MAINTENANCE GUIDEBOOK VII
TERMITE, INSECT, AND RODENT CONTROL

CHAPTER SEVEN - FLIES

SECTION A CHARACTERISTICS AND RECOGNITION

In terms of both numbers and health concerns, flies make up one of the largest groups of insect pests. Although the major features and control measures given here are for urban pest flies, the principles generally apply to all flies. The main urban fly pests in the United States are the house fly, fruit fly, hump-backed fly, bottlefly, moth fly, and fungus gnat, each of which have very similar life cycles. Adults seek moist garbage, dead animals, or manure in which females deposit eggs. Eggs develop into grub-like larvae (or maggots) that feed on the food source on which eggs were deposited. After a week or so, larvae leave the food source and spend another week or so in a non-feeding, cocoon-like form (pupa) from which adult flies emerge in a few days. Adult flies quickly mate and may move from the breeding site into human living quarters through open doors and windows, seeking food.

Food for a fly consists of almost any organic material. House flies (among many others) eat solid food by vomiting digestive enzymes onto the food source and macerating it into a liquid form that can be lapped up with sponging mouth parts. Since flies continually vomit and defecate while feeding, germs are deposited on the food they feed on.

1. HOUSE FLY

Worldwide, the common house fly (Fig. 7-1) is one of the most widely distributed insect pests. House flies are soft-bodied, gray-colored, about 1/4-inch long, and have only one pair of wings that span about 5/8-inch. Their faces have two soft stripes, silver above

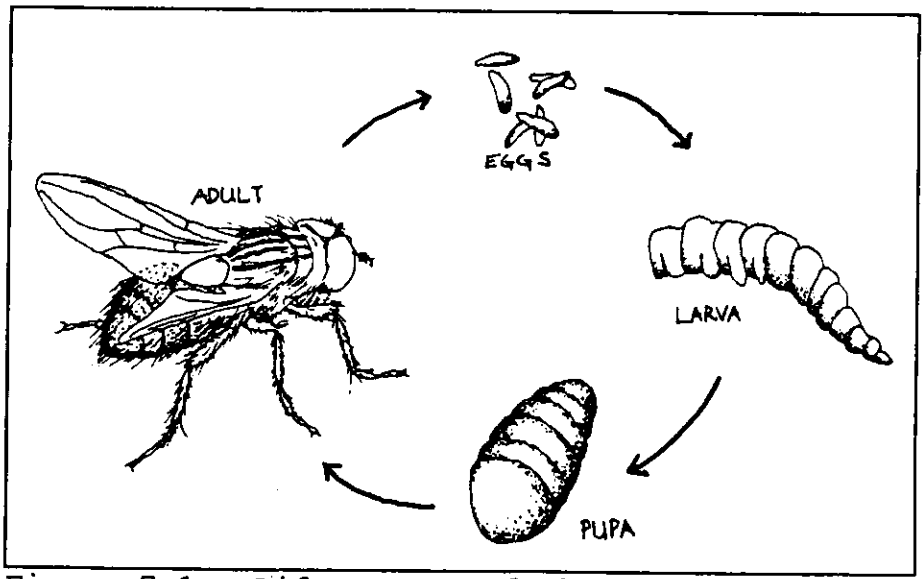

Figure 7-1: Life stages of the house fly

and gold below. The upper surface of the thorax is marked with four dark longitudinal stripes, and the abdomen is yellowish-white at the sides and base. They are active year-round outdoors in mild weather and indoors during fall and winter. House flies rarely moves more than a mile to food from their breeding sites. They have an excellent sense of smell, which leads them to food and water. Their range of vision is about eighteen inches, and they are attracted to the color red.

Over their lifetimes, female house flies will lay from 350 to 900 eggs in any moist excrement, garbage, decaying fruit, vegetable waste, and soil contaminated with organic matter. After eggs hatch, larvae feed, eventually migrate to cool sites (for instance, soil beneath boards or stones) where they pupate. In three days to four weeks, depending on temperature and humidity, adult flies emerge from pupae. Adult house flies live two to three days if denied food, but up to 54 days when food is present. The period from egg to adult stages ranges from seven to 45 days, and in warm weather two or more generations can be produced per month. House fly populations may be greatest in early fall (September and October). Because larval house flies produce a glycerol compound, which keeps their body fluids from freezing, they mostly over-winter as maggots or pupae. Various similarities in appearance and behavior make it important to be sure that suspected "house fly" problems are not really flesh fly problems, which originate with dead animal carcasses.

