

General Insect Pests

Learning Objectives:

After completion of the study of Pests On or Near Food, the trainee should be able to:

- Given a cockroach specimen, hand lens and pictorial key, identify the specimen by common name.
- Given a list of common cockroaches, match each with its habitat.
- Cite monitoring strategies for cockroaches.
- Given an actual control situation, apply all elements of cockroach management to include sanitation, proper selection of pesticides, application techniques and other control methods.
- Identify key features in the life cycle, habitat and appearance of the common species of ants.
- Given a problem situation for each species of ant, select appropriate control and management procedures, including both chemical and non-chemical.
- Describe the life cycle and habits of common urban flies.
- Given a specimen of a common urban pest fly species, identify its common name or group.
- Given a fly management problem, describe pest management procedures needed to suppress it.

The basics of controlling insects and other pests which attack man or his possessions include pest recognition, understanding its life habits, determining the need for treatment or environmental/structural modifications, pesticide selection, proper timing and application of pesticides and determining the need to treat again. The following information deals with the most common pests in Arkansas that will likely be encountered on or near food.

Cockroaches

Cockroaches are major pests in homes, restaurants, hospitals, warehouses, offices and other structures with food-handling areas. These insects can contaminate food and eating utensils, destroy fabric and paper products and impart stains and odors to surfaces they contact.

Cockroaches have not been found to be direct carriers of disease; however, they can mechanically contaminate food or utensils by transporting filth or disease organisms on their bodies or by way of their excreta. They are suspected to be associated with the spread of dysentery, diarrhea and food poisoning. They are also associated with allergies and related to some aspects of asthma attacks. Although there are more than 50 species of cockroaches in the United States, only five are considered major pests in Arkansas. These species are the **German, brown-banded, American, Oriental, and wood cockroaches.**

Since different species of cockroaches have different habits and habitat preferences, proper identification is essential for control. Cockroaches are mainly active at night but may be commonly seen at other times when infestations are severe. Signs of cockroach infestation are visual sighting of live roaches, fecal droppings, full or empty egg cases (oothecae), cast skins from nymphs, stains and strong musty odors. The use of flushing agents frequently helps to locate cockroach infestations.

Many cockroach infestations begin by the introduction of a few individuals on equipment or other materials from an already infested area. Any suspect objects should be thoroughly inspected. Although this is frequently difficult, the effort may be worthwhile, especially if a structure has a record of recurring infestations.

Sanitation is the key to control. Cockroaches require adequate food, water, shelter and favorable temperatures to survive. Once cockroaches have been introduced into a structure, infestations are likely to build up much more rapidly, be more severe, and more difficult to control, if proper sanitation conditions do not prevail. Accumulations of materials such as garbage, rubbish, boxes, sacks, newspapers, and empty soda and beer bottles should be eliminated. Areas of excessive moisture within a structure should be eliminated. Proper cleaning of areas where scraps of food or grease accumulate is also helpful. In general, anything that can be done to reduce the supply of food, water, or shelter for roaches will reduce possible infestations.

Once a colony of cockroaches has established itself in a structure, proper sanitation will not rid the premises of the infestation. In this case, chemical

control is necessary. Since domestic cockroaches have different environmental habits and biologies, the method and extent of chemical treatment should vary by species.

General Characteristics and Life Cycle of the Cockroach

Cockroaches are oval, flattened, fast-running insects. Their body structure permits them to squeeze into very small cracks, which makes it extremely difficult to seal them off from harborages. Cockroaches have long hair-like antennae, a saddle-like plate (pronotum) that covers the thorax and projects forward over the head, and antennae-like structures called cerci that extend from the rear of their abdomens. The adults of most species are fully winged. The outer pair of wings are leathery in appearance and the hind wings are membranous and folded under the forewings.

Cockroaches go through gradual metamorphosis with three stages in the life cycle: egg (a number of eggs are laid in a capsule-like case called the ootheca), nymphs (the young pass through several molts but basically look like adults except they are smaller and have no wings) and adult. Occasionally a white cockroach will be seen. This is merely one that has recently molted and has yet to regain its normal color. Most species are nocturnal and seek protective cover in the daytime.

In general, cockroaches prefer an environment that is warm, dark, and humid. The four major factors that influence areas where they will inhabit are: temperature, moisture, food supply and amount of light. The areas where cockroaches will be found will vary among species depending on environmental preferences resulting from a mixture of these four factors and population pressure.

German Cockroach *Blattella germanica*

The German cockroach is the most common species encountered indoors in Arkansas. This species can complete one generation in approximately one-fourth to one-half the time of other species. Thus, it is no wonder that the German cockroach is found in such great abundance and can infest or reinfest a structure in a comparatively short period of time.

Once a female German cockroach contacts a chemical and dies, the eggs in the case (oothecae) protruding from her abdomen generally die also. Other domestic species may deposit egg cases on surfaces not reached by a chemical. Consequently, the eggs may continue to hatch over a 30- to 60-day period. The residual activity of some chemicals is not long enough to kill the later hatching nymphs, and retreatment is sometimes needed to insure adequate control.

The German cockroach prefers areas of warmth and high humidity, which are generally found in the kitchen and bathroom. Consequently, monitoring for and thorough treatment of these areas is needed for control of German cockroaches. Typical resting places for German cockroaches include under and behind large appliances, under sinks, and in the cracks and crevices of drawers and cupboards. Severe infestations of German cockroaches will frequently result in a scattered infestation throughout a building. German cockroaches are capable of rapidly adjusting to different conditions and situations. Occasionally they may be found behind ceiling trim, between ceiling voids, and other similar locations, especially in commercial buildings.



Figure 2-1. German cockroach, *Blattella germanica*

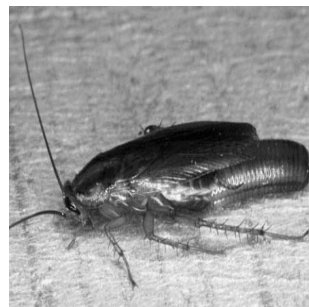


Figure 2-2 and Figure 2-3. As with many species of cockroaches, female German cockroaches lay their eggs into a capsule called an ootheca. German cockroach females carry these egg cases throughout most of the incubation period.

Characteristics:

- Adults are pale brown to tan and approximately 1/2 inch long.
- Adults are fully winged and have two dark stripes that run lengthwise on the pronotum (the shield-like plate behind the head).
- This species has the highest reproductive potential (number of eggs laid and shortest life cycle) of the house-infesting cockroaches.
- Females carry egg cases (oothecae) protruding from their abdomen until eggs are ready to hatch. Females produce about four to eight capsules in their lifetime. Each capsule contains 30 to 48 eggs that hatch in about 28 days at room temperature.
- Females live an average of 250 days.
- German cockroaches will generally be found close to moisture and food (e.g., kitchens and other food areas, restrooms, and around plumbing fixtures). Check such items as cracks and crevices, under tops of tables, behind sinks, in cabinets, the motor compartments of refrigerators, soft drink and other equipment, underneath kitchen equipment, in switch and fuse boxes and other areas where conditions are favorable.
- When they are found scattered throughout non-food areas of building, it is usually due to very heavy population pressure.



Figure 2-4. Brown-banded cockroach, *Supella longipalpa*

Brown-banded Cockroach *Supella longipalpis* (*S. supellectilium*)

The brown-banded cockroach prefers warm but frequently drier locations than the German cockroach. Brown-banded cockroaches tend to be found in higher locations, such as behind wall decorations or bureaus, and behind plates covering electrical switches and plugs. This cockroach may be found in any room, and an infestation is frequently spread throughout the structure. In addition, the female

carries the egg case only a short time making control of this species difficult if a building is not thoroughly treated. In Arkansas, this species is not nearly as common as German cockroach.

- Brown-banded cockroaches vary from light tan to glossy dark brown in color. The adults are slightly smaller than German cockroaches and have two light yellow or cream-colored transverse bands at the base of the wings.
- Egg capsules (oothecae) are usually deposited or glued to surfaces in dark areas such as cabinets, chairs, couches, drawers, and in higher areas of the building. Females produce about 14 capsules in their lifetime. Each capsule contains about 18 eggs that hatch in 50 to 75 days, depending on temperature.
- Females live an average of 200 days.
- Brown-banded cockroaches tend to scatter throughout buildings, preferring temperatures of 80 degrees F or slightly higher. These cockroaches are more often found in homes, apartments, hotels, hospital rooms, stores or restaurants. Infestation frequently results from shipments of furniture, luggage or other animals.



Figure 2-5. American cockroach, *Periplaneta americana*

American Cockroach *Periplaneta americana*

The American and Oriental cockroaches may be found outdoors during the warmer months of the year, as well as indoors. The Oriental cockroach prefers cool, damp situations and is usually found near the floor level of basements. They are also frequently found in abandoned cesspools, storm drains, water meter boxes and crawlspaces under buildings.

The American cockroach prefers warmer temperatures and moist areas, but occasionally they may be found in some fairly dry sites. They are likely to be found in upper levels of basements, alleyways and sewer systems. American cockroaches are often found in food handling establishments and industrial plants. Occasionally, control of Oriental and American cockroaches may require treatment of outdoor areas, underneath crawlspaces and indoor areas.

Characteristics:

- American cockroaches are the largest species found in buildings in Arkansas. Adults average about 1 1/2 inches in length, are reddish-brown in color and have a light yellow or tan band around the edge of the pronotum.
- The oothecae are usually dropped near food sources. Females may produce an egg capsule per week until 15 to 90 are produced. Each capsule contains from 14 to 16 eggs. Eggs hatch in 50 to 55 days at room temperature.
- Females live an average of 450 days.
- Nymphs and adults are commonly found in dark, moist areas. Common habitats include sewers, basements, boiler rooms, steam tunnels, storm gutters, machine rooms, around manholes, under buildings and around plumbing fixtures. Occasionally they will be around garbage containers or dumps in alleyways. They are more commonly pests in hospitals, zoos and in institutional or industrial buildings than in homes.

