

SCHOOLS INTEGRATED PEST MANAGEMENT (IPM) FOR COCKROACHES

Important Note

According to the Virginia Pesticide Control Act (Section 3.1-249.53), in order to apply ANY pesticide (including Raid®, Round-Up®, and other over-the-counter pesticides) in public areas of ANY educational institution, the applicator must first be certified by the Virginia Department of Agriculture and Consumer Services. In other words, it is illegal for uncertified teachers, staff, administrators, or contractors to apply pesticides on school grounds.

INTRODUCTION

Cockroaches are one of the most common urban pests in Virginia public facilities. Cockroaches are pests for several reasons. First of all, cockroaches, in their search for nourishment, invade human food resources. By invading human food and contaminating it with feces and saliva, cockroaches become possible vectors for food borne illnesses, like *Salmonella*. In addition, cockroaches are malodorous. Finally, cockroaches have been implicated as a major cause of allergies in children.

BIOLOGY AND IDENTIFICATION

Cockroaches are flattened insects with long antennae. Their colors may vary but are usually brownish. The cockroach head is hidden from view, tucked under the insect's pronotum (see Figure 1). Cockroaches may have wings or be wingless.

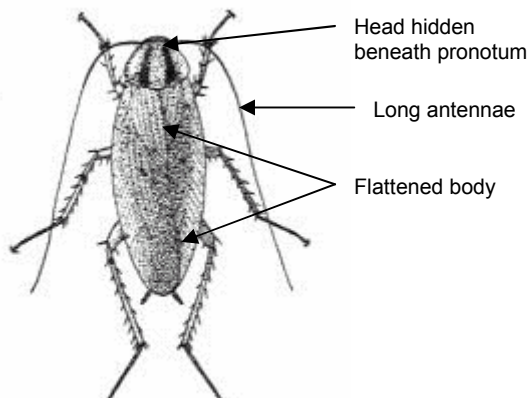


Figure 1. Typical cockroach characteristics.

Cockroaches experience “simple metamorphosis”. This means that they pass

through three different life stages: egg, nymph, and adult. Nymphs and adults have similar habits and behaviors. Nymphs look like the adults but are smaller and have no wings.

Cockroaches, in general, enjoy living in warm, dark, moist environments. Cockroaches also prefer to be in protected areas. In schools, one may find cockroaches in cracks and crevices in the walls, in cluttered environments, and near drains and leaking pipes. It is rare that a cockroach will be seen in broad daylight, unless large populations of cockroaches are present. Instead, cockroaches become more active at night.

Identifying the correct species of invading cockroach and understanding that particular species' biology is helpful in making correct pest management decisions. Each species varies in its environmental preferences, feeding habits, and reproductive capabilities. The most common cockroaches include the German cockroach, the brown-banded cockroach, the oriental cockroach, the American cockroach, and the wood roach. Use Table 1 in order to help you identify which type of cockroach with which you are dealing.

PREVENTION

A population of cockroaches can be kept from infesting a structure by making the structure less hospitable. The goal is to decrease the accessibility of the resources the cockroaches need (food, water, shelter, etc.) The best way to accomplish this goal is through sanitation and maintenance. This

may require time and effort but can be a permanent fix to the problem if done correctly. Below are some of the most effective methods of cockroach prevention using sanitation and maintenance:

1. Remove any dependable water source by repairing dripping pipes or leaky faucets.
2. Caulk any holes and cracks used by cockroaches as passageways from their shelter to foraging areas.
3. Weather-strip around windows and doors where cockroaches may enter.
4. Store food in sealed containers (not cardboard boxes) and store food containers in clean dry areas.
5. Always keep areas where food is handled clean. Regularly mop, vacuum, sweep, or scrub areas where food is handled.
6. Remove all garbage promptly from inside the structure.
7. Clean all recyclable materials with soapy water and store outside the structure if possible.
8. Keep food containers off the floor.
9. Keep clutter to a minimum.
10. Limit certain areas in the building for eating. This will keep cockroaches from spreading to other parts of the facility.

MONITORING AND INSPECTION

Detection and monitoring are very important in controlling cockroach populations. Since cockroaches are cryptic in their behavior, it can be difficult detecting their presence and monitoring the effectiveness of a control program. By understanding cockroach biology and by utilizing the tools available to you, you can detect their presence and evaluate your control program.