2. FRUIT FLY

Fruit flies, also called vinegar gnats and pomace or vinegar flies (see Fig. 7-2), are made up of a number of species with worldwide distribution, and are the most common of all small flies. They are 1/8- to 1/4-inch long, dull yellow to dark-brown, and some kinds have distinctive bright red eyes. They are small enough to pass through window screens with a mesh size larger than 12 per inch.

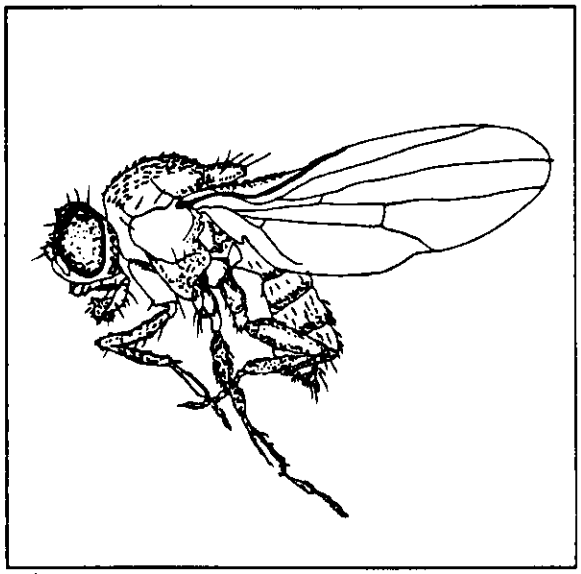

Figure 7-2

Fruit flies breed in decaying matter such as juices or other liquids in empty cans, ripe fruits and vegetables, drain slime, wet mops, and dumpsters. Female fruit flies lay from 400 to 1,000 eggs on the surface of decaying organic materials and in garbage cans; some species prefer briny or vinegary liquids around jar lids. Larvae hatch within 30 hours and begin feeding near the surface of the food source. Mature larvae move into dry areas to pupate, and development is completed in nine to twelve days. Outside in summer, fruit fly numbers quickly build until populations peak during fall harvest. They can be present year round, especially

indoors, where preferred foods and breeding sites are available. Their ability to quickly reproduce in large numbers gives them opportunities to contaminate food if not controlled.

3. MOTH FLY

Moth flies—or drain, moth, filter, and sewer flies or sewer gnats—(Fig. 7-3) are generally found in drains, especially in bathrooms. Adults resemble moths, and are about 1/8-inch long. They have light gray, tan, black, or brown bodies and lighter colored wings that are held roof-like over the back when at rest; both body and wings are covered with long hairs, giving the body a fuzzy look. Moth flies are poor fliers and are most commonly seen just walking or running along walls. Their flight covers only a few feet, and is short and jerky. Some species are active in winter.