Oriental Cockroach

Blatta orientalis

Characteristics:

- Adults are approximately one inch long and dark brown to black in color. This species is often referred to as the “waterbug.”
- Females have small wing pads, while males have wings that cover about three-fourths of their abdomen. Neither sex can fly.
- Females drop egg cases in warm, sheltered areas near a food supply. Females produce an average of eight egg capsules, with each containing about 160 eggs. Under room conditions, eggs hatch in about 60 days.
- Females live an average of 180 days. Nymphs and adults have similar habits and are frequently found associated with decaying organic matter indoors and out. Oriental cockroaches are rather gregarious and “clusters” are generally found in moist, dark habitats. Common habitats include

floor and storm drains, water meter boxes, under siding next to soil, around plumbing fixtures, crawl space areas underneath buildings, sewers, basements, around dumps, garbage containers, and compactors. Oriental cockroaches are seldom found high on walls, in high cupboards or in the upper floors of buildings.

- This species can live approximately 30 days without food if water is available, but die within two weeks without water.

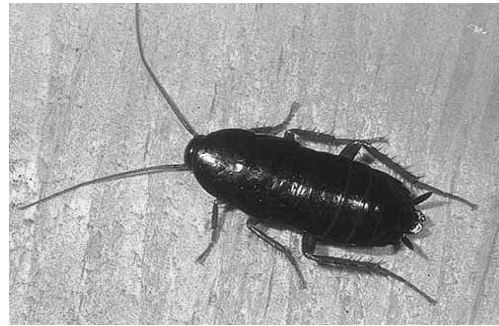


Figure 2-6. Oriental cockroach, *Blatta orientalis*

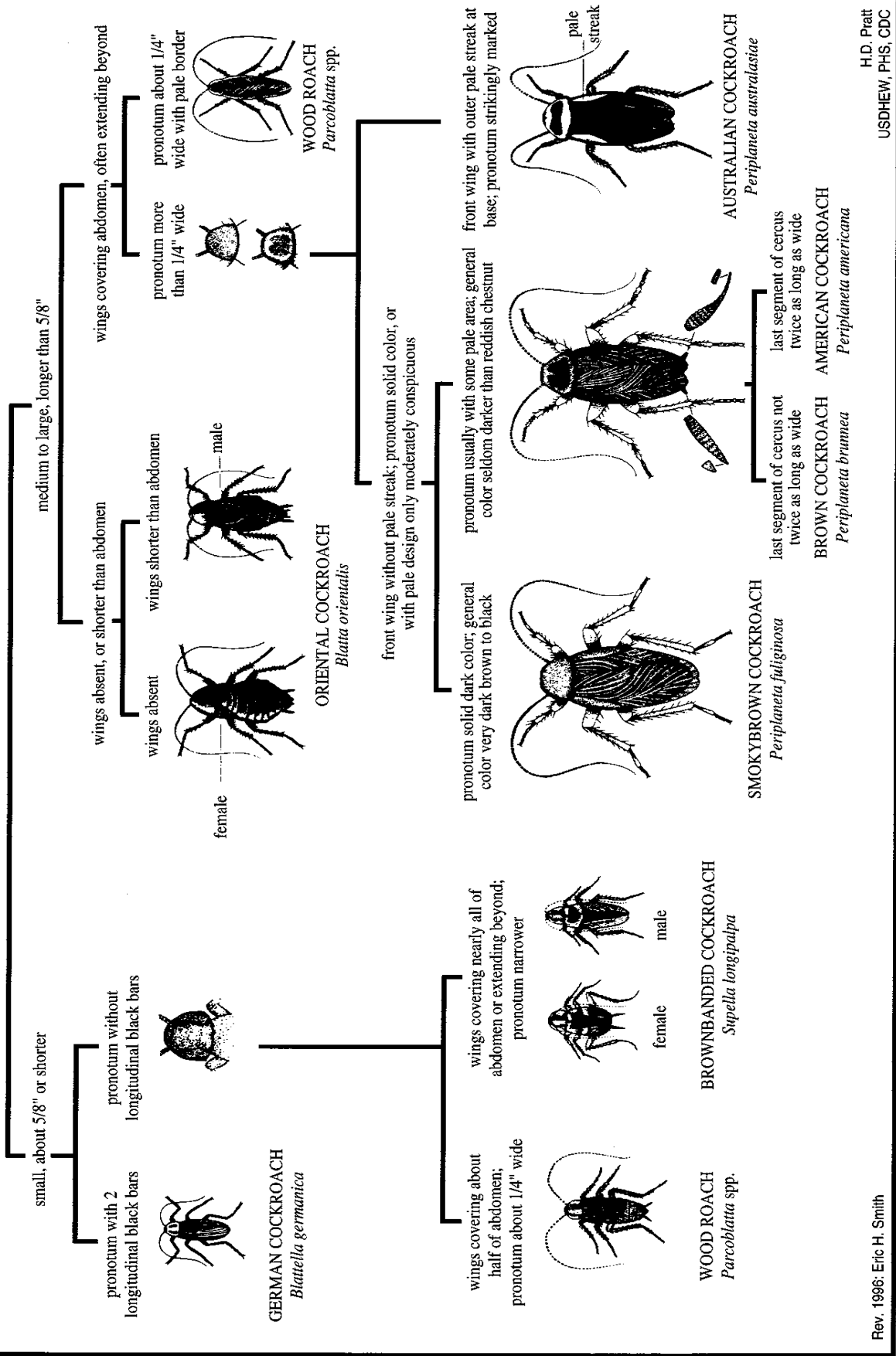
Wood Cockroaches

Parcoblatta spp.

Characteristics:

- The most common species in Arkansas is the Pennsylvania wood roach, *P. pennsylvania*. The adults are about one inch long and chestnut brown to black in color. The edge of the thorax and front half of the wing are margined with yellowish white.
- Males are fully winged and are strong fliers. The wings of females cover only one-third to two-thirds of the abdomen.
- Males are attracted to lights during the mating season, May and June, and to the lights around buildings. Occasionally, males will congregate around doors or windows or in gutters of buildings, especially when the building is near creeks and wooded areas.
- Nymphs and adults are usually found outdoors beneath loose bark, in woodpiles, stumps and in hollow trees. Females deposit their egg capsules loosely behind the bark of dead trees, fallen logs or stumps.
- They are normally only nuisance/annoyance pests. Females rarely deposit egg capsules in homes or other buildings. The possibility of continuing infestation is highly unlikely. Inside treatment is occasionally needed. Replacing outside incandescent lights with yellow lamps frequently helps reduce wood cockroach problems.

Cockroaches: Pictorial Key to Some Common Species



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Figure 2-7a. Cockroaches: pictorial key to some common species

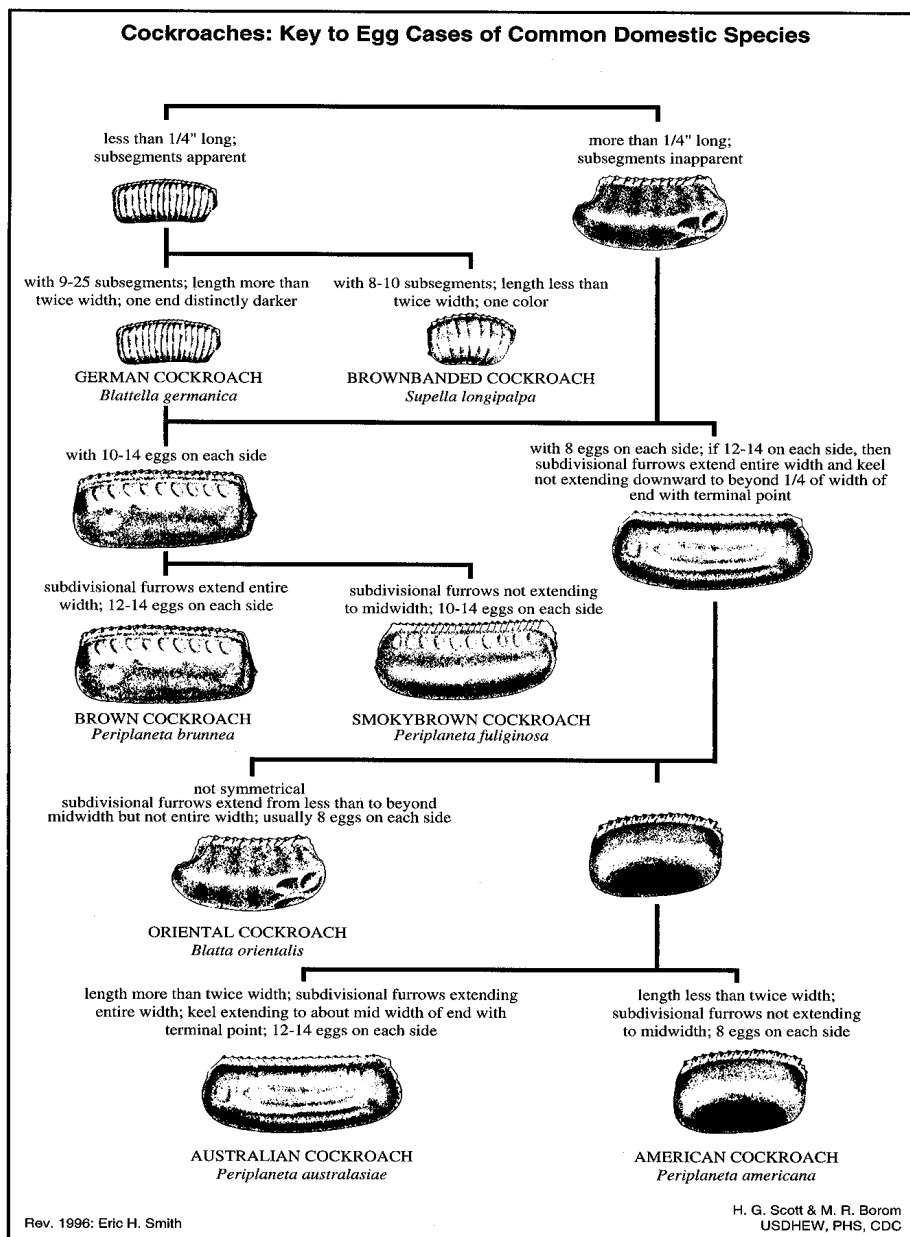


Figure 2-7b. Cockroach Egg Cases: pictorial key of the common domestic cockroach species

Management Guidelines for Cockroaches

The control of cockroaches requires a great deal of care and planning on the part of the pest control operator. Successful management depends on identifying the species involved and then selecting methods of control that are effective against these species. Because life cycles and habits vary with the species, knowledge of these factors is important in finding their hiding places and establishing a control program.

