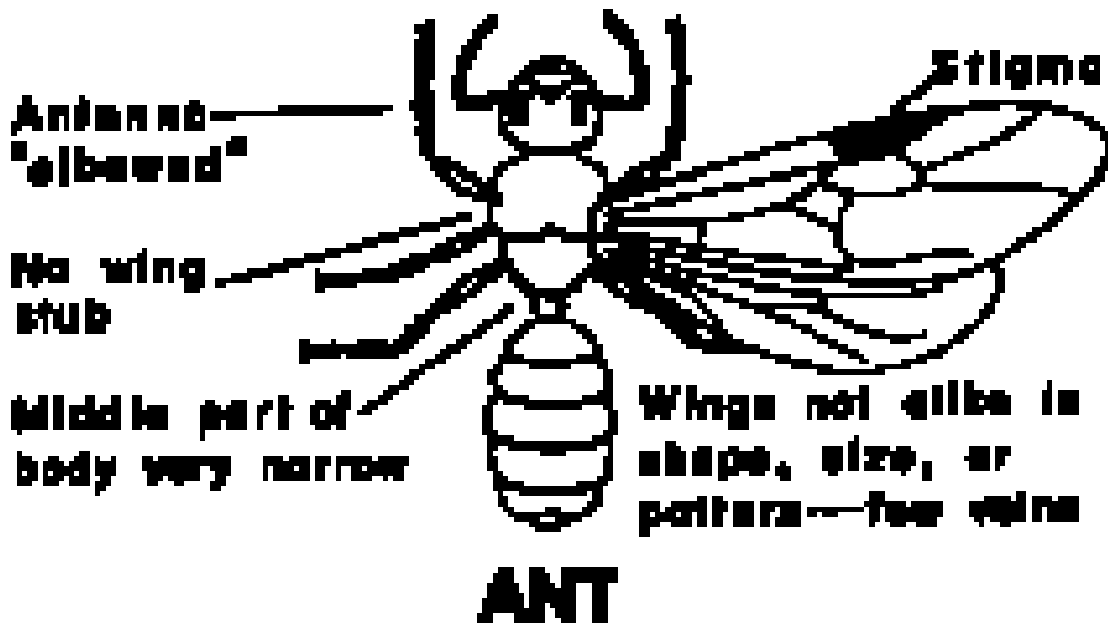


AN ANT DIAGRAM

There are more than 20,000 species of ants in at least 16 subfamilies and at least 300 genera, all of which belong to the formicidae family of ants, but only about 570 species in the U. S. and only about 30 species are considered house infesting pests. Ants are stronger than elephants! The strongest elephant lifts less than its own weight, but ants, working together, can lift several times their own weight. Some ants can lift 50 times their own weight! If man could do the same, he could lift a 5-ton school bus!

Along with termites, ants do most of the aeration and turning of the earth - moving more soil than earth worms and much more than all the world's human farmers. Ants are also important pollinators of some plants. They are little garbage collectors. Ants are also the most important carnivores on earth; they eat huge numbers of other insects, keeping many insect populations from reaching pest proportions. The results of PCT's April 1988 issue of "Service Technician" noted its Reader Poll Survey on which insect gives you the most headaches? Had 77% picking ants, 15% picking termites and only 8% picking cockroaches as the insect hardest to control. For those who may be interested, read Proverbs 6:6-8.

HOW YOU CAN DISTINGUISH ANTS FROM TERMITES



PEST OVERVIEW

Ants are the most dominant group of social insects. In the savanna of the African Ivory Coast the density of ants is more than 7,000 colonies and 20 million individuals per hectare. Ants belong to the insect Order Hymenoptera and are close relatives of bees and wasps. Throughout the world there are over 20,000 species of ants, but only about 50 are known to be pests of the food or structures of man. Except for the polar regions and a couple



of islands, they flourish on all land areas of the earth, from rain forests to deserts. All pest control technicians become involved with ant problems at some point in their career— most commonly because ants are found foraging or nesting inside structures - or because swarming ant reproductives are confused with swarming termites. Only a comparatively small proportion of ants cause damage - only these ants are considered to be pests around our homes and buildings because they feed on and contaminate our food stuffs, damage our wood structures, build unsightly mounds in our lawns and even fewer ants are aggressive and are able to inflict painful bites or stings. Most ants are extremely beneficial cleaning up mess after mess and up to 95% of all weed seeds! (They truly are nature's little garbage collecting ladies.)

INTRODUCTION TO ANTS -The Family Formicidae

The Ant Colony - The winged female reproductive mates with a male reproductive either during the swarming flight or on the ground or in the nest. The male usually dies shortly afterwards. The male is usually winged and retains its wings until death. The female then digs or adapts a cavity, usually in the soil, and walls herself in. At this time, if her wings are not already broken off, she tears them off. She then produces eggs. When the tiny, white, legless grubs (larvae) hatch, they are fed with salivary secretions from the female's stored fat cells and the breakdown of her now useless wing muscles. There are at least ten thousand trillion ants on earth and there may be 20 million in one colony. Although they each weigh only 1/10,000th of an ounce, collectively they weigh more than all the human beings on earth! Leaf cutter ants in the tropics consume more vegetation than any other creature and their nest may cover more than one acre. See Proverbs 6:6-8. After several molts, the larvae change into soft, white, pupae that look like motionless, white adults. Before they pupate, the larvae of some ants (carpenter ants and others) spin a silk cocoon — a white or tan papery capsule. When the pupae have made all the internal changes for adult functioning, they molt into the adult stage. Adults take on one of three roles or castes of the community: workers (all females), female reproductives, or male reproductives.

- Males usually live short lives, they mate with an unfertilized female reproductive and die.
- Ant queens are females. They mate and raise the first brood by themselves. Afterwards, they produce eggs for the subsequent broods that go on to make the colony, or large cooperative group. They may live many years. She is usually the largest individual.
- Workers, also females, tend the eggs, feed the adults, queen, and larvae and tend the pupae (often called incorrectly "ant eggs". They forage outside for food and construct, repair, enlarge and defend the colony workings. Worker ants are seldom winged. They are often extremely variable in size and even in appearance within a given species (monomorphic-one form; dimorphic-two forms; polymorphic-many forms).
- Other specialized groups may arise from the worker caste in certain species, soldiers, for example.
- Ants belong to the insect order Hymenoptera, which also includes wasps and bees.

Foraging - Ants are omnivores and eat a wide variety of food, including other insects, seeds, nectar, meats, greases, sugars and honeydew. Honeydew is a liquid produced by plant-sucking insects, such as aphids or plant lice, mealy bugs (groups of small insects with a white powder clinging to them), scale insects, and plant hoppers. These insects feed in groups on plant stems and leaves. Many species of ants protect these aggregations from other insects. Ants are a part of this pattern; they also take drops of honeydew continuously produced by the small sap-sucking individuals. Some ant species appear to just wander randomly; others trail each other precisely from colony to food and/or water source and back. Most ants follow structural guidelines as they travel, rather than in a straight "beeline". Ants communicate with each other using different methods, including pheromones, touch and stridulation (sound production), for transmitting messages. Workers foraging for food attract attention and communicate their messages when they return to the colony. Honey or light Karo Syrup seems to really attract honeydew-eating ants. Add 2% - 5% boric acid or sodium borate, or better still

4% - 5% food-grade DE or aspartame to make an excellent sweet bait which has both a food attractant and a convenient moisture source.

Ant and Termite Swarmers - The swarming of small, dark insects near or inside a structure usually panics people who fear their home is infested by termites. You must recognize the difference between ant and termite reproductives and communicate it clearly and confidently to all of the occupants.

Principal differences are:

Ants are holometabolous insects (i.e. they have a complete metamorphosis), that is, they go through the egg, larva, pupa and adult stages all which have different appearances. Ant workers are adult females and look all alike but may vary in size.

Termites have a gradual/simple metamorphosis. They go through the egg, nymph and adult stages. Nymphs look like small adult workers. Reproductives are dark-bodied and their wings are all the same size.

Ants have elbowed antennae. A long, straight segment called the scape connects to the head. The remaining segments flex and bend and are called the funicle.

Termite antennae are entirely flexible. Termite antennae are made of many small segments strung-out like beads. Termites wave them in front, using them to touch and feel.

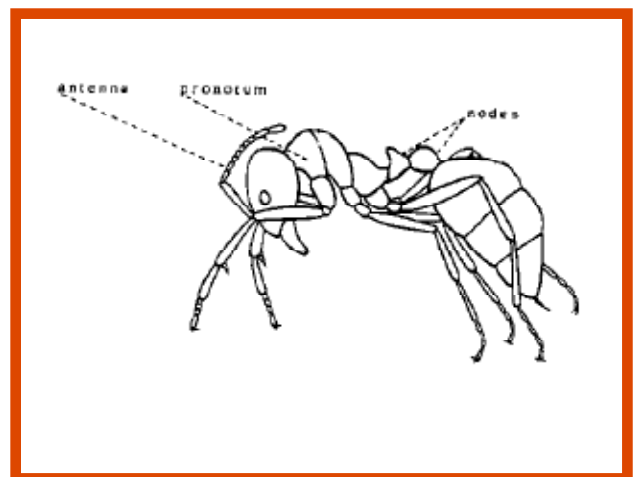
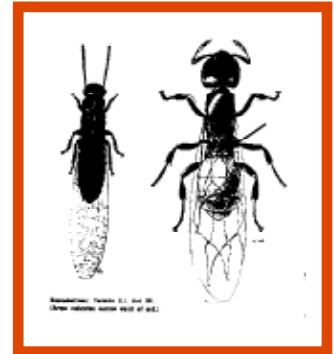
Ants have a thin or “wasp” waist between their thorax and abdomen called the abdominal pedicel.

Termite waists are NOT narrow. Termite bodies are straight-sided with no constriction. Both the thorax and abdomen blend together. Their wings are the same size.

Ant reproductives have two different pairs of wings. The front pair is much larger in size, wider and markedly longer than the back or hind pair. Often ants have a black dot near the tip of the front wings, and dark wing veins can be seen. Ant wings do not break off easily. Ant reproductives can fly considerable distances.

Termite wings are long and narrow; both pairs are the same shape and almost the same length. Termite wings break off with a touch. If termite swarmers have been crawling, their broken wings litter the swarm area. Termite wing veins cannot be seen with the naked eye. Termite swarmers usually can only “flutter” for short distances.

ANT CONTROL AND MANAGEMENT - The best control is cleanliness. The ant's greatest enemies are other ants. It is important to note that all of the ants found indoors, only a few species are responsible for the majority of infestations; some species are not common inside a structure but appear sporadically; and other types of ants are found inside only under rare or accidental conditions. While the third group is difficult to prepare for, the first group will be studied, discussed, and control experiences analyzed. The middle group may take an inordinate amount of your time, with inconclusive results. These elusive ants may appear several times in one year, then not be encountered for several years. Some are more or less common in some regions and uncommon in others. Remember, most ant infestations originate outside the building. **Ants are the most common cause of callbacks for the pest control industry.**



Remember if you are preparing your own baits or buying commercial baits that house infesting ants constantly vacillate between a carbohydrate and a protein menu - and remember ants are finicky eaters that prefer **fresh** baits. One example of a homemade ant bait: Mix 1 level teaspoon (or less) of boric acid per 2½ fluid ounces of corn syrup or honey. Heat until boric acid dissolves. Cool. Dilute bait with an equal volume of water. Apply bait with an eye dropper, or place it in small, shallow lids where ants feed. Keep baits available to ants for two weeks. Keep the mixture out of reach of children and pets. We only recommend using boric acid baits of 1% or less so they can act as a non-repelling toxin to ensure that the toxin remains effective after trophallaxis and that it is thoroughly spread throughout the colony before taking effect (slow-acting poison). Put green or red food color in the bait. Another safer bait is powdered sugar and baking soda, or use 5% food-grade DE or aspartame instead of boric acid.

Use negative ion plates, Safe Solutions, Inc. Enzyme Cleaner (with or without peppermint), Not Nice to Bugs®, salt and white pepper water, chalk, talcum powder, disodium octoborate tetrahydrate, borax, food-grade DE or medicated body powder to quickly control these pests. Try repelling them from coming inside with dry Tide® Soap, chalk, Comet®, talcum powder, cedar oil or freshly ground (cayenne) pepper. Incorrect identification is a very common reason for failure of ant control programs. Specialists who study ants are called “myrmecologists”. The best way to learn about ants is to build a collection and keep it for comparison. Elements important to consider when identifying an ant species and its control plan are:

Size. Ant species have fairly consistent size. At least 30x magnification is needed to distinguish features.

Nodes. Nodes are swollen segments of the petiole (the narrow connection between the thorax and abdomen). Most species have one; others have two; a few have none.

Color. Color may vary within the same species of ant, but it also can be a useful eliminating factor. Be sure to note the surface appearance of the exoskeleton.

Range. Most ant species are known to occur in a specific region.

Inspection - The key to virtually any ant control is to find the nest. All ants are social insects that live cooperatively in a colony. Large numbers of ants can be killed without ever solving your pest infestation. Keep a daily log or record of where ants are seen. Bait the workers with jelly, peanut butter, cut-up crickets, oils, proteins, etc., and follow them back to their nests, or look with a yellow or red light at night.

An important first consideration in the control of ants is to determine whether:

- the colonies are located inside the structure, or
- the colonies are located outside the structure, or both.

Indications that a colony is inside are when:

- ant workers are consistently found inside during the winter over a long uninterrupted period,
- nest building is observed inside (Look for wood shavings of carpenter ants, “dumping “ of various materials of pavement ants, etc.),
- the infestation is located on a top floor of a high-rise building, or when
- inside swarming is observed.

Indications that a colony is outside are when:

- ants outside can be visually seen coming inside.
- nesting sites outside are near the structure with an inside infestation, (Look for ant mounds next to the foundation, or trees with large carpenter ant colonies touching an infested portion of the house.)
- ants are seen nesting under slabs or swarming inside, but workers do not forage inside.
- ants seen inside can be visually “trailed” outside.

Whether or not the colony is inside or outdoors, ants that are known to tend honeydew-producing insects often will forage inside before plant insect populations can buildup outside. After populations of aphids, mealybugs,

scale insects, white flies and plant-hoppers become numerous (in late spring), ant colonies nearby put a great deal of energy into tending and protecting these plant-sucking insects. Worker ants foraging inside kitchens and basements often leave houses at this time to tend their honeydew producers outside. They may return in dry weather seeking moisture, but often will not be seen until the next spring. When pest control efforts coincide with this period, it is often difficult to tell whether the pest management procedures are effective, or whether the ants simply abandoned the structure due to natural causes or cycles.

Please attend to the following general considerations in developing a specific ant control plan:

Collection Tip - It helps to determine exactly which ant species you have infesting your building before you plan any control strategies - so put some food stuffs in a plastic bag (sealable) and let the ants enter and feed - or find some infested material and place in the bag - seal the bag and freeze it overnight - in the a.m., take several ant specimens and drop them into a vial of alcohol and then submit them to an expert for identification.

Location of and removal of the nest is the key to management because ants are social insects. Large numbers of individual ants can be killed without ever solving the problem. Determine the kind of ant species. Most species of ants never enter buildings; others will build their nests near buildings and forage indoors. Others usually nest indoors.

Inspection

- Talk to all of the occupants, especially children who like to watch ants. Get all of the information possible from the residents. Look for infested plants and mulch.
- Observe ant worker movement and plot it all on diagram if need be. Look for the focus of the infestation.
- To confirm your observations, use traps baited with a grease and a sugar or syrup or other ingredients suggested in **The Best Control II**® individual control notes, e.g., peanut brittle, peanut butter, cookies, light Karo syrup and/or cut-up crickets.
- Keep a written record of all sightings - bait these areas and follow the workers to the nest.

Inside: Inspect all holes and cracks where workers enter, any old or new moisture stains, note any food accumulations, e.g., dry pet food, activity near appliances, e. g., dishwasher and washing machines, under bath tubs, showers, in drawers, corresponding areas in adjoining room or rooms above and below activity.

Outside: Carefully inspect for workers behind vines, shrubs, other plants near house, expansion joints, slabs, patio blocks, bricks, boards, plant pots, under stones, rocks, boards, wood, debris and inside wooden columns and pillars, outside door and window frames, window wells, penetrations of house wall by telephone wires, air conditioning refrigerant pipes, trees that harbor colonies and provide access to houses by overhanging limbs that touch or even scratch shingles; water meters and storm drain inspection manholes. Inspect plants for ants and/or scale, aphids, mealybugs. Note: Leaf-cutter ants will not defoliate tall plants, e.g., roses, fruit trees, etc. if loosely-wadded sheep wool is tied around the stem; ants don't like to cross it and it is almost totally effective.

Use a red/yellow flashlight inspection at night.

Habitat Alteration

- Proper sanitation is the most important alteration you can make.
- Sprinkling food-grade DE or Comet® or Tide® laundry powder/soap or planting mint and lavender around the building or dog runs or spraying cedar oil are a delightful deterrents/repellants.
- Caulk all wall penetrations and mortar masonry cracks. Wall penetrations include utility lines, air conditioning, refrigerant pipes, phone lines, etc.
- Tighten all door and window frames. Lightly sprinkle talcum powder, baking soda, Comet®, food-grade DE and/or medicated body powders where the ants are entering.
- Repair water and plumbing leaks.
- Trim all shrubbery and branches away from house. Remove mulch and clutter.
- Remove any firewood that is stacked close to buildings; boards, stones, etc. that encourage nesting; screen openings in hollow pillars, columns, and ventilators.
- Control ant-tended aphids and mealybugs with horticultural pesticides, such as oils or soaps, or better

yet, with very diluted Safe Solutions, Inc. Enzyme Cleaners with Peppermint.

Intelligent Pest Management® Control

- Conduct a thorough inspection. Install negative ion plates. Spray Not Nice to Bugs® and/or mop with borax. (Mop with ½ cup borax per gallon hot water. Remember to keep borax away from plants, surfaces/areas that food, children or pets touch.)
- Consider the species when choosing bait. Some excellent all purpose bait choices include Light Karo Syrup, cornstarch, honey, molasses, peanut butter and/or jelly. Use baits with non-volatile stomach poisons, e.g., boric acid, borax or sodium borate. Baits are excellent in critical areas, e.g., computer or hospital rooms. Mix (5% or less) boric acid (or borax) or, better yet, 5% food-grade DE or aspartame into any food you see the ants eating - if the ants die by the poisoned bait - use less boric acid or DE - be careful not to allow children, pets or wildlife to eat the boric acid baits. Remember to routinely switch from carbohydrate back to protein baits, or use both. Do not spray or dust around baits. Never store baits or bait materials where they can be contaminated with any other odors, especially smoke or fumes of volatile pesticides. Ants and other insects can detect minute amounts of foreign or repellent chemicals and will avoid smoke, fragrances or chalk lines, calcium chloride, baking soda, cedar oil, food-grade DE, Comet®, talcum powder and other dusts.
- Vacuum and then carefully caulk/seal all cracks and crevices where a nest is suspected.
- Spray nests with Not Nice to Bugs® white vinegar, diluted Safe Solutions Enzyme Cleaner with Peppermint and food-grade DE or Fantastic®, or sprinkle them with talcum (baby) powder, calcium chloride dust, medicated body powder, Comet®, Bon Ami®, food-grade DE or crushed chalk. Fumigate with carbon dioxide or steam them with a steam cleaner.
- Make your own fresh boric acid (or borax) baits using their preferred foods, e.g., a liquid bait can be made with ½ teaspoon (or less) of boric acid in 2½ fluid oz. of honey or corn syrup or molasses - heat and stir until the boric acid is dissolved completely - mix in at least 1 - 2 equal parts of water (use more if you see dead ants by the bait) then put in small vials or lids or small tin foil "cups" where you have seen ant activity - but out of the reach of children, pets and wildlife. Bait until control is achieved (usually boric acid (or borax) baits should have 5% or less boric acid) or substitute 5% food-grade DE.
- **Finding and then eliminating the nest is the most effective ant control technique.**
- Pliny writing in the first century in book 18 of his Natural History noted "the most effective thing for killing ants is the heliotrope plant (*Heliotropium*).
- Ants in your pets food? Draw a line of chalk around the dish or sprinkle food-grade DE on the food.
- Ants in the ground? Flood with diluted Safe Solutions Enzyme Cleaner with Peppermint and food-grade DE or "fumigate" with carbon dioxide or carbon monoxide.

Develop a specific ant management plan. Where large outside areas need treatment, e.g., fire ant problems; do not treat with volatile, synthetic pesticide poisons as an extension of a yard problem. Ants use two methods to establish trails - pheromones and structural guideline orientation - investigate both. Properly install negative ion plates; use food-grade DE, borax, Comet®, Tide® laundry powder and/or spray with white vinegar, diluted enzyme cleaners or diluted peppermint or lavender soap and/or soapy, e.g., Lemon Joy®, water. Practice proper sanitation, structural alterations and moisture source reduction.

Follow-up - Reinspect in two weeks; ask all occupants if they have seen any remaining troublesome ant problems. Remember, some treatments can repel ants and make them active in other areas. Colonies with multiple queens may break up into several colonies, so do not use synthetic pesticide poisons for this reason, and because they are very dangerous to you, the occupants and the environment. Use talcum powder, chalk, baits, vacuums and, if absolutely necessary, you may apply spot treatments of silica aerogel, food-grade diatomaceous earth, and/or boric acid dusts as a last resort. **Try baking soda or diluted Safe Solutions Enzyme Cleaners first.**

HYMENOPTERA OVERVIEW - Hymenoptera means "membranous wing".

HYMENOPTERA - This is a very large order with over 60,000 species on earth. Members of the order have two pairs of wings, the front pair larger than the hind pair. They are fastened together by a row of small hooks along part of the front edge of the hind wings which lock with a corresponding curled-over length of the hinder edge of the front wings. Their mouthparts are biting and/or sucking. A large number of hymenopterous insects have a "wasp waist" or constriction occurring at the second abdominal segment, the first segment being fused

to the thorax. The females have an ovipositor which may be modified for sawing, piercing or stinging. The larva is usually legless with a well-developed head. A large number of insects in this group are beneficial to man, e.g., one outstanding example is the honey bee which produces honey and is our major pollinator. In addition ichneumon flies and some of their relatives are of extreme importance as parasites of harmful insects.

The order Hymenoptera may also live in social communities, e.g., the honey bee, the “social” wasps and all of the following ants.

ANT SPECIFICS

ORDER - Hymenoptera

FAMILY - Formicidae - Contains over 20,000 named species.

SUBFAMILIES - Dolichoderinae, Dorylinae, Formicinae, Myrmicinae, Ponerinae, (at least 16 in all).

TYPE METAMORPHOSIS - Complete.

Egg - (microscopic in size) Laid by the queen ants which may live 15 years; cared for by worker ants which live 4 - 7 years.

Larva - Soft, grub-like, legless, and head end usually the smallest - fed by workers on predigested, regurgitated liquid food.

Pupa - The transformation period between the larval and adult stages. Naked or borne in cocoons, according to the species. Inside these resemble the adult, but are paler in color and motionless. Commonly referred to as ant “eggs” and sold as fish food, you can see the workers carry them to safety after you disturb the nest.

Adult - (1) Worker, (2) virgin or fertile female or queen and (3) male. Note: It takes several days after emergence from the pupa for the ants to reach complete maturity; during these days of waiting their body hardens and attains full coloration. Workers can carry 50 times their own body weight.

Queen - A queen is generally the largest individual member in the colony. She has wings until after her mating flight, when she removes them. The primary function of the queen is reproduction, but after establishing a new nest she may also care for and feed the first brood of workers. Once she has reproduced her first brood, she becomes an “egg-laying machine,” cleaned and fed by her offspring. She may live for many years until replaced by a daughter queen. Some ant species have more than one queen in the nest. **It is impossible with sprays and dusts to kill the queen(s) unless you find the nest(s).**

Males - Male ants are generally winged and usually keep their wings until death. Apparently, the male ant’s only function is to mate with the queen. Once he does, he dies, generally within two weeks. Males are only produced in old, mature colonies.

Workers - The workers are all sterile, wingless females who build and repair the nest, care for the brood, defend the nest, and feed both immature and adult ants, including the queen. There may be female workers and soldiers of different sizes that specialize in certain tasks.

Note: Ants normally will not enter a building where food is not accessible; clean up all spills, crumbs, garbage, etc. and store food in ant-proof containers. Pour white vinegar, diluted Safe Solutions, Inc. Enzyme Cleaner with food-grade DE, diluted orange juice and peppermint soap and/or boiling water on the nests or “fumigate” with carbon dioxide or carbon monoxide or steam the nests. Eliminate all food sources that attract ants. Follow good sanitation practices. Thoroughly caulk openings and cracks on outside and inside where ants enter. Install negative ion plates. Draw a chalk line or lightly sprinkle talcum powder or medicated body powder or Comet® or baking soda or food-grade DE where you do not want them to enter. For permanent control practice proper exclusion, habitat reduction and proper sanitation.

TYPE MOUTHPARTS - Chewing & biting.

NORMAL LENGTH OF ANT LIFE CYCLE - From one month to 15 years depending on species and climatic conditions.

HABITAT - Ants can be found anywhere outside or inside in any room in a structure, particularly where food or garbage is stored, prepared, or handled. Wherever moisture is available; as around plumbing fixtures, around foundations, slabs, sidewalks and porches or dispersed throughout a lawn. In wooded areas in logs, stumps, trees, fences, telephone posts and railroad ties. Ants are the most prevalent pests in households. Ants are also found in schools, restaurants, hospitals, offices, warehouses and in any other buildings where they can find sweets, carbohydrates, fats, and/or proteins and water. Ants are social insects that live in colonies; ants build structures called *nests*; the nests are found in walls, in the earth, in wood or anywhere they choose. The nests protect ants from their enemies and the weather and are usually located near their food and moisture sources. Most ants can bite with their pincer-like jaws (few actually do), and some have venomous stings. However, ants are annoying pests primarily because they appear in large numbers in buildings and may nest in wall voids or other parts of structures. Ants can contaminate and destroy some agricultural products and stored foods. Certain ant species stain or cause feeding damage to textiles. On plants, ants protect and care for honeydew-producing insects (aphids, soft scales and mealybugs), which may interfere with the natural biological control of these pests. In nature, and in our buildings, ants are considered beneficial because they eat insect pests, e.g., termites, silverfish, clothes moths, fleas, etc. and aerate our soils. Look for indoor nesting sites, e.g., potted plants - if found, take the entire plant/container outside - then submerge the entire pot/dirt in standing water with a few drops of liquid dish soap or Safe Solutions, Inc. Enzyme Cleaner to kill the ant colony.

GENERAL DESCRIPTION - Ants are distinguished from other insects by their narrow abdominal pedicel, consisting of 1 - 2 segments situated between the thorax and the abdomen. Each segment is somewhat enlarged on the upper surface and the enlargements vary in size and shape from a slight hump to a rather high, flattened, plate-like structure called a node, knot or petiole. Ants are usually colored black, brown, yellow or red or a combination of these colors. Some ants can inject poison by bite, sting or spray. They feed on sweet material, grease, honeydew, starches, plant, insect and animal material of all types. All ants have a distinctly elbowed antennae resembling a man's bent arm which they use to taste and touch and recognize and communicate with other ants. Ants are eusocial, which means they beneficially live in organized groups.

Seasonal Abundance - Most outdoor ants increase in population and activity from spring into summer months and then decline from fall into early winter as the temperature drops and the ants' natural food supplies dwindle. Other ants, such as the Argentine ant, may increase in numbers in the fall as various colonies aggregate together to overwinter. Some ants, such as the Pharaoh ant, which may live entirely indoors, exhibit little seasonality.

Historically, ants are second only to cockroaches as "pests" the public continually tries to "control" with volatile, synthetic pesticide poisons.