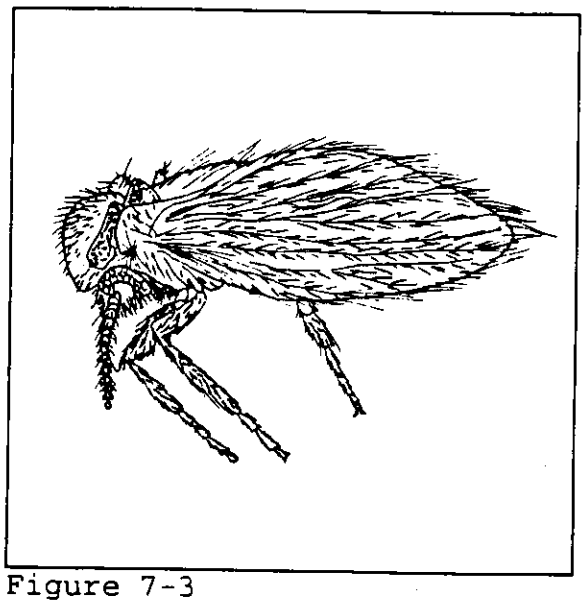

Figure 7-3

Moth flies breed in similar material to fruit flies; females lay masses of eggs, especially between loose floor tiles in wet areas, in drain pipes, dirty garbage containers, water traps, plumbing fixtures, around sinks, and near decomposing organic matter. Larvae (maggots) develop in shallow, polluted water and feed on sediments, decaying vegetation, and microscopic plants and animals found in gelatinous drain film. The life cycle is usually two to three weeks, but may be as short as one. Adult moth flies emerge from sink, tub, shower, and floor drains. Some species are small enough to pass through window screens. Moth flies are mostly active in the evening, around drains or sinks. Moth flies do not bite and are of little significance.

4. HUMP-BACKED FLY

Hump-backed, phorid, or coffin flies (Fig. 7-4), are 1/16 to 1/8-inch long and similar in appearance to fruit flies, except that they are more humpbacked. Most species are brownish-yellow with brown wings, small head, and have a large and humped thorax. Larvae are whitish, legless, worm-like and feed on sewage, dead animals, insects, rotting plant material, animal feces, and open wounds. They infest clogged drains and dirty garbage containers, and adults are attracted to light. These flies are active in buildings during winter. Hump-backed flies have strong legs and are reluctant to fly. They are seen running across surfaces in quick and jerky motions. Hump-backed flies can infest building complexes.

Hump-backed fly adults and larvae are common around decaying vegetation (mold and organic

matter). They can penetrate several feet into the soil to infest animal carcass or organic wastes. Flies emerging in large numbers inside a structure may indicate plumbing leaks in the crawlspace or beneath floor slabs, and considerable effort may be required to locate their hidden wet breeding areas.