Careful inspection is necessary to find their hiding places and then to treat them thoroughly. Nighttime surveys are useful because cockroaches are nocturnal (active at night). Use a flashlight and search in cracks, under counters, around water heaters and in other dark location. Look for live and dead cockroaches, cast skins, egg capsules and droppings – all of which aid in identification.

Good sanitation is as important as the use of insecticides. The pest control operator should work very closely with the customer to see that all

possible sources of food supply are removed. Cleanliness and good housekeeping are very important. Do not leave food exposed. Keep garbage in closed containers and check dog and cat foods because roaches can live on these alone. Eliminate dripping faucets, leaking water pipes and other sources of moisture. Keep sewer openings screened. Incoming merchandise, especially groceries and drink cartons, should be inspected for cockroaches and egg capsules. Unnecessary boxes and other trash should be discarded. Exclusion of roaches by such methods as equipment design, good screening, tight-fitting doors and by filling cracks and crevices is important in a program of prevention and control.

In spite of sanitation, cockroaches do become established in some locations. Before and during treatment, a thorough inspection with a flashlight should be made to locate infestation sites. A flushing should be made to locate infestation sites. A flushing agent may be useful. Often, where no previous control has occurred, the initial treatment consists of what is commonly known as a “cleanup” or “clean-out.” That is, sprays and/or dusts are applied in a very thorough treatment. There is an immediate reduction in the number of roaches, but usually they are not totally eliminated. There are several reasons for this. The egg cases may not have been affected by the treatment and more roaches emerge one to several weeks later. It may not be possible to kill every roach in heavily infested premises. For these reasons, some pest control operators apply a “follow-up” treatment one to several weeks after the “clean-out.” Often, it is general practice to apply control measures at monthly or shorter intervals to keep the infestations at a minimum and to prevent further reinfestation. Less insecticide and time is required in these “follow-up” trips; consequently, the cost of treatment is much less than that for a “clean-out.”

Control chemicals may be oil base sprays, water emulsion sprays, dusts and, for some species, baits. Choice of chemical frequently is dependent on the situation requiring treatment. Dusts may not be appropriate where they would be unsightly or cause contamination problems. On porous surfaces, oils will penetrate deeply and leave less surface residue than will a water emulsion. Most of the time a residual chemical is preferred for roach control, but in some instances, it may be necessary or desirable to use a contact spray. Common residual sprays include oil-based or water emulsion sprays. These sprays should be applied to cockroach harborages

with emphasis on cracks and crevices, and minimizing treatment of exposed surfaces. When it is necessary to treat exposed surfaces, the application should be made with a low-pressure spray. Avoid runoff or puddling. Excess spray should be wiped up immediately to avoid staining or damaging certain materials. Other precautions include:

- Do not apply oil-based insecticides near open flames, to tile floors or on plants.
- Do not use water-based sprays near electrical outlets.
- Remove pets and cover aquariums before spraying and allow treated surfaces to dry before dishes, foods, cooking utensils or other items are placed on them. These items should be covered or removed when it is necessary to spray near them.

No matter what type of insecticide is used, insecticides placed in or near regular hiding places will give better control than those placed where roaches will only walk over them occasionally.

Contact or space sprays are used to knock down and flush cockroaches from their hiding places. These insecticides irritate the insects, causing a very rapid response. For this reason, they are useful as a **flushing agent** to bring the insects out of their hiding places. Space treatments used alone do not penetrate cracks and crevices well enough to provide effective control, but cockroaches on exposed surfaces can be killed with space treatments.

Dusts are useful for placing insecticides into cracks and crevices, under large appliances and other harborage areas. Light applications are more effective than heavy applications that may repel insects. Dusts generally provide longer residual control than sprays except under conditions of excessive moisture that can make them ineffective. Silica aerogels also may be used alone or in combination with insecticides.

Baits are generally long lasting and can be applied to sensitive areas that cannot be effectively treated with sprays or dusts. Baits often include an attractant and/or a food source, in addition to an insecticide. To be effective, baits need to be used in small amounts placed very close together because of competition from other food sources; baits only work if the cockroach eats it. Baits can be effective when used in conjunction with other methods and treatments. Heat can cause bait formulations to run and drip.

When using a baiting method, it is important to nutritionally stress the roach population by practicing good sanitation. A larger portion of the cockroach population will find and consume bait if there is, less alternative food available. It is also important to recognize the nutrients that cockroaches need (such as protein and fat around a stove, or carbohydrates in a pantry) to help with choosing baits and where to place them. For example, a cockroach infestation in a pantry may not have a water source readily available; therefore, gel bait may be more practical. Alternately, an infestation of cockroaches under a sink, with a stove or fryer located some distance away, might allow the use of bait with higher levels of protein.

Equipment

Several types of application equipment may be used for roach control; however, the hand-operated compressed air sprayer is most frequently used. To apply a residual spray over a general surface, a fan or cone nozzle should be used. Be certain the insecticide is cleared for spot treatments if the application is being made in a food-handling establishment such as a grocery store or restaurant. Generally, it is most desirable and often specified by the label to force the insecticide into cracks and crevices where roaches hide. This is done with a fine pin stream nozzle or a nozzle equipped with an extension tube that aims the insecticide as directly into the crack as far as possible so that it will penetrate deeply. A sprayer pressure from 15 to 40 pounds is adequate for this method of treatment.

Dusters most commonly used in roach control are small rubber bulb or bellows-type hand dusters. They are designed so small amounts of dust can be placed in narrow cracks and crevices.

It is important to remember to only use formulations of insecticides registered by EPA for cockroach control and for the particular site or location where control is needed. Most labels of insecticides registered for roach control have very specific instructions for their use in food and non-food handling locations. Read and follow these instructions to the letter. Consult your pesticide dealer, Cooperative Extension Service or Arkansas State Plant Board for insecticides labeled for cockroach control.

Cockroaches may avoid certain deposits of residual insecticides. For this reason, it is important to use materials that do not repel them; otherwise you must have thorough coverage to ensure that the cockroaches will contact treated areas. Cockroach populations may develop resistance to the insecticides. Populations of cockroaches migrating in from another area may already be resistant to insecticides that were used against them elsewhere. Methods that may help to reduce resistance problems include:

1. Use of alternate, nonchemical control methods such as biological control and good sanitation.
2. Lowering the frequency of insecticide application.
3. Alternating the types of active ingredient and formulation.
4. Using insecticides that do not repel cockroaches.

Sometimes cross-resistance develops in cockroach populations. This is a condition where the resistance to one type or class of insecticide makes the insect resistant to one or more other types or classes of insecticides.

Monitor and Evaluate

After a cockroach control program begins, evaluate the effectiveness of the methods. Use traps or visual inspections to help determine if treatment is necessary. If populations persist, reevaluate the situation. Look for other sources of infestations, make sure that all possible entryways are blocked, be certain that food and water sources are eliminated as much as possible and continue sealing and eliminating hiding places. Repeat insecticide applications if necessary. However, if insecticides appear to be less effective, resistance may be occurring. Overuse of insecticides and indiscriminate application may cause resistance.

If cockroach populations are controlled, continue monitoring with baited traps to check for reinfestation. Maintain sanitation and exclusion techniques to avoid encouraging a new infestation. If severe reinfestation continues, consider having the areas modified or remodeled to reduce the amount of suitable cockroach habitat.

Ants

Ants are among the most prevalent pests in households. They are also found in restaurants, hospitals, offices, warehouses and other buildings where they find food and water. Most ants can bite with their pincer-like jaws (few actually do and some have venomous stings). However, they are annoying pests primarily because they appear in large numbers and may nest in wall voids or other part of structures. Ants contaminate and destroy some agricultural products and stored foods. Certain species stain or cause feeding damage to textiles. On outdoor 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, ants may perform beneficial functions by preying on certain species of insect pests and aerating soils.

Ants belong to the insect order Hymenoptera and are close relatives of bees and wasps. Ants, like many other hymenopterans, are social insects with duties divided among different types, or castes, of adult individuals. Queens conduct the reproductive functions of a colony, laying eggs and participating in feeding and grooming. Sterile female workers gather food, feed, and care for the larvae, build tunnels, and defend the colony. Workers are not always the same size in a given species as in the case of the black carpenter ant. Larger workers with well-developed mandibles are called soldiers. Males do not participate in colony activities; their only apparent purpose is to mate with the queens, after which the male dies. The male is generally winged and keeps its wings until death. Males are usually larger than workers, but smaller than the female reproductives. Few in number, males are fed and cared for by the workers.