Feeding Habits - Knowing the food habits of the particular ant species is important in ant management because it may indicate the locations, and elimination of the food that is attracting the ants to the site, it can also help to locate foraging trails to track the ants back to their nest, and it can help to choose an effective bait. **A 1947 USDA bulletin on ant control flatly stated that baits are the certainly best way to deal with ant infestations.**

Ants feed on many different types of fresh food. Some species will feed on practically anything; others may limit their food to a narrow range, still others will have select groups feeding on several different types of food at one time. Ants infesting structures are typically feeding on "people food," both food in storage (sugar, cakes, cookies, breakfast cereals, etc.) and food from spills and garbage. But they may also be preying on other insects or scavenging on dead insects in windows or lights or on the honeydew of your house plants. **Ants are extremely beneficial and truly are nature's little garbage collectors - ants ate 95% of the weed seed in a no-till cornfield study. They also clean yards of ticks, fleas, cutworm eggs and numerous other pests.**

Food preferences are often seasonal or opportunistic. When the Queen is actively laying eggs, worker ants typically gather protein - based foods for the Queen. At other times they may ignore protein foods completely and restrict their foraging to seeds, sugars, pollen and/or grease. So, vary your baits from proteins to carbohydrates or whatever you see them feeding or drinking - as ants constantly vacillate on food choices.

Many ants obtain sugar by feeding on honeydew, a sweet substance secreted by aphids and other plant - sucking insects. They often defend these insects from predators and "herd" or tend them as if they were the ant's personal food supply. Indoor infestations of ants are occasionally traced to large populations of aphids on

outdoor foundation plants or indoor house plants. Most will feed on light Karo Syrup or honey. Here is a recipe for effective, homemade ant baits/traps that use borax, a less-toxic, non-volatile remedy than most synthetic pesticide poisons. It attracts ants looking for either moisture or food.

You will need: 3 c. water
1 c. sugar
1 tsp. borax or 2 tsp. food-grade DE or aspartame
6 small screw-top jars with lids, such as jelly jars or mustard jars covered with masking tape

Mix the sugar, water and borax (or food-grade DE or aspartame) in a bowl. Loosely half-fill the jars with cotton balls or pieces of sponge or wadded paper towels. Pour up to ½ cup of the sugary mixture over the cotton balls, saturating them. With a hammer and nail, make several small holes in the lid. Screw the lids on the jars tightly. Place in areas frequented by ants, **but keep borate or borax baits out of the reach of children and pets.**

The seven most common ant species that infest buildings are the carpenter ant, the pavement ant, the thief ant, the crazy ant, the field ant, the Pharaoh ant and the Argentine ant.

All ants are social insects and live in colonies. Usually there are three distinct ant castes: workers (sterile females), queens (the largest members) and males (short-lived breeders). Some species also have a soldier caste. Castes usually look different from each other, perform different functions within the colony and are recruited into the caste at birth or later during their development. There are at least 12,000 species in 250 genera described worldwide (and probably 3 - 4 times as many exist) with at least 700 species in North America, but only about 25 species infest homes here. Nesting occurs either in the ground, under a structure, or within lumber, logs or within the walls of a structure. Ants will also nest in lawns, flower beds, beneath slabs, rocks, sidewalks, porches, crawl space areas and/or even in salt shakers. Nests may be terrestrial (on ground), arboreal (in trees) or structural in their location.

Ants locate food by random searching. When a scouting [worker] ant finds some food, she carries some of it back to the nest. Their exact means of communication is not known, but most ants leave scent trails that the others can follow back to the food source. Remove these scent trails and any visible ants with Safe Solutions, Inc. Enzyme Cleaners, or spray them with vinegar or bleach and you confuse and demoralize the colony. Ants require water to survive and will travel some distances for it if necessary. Workers are able to bring water to the rest of the colony in their stomachs - so supply them with 2% - 3% (or less) borax or boric acid or disodium octoborate tetrahydrate (DOT) or 4% - 5% food-grade DE, poisoned sucrose water in a bait container, e.g., light Karo Syrup or honey in a red packing slip.

Adult males and females of many ant species are winged with the front pair of wings always larger and wider than the hind pair, and they usually extend slightly beyond the tip of the abdomen.

In some ant species, the worker caste is polymorphic, usually taking two forms: large-bodied and small-bodied, but usually only one form is found. The worker ants ordinarily enlarge and repair the nest, forage for food, care for the young and the queen and defend the colony. In some ant species workers can also lay eggs.

Some ant species have only one queen per colony, whereas other ant species have multiple queens. In some species, colony reproduction occurs with a nuptial flight; in others, queens do not fly but walk off with some workers to start a new colony, a process known as budding. During this process, workers take small amounts of the brood, eggs and some queens and move away from the colony. Most ants need a queen to start a colony, but not pharaoh ants. They can start a colony with a few eggs, larvae, pupae and some workers. Pharaoh ant colonies usually consist of several nests with free movement of the workers between them.

It often takes several years for a new ant colony to develop to the point where alates or swarmers (winged reproductive males and females) are formed. When conditions are right they *swarm* and leave the ant nest to reproduce and start new ant colonies.

New Colony Formation - Once a colony of ants matures, it can establish new ant colonies through various methods, depending on the species. The two most common means are budding and swarming. The appropriate intelligent pest management® strategy depends on how a colony spreads, so it is essential to correctly identify

the ant species before deciding on how to control it.

Budding - Budding is the breakaway of a group of ants from a mature colony to form a new colony. The group usually consists of one or more queens and some workers carrying larvae. Budding is common with species of ants that have multiple queens, e.g., Ghost ants, Pharaoh ants, Argentine ants and some kinds of fire ants. Residual synthetic insecticide poisons should **never** be used to try to control ants that undergo budding because you make the problem worse because these volatile toxins can stimulate this process.

Swarming - Most ants establish new colonies through swarming. Every now and then, particularly in spring or early summer, mature ant colonies generate large numbers of winged forms. These are the young queens and males, going off to mate. An inseminated queen then rids herself of her wings and attempts to start a new nest in a cavity, under a stone or a piece of bark, or by excavating a hole in the ground. She rears her first brood alone, feeding them with salivary secretions and infertile eggs. If successful, the first brood opens up the nest and brings in food for themselves, the queen, and subsequent broods, and the colony grows. However, the percentage of queens that successfully begin new colonies is thought to be very small.

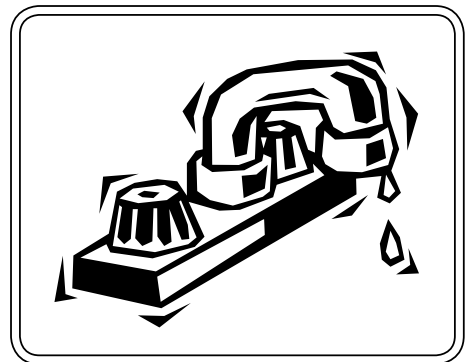
Swarming or Flying Ant Control - Turn on a (table) light at night; then when you get up or return, vacuum up all the ant swarmers in the area or hang a light over a 5-gallon bucket of soapy water.

The ant larvae, which hatch from microscopic eggs, are blind, legless, segmented and shaped like crookneck squash. The larvae are carried about by nurse-workers, who feed them with regurgitated liquids, partially masticated flesh or, in the case of fungus-eating ants, parts of fungi. The pupal ant stage varies in length from species to species and according to conditions in the colony and climatic conditions, e.g., Argentine ant pupation may range from about a week and a half to several weeks or more. When flooded from their nests, adults transport the pupae to drier ground. Argentine ant pupae are white and conspicuous and are easy to mistake for "eggs". The primitive ants have pupae that are enclosed in parchment-like cocoons, whereas the higher ants have naked pupae.

The more primitive ant subfamilies Ponerinae and Dorylinae are largely carnivorous and live on insects and other invertebrates. Many dorylinids prey on other ants. They include the army or driver ants, which are particularly vicious and kill and eat a wide range of ant species. The genus *Neivamyrmex* represents this subfamily in the southern parts of the United States, but these ants usually present no interior pest problem. The higher ants in the subfamilies Myrmicinae, Dolichoderinae and Formicinae are mostly herbivores, yet many higher ants can consume animal tissue as well.

Carpenter ants are usually a symptom of a water leak or moisture problem because they usually nest in wood that remains wet.

Check for moisture problems and leaks around windows and doors, plumbing fixtures and under shingles and make necessary repairs. Keep all human and pet foods in tightly sealed containers or in the refrigerator. Most ants prefer sweets, protein, fats or grease. Practice good sanitation. Avoid leaving dirty dishes or food particles where they are accessible to ants. Caulk cracks and crevices in building foundations. Remove rotted lumber, firewood and stumps inside crawls and from around buildings. Prune tree branches that overhang or touch buildings to prevent carpenter ants from coming inside.



Beneficial Aspects - A Midwest study of ants in no-till cornfields found that ants ate 95% of the weed seeds in the study area. They are nature's little garbage collectors and will control numerous insects including ticks. **They cart off and recycle 90% of the world's dead insects.**

HARMFUL ASPECTS - Visual annoyance, stings, destruction and pollution of food, damage to woodwork and masonry objects, holes gnawed in fabric and rubber goods, theft of seeds from flower and lawn beds, damage to domesticated plants. Some ants also act as intermediate hosts for parasites of animals and poultry and are also carriers of human and plant diseases, e.g., dysentery, streptococcus, pseudomonis and staphylococcus. Ants can contaminate food, hollow out wood, destroy textiles by feeding upon the soiled portions. There is evidence to suggest that ants may be mechanical carriers of such human diseases as small pox, cholera, dys-

entery, tuberculosis, staphylococcus, streptococcus, psedomonas and plague. **They can also destroy plants and may bite and/or sting.**

HARBORAGE LOCATIONS - Ant habits and harborage locations vary among species but have a basic pattern. Worker ants forage out from their brood nest in search of food. Once food is found, worker ants usually travel over established trails between the food and nest. If someone has seen ant activity in the building - observe and mark the positions of all workers on your floor plan inside and out to determine the direction of the trail. Extend an imaginary straight line to locate the nest in a stump, a tree, or wall etc. If you can not find the workers bait them with frozen/chopped crickets, jelly, peanut butter, bacon grease, raw liver, honey or cream and honey or a combination of baits (placed preferably on the trails) and follow the "food" back to the nest. Active sites should be noted on a survey diagram for a period of days. "Permanent" ant trails are found around drain boards, baseboards, molding, plumbing, electrical conduits, door and window frames, and cracks in the walls and foundation of the structure and outside on plants, trees and/or through lawns.

GENERAL INTELLIGENT PEST MANAGEMENT® CONTROL NOTES - Install negative ion plates. Lightly sprinkle baking soda, talcum powder or Comet® or Tide® soap or food-grade DE and/or spray with diluted Safe Solutions, Inc. enzyme cleaners with peppermint. Routinely repair all plumbing and moisture problems and caulk all cracks, crevices and openings; clean up daily and store garbage and food properly. Mop with ½ cup borax per 1 gallon water. The most pest-proof containers for storing of sugar, flour, rice and grains and pet food are glass jars with rubber seals and lids that are held closed under pressure with metal clamps. Such lids make a far better pest barrier than screw-top lids, which contain grooves insects can travel along. Foodstuffs can also be stored in plastic containers with tight-fitting snap-on lids.

- **Steaming the nest or carefully pouring 3 gallons of boiling water on the nest** works wonders - if they do not get the message the first time, they surely will understand your meaning the second time! You also can "fumigate and freeze" with carbon dioxide or carbon monoxide. An extremely fast and effective way to control ground nests is to mix 6 oz. Safe Solutions Enzyme Cleaner with Peppermint in 1½ gal. water and put this mix into a 2½-gallon stainless steel rechargeable fire extinguisher; pump up the pressure to around 100# and then spray directly into the next. You could also use a hose-end sprayer.
- **Use soapy water sprays, diluted peppermint soap and/or diluted Safe Solutions, Inc. enzyme cleaners, dusting with food-grade DE, baking soda, borax, Comet® or wiping up with white vinegar or a soapy sponge** to kill invading ants until you can undertake more permanent solutions.
- **Store all food stuffs and organic wastes in tight (sealed) containers.**
- **Buy a bag of oranges or other citrus fruit** and put them through a food processor blender; add a little dish soap. Sprinkle this mixture around foundation or on driveway seams or sprinkle Tide® soap.
- **Caulk cracks** where ants may nest or enter the house or spray cedar oil if you are not sensitive.
- **Use absorptive dusts**, e.g., talcum powder, medicated body powder or Comet® or food-grade DE in cracks, wall voids and similarly inaccessible places before caulking. **Spray nests with white vinegar or flood with diluted Safe Solutions, Inc. enzyme cleaners. Draw a chalk line where you do not want ants to cross.**
- **Flood flower pots** and outdoor nests with diluted Safe Solutions, Inc. enzyme cleaners to move or kill the ants.
- **Select the least-toxic poisons**, such as insecticidal or peppermint or lavender soap, orange juice and a dash of soap, Safe Solutions, Inc. enzyme cleaners, carbon dioxide, water, boric acid, Comet®, talcum powder and/or aspartame for baits and sprays.
- **Avoid planting plants that support honeydew**-producing insects next to your building.
- **The Ideal Ant Bait** will have a slow acting, non-repellent poison (e.g., boric acid, aspartame, sodium borate or food-grade DE) added at a rate of from 1% - 5% to a preferred food source, e.g., honey or light Karo syrup. Note: if your bait is too strong, there will be dead ants by the poisoned bait, which causes other ants to avoid the area and not feed on the bait. If you have dead ants by your bait - increase the bait or food and clean up the eating area before rebaiting. Keep all poison out of the reach of people, pets and wildlife. Remember ants will avoid tobacco smoke and not eat your poisoned bait if more desirable food is nearby - so stop smoking and clean, clean, clean!

The most effective ant control results from the destruction of the queens and the nest itself. Once the ant colony or nest is found by tracking returning workers, or through a survey, eliminating that nest is fairly simple, particularly if once it is located, as it often is, outdoors, or in the soil beneath a cracked floor. It is simply a mat-

ter of mechanically destroying the nest and the ant colony with carbon dioxide, boiling water, steam, food-grade DE, diluted Safe Solutions enzyme cleaners and/or peppermint soap, aerosol foam insulation, Comet®, talcum powder, etc.

But effective ant management is rarely that simple. Sometimes you can't find the nest. Often there are multiple nests. (One species, the Pharaoh ant, can have hundreds of small nests within a single room.) There may be a constant pressure from ant colonies invading from surrounding (outside) areas. In most cases, long-term management of pest ants means integrating improved sanitation, structural repairs, and habitat modification along with one or more direct control tactics such as vacuuming, insecticide baits, crack and crevice treatments with dusts or caulking, and direct physical controls, e.g., diluted Safe Solutions enzyme cleaners (1 oz. per quart water).

Successful ant management usually requires a combination of management tactics, ranging from caulking to cleanup, improved sanitation to habitat modification, spraying with diluted Safe Solutions enzyme cleaners with peppermint, as well as targeted and limited baiting with aspartame, or dusting with baking soda, talcum powder, boric acid, sodium borate, Comet® and/or food-grade diatomaceous earth, usually in that order.

The keys to success in ant management are, first, a vigorous and thorough inspection to determine the exact species and the nature and extent of the infestation, their feeding habits and, if at all possible, the location and structure of the nest(s). Second, meticulous sanitation to eliminate readily available food and water. Third, the choice of the right combination of tools to eliminate the problem. The listing for each ant species provides more detailed information on management strategies relevant to that ant.

Improved Sanitation - The best preventative control for ants is cleanliness. Like all pests, ants need food, water, and shelter to survive. By limiting these three essentials, you make it impossible or at least more difficult for ants to live in the infested area. Simply by improving sanitation you can often suppress existing populations and discourage new invasions. **Safe Solutions enzyme cleaners are not only excellent sanitizers, they can literally “dissolve or melt” ants.**

Ants can enter many types of food packaging, particularly once the package has been opened. (They have even been found inside glass jars after traveling around the threads of a screw-on lid!) Cereals, sugar, and other bulk food should be stored in tight plastic containers with snap-on lids, in glass jars with rubber seals, or in a refrigerator. Draw a line of chalk around or stick a bayleaf in flour or sugar tins to help keep ants away.

Food spills also feed ants. As with cockroaches, routine thorough cleaning helps to minimize ants. Frequent vacuuming, sweeping, or mopping of floors and washing of counter and table tops with diluted enzyme cleaner eliminates much of the food ants may be foraging on. Trash should be stored away from infested areas and monitored for spills. Remove plants that can attract ants or aphids or whiteflies and other insects that produce honeydew.

Ants can get their water from many sources inside a structure: condensation on windows, pipes and air conditioners, leaky plumbing, aquariums, pet dishes, house plant containers, floor drains, etc., and completely limiting these is usually not practical without a dehumidifier and/or air conditioner.

Ant-Proofing - Ants can enter and move through a structure through innumerable tiny cracks and openings. Yet caulking and otherwise sealing cracks and crevices being used by ants can often have great effect in suppressing the population. Many easy-to-use and effective silicon sealers and expandable caulk products have been recently developed, including some designed specifically for pest management. Repairing torn screens and installing doorsweeps can also prevent ants from readily entering a structure. Non-vegetation barriers such as stones or brick walkways next to a building can be helpful in helping to keep ants out of structures as well. Sprinkle baking soda, talcum powder, Comet®, food-grade DE, bone meal and/or dry Tide laundry soap around the foundation.

Habitat Modification - Trim the branches of trees that overhang, touch or are even located close to structures so the branches do not act as runways from nest sites to roof or siding. Eliminate structural openings, heavy mulch, debris, firewood and garbage. Alter landscaping to minimize the number of aphids and other honeydew-producing insects that can attract ants. Establish food policies. Firewood kept indoors should be moved outdoors

or regularly inspected for ants. Don't stack wood next to structures and move trash, since ants often nest under objects. Correct all plumbing and moisture problems. Moisture accumulation in buildings can also result in ant infestations. **So properly install and maintain dehumidifiers and vents and air conditioners.**

Direct Physical Control - Ants can be discouraged from foraging in certain limited sites with sticky barriers or negative ion plates or talcum powder or baking soda or food-grade DE or Comet®. Commercially available sticky repellents, Teflon, chalk, Tanglefoot or petroleum jelly can be applied in a narrow band around table legs to prevent ants from walking up to the tabletop. Double-sided sticky tape (try carpet tape) can also be used. Boric acid/sodium borate baits/food-grade DE properly mixed in food/water and safely placed out of reach of people, pets and wildlife work well for long-term control. Instant control can be achieved by spraying ants with diluted Safe Solutions enzyme cleaners. Large numbers of worker ants can be mopped or sponged up with soapy water. Water, especially boiling water, has also been used to flood ant nests as has carbon dioxide fumigation. Some ground-ant nests have been destroyed by digging them up and destroying the nest structure, or by drenching them with copious amounts of diluted Safe Solutions enzyme cleaner with peppermint or diluted (soapy) orange juice. **Mop with ½ cup of borax per gallon hot water.**

INTELLIGENT PEST MANAGEMENT® CONTROL OVERVIEW - Inspection - Location of the nest is key to control, because ants are social insects, large numbers of individual (sterile) ants can be killed without ever solving the problem. Determine the ant species - most ant species never enter buildings, others build their nests their nests outside and forge inside and still others nest inside - **know where to begin looking.**

Simply vacuum or mop them up. Wipe an ant trail with diluted Safe Solutions Enzyme Cleaner with Peppermint, soapy water or vinegar or borax or baking soda or bleach to destroy the scent the ants use to find a food source. Draw a chalk line or lightly sprinkle Tide® soap or talcum powder or baking soda or Comet® or food-grade DE where you do not want them to cross. Also look for ant nests in the soil of potted plants. Take the plant outside and flood the soil to drive ants out. If the nest of house-invading ants is outside, pour white vinegar or boiling, soapy water with orange juice, or diluted enzyme cleaners with peppermint on it or fumigate the nest with carbon dioxide or steam the nest. You may be able to find their nest (or entrance way into the building) by following the ant trail. If you cannot find a trail, put out honey, molasses, chopped up crickets, sliced wieners, sugar, mint jelly, peanut butter or syrup coated cardboard squares overnight for the ants to find. If you use enough (preferred) baits, e.g., honey or peanut butter or syrup, the next morning you should be able to easily identify and find their trails and can take action to close the cracks through which they are getting in.

For some ants, poison (or food-grade DE) baits are useful, so you will need to know their preferred feeding habits. Bait traps are manufactured with various (non-volatile) poisons and ant attractants or foods. The object of bait traps is for ants to bring the poisoned food back to the colony to destroy the colony. Boric acid is a relatively safe choice of poison bait; the best type of food will depend on the food preference of the ants which are bothering you. Use baits in conjunction with cleanliness and caulking. Establish food policies. To make your own bait, mix 3 cups water with 1 cup sugar and 1 teaspoon (or less) of boric acid or borax or food-grade DE or aspartame. Or if you have grease ants, use cat food or tuna fish instead of sugar. Pour 1 cup of bait into each of several small screw-top jars. Loosely fill half of each jar with cotton wool and then saturate with the bait solution. Close lids tightly with adhesive tape. Make a few small holes on the lid. **Do not let wildlife, children or pets near these borate or borax poisoned baits as they also can be severely injured.**

The “best” control you will use depends on the ant species involved. If the nest can be located usually permanent control can be accomplished simply by injecting the nest with talcum powder, boric acid, sodium borate, borax, silica aerogel and/or diatomaceous earth. To locate the nest, follow the trails from the food source (sliced wieners or crickets, sugar, etc.) back to the nest. If nocturnal, use a flashlight covered with red or yellow cellophane at night. **If you can not find the nest, you probably should use several best controls!**

Indoors - Use Safe Solutions enzyme cleaners and/or borax or baking soda or talcum powder or food-grade DE and/or negative ion plates. If the nest is indoors, such as within walls, hollow-core doors, floor, cabinets, etc., apply white vinegar, diluted peppermint or lavender soap or enzyme cleaners or an absorptive dust, e.g., baking soda, talcum powder, Comet® or boric acid or food-grade DE, directly into the nest. At times it may be necessary to bore a small hole into the wall void area to make this application. Following treatment of the nest, a supporting treatment of commercially prepared or homemade baits will help eliminate troublesome infestation. Placing baits closer to colonies may reduce completion from alternative food sources and increase

the probabilities of ant workers finding your baits. Use a food bait that is easily gathered and highly palatable to the infesting ant species, e.g., use low levels of aspartame, boric acid or sodium borate or food-grade DE as the slow acting poison on corn meal or light Karo Syrup or honey. Baits can be placed in electrical receptacles or red packing slips (stuck open) and secured in other areas traveled by ants. **Place boron-based baits with caution, out of reach of children or pets. Be careful not to contaminate food or food surfaces.**

Ant baits work on the principle of trophallaxis (the exchange of regurgitated food). A very low dose of a poison, e.g., boric acid in a favored food is provided to some scouts or workers. They not only eat the bait themselves, but bring it back to share with other members of the colony, especially the developing brood, who eventually obtain a lethal dose. **The queens may survive for a short time after all the workers have been killed, as they are larger and require a larger dose of poison.** However, surviving queens are very vulnerable since they usually require workers to forage for them and nurse their young. Workers in the pupal stage during the baiting period are also likely to survive, since they have not eaten any poisoned bait. Depending upon the size of this remaining group and the term of survival of the queen, the ant colony may be able to reestablish itself over time. **Ant species whose workers are also capable of laying eggs that develop into other workers and reproductives may be harder to eliminate entirely.** They can rebuild a colony without the queen if some of them are in the pupal stage during the baiting period. Periodic retreatment may be necessary. **At times ants will nest within concrete block wall voids.** If these voids cannot be penetrated from the top, holes will have to be drilled into the voids and boric acid or other sorptive dusts, e.g., talcum powder, applied. **If ants are using heat or cold air ducts for travel, only the use of vacuums, diluted Safe Solutions enzyme cleaners and/or non-volatile baits are recommended.**

Outdoors - Seek out the ant nest or simply follow ant trails to locate the nest (opening) and place baits containing aspartame, borax or boric acid; spray white vinegar, orange juice and soapy water, or diluted enzyme cleaners and/or Peppermint Soap in water, carefully vacuum near and/or on the nest and around the immediate area surrounding the nest. Try mixing 1 - 2 oz. disodium octoborate tetrahydrate or 2% - 5% borax or boric acid (in a slurry) into (heated) light Karo syrup or honey; place in out of the way places, out of the reach of children, pets and wildlife, and/or lightly dust with talcum powder or Comet® or food-grade DE. Or you can drench the nest area with hot soapy water and/or diluted enzyme cleaners thoroughly. As an alternative, you could use Safe Solutions, Inc. diatomaceous earth (DE) or you could or “fumigate” with carbon dioxide or carbon monoxide or steam it. More than one drenching may be necessary. Spray diluted Safe Solutions Enzyme Cleaners with Peppermint and/or properly bait in crawl areas, bait inside the foundation walls, around supports, posts, pillars, pipes or any other object ants may use for travel routes. Properly bait all shrub or flower beds and all the immediate surrounding areas. **Be careful to restrict access** to these treated areas from children and pets.

DESCRIPTIONS OF SELECTED SPECIES

ACROBAT ANTS

Crematogaster spp

Subfamily - Myrmicinae



Acrobat worker ants measure around 1/16” - 1/8 inch long and easily identified because of a somewhat heart-shaped gaster, especially when viewed from above. The ant has two nodes; it is shiny brown to nearly black in color. The workers appear to have their abdomens attached upside down: flat on top, “bellied” below, and pointed at the tip. When excited they point their abdomens up or even over their heads, hence, their name. Acrobat ants are common over most of the United States. There are many species. Antenna has 11 segments and thorax has one pair of dorsal spines. Some

species are quick to bite and emit a repulsive odor disturbed. Acrobat ants feed on sweets and proteins and will tend aphids, scale and mealybugs for honeydew (so bait with light Karo Syrup or honey and 1% - 2% borax or boric acid or food-grade DE) and also feed on other insects. They usually establish their colonies in wet wood, e.g., in or under rotting logs, trees and stumps in nature and sometimes live in abandoned termite or carpenter ant galleries if the wood is damp enough. They can also engrave their own small galleries in wet roof boards, foam insulation, house siding, porch rafters, pillars, sill plates, eaves, soffits, firewood, wall voids or virtually any part of a structure where the wet wood does not completely dry out. Like Pavement ants, Acrobat ant colonies occasionally dump their refuse. It consists of tiny wood shavings like those of the Carpenter Ant. The difference

between Acrobat Ant and Carpenter Ant shavings is that those of the Acrobat Ant are smaller and always dark stained from fungus. Acrobat ants may forage 100 feet from their nest and may feed inside kitchens; they are opportunistic omnivores that feed day and night; they seem to prefer sweets, high carbohydrate and protein foods. New colonies are formed by swarming flights of reproductives. The workers in large colonies can inflict a painful bite and sting when disturbed. New colonies are formed by mating flights.

Inspection

Look where structural wood has been subjected to water leaks and in all foam insulation:

- Look at the porch roof near the house, porch floors, siding where gutters overflow, ends of rafters in the shade, sills, and window and door casings where rain water hits, or carefully inspect older buildings and historical buildings that haven't been kept up. (Fungus or rot problems are very likely more important here than ant damage.)

Habitat Alteration

- Properly install vents and dehumidifiers.
- Remove and replace damaged wood. Install and maintain dehumidifiers and fans.
- Change the grade and install or redirect downspouts that pitch water toward structural wood.
- Clean or replace gutters.
- Trim all overhanging tree limbs that keep structural wood from drying.
- Move any/all logs, stumps, leaves and grass clippings away from structures.

Intelligent Pest Management® Control

Habitat alterations, especially dehumidifiers, fans and/or negative ion plates, should stop the problem. If not, bait with fruit juice and aspartame and/or vacuum. Inspect with stethoscope and moisture meter, then inject nests as needed.

Follow-up - Susceptible structures, especially damp or wet buildings with historical significance should always be periodically monitored. Detailed records concerning pest infestations, treatments and repairs should be kept on file.

ALLEGHENY MOUND ANT

Formica exsectoides (Forel)

Subfamily - Formicinae

(See the Ant Diagram found at the beginning of this chapter)

Allegheny Mound Worker Ants are often called field ants and are over 1/8" to over 1/4" long. These large black and red ants are found in the eastern United States making mounds often up to two feet high. More common in mountains than at coastal elevations, these ants forage actively around their mounds which often are interconnected. They are harmless ants and never forage inside. All your efforts should be made to educate the public NOT to destroy these ants. Swarming occurs in the spring.