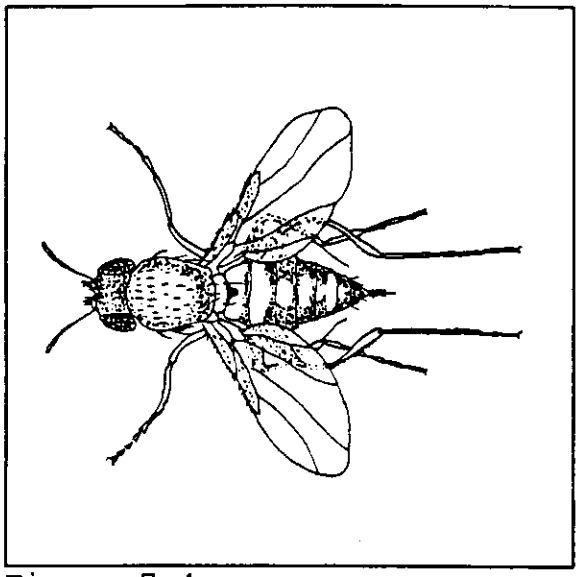

Figure 7-4

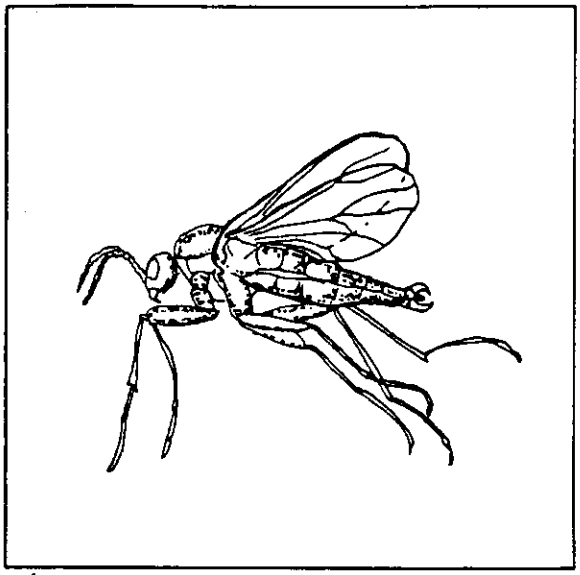

Figure 7-5

5. FUNGUS GNAT

Adult fungus gnats (Fig. 7-5) are 1/8-inch long and resemble small mosquitos, except that they do not bite. Fungus gnats are readily identified by their small size, distinctively long legs, and pointed abdomens. Adults are not strong fliers and are seen running across soil surfaces as potted plants are watered. Adults are also attracted to light and collect at windows. Larval fungus gnats are worm-like, about 1/4-in long, have a transparent body and dark head, and are usually found in the top layer of damp potting soil. Outside, fungus gnats are usually found in gardens, where some larvae live near the soil surface, and others are deeply buried where they feed on plant roots. They reproduce all year long indoors, and the life cycle is twelve to 27 days, depending on temperature.

Over-watering of potted plants supports fungal growth. Larvae thrive in dampness, decaying vegetation, and outdoor compost. These flies do not generally damage plants.

6. BLOWFLY OR BOTTLEFLY

A number of blowflies—blue, green, and black blowflies or bottleflies—(Fig. 7-6, next page) are common throughout the United States and may enter dwellings, where they are attracted to windows. Blowflies are common in populated areas, especially near slaughter houses, meat-processing plants, and garbage dumps. Blowflies are usually the first flies to appear in spring, sometimes emerging from

hibernation on warm, sunny winter days. Blowflies invade buildings mainly during cool weather, when they are readily attracted to garbage cans. At night blowflies rest on shrubs or building walls, from which they can easily enter buildings when doors and windows are left open. Blowflies are found in trash compactors and chutes, compost piles, on the ground, and in wall voids, attics, and chimneys. The larvae are sometimes observed on floors or falling from ceiling fixtures.

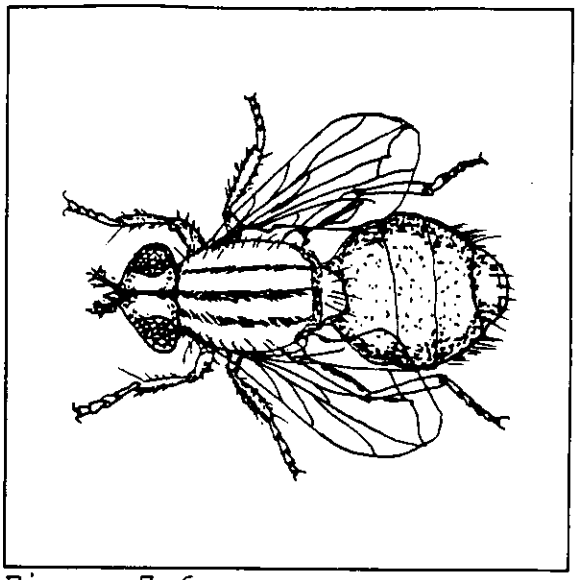

Figure 7-6

Adult blowflies are primarily scavengers. They are larger than house flies, make annoying buzzing sounds, and have metallic blue, green, or yellow or brown-colored bodies. They range in size from 5/16 to more than 1/2-inch long and have a single pair of wings.

Females usually lay 200 to 700 eggs (one species, up to 3,000 eggs) on meat, dead animals, decaying plant matter (such as lawn clippings), solid animal waste (dog manure is preferred), or at the edge of wounds on living animals. They can produce more than 30,000 flies per week. Larvae are large and develop fast; they feed for up to ten days on the surface of decaying matter and, when larger, burrow into less decayed areas. When mature (about 3/4-inch long), larvae wander away from the food source and burrow into the ground to pupate. In one to three weeks they emerge as adults. The period from egg to adult in some species is only nine to eighteen days, which allows four to eight generations per year. Some species over-winter in the soil as full-grown larvae, and others hibernate in attics, walls, and ceilings, but not in clusters. The life cycle is from two to four weeks. The presence of both adults and larvae in a structure indicates the presence of dead animals or rotting organic matter.

SECTION B HAZARDS OF INFESTATION

1. FLIES IN GENERAL

Flies provide great potential for disease transmission because of their feeding habits. Along with mosquitoes, flies are responsible for spreading serious diseases: malaria, sleeping sickness, leishmaniasis, and filariasis. Other disease-causing organisms that have been collected on flies include germs causing dysentery, tuberculosis, cholera, tularemia, anthrax, poliomyelitis, yellow fever, and typhoid.