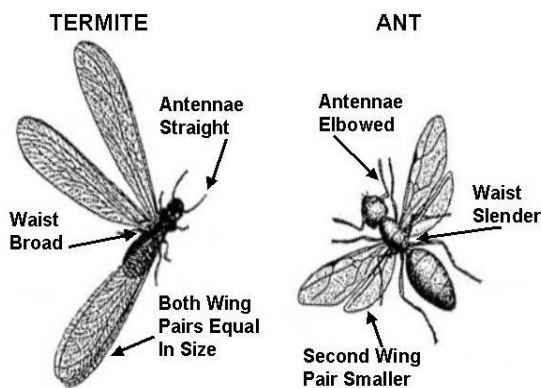


Figure 2-8a. Basic differences between ants and termites

Ants have narrow or pinched waists; that is, their body is very thin where the abdomen and thorax join. In addition, their antennae are elbowed, meaning that each antennae looks like an arm bent at the elbow. Fully winged adult ants are often confused with swarmer termites, but they can readily be differentiated based on the following:

1. Ants have elbowed antennae and termites have straight, beadlike antennae.
2. Ants have pinched waist lines, while the bodies of termites are virtually the same width from end to end (or termites have broad waists).
3. The front wings of ants are longer than their rear wings, while both pairs of wings of termites are about the same length.

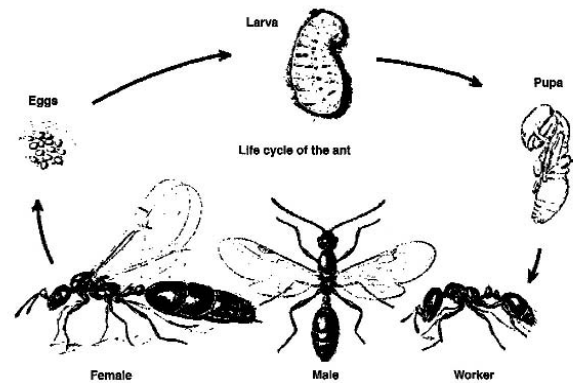


Figure 2-8b. Life cycle of the ant

Ants have complete metamorphosis; thus the development stages are egg, larva, pupa and adult. The eggs are extremely small and vary in shape according to species. Upon hatching a soft, legless larva is produced. After feeding and passing through several molts, the larvae pupate. The pupa resembles the adult, but it is soft, white and does not move or feed. The adult may require a few days to attain complete maturity after emerging from the pupal stage. Six to eight weeks or more are required for development from egg to the adult stage depending on the species and climatic conditions.

Ants require water for drinking and will travel some distance for it if necessary. This is frequently the reason for finding ants in kitchens or bathrooms of residences or commercial buildings.

Ants that invade homes and buildings include the **Argentine**, **odorous house**, **pharaoh**, **thief**, and **carpenter**. Other species such as

imported fire ants may be occasional indoor pests. Harvester, cornfield, pyramid and other species of ants nest outdoors but also occasionally invade structures.

Acrobat Ants

Crematogaster spp.

Description, Development and Habits

Acrobat ants tend aphids and mealybugs for honeydew and also feed on other insects. They usually establish their colonies in or under rotting logs and stumps in nature and sometimes live in abandoned carpenter ant galleries if the wood is damp enough. They can also engrave their own small galleries in wet roof boards, house siding, porch rafters, pillars, sill plates or any part of a structure where the 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 feed inside in kitchens.

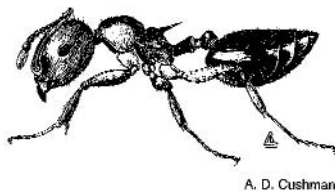


Figure 2-8c. Acrobat ant

Worker ants measure around 1/8 inch in length. 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.

When an infestation of Acrobat ants is suspected, look where structural wood has been subjected to water leaks. Habitat alteration is the best means for controlling an infestation. This can be accomplished by removing and replacing damaged wood, altering grade and redirecting downspouts that pitch water toward structural wood and

cleaning or replacing gutters. Trim overhanging tree limbs that keep wood from drying, and move logs, stumps, leaves and grass clippings away from structures. Habitat alteration is the best long-term solution, but the use of contact sprays may be needed for persistent problems.

Argentine Ant

Iridomyrmex humilis

The Argentine ant forages in restaurant, grocery stores, offices, schools, warehouses and any other location where suitable food and water are available. It is a persistent pest and is difficult to control once it has established a colony inside or near a building. This ant is not a native species, but it was introduced into the United States around 1890.

Description, Development and Habits

The adult worker is about 1/12 inch long and is light to dark brown. Queens are lighter colored and are 3/16 to 1/4 inch long; several hundred queens may live in a single, large colony. Argentine ants usually nest in the soil and are often next to buildings or along sidewalks. They also construct nests under boards and plants and sometimes under buildings. They occasionally make nests in wall voids or in soil of houseplants if conditions are satisfactory. When foraging, thousands of workers form long trails from the nest to the food location. Ants can be seen traveling in both directions along these trails. Workers all share food with each other and with the colony’s queens.

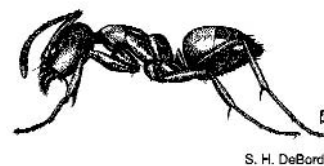


Figure 2-8d. Argentine ant

The queens lay tiny white eggs throughout the year. The maximum production, between 20 and 30 eggs per day per queen, occurs during warm months. The average incubation period is 28 days under favorable weather conditions. After hatching, larvae remain in the nest and are fed, groomed and protected by adult workers. The larval stage lasts approximately 31 days and pupation takes about two weeks. During warm weather, colonies usually break up into smaller groups and migrate closer to

food supplies. In the winter, they again aggregate into larger colonies. Mating most often takes place in the nest rather than on a mating flight. Queens can live as long as 15 years.

Inside a building, the Argentine ant feeds on sugars, syrups, honey, fruit juice and meat. Outdoors it is attracted to the sweet, sticky secretions called honeydew produced by soft scales and aphids. It also feeds on dead insects, other arthropods and decomposing tissues from dead animals. This diversified diet aids colony survival and success because there is almost always some food available. The Argentine ant's high reproductive potential (a result of the large number of queens in each colony) and the ability of a colony to rapidly adapt and settle into nest sites in a great variety of buildings and natural locations also contribute to this species' success. New colonies can be set up quickly and grow rapidly in size because queens mate in the nest and participate in the feeding and grooming of larvae. The Argentine ant has no important natural enemies.

Big Headed Ant *Pheidole spp.*

This ant is found in and around homes, but it is primarily a seed feeder nesting in the soil. This genus is remarkable for the large heads of the soldiers. In some species of *Pheidole*, the huge heads of the soldiers are removed by the workers before the winter season. Apparently this is because it is easier to breed new soldiers than feed old ones. These ants may enter homes contaminating a wide variety of foods. In the wild they feed on live and dead insects, seeds and aphid honeydew.

Description, Development and Habits

Depending upon the species, small big headed ant workers are 1/16 to 1/10 inch in length. Large workers (soldiers) are 1/10 to 1/7 inch in length. The antennae are 12 segmented with a distinct three segmented club. The head of the major worker is very large in comparison to the size of the body. The body color is light to dark brown.

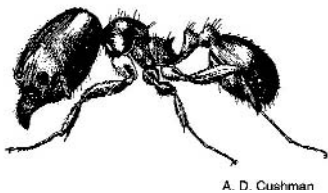


Figure 2-9a. Big headed ant

Carpenter Ant *Camponotus spp.*

This ant is frequently found in decaying logs in woodlands and because of their habit of dwelling in and excavating wood they are given the common name of "carpenter ants." They are very often pests in lawns as well as in homes. Structures can be threatened by damage from carpenter ants. These long-legged swift moving ants rank among the largest ants.

Description

Workers vary greatly in size from 1/6 to 1/3 inch with the queens ranging from 1/2 to 1 inch in length. Most ants are dark brown to black in color but some are red and black. The workers of this group do not sting, but are capable of inflicting a painful bite.



Figure 2-9b. Carpenter ant

Cornfield Ant *Lasius alienus*

The nests of these ants occur very commonly in fields. In and around the home they may be found between bricks in the wall, beneath rocks, in cracks in the pavement, in lawns, etc. Their nests may become extended to form a group of mounds. This ant will enter the home in search of sweets and becomes a problem in the home. They will also feed on the honeydew of other insects and are predacious on other insects. This ant is moderate in size, brownish in color and is often found in association with the aphids common on the roots of corn.



Figure 2-9c. Cornfield ant

Crazy Ant

Paratrechina longicornis

This ant has a very slender body about 1/8 inch long; it has only one node and is glossy dark-brown, nearly black in color. It can be found in some scattered locations in Arkansas.



Figure 2-9d. Crazy ant

The Crazy ant is unique in appearance. The 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 become immense and 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 insects and especially enjoy concentrations of house fly larvae, garbage and kitchen scraps.

Colonies have been repeatedly introduced to the United States with plants from South America, Puerto Rico and the Philippines. Colonies exist outside in the southern United States and can overwinter in buildings in the northern portion of its range.

Crazy ant infestations quickly call attention to themselves by their activity. When outside, inspect manholes, crawlspaces, window wells and refuse piles. Inside, inspect garbage rooms and kitchens as well as apartments. 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 is recommended for management of this pest. Practice the highest standard of sanitation in homes, commercial food services, and food processing establishments. Always leave food areas clean after work. Practice garbage schedule control (dump before dark) and maintain clean garbage rooms, garbage cans and dumpsters and their surroundings. Caulk and tighten-up around doors and windows

and low wall penetrations. When using pesticides for control, granular formulations around foundations and dumpsters can be applied and watered in to give initial population suppression. Residual pesticides alone, or fogs in garbage rooms and food areas that are not also cleaned up, will not control large populations. Crazy ants usually don't respond well to bait insecticides. Crack and crevice application must be thorough. Spot treatment around doors reinforce other control and management efforts. Dusts in infested manholes and other protected voids kill large numbers.