ARGENTINE ANT

Tribe Dolichoderini, Subfamily Dolichoderinae

Iridomyrmex humilis(Mayr) or *Linepithema humile* (Mayr)

Argentine ants are an imported species common throughout the southern U. S., California and Hawaii; they are native to Brazil and Argentina. These aggressive, nomadic ants will nest in soil and mulch (and potted plants), as well as under stones, sidewalks, logs, and debris. They are also often found in soil, rotten

wood, refuse piles, termite bait stations, fruit trees, trash receptacles, empty soda pop cans, humming bird feeders, tree holes, bird nests, leaf litter, bee hives, roofs, wood shake shingles and in vehicles. These ants form

large colonies; workers from different colonies do not fight and will often join together to form larger aggregate colonies with hundreds of queens. This means that areas from which colonies are eliminated can quickly be repopulated. These large colonies will often split by budding during the warmer months. Although Argentine ants form winged reproductives, they do not swarm. Male swarmers are often attracted to exterior lighting; due to their diminutive size, small heads and large thorax, male alates are often misdiagnosed as midges or gnats. They are opportunistic and will feed on a variety of foods but seem to prefer sweets, e.g., 10% sucrose water baits, and will tend and feed on aphid and scale honeydew and nectar, which comprises 99% of their diet - so bait them with light Karo Syrup and 3% - 5% DOT or aspartame in large enough quantities. The workers are also opportunistic hitchhikers, predators and scavengers. They will even feed on fruit crops and are considered an agricultural pest in some areas. They will destroy practically all native ants and can be found on sleeping people and infants. Multiple queens that are each able to produce 60 eggs per day. Argentine ants are capable of transporting pathogenic bacteria. **Cedar oil repels them.**

Argentine ant trails are easy to locate along sidewalks, foundations, and along the edges of buildings (nests often share workers). If grass grows to the edge of the building it should be pulled back during an inspection. These ants will also move into buildings by climbing up trees onto wires entering buildings, so any place where branches touch wires or buildings should be inspected as well. As with so many other ants, use of a vegetation-free border and correction of moisture problems will help in management of Argentine ants. Perimeter baits using sweet baits are useful for managing this ant outside. Synthetic pesticide poison "barriers" are often ineffective because only a relatively few foragers are killed, at most 1% of a colony. Since there are multiple, interconnected nests, a search-and-destroy procedure for all of the nests is often ineffective also. They help aerate our soil and help decompose plant and animal materials. They will eat bedbugs and also other pest insects and drive off fire ants and harvester ants. Aromatic cedar mulch will control/kill these ants for at least 4 months.

Adult - They are small, slender ants, about 1/16" - 1/5" long, light to dark brown with a silky shine in color with lighter appendages and yellowish mandibles. The antennae have 12 segments, with the first segment about the same length as the (rounded) head. Thorax is uneven and there is a circle of hairs at tip of abdomen. The head is oval or somewhat triangular or heart-shaped. They have a single segment, node or knot in the pedicel, and a stale greasy or slight musty odor when crushed; they always walk in lines and travel in definite trails. There may be several to many multiple 1/8 - 1/4" queens (up to 10%) in one nest, each of which lays hundreds of eggs at a rate up to 60 per day! About 30 days later, the eggs hatch into larvae that are cared for by the all-female workers. In 11 to 61 days the larvae pass into a pupal stage before becoming adults 12 to 25 days later. If ant nests are flooded, lines of workers can often be seen carrying the white pupae to drier ground. They very seldom have mating flights, but male swarmers are attracted to outside lights. Reproduction usually by budding. Introduced originally from South America, this ant is now found from Maryland west to Illinois, in Washington, Oregon, in the southern states, especially from the Gulf Coast to Southern California and occasionally elsewhere, especially in urban centers in moist situations near a food source. They tend honeydew-producing aphids/scale. They prefer sweets, but will feed on almost everything. They do not like dry, hot weather. Look under boards, stones and concrete. Seldom bite; never sting. Queens and ants from all colonies are friendly with one another. They have no natural enemies. Because of their *sweet tooth*, use sweet baits, honey, sucrose water or light Karo Syrup with aspartame or 2% boric acid or 1% disodium octoborate tetrahydrate (DOT) or 3% - 5% food-grade DE to control this ant. But remember, while sugar or light Karo Syrup or 7-Up® is the preferred food source of workers - queens may also have high protein requirements, so we suggest you **also** use some peanut butter baits or fish meal baits with 1% borax or 3% food-grade DE. **Keep all baits out of the reach of children, pets and wildlife.**

HARBORAGE

In their primary range, these ant populations are intense. They forage night and day. They can constantly infest and reinfest structures, vehicles, e.g., trains, cars, buses, etc., and agricultural land, e.g., citrus orchards and cane fields and pool areas, potted plants, roof debris, wood shingles and roofing and termite bait stations. Argentine ant colonies quote often are large and compatible: Workers and queens of different colonies are not antagonistic toward each other; foragers maintain vigorous trails that often coalesce with those of other colonies to form super-colonies. Argentine ants love fruit trees, tend honeydew producing insects, protect them (e.g., aphids and scale) from their predators, and are known to move aphids to other plants where they begin new infestations. Argentine ants will not tolerate other species of insects, especially other species of ants, within their foraging range. Argentine ants seek sweets: outdoors - fruit, honeydew from insects, plant nectar, hummingbird

feeders and honeybee colonies, etc.; indoors - pop cans, trash cans, juices, sugar and syrups. Populations have been introduced in urban areas outside the primary range with the transfer of plants and household goods; these infestations are smaller and local. This secondary distribution includes many southern cities where *exterminations* and reintroductions proceed on a case-by case basis. Other more northerly cities (where the Argentine ant is established, but not a primary problem ant) include St. Louis, Chicago, Baltimore and probably other areas where it has not been recognized. They usually do not overwinter outside in these areas - It helps to remove branches and vegetation and/or organic mulch that touch the walls of the building. Like fire ants, they can mass into balls and float in flood waters. Large colonies of Argentine Ants will keep fire ants at bay or the fire ant colony, if large enough, will remove all Argentine ants. They also will kill German cockroaches and conenose bugs. Regularly clean with diluted enzyme cleaners and/or borax.

Inspection (They do not forage at 43° F. or lower or 90° F. or higher and normally forage at night.)

In the primary distribution area where Argentine ants commonly infest the majority of structures, make every effort to locate nests outside near the infested structure. **Their nests can be 60 yards away or more.**

Outside (An entire colony with hundreds of queens can move into your yard in 2 hours):

- Practice proper sanitation.
- Remove all mulch (other than aromatic cedar mulch) from around the foundation of the building. Seal all cracks and crevices.
- Thoroughly inspect soil area next to foundations especially moist soil.
- Survey inside and outside for colonies of honeydew-producing insects.
- Inspect shrub stems and under plant leaves. Do not let any branches touch the building.
- Follow ant trails and identify nests, food, and active entry points into structures.
- Inspect all nearby manholes, trash cans, streamline tunnels and beehives.
- Prebait/monitor with light Karo Syrup, 50% honey, 50% water, and peanut butter bait stations.
- Flood nests with diluted Safe Solutions enzyme cleaners with peppermint and food-grade DE or diluted orange juice in soapy water or carbon dioxide or steam.

Inside:

Inside ant populations tend to be relatively small, less active, and can be eliminated temporarily. Locate the most active areas. Decide whether the activity is because of a food source or an entry point. Inspections for Argentine ant in urban areas outside the primary range requires closer inside inspection. Often the nest and entire population is completely within the area of activity.

- Beginning with the problem location, first inquire whether any of the occupants have used any pesticide poison sprays or dusts that may have spread the ant population or repelled them from another area.
- Ask if any goods have been brought in from other infested structures in the past year.
- Inspect for moisture sources, pop cans and other sweet food sources. Use non-toxic sweet bait cups if necessary, and make close inspection in the kitchen and adjoining rooms.
- Inspect streamline tunnels connecting buildings. **Be careful** - many contain asbestos.

Habitat Alteration

- Practice proper and routine sanitation.
- Wash dishes and clothing, clean, dust, vacuum and mop regularly. Practice proper sanitation.
- Keep food preparation areas and dining areas clean and dry. Store food in ant-proof containers.
- Recommend trimming back all vegetation, shrubs and other plants next to foundations - both to facilitate inspections and ventilation and bait placements outside. Wash recycling containers.
- Reduce any/all sources of water that contribute to moist soil. Empty garbage regularly.
- Eliminate plants that produce fruit or support honeydew producing insects if possible, (e.g., citrus, bamboo, oleander, cherry laurel, fig). Replace with low maintenance plants or recommend treatment of aphid, scale insect, mealybug and plant hopper colonies with low-toxicity sprays registered for use on plants, or better still, spray with diluted Safe Solutions enzyme cleaners. **Clean with borax.**
- If ants are trailing up and down a tree, use a sticky barrier or Vaseline® to prevent them from obtaining

honeydew.

- Weather-strip and/or caulk ant entryways into structures such as foundation cracks and crevices, openings under siding, frames around windows and doors, wall penetrations of wires, plumbing, etc.
- Lightly sprinkle baking soda, Comet®, talcum powder and/or Tide® soap or medicated body powder or food-grade DE. You can also spray ant trails with bleach or vinegar.

Intelligent Pest Management® Controls - Baits work best, but you must control more than 90%!

Outside:

- **Install negative ion plates and/or cedar mulch and/or drench nests with steam or boiling water, or white vinegar or diluted Safe Solutions Enzyme Cleaner with peppermint and/or bait with liquid sweet bait stations every 10 lineal feet. Sweet baits can be simply made with 50% water and 50% honey (or use light Karo Syrup) and then adding a 4% - 5% food-grade DE or 2% or less boric acid or borax or, better yet, 1% disodium octoborate tetrahydrate (DOT) to the bait. But keep boron baits away from people and pets.**

Inside:

- **Install negative ion plates and vacuum and/or spray and clean with diluted Safe Solutions Enzyme Cleaner with Peppermint or borax;** wait 2 weeks - then and only then use any available registered sweet and/or protein baits either with boric acid or sodium borate applied according to label recommendations. Use baits that will be taken back to the queen and larvae. Baits are more effective during periods of low honeydew production. Use sugar water or molasses or honey with diluted aspartame or food-grade DE.
- As a last resort, you may have to make boric acid or borate baits and make a spot application with residual dusts, e.g., boric acid, (or, better yet, talcum powder or medicated body powder or Comet® or food-grade DE) which can be applied in cracks and crevices, wall voids and electrical outlets. These dusts applied in cracks and crevices and are transferred in the nest by preening of other workers.

Follow-up - Ongoing monitoring/baiting is recommended where Argentine ants are recurrent problems. Monitor for honeydew-producing insects as well as for ants. Borax and boric acid and sodium borate baits must be kept out of reach of children, pets and wildlife. Nests are in dark places.

Little follow-up is necessary after treatment for Argentine ants except vacuuming of isolated infestations outside the area of primary distribution. Never bring in goods from known sources of infestation without first **thoroughly** inspecting for them. They can follow the spiral thread into screw-top jars. They are commonly found inside refrigerators. Fall and again in spring are the best times to (protein) bait for Argentine ants. **Want to repel ants? Apply Vaseline. Need more repellency? Add eugenol or farnesol or cedar oil.**

In 1911, Professor L. J. Nickels from the University of California at Berkeley published a paper outlining his control plans for the San Francisco Bay Area using an arsenical poison. Professor Nickels concluded with: "As I have said, the results so far are very satisfactory. We have established that it is possible to eradicate the Argentine ant and to absolutely prevent its spread." The Professor's trust in poison was obviously misguided.

CARPENTER ANT

Tribe Camponotini, Subfamily Formicinae

***Camponotus Spp.* (More than 1,000 described species)**



GENERAL DESCRIPTION

Note: See also the Carpenter Ant section in the Wood Destroying Organisms Chapter.

Adult - Carpenter ants are the most visible ant found in and around buildings; they are large, approximately 1/4" to 3/4" in length. Thorax evenly rounded. Circle of hairs at abdomen tip. (Polymorphic adults will vary greatly in size in the same nest.) Black, yellowish or black variegated with reddish (rusty) brown or grayish in color. At least ten species are native to the United States; they are found nesting in decaying wood, including lumber in buildings, but do not eat wood; primary foods are honeydew derived from other insects, as well as fruit, fruit juice,

meat, grease, fat and dead insects. Their thin waist consists of one petiole or “knot” which is pointed. The legs are long and the antennae elbowed. The winged forms have four wings, the front wings longer and larger than the hind wings. The male can be distinguished from the female by its smaller head and protruding genitalia. Ants in the genus *Crematogasta* are also called “carpenter ants”. The most common species is *Lineolata* (Say) which is variably colored and only about 1/8” long. Knock on the wall or hollow door and listen - they sound like crinkling cellophane as they move about inside their nests. Wood with 20% or greater moisture content is a prime location for nests.

Larva - Larva are white grub-like young found only within the nest where it is fed and cared for by adult workers. **Cannibalism of larvae is common when there is a low food supply.**

Pupa - Pupa are brown in paper-like cocoon. Size of the cocoon is dependent on the type of pupa inside-worker, female or male. **Pupal case must be torn open by adults or the pupae cannot emerge.**

Egg - Small, white, egg-shaped object laid singly by the queen ant in a very moist environment.

LENGTH OF LIFE CYCLE - Approximately 2½ months or longer. Colonies of ants mature in 2 to 6 years and normally contain 2,000 - 3,000 individuals. Colonies of *C. Modoc* and *C. vicinus* can have 50,000 to 100,000 workers in 10 years. Swarms of 200 - 400 winged reproductive forms are then produced each spring or early in the summer - they mate in the air on warm, still days. Most active at night.

HABITAT - These ants can be found outside or inside or any (humid) room in a structure, particularly where food or garbage is stored, prepared or handled. Initial nesting usually occurs in the soil, or under a rock, then in softer wood, such as decaying logs, moist or rotted beams, structure siding, trees and wood fences, hollow doors, window and door sills, decks, fireplaces, sill boxes, fuse boxes, attics, closets, etc. especially wherever there is or has been a source of moisture. These nests of random galleries are usually referred to as the brood nests where the eggs, larvae and pupae are held during development. Sometimes some of the brood is carried to a nearby location to create a satellite nest. Carpenter ants are nocturnal by choice and are, therefore, best observed at night with a red light. They love high humidity (wood or voids with over 20% moisture content), so use a dehumidifier and repair all moisture and/or drainage problems. Look at the base of trees, poles and fences.

NATURE OF INJURY - Carpenter ants carve galleries into the damaged/soft wood (with the grain) to make their nest. They may eventually hollow out and damage sound structural timbers. They are also a visual annoyance as they wander in search of food, and the foraging workers have rather large mandibles with which they can bite. When excited, carpenter ants click their mandibles. Bang on the wall and hollow doors and then listen for carpenter ant “rustling” noises with a stethoscope.

FOOD - Carpenter ants do not eat wood; they only cut galleries and create frass (wood fragments or sawdust) as they hollow out their nests from decayed areas in your building. Workers forage for pet food, candy, honeydew, syrups, honey, jelly, pop, sugar and other sweet materials, e.g., apples and fruit, or even garbage, the juices of dead or living insects, grease, proteins, peanut butter, fat and/or meat scraps. They may travel 300 feet or more from the brood nest to find food or water. In their natural setting, the feeding area is limited to the canopy of adjacent trees where they feed on insects and honeydew, usually at night. Food is carried back to the nest where it is regurgitated and used to feed the queen, larva and non-foraging workers. Honey poisoned with 1% or less of sodium borate (DOT) or 3% - 5% food-grade DE will kill some carpenter ants who will then be cannibalized by some of their meat-eating sisters and/or the queen will be killed. Put baits in red traps or red packing slips (stuck open) securely fastened in out-of-the-way locations; check and replenish the liquid bait as needed. Note: In the North they do little feeding after September 1, so bait them before this date or wait until next spring. Also, bait placements should be made later in the day. Kill them with open packets of aspartame.

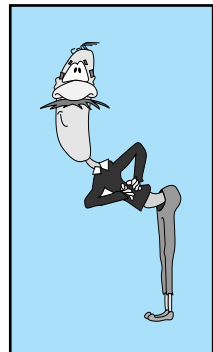
PREVENTION - The best carpenter ant protection is to maintain dry conditions with proper construction and maintenance. Remember that anywhere wood is in contact with soil there is a risk of carpenter ant infestation.

1. Remove and repair all wood damaged by moisture, ventilate damp areas, clean gutters to avoid clogging which leads to water damage to siding or roof. **Remove all moisture sources. Properly install vents and dehumidifiers.**
2. Store all firewood on raised platforms, outside and well away from the house.

3. Prune trees so branches don't touch or overhang the house.
4. Remove all nearby rotted stumps or logs. Check for rotting landscaping wood.
5. Ensure that all the wood of the siding or structure isn't in contact with soil at any point around the house foundation. Air currents irritate these ants, so keep the fans going.

HARBORAGE POINTS (Nests) - Carpenter ants make two types of nests. **The main or brood nest is normally located in soil, under rocks or in plants; most are not in decaying wood.** This site must be permanently moist or the eggs and younger larvae cannot survive. Old nests can contain thousands of ants, but it takes several years for a new nest to build up to a few hundred individuals. Main nests are usually outdoors in rotting stumps, trees or in decaying landscape timbers. They can become established in houses where wood in the structure has begun to decay. Although carpenter ants do not eat wood, they do tunnel into it to make their galleries. Once they establish a nest in damp wood they will eventually damage the structure by tunneling from the decaying wood into the sound wood. Carpenter ants can also make **satellite nests** where they care for the older larvae and pupae that tolerate dryer conditions. These nests are often in wall voids and eaves, ceilings or under materials, e.g., insulation in attics or crawl spaces. Most carpenter ant nests in houses are opportunistic satellite nests that maintain communication with the main nest. **Remove them all!** (There are over 300 times as many ants out at night, so inspect at night.) Nine out of every ten nests can be found outside in soil or in trees 8" or larger in diameter; look for rotten areas and holes and frass (sawdust). Typical carpenter ant nesting sites are found in the soil, inside branches, hollow porch columns, exposed wood beams, floors and walls near leaking plumbing, roof areas with leaks or built-up roofs, walls near stopped-up gutters, hollow core doors, wallboards, particularly under sinks, toilets, dishwashers and/or windows that sweat such as storm windows, cabinet bases, planter boxes, wood shingle roofs, firewood in fireplaces, or in any damp or rotten structural members of a structure. In the woods, they will be found in fallen logs, hollow trees and around broken limbs. Galleries are continually being carved inside timbers to create the ever-expanding nest. As the colony numbers increase the nest will eventually extend into dry, sound lumber. Galleries are irregular in shape, smooth surfaced and clean; they look like they have been sand-papered. Frass or undigested wood fragments are carried from the nest and deposited outside. Piles of this frass or sawdust (which can also include insect fragments, soil particles and food residues) may often be found beneath infested wood members and is very helpful in locating the nests. Inspections should also be made at night using red or yellow light. Don't forget to look for nests on the roof, e.g., under shingles near a skylight or where telephone/electrical lines lead to a roof. **The majority of carpenter ants nests are found in the soil or in partially buried wood.** Air currents irritate them, so use air to flush them and leave the fans run 24/7.

For proper control of a carpenter ant infestation, you must first locate and destroy the nest(s). Ask where the ants are seen most often. Have there been any water leaks in the last few years? Where has anyone seen any piles of sawdust or insulation? Are the ants seen inside when it is cold or cool outside? If so, look for inside colonies. Thoroughly inspect the crawl spaces and attics as well as under porches. Look for signs of nesting activity, such as mounds of loose frass or shavings or sawdust beneath a crack in a wall or eave space. Also, listen for rustling sounds in the walls (use a rolled up paper tube or stethoscope to amplify the noise). Carpenter ants particularly like to nest in wall cavities, under siding, between floors and where wood is in contact with soil. Satellite nests can also be near roof gutters, downspouts and in the ceiling. Ask the occupants to mark with small "Post It" dots every place they see ants for the next 48 hours, especially at dusk, after dark and in the early morning hours. (You could use different colors or note on the "Post It" notes when you saw them and the numbers.) Some people have had success putting out sugary food (a few drops of honey or syrup in bottle caps where ants have been seen) and/or trays of frozen crickets and following the ants carrying food back to their nest (about 1 hour after dark). Place a 50-50 mixture of honey and water where you have seen carpenter ant workers in your building of sundown - when full they should return to their nest by the most direct route - you may have to follow them at night so bring a yellow or red flashlight. If you can remove the nest completely, no further control will be needed. Otherwise, poison the nest with talcum powder, boric acid, Comet®, sodium borate, (or as a last resort) silica gel or food-grade diatomaceous earth. Install negative ion plates and/or put boric acid or DOT or food-grade DE or aspartame in sugary water or light Karo Syrup or honey water and protein baits, or simply 2 packets of Equal® wherever you see carpenter ants. Baits should be placed near observed trails and along natural "edges", e.g., walls, shelves, cracks, floor boards, expansion joints, etc. - wherever ants have been seen and in electric boxes. Be careful not to allow people, pets, or animals access to your boric acid baits or spray the nests/wood with diluted Safe Solutions Enzyme Cleaner with



Peppermint and/or food-grade DE or with borax or DOT; this mix will not only kill on contact - it has an ability to penetrate wood and/or galleries with “fumigant” action and residual action. **Then fill in with foam insulation in an aerosol can.**

Remove and replace all damaged and wet wood and do all necessary repairs to prevent future moisture build-up in wood. Also take precautions to prevent access to your building, e.g., trim all branches or vegetation that touch or overhang the building and remove debris on the roof.

Even if least-toxic pesticide poisons are to be used, only use them to spot treat the nest. Never allow monthly synthetic pesticide poison applications or allow an application of these toxic materials to the entire building. These practices are unnecessary and very dangerous to people and pets.

Carpenter ant control is easily accomplished if the nests can be located. Tap the walls and hollow doors and listen for a rustling noise in the wall, floor, woodwork or prefabricated doors that is loud enough to hear when you place your ear against the surface adjacent to the nest. A thorough initial inspection should be made both indoors and outdoors to locate the colony sources. When a nest is located, it should be removed, vacuumed or treated with boric acid or some other desiccation dust, or you can completely treat the wood with sodium borate or use baits and/or fill it with aerosol foam insulation. **Install and properly maintain enough dehumidifiers, vents and fans.**

OUTSIDE TREATMENT - Carpenter ants migrate from recently removed trees and buildings and from rotten structural timbers, trees, old logs, fireplace wood and similar areas to enter your building. Remove and burn all infested wood, hollow trees, old logs, firewood, etc. and/or treat with boric acid and/or sodium borate or borax and fill all cavities with foam insulation. If your building has with vine covered walls (which are particularly attractive to ants), you should consider removing the vines completely. Carpenter Ants may also use crevices in wood shingle roofs for harborage. If found, caulk these areas completely. **Be sure to inspect any/all holes in trees.** Prune all tree limbs and branches so that they do not touch or overhang the building and correct all visible moisture problems that cause wet and rotting wood. Put Tanglefoot® pest barrier or STP® oil treatment or duct tape (sticky-side up) around all infested trees, vines and shrubs outside and Vaseline®, or talcum powder, or Comet® across all trails inside. **Install and properly maintain eavestroughs and downspouts. Do not forget to properly install dehumidifiers and fans and aspartame inside.**

Attics and crawl spaces should be inspected and spot treated or baited and properly vented. If necessary, they may even be treated completely with sodium borate per the label directions. Spray nests with white vinegar and/or with Safe Solutions, Inc. Enzyme Cleaner with Peppermint or dust with baking soda, boric acid, talcum powder, food-grade DE, Comet®, Neasorb®, disodium octoborate tetrahydrate (DOT), medicated body powder, silica gels or food-grade diatomaceous earth (DE).

INTERIOR WORK - Thoroughly caulk all cracks and crevices that carpenter ants could use to migrate from wallboards and other similar areas to their food sources. Watch for live ants, ant pieces and/or the sawdust like material they discard in building their nests. When the actual nests are located or suspected, treat the voids with dusts, e.g., borax, boric acid and/or sodium borate. Nests in wall voids such as under windows may require drilling. Be sure to reseal with a caulk or plaster any holes you make to inject boric acid, talcum powder, Comet®, borax and/or sodium borate. **You must find and eliminate all of the nests.**

Apply a fine layer of dust (baking soda or talcum powder or Comet® or food-grade DE) to house wiring and plumbing pipes, wherever they can be reached. Research has shown that ants use these items as pathways through the wall voids. Unscrew the cover plates from electrical switches and outlets [turn off the main power switch first!] and insert a dust applicator wand inside the box. If the house has a sealed vapor barrier around the electrical box, be sure to reseal any and all openings you make with caulk duct tape or electrical tape or foam after applying the dust. Apply dust to all accessible plumbing pipes in walls and crawl spaces. Leave fans run 24/7.

Reinfestations - Carpenter ant reinfestations usually indicate that more ants have moved into the structure or that ants have not contacted earlier controls in their foraging trips. Be sure that enough time has elapsed (at least two weeks) to gain control before making any retreatments. Inspect at between 11 p.m. and 2 a.m.!

Make a careful re-examination to try to locate all of the carpenter ant nests. Look for sawdust or ants or ant pieces. Carpenter ants prefer to eat sugars and insects - remember this when you prepare boric acid or DOT baits.

Feed and Follow - Small jar lids of honey or jelly or cut up crickets or yellow mealworms can attract ants so that you may be able to follow them to the nests. Carpenter ants, however, may not go directly to a nest but take other erratic paths. Thus, considerable time may be required to find all of the nests. **At night try to follow them with a flashlight covered with red or yellow cellophane.** You can fill the nest cavity with aerosol foam or treat it with dusts or diluted Safe Solutions enzyme cleaners. Properly place use either labeled commercially prepared baits or powdered aspartame or equal portions of honey or jelly and/or peanut butter and 2% or less borax or boric acid or 3% DE. **Place the baits out of reach of children, pets and food. If you find ants dead by the bait, cut back on the boric acid.** Remember whenever you use boric acid baits - usually less poison is more efficient - try 3% or less boric acid or sodium borate. **Drinkable carpenter ant baits** with 1% or less sodium borate and 10% sucrose water in a 35 mm film capsule drilled at the edges on opposite sides and inverted on its lid - the "lid" now the base and the feeding trough; rinse or refill them weekly for at least 1 month; or put light Karo Syrup or honey with a boron toxin in red packing slip envelopes placed near ant trails, but out of the reach of children, pets and/or animals. Put 10-15 stations up where you see carpenter ant activity. **Whenever you find a nest, eliminate it. Keep boron baits away from people and pets.**

LARGE ANTS (½ Inch or Larger) CARPENTER ANT *CAMPONOTUS* SUMMARY

There are many species of Carpenter Ants in North America, but only a few enter structures to forage; fewer still nest in structures. But these two habits (foraging and nesting inside) coupled with their large size and vigorous activity make these invaders impossible to ignore. They actively feed at night after sunset and continue feeding until the early morning hours. Foraging trails may extend 300 feet and can often be visually seen on the ground as narrow worn paths in the grass. Two species claim the majority of attention: the Black Carpenter Ant of the eastern and southern United States and the Western Carpenter ant, a particular problem in the Pacific northwest. As their name implies, carpenter ants work and live in wood; they do not digest it. They mate in the air - the queen gets enough sperm from this one-time affair to last 10 years or more. One colony may have 3 different sets of workers gathering 3 distinct types of food, e.g., proteins, pollens and carbohydrates - a good baiting program will address all of their food preferences - containing 1% - 2% disodium octoborate tetrahydrate (DOT) as the toxin - any more toxin than this may alert or move the colony. There are more than 1,000 species in this genus worldwide, but only a few infest structures.



BLACK CARPENTER ANT *Camponotus pennsylvanicus* (DeGeer)

The Black Carpenter Ant workers range in size from 1/4 inch to almost 1/2 inch with the queen being 3/4 inch. This is the most common carpenter ant in the East. Outside workers can be confused with field ants (*Formica*) which do not enter structures. Carpenter ants have an even, smooth, arching profile beginning just behind the head and descending to the waist, or petiole, which has one node. (Field ants and most other ants have bumps or spines along the profile of the thorax, particularly

near the petiole). The Black Carpenter Ant's abdomen is covered with gray or yellowish hairs, but the basic black color is still obvious. The head and thorax are also black in the majority of individuals but the sides of the thorax and part of the legs of a few may be dull red. In the northern states where subterranean termites begin to be relatively less common than in the south, Carpenter Ants become more obvious as structural pests. These ants love to destroy foam insulation and live cedar trees. Mature colonies (including satellite nests) range from several thousand to 10,000 to 15,000 members. Primary nesting sites are larger (over 3' in diameter) oak trees and, if located in fallen logs or stumps, usually 75% softwoods and 25% oak. Swarm May through August.