Cockroaches tend to concentrate themselves in areas where water and food resources are readily available. Seldom do cockroaches disperse throughout an entire building. Thus, the first step to managing cockroaches

is locating areas where high densities of cockroaches exist.

Initial Phase: Locating the Cockroach Problems

Locating the areas where cockroaches are abundant can be accomplished by using sticky traps as monitoring devices. Place sticky traps at regular intervals (about every 10-15 feet) in rooms or areas where you wish to monitor for cockroaches. Traps should be positioned in such a way that maximizes the trap's effectiveness. The following suggestions will maximize trap effectiveness:

1. Place traps along baseboards, walls, and against the sides of freestanding objects. Cockroaches normally use vertical surfaces as guidelines while they move from place to place. Placing sticky traps along cockroach highways will increase your chances at finding areas of high densities. Traps set out in the open away from walls or edges are unlikely to catch cockroaches.
2. Place traps near areas where water, food, warmth, and protection are readily available. This may include near sinks, drains, vents, computers, leaky pipes, appliances, food handling areas, air conditioning units, snack dispensers, dishwashing areas, trash receptacles, bathrooms, and storage areas.
3. Place each trap so that it opens parallel to the wall, baseboard, etc.
4. Avoid placing traps in extremely dusty areas, as the dust will decrease the stickiness of the trap.
5. Try to "think like the roach" when deciding where to most efficiently place traps.

As traps are placed around the facility, number and date the traps and mark on a map of the facility the placement of each trap. The map of the facility will eventually be the permanent record of your cockroach IPM program. Therefore, it is important that you keep clear, accurate records of all

monitoring activities in which you participate.

Second Phase: Evaluating Trap Counts

After 24-48 hours, return to the traps, replace the traps with new ones, and then count and record the number of cockroaches in each trap on the map. It may be necessary to evaluate trap counts over a week or two in order to get an accurate picture of the cockroach infestation. Remember that it is imperative that you keep clear, accurate records of all monitoring and treatment activities. An evaluation of the numbers of cockroaches in each trap can tell you the following:

1. Traps with high numbers of cockroaches indicate a problem site. These sites are where future management efforts will be directed.
2. Traps with few or no cockroaches indicate a site where management efforts are unnecessary.
3. If a trap only contains a few cockroaches (1-2 individuals) and no adjacent traps contain cockroaches, this likely indicates that the area does not need to be treated. The trapped individuals are probably stray cockroaches from a larger nearby population.

Third Phase: On-Going Monitoring

Upon prioritizing areas for treatment and then carrying out treatment activities (see **Management Options** below), it is then necessary to determine the efficacy of the treatment. This can also be done using sticky traps. Put out fresh traps a week or so after treatment and count the number of cockroaches 24-48 hours later. If the cockroach population has decreased markedly, progress has been made. If not, reevaluate your treatment methods and seek to also eliminate any food, water, or cockroach harborage.

In order to determine the continued success of your management plan and to locate new

infestations, continue monitoring for cockroaches on a regular basis throughout your IPM program.

LEAST TOXIC CONTROL METHODS

The purpose of integrated pest management is to reduce two things: the pest population and the amount of pesticides needed to accomplish that goal. With the exception of emergency situations, all other available control methods should be used prior to using a pesticide. Below are some of the most effective and least toxic methods available for cockroach control.

Physical Removal

The physical removal of cockroaches is difficult. Cockroaches normally forage at night, thereby limiting a pest control operator's direct access to a cockroach population. Lone cockroaches found during the day may be crushed and then removed from the premises, but the removal of one cockroach will not have much of an impact on the entire population. Vacuums may be used to remove large numbers of cockroaches. Also, sticky traps may be left overnight to trap live cockroaches allowing for their easy removal in the morning. The use of traps to control cockroaches may have some effect on small cockroach problems but may have no effect on larger infestations.

Chemical Management

Sometimes sanitation, maintenance, and physical removal alone may not be enough to control an existing cockroach problem. If cockroaches persist or if an emergency situation warrants immediate control of a cockroach population, chemical pesticides may be needed. Remember that Virginia law requires that all pesticides applied on school grounds must be applied by a certified applicator. All pesticides should be applied according to labeled directions. Applicators must wear protective clothing.

Pesticides should never be applied where they might runoff into storm drains or sanitary sewers.

Whatever the control method you choose, it is imperative that you keep clear, accurate records of all actions taken. Using the