2. HOUSE FLIES

House flies alone transmit more than 20 human diseases and parasitic worms (including salmonella, typhoid and paratyphoid fever, cholera, summer and infantile diarrhea and dysentery, tuberculosis, and anthrax) which adhere to the fly's sponging mouth parts, sticky foot pads, wings, body surface, or live within the fly's gut.

3. BLOWFLIES

Blowflies deposit eggs on meat, which, when eaten are responsible for cases of intestinal myiasis (caused when live fly larvae are accidentally ingested, causing nausea and other conditions similar to food poisoning).

4. EYE GNATS

Eye gnats are suspected transmitters of conjunctivitis.

SECTION C IDENTIFICATION, INSPECTION, AND MONITORING

1. IDENTIFICATION

If it is difficult to identify flies, request assistance from state health departments or preserve flies in alcohol and send them to university departments of entomology when necessary.

2. INSPECTION

Do not stop inspecting after finding the first breeding site, nor concentrate efforts only on those areas where flies were seen. Seek out all possible places which could contain decaying material, garbage, rotting fruits, vegetables, meats, or grass clippings.

When inspecting for fly-breeding sites, first search for wet areas: floor drains, open drums, buckets, cans, bottles, potted plants, dish washers, machinery, and around cracks, roof eaves, and loose tiles. Look for moist animal feces, garbage, wet mops, and towels. Housefly maggots on floors or pupae under carpets signal the probability of fly-breeding sites inside the building.

Begin inspections outside by intensively searching for breeding sites, first concentrating on garbage and refuse areas. Look under equipment for maggots in dead animal carcasses (mice, trapped

animals, dead rodents), and in garbage and drain sludge. Examine building cracks and crevices, dumpsters and garbage cans, drains and refuse piles. Cat, pigeon, and rodent feces and dead rodents are ideal breeding sources. Develop maps of likely breeding sites and periodically re-check those areas for live fly larvae.

Inside the building, inspect trash-container interiors and areas prone to litter (such as lunch rooms and lounges). Look for empty soda cans, coffee cups, rotting fruit products, lunch bags, wet towels, and debris in locker and lounge rooms. Inspect all cracks at baseboard level, crevices around loose floor tiles, hollows and voids, inaccessible areas in machinery that are caked with dirt and organic matter. Inspect potted plants and grease traps.

In kitchens and food processing areas, thoroughly search for decaying food. Inspect floor drains, floors under work counters and equipment, and enclosed counters which permit water or food to accumulate inside or beneath them. Look under ovens, in both hard-to-reach and hard-to-clean machinery at floor level.

3. GENERAL MONITORING

House flies have certain preferred resting places. During the day and when not feeding, adult flies may be found resting on floors, walls, ceilings, in cracks and crevices, and on other interior surfaces, as well as outdoors on the ground, fences, walls, privies, garbage cans, clothes lines, and vegetation. To monitor for adult flies, place scatter grids out for 30 seconds in locations near preferred resting places and count the numbers of flies landing on grids. Sticky tape, 3x5-inch wide sticky paper, or sticky strings can also be used to monitor adult flies. When problem flies are attracted to light (for instance, cluster and hump-backed flies), place light traps in dark places or capture flies at windows.

Use monitoring information to establish levels of infestation upon which to base control actions.

4. MONITORING INFORMATION ON SPECIFIC KINDS OF FLIES

a. House fly

Sticky or light-trap monitoring which produces, on the average, 50 to 75 house flies per trap per day indicates a moderately heavy population. More than 150 house flies per trap per day indicates a heavy population.

b. Drain Flies

To find possible entry points of drain flies:

- Place sticky traps near suspected sites;
- Set clear glass or plastic containers over drains or tape plastic bags over drains to capture emerging drain flies;
- Fit a piece of fine screen over the drain to see if drain flies stop appearing;
- Scrape a pocket-knife blade around the film inside the drain and look for tiny, worm-like drain fly larvae;
- Look for points of entry for drain flies through cracks in the slab or floor expansion joints, suggesting sewage-soaked soil or broken sewer lines.