A Black Carpenter Ant colony begins in isolation, but not necessarily in wood. This first brood may be under a stone, in a roll of tarpaper, or in innumerable other secretive spots, but the colony soon moves into wood (such as a fallen log, tree hole, stump or a structure wall). Usually vegetation, e.g., crown canopy, blocks 65% - 70% of the sunlight over/around primary nesting sites. When carpenter ant workers excavate nest galleries, they use their jaws as gouges and make tunnels by shaving out small pieces. Unlike termites, they do not eat the

wood; it has no nutritional value to them, and they discard it by dropping it out of the nest area or by piling in one place and discarding the whole pile later (similar to the pavement ant's dumping habit). This pile of carpenter ant shavings, called frass or sawdust, is very soft and is made up of pieces a fine chisel would make. (Gritty construction sawdust in attics or on sills can be left over from construction or repairs and might suggest carpenter ant shavings to those who do not know the difference.) The process of ant gallery excavation results in galleries with very smooth sides. No mud is involved (like in the tunnels of subterranean termites), and there is no dust or pellets like that produced by woodborers or dry wood termites) - only numerous large, smooth, brown-stained tunnels that provide harborage for the carpenter ant colony. A nest or colony might harbor several thousands of inhabitants. Large colonies of carpenter ants in critical areas of structures can cause structural damage, but the colony more likely resides partially in structural wood and partially in void spaces, e.g., between roof boards, between studs under windows or between subflooring and shower bases). They feed well after sunset.

The most common urban outdoor harborage for carpenter ants is a living tree with a rotted spot inside, so fill the entire cavity with an aerosol foam and the protect the foam from deteriorating with cement or paint. Other common sites are decking, stumps or firewood. The carpenter ant is a valuable link in the reduction of plant cellulose. It is not surprising that mature wooded neighborhoods often have structural carpenter ant problems. New neighborhoods or developments built on cleared woodlots can inherit ant colonies from their trees; some colonies are brought in with building materials. Rustic cabins, summer homes, decking and park structures left untreated will likely become infested sooner or later.

Black carpenter ant workers forage for food such as honeydew, insects, and juices from ripe fruit. Indoors, they like sweets, meats, fruit juices and moist kitchen refuse. [Carpenter ants always prefer to operate in a humid atmosphere.] Vines on building walls, branches, telephone wires provide a bridge-like access into structures. **Remember these preferred foods when you prepare your own DOT or boric acid or food-grade DE baits.**

Inspection - It is important to discover whether carpenter ants are nesting inside or outside. If nesting inside:

- you will see them at night; they run when you turn on the lights.
- they may make rustling or chewing sounds within wall voids; also look in hollow curtain rods, garden hoses, and plumbing overflow pipes, hollow doors, pillars, door framing, etc.
- their frass (sawdust thrown through slit-like openings in the wood) or visual presence usually indicates a moisture problem in the building, and that
- they have excavated galleries for harborage in structural wood, foam, firewood, etc.

Moisture problems and black carpenter ants are nearly inseparable so they all must be corrected. In the majority of cases Carpenter ants make their nests in wood that has been wet and infested by a brown rot fungus. Dark fungus stains on the wood is an indication of the presence of such moisture. A moisture meter will also pick up the moisture from the colony's respiration. Moisture can also be caused by:

- improper construction of roofs, improper drainage, lack of caulk, improper attachment of wooden additions, dormers, and hollow wooden columns that absorb moisture,
- patios or porch floors, door sills, railroad ties, landscape timbers, firewood, retaining walls, downspouts, or grading where water collects or drains toward the structure,
- regular gutter overflow pouring rainwater down the side of the building as well as back onto roof boards, fascia, soffits, etc.,
- poorly constructed flashing or leaking roof valleys,
- improper flashing and/or lack of tar, especially around chimneys, vents and skylights,
- improper roofing or holes in the roof,
- unsealed or uncaulked window sills directly exposed to rain, or
- lack of ventilation in any area where moisture can accumulate.

Inside moisture accumulates

- around any condensation, leaking plumbing or drains (especially shower drains),
- unvented attics and crawl spaces, or under or behind
- unvented dishwashers, washing machines, ice makers, etc.

The many nesting sites, foraging entrances and food and moisture sources offer clues for inspection and location of the nest. The area where the majority of ant activity is seen may identify a nest site if entry from the outside can be ruled out. **Carpenter ants are more active at night** and inspection at that time may be helpful. Use a red or yellow filter on your flashlight. Tap on the door/wall and listen - preferably with a stethoscope.

Harborage Alteration

- Practice proper sanitation.
- Where nests are located inside, remove and replace infested structural wood.
- Stop the intrusion of moisture and ants. Put Vaseline® across trails. Caulk all cracks and crevices.
- Advise staff to perform caulking and screening of actual and potential ant entryways.
- Ventilate areas where moisture accumulates; regrade where necessary; repair roofing, guttering, etc.
- Recommend trimming trees where branches or vegetation touch a structure or overhang roofs. Tree removal may be necessary, **especially all hollow hardwood trees**. Put Tanglefoot® pest barriers or petroleum jelly or STP® oil treatment or duct tape (sticky-side out) around all infested trees, vines and shrubs.

Intelligent Pest Management® Control

Eliminating colonies and nesting sites is a primary way to eliminate carpenter ant infestation, so use boric acid, Comet®, talcum powder, DOT, borax, food-grade DE, Safe Solutions, Inc. enzyme cleaners, negative ion plates, fans and/or dehumidifiers.

- If any ants remain after 2 weeks, use vacuums and/or as a last resort you may spot treat using boric acid or silica gel dusts or foam insulation in pressurized canned aerosols when nests are in wall voids. Volatile, synthetic pesticide poison sprays are less effective, so why use them?
- Do not use any flushing agents, e.g., pyrethrum; hundreds of ants may remain unaffected and can relocate the colony in a matter of hours or less to trunks, storage boxes, furniture drawers and other voids. If you need to flush carpenter ants, use a hot air dryer or a blast of air.
- When indirect treatment is required, liberal placement of acceptable bait stations can be used.
- Safe Solutions Enzyme Cleaner with Peppermint or white vinegar can be used on outside colonies, e.g., in tree rot. Then fill in the rotted area with aerosol foam insulation.
- Honeydew-producing insects involved in feeding carpenter ants should be treated with pesticides that will not eliminate parasites and predators, e.g., soap and water, diluted Safe Solutions Enzyme Cleaner with Peppermint and/or natural soaps.
- Trees with several rotted places should be evaluated and treated/removed by professionals.

Follow-up - Painstaking inspection is needed to make ant management effective. Follow-up monitoring also assures that necessary habitat alterations have been made. If necessary - mop areas where infestation has been observed with MOP-UP® or ½ cup borax and/or disodium octoborate tetrahydrate (DOT) and/or 2 oz. Safe Solutions enzyme cleaner per gallon water - avoid contaminating food, water, pets and/or dishes. Bait with small grains of wet rice and follow back to their nest. Light puffs of air can bring ants to the surface. Inspect hollow curtain rods, pillars and doors, hoses, overflow pipes, underground wiring and sprinkling systems. Inspect at night after dark; look near sidewalk edges and picket fences, etc. **Maintain records of all inspection discoveries and subsequent recommendations as well as any other notations mandated by law.**

WESTERN CARPENTER ANT *Camponotus modoc* (Wheeler)

The principal carpenter ant species in the northwestern states is the Western Carpenter Ant. This carpenter ant is very similar to the Black Carpenter Ant most common in the eastern United States.

Appearance - The Western Carpenter Ant has a black body with a slight gray sheen. Its abdomen has a thin covering of hairs on each segment like the Black Carpenter Ant, but it is less yellow - and appears more gray. The legs of *C. modoc* tend to be reddish. Swarm February through June.

Behavior and Harborage - The background of the principal eastern and western Carpenter ants are similar,

but the *C. modoc* usually produces larger colonies. Clean grass trails an inch wide are more prevalent in the northwest than in the east. These trails and other routes of march are extremely active from sunset through the early part of the night. Thoroughly inspect for carpenter ants with red or yellow lights at night. The Western Carpenter ants have principal colonies (with 10,000 - 20,000 members on average), but they can grow to over 100,000 members) in trees and stumps from which they forage. This activity, especially in springtime, brings them into the proximity of buildings. They enter structures through construction gaps, particularly along electric lines, plumbing and/or fuel lines.

Control and Management - See also Wood Destroying Organisms Chapter.

Inspection - Search for carpenter ant activity in wall voids, around electric outlets, wall panel grooves, under attic insulation. The workers feed at night, well after sunset.

Habitat Alteration - Install negative ion plates, fans and dehumidifiers. Lightly sprinkle talcum powder or Comet® or food-grade DE. Management of the *C. modoc* may include:

- removal of stumps,
- trimming trees and shrubs and vegetation,
- elimination of infested firewood and fencing and decking near the house,
- caulking of entrances through wall penetrations,
- control of wood moisture correct all drainage and plumbing problems,
- repair of roof or flashing leaks, and the
- construction of vapor barriers in the soil surface of crawl spaces, provide proper ventilation in attic areas and crawl spaces;
- properly install and maintain dehumidifiers, vents, fans and/or air conditioners;
- install Tanglefoot® and/or Vaseline® or duct tape or food-grade DE pest barriers.

Intelligent Pest Management® Controls

Outside:

- Locate all ant nests - carefully bait or dust or foam or flood all of them if possible.
- Remove or at least inject or spray stumps and decayed spots in trees with white vinegar or Safe Solutions enzymes; then fill in with aerosol foam or hydraulic cement and/or put Tanglefoot® pest barrier or Vaseline® or STP® oil treatment around all infected trees and plants.

Inside:

- First of all, practice proper sanitation and properly install dehumidifiers, routinely clean with borax and/or Safe Solutions enzyme cleaners or soaps and/or vacuum - then dust with baking soda, talcum powder, Comet® or medicated body powder, and then, only if necessary,
- Dust wall voids with desiccants, use the Electrogun®, liquid nitrogen or boric acid or disodium octoborate or silica aerogel baits or dusts.
- Apply pesticide dusts, e.g., boric acid, or better yet, a pestisafe®, e.g., talcum powder or Comet® or food-grade DE around electric outlets. Always turn off the main power switch when injecting dust around the outlet boxes; be careful of electrical wires.) Drill 1/4" holes for dust or 1/8" holes for pressurized canned dust pesticides, e.g., boric acid and/or silica aerogels.
- Dust under attic insulation, if necessary. Try food-grade DE or Comet® or medicated or talcum powders first - then boric acid or disodium octoborate tetrahydrate (DOT) or borax.
- Spray wood nests with diluted Safe Solutions enzyme cleaners for instant contact control and for the ability of this material to penetrate wood and/or galleries with a "fumigant" action.
- Spray wood or dust galleries with sodium borate or borax.



THE CRAZY ANT

Paratrechina longicornis (Latreille) = *Nylanderia longicornis*
Subfamily - Formicinae

Crazy ants were introduced to the United States from India. Their distribution is limited to the Gulf coast from Florida to Texas. They are easily identified by their long legs and their habit of erratically moving from place to place (hence the name "crazy"). Crazy ant trails are not readily obvious because of this erratic movement. The

easiest way to find the nest is to look for workers carrying pieces of food or workers with swollen abdomens. These ants are carrying food back to the nest. By observing their movement, it should be possible to find the nest. Crazy ants are highly adaptable and will nest in a variety of locations, from very dry to moist. They will nest under objects, in rotten wood or trash or potted plant soil, in tree cavities, as well as in debris left standing in buildings for long periods of time.

These ants feed on a variety of foods including grease, sweets, and other insects. In some areas they are considered a biological control agent for houseflies. They also tend aphids and scales to feed on their honeydew. While crazy ants prefer moisture, elimination of water by itself will not get rid of these ants since they can survive under a wide range of conditions. Dusts and the elimination of food sources and nest sites are equally important in the management of this ant. Crazy ants do not respond well to baits, so they cannot be relied upon for management of this ant. Surrounding buildings with vegetation-free barriers such as stone or brick or ground-up tires (but not wood mulch) will keep ants from entering these buildings to nest.

Adult - This monomorphic ant has a very slender body about 1/16" - 1/8" long; it has only one node; dark-brown, nearly-black in color with a glossy gray sheen. Nests outside in soil, pavement cracks, logs, sprinkler heads, debris, tree holes and rotted wood or inside in debris; up to 2,000 workers per nest.

The Crazy Ant is unique in appearance. The extremely long antennae and hind legs are each as long as the body. These ants do not trail each other, but large numbers follow pathways along foundation walls, pavement, and such. The Crazy Ant gets its name from its rapid, jerky gait; in large numbers it runs so rapidly, it is impossible to focus on a single individual. Some colonies have been observed both outside and inside throughout an apartment complex. Populations fluctuate during the summer rebounding after wet weather, declining during dry weather. Crazy Ants accept broad menus of food including sugars, proteins, insects, honeydew, and especially enjoy concentrations of maggots, garbage and kitchen scraps. Remember this when you make your (5% or less) boric acid and/or (3% or less) sodium borate baits. The colonies are very mobile and can contain 40 queens and as many as 2,000 workers. Colonies have been repeatedly introduced to the United States with plants from South America, Puerto Rico, and the Philippines. Colonies exist outside the Gulf Coast and southern United States and commonly overwinter in buildings and manholes in the northern portion of its range along the Atlantic and Pacific coasts. They have no sting.

Inspection - Crazy ant infestations quickly call attention to themselves by their erratic activity.

- Outside, inspect logs, stones, tree holes, rotted wood, sprinkler heads, garbage areas, manholes, rooftops, exterior stairwells, window wells, refuse piles, weep holes, etc.
- Inside, inspect garbage rooms, potted plants, kitchens, baseboards, door frames, windows and other exterior openings, crawl spaces, etc.
- Give special attention to entry through doors and windows on ground floors.
- Investigate connections such as pipe chases between kitchens and garbage rooms.

Habitat Alteration - Recommend the highest standard of sanitation both in homes, schools, commercial food services, and food processing establishment.

- Tree and shrub branches should be cut back. Clean up all litter, logs, etc.
- Recommend garbage schedule control (dump before dark) and routine cleaning of garbage rooms, garbage cans, and dumpsters and their surroundings. Flood potted plants with diluted enzymes.
- Caulk and tighten-up around doors and windows and low wall penetrations.

Intelligent Pest Management® Controls - Bait along foraging trails and/or sprinkle talcum powder or Comet® on these trails.

- Install negative ion plates; wait 2 weeks and then and only then vacuum.
- Baits are helpful, but it is better to find the nest and inject boric acid or silica aerogel or food-grade DE.
- Caulking/sealing of all crevices must be thorough. Dust lightly with talcum powder or food-grade DE.
- White vinegar and/or diluted Safe Solutions enzyme cleaners with or without peppermint in infested manholes and other protected voids will kill large numbers. Mop with ½ cup borax per gallon water.
- Lightly sprinkle baking soda, talcum powder, Comet®, food-grade DE or medicated body powder or apply Vaseline® wherever you see these ants.

Follow-up - Large Crazy ant infestations need to be followed and treated until the population is controlled. Monitor areas that support high populations such as garbage rooms, etc. Some Crazy Ants will be attracted and others repelled by the same bait, e.g., light Karo Syrup or sugar water or honey and boric acid, in red packing slips (stuck open) secured in out-of-the-way places at a 45° angle. **Keep these baits away from children and pets.**

FIELD ANTS

Field Ants (*Formica* spp.) are found through the United States but primarily in the Midwest and the North. They are large (3/8" long) and dark brown to black. They are often confused with carpenter ants, but can be distinguished by an uneven thorax. Field ants feed on other insects as well as honeydew. They cause concern because they usually nest near structures and are often mistaken for carpenter ants. Nests are often made in grassy areas and can be difficult to see because they are low to the ground. Field ants will also nest in leaf litter or mulch that is more than 2 inches thick, and can live under stones, firewood or other debris that might be found in a lawn area. If diluted Safe Solutions enzyme cleaner and diluted food-grade DE drenches of mounds are used to manage this insect, it should be remembered they may be slow to act because it often takes some foraging ants days to return to the nest.

FIRE ANT - GENERAL OVERVIEW *Solenopsis* spp.

After World War II, the spread of these fire ants was largely due to the sale of grass sod and woody ornamental plants used in landscaping. Fire ants include a large group of reddish-brown to black ants that normally spread by one of the following methods: seasonal relocations, migration in nursery stock, natural flights, and after floods rafting on water. Ants can be blown by the wind 12 miles during mating flights. They can "hitchhike" on birds or mass together to form a floating ball to ride out a flood. Fire ant workers are sterile females that range in size from .08" to .2" in length. The larger workers are called majors, the medium sized are called medias and the smallest size are called minors. All of the workers sting and inject a venom that causes blisters and allergic responses, including possible anaphylactic shock. A single fire ant can grab hold with its mandibles and then whip its abdomen down and sting multiple times, injecting the poison each time. They are now found in 11 southeastern states and over 33,000 people a year in the U.S.A. seek medical attention from fire ant stings. A fire ant mound can be 15" - 24" in diameter and 10" - 18" high and 1' - 3' deep with some tunnels extending 5' or more down to the water table and can contain 80,000 to over 250,000 workers. **A.K.A. the six-legged scourge of the South. Note: They are adapting to the cold and coming North. Talcum powder will repel them.**



Fire ants are omnivores and will eat plant and animal material including mice, turtles, snakes, and other vertebrates, crops (including okra, corn, strawberries and potatoes), plants, saplings, wildflowers, fruit, and grass but prefer insects. U. S. fire ants readily defend their mound. Disturbed or injured workers release alarm pheromones. There are four major species, two native and two imported, found in the U. S. from the Carolinas to California. Mating between the winged forms or alates takes place 300' to 800' in the air, usually in late spring or early summer. The males fly up first and wait for the females, after mating, the males die and the newly mated queens seek moist areas, normally within one mile of the mother colony. If the female lands on a suitable moist site, she removes her wings and digs a small burrow in the soil and then seals it. Within 24 hours the queen begins laying eggs, normally only 10 - 15 in the first cluster. The queen ant can live up to 7 years and will produce up

to 1,500 to 1,600 eggs per day throughout her life. Queens are the first to be fed proteins, so any fire ant bait has to be protein-based. Fire ants feed on honeydew, sugars, proteins, oils, seeds, plants and insects. Fire ants frequently enter and nest in houses and are attracted to water and electrical wires and their associated magnetic fields or impulses. They can ruin gas pumps, transformers, traffic lights, air conditioners, heat pumps and other electrical equipment. Locate ant activity inside by watching the ant trail and follow back to the void and treat with ant baits or dusts or diluted Safe Solutions Enzyme Cleaner with Peppermint, 1 ounce each per quart of water. They will kill plants by feeding on seeds or by girdling freshly planted nursery stock. Fire ant workers compensate for changing conditions, e.g., temperature and humidity by moving the larvae and queen to suitable locations within the mound. On cool mornings in the summer the queens are near the top of the mounds where it is warmer; as the day heats up the queens go deeper into the soil.

Note: Fire ants are tick predators - normally yards with fire ants also do not have ticks. If you have no ticks there, obviously, is less danger of disease. They also control the ground stage of horn flies. One simple non-toxic fire ant control is to simply drive over the nests repeatedly with your car or truck; repeat as often as needed. Try dusting with talcum powder or Comet®. Only undisturbed forested areas remain virtually fire ant free. Fire ants must have sun energy to exist. Cloudy, cool days in early morning or late afternoon, in fall, winter and/or spring are the best times to kill fire ants. Spring is the best time to try boric acid or aspartame baits mixed in sugar, jelly or pet food. **Try flooding nesting sites with copious amounts of diluted Safe Solutions Enzyme Cleaner with Peppermint or Not Nice to Bugs® or with 1 gallon of orange juice and 2 gallons of water and a dash of peppermint or dish soap.**

FIRE ANTS - a.k.a. Red Ants

The National Park Service has noted that fire ants are so called because their fiery venom, they latch on with barbed mandibles and sting repeatedly with spiked tails, their venom is injected by a stinger like a wasp's, and creates a burning sensation and a small bump or pustule within 8 - 24 hours that can last for 10 days! Fire ants in the U. S. are active and aggressive, swarming over anyone or anything that disturbs their nest, be it wild animals, domestic animals and birds, pets or people. An encounter with a fire ant nest can leave a lasting memory of burning pain, followed by tiny, itching pustules, especially *Solenopsis invicta*, and sometimes even more severe reactions including anaphylactic shock. Fire ants are also identified in the U. S. by their reddish-brown to black color, small size (1/8" - 1/4" long) and by distinctive swarming behavior when their nest or mound is disturbed. **See all of the individual fire ant species in this chapter.**

Because of this, and occasional news stories of livestock or people killed by multiple fire ant stings, people fear fire ants. In some areas infested with certain species of fire ants, lawns, school yards, river banks, athletic fields, mulched areas, compost piles, playgrounds, parks and picnic areas lie abandoned, unused because of the medical threat caused by the presence of fire ants. In campsites of state and national parks in fire ant infested areas, it is often difficult to put up or take down a tent without being stung by angry fire ants. In the U. S., they will storm anything that threatens their mound or that looks like food, whether it be old people, crawling babies, injured waterfowl, newborn rabbits and fawns, bedridden hospital patients, or you just walking along. The University of Florida and Eckerd College have begun a 2-year study of the Red Imported Fire Ant and its negative effects on endangered species in the Florida Keys including the Lower Keys marsh rabbit, the Stock Island tree snail and nesting green sea turtles - they are finding no island is safe.

Daniel Wojcik, an adjunct UF/IFAS scientist and a research entomologist with the USDA's Agricultural Research Service, said fire ants are very adaptable and do well in both sandy and mild soils, and in the mucks of the Everglades. They are often found along beaches, which surprises many people, Wojcik said. "People will have to learn to deal with fire ants over the long-term. The days of massive chemical treatments, I think, are pretty much over," Wojcik said. "We are working on introducing a number of organisms from South America to provide biological control for fire ants, maybe some diseases of the ant, some parasites, and probably eventually some predators. But none of those things are going to be the golden bullet."

Fire ants are pests in other ways besides their stinging. They are attracted to the AC and DC currents in electrical appliances. They can destroy or damage crops such as soybeans, blueberries, peanuts, sunflowers, watermelons, canteloupes, cucumbers, pecans, eggplant, corn, okra, strawberries, and potatoes by feeding directly on the plants and/or by protecting other insects that damage the crops. The fire ants may feed on plant seedlings and germinating seeds causing crop damages. They chew the bark and growing tips of citrus trees and feed on the fruit. (Stop their climbing with bands of Tanglefoot® or Vaseline® or duct tape (sticky-side up). Fire ant

mounds can break equipment and interfere with farming and mowing operations and turn ornamental turf and recreational fields into aesthetically disfigured moonscapes. Fire ants have caused sections of roads to collapse by removing huge amounts of soil from under the asphalt. Fire ants can nest in air conditioners, traffic lights and other electrical connections, often causing disruption of service. (They can be quickly removed if you carefully vacuum them out - put 1 tablespoon of talcum powder or cornstarch in your dry vac bag or some diluted Safe Solutions Enzyme Cleaner in your wet vac.) **They are especially partial to sun and sandy soil.**

Beginning in the late 1950's, when the federal government first declared war on fire ants, stating it would attempt to wipe out *S. invicta* once and for all. World War II-era bombers dusted millions of acres in the South with the highly poisonous pesticides dieldrin and heptachlor. Some fire ants died, but so did birds, fish, raccoons, opossums, dogs and cattle. The bird population declined over 85% in Texas and Louisiana. When the program was finally halted, the government had spent \$70 million, all in vain. Before the campaign, *S. invicta* had only infested 90 million acres; five years later, they had spread to 126 million acres! In 1958, the Federal Fire Ant Quarantine was implemented try to limit the spread of fire ants from quarantined areas. Hay, sod, plants and used soil moving equipment must be inspected and/or treated before being moved out of the quarantine area. **USDA, APHIS and PPQ mandate plants must be pest free but do not dictate treatment strategies - Flood or spray with diluted enzyme cleaner or dust with talcum powder or bait with "misted" aspartame.**

Frustrated but undaunted, the feds spent another \$200 million in the 1960's for a new war (poison) effort, with similar dismal results. A survey conducted in 1981 showed about 1 million households were using insecticide poisons and other controls including gasoline trying to eradicate fire ants (Headley 1982). Today there are 157 chemical (poison) formulations *registered* for the control of fire ants - but none of these volatile, synthetic pesticide poisons has ever stopped their spread. **Today the fire ant epidemic infestation count is over 300 million acres in the U. S. and Puerto Rico - and the number is growing!** At the time of this writing fire ants were found in Florida, Georgia, South Carolina, North Carolina, Tennessee, Alabama, Arizona, New Mexico, Mississippi, California, Louisiana, Arkansas, Texas and Oklahoma.

Fire ants have developed a unique method to keep from drowning. At first hint of rising water, worker ants gather the entire colony into a ball - sometimes as big as a basketball. As the water overtakes the mound, the ball rides the flood like a living raft, rolling in the water so all the members can take turns breathing. When they strike a solid object, be it a swimming dog or your canoe, they quickly swarm aboard. **If sprayed with diluted Safe Solutions, Inc. enzyme cleaners they will quickly die.**

Increasingly, fire ants have also been found nesting in water meter casings, computers, t.v.'s, wall voids, around plumbing, and under carpeting in structures. Their presence inside can threaten pets, children and sleeping or bedridden people. You can usually quickly control them with diluted enzyme cleaners or carbon dioxide or aerosol foam insulation or steam them with a Vapor Dragon®. The ants have also been found invading and chewing on insulation on wiring and moving soil into these areas causing power failures in outdoor electrical equipment, apparently attracted (like many ants) to the electrical fields or impulses. Infested sites include household electric meters, air conditioning units, traffic signal control boxes, and even airport runway lights. Where you can not safely use diluted Safe Solutions, Inc. enzyme cleaners or steam or aerosol foam insulation, you can spray them with WD40 or carefully vacuum them up or you can follow foraging ant trails (at night if needed, with a red light) to the nesting area and then you can treat these areas with talcum or medicated body powder or food-grade DE or Comet® cleanser, or you can use some bands of Vaseline® or Tanglefoot® to trap them or keep them out. The Solar Ant Chamber™ takes advantage of the fire ants' attraction to electrical impulses. Call them at 1-800-472-5024 and ask how the cone that is pushed into the mound uses sunlight to kill fire ants.

Fire ants are mainly beneficial insects - when they are left alone - because they are truly voracious predators that feed on pests such as fleas, filth breeding flies, horn flies, boll weevils, sugarcane borer, ticks and cockroaches. **The Imported Fire Ant is credited with having dramatically reduced the range of the Lone Star Tick, a serious livestock pest. When left alone, this also may deter multiple-queen colony formations.**

In the South, during the summer, usually after a rain, hundreds of winged fire ants will ascend from their mounds to mate 300-800 feet in the air. The males quickly drop to the ground and die, their only purpose in life fulfilled. The females, now queens, drift downward to start new colonies; on a windy day, this may be as far as five miles away. The queens burrow into holes and begin laying eggs. Two months later there will be several thousand, each queen capable of laying 1,500 to 1,600 eggs a day. In a year, a new colony can be 100,000 strong. A

mature colony can contain over 400,000 ants. The process can repeat up to eight times each summer, spreading the ants 20 to 30 miles a year. There can be 35 million ants per acre that are constantly foraging and will eat anything that sits still for less than a minute - they will find it, kill it if they can, and then try to eat it.

BIOLOGY AND IDENTIFICATION OF FIRE ANTS

Tribe Solenopsidini, Subfamily Mymicinae

Pest Species of Fire Ants — The “Ant from Hell”

There are many species of fire ants in the United States, but the most serious U. S. fire ant pests are four in the genus *Solenopsis*: the Red Imported Fire Ant, the Black Imported Fire Ant, the Southern Fire Ant, and the native fire ant. Distinguishing between imported and native species of fire ant is difficult, even for experts. Identification usually requires 40 or more randomly collected worker ants for study. The following sections briefly discuss the four fire ants of major concern in the U. S. The Little Fire Ant is described later in the chapter.