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.

Southern Fire Ant

Solenopsis xyloni

This fire ant is a native species occurring throughout most of the South. However, it is now absent from many areas where it was once abundant because of pressure from the imported fire ant species.

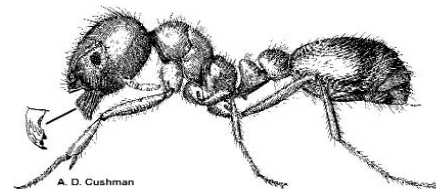


Figure 2-10a. Southern fire ant

This species is an outdoor ant that nests in the ground. The ground nests are as large as those of the imported species, but are more flattened. Nests of imported fire ant species are more cone-like in shape. However, this varies considerably with soil type and moisture conditions.

Description, Development and Habits

The workers are 1/10 to 1/5 inch in length. The head is not greatly enlarged and the pedicel is two segmented. The first segment of the pedicel is narrow in profile with a sharp, blade-like summit. The thorax of the worker is heavily sculptured with many ridges. Color varies from red to black. Mandibles have three teeth in contrast to the imported fire ant, which has four teeth.

Importance

This fire ant is an important predator of all ants. As such, it should not be eliminated without good reason, especially since it is not as aggressive as imported fire ants. Typically, once it is eliminated from an area, the imported fire ant species moves into the vacated niche. However, the sting of the “native” fire ant is painful. Enough stings may result in the death of young birds and poultry. Due to the lack of an excessively aggressively nature, they are less likely to cause stinging problems.



Figure 2-10b. Red imported fire ant

Imported Fire Ant *Solenopsis richteri* and *Solenopsis invicta*

There are two species of imported fire ants. The black imported fire ant, *Solenopsis richteri*, entered the U.S. in 1918 or earlier. This ant now occupies only a small area in Alabama, northern Mississippi, and eastern Arkansas. The red imported fire ant, *Solenopsis invicta*, did not enter the U.S. until about 1940 and has spread rapidly. This ant presently infests many southern states, including the lower two thirds of Arkansas.

Description, Development and Habits

Imported fire ants are 1/8 to 1/4 inch in length and reddish brown to black. They are social insects and that live in colonies up to 200,000 individuals. Fire ant colonies are made up of a queen ant, winged males and females (virgin queens), workers and brood (eggs, larvae and pupae).

Since it is not necessary or desirable to treat for native fire ants, it is important to know the difference between the native fire ant and the red imported fire ant. The head of the imported fire ant large worker is not wider than the abdomen, whereas the head of the native fire ant large worker is wider than the abdomen. Imported fire ants nests are rounded and conical; nests of native fire ants are irregular in shape. However, in sandy soil, the conical mounds of imported fire ants do not maintain their shape.

Biology

The winged reproductives mainly leave the fire ant colony on mating flights in late spring and summer, although swarming may occur at any time of the year. The ants mate during flight, and the females land to begin a new colony. Most of the females fly or are blown less than one mile from the nest, but some may travel a distance of 12 miles or more. Fire ant nests are normally prevalent in open, sunny areas. Pastures and other farmlands, roadsides and home yards are often infested.

In heavy soils, each mature colony of imported fire ants can build a mound that is sometimes as much as 2 feet tall and 3 feet in diameter. In many heavily infested areas, there are as many as 50 mature colonies per acre. Infestations of 20 to 30 colonies per acre are common. In freshly invaded areas, there may be several hundred small, new nests per acre. Imported fire ants achieve their greatest density in high maintenance areas such as lawns, parks, roadsides, pastures and areas disturbed by flooding, draining, mowing or plowing.

Importance

The imported fire ant is a small, aggressive ant that causes damage difficult to measure in dollars. In landscaped areas, its large mounds are unsightly. Its painful, burning sting results in pustules that may take up to ten days to heal. If broken, the pustule may become infected. Some people have allergic reactions to fire ant stings. Such a reaction may cause seizure or heart attack. A few individuals have died as a result of allergic responses to fire ant stings, but this is rare. More people die from bee stings than fire ant stings.

Fire ant mounds in yards, playgrounds and recreational areas are a hazard to children and pets. In southern states, imported fire ants are often found in electrical boxes and air conditioning units around homes and businesses.

Harvester Ants *Pogonomyrmex spp.*

The harvester ant is most commonly found in parking lots, sidewalks, lawns and landscaped areas. It is an occasional invader of buildings. This ant has the worst sting of any ant in Arkansas and will usually attack when disturbed.

Description and Habits

These ants are relatively large in size, from 3/16 to 1/4 inch (5-8 mm) long, and vary in color from red to dark brown. Males are black and red. These ants have a brush of long hairs on the underside of the head. Vegetation is often destroyed from the large areas and their chief food is seeds and grains of various kinds. Nest openings are characterized by a fan-shaped mound.

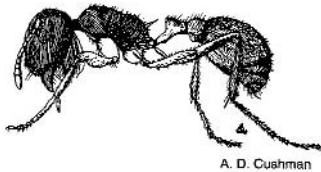


Figure 2-11a. Harvester ant

Little Black Ant *Monomorium minimum*

Nests are found beneath rocks, in lawns or in areas free of vegetation. Nests in the ground may be identified by their appearance (very small craters of fine soil). This ant may also establish its nests in the woodwork or masonry of buildings.

Description, Development and Habits

This ant differs from the pharaoh ant in that it is jet black in color and 1/16 inch (1.5 to 2 mm) long. The antennae are twelve segmented with a three segmented club.

Their natural food is honeydew, but sweets are their preferred foods; therefore, they may occur in homes. The colonies are large and each contains a number of queens.

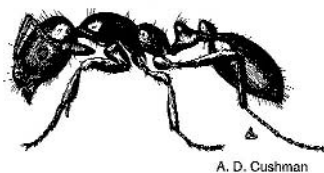


Figure 2-11b. Little black ant

Odorous House Ant *Tapinoma sessile*

The odorous house ant gets its name from the foul, musty odor emitted when it is crushed. Like other ant pests, the odorous house ant sometimes invades houses and other buildings in great numbers.

Description, Development and Habits

The worker is approximately 1/8 inch (3 mm) long and has a brownish to black body. It is slightly longer and broader than Argentine ants. Nests are made outdoors in sandy soils, pastures, wooded areas, under stones and logs, in trees and tree stumps, and occasionally in bird and mammal nests. In homes it will nest in the walls, sills, under foundations, around water pipes and water heaters or beneath the floor. This ant is largely a sweet-eater and becomes a household pest especially after rains which wash away much of the honeydew secretions left by aphids and other insects. In locations where the Argentine ant is also a pest, the odorous house ant is usually driven off or out competed for food.



Figure 2-11c. Odorous house ant

Pavement Ant *Tetramorium caespitum*

The pavement ant is found in New England, occasionally the Middle West, and in California. The pavement ant is of interest since it invades homes for food. This ant forages in the home throughout the year, but is observed in greatest numbers during summer. The nests are outdoors under stones, along edges of curbing and in cracks in the pavement, especially when the latter is next to the lawn. Sometimes small craters surround the nest openings. During the winter, the ants often nest in the home in a crevice near a heat source such as a radiator. Although the workers can bite and sting, they are not as aggressive or painful as the fire ants.

Description, Development and Habits

Pavement ant workers are 1/10 to 1/8 inch long. The antennae are twelve-segmented with a three-segmented club. The head and thorax are highly sculptured with numerous parallel ridges running lengthwise. There is a second pair of spines on the posterior dorsum of the thorax. The body is light brown to black, but the appendages are lighter. Hairs are thickly distributed over the entire body.

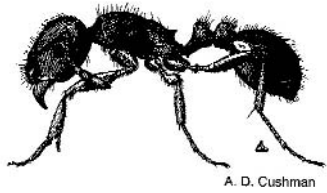


Figure 2-12. Pavement ant

Pharaoh Ant *Monomorium pharaonis*

Pharaoh ants are particularly troublesome pests because of their small size and the fact that they feed on a variety of foods, including syrups, fruit juices, jellies, cakes, greases and even shoe polish. They are greatly feared as pests in hospitals because they have been known to enter the open wounds of patients and also carry bacteria.

Description, Development and Habits

The workers of this ant are 1/16 inch long and vary in color from yellow to red. They can be distinguished from the similar-appearing thief ant by the three segments in its antennal club; the thief ant has two. Use a hand lens to examine the ant's antennae to assist in your identification. Queens produce four to twelve eggs per day throughout the year and are most productive during warmer seasons. Under average weather conditions, eggs hatch after seven days. The larval stage lasts 18 days, followed by a three-day prepupal period and a nine-day pupation. Queens live approximately 39 weeks. Their diet includes sweets and fatty foods, although fats are preferred. Workers also feed on live and dead insects. Food is carried back to the nest for queens and larvae.

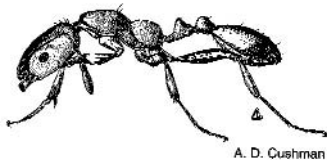


Figure 2-13. Pharaoh ant

Pharaoh ants enter buildings through cracks and other openings. They can also be transported into buildings on packages, supplies and furnishings. These ants nest in buildings, preferring warm places such as hot water pipes and heating systems. They colonize in wall voids, behind baseboards, between layers of flooring and under furniture. They also

build nests in odd places such as in linens, appliances and paper products. Pharaoh ants travel great distances from nest sites to food and do not always follow the same path. This makes it difficult to find their nests.

Pyramid Ant *Dorymyrmex pyramicus*

These ants invade homes and become pests in the garden. They occur from North American to Argentina.