SECTION D CONTROLS

1. MISTAKES IN FLY-CONTROL PROGRAMS

The following are the most common mistakes made in fly-control programs:

- Failure to properly identify flies and to find and correct conditions providing breeding sites.
- Stopping after finding the first breeding site; all possible breeding sites must be discovered and eliminated.
- Trying to control adult flies without first controlling larval breeding sites. Control of adult flies may be helpful to alleviate complaints, but it is not as important as controlling larval breeding sites.
- Attempting to control flies with only pesticide chemicals. Pesticides alone will not eliminate fly problems, and are only effective when good sanitation and exclusion are practiced as primary steps.

2. PHYSICAL, MECHANICAL, CULTURAL CONTROLS

a. Sanitation

The first step in any successful fly program is to reduce fly numbers; the key to that is an effective sanitation program for potential breeding sites.

Outside:

- Eliminate conditions encouraging fly-breeding sites around buildings by properly disposing of food and garbage (especially under dumpsters), preventing accumulations of moisture, and weed control.
- Do not throw waste water from cleaning operations onto the ground; pipe it into covered

drains. Keep areas around garbage cans clean. Ensure that tight-fitting lids on garbage receptacles are used.

- During warm weather, steam-clean and rinse out garbage cans and dumpsters with household disinfectant solutions on a weekly basis.
- Ensure twice-weekly garbage picked up so larvae will not have time to develop into adults.
- To ensure that fewer flies will enter structures, keep garbage cans and dumpsters tightly closed and as far from buildings as possible.
- Keep dumpster bottoms as dry as possible by installing bottom-drains and lead water drainage into sewer systems.

Inside:

- Fit garbage cans with tight-fitting lids and always keep receptacles closed;
- Routinely clean cans with household disinfectants;
- Seal up all wet and dry garbage in plastic bags before placing it into cans; this excludes flies and reduces both odors and the attractiveness of garbage to flies. Be sure to take garbage out every night.
- Keep floors, walls, cooking, and food-preparation surfaces clean and dry.
- Examine plumbing pipes for possible leaks and water condensation.

b. Notes on Control of Specific Flies

House fly: House-fly control requires a fully integrated approach based on exclusion and improved sanitation. Reliance on chemicals usually fails in long-term controls, since house flies develop resistance to pesticides.

Fungus Gnats: Allow potted plants to dry out between waterings. Remove potted plants if they supply flies food, water, or harborage sites.

Fruit Flies: Control of fruit flies first requires that sources of infestation be removed. This is often difficult because fruit flies feed on a wide array of organic materials, much of which may be well-concealed behind plumbing, janitor's closets, stagnant drain traps, bottoms of garbage cans, cracks, under appliances or counters, or outside the building. Unless thorough sanitation is practiced to achieve fruit-fly control, problems continue to develop.

Drain Flies: Finding and removing breeding sources and good sanitation practices are the only permanent solutions to drain-fly problems. Use a brush and industrial cleaner to remove slime and film from drains, and flush drains with hot water and commercial caustic drain cleaners or household disinfectants. Check carefully under the crawlspace for leaks or water backups from

possibly broken garbage disposal or sewer pipes. Inspect such other possible breeding sites as clogged roof gutters, air conditioners and cooling towers, clogged storm drains, septic tanks, loose floor tile, water beneath potted plants, rain barrels, sewage treatment plants, dirty garbage cans, and moist compost piles.

Hump-Backed Fly: The presence of hump-backed flies most often indicates that plumbing is leaking. Hang yellow sticky traps in various places in the room to show where flies are entering, or tape a plastic bag over suspected floor drains. Hump-backed flies are attracted to light, and windows are a good place to collect them. Electric-light traps can also be used in dark areas with no other source of light. Once found, eliminate larval food sources (there may be more than one). If broken pipes are found, excavate and discard and replace all gooey soils saturated with organic material. Ventilate and dry out areas so as not to support insects.

c. Exclusion

Exclusion is second only to sanitation in effective fly-control programs, because flies are always attracted to the warmth and odors of buildings.