Red Imported Fire Ant, Subfamily - Mymicinae

Introduced from western Brazil (Argentina or Paraguay), this fire ant species quickly and usually becomes the number one fire ant pest wherever it occurs. The main reason for this is when it was introduced into the U. S. about 60 years ago its more than 30 natural enemies were left behind in South America. The average densities of fire ant colonies in the USA are more than 5 times higher than their native South American habitats. (Porter, et al. 1997a) Since 1958, many hundreds of millions of dollars have been uselessly spent and many thousands of chemical poison compounds have been evaluated for delayed toxicity against just this ant by the USDA Agricultural Research Service. Nothing has stopped its spread. **The Red Imported Fire Ant, *Solenopsis invicta* - (Buren)**, is associated with disturbed habitats, mostly created by humans, and is abundant in old fields, pastures, lawns, roadsides and many other open sunny areas. It often inhabits fields used for agricultural purposes where its large above-ground mounds (3” to 36” high) create problems in planting and harvesting crops. John Morrison, Jr., et al, 1997, noted that Red Imported Ants will feed on wheat, corn and sorgham seed and to some extent on dry cotton and soybean seeds under laboratory conditions. In areas where grass is periodically cut, and in some soil types the mounds are flush with the ground and are hard to see. This fire ant species is rarely found in mature forests and other areas with heavy shade, unless part of the area has been disturbed or opened by fire or storms. They prefer open sunny areas, e.g., pastures, lawns, meadows, cultivated fields and parks. *Solenopsis invicta* has the most toxic venom of all U. S. fire ants. Within this single species a colony often shows both strict monogyny alongside spectacular polygyny.

The Red Imported Fire Ant builds mounds that are, on average, 10” - 24” in diameter and 18” high. But larger fire ant mounds are not uncommon. They also may extend 6’ underground. They also build soil tubes on foundations of buildings. The primary function of mounds, beyond that of the simple ground nests of other ants, is microclimate regulation - controlling the temperature and humidity. The ants can maintain a temperature inside the mound much higher than that outside, allowing them to continue colony growth even during cool weather. They have a filtering system that admits only liquids into their digestive systems that even removes bacteria (e.g. *Bacillus thuringiensis*) - so feed them sugar water with 1% boric acid or .5% Disodium Octoborate Tetrahydrate or food-grade DE or aspartame for up to 8 weeks. Originally it was incorrectly identified as *Solenopsis saevissima richteri* (Forel).

In a nursing home, fire ant workers will gather food from soiled linens, garbage, IV equipment and even body oil buildups. Control all visible fire ant mounds outside and dust with talcum powder inside.

The fire ant mounds are symmetrical piles of excavated soil, rich in organic materials, laced with interconnected galleries and chambers. The soil below ground also contains galleries and chambers. During foraging periods only a small percentage of ants may be inside the mound; the rest are out gathering food. Workers create and use foraging tunnels 50 to 100 feet long to collect food. **That is why there are times of the day or night that flooding or drenching mounds are more effective.**

A newly mated queen lays about a dozen eggs. When they hatch 7 to 10 days later, the larvae are fed by the queen. Later on, a monogyne queen fed by worker ants can lay up to 800 eggs per day. Larvae develop 6 to 10 days and then pupate. Adults emerge in 9 to 15 days. The average colony contains 100,000 to 500,000

workers from a few to seven hundred winged forms and queens. Queen ants can live 7 years or more, while worker ants generally live about 5 weeks, although they can survive much longer. About 90% of queens in polygyne colonies lay from 1 to 75 eggs in a 5-hour period.

A newly established fire ant mound or nest rapidly produces young workers, and winged reproductives are produced for most of the year (8-10 months), much longer than the native species. Red imported fire ants quickly spread through a suitable habitat, and the species is now found throughout most of the southeastern United States and west into Texas and California (over 320,000,000 acres in the USA and Puerto Rico). They can bite and quickly latch onto your flesh with barbed mandibles and sting then repeatedly, pivoting in tiny circles until you, the victim can repel them or dies. **The venom burns like a hot match and causes tiny blisters or white pustules that persist for days if left untreated or for weeks if scratched or infected and may leave permanent scars.** About 1% of the U.S. population is allergic to the venom and reactions can include death by anaphylaxis. Somewhere between 30% to 60% of all the people in fire ant territory are stung each year with anaphylaxis occurring in 1% or more of these people; deShazo and Williams 1995 suggested that more than 200,000 persons a year may require a physician's aid for fire ant stings. Red imported fire ants have two types of colonies. Single-queen (monogyne form): only one queen per colony or mound; slightly larger workers; members of colonies are territorial; mound densities usually 20 - 80 mounds (up to 150 mounds) per acre; up to 7 million ants per acre. Multiple-queen (polygyne form): dozens of queens per colony; smaller average worker ants; colonies are interconnected; mound densities of 100 to 1000+ per acre; up to 40 million ants per acre. Bait with raw fish, canned sausage, maple syrup (treated with 5% food-grade DE, boric acid 5% food-grade DE or sodium borate 2% - 5%) or a combination of vitamin C and baking soda or 3% aspartame.

In 2000, the red imported fire ant invaded Australia. They estimate that it will cover most of the Australian continent and over the next 30 years cause an estimated 8.9 billion dollars worth of damage.

Black Imported Fire Ant

The Black Imported Fire Ant, *Solenopsis richteri* (Forel), is very similar to the Red Imported Fire Ant. It is currently limited to a small area of northern Mississippi and Alabama. It may be displaced from established habitats by the Red Fire Ant. The Black Fire Ants come here from Argentina and/or Uruguay.

Scientists have long thought that the Black and Red Fire Ants were two distinct species. Recently it has been discovered that hybrids of these ants produce viable offspring, and some scientists now wonder whether they are simply two races of the same species, varying only in color and perhaps behavior and/or have created hybrids.

Southern (California) Fire Ant

The Southern Fire Ant, *Solenopsis xyloni*, (McCook) is a native species that occurs from North Carolina south to northern Florida, along the Gulf Coast and west to California. Colonies may be observed as mounds or more commonly may be constructed under the cover of stones, boards, and other objects or at the base of plants. These ants also nest in wood or the masonry of houses, especially around heat sources such as fireplaces. Nests often consist of loose soil with many craters scattered over 2 to 4 square feet. In dry areas nests may be along streams, arroyos, and other shaded locations where soil moisture is high. Southern fire ants usually swarm in late spring or summer.

Fire Ant (Tropical or Native fire ant)

The fire ant, *Solenopsis geminata* (Fabricus), is a native species sometimes called the Tropical Fire Ant. This ant ranges from South Carolina to Florida and west to Texas. Very similar to the Southern Fire Ant, this native fire ant usually nests in mounds constructed around clumps of vegetation, but may also nest under objects or in rotting wood. This fire ant will collect 8 times as many seeds as the red imported fire ant.

The Fire Ant Colony and Life Cycle

The life cycles of the four described fire ant species are all very similar.

Development of the individual: Like all ants, an individual fire ant begins life as an egg, which hatches into a legless, grub-like larva. The larva is very soft and whitish in color. It is also helpless and depends totally on worker ants for food and care. The fire ant larva is specialized for feeding and growing, and almost all growth occurs during this period. As in all insects, growth is accomplished by periodic molting, or shedding of the cuticle (skin) **using an enzyme zipper**. Having reached its final size, the larva becomes a pupa in which various adult structures, such as legs, and in some cases wings, become apparent for the first time. The fire ant pupal stage is the transitional stage between the larva and the adult that emerges during the final molt. In insects in general, the adult stage is specialized for reproduction and dispersal; with ants, some adult individuals are capable of reproduction (queens and kings) and the remainder are sterile workers.

The fire ant colony: The social unit of fire ants contains several hundred to several thousand related members depending on the age of the colony. Colonies, like individuals, pass through a characteristic life cycle. New colonies do not make a conspicuous mound for several months. Older colonies may have mounds up to 3 feet in diameter. Mounds are usually found in open sunny areas such as lawns, pastures and fields, but may also be found in logs, around trees and under pavement. There may be 20 to several hundred mounds per acre. Occasionally fire ants can be found nesting on the roof or debris on the roof or in an electric receptacle, but most often they are found in the ground. There are several pheromones used by fire ants; the key recruitment chemical is an alpha-farnesene which is supplemented by 2 or 3 other chemicals.

Fire ants feed on many things, including insects: body oils, soiled linen, oil from seeds, meats, grease and honeydew. The adult ants cannot eat solid food, and must extract or liquefy the food source. This is done by feeding juveniles the solid food; the juveniles turn it into liquid food which can be regurgitated. This liquid food is passed to the other ants in the colony including the queen, the workers and the developing young ants or brood. Any bait used, therefore, must be extremely slow acting. Worker ants search for food up to 100 feet away when the temperature is between 70° F. and 90° F. during the day or night. When temperatures exceed 95° F., fire ants only forage at night. **Their foraging tunnels can be 50 - 100 feet long.**

Fire ants are very typical of ants in general. In addition to workers and a queen, mature colonies contain males and females capable of flight and reproduction. These individuals are generally called "reproductives." The average colony can produce about 4,500 reproductives per year. On a warm day, usually one or two days following a rain, the workers open holes in the nest through which the reproductives exit for a mating flight. Mating takes place 300' to 800' in the air. Mated females (are attracted to shiny surfaces) descend to the ground, up to 12 miles away, break off their wings, and search for a place to dig the founding nest, a vertical tunnel 2" to 5" deep. They seal themselves off in this founding nest to lay eggs and to rear their first brood of workers. During this period they do not feed, instead utilizing reserves stored in their bodies. The first worker brood takes about a month to develop; these are the smallest individuals in the entire colony cycle. Fire ants open the nest, begin to forage for food, rear more workers, and care for the queens. Hereafter, the queen or queens essentially become egg-laying machines, each able to lay up to 1,500 to 1,600 eggs per day and can live 2 - 7 years. If the colony is disturbed, the workers swarm over the mound for 8 minutes; if the disturbance continues, the workers will quickly carry the queen through underground tunnels so she can begin a new colony.

Multiple fire ant queen colonies are fairly common. A single colony may have 10 to 300 or more queens, each reproducing. Multiple queen colonies can mean up to 10 times more mounds per acre. The fire ant queens generally mate several times and may live for up to 6 - 7 years. Workers are less long-lived and usually will not survive an entire season. **Each queen can lay from 1000 to 1500 eggs a day for up to 7 years!**

The fire ant colony grows rapidly by the production of workers that gradually enlarge the original vertical tunnel into multiple passages and chambers. Colony maturity is attained when fire ant reproductives are once again produced. The reproductives leave to mate and form new colonies. A mature colony of Red Imported Fire Ants can produce as many as 4,500 reproductives during the year in 6-10 mating flights between spring and fall. Mating flights usually occur about 1 - 2 days after a rain on warm, sunny days about 10 a.m. Nearly 100,000 queens may be produced per acre in heavily infested land, but mortality rates, mostly from natural predators, can reach 99%.

Fire ant colony size: Colonies of Red and Black Imported Fire Ants become territorial as they grow; they defend their territory area against all other fire ants. Therefore, fire ant colony populations often reach an upper limit depending on the territory size of mature colonies. A typical figure for pasture land seems to be about 20-50

mounds or more per acre in single queen nests and up to 250 mounds or more (up to 700) in multiple queen nests. Mature colonies of Imported Red Fire Ants consist of an average 80,000 workers, but colonies of up to 200,000 to 400,000 and more have been reported.

Fire Ant Feeding Habits

Almost 80% of their successful foraging trips, irrespective of the season, they return with liquid food five times as frequently than with solid food. Remember this when baiting: 80% of their successful foraging trips were liquid, not solid foodstuffs. Also note that the red imported fire ants in Texas prefer carbohydrates in the winter and protein in the warmer months.

The oldest and most expendable 20% or so of the colony's fire ant workers leave the nest to search for food. They explore 50-100 feet from the nest with an efficient looping pattern. They can gnaw on soiled clothing. Although the worker ants can chew and cut with their mandibles, they can only swallow liquids. When they encounter liquid food in the field, they swallow it and carry it back to the nest. Solid food is cut to reasonable size and carried back to the nest. They prefer protein foods, e.g., insects and meats, but will feed virtually on everything, including fruit, seeds, plant sap, insect hemolymph, grease, butter, honeydew, plants, nuts, garbage, i.v. tubes, needles, body oils, etc. They love to eat tuna fish, (They first suck out the juices and then carry dry tuna sticks back to the nest.) grape jelly and Coca-Cola, so add 5% or less of boric acid or aspartame or food-grade DE or borax to these baits. **Keep baits out of the reach of children, pets and wildlife.**

Like other ants, fire ant workers share their food with their nest mates by regurgitating it so that it can be licked or sucked up as a liquid by other ants. In this way, most ants in the nest get fed equally. This food sharing is also why slow-acting poison baits can be an effective control tactic against fire ants. You can try using 1% or less borax or boric acid with 10% sucrose or aspartame in water by ant colonies for 3 - 4 months - it may take that long to get control. Quickly clean up food debris and garbage to help direct the fire ants to your baits. Try using several (filled and drilled) 35 mm film capsules per nest or sponge pieces soaked with bait.

Fire Ant Stings - At least 5 million Americans are stung every year! The CPCO ADVANTAGE - January 1999 noted: A survey conducted in just South Carolina revealed that in the single year 1990, physicians reported treating 5000 cases of imported fire ant stings on humans. This represented a 14-fold morbidity. In all, there were 27 hospitalizations, one death and 170 cases requiring imported fire ant desensitization by an allergy specialist. An updated imported fire ant sting survey is about to get underway. - Agromedicine Program Update; September 16, 1998

The fire ants are small (less than a quarter of an inch long), reddish-brown to black and live in mounds with long, radiating underground tunnels. Children can mistake the fire ant mounds for sand piles and be attacked. Older people may also be attacked and killed.

The fire ant's attack is a two-part process consisting of a bite and a sting. When one ant stings, they all sting and inject a venom that causes the release of histamine, a chemical in our bodies that can produce pain, itching, swelling and redness of the skin. Within seconds after the stings, discomfort occurs at each site and a small red welt appears. Each welt can enlarge rapidly, depending on the amount of venom that was injected and the victim's sensitivity to the venom. The reaction persists for up to an hour, and then a small, clear blister will form. Over the next half day or so, the fluid in the blister may turn cloudy, and the area will begin to itch. Most people experience only a small amount of redness around the sting site. A small percentage of people are sensitive to the venom and experience more extensive redness and swelling. A few victims have extensive allergic reactions such as breathing difficulties or widespread swelling of body parts or worse.

The fire ant's venom is an oily alkaloid mixed with a little protein, and your one chance to lessen the effect of the bite is to quickly break down the protein. Try dabbing the bite with bentonite clay paste, diluted bleach or Safe Solutions, Inc. Enzyme Cleaners or Not Nice to Skin Irritations, or covering it with a paste of meat tenderizer and water. This method is not effective if more than 15 minutes have passed. Another option is to treat stings with an insect bite remedy containing benzocaine or other ingredients that deaden pain and protect against infection.

In infested areas, fire ant stings occur more frequently than bee, wasp, hornet, and yellowjacket stings. Stepping on a fire ant mound is almost unavoidable, especially when walking in heavily infested areas. Furthermore,

many mounds are not easily seen, with many lateral tunnels extending several feet away from the mound just beneath the soil surface. Ants defend these tunnels as part of their mound. More than 25,000 people each year seek medical attention for painful fire ant bites. The sting itself is usually not life-threatening, but secondary infections can result. To prevent infections do not scratch pustules and treat the sting with an insect bite remedy. Persons who are hypersensitive to the fire ant venom may experience symptoms such as nausea and dizziness or even shock or death. **Individuals exhibiting such reactions to fire ant stings should see a physician immediately. About 1 dozen Americans die of their wounds each year! Use bentonite clay paste to pull out the toxins.**

A person who stops to stand on a mound or one of its tunnels, or who leans against a fence post included in the defended area, can have hundreds of ants rush out to attack. Typically, the ants can be swarming on a person for 10 or more seconds before they grab the skin with their mandibles, double over their abdomens, and inject their stingers. **That is why some people die! This does not happen in their native land where the fire ants fear phorid fly species who only live to torture and kill fire ants.** Phorid flies are being currently evaluated in Gainesville, Florida and elsewhere.

Although a single fire ant sting normally hurts less than a bee or wasp sting, the effect of multiple stings is impressive. Multiple stings are common, not only because hundreds of ants may have attacked, but because individual ants can administer several stings. Each sting usually results in the formation of a white pustule within 6 to 24 hours. The majority of stings are uncomplicated, but secondary infections may occur if the pustule is broken, and scars may last for several months. Severe infections requiring skin grafting or amputation have been known to occur from fire ant stings. DMSO has been used to stop pustules and itching. Try bentonite clay paste.

Some people experience a generalized allergic reaction to a fire ant sting. The reaction can include sweating, slurred speech, chest pain, shortness of breath, hives, swelling, nausea, vomiting, and/or shock. People exhibiting these symptoms after being stung by fire ants should get medical attention immediately. Death can occur in hypersensitive or older or very young people. Individuals who are allergic to fire ant toxins may require desensitization therapy. The March 2002 issue of Pest Control Magazine noted that in 1998 an estimated 660,000 people were stung in South Carolina alone and approximately 33,000 sought medical treatment costing an estimated \$2.4 million. **First Aid: Try applying a mix of 1 oz. per quart of Safe Solutions, Inc. enzyme cleaners per 1 quart of water or a 1 to 1 mix of bleach and water to the stung area. Try to avoid stings by lightly dusting your shoes, socks, feet and legs with talcum powder. You might need a medical practitioner to administer epinephrine in a timely manner. If you are allergic to their venom, you can be dead within minutes from anaphylaxis or anaphylactic shock.**

Fear of Fire Ants

An important indirect effect of the presence of fire ants is just the fear of being stung. Fear and anxiety about fire ants may limit the use of sites where fire ants are present. In some parks, playgrounds, athletic fields, and campsites are not used simply because of fear of the fire ants in the area.

Natural enemies in the U. S. include dragonflies, other ants, birds, lizards, spiders and toads. There are parasitic flies, fungi and nematodes.

MONITORING AND THRESHOLDS FOR FIRE ANTS

Monitoring

The first step is to correctly identify the species of fire ants in the area. Population monitoring for fire ant control generally consists of determining the number of active mounds in a particular unit area. Any fire ant mound where at least three ants are observed after mound disturbance should be considered active. Heavily infested fields can contain over 100 active fire ant mounds per acre.

Another method of estimating fire ant populations for comparison studies is by collecting fire ants attracted at baits in a test area. A small piece of hamburger and a small piece of agar containing 40% honey are each placed on a small piece of aluminum foil or in a small plastic cup. The two baits are placed on the ground at each bait station, 1'-3' apart, at each bait station. Bait stations are placed about 10 yards apart. The number of fire ant workers attracted to the baits per unit is monitored. Remember this mix if you decide to use baits to kill - mix in

5% or less boric acid or 3% or less sodium borate - **keep out of reach of people and animals.**

Fire Ant Threshold/Action Population Levels

The National Park Service has noted that threshold population levels for fire ants will vary according to the species and the sites. In certain camping and recreational areas, for example, very few active fire ant mounds per acre would likely be tolerated, particularly of the imported species. In contrast, a few active mounds per acre probably would be acceptable in other types of sites; little-used hiking areas, for example. Every effort should be made to correlate fire ant populations observed through the use of monitoring techniques with complaints received. In this way, a complaint threshold level can be established for each area.

In areas where fire ants are not causing any problems, the best solution is to do nothing. Some sites will only support a limited number of fire ants. These may be in the form of a few large colonies or many small ones. Established mounds defend territories, preventing the establishment of new colonies. Maintaining several large, and perhaps well-marked, colonies may be a sound way to stabilize fire ant populations in an area, as long as there is a low risk of people or pets stumbling into the nests.

Some researchers believe it may be best to selectively control fire ant colonies - allowing native species to flourish as a way to prevent the introduction of the imported species, or leaving single queen imports alone to prevent the area from invasion by a multiple-queen "supercolony."

Mounds built by fire ants in fields often interfere with mowing and farming operations. Not only is equipment damaged by dried and hardened fire ant mounds, but operators may refuse to enter fields infested by ants. The number of mounds per acre that can be tolerated as regards equipment damage must be determined on a case-by-case basis.

INTELLIGENT PEST MANAGEMENT® - ALTERNATIVE CONTROLS OF FIRE ANTS

Fire ants, particularly Red and Black Imported Fire Ants, pose a serious dilemma. On the one hand, there can be no doubt that the fire ant is a major pest, stinging people, pets and livestock, disfiguring the landscape, even attacking native animals. In one private preserve, imported fire ants were killing hatchlings of the brown pelican, a threatened species. On the other hand, aggressive insecticide (poison) treatment of critical habitat can have a greater negative impact on a sensitive environment, and volatile, synthetic insecticide poisons have never proven to really control fire ants anywhere - there generally are more fire ants after an "aggressive" poison campaign than before. **So why continue to use these volatile and useless poisons?**

Fire ant management consists of a series of questions and decisions: What fire ant species are in the area? How extensive is the infestation? What can be done to control these pests in neighboring areas? How high is the risk that people, pets or animals will be stung? How much damage are the fire ants doing? Is control action justified? What are the best strategies of control? Answering these questions requires proper inspection and monitoring to determine the nature and extent of the problem. **You must destroy the queen(s)!**

Water Controls - Carefully make a hole in the mound first.

Boiling water has been added to individual fire ant mounds with varying degrees of success reported. Approximately 3 gallons of hot water (at least 160° - 170° F.) poured into each mound will eliminate about 60% of the mounds treated. Surviving mounds will need to be treated again, at least for 3 consecutive days. **Caution: Boiling water can sterilize the soil.** Water has also been applied as steam, using a steam generator, usually on a cool day. Both techniques are cumbersome in the field, especially where large numbers of mounds are involved. You can cover the top of the nest with salt and then soak the nest with a sprinkler. We suggest **slowly** flooding with 3 gallons of diluted Safe Solutions Enzyme Cleaners (3 - 4 oz.) with 3 - 4 tablespoons of Safe Solutions food-grade DE, with or without 3% - 4% citrus oils), or try using 1 gallon of orange/grapefruit juice, 2 gallons of water and a dash of dish soap or peppermint soap or 3 gallons of hot water and ½ cup lye soap on a sunny but cool day - your success rate will greatly improve. One of the best tools for flooding nests is a 2½-gallon rechargeable fire extinguisher with 1½ gallons of enzyme mix and 110# of pressure. **Area-wide flooding or prescribed burning of fire ant infested areas has proved ineffective, and may actually promote the establishment of new colonies.**

Mechanical Disturbance

Fire ant mounds can be dug up and moved or destroyed, but not without some risk that the fire ants will successfully catch and attack the digger. Talcum powder dusted on shovels and equipment will help prevent fire ant contact. Dragging, shallow discing, driving over or repeatedly knocking down fire ant mounds may provide a limited level of control, but only if mounds are dragged or disced, or driven over just before the first hard freeze. Even tall, hardened mounds can be destroyed by pulling a steel I-beam drag, weighing about a ton, behind a tractor across the fire ant-infested area. Mechanically disturbing or even destroying fire ant mounds during the warm season will usually not reduce the number of active mounds; ants quickly and simply rebuild them. Fields that are annually tilled have fewer fire ant mounds than non-tilled fields because of the continuous mechanical disturbance from conventional tillage practices.

A number of mechanical mound pulverizers, ant electrocuters, even nest exploders, have been developed for fire ant control, but so far the effectiveness and practicality of these alternative devices has not been proven.

Orange Juice - The Author has killed fire ant mounds using 1 gallon of orange juice or grapefruit juice and 2 gallons of cold water and a splash of dish soap; open the nest and pour in the 3 gallons. There are literally tons of free oranges with a low sugar content rotting in fields around Ft. Pierce, Florida.

Electrical Attractants

Electrical fields and/or impulses seem to attract fire ants; use this attraction to lure fire ants to your food-grade DE, aspartame, borax or boric acid baits or Safe Solutions food-grade DE or glue/tape traps. Solar powered yard lights can be adapted to provide electrical current for a field attractant.

Prevention and Sanitation and Habitat Reduction

Be sure the exterior grade diverts water away from the buildings. Repair leaks and moisture problems. Trim vegetation 18" away from buildings. Keep the yard, roof, gutters and downspouts free of debris. Remove mulch, food sources, garbage, manure, fruits and nuts, debris, pieces of lumber, old equipment, weeds and grass; elevate bee hives; caulk and seal or fill with aerosol foam insulation all open voids, cracks, crevices; quickly remove dead animals and hay bales; regularly mow and trim and lightly dust with talcum powder or Comet® or food-grade DE; smear petroleum jelly or Tanglefoot® or Stick'em or duct tape (sticky-side up) where you want to keep them out. Look for mounds and quickly treat them.

Some Biological Controls

A number of biological enemies (pathogens, predators and parasites) of the fire ants have been evaluated as biocontrol agents, including nematodes, bacteria, fungi, viruses, and microsporidia., but biological control has not yet a proven effective control tactic for fire ants. Some show promise, for example, the workerless parasite ant, *Solenopsis daguerrei* (Santchi) formerly *Labachena daguerrei* was first discovered infecting 1% - 4% of the colonies of the imported fire ant, *Solenopsis ricteri* (Forel) (formerly *Solenopsis saevissima* variety *ricteri*) in Argentina. This permanent parasite kills the host colony by decapitating the queens. While scarce in South American they (*S. daquerrei*) might be able to propagate better here as a biological control agent. Phorid flies: There are about 15 species in Brazil and Argentina that attack fire ants there. These (*Pseudacteon* spp.) Parasitoid flies (Diptera: Phoridae) all parasitize the red imported fire ant *Solenopsis invicta* (Buren). There are at least four (4) species *P.litoralis*, *P.wasmanni*, *P.tricuspis* and *P.curvatus* that have been described. *P.curvatus* has also been found ovipositing on the native North American fire ant, *Solenopsis geminata* (F). Sanford Porter, et al, 1997 noted that *Pseudacteon tricuspis* (Borgmeier) has been developed successfully on *Solenopsis invicta* and a hybrid *Solenopsis ricteri* x *invicta* from Mississippi. This fly and its cogener, *Pseudacteon litoralis* (Borgmeier) have the peculiar habit of decapitating their living host and using the ant's empty head capsule as a pupal case. The fly takes 4 - 6 weeks to develop from egg to adult. They live only to attack and kill fire ants.

Thelohania. *Thelohania solenopsae* is a microscopic protozoan (or pathogenic microsporidium) that infects immature and adult fire ants. Diseased ants, including the queens, have shorter life spans and can lay less eggs, so over a period of several months to a year, the colony declines. The pathogen is apparently transmitted by diseased ants moving between multiple-queen colonies. *Thelohania* attacks only the exotic (or red) and the

black imported fire ant and does not attack other ant species native to the U. S.