Description and Habits

They feed on honeydew but are also predacious, feeding on other ants and insects. The workers are generally 1/16 inch long with a definite pyramid or tooth on the thorax. These ants are a uniform black color or have a reddish tint on the head and abdomen. These ants construct small cone-shaped nests that often are found on the side of harvester ant nests.



Figure 2-14. Pyramid ant

Thief Ant *Solenopsis molesta*

Thief ants are pests in homes and other buildings. Their name is derived from the habit of building nests near colonies of other ant species and stealing food from them. They also kill and eat larvae of larger ants. Thief ants are small, light-colored ants that may be difficult to see, especially in some parts of buildings or poorly lighted areas. They are attracted to greasy foods, cheese and animal feces. Being one of our most important house infesting ants, it is common around the kitchen sink and cupboards. Because of their size, they can get into almost any type of container where food is stored. Their omnivorous feeding habits make it possible for them to transmit disease organisms to food items. They are persistent and difficult to control once they have invaded a building.

Description, Development and Habits

This is one of the smallest ants; workers are about 1/6 inch long and are yellowish in color. This species resembles pharaoh ants, but individuals are smaller. They have a two-segmented antennal club whereas the pharaoh's antennal club is three-segmented. Workers are capable of inflicting stings if they are disturbed, although they are not very aggressive.



Figure 2-15. Thief ant

Eggs incubate for about 22 days. The larval stage lasts 21 or more days, the prepupal period 2 to 11 days and pupation 20 days. When thief ants nest outside, their colonies are usually found under rocks or boards near nests of other ant species. They build small tunnels into the nests of larger ants, providing them access to food as well as the larvae of their host. Thief ants may also build nests in wall voids and other secure locations inside buildings.

General Management Guidelines for Ants

The best control of ants can be achieved if the nest can be located and treated. Since ants nest both indoors and outdoors, we will deal with each location separately. Specific ant control techniques for various species will be reviewed separately.

Indoor Ant Management

Certain species of ants are more likely to nest inside a home. These species include the thief ant, Pharaoh ant, and odorous ant. Control of these ants is more likely to be effective if the foraging workers can be traced to the nest. This may be difficult to do because the workers may be coming from under baseboards, behind a sink or under cabinets while the nest is in a wall or a false bottom of a cabinet some distance from where the ants are entering. Treatment only at the points of entry may be ineffective if they find alternate routes to food. Forcing an insecticide dust into all cracks and crevices for several feet on each side of where the ants are seen

is a good practice. Sometimes drilling small holes into voids for treatment is helpful.

Treatment of baseboards, door moldings and other cracks along the length of the wall from which ants are seen entering with residual sprays may be helpful in control for all but Pharaoh ants. A small strip of floor adjacent to the wall should also be treated. This treatment should be applied on both sides of the wall whether it is an inside or outside wall. Treat cracks in the wall or at the top of the wall. The object of residual treatment is to completely surround the nest area so that ants leaving the nest will be forced to cross the insecticide barrier. This might be difficult to accomplish if the wall joins several other walls or if the nest is beneath the floor or if the colony is very large as are pharaoh ant colonies. It may be necessary to start the treatment a considerable distance away from the infested area and then work towards the nest. Baits may be useful, especially for Pharaoh ants, and several commercially prepared ones are available. Check with your chemical supplier for appropriately labeled baits. Many of the commercial baits are classified as weak baits and do not repel ants as the strong baits may do. The disadvantage with baits is that control may take several weeks. Baits must compete favorably with other food sources. Some commercial baits have a sugar base and others have an oil base (peanut oil is commonly used). The advantage of baits is that the ants take the pesticide back to the nest and feed it to the larvae and reproductives. Place baits along the trails ants travel (out of reach of children or pets). Do not contaminate food or surfaces that exposed food will contact and always follow directions on labels of insecticides used.

Outdoor Ant Management

These ants become pests by foraging inside for food. It is important to find their nest and to treat it heavily with residual sprays or dusts. If dusts are blown into the nest with force, they will generally be distributed throughout the nest. In the case of large nests, it may help to pour two to five gallons of water into the opening after dusting. Dry wettable powders can be sprinkled on the nest and washed in with a hose. With some mound-building species, it helps to break or scrape the mound before treatment. Besides treating the mounds, the walls through which the ants are entering should be given a barrier treatment with residual insecticides. Spray steps, pillars, vines, bushes, wires, etc., that can be used for entry. A soil barrier around the building

Table 2-1. Characteristics of Common Ants Found In Arkansas

Ant Name	Major Forage Locations	Nest Locations	Food Preference	Size of Workers (inches)	Sting	Unique ID Characteristics
Argentine	Inside where food and water are available	In soil near buildings and sidewalks	Sugars, syrups, honey, fruit juice & meat	1/12	No	
Big Headed	Inside or outside	In soil	Seeds, insects and aphid honeydew	1/16 to 1/7	No	Large headed soldiers
Carpenter	Mainly outside, but will invade structures	Decaying logs, lawns & structures	Plant & animal materials	1/4 to 1/2	Painful bite	Long-legged & swift moving
Cornfield	Corn fields	Most common in fields, but also around structures	Honeydew of other insects and sweets	Moderate	No	Found in association with the aphids common on the roots of corn
Fire Ant (Native)	Outside	Outdoor in soil	Other ants & insects	1/10 to 1/5	Yes	Large flattened nest mounds; mandibles have three teeth
Harvester	Outside, occasionally inside	Landscaped areas, park lots, sidewalks	Seeds & grains	3/16 to 1/4	Yes	Mounds are fan shaped; have a brush of long hairs on underside of head
Little Black	Outside	Under rocks, in lawns, areas with no vegetation	Honeydew & sweets	1/16	No	Jet black in color
Odorous House	Outside, but can invade structures	Sandy soils, pastures, wooded areas, in trees	Honeydew & sweets	1/8	No	Emits foul, musty odor when crushed
Pavement	Inside	Outdoors under stones, cracks in pavement	Sweets	1/10 to 1/12	Yes	Head & thorax highly sculptured with many parallel ridges running lengthwise
Pharaoh	Inside	Buildings in warm places	Syrups, jellies, juices, greases	1/16	No	Differ from thief ant by three segments in its antennal club
Pyramid	Inside & outside	Near harvester ant nests	Honeydew & other insects	1/16	No	Have definite pyramid or tooth on the thorax
Fire Ant (Imported)	Outside	Open sunny areas outside	Other insects & seeds	1/8 to 1/4 (varies)	Yes	Nests are rounded & conical; mandibles have four teeth
Thief	Inside	Near other ant colonies to steal food	Greasy foods, cheeses & animal feces	1/6	Yes	Have two segments in antennal club

should also be treated. The previous descriptions of some of the more common ants and the field key (Fig. 2-16) will aid you in identification. All the ants found on the field key are not covered in the previous discussions, only the ones more commonly encountered by pest control operators.

Management Guidelines for Carpenter Ants

Effective control of these ants is dependent on finding the nest. When carpenter ants are found in a building, they can be nesting inside or outside the building and entering to forage for food. In some circumstances, an entire colony may migrate from one nesting site to another, so it is important to eliminate the nest outdoors as well as the one indoors.

A thorough inspection of the building and the grounds because more than one colony may be involved. The inspection should include an interview with residents or managers, inspection indoors, inspection outdoors and sound detection.

The interview with the residents and/or managers should be used to obtain information on where ants have been seen, where they are most prevalent, patterns of their movement and whether swarmers or sawdust-like material has been seen. Moisture problems in the building should be determined because carpenter ants strike in these areas.

The indoor inspection should concentrate on looking for areas of wood associated with high moisture. Critical areas include plugged drain gutters, poorly fitted or damaged siding and flashing, wood shingle roofs, hollow porch posts and columns and leaking doors and window frames. Look for wood in contact with soil and wood in crawlspaces or under dirt-filled slab porches.

The outdoor inspection should include checking for tree holes, damaged areas in trees and by timbers and firewood for signs of carpenter ant nests.

Sometimes carpenter ants will be found in a perfectly dry environment. Nests may be found in hollow veneer doors and small void areas such as the space between the top of a door casing and the ceiling. In many of these cases, the wood is not mined. The ants are merely using existing cavities.

When looking for a nest indoors, look for:

1. Piles of wood debris ejected from the colony. This debris has a shredded quality that looks somewhat like shavings found in pencil sharpeners. Sometimes this debris is deposited in the voids in the wall and is not visible.
2. “Windows” or small openings to the nest. “Windows” may not always be present since the ants may use existing cracks.
3. Ant activity. The ants frequently forage in the kitchen, pantries, etc., for food. Few ants are seen during the day, as they are more active at night.
4. Swarmers possibly trapped in spider webs.
5. Damaged timbers. The surface may appear solid, but by sounding, the damaged areas can be located.

Outdoor inspection includes a thorough inspection of the structure as well as the grounds. Carpenter ants commonly nest in trees and stumps and use branches and vines to travel. While they may nest in living trees, they are more commonly associated with knot holes, scars, dead areas, and crotch areas. Firewood is another possible nesting site. Look for areas outdoors where a moisture problem may exist or did exist.

Sound detection is sometimes useful in carpenter ant nest location. An active colony at times produces a distinct, dry rustling sound which may be heard from outside the nest. The sound is not related to chewing of wood. It is thought to be a means of communication and intensifies if the colony is disturbed. Sometimes it is very loud but generally it can only be heard when conditions are very still and outside noises are at a minimum.

Protection of structures from carpenter ants requires destruction of ants in all of the colonies that are both in and/or near the structure.