- Assure that all doors, windows, air curtains, and door closing devices are in good repair and maintained to keep flies from entering the structure. Fit windows and doors with 16-mesh-to-the-inch, tight-fitting screens and install self-closing door devices.
- Screen doors should open outward; double sets of screen doors may be required.

d. Other Controls

Heat: Flies die in 30 minutes when exposed to dry heat at 120 degrees F.

Vacuum: A vacuum may be used to collect flies in groups (such as cluster flies).

Sticky traps: The best place to put sticky traps is where flies usually rest: in corners, on edges, on thin objects (suspended wires or strings), and on ceilings. Sticky paper and sticky strings are useful to capture house flies, but flies are also trapped when encouraged to alight on cotton balls.

Live-Capture Fly Traps: Outdoor, mechanical, and food-attractant fly traps are useful in some locations to lessen fly numbers, but they require attractive fly bait.

- Home-made fly trap: Place one cup of sugar, one cup of vinegar, and one banana peel in an empty two-liter bottle; fill with water to within four to five inches from the top; tie a heavy cord around the neck to hang it from a tree. This trap catches flies all season long.

- Fruit-Fly Trap: For fruit flies, use "fly-in" type traps having specialized saucer-like lids that fit a quart-size mason jar. Bait these traps with a one-inch piece of freshly sliced banana and add one teaspoon of water to keep the banana moist. Replace the banana every two to three days. In areas of high infestation, a trap may become filled with fruit flies in less than 24 hours. In kitchens, place traps out of sight and covered with paper. To kill flies before removing them from the trap, run hot water (150 degrees F.) into one of the entry holes. Keep the outside of the jar clean and dry, or fruit flies will feed on the outside and will not enter the trap. Since fruit fly eggs hatch in ten to fifteen days, clean the jar every two to three days. Meanwhile, carefully inspect the building to find the source of the flies.

e. Insect Light Traps

Electric and ultraviolet (UV) insect light traps (ILTs) offer good controls when used according to manufacturers' directions. Correct use of ILTs can help solve many flying pest problems in small facilities. Proper maintenance of ILTs requires annual (or more frequent) lamp replacement, weekly trap cleaning to control dermestid beetle problems, and a sufficient number of properly located traps. Locate traps twelve or more feet from doorways so flies cannot see them from the outside (to prevent attracting flies into the building), less than five feet from floor level, and at ceiling level in front of large overhead doors, but not facing outside. Each situation is different, and it should be determined in advance how flies enter and move through a building. Clean light-trap trays often, both to monitor efficacy and to prevent scavenger insect problems.

f. Outside Lighting

If practical, place outside lamps on poles away from buildings but shining onto doors, so as to attract night-flying insects away from the building. High-pressure sodium-vapor lamps help to minimize flies when installed at, but not over, entrance ways.

g. Temperature

Flies become sluggish or do not fly in lower temperatures. Keep inside temperatures as low as practical.

h. Other

Fungus gnats: Where fungus gnats are a problem inside, stir soil of potted plants so it will dry out. Begin watering to allow soil to dry out between waterings (just until plants begin to show very first signs of wilting). Discard dead plants, rotting vegetation, and infested soils. Pot new plants

and transplants only in sterile potting soil. Store unused soil separately in a covered container where it cannot become infested. Hanging yellow sticky cards (used by the greenhouse industry) above the plants will also help control white flies and other plant pests.

SECTION E CHEMICAL CONTROLS

Although many flies have developed resistance to pesticides, space treatments are effective in controlling adult flies. Space sprays, however, are not effective on larvae because aerosol mists do not penetrate breeding sites. Space treatments, however, are not long-term controls and need to be periodically repeated. Fly space treatments can be enhanced by turning off all but one light in one corner of a room to be treated and after several minutes, using an aerosol spray where the most flies have been attracted to the light. This reduces the amount of spray needed. Similarly, a light over a dishpan of water with a few drops of added detergent will also catch flies at night.

Commercial bleach is a good fly larvicide for dumpsters and garbage cans. Insecticide in or near food-service should be the last resort and carefully used.

END OF CHAPTER SEVEN