In Argentina, about 20 percent of the red imported fire ant colonies are infected. Surveys in the U. S. did not detect this disease organism until 1997, when it was discovered in Florida. Since then, *Thelohania* has also been found in Texas and Mississippi. Research is under way to discover ways to increase the impact of this pathogen and culture it in the laboratory. (Knutson & Drees)

Beauveria. *Beauveria bassiana* is a common fungus that attacks many species of insects. A strain of *Beauveria* that attacks the imported fire ant was reported from Brazil in 1987. This fungus produces microscopic spores that attach to the ant's body, germinate, and grow inside the ant. The fungus feeds on the internal organs of the ant. The ant soon dies, and its body is filled with a fungal growth. The fungus sometimes grows outside the dead ant, covering it with a white, fuzzy growth. Studies have shown that *Beauveria* applied to the soil is much less effective than if the spores are applied directly to the ants. The application of *Beauveria* to fire ant baits is being investigated. (Knutson & Drees)

Strepsiptera. Strepsiptera are minute insects that parasitize other insects. They spend part of their life as an endoparasite that develops in the abdomen of the insect host. Only the first instar and short-lived male are free living. The developing male and female are wholly endoparasitic in insects. The male and female are completely different. The first instar larva jabs itself between the outer shell and skin of the host. Once the entire larva body has fully penetrated its host's layers, it remains in constant motion for 24 - 36 hours until it is entirely enclosed inside the host. The host's skin forms a bag suspended by a thin stalk. When the larva develops another instar. The stalk pinches off from the overlying epidermal layer and the second instar moves passively through the host until it reaches the abdomen, where it develops into a fourth-instar larva. The female develops no further, except to harden a cephalothorax (anterior portion) which squeezes out of the abdominal segments of the insect host and emits a male attractant. The male develops within the ant and when it is time to emerge, the infected ant leaves the colony and climbs to the top of a twig or grass. The short-lived male then emerges from the ant and finds and mates with a female. The gravid female develops up to 800,000 eggs and lays live young who emerge from the female and start the cycle all over again. One species, *Caenocholax fenyesei*, attacks the red imported fire ant in the U.S. Like other Strepsiptera, *C fenyesei* has a complex and unusual life cycle. The female parasitizes a species of bush cricket, *Hapithus agitator*, or, as Dr. Spencer Johnson has found, the long-horned grasshopper can be used, a pest of palm oil plantations in Papua, New Guinea can also be parasitized by the female. Once the immature parasite has consumed the cricket, she develops into the adult stage. However, the adult female never leaves the dead cricket. Rather, she produces thousands of eggs that hatch into larvae called triungulins. The tiny, flattened triungulins leave the female and search for new hosts. While female triungulins must find another bush cricket, male triungulins develop in fire ant adults. Once a male triungulin attaches to a passing fire ant, it burrows into the ant to feed and develop. Parasitized fire ants typically climb to a high perch where they soon die. The adult male Strepsiptera then emerges from the dead fire ant. Only about 1% to 2% of the fire ants in a colony are parasitized by *C fenyesei* in Texas. However, Strepsiptera may have potential benefits if inexpensive mass rearing techniques can be developed that provide high numbers for periodic applications. (Knutson & Drees)

Oraesema. Species of *Oraesema* (Eucharididae) are tiny wasps that parasitize immature fire ants. Female *Oraesema* wasps lay large numbers of eggs on plant leaves and buds. The eggs hatch into tiny flattened larvae called planidia. The planidia lie in wait and attach to passing ants. Once in the ant colony the planidia leave the worker ant and attach to ant larvae. When the ant larva pupates, the planidia consumes the ant pupa. Typically, only a small percent of the fire ants are killed by *Oraesema*. Several species of *Oraesema* parasitize the imported fire ant in South America, and several other species of *Oraesema* occur in the U.S. Research is under way to learn more about these ant parasites and to develop mass-rearing techniques.

Nematodes and mites and viruses. Certain nematodes (*Steinernema spp.* and *Heterorhabditis* species and parasitic mites *Pyemotes tritici*) also attack and parasitize red imported fire ants, and other insects. Ants in treated colonies often leave the nesting site or mound and move to a new location. However, field evaluations of commercially available species/strains of these parasites currently being marketed for fire ant control have not yet been conducted to demonstrate their effectiveness. (Knutson & Drees)

So far, one of the most effective of these biological controls is a nematode, *Neoaplectana carpocapsae*. In trials, one application has inactivated about 80% of treated mounds in 90 days. The straw itch mite, *Pyemotes tritici*,

has also been shown to inactivate fire ant mounds. Three to ten applications at about two week intervals gave 70% control. Practical use of this mite for fire ant control must await the development of more efficient methods of mass production and increased effectiveness. Another problem is that this mite is a pest of people and animals; it bites and causes dermatitis. It is thought the phorid flies only parasitize 1% - 3% of the fire ant colony, but the ant behavior is far more important, the fire ant workers quickly learn to escape underground or assume a defensive position and only 3 - 4 flies are needed to disrupt normal ant activity. We need to carefully study viruses as control agents against fire ants and ants in general.

Ant-Proofing

Fire ants, like other ants, may be nesting near buildings and can enter and move through a structure through innumerable tiny cracks and openings. Caulking and foaming with aerosol insulation or otherwise sealing cracks and crevices and areas being used by fire ants can often have great effect in suppressing the population inside. **If it is not safe or possible to caulk and/or to foam, dust with talcum or medicated body powder or food-grade DE.** Many effective, easy-to-use silicon sealers or caulks and expandable aerosol foam insulation products have been recently developed, including some designed specifically for pest management. Use other barriers such as teflon tape, Vaseline®, Tanglefoot®, geraniol, peppermint oil and/or duct tape sticky-side up.

Public Education

The most effective measure for preventing fire ant injury to people is education. Activities should be directed away from highly infested fire ant areas. People should be informed about the habits of fire ants, how to recognize them, and how to avoid them. People should be encouraged to use proper sanitation so that fire ants are not attracted to such sites as picnic areas. And if the worst happens, information should be available on what to do if a person is stung.

Intelligent Pest Management® Alternative Mound Treatments

Treating individual fire ant mounds is time consuming, but it is generally the most effective method of control. It takes from a few hours to a few weeks to "kill" the mound, depending on the product used. Individual mound treatment is usually most effective in the spring. The key is to locate and treat all the mounds in the area to be protected, not always a simple task. If many young mounds are missed, reinfestation of the area can take place in less than a year. The following discussions describe different ways to treat individual mounds.

Aspartame - Sprinkle aspartame (Equal® or Nutrasweet®) on the fire ant mounds and then mist the aspartame with water and watch the action.

Fire Ant Mound Drench. Take 3 gallons of water and add 3 oz. - 4 oz. of Safe Solutions, Inc. Enzyme Cleaner with Peppermint and 3 - 4 tablespoons food-grade DE and gently flood the mound and surrounding area (or a 3-gallon mix of 1/3 orange juice and 2/3's water and a dash of dish soap). Break open the top of the fire ant mound and pour 3 gallons of the diluted enzyme/orange juice dilution directly into the galleries. It has been observed that when a man urinates on the mounds, the ants die, so try urine or a mix of turpentine or pine oil and ammonia in water. Other drenches include diluted peppermint soap at a rate of 1 pint per 3 gallons of water. **Open the top of the mound; then wet the top of the mound, then soak an area around the base of the mound and pour the remaining drench on the top of the mound from a height of at least 3 feet to help penetrate the entire mound.** Mound drenches are most effective after rains when the ground is wet and the ants have moved up into the drier soil in the mound. During excessively dry weather, effectiveness of the treatment may be enhanced if you soak the soil around the mound with plain water or diluted enzyme cleaners before you flood the mound with 3 gallons of diluted Safe Solutions enzyme cleaner or orange juice, or steam. A simple way to flood a lot of mounds in your yard is to use a hose end sprayer and fill the container with Safe Solutions Enzyme Cleaner with Peppermint and a few ounces of food-grade DE and then simply soak the mound and surrounding area, or you can use a 2½-gal. stainless steel fire extinguisher with 1½ gal. water, 4 - 5 oz. Safe Solutions Enzyme Cleaner with Peppermint and 110# pressure and "pressure bore" right into the nest. Be sure your canister is rated for this much air pressure.

Coke. Take two (2) 2-liter bottles of Coca-Cola and pour directly into (a hole) in each mound.

Carbon Dioxide (CO₂). Insert several pounds of dry ice or inject the dense gas which is one and a half times heavier than air (use a 20# cylinder of CO₂ with 12 feet of hose and a 3' - 4' pipe attached) into the fire ant mound and it moves downward killing all worker ants, larvae and the queen. There is no odor or warning as the CO₂ gas silently replaces the air in the entire chamber and any connecting tunnels or chambers or mounds. CO₂ is not harmful to plants or lawns and after killing the fire ants in the mound, CO₂ returns harmlessly back into the air. **Fire ants do not like frozen ground.**

Carbon Monoxide (CO) created by burning (6 - 8) charcoal briquettes will also control fire ants if you throw them into a hole in the mound with a 2'+ wall (e.g., half of a barrel, open on both ends) around the mound/hole. Propane and other heavier than air gases will also work, but are certainly not as safe.

War! Take 2 shovels, dust the handles, your shoes, socks and trouser bottoms with talcum powder; get a shovel full of each mound; then transfer each shoveful to the other mound and see if the ants fight it out among themselves. This is becoming less and less effective.

ADDITIONAL FIRE ANT CONTROL THOUGHTS: Fire ants will usually not build a mound in a shady location. Mounds on clay soils are usually higher than those on sandy soils. There can be 50 - 800 mounds per acre with a combined biomass equal to that of a cow! They move quickly and can relocate their entire colony in less than 24 hours. 75% of fire ant colonies move at least once every 90 days, usually when they are disturbed by vibrations, lawn mowers, traffic, insecticide poisons or repeated flooding either natural or man-made. There are several biological controls for fire ants, e.g., parasitic pyemote mites and parasitic nematodes, e.g., Nc Nematodes. There are at least 18 species of parasitic phorid flies, 3 species of nematodes, 10 or more microorganisms, a parasitic ant, a parasitic wasp and dozens of other symbionts of undetermined importance and/or effectiveness in South America but only 2 - 3 in the U. S. (Collins 1971). That is, obviously, why the fire ants are 4 - 7 times more abundant here than in South America. When fish eat fire ants, they often die. Whole fire ant colony "balls" can float in clear water, but sink in soapy or enzyme water and will not cross a sticky barrier. As a last resort use natural diatomaceous earth with pyrethrin, e.g., Perma-Guard® or call 1-800-322-5252 and order Insecto Formula 7 which uses all natural ingredients, e.g., sugar, ammonia and pine oil and is mixed 1 oz. to a gallon and then poured directly on the nest. Try boiling your own "brew" of soapy water (3 - 4 oz. liquid dish soap and 1 oz. Safe Solutions, Inc. Enzyme Cleaner with Peppermint per gallon for a total of 3 - 4 gallons) with or without vitamin C, ascorbic and citric acid, orange juice, pine oil, food-grade DE, citrus oils, sugar, white vinegar and/or ammonia and pour the mixture on each nest in the yard; repeat daily as needed. The oils in citrus peels are very effective on ants that contact them - but they break down quickly, so copiously flood the nests with them. Spray geraniol diluted in olive oil or cedar oil as a repellent.

Baits. Late summer and early fall are great times to bait as the ant colonies are then stressed for adequate food and water. You can broadcast freshly processed corn cob grits coated with soybean oil with 1% borax or 3% - 4% aspartame as a homemade bait in the spring and the fall, especially when no mounds are visible. If you bait in summer, bait in the late afternoon or at night. Use about 1 - 2 oz. per 1,000 square feet. The ants will find the grits and extract the toxic oil for food. Prebait with potato chips to see where to place the baits. If you have a mound, bait around the mound up to 3 feet away (or in a bait container) rather than broadcast the baits. **Do not put bait on top of the mound, unless you open it up first and wait 8 minutes.** 10% sugar and 1% boric acid or borax liquid baits may eventually work but the control may take 3 - 4 months to obtain control. You can try sprinkling 1/2 cup of dry instant grits or Malt-o-Meal® on each dry mound. Try using a sweet bait (10%) with soybean oil (87%) and enzyme cleaner or food-grade DE (3%) soaked into corn cob grits or pieces of sponge. Try sliced raw fish soaked in a 5% - 10% boric acid bath for 10 minutes. You can use freshly ground crickets lightly dusted with powdered sugar with 3% - 5% boric acid. **Do not apply baits if the ants are not actively foraging. Keep baits away for animals and people.**

Dusts. If you are digging up a mound, dust the bucket and/or shovel with baby powder containing talc to keep fire ants from climbing up. You can also dust the nest and surrounding area with food-grade DE, Comet® cleanser or medicated body powder to control or repel fire ants or keep them from entering an area or electrical device or building or bee hive, etc. In a pinch, simply cover the mound with fire wood ash. There is some anecdotal evidence that consuming zinc will help repel fire ants.

Fire Ant Control Summary: Fire ants can be quickly controlled when sprayed or flooded and drenched with Safe Solutions Enzyme Cleaner with Peppermint and food-grade DE or with carbon dioxide. Applications of

copious amounts of diluted enzyme cleaners or carbon dioxide are most effective when the nest is drenched mid-morning on sunny days after cool nights in the early spring or late fall. Poke a stick into the nest and make several holes to accept the mixture; then flood the entire area, or bait with enzyme cleaners. Call Safe Solutions, Inc. at 1-616-677-2850. Whitmire Research Laboratories recently introduced PT 370 Ascend Fire Ant Bait® which contains 0.011% avermectin B₁ in a highly attractive corn grit base saturated with protein oil. Avermectin is naturally derived from the soil fungus *Streptomyces avermilitis*. Ascend works both as an acute toxicant and as an insect growth regulator to quickly and effectively control fire ants. Foraging fire ants carry Ascend's dual action insecticide back to the mound. Ascend's stomach insecticide works slowly but surely to reduce the colony's population; be sure to allow enough time for its unique sterilizing property to be passed on to the queen. This causes the worker brood to eventually disappear, and the colony is ultimately destroyed. Note: Parasitic Brazilian, *Pseudacteon* 18 spp, flies are parasitic only on fire ants. The female fly deposits an egg on or in a fire ant's body. The maggot moves through the neck into the head and eats the contents; **then an enzyme dissolves the connecting tissue and the head falls off.** That is just another reason why Safe Solutions, Inc. enzyme cleaners kill any ant species very quickly. At least 18 species of Phorid flies are known to be parasitic on a number of ant species, including imported fire ants. The parasitic nematode (*Neoplectana carpocapsae*), when combined with a bait may give results if undetected as will the fire mite when introduced into the colony. There is another nematode that also can be used - *Steinernema carpocapsae*. There also is a protozoan disease called *Theohania solenopsae* and a workerless social parasite called *Solenopsis dagerrei*. Large colonies of Argentine ants will keep fire ants at bay - These two species can not and will not co-habit or co-exist in the same area. Talcum powder and/or medicated body powder or food-grade DE or naphthalene will also control/repel fire ants. Also, don't forget to caulk, fill or seal off any openings into your building. You can also use WD40 or vacuum up fire ants where it is not safe to use water sprays or foam or steam or carbon dioxide. Kill them with aspartame. Sprinkle the granules on the colony and mist with water. Once a natural enemy or pathogen is introduced to a small area, it spreads quickly on its own - thus no *professional* from the poison *industry* wants to develop these extremely safe and effective pest controls - because there is no profit incentive. **Reinfestation can be expected every 6 months if you use "registered" poisons.** According to an advertisement in the February 2001 issue of Pest Control: "Purchases of fire ant 'control' products are in excess of \$100 million annually and growing." By 2005 over \$1 billion were spent annually in the USA to try to "control" fire ants.

Texas Fights Fire Ants - In 2000, Texas authorities spent over \$580 million trying to "contain" their fire ant infestation. Total Texas spending is over \$1 billion a year trying to "control" this pest.

California's Fire Ant (Pesticide Poison) Battle Plan - Leslie Berkman from The Press Enterprise Company published 3/20/99 quoted the California State Department of Food and Agriculture who acknowledged that "the possibility of eradication is low and will be difficult to achieve." That conclusion, the State said, is based on "the widespread nature of the infestation, the biology of (the ant) and the fact that the ant) has never been eradicated since being introduced in the United States." Conspicuously absent from the State plan was a price tag. (The State's "battle plan" will spray "registered" poisons via helicopter even though this has never been done successfully anywhere. California State Republican Assemblyman, Bill Campbell, said, "I'd be willing to stand out in the field when that helicopter is going overhead." Amazing!

GHOST ANTS

Tapinoma melancephalum (Fabricius)

Subfamily - Dolichoderinae

Adult - Very hard to see because of its pale color and very tiny size, about 1/16" long or about the size of a pin head. Antennae 12-segmented, gradually thickened towards the tip. Its head and thorax is black and the rest of the body and legs are a pale grey color, almost transparent. Ghost ants live in just about anything outdoors and can be carried inside in plants, wood, soil and plant products; they then move in just about anywhere in book bindings, interior walls, behind baseboards, between cabinets and walls, in plant soil, in greenhouses, etc. Their nesting habits and size are similar to Pharaoh Ants. They stink like rotten coconuts when crushed. They like honeydew and sweets and like to be around moisture.

Intelligent Pest Management® Controls - A thorough inspection with prebaiting should reveal all the nest locations. Then try light Karo Syrup, honey, watermelon juice, Listerine, jelly and/or peanut butter baits with 1% or less sodium borate or boric acid. Better still, use 3% - 5% food-grade DE or aspartame. Trim back all branches that touch or overhang the buildings. Remove all mulch, stones, rocks, boards, firewood and other

debris that abuts the building. Lightly sprinkle talcum powder or Comet® or food-grade DE. Look for nests and flood with diluted enzyme cleaners. Spray all visible ants with diluted Safe Solutions, Inc. enzyme cleaner. Draw a line of chalk or petroleum jelly where you don't want them to cross. Turn over all stones, rocks, logs, bricks, firewood, etc. outside when searching for nests. Don't forget to look in potted plants. Caulk and seal all openings. Mop with diluted enzyme cleaners and/or borax. These ants and some Crazy Ants will stand on each other to get to a fresh light Karo Syrup bait with DOT - they will literally pour out of the ground to drink even a 5% DOT (disodium octoborate tetrahydrate) poison solution. They and Pharaoh Ants respond quickly to sodium borate or DOT baits in sucrose water or light Karo Syrup or freshly ground crickets, which act not only as a food attractant but as a moisture source. You also can spray them as needed with diluted Safe Solutions, Inc. enzyme cleaner (1 oz. per quart of water). Dusts, e.g., Comet®, talcum or medicated body powder or food-grade DE will kill and/or repel them.

HARVESTER ANT
Subfamily Myrmicinae
Pogonomyrmex spp.



Adult - Harvester ants are comparatively large, 3/16" - 1/2" long, red to dark brown in color with a pair of spines on the thorax. Long hairs form a "brush" under their heads. The pedicel has two knots. A stinger is present on the abdomen. They regularly gather, store and eat seeds. They commonly are found outside in lawns, paths, around door steps, etc.; they are primarily an agricultural pest; removing vegetation from around their nest; but they are also a fierce stinger, and can occasionally invade inside and inflict painful stings when disturbed. California Harvester Ant venom can persist for over 30 days. The California Harvester Ant (*Pogonomyrmex californicus*) workers will leave the nest individually and fan out in all directions. Red Harvester Ant workers (*P. barbatus*) leave the nest on scented trails and then later fan out in all directions. Found normally in the arid (sandy) regions (high desert country) of our Southwest. When the reproductives emerge a group of males will swarm over a single female forming "balls of ants" on the ground, producing two genetic lineages. Head has rows of long hairs underneath and antenna has 12 segments. These are the ants used in most ant farms. To corral the ants the Fawcetts family from Washington County, Utah **use straws to drive them out of their mounds**. The vibrations they create by blowing into a trench near the ant hill opening prompt the ants to rush out to do battle with whatever is near their entrance. **Few North American insects have a worse sting! The stinger is barbed! Treat mounds during the hot part of the day when most of the ants are in the nest.**

LARGE(R) YELLOW (CITRONELLA) ANT
Subfamily Dolichoderinae
Acanthomyops interjectus (Mayr)



Adult - Larger Yellow Ant workers 1/8" - 1/4" in length (reproductives are larger), pale yellow to yellowish red in color, and have only one segment or node or knot in the pedicel. Nests in many different locations including under basement floors and around and inside foundation walls; (outside) in and under old logs and stones. Found throughout New England and the Midwest. They can be found primarily in the Southern states, e.g., Texas and Louisiana. These ants feed on honeydew from aphids and mealy bugs, which they attend. Yellow ant workers and reproductives emit a lemon or citronella odor from the head. This can be detected when the head is crushed. If the abdomen is crushed, a strong formic acid odor is produced. Workers forage outside in lawns, fields and open woodland. Colonies are sometimes located next to or under basement slabs; in late winter, workers will excavate the soil and enter through cracks in the slab. They commonly pile their anthill on concrete or between cracks in the slab. If undisturbed, many hills may appear. Winged ants occasionally swarm from these hills, but workers normally do not forage inside. Vacuuming the soil hills is recommended. Treatment of yellow ant hills outside near the building foundation with white vinegar/enzymes and some food-grade DE may be indicated in the spring with repeat cases. They forage at night, so do your inspection then. When they swarm in late winter or spring, they are often mistaken for termites. Control is not justifiable based on potential damage. Try a sweet bait with aspartame. They have been known to strip a tree of leaves in one night. Occasionally invades buildings for cereal products. Spray with diluted Safe Solutions Enzyme Cleaners with Peppermint and/or food-grade DE.



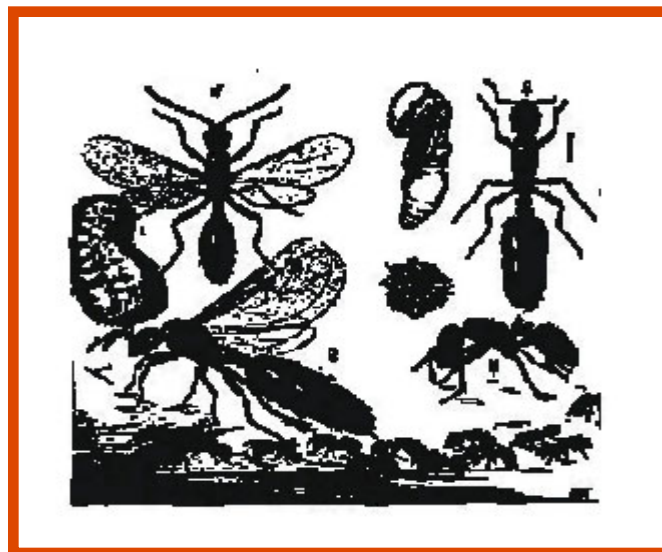
TEXAS) LEAF CUTTING OR FUNGUS GROWING ANT
Subfamily Myrmicinae
Atta spp.

Adult - This ant is about 1/16" to 1/2" long, light to dark brown or rust brown in color with three or more pair of spines on the thorax. The pedicel has two knots. The nests are 8 - 20 feet deep in sandy soil with a 6 foot square growing chamber surrounded by a mound. Their food is mainly fungus which they raise in their nests on segments of leaves they have cut and stored in their nests. They have been known to strip a tree of leaves in one night. Found primarily

in the Southern states, e.g., Texas and Louisiana. Occasionally invades buildings for cereal products. Spray with diluted Safe Solutions Enzyme Cleaner with Peppermint.

LITTLE BLACK ANT
Subfamily Myrmicinae
Monomorium minimum (Buckley) & *Monomarium destructor* (Jerdon)

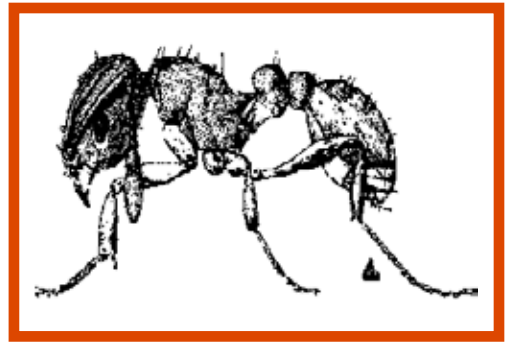
Adult - Little Black ants are very small; about 1/32" - 1/16" long, shiny jet black, slender. It has 2 nodes. Outside nest openings marked by craters of fine soil. Several 1/8" queens usually live in each colony, which may become very large. An occasional building invader; their nests can be found in woodwork, decaying wood and masonry. Found throughout the U. S., especially in the northern and eastern states and southern Canada. They normally nest outdoors and tend honeydew producing insects. They feed on virtually everything inside, e.g., bread, grease, sweets, meat, fruits and vegetables, but outside they normally only feed on honeydew and plant juices. Destructor has been known to damage fabrics. They bite viciously and have been used as "stitches" to close wounds. Follow back to nests and treat with baking soda, talcum powder, chalk dust, Comet®, boric acid, borax or diluted Safe Solutions Enzyme Cleaner with Peppermint and/or with borax.



LITTLE FIRE ANT

Tribe Blepharidattini, Subfamily Myrmicinae
Wasmannia auropunctata (Roger)

The Little Fire Ant is less than 1/16" long with two nodes and two spines near the end of the thorax. It is not shiny and is yellow to brown in color with a darker abdomen. The ant is established in localities in Florida and California. It usually nests out-of-doors, tends honeydew-producing insects, and feeds on insects. This tiny ant can sting and sometimes infests bedding. It is not related to fire ants in the genus *Solenopsis* and does not make mounds. Can sting 3 - 4 times before you hit it. Look under partly covered bricks and stones. Flood with copious amounts of diluted Safe Solutions Enzyme Cleaners with Peppermint and/or diluted orange juice. Bait with light Karo Syrup and (1%) boric acid or borax or 3% food-grade DE or aspartame.



ODOROUS HOUSE ANT

Subfamily Dolichoderinae
Tapinoma sessile (Say)

Adult - The tiny Odorous House Ant is slightly broad and measures from 1/10" to 1/8" long, soft-bodied, pedicel one-segmented, dark reddish brown to brownish-gray to black in color and covered with a velvety sheen. Have a slit-like opening on the underside of the gaster and all of the workers are one size. Similar to Argentine ants in appearance. Abdomen broad and hides a vestigial scale. Not so agile in their movements. When crushed, they give off a pungent, nauseating, rotten coconut or rancid butter odor or pine smell. Colonies may contain numerous queens. The pedicel connects to the lower part of the abdomen. A frequent building invader, it will also nest outdoors or in foundations. Outside the nests are usually shallow and underneath an object, e.g., a rock, board, tarp or debris. Feed primarily on proteins and sugars; their natural food is honeydew. Usually found under floors and in wall voids, especially near a heat source. Does not sting. Indoors they usually invade buildings to forage (following grooves and/or structural guidelines) especially in rainy weather when honeydew is washed from trees. Follow back to the nest and treat with boric acid and/or appropriate baits. The Argentine ant will drive them out. They have been frequently confused with Argentine ants, but they are darker in color and the front of their abdomen overhangs and hides the petiole. They will forage both day and night when the temperature is 50° F. or above. They have multiple queens.



Odorous House Ants can be found from Canada to Mexico including all of the lower 48 United States, especially in the West. They are the most common ant found in structures in North America, except for the Argentine ant within its primary range (the Gulf Coast and southern California). They do not bite or sting.

The body of the odorous house ant is relatively soft and can be easily crushed. When this occurs, a very unpleasant, foul "coconut" odor is released. The single node of the petiole is very small and hidden by the overlapping abdomen. (This identifying characteristic is best seen by crushing the soft ant and with a good hand lens noticing the absence of a distinctive node.) From above, the abdomen is broad compared with the width of the thorax.

When alarmed, workers scurry around with their abdomens stuck up in the air.

An average Odorous House Ant colony will have 10,000 to 34,000 members and several queens. They can range in size from a few hundred to over 100,000 members. Mating and swarming takes place in the nest and new colonies are formed by budding. They are opportunist nesters, nesting anywhere that provides shelter. Outdoor nests are shallow and are located under stones and boards. Inside, a colony can nest in many types of cavities, usually around a heat/moisture source. They have no sting.

The Odorous House Ant workers trail each other. Outside they actively tend honeydew-producing insects and take flower nectar and consume dead insects and animals. Inside, workers seem to prefer sweets, pet food and garbage. In California, workers forage indoors late in the warm season and during rainy spells, possibly in response to reduced sources of honeydew. They will defend their nest, but not their food source or foraging

territory.

Inspection

- Begin by investigating any/all locations where ant activity is observed or reported.
- Pyrethrins can flush ants causing them to rush around erratically, excitedly elevating their abdomens. (This could cause the colony to split itself and relocate, as with the Pharaoh Ant.) So do not spray. Vacuum and or bait or simply blast with air.
- Always inspect outside close to the location of inside activity. Look under stones and boards for colony openings and activity. Remember, they can move their nests once every three weeks, usually in response to rain.

Habitat Alteration

- Remove stones, firewood, mulch, debris, stumps, tarps, logs and boards harboring odorous house ant colonies.

Intelligent Pest Mangement® Controls

- Good sanitation is a vital part of effective control and/or prevention. Find and destroy all the nests.
- Plants, moisture and mulch are ideal habitats that should be addressed first.
- Lightly sprinkle baking soda or medicated body powder, food-grade DE or Comet® or talcum powder where you see activity and/or install negative ion plates and vacuum. As a last resort you may make spot applications using only dusts or residual sprays or diluted borax or disodium borate applied in cracks and crevices in the area of entering worker trails. Any ant exhibiting strong affinities to the outside environment (honeydew insects, flower nectar) and with nesting mobility (shallow nests, cavity nests, utilization of protective objects) should be sought outside as well as inside, unless its locality in side precludes its reaching the outside. Mop with 1/2 cup borax per gallon of hot water. Make Vaseline® barriers.
- Control populations of honeydew producing insects on plants near the structure. Bait with aspartame or boron-poisoned (4% - 5% or less [or 3% - 4% food-grade DE]) in light Karo Syrup or honey in a red bait station. **Keep boron baits away from people and/or animals.**
- As a last resort use food-grade diatomaceous earth (DE). To maintain parasites and or predators of these plant insects, use least-toxic pesticides such as insecticidal soaps and oils or pestisafes®, e.g., diluted Safe Solutions. Enzyme Cleaner with Peppermint.

Follow-up - Control honeydew insects on plants and to eliminate nest harborage near structures. Remember, any synthetic pesticide used against any ant population will quickly become ineffective because the ants quickly develop resistance. In addition to their inherent danger, they just do not work as well as Comet®, baking soda, soap and water, borax, boric acid, disodium octoborate tetrahydrate, talcum powder, white vinegar, diatomaceous earth, chalk and/or diluted Safe Solutions, Inc. Enzyme Cleaner with Peppermint, all of which do not create resistant species and do not volatilize/contaminate the ambient air for months and/or years.

PAVEMENT ANT

Tribe Tetramorini, Subfamily Myrmicinae
Tetramorium caespitum (Linnaeus)

Adult - Pavement ants are small, about 1/16" - 1/8" long, hairy, robust, hard bodied with a sparse array of small (stiff) hairs all over. They originated in Europe and now are found throughout the U. S. and can bite and sting. They have two nodes or segments in the pedicel and no antennal club. The shiny abdomen is light to dark brown to blackish in color and the appendages (legs) pale or lighter. Dull red-brown, head and thorax are visibly grooved with fine parallel lines or ridges and there is a pair of small spines on the posterior portion of the thorax. As the name suggests, they normally nest outside in or under cracks in the pavement, but can and do relocate the colony indoors during the winter. Queens are about 3/8" long. Once inside they often follow pipes and can nest occasionally in walls, insulation and under floors, generally next to a radiator or other heating source. Common in



lawns, under stones and along the edge of pavement in sandy or rocky places, and in woodwork and masonry; practically omnivorous and will eat virtually everything, but prefer grease and sweets - so use these items with boric acid or DOT if you are making your own baits. Draw a line of chalk and see if they will cross it. They will not cross Safe Solutions, Inc. Chalk De-Fence™ Barrier. Mop with 1 cup borax per gallon of hot water. **They forage for up to 30 feet from the nest.** They are major pests in the Northeast and Midwest, and they sting and bite. Pavement ants are common along the Atlantic seaboard; they are less common in the southern states. This ant is found as well in cities in the midwest and California. The red-brown head and thorax are dull because of minute, parallel furrows found on the front and sides.

Pavement ants nest outside under rocks, stones, boards, bricks, and mulch or leaf piles, along sidewalks, building foundations, at the edge of pavement, door stoops and patios. They commonly move their colonies inside between the foundation and sill plate. Outside, pavement ants tend honeydew-producing insects, and feed on other insects and seeds. These ants readily make trails to and from food sources and often forage rather slowly along the edge of carpeting or baseboards. They are also common around the base of toilets. They often nest in protected areas so the nests may be hard to locate, but their locations are essential to manage infestations of this species. There can be several thousand members in a colony.

Outdoors pavement ants feed on a wide variety of foods including other insects, greasy foods, and plants. **Inside** they seek sweet materials and grease. While they are often found in damp areas, lack of moisture does not limit their development, so solving moisture problems alone will not affect these ants. Vegetation-free borders should be installed around buildings, and any cracks in building foundations should be sealed. Any loose material under that could provide nesting habitats and should be raised off the ground.

Pavement ants store debris in certain areas of the colony or nest. When this area is needed for nest expansion, workers clean out the junk accumulation and dump it. Colonies located on foundation walls drop debris over the side in a pile on the basement floor. The ant dump consists of sand, small pieces of gravel, seed coats, dead insect parts, wood fibers and sawdust from the house construction. Not knowing the source, householders often view these dumps with alarm. **Pavement ants can bite and sting if pressed.**

A closely related species, *Tetramorium guineense* (Fabricus), with good trailing habits and rapid movement is commonly introduced with tropical plants and flourishes in warm moist environments.



INSPECTION

- Carefully inspect along sill plate in basement, around heat ducts and baseboards in areas where ant workers are active.
- Look for foraging in the kitchen; such activity may indicate a nest in the basement below or just outside.
- Outside, look for tiny mounds next to the house near windows and doors or nest openings under stones or any object lying on the ground and flood with diluted Safe Solutions Enzyme Cleaner.

Habitat alteration

- Practice proper sanitation.
- Remove any and all stones, boards, bricks, lumber, etc., that are sheltering ants or raise them off the ground.
- Recommend indoor sanitation including the elimination of moist garbage in dry weather.
- Caulk observed ant entrance points and all cracks and crevices. Mop with borax.
- Lightly sprinkle baking soda, talcum powder or medicated body powder, food-grade DE or Comet® or place duct tape (sticky-side up) where you see ant activity.

Intelligent Pest Management® Controls - If you can not find the nest, bait with equal parts of peanut butter and shortening and 3% or less boric acid or aspartame, but never spray any volatile, synthetic pesticide poisons.

Inside:

- Practice proper sanitation.
- Install negative ion plates and vacuum; wait 2 weeks - then and only if necessary.
- Apply dusts, e.g., baking soda, talcum powder, Comet®, boric acid or food-grade diatomaceous earth in cracks and crevices of baseboard molding or mop with borax or Mop Up® where and when activity is noticed.
- Caulk/seal and vacuum any remaining cracks, crevices and other openings.
- Be sure your potted plants do not contain Argentine ant nests.
- Bait with 3% or less boric acid or aspartame or food-grade DE baits in light Karo Syrup or honey.

Basement:

- Caulk/seal any cracks along foundation walls, under sill plates, and cracks near heat ducts. Properly install and maintain a dehumidifier.
- Caulk/seal cracks in slab on-grade foundations as well as the base of outside door jambs.
- Lightly dust sill boxes with talcum powder, medicated body powder, DOT, boric acid, food-grade DE or Comet®.

Outside:

- Caulk cracks and entry points.

Follow-up - Follow-up is usually not needed, but where initial control is not achieved, an intense reinspection is indicated.

PHARAOH ANT

Tribe Solenopsidini, Subfamily Myrmicinae
Monomorium pharaonis (Linnaeus)



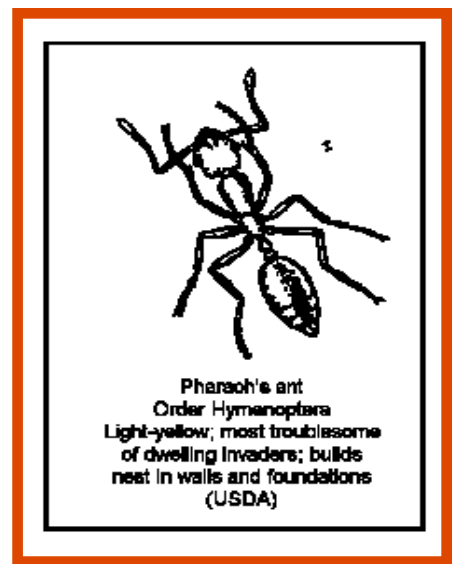
The Pharaoh Ant was described by Linnaeus in 1758 from specimens collected in Egypt. Linnaeus incorrectly noted the Pharaoh Ant was one of the 10 plagues. Pharaoh Ants are small yellow ants about 1/16" long. (Pharaoh ants can range in color from yellow to light brown to red.) They are easily confused with thief ants, also a small yellow ant. To distinguish the two, it is necessary to look at the antennae. Pharaoh ants have twelve segments with a three-segmented club on the end, while thief ants have ten segments with a two-segmented club. Pharaoh Ants will travel long distances to find food and/or water sources. Pharaoh ants were native to tropical Africa but are now distributed throughout the world. They are usually associated with heated buildings since they cannot survive outside year round in the majority of the United States. These ants will nest (in unstructured nests about 1/4" in width) in any dark void in any structure as well as in folded bags, newspapers or salt shakers. In the subtropical United States they will nest outside in leaf litter, piles of bricks, potted plants, or under roof shingles. **Pharaoh ants are primarily nocturnal and prefer to feed on food items they have not recently encountered and dead insects.** Once food is located, at least three different pheromone trails are laid down at 60 degree angles, normally along edges and behind baseboards, refrigerators, appliances, furniture and cabinets.

Pharaoh ant colonies can become quite large, often containing as many as 350,000 workers. Each nest only houses about 2500 workers and up to 200 queens. New colonies are formed by budding and fission, especially when pesticide poison treatments are applied; some of the workers, brood and a few queens move to a new location to help ensure one or more colonies will survive. In warm, moist areas where they can survive outdoors, they will move from building to building. **There literally can be hundreds of small nests in a single room!**

Pharaoh ant management is more dependent on locating areas of ant activity than eliminating a specific nest or colony, since they are so large and numerous and can spread so easily. Nests are usually located in kitchens or bathrooms which have warm/moist areas. Place jelly baits on 1" squares of paper or tape and place in damp, dark areas. These ants also move along electrical wires, so an inspection should include areas where wires enter walls or appliances, as well as behind switch plates and outlets. Pharaoh ants will also nest in and around

appliances such as refrigerators or stoves that have food or water around them. A useful tool for the management of this ant is to make a map of the site and mark locations where ants and their colonies are found. This will help to identify new areas of activity over time. Proper sanitation is essential for Pharaoh ant management, since elimination of food sources will make them more receptive to insecticide (boron) baits. Residual insecticides should not be used for Pharaoh ant management. They can repel ants, forcing more colonies to form through budding while killing only a small number of ants. During the first two to four weeks of the program, place baits containing only a small amount of DOT, borax or boric acid or food-grade DE (1/2%) and a food attractant or half and half fruit juice and aspartame inside a soda straw throughout the area of infestation. These should be located along edges and in corners where ants are most likely to encounter them. Pharaoh ants eat live or dead insects, (e.g., crickets) meats, grease, peanut oil, sweet syrup, 10% sugar water, fruit juices, jelly and cakes. Placing baits inside straws will keep them fresh and away from people and domestic animals. Replace or alter these with boric acid/food attractant baits. One food bait is three parts honey: two parts peanut butter: one part mint apple jelly one part egg yolk baby food and (3% or less) boric acid or food-grade DE. Commercial baits are also available. Place them as close to the nests as possible. Exterior treatments with talcum powder, salt and pepper sprays or sprinkled Tide® soap or Comet® or food-grade diatomaceous earth (DE) may be necessary in subtropical areas of the United States or during the warmer months in northern areas.

Adult - A tiny ant, about 1/16" - 1/10" long (queens may be twice this size), yellow to light brown to red in color and has three distinct segments in the antennal club and two segments or nodes in the pedicel. Its head and thorax are dull-yellowish to light orange or little darker. It has a shining dark abdomen, especially at the end. They range widely from their nests (hidden in any secluded spot including salt shakers) and will always follow a definite path in their foraging. They will forage up to 150 feet or more! They can carry pathogens. Many 1/8" queens in each nest. They prefer to nest in dark, relatively inaccessible areas, with an ideal temperature of 80°, and an ideal humidity of 80%. Males live about 3 weeks and queens live up to 40 weeks. Pharaoh ants often nest in wall voids, under flooring, and/or especially near hot water pipes or heating systems. Lower the humidity and maintain the temperature below 65° F and you control this pest and kill the hidden nest(s). Multiple queens can lay 35 - 40 eggs a day and from 350 to 450 eggs in a lifetime. **Colonies may be extremely large with 350,000 workers, several thousand queens and hundreds of males!**



Only the sexually mature individuals of both sexes have wings, but males and queens do not have mating flights. Mating usually take place in the nest. Often Pharaoh ant workers create temporary nests until they can construct a permanent nest - but loosely structured colonies may also simply take advantage of every crack and crevice that provides the right "microclimate" necessary for survival - Pharaoh ant colonies frequently live in the walls or hidden areas of buildings. Most nests are produced by budding and are no more than 1/4" wide. Spraying synthetic pesticide poisons actually increases "budding" or the number of colonies. Pharaoh ants are attracted to moist areas, toilets, bedpans, urinals, sluices, drains, coffee cups and sinks - so make some boric acid or borax/sugar water/aspartame baits, **but keep them out of reach children, pets and wildlife.**

These ants are known to infest open wounds and to and can carry various disease pathogens, including streptococcus pyogenes, pseudomonas aeruginos and staphylococcus epidermidis. They nest in warm humid areas in inaccessible areas - so correct these conditions. IGR baiting with one labeled ant station per line of visible ants is an effective means of control. They will eat virtually everything including dead roaches and other insects, sponges, shoe polish, meat, blood, sugars and sweets and fatty foods and oils but prefer light Karo Syrup, fats, peanut butter, oil, lard, honey, liver, 10% sugar or sucrose water and sweet bakery products. Remember this when you make (1% or less) boric acid or (1% or less) sodium borate baits. **The higher boric acid or borax rates, 5% or more, are consumed at significantly lower rates. Keep boron baits out of the reach of animals and people.**

DO NOT SPRAY VOLATILE, SYNTHETIC PESTICIDE POISONS OR DISTURB THE ANTS OR THE BAIT STATIONS. Pre-bait with peanut butter, protein or liquid sugars to locate nests in wall voids, salt shakers, electrical

outlets, closets, water pipes in drawers and cabinets and in or near appliances. Colonies can grow to hundreds of thousands of workers. Male and female reproductives are winged, but do not fly, **so swarms are usually never observed**. Once the ants begin to feed, add 1% - 4% borax or 10% aspartame to your baits.

They are the ultimate hitchhikers and are virtually carried all over - they are now found in most urban centers in the United States. Pharaoh ants prefer warmer buildings and warm areas (80-85 F.) in buildings for nesting. These ants are active year-round in houses and portions of large buildings such as hospitals, office buildings, laboratory buildings, etc. Nesting sites include wall voids, cracks in woodwork, stacks of paper, envelopes, bed linens, bandage packs, harborage in desk drawers, etc. It is common to find many colonies in one building and, perhaps, several in one room. Colonies have multiple queens and increase by dividing: one portion of the colony going with each queen. No swarms have been recorded, so new infestations are apparently transferred by moving infested objects. **Pharaoh ants mate in the nest.**

Slow-acting baits are ideal - because Pharaoh ant colonies feed by trophallaxis - foraging workers find the bait or liquid, ingest it, bring it back to the nest, vomit or regurgitate it and feed the others. If you use too strong a boric acid/sodium borate mix - they will die enroute. Remember you have to use 20-50 bait stations in the average home to control these pests. If you wish to spray visible pharaoh ants and kill them instantly without causing "budding" or endangering the environment, spray them **only** with diluted Safe Solutions enzyme cleaner, 1 ounce per 1 quart water. Don't forget to dust with talcum powder or Comet® or Safe Solutions food-grade DE and/or to bait all electrical outlet boxes in walls and outside and to routinely mop with 1/2 cup borax per 1 gallon hot water.

Pharaoh ants trail each other and are attracted to grease, meats, insects, and sweets. Workers are frequently seen trailing along window sills, counter tops and baseboards. These harborage and food preferences bring it to coffee areas, kitchens, paper and other supply storage, office equipment, medical storage, laboratory benches, many kinds of biological cultures including insect-rearing chambers, hospital rooms with wound or burn patients; the ants have turned up in I.V. tubes, medicine droppers, and bandage stacks. Pharaoh ants present a major problem because they have been associated with more than 20 disease-causing or pathogenic organisms and frequently enter isolation wards, operating and patient rooms to feed on sputum, blood and blood products and in doing so contaminate sterile areas in hospitals. They also will move small colonies into the back of high-tech equipment and computers and cause considerable damage. Pharaoh ants are usually found indoors, but have been found outdoors in the warmer regions of the U. S. Bait with 1 teaspoon (or less) 99% boric acid or aspartame mixed with 1/3 cup peanut butter and 1/3 cup mint-apple jelly or peanut butter oil or powdered sugar and liver powder or peanut butter and liver powder or sugar or syrup water in a container such as a corsage vial, or better yet a combination of water, sugar, protein and fat. **Be sure no wildlife, people or pets have access to these toxic baits or to floors washed with Mop-Up® borax.**

Inspection - interview the residents or workers first.

- Carefully inspect where sanitation is slipping. Clean with Safe Solutions, Inc. Enzyme Cleaners with Peppermint.
- Ants are found where food is available, particularly sugars: where coffee is made, lunch is eaten, especially in desks where snacks are stored. They prefer warmer, moister areas than most other house infesting ants.
- Inspect storage room spills, laboratory media, culture and formula preparation rooms, nurses' stations, unwashed cups, and coin machine canteens, sink areas, dishwashing areas, water fountains, aquariums, house plants and kitchens frequented by children.
- Use small disposable peanut butter baited cups or pieces of filled straws to demonstrate where ants are most prevalent, e.g., desk drawers, opened food boxes. **(Pharaoh ants are easily baited.)** Look at water sites. (These ants are attracted to dripping faucets; they drown in plant water bottles and coffee water held overnight. Floating ants are frequently the first sign that these ants are present.) So make some sweet baits with boric acid or food-grade DE, or simply aspartame in fruit juice.

Habitat Alteration (They like 80° F. temperatures and 80% humidity.)

- Practice proper sanitation.
- Remove organic mulches from around the foundation of the building.

- Reduce stored supplies.
- Clean, rearrange, and rotate supplies to expose nests. Mop with borax.
- Clean food areas before the end of the work day or bedtime and empty water containers that stand overnight. Routinely clean with diluted Safe Solutions, Inc. enzyme cleaners or their peppermint/lavender soap. Inspect all incoming food, especially packages of sweets.
- **Use fans, air conditioners and dehumidifiers to reduce temperature and humidity levels.**

Intelligent Pest Management® Controls — Properly install negative ion plates, caulk/seal thoroughly; vacuum up any ants you see. Several commercial baits are available for Pharaoh Ant control. Place a liquid or semi-liquid bait stations where every positive monitoring trap was located.

- Make your own baits and inject them into a soda straw, cut the straw into 1" segments and place wherever you see ant activity, or use 1% - 2% borax or boric acid or (DOT) or food-grade DE - peanut butter oil or Kroger's mint jelly or honey or sucrose water or light Karo Syrup in red packing slips or in bottle caps or in pieces of tin foil installed in out of the way places. The baits are attractive as long as they stay moist and do not crystallize. **Baiting may take a few months to over a year.**
- Set commercial bait stations. One that uses a stomach poison well accepted by ants, and a grain-based bait that includes ground insect exoskeletons are specifically manufactured for Pharaoh Ant control. (These bait stations can be placed in desks and used in hospital rooms and laboratories.)
- Make your own fresh baits - use freshly ground crickets or a mixture of liver extract for (or strained-liver baby food), angel food cake and honey or syrup or peanut butter with a 1% - 2% borax, or boric acid powder or sodium borate. This bait can be placed in small cups, screened vials or injected into 1" sections of cut drinking straws using a good baster or a syringe. Mix to a suitable consistency. Check baits every 3 - 5 days.
- Use a commercial (syringe) preparation (Drax®) of mint apple jelly and boric acid; ingredients can also be purchased separately and mixed. Place the preparation on pieces of masking tape or on tin foil, in bottle caps or in straws or cups for easy retrieval. (Do not block trails with baits.)
- Put (5% or less) borax or boric acid or DOT or aspartame and sugar water or light Karo Syrup into little plastic vials florists use to hold corsages or a single rose and push them into the dirt of house plants.
- You can spray them and their trails with diluted Safe Solutions, Inc. Enzyme Cleaner with Peppermint and/or mop with ½ cup of borax in 1 gallon of hot water or place duct tape (sticky-side up).
- You can bait with aspartame, Taro® or Maxforce® granules, but first you must regrind the granules in a peppermill (one which won't be used later for grinding pepper).
- Set out sugar water bait stations in plastic saucers or bottle tops with a drop of liquid dish soap to break the surface tension. If you are positive people will not get into the sugar water add a little borax, DOT, boric acid or better still a drop or two of diluted Safe Solutions, Inc. enzyme cleaner.
- As a last resort you may spot apply pestisafe® dusts, e.g., talcum powder or food-grade DE; then you should caulk/seal all cracks and crevices. All potential harborages near positive monitoring locations may also be treated.

Follow-up - Reinspect by monitoring baits; add a drop or two of water. When sprays or dusts are used, or when colonies are disturbed by inspection or habitat alteration, colonies may move or split and create even larger control problems. **Never put borax, boric acid or DOT (sodium borate) baits where children or pets can reach them. Aspartame baits, especially in fruit juices, will kill most ants.**

PYRAMID ANT

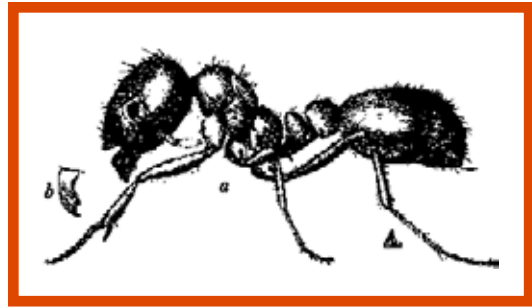
***Dorymyrmex pyramicus* (Roger) & *D. bi-color* (Wheeler)**

Adult - Pyramid Ant workers are 1/5" - 1/8" long and dark brown to black to reddish brown in color. One segment is present in the pedicel and the last thoracic segment has a distinct tooth or pyramid (hence the name) on the upper surface. Their nests are usually found in open sunny places in the soil and can appear in lawns as ugly mounds. They frequently enter buildings along distinct foraging trails. Workers are very aggressive predators of ants and other insects. They also are fond of honeydew and other sweets. Bait with a sweet bait with aspartame. Common in the southern states and California.



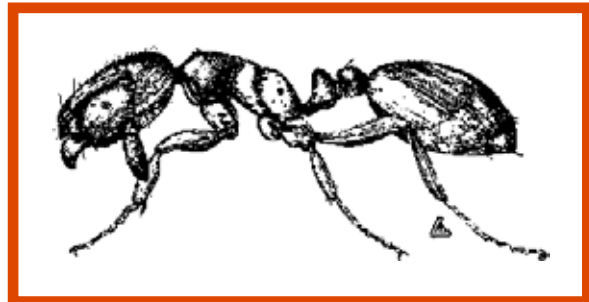
SOUTHERN FIRE ANT
Subfamily Myrmicinae
***Solenopsis xyloni* (McCook)**
(Also called the California Fire Ant)

Adult - The Southern Fire Ant is from 1/16" to 1/4" long, shiny, the larger ones brownish to yellowish-red, smaller ones much darker brown to black in color. Pedicel is two segmented and antennae also two segmented. Queen can lay over 1,000 eggs. Eyes prominent, body hard, all *Solenopsis* have 10-segmented antennae with a 2-segmented club. Have a painful, bee-like sting and can sting repeatedly. Typically, a ground nesting ant, but will sometimes enter buildings through cracks in the concrete; they also can nest in wood or masonry near the soil or warmth (fireplaces, foundations, rotted wood, etc.); nests outside consist of loose soil with craters 2 ft. square; painful sting; found in the Gulf Coast and from the Carolinas to California. The little fire ant, *Wasmannia auropuctata* (Roger), is found in Florida and California. It is only 1/15" long and reddish in color; they move slowly. Imported Fire Ants were originally from Brazil and are brownish or reddish up to 1/4" in length and usually nests outside in mounds 1 - 2 feet in diameter and 1½ feet high. They have a very painful sting. Usually found in southern North Carolina through Texas, they have also been found as far west as California and up into Kansas and even in Maryland. The Tropical fire ant, *Solenopsis geminata* [Fabricius] and the Black Imported Fire Ant, *Solenopsis richteri* [Forel] and the Red Imported Fire Ant, *Solenopsis invicta* [Buren] and the Southern Fire Ant, *Solenopsis xyloni* [McCook] are the four true species of fire ants found within the contiguous Southeastern U.S. There has been a hybridization between the two Imported fire ants and our two "native" species. **All species can be controlled with properly positioned negative ion plates and/or with 1% borax or 1% boric acid or ½% DOT or aspartame in 10% sucrose water baits and/or sprays of diluted Safe Solutions Enzyme Cleaner with Peppermint or Fantastic®, white vinegar and/or limonene and linalool citrus oils or dust with talcum powder or Comet®, or better still, by flooding with copious amounts of diluted enzyme cleaner with peppermint and food-grade DE (at least 3 gallons of water with at least 3 - 4 oz. of enzyme cleaner and 2 oz. DE per gallon), or 1 gallon of orange juice and 2 gallons of water with a dash of dish soap, or place duct tape (sticky-side up) wherever you see ant activity.**



THIEF ANT
Subfamily Myrmicinae
***Solenopsis molesta* (Say)**

The native thief ant is found throughout the United States, but primarily in the eastern and central states. A very tiny (less than 1/16" long) ant, thief ants are easily confused with the Pharaoh ant. The best way to tell them apart is to look at the club on the end of the antenna with a magnifying glass and count the number of segments; thief ants have two segments, while Pharaoh ants have three. Thief ants are named for their habit of stealing food from the nests of other ants. They nest outside under debris, rocks, or logs; indoors they nest in wall voids and behind baseboards. They are very small and can easily enter packaged foods, so food should be enclosed in tightly-sealed containers. Locating thief ants' nests can be difficult and time-consuming because their small size can make it difficult to follow the trail. Thief ants feed on both live and dead insects, seeds and sweets and will tend aphids, mealybugs, and scales to obtain the honeydew they excrete. Mating flights start in June and continue into late fall.



All cracks in walls should be sealed to keep these ants from entering buildings. Patience is essential in managing the ants because the nest can be so hard to locate. Baits do not seem to be effective for thief ants since they tend not to eat enough bait to bring sufficient quantities back to the nest for it to work. They will steal food and brood from other ants.

Adult - One of the smallest pests, they are light shiny yellow to bronze to dirty brown in color, very small, 1/32" - 1/16" long, with two nodes or segments in the antennal club and two segments in the pedicel. They have ex-

tremely small eyes. The thief ant nests both inside and outside and tends honeydew-producing insects. May have many queens in a nest. Rarely sting; they are omnivorous, preferring grease or high-protein foods over sweets; frequent house invader; may nest indoors in cracks and cupboards. They are so small they may go undetected until people complain about the flavor of food infested with thief ants. They may be found nesting in cracks or crevices or beneath the counter tops. Have the habit of living in a larger ants' nest and stealing their food and larvae. The thief ant is attracted to greasy foods, honeydew, cheese, meats and feces and is found throughout the U.S., especially in the eastern and southern states. Try baiting with bacon grease and honey and boric acid or aspartame. Clean often with diluted Safe Solutions Enzyme Cleaner with Peppermint and/or borax.

WHITE-FOOTED ANT

***Technomyrmex albipes* (Fr. Smith)**

The White-footed Ant is related to the Ghost Ant and the Odorous House Ant. It is a very small, dark brown ant that may look black to the naked eye. The "feet," called tarsi by entomologists, are creamy, pale yellow, giving the ant a distinctive "white-footed" appearance. The colonies may contain from 50,000 to a few million adults residing in several different "nests" or satellite locations. Like many ants, they are drawn to electrical connections. They may short out these connects causing serious damage and electrical outages. Homeowners can find large bands of thousands of white-footed ants marching across their front entry and into their homes. The pests have been known to form piles of ants 5" high, with members walking on and consuming their dead companions to reach their objective. These ants often nest in landscape trees and bushes where they farm or tend insects such as aphids and scale that produce honeydew. They are common on nectar-producing plants in the subtropical landscape, such as gingers and orchids, and have been found in mulch and ground nests as well. Unfortunately, they are also known to take up residence in walls and ceilings once they enter a structure in search of food sources. Trophallaxis does not occur in white-footed ant colonies. White-footed Ants must eat the baits directly to be killed or affected by them. White-footed workers and wingless females also produce infertile or trophic eggs, which are used to nourish immature ants as well as other adult members of the colony. Half of the colony is fertile and capable of reproduction. This high level of fertility allows for continued supply of replacement ants, even when a large part of the colony is eliminated. Prune back trees and shrubs around problem buildings so they can no longer touch or overhang the structure. This eliminates one important route that the ants often take from landscape to house. Nests can be as deep as 2' below ground. Flood them with diluted Safe Solutions enzyme cleaners. This ant can be found in its native Japan and now resides in Florida, California and Hawaii. Put it on a sheet of black paper to see the white feet. **It looks like a black ant, but neither bites nor stings.** It can have extremely large colonies (in the millions) nesting in your building. About half the colony is made up of sterile female workers; the rest are males and females who lay an abundance of fertile eggs. The sterile females lay sterile eggs which are eaten by the colony. Lightly dust with talcum powder or Comet® or food-grade DE, bait with sodium borate (5% or less) or aspartame in light Karo syrup and routinely clean and/or spray with diluted enzyme cleaners. **Remember to trim all branches that touch or overhang the building. Soak mulch routinely with diluted Safe Solutions Enzyme Cleaners and DE.**

INTELLIGENT PEST MANAGEMENT® ANT CONTROL SUMMARY

Cleanliness is the ant's worst enemy. Ants are the most dominant group of social insects. **From a consumer standpoint, ants are now considered the number one pest in the U. S. (followed by cockroaches).** Their relatives are bees and wasps, some of which also have social habits. All of these insects undergo complete metamorphosis. Ants have three principal castes: the female reproductives, the male reproductives, and female workers. Each caste has different tasks and behavior. Ants, being social, live in colonies. A single female starts the colony after being fertilized by males. Most of the offspring of this female (often called the queen) are also female and they do the work of the colony such as food gathering and rearing the young (larvae and pupae). The sterile female worker ants are responsible for leaving the colony and foraging for food and water and then carrying it back to the colony. The workers then feed the larvae who digest the regurgitated liquids. The workers also feed the adults and the queen. Trophallaxis is the term used to describe this process of food sharing. You can exploit this food cycle by simply preparing food-grade DE or aspartame or as a last resort, (1% - 5%) boric acid (or DOT or borax) in a tempting combination of food, e.g., honey or light Karo syrup. These slow-acting stomach toxicants will allow the ants to pass the toxin throughout the entire colony before it takes effect in 7-21 days depending on the colony size and other factors. Many ants tend insects that suck plant sap and produce a liquid that ants eat. Many species also have a broad diet, feeding on other insects, sugars and greases; their habits may change seasonally. Most ants have subterranean colonies and do not enter buildings, but some

can live outside or set up their colonies inside. One species, the Pharaoh ant lives inside almost exclusively. Knowing the behavior of the common ant species will help to decide the control measures needed to suppress your pest ants, and reduce that habitat and reduce their habitat. and correct the individual conditions conducive to each infestation.

CONTROL NOTE: Nicotine is a strong repellent as well as poison; ants avoid baits placed by smokers.

- 1. Sanitation.** Cleaning, caulking and exclusion are the key ingredients. Clean, empty garbage and vacuum daily. If you still have a problem after 2 weeks, you need to conduct a very thorough inspection. Use diluted Safe Solutions Enzyme Cleaners with Peppermint. **Trim branches that touch or overhang buildings.**
- 2. Correct identification.** You need to know the correct species and their specific feeding habits and colony structure. This is crucial to determine proper control techniques. Some species can best be controlled with traps and/or boric acid baits, while others may eventually require mopping with borax or Mop-Up®, flooding or injections of aerosol foam insulation or the use of dusts. Some may be best controlled outside. Some may need to be baited with Equal® or Splenda® and honey, or controlled with diluted Safe Solutions enzyme cleaner sprays or drenches, or solutions of salt and white pepper or borax and/or boric acid dusts or simply try dried coffee grounds, chalk, vinegar, Vaseline®, peppermint oils, cucumber rinds/peels, Comet®, talcum powder or cedar chips.
- 3. Location and destruction of the nest(s).** Infestations of ants are often located near exterior perimeter walls. Next, you should determine all of the exact nest locations, if the ants are coming from inside walls, from outside or under the structure. Ants tend to make trails by or in corners or edges of baseboards, countertops and splash boards, or under the edges of carpets, or they use the tops of utility wires and/or pipes inside walls as bridges. Location of their nests can often be accomplished by following the trail of foraging workers back from the preferred food source bait you provide. The workers may have their abdomens distended or swollen or they will be carrying bits of food in their mandibles. Then drench these mounds with diluted Safe Solutions Enzyme Cleaner with Peppermint (3 oz. to 5 oz. per gallon of water). Outside, be sure to remove any branches that touch or overhang the building and any grass from around foundation walls and concrete sidewalks and driveways. Ants will normally make their trails below the grass line where they cannot be seen; so closely inspect for trails/ants below the mulch line. Look under and in objects on the ground such as stones, boards, logs, firewood, landscape timbers, debris, etc., and in tree trunks for wood-infesting species. After the nest(s) is located, eliminate it, by drenching it with enzymes or fill the void with foam insulation. Depending on the nest location, use aerosol foam insulation sprays, baits, dusts, e.g., baking soda, Comet® or talcum powder, or drenches or sprays with boiling water, or diluted Safe Solutions, Inc. Enzyme Cleaner with Peppermint or white vinegar or diluted orange juice or carbon dioxide fumigation to control these pests. **Be careful!**
- 4. Baiting.** This is often the most effective and least toxic way to control ant species, and this will eventually and/or usually be the preferred method of control in most instances, but, routinely and/or seasonally vary the baits between sugars, proteins, plant exudates, fruit, lipids, seeds and carbohydrates. Routinely monitor the baits. Place as close as possible to the ant colony. Use enough bait placements. Spraying pesticides is not only dangerous but useless as sprays only kill some of the expendable worker ants and not the queen, who is an egg laying machine. Try using Tide® soap, Drax® or the Snuffer™ or stakes (outside) or any **fresh** bait that contains aspartame, food-grade DE or a boron-based product. Put (5% or less) boric acid in sugar water into the plastic vials florists use to hold corsages or in drilled 35 mm film capsules and carefully place them around the dirt around the foundation. Feed them instant grits or powdered sugar and baking soda (and dry yeast) and see if they “blow-up”. Try prebaiting first without toxin, then use the species own Dufour gland to attract ant workers to your baits. An exceptional ant bait for all species, except perhaps some crazy ants and some carpenter ants, can be made using 1 gallon of (clear) light Karo syrup or honey heated to about 100° F.; add 1% - 2% DOT to 1/8 - 1/4 cup hot water until the sodium borate mixture pours freely; mix into the gallon of heated light Karo syrup or honey by shaking; add about 1 oz. of this sodium borate mixture into a red bait station or red packing label stuck open on a 45° angle and firmly secured behind cupboards, appliances and other out-of-the-way spots where you have seen ants. The baits will stay fresh and liquid for months. Sprinkle preferred foods with food-grade DE or aspartame.

5. **Repellents** work best after all food and moisture sources are removed; try using Vaseline®, baking soda, Comet®, cedar oil, calcium chloride dust or medicated body powder, Tide® soap, talcum powder, peppermint or lavender soap, chalk, lemon juice (and leave the peel), damp or dry coffee grounds, borax, garlic, charcoal powder, fresh lemon/orange/cucumber peel, anise oil extract, broken egg shells, bone meal, black pepper, peppermint, spearmint, cayenne pepper, paprika, chili powder, red pepper, powdered red chili pepper or cloves, fresh/dried mint leaves and/or insecticidal soaps.
6. **Traps.** Ant traps can easily be made from duct tape (sticky-side up). Hummingbird feeders can also be attacked by ants, so put duct tape (sticky-side out) on the wire holding the hummingbird feeder. You can place duct tape (sticky-side up) as collars or anywhere you do not want ants to climb.
7. **Summary of least-toxic control methods.** Diluted Safe Solutions, Inc. enzyme sprays literally “melt” ants and remove scent trails. When sprayed on baits and allowed to dry, enzymes will reactivate inside the ants. Remember to drench all ant mounds with diluted Safe Solutions Enzyme Cleaner with Peppermint. A wonderful tool for doing this is a 2½-gallon rechargeable fire extinguisher. Depending on the ant species involved, you may need increased sanitation to remove ant food, removal of all plants and grass next to the building that are attractive to ants, change landscaping to discourage ants and/or plants attractive to aphids and scale, trim branches on all trees and shrubs that touch or overhang the building, drench nests outside with diluted (soapy) orange juice, copious amounts of diluted enzyme cleaner, vinegar and/or hot, soapy water or insecticidal soaps, reduce moisture sources including condensation, leaking plumbing, stopped-up eavestroughs, etc., seal pipe and utility line entrances, and replace outside hollow-core doors with solid doors. Baits used for the control of ants should contain a slow-acting, non-volatile pesticide poison, e.g., aspartame or food-grade DE so workers will carry it back to the nest. This will provide control of larvae as well as adults. Wash floors with Mop Up® or borax or sodium borate. Treat wall voids with absorptive dusts as a **last** resort. Ants will not usually cross lines of petroleum jelly or chalk, Tanglefoot, duct tape (laid down sticky-side up), Tide® laundry powder/soap, talcum powder, Comet®, agricultural lime, garlic powder, bonemeal or charcoal.
8. **Some Old Fashioned Ant Controls - Be sure to add green food coloring to your boric acid or borate baits to note they are toxic or poisonous.**
- Spray white vinegar or bleach to get rid of ants. Vinegar or bleach messes with the ant's sense of smell.
 - Mix baking soda with powdered sugar (and powdered vitamin C) and apply to infested areas.
 - Steep one clove of garlic, one onion, and one tablespoon of cayenne pepper in a quart of water for one hour, strain and add 1 tablespoon of liquid dish soap and spray for ant and roach control.
 - Apply perfume or a chalk line or Vaseline to the entry point.
 - Mix a tablespoon of sugar and a tablespoon of borax with 2 tablespoons of water. Soak cottonballs in mixture and place on low lids out of the reach of children and pets.
 - Border homes and gardens with spearmint or chives, or sprinkle garlic powder, lemon juice, orange peels, lime, bone meal, talcum powder, or cream of tartar and/or chili powder or Tide soap or Come®.
 - Wash surfaces with diluted Safe Solutions, Inc. Enzyme Cleaners or soap and water or vinegar solutions and then lightly sprinkle with one or more of the following: talcum powder, medicated body powder, Comet®, instant grits, bone meal, mint, pennyroyal, camphor, clove oil, cream of tartar, tansy, cedar oil, broken egg shells, freshly ground pepper, chili powder, powdered charcoal, Safe Solutions, Inc. food-grade DE, cucumber rind, agricultural lime or garlic in and around suspected points of entry.
 - Put Teflon or sticky, adhesive materials or duct tape (sticky-side up) around the base of plants and trees to deter ants which can carry and colonize aphids.
 - Carefully pour boiling (soapy) water into the nest.
 - Mix 2 tablespoons boric acid, 2 tablespoons sugar and a cup of water. Soak paper towels with mixture, and place them on dishes and set out for ants. Remember to place them out of reach of children and pets and to wash the dishes before reusing.
 - Mix 4 oz. of mint jelly and 4 oz. of peanut butter with a teaspoon of boric acid powder, put some of the mix on adhesive or masking tape and stick behind furniture and appliances or into 1-3” pieces of soda straws and place out of the reach of children and pets.
 - Mix 2½ oz. Safe Solutions, Inc. peppermint soap, 3 oz. of tobasco sauce in a quart of water and spray where ants are entering the building.
 - Mix 1 part active yeast, 1 part sugar and 2 parts molasses, put a teaspoon of the mix along ant trails where the bait will not be disturbed. The ants will the sugary treat, and the yeast will produce a gas that

will explode them.

- Wrap bands of paper coated with non-drying glue or Tanglefoot® or Vaseline® or duct tape placed sticky-side up around the base of trees to keep ants from getting to the honeydew or fruit. An easy way to do this is to fold sticky shelving paper in half, with the sticky-side out.
 - Piles of instant dry grits or instant coco wheats or Malt-O-Meal® in or on nests or near runways will expand the ants bodies and may kill them. Sprinkle Comet® or food-grade DE on the top of nests to dessicate them. Sprinkle Equal® to kill them.
 - Some ants hate aromatic plants like garlic, mint, lavender, and chives.
 - Blend orange peels and pulp and water and pour directly on the ant hill. Add a little soap or a mash of hot chillies for a kicker.
 - Do not forget to sprinkle finely ground calcium carbonate or Comet®, salt, chalk, Tide® soap, pepper, Splenda®, Equal®, baking soda and powdered sugar, baby (talcum) powder or medicated body powders in seldom used reas such as: sill boxes, closets, garage shelves, attics and crawl spaces. You can't cross an area with concertina or razor wire, but ants can. You can dust yourself and a baby with talcum powder, but many ants and other insects can't stand the stuff!
 - Take 2 shovels; get a shovelful of each ant mound; then transfer each to the other ant mound and let the ants fight it out among themselves. Be sure to put talcum powder on the handle so you don't get stung or bit.
9. **Summary of non-toxic or non-volatile control methods - negative ion plates, talcum powder, food-grade DE, sticky tapes, Comet® baking soda, Equal®, Splenda®, petroleum jelly, diluted Safe Solutions Enzyme Cleaners with or without peppermint, borax, white vinegar, vacuums and/or least-toxic (non-volatile) borax or boric acid. Moisture problems and sanitation should always be corrected. Keep all boron baits away from people, pets and wildlife.**

At this point, no better words can be found than those of Albert Einstein, "Concern for man himself and his fate must always form the chief interest of all technical endeavor."

Final Control Note - Edward O. Wilson, a myrmecologist extraordinaire, in a 1990 interview described an ant colony and clearly noted why the emphasis of your control efforts should always be on the destruction of the Queen: **"The ant colony (a superorganism) is essentially a factory within a fortress, a splendid arrangement of soldiers, builders, nurses and other specialists united in single-minded dedication to the survival and reproduction of the queen."**

In the late 1950's, E. O. Wilson worked with a colony of imported fire ants, *Solenopsis invicta*. *Solenopsis invicta* is rendered "the unconquered one." Wilson dissected the rectal sac and two main glands of its poison apparatus. The organs were washed, then crushed and placed on several glass plates. When the plate was placed outside the nest, ants came streaming out; he later wrote "the pheromone is not just the guidepost but the entire message." Wilson calculated that if this pheremone from the ant's Dufour's gland (normally squirted through the sting in the gaster) was gathered into one milligram (or .000035 oz.) and then was dispensed with maximum efficiency it would be enough to excite billions of workers into immediate activity or lead a column of fire ants around the world three times!

Later, Wilson found the alarm substances of fire ants in their mandibular glands. That is why when you crush the head of many ants - you declare war and they attack. Ants communicate through 10-20 signals, some are tactile or visual, but about 90% are chemical. All these chemical signals are referred to as *pheromones* as long as the communication is between members of the same species. When the chemical signaling is between two different species, the name changes depending on whether the communication is favorable to the emitter an *allomone*, or to the receiver, a *kairomone*. Most of the chemical signals come from glandular secretions. Every ant is a minipharmacy of up to ten compounds, with a different chemical or pheromone in each gland. In some cases, the compound used by one species of ant can mean an entirely different thing to another species of ant or other social insect. These pheromones can be used to bring your pest ants directly to your baits or into your traps. We will discuss these pheromones more as we conduct more field trials. **But, if you are making baits now, remove the gasters from your pest ant species, grind them up, and add them to your baits, e.g., light Karo® syrup or honey with food-grade DE and/or aspartame. Crush a head or two or a gaster or two and place on a glueboard or rat-mat or inside a 2-liter (wasp) trap. Let us know what happens.** Hopefully you will find your pest ants are literally attacking your baits or traps and dying or carrying the poison back, and

thereby killing the queen(s) for you. **If you cut the head off of a carpenter ant, it can walk around or stand for over a month.** Every ant/insect has a main brain in its head and mini-brains in other parts of the body. Without the head it can not eat, but the mini-brains let the insect lay eggs, walk and fly until it starves to death! Ants can lift objects 50 times their own weight; if a 200# man could do the same, he could lift 10,000 pounds! Since 1880 it has been illegal in Germany to harm a red ant nest. This law protects the ants who protect the trees and fields by eating 100,000 caterpillars and other pest species each day!

Ants - Typical First Strikes by Housekeeping/Maintenance

1. The Best Control is cleanliness and to locate and destroy the nest(s). Remove all clutter and debris inside and outside; trim all branches that touch or overhang the building and caulk all visible cracks, crevices and other openings. Keep food and garbage properly stored and make sure people eat only in designated areas. Maintain routine and thorough sanitation.
2. Routinely clean with Safe Solutions Enzyme Cleaners (1 oz. per gallon water) and/or borax (½ cup per gallon hot water), empty garbage and vacuum daily. Eliminate clutter and debris. Put down double-sided carpet tape over their trails.
3. Lightly sprinkle talcum powder, baking soda, Splenda®, cinnamon, Tide® soap or freshly ground pepper or calcium chloride (Comet®) outside and lightly dust with talcum or Comet® or calcium chloride dust or baking soda or medicated body powder or Safe Solutions food-grade DE or draw a line with their Chalk De-Fence™ inside along the edges and in all remaining cracks, crevices and sill-boxes. Keep food and garbage properly stored away from ants. Improve drainage. Trim all branches that touch or overhang the building. Put bands of cedar oil, Tanglefoot or petroleum jelly or fluoride toothpaste or Chalk De-Fence™ or duct tape (sticky-side up) around the perimeter of infested trees. Spray Not Nice to Bugs®.
4. Mix 50% baking soda and 50% powdered sugar and place the bait mix or instant grits or use 2 packets of Equal® wherever you see ants. **The only way to eliminate ants permanently is to destroy the queen(s).**
5. Spray ant trails with diluted Safe Solutions Enzyme Cleaner with Peppermint, Lemon Joy® or vinegar or perfume, or sprinkle talc, food-grade DE, freshly ground pepper, cedar oil, calcium chloride (Comet®), baking soda or damp coffee grounds or draw a line of chalk or place duct tape (sticky-side up) where you do not want them to cross. Install and maintain dehumidifiers. Eliminate moisture problems and improve ventilation. Flood nests with diluted enzyme cleaner or Splenda®. Locate the place of entry, squeeze the juice of a lemon into it and leave the peel.
6. Spray all visible ants with Safe Solutions Enzyme Cleaner (1 oz. per qt. water) and/or diluted dish soap (2 oz. - 4 oz. per qt. water) or vacuum them up. Remove all debris.
7. Mop the floors with ½ - 1 c. borax or baking soda per gallon of hot water. **Keep crawling children off the borax cleaned floor!**
8. Flood or drench all outside nests with 3 gallons warm water and 4 - 5 oz. Safe Solutions Enzyme Cleaner with Peppermint and/or ¾ cup food-grade DE or carbon dioxide or diluted orange juice or steam. Be sure landscape mulch is 2" or less. Dig them up several times. Dust with Splenda®.
9. Ants in voids or hollow trees: Dust with talcum powder and then fill the cavity with aerosol foam insulation. Put bands of Tanglefoot or Vaseline or fluoride toothpaste or duct tape (sticky-side up) around the perimeter of infested trees and/or rooms. Eliminate moisture problems.
10. **Fire Ant Repellant:** Sprinkle talc or food-grade DE on shoes, socks, cuffs and legs to protect yourself.
11. **Ant baits** can be made by first finding a preferred food source, e.g., apple sauce, creamy Jif peanut butter, Crisco shortening, sugar water, moist cat food, honey, light Karo Syrup, mint jelly, and then lightly mixing in a small amount of borax (about 1% - 2%); or, better yet, 3% - 5% food-grade DE or aspartame (Equal® or Nutrasweet®). Most ants living in a house or other structure are typically feeding on people food and only occasionally on honeydew. Food preferences are often seasonal. **Use a variety of baits.** If the ants are dying near the bait, it is too strong! You may wish to add a little diluted Tagmet or baking soda or aspartame to your baits. If you still have ants in 2 weeks, your bait is too weak. Ant baits should be used when the temperature is above 70° F. and less than 90° F. and kept out of the rain. Spray dry dog food with diluted 1% borax or sodium borate; let dry and grind to powder and then use as a bait. The sodium borate bait will also kill rats and mice. If you smoke, wear clean gloves before baiting. **Keep all borax or borate baits away from children, pets and wildlife. Bait until they quit taking the bait.**
12. **When ants invade a classroom or food operation area, the best control treatment is a mixture of**

enzyme cleaner or a detergent and water in a spray bottle. Each classroom and food preparation area should be equipped with a spray bottle so teachers and staff can safely and quickly control ant problems. Mix at a rate of 1 oz. per quart water.

13. If you are still seeing ants, read the entire chapter - there are many other controls available.

Alternative Controls

1. Mix 10% salt and some white pepper or Tobasco sauce in water and spray to repel ants.
2. Blend 1 clove of garlic, 1 onion, 1 tablespoon cayenne pepper and 1 quart water. Steep mixture for 1 hour, strain, add 1 tablespoon of liquid soap and spray it for ant control.
3. Wash kitchen surfaces with vinegar or baking soda solution. Lightly sprinkle dried peppermint, cayenne, baking soda, calcium chloride, bone meal, chili powder, talcum powder, Tide® soap food-grade DE and/or powdered charcoal in and around suspected points of entry. Dilute geraniol in olive oil and use as repellent spray. Sprinkle table salt in order to dry them out.
4. Pour a line of any of the following where ants are entering the building: baking soda, calcium chloride, Bon Ami® or Comet®, cinnamon, talcum or chili powder, bone meal, garlic powder, medicated body powder, cream of tartar, red chili pepper, salt, Tide® soap, dried mint or sage, food-grade DE, cucumber peelings, or simply draw a line of chalk.
5. Mix of 10½ oz. water, 3 oz. Tabasco sauce, ½ oz. Safe Solutions Enzyme Cleaner with Peppermint. Spray where ants enter the home or building.
6. Spray them with Fantastic® or WD40®. Create a barrier with Vaseline® or STP® oil treatment or duct tape (sticky-side up) or double-sided carpet tape.
7. Find the entrance and block it with a patch of petroleum jelly, toothpaste, white glue or tape. Bait with 1/3 powdered sugar, 1/3 baking soda and 1/3 powdered vitamin C.
8. Lightly dust with Safe Solutions, Inc. food grade diatomaceous earth. This can also be mixed at a rate of 4 tablespoons per gallon of water to make a residual spray or to drench a mound.
9. Seal tree voids or other voids with aerosol foam insulation and make some “instant fossils”.

Alternative Baits (Remember, food needs can and do vary hourly. Baiting works best when sanitation measures have eliminated alternative food sources.)

Combine: 1 part active yeast, 2 parts molasses and 1 part sugar. Mix the ingredients well. Drop a teaspoonful on several small squares of white paper. Place the paper squares along ant trails where they will not be disturbed. How does it work? The ants are attracted to the sugary feast and consume it readily. The action of the yeast, however, produces gas in their bellies and they can not rid themselves of it. They essentially pop. Try vitamin C in sugar water. Try aspartame. Try mixing equal parts of baking soda with vitamin C powder. You can also add some powdered (confectioner's) sugar. Try 5% - 7% aspartame or food-grade DE in honey or whatever the ants are eating at this time. The best part of this method of alternative pest control is that it utilizes no volatile poisons which could harm you or your family or your pets. **Ant baits or food or moisture will be equally distributed within a social colony within a week due to reciprocal feeding. The crop serves as a “social stomach” - that is what one worker holds in her crop is basically identical to whatever the colony has - so foragers know individually what the entire colony requires. Once a toxicant is recognized, the ant colony will cease eating that particular bait.**

Alternative Controls - Place duct tape (sticky-side up) wherever you see ant trails. Hold the duct tape in place with a few pieces of tape on the edges. Try a squirt of Elmer's Glue in the entry hole.

The Spring 1998 issue of the “American Entomologist” noted: “Ants are tenacious and will fight to the death.” Some scientists believe this is because they are all females and the word “uncle” is not in their vocabulary.

Fire Ant Damage - The IPM Practitioner, February 2000 issue, noted fire ant damage in California could total \$3 billion over 15 years, not including damage to wildlife agriculture and biodiversity. Red imported fire ants cause Texas \$300 million per year in losses, including \$75 million to the cattle industry. The Texas legislature provides \$2.5 million per year to fund research and management (details at <http://fireant.tamu.edu>). The red imported fire ant is now predicted to move into Oklahoma, Arkansas, Virginia, Tennessee, Maryland, Delaware, New Mexico, Arizona, California, Oregon, Nevada and even Washington. It was also noted a wire contaminated with electrocuted red imported fire ants attracted even more ants. The electrocuted ants release a mixture of

alarm and recruitment pheromones along with venom alkaloids and other semiopchemicals. This could be useful in trapping them or calling them to your baits. **Good Hunting!**

NOTE: Cigar or cigarette smoke repels ants, so if you are baiting and you smoke, remember to wash and then wear clean gloves before you touch ant bait.

Formicidae (ants) have been used in Italy as a sexual stimulant and love potion.

Note: Every year more and more invasive species, including ants, enter the USA including:

1. The Caribbean Crazy Ant (*Paratrechina pubens*) is golden to reddish brown in color with long legs and 12- segmented antennae. They are covered with small hairs and resemble small honey ants and nest under leaf debris in the soil. They trail 3 - 4 ants wide and run erratically. Currently found in Florida.
2. The European Fire Ant (*Myrmica rubra*) is medium-sized and reddish and has a painful sting. It nests in earthen mounds, especially at the base of trees. There are multiple queens. Currently found in New England.
3. The Rover Ant (*Brachymyrmex* spp.) is a dark brown, soft-bodied ant that likes nesting under stones in the yard and occasionally in rotten wood. Male alates are small enough to fit through mosquito netting, but the female alates are 3 times as big. Currently found in California, Florida, Louisiana and Texas.
4. "The Giant Needle Ant" (*Pachycondyla chinensis*). This black ant has been in the USA since the 1930s but is now becoming another spreading ant invader. In Japan it is called oo-hari-ari (The Giant Needle Ant). Its sting is from a large needlelike stinger and is very painful and potentially fatal to humans. Unlike the fire ant, it will invade undisturbed areas, e.g., woods, and can be found in great numbers around homes.

Myrmecology is the study of ants. It's from Greek myrmex, meaning "ant." One Hebrew dictionary (Jastrow) says that the Hebrew word for ant is "nemalah" is derived from the root "amail" which means "to toil or do very hard work". The Old English word for *ant* was *aemete* which meant a "biter-off". Sometime in the 1300s, this word acquired a "p" to become the Middle English *ampete*. Over time, much as *accompete* lost its "p" to become *account*, *ampete* turned into our modern word *ant*. In some dialects an "ant" is still called an *emmet*. It is believed that early Latin had an equivalent of *myrmex* which was something like *mormica* but, for reasons known only to the ancient Romans, they decided to pronounce it *formica*. It may be that the ant has its Latin name (*formica*) because it carries bits (*ferat micas*) of grain. This Latin word for "ant" is responsible for *formic acid* (which is what stings when they bite) and for *formication*, the medical term for an abnormal sensation that ants are crawling over one's skin. Now there's another word likely to cause a few double-takes. Try dropping it into casual conversation at work sometime.

"If ants had nuclear weapons, they would probably end the world in a week." – E. O. Wilson



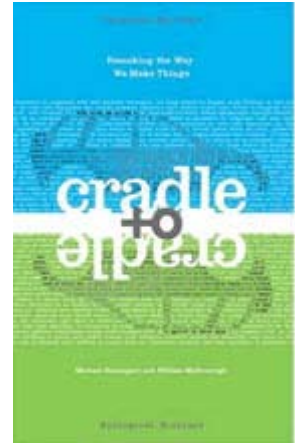
“Knowledge must come through action.” – Socrates

“Consider this: all the ants on the planet, taken together, have a biomass greater than that of humans. Ants have been incredibly industrious for millions of years. Yet their productiveness nourishes plants, animals, and soil. Human industry has been here in full swing for little over a century, yet it has brought about a decline in almost every ecosystem on the planet. Nature doesn’t have a design problem. People do.”

As part of their daily activity, they (ants):

- safely and effectively handle their own material wastes and those of other species
- grow and harvest their own food while nurturing the ecosystem of which they are a part
- construct houses, farms, dumps, cemeteries, living quarters, and food-storage facilities from materials that can be truly recycled
- create disinfectants and medicines that are healthy, safe and biodegradable
- maintain soil health for the entire planet.

— William McDonough and Michael Braungart, Cradle to Cradle



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