Indoor Carpenter Ant Management – The steps to be taken are two-fold:

1. Eliminate high moisture conditions to aid in carpenter ant control and to prevent future attacks.
2. Apply insecticides to nest and nest areas. Dusts are particularly effective in treating nest galleries. They may be used alone or

in conjunction with sprays. Spraying or dusting the infested area with residual insecticides without locating or treating the nest usually does not result in complete control. These ants do not respond to baits. The foraging workers may come into contact with the insecticide and die; however, some of the ants confine their activities inside the galleries of the nest and survive. The queen and developing larvae would not be affected. Individual carpenter ants can live over six months without feeding, so it becomes obvious that the galleries of the nest must be treated.

Residual insecticides are usually preferred, but sometimes volatile or contact insecticides may be useful in flushing out and killing the ants. Under favorable conditions, vapors may spread to penetrate inaccessible areas in a nest that cannot be treated directly and thereby aid in eradication of the colony. These insecticides need to be injected or flushed directly into the galleries.

Consult Extension Service personnel or chemical dealers for specific insecticide control suggestions. Follow the instructions on the label.

The insecticides should be applied so as to reach as much of the areas inhabited or traveled by the ants. The extent of the galleries should be determined to whatever degree is practical by careful inspection. Then it is often advisable to bore 1/4 inch (6.25 mm) or 3/8 inch (9.37 mm) holes at about 12 inch (30 cm) intervals in the infested timbers to intercept the cavities and galleries of the nest. Void areas may be drilled into in the same manner. The spray or dust is best applied by using a nozzle that will fit tightly into these holes. The sprayer or duster should be of a type that will force the insecticide into and through the different chambers. Care must be exercised when using liquid insecticides so that the fluid does not leak through and stain surfaces adjacent to the treated areas. The holes may then be sealed by hammering in dowels as plugs or small corks of appropriate size. Approaches and areas adjacent to the nest should also be thoroughly treated with residual insecticides.

When it is impossible to find the nest, a more general treatment of the premises is necessary. The outside of the foundation should be thoroughly sprayed with a residual insecticide as well as the base of trees, fences and shrubs. Baseboards and

doorframes should be sprayed also. In basements or crawlspaces, the mudsill (board that lies on top of foundation) and any structural timbers between it and the subfloor should be sprayed so that a continuous film of insecticide is present. Unused attic areas should also be sprayed. Since many of the carpenter ants do not forage, it is very difficult to eliminate an entire colony with a bait.

Outdoor Carpenter Ant Management – Control outdoors is most successful if residual insecticides are applied directly in the nests. Water emulsions or wettable powders generally are preferred over oil solutions because of the toxicity of the oil carriers to vegetation.

Pharaoh Ant Management

Control of these ants may be very tricky because of one of the ants' behavior patterns known as "fractionating" or "satelliting." If an insecticide is sprayed nearby they will scurry about, pick up eggs, larvae and pupae, and split-up-fractionate into several smaller colonies. Residual treatments must surround the entire colony. To insure the entire colony is surrounded, the residual treatment should be applied first to areas known to be beyond the infestation and then work towards the center. These treatments are considered to be barriers and will likely need to be repeated unless the nest(s) are found and treated. Pharaoh ants can generally be most effectively controlled through a comprehensive baiting program. Refer to the general discussion on control of ants for more detail on barrier treatments and the use of baits for ant control.

Harvester Ant Management

Control of the harvester ant requires finding nests and physically destroying them or applying insecticides to openings. Destroy nests by digging them up with a shovel or using a mechanical cultivator. Once nests have been opened and exposed, thoroughly saturate the area with soapy water to stop survivors from rebuilding. Ants in disturbed mounds that can potentially hold water during the winter months (or melted snow) will often be killed out or have their colony greatly weakened by freezing and thawing activity. Removing food supplies is nearly impossible unless all seed-producing plants are eliminated in the area where the colony forages. When working around ant nests, take precautions to avoid being stung by workers. Harvester ant venom usually causes a painful reaction that has been known to persist for over 30 days.

BASED ON WORKER CHARACTERISTICS

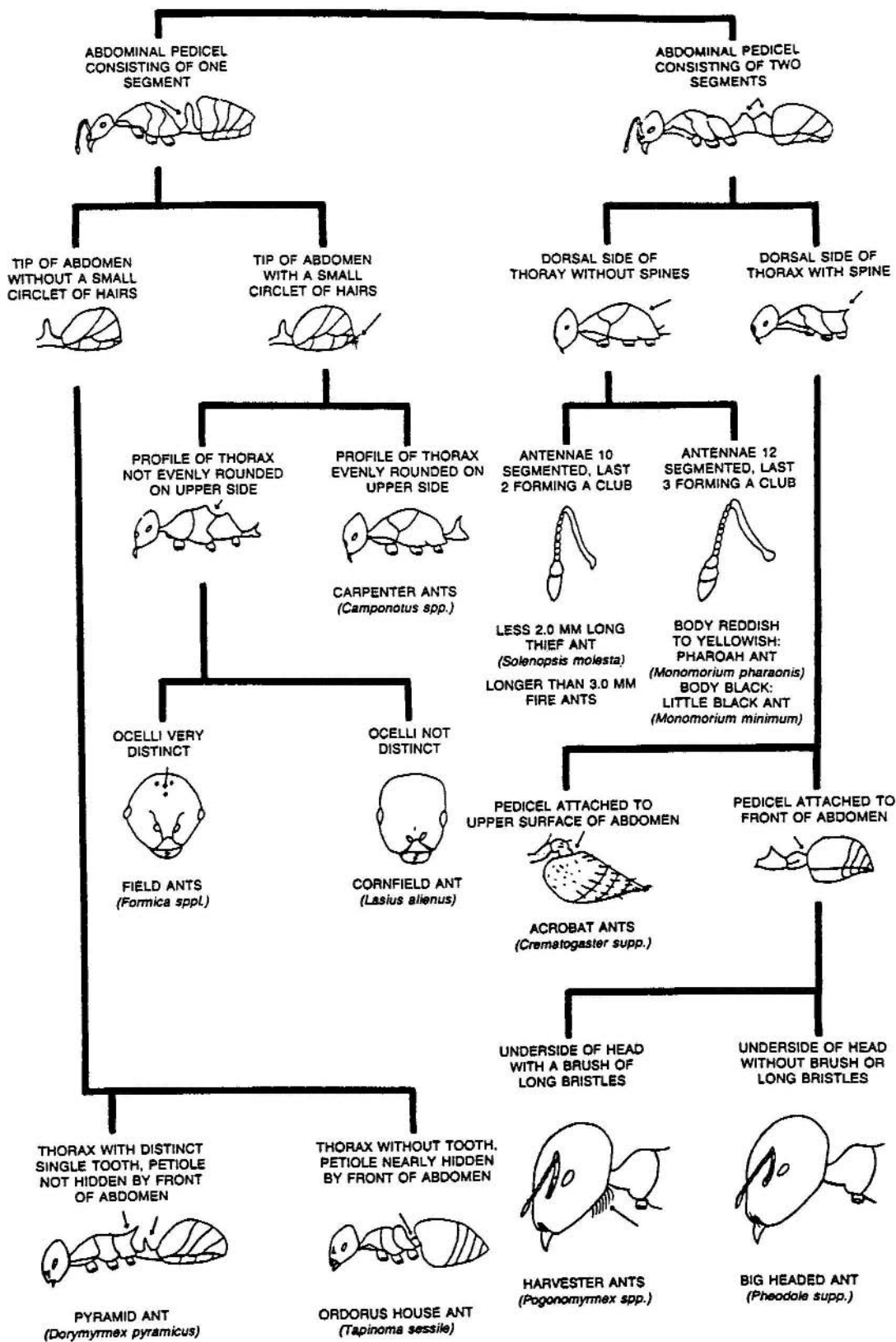


Figure 2-16. Field key to some common ants in Arkansas

Fire Ant Management

With some persistence, fire ants can be controlled by using the Two-Step Control Method. The two-step method is a simple approach that can control fire ants in heavily infested areas when conducted once or twice a year. The first step in this method is to broadcast a bait insecticide over the entire yard. The best times for applying baits are spring and fall, although baits can be applied any time during the warm season when ants are active.

The second step is to treat individual problem mounds with an approved mound drench, granule, aerosol, or dust insecticide. Individual mounds should be treated no sooner than three days after baits are applied. Treatments should be limited to mounds causing immediate problems, such as those found along building foundations or next to high-traffic areas such as sidewalks or play equipment. Be sure not to disturb mounds before treating.

Flies

The order Diptera (flies) is one of the largest and most diverse in the class Insecta. There are close to 17,000 species of flies in North America. Most of these flies are rarely encountered by man and are of little concern. A rather small group, referred to as domestic flies, have evolved to live in close association with man. These flies are typically found around or within structures and can become extremely annoying by their constant presence and ability to bite and transmit diseases. They also leave deposits of regurgitated food and excrement on walls, furniture, draperies, paintings and other belongings. Flies are also pests in outdoor eating areas, open-air markets and home yards.

Although there are several thousand species of flies, only a few are persistent pests in or around buildings. These include the **house fly; little house fly; green, blue, and black blow flies; stable fly; vinegar/fruit fly; false stable fly; and flesh flies.**

Fly Identification

It is extremely difficult to identify domestic flies in their egg or pupal stage. The larval stage may be used for identification, but this is frequently difficult. Table 2-2 provides a guide for identification of the common adult domestic flies.

Fly Biology

The life cycle of each species of the domestic flies is quite similar. The immature stages are found in moist, solid organic matter that is usually associated with man's activities. The female deposits small (approximately 1/25 inch long), white eggs in or upon the host material. The eggs typically hatch in a day or less and are extremely susceptible to desiccation (drying). The white, legless carrot-shaped larvae (maggots) may reach 1/2 to 3/4 inch in length. When preparing to pupate, the larvae move to drier areas of the host material.

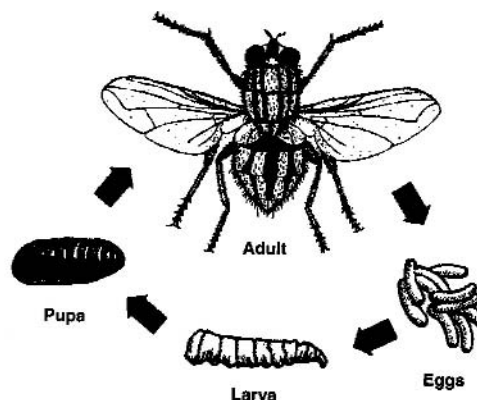


Figure 2-17. Life cycle of the fly

The pupa can be recognized by the hard, brown pupal case in which the larva transforms into an adult. Empty pupal cases may be found in the host material long after an infestation has ceased and are not necessarily a sign of an active infestation.

The development period of domestic flies is relatively short compared to other insects. The house fly, under favorable environmental conditions, is capable of developing from egg to adult in as few as 7 days. The cycle of the other domestic flies may be completed in as short as 8 to 18 days depending on the species. This short life cycle coupled with the ability of female flies to lay large numbers of eggs gives these pests tremendous reproductive potential. Under favorable conditions, large numbers can appear in a very short period. The specific biologies of domestic flies are presented in Table 2-2.

Management Guidelines

The basis for domestic fly control is the elimination or prevention of favorable habitats for fly production. If suitable habitats exist and environmental temperatures are favorable, a domestic fly problem will undoubtedly result. The use of insecticides is only secondary to sanitation and other

practices in fly control. Habitats where flies breed cannot effectively be reached or penetrated by insecticides. Insecticide treatment at locations other than the site of breeding and development is at best only a temporary means of control.

Some of the fly problems in urban areas and most of the problems in rural areas originate at sites other than in the immediate vicinity of homes, restaurants and similar structures. However, most flies live within a half mile of where they hatch. Rarely do large numbers of flies travel more than two miles. Nevertheless, if a large population exists around a structure, it is advisable to consider all possibilities of their origin.

Common agricultural areas where large fly populations may breed include chicken ranches, dairies, beef feed lots, hog ranches, horse stables and areas of crop production where manure is used or fruits and vegetables are culled.

Fly control in the urban areas follows the same principles as that in rural areas. That is, locate the

breeding place or places of the population and eliminate the breeding site. The first step is to identify the pest species. In many instances this will limit the potential breeding localities. If large numbers of blue blow flies are present, the operator should first expect some animal carcasses in the vicinity. Once a breeding site has been eliminated, corrective steps should be taken to prevent a recurrence of the problem. Possible breeding areas for domestic flies are outlined in the following discussion.

1. Garbage cans and dumpsters are probably the single most important source of domestic fly production. Tight-fitting lids may be of some value. Also, twice a week garbage collection and a thorough cleaning of the cans/dumpsters are very helpful.
2. Grass clippings may be an important source of fly production if piles of grass are allowed to accumulate and decompose until the inner areas reach a slimy stage. If clipping piles are removed every other week, there should not be a fly problem.

Table 2-2. Identification of Adult Domestic Flies


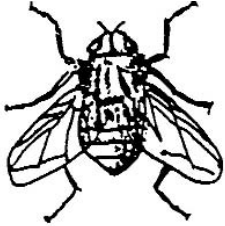
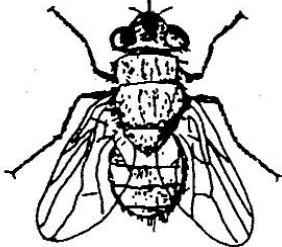
Species	Illustration	Identifying Characteristics
Black blow fly, <i>Phormia regina</i>		Shiny black or green and similar in size or slightly larger than house fly. Distinguished from green blow fly by presence of orange anterior spiracle.
Blue blow fly, <i>Eucalliphora</i> and <i>Calliphora</i> (several species)		Bicolored, the thorax gray with stripes and abdomen shiny blue. About size of green blowfly.
False stable fly, <i>Muscina stabulans</i>		Similar to house fly but can be distinguished by pale or reddish color on tip of scutellum and the fourth longitudinal vein only slightly curved upward near tip of wing.

Table 2-2. Identification of Adult Domestic Flies (continued)

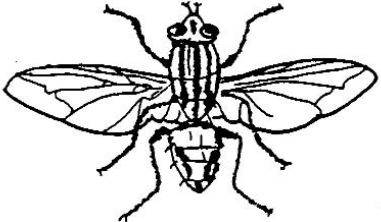

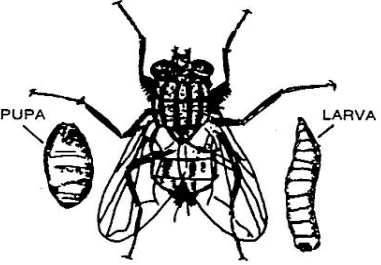
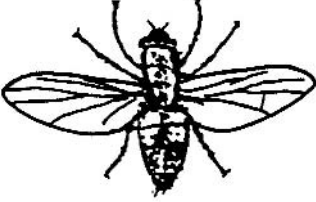
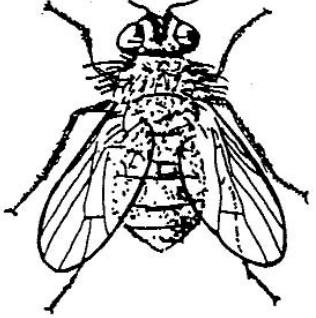
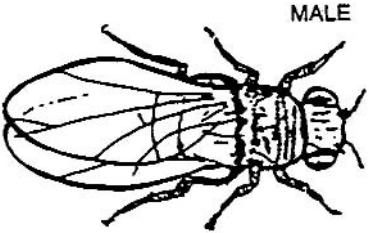
Species	Illustration	Identifying Characteristics
Flesh flies (several genera)		Dull gray. Only 3 black stripes on thorax. Abdomen usually has a checkered pattern. Males of many species with red spot on tip of abdomen. This fly is generally larger than the house fly.
Green blow fly <i>Phaenicia</i> (2 species)		Shiny green or copper colored. Slightly larger and more robust than house fly.
House fly, <i>Musca domestica</i>		Dull gray with 4 stripes on thorax. Abdomen lighter color than thorax. Fourth longitudinal vein sharply angled. Body 1/4 inch in length.
Little house fly, <i>Fannia canicularis</i>		Males easily recognized by habit of hovering in protected places. Dull gray with abdominal segment next to thorax yellow. Similar in size to house fly, but less robust.
Stable fly, <i>Stomoxys calcitrans</i>		Similar in size to house fly, but has elongate blood sucking mouthparts. When at rest, body slightly angled rather than parallel to surface
Vinegar fly or Fruit fly <i>Drosophila</i> (several species)		Small (1/8 inch), yellowish brown. Typically found hovering around overly ripe or decaying fruits and vegetables.

Table 2-3. Biology of Domestic Flies

Species	Life Cycle	Adult Occurrence	Preferred Host Material
House fly, <i>Musca domestica</i>	200-2000 eggs per female. Egg to adult in 7 to 45 days.	Prefer warm but not too hot weather. May occur year around but most abundant in September and October.	Larvae almost always occur in man-made sources; animal waste, culled fruits and vegetables are preferred.
Little house fly, <i>Fannia canicularis</i>	180-560 eggs per female. Egg to adult in 18 to 24 days.	Males typically hover in protected locations such as garages, porches and inside houses. Less abundant during summer and winter.	Larvae develop in almost all kinds of decaying organic matter. Chicken manure is usually the source of large infestations. Other types of manure also favored.
Green blow fly, <i>Phaenicia</i> (2 species)	3000 eggs per female. Egg to adult in 9 to 18 days.	Frequently most common flies in urban situation. Common during summer months.	Garbage cans common source during summer months. Dog droppings also preferred.
Blue blow fly, <i>Eucalliphora</i> and <i>Calliphora</i>	500-700 eggs per female. Egg to adult in 15 to 21 days.	Usually first flies to appear in the spring.	Decaying carcasses of birds and mammals. Also found in garbage dumps.
Black blow fly, <i>Phormia regina</i>	200-400 eggs per female. Egg to adult in 10 to 25 days.	Most common blow fly in wild areas. Active in relatively cool temperatures in spring and summer.	Decaying carcasses. Also lays eggs in open wounds of animals.
Stable fly, <i>Stomoxys calcitrans</i>	200-400 eggs per female. Egg to adult in 13 to 40 days.	Common around dairies. Occasionally attracted to and bite dogs in large enough numbers to be a problem.	Manure, especially when mixed with straw. Lawn clippings and animal feed waste also preferred.
Vinegar fly or Fruit fly, <i>Drosophila</i> (several species)	400-1000 eggs per female. Egg to adult in 8 to 11 days.	Most abundant around larval source and during fall, but can be present year around.	Larvae found in decaying fruits and vegetables. Garbage cans frequent source.
False stable fly, <i>Muscina stabulans</i>	140-220 eggs per female. Egg to adult in 15 to 30 days.	Most abundant in early spring prior to peak house fly emergence. Occur in many situations.	Manure and decaying plant waste such as culled fruit.
Flesh flies (several genera)	Female deposits 30 to 60 larvae instead of eggs. Eggs held in female until they hatch. Larvae to adult 8 to 18 days.	Year around, more common in warm months.	Garbage cans, manure (especially untrampled) animal carcasses including snails.
Moth fly, <i>Psychoda</i> (several species, also called sewer or drain flies)	30-100 eggs in irregular masses. Egg to adult in 8 to 24 days.	Most abundant around drains, sinks, bathtubs, water closets and sewage filter plants in the spring.	Sewage traps and wash basin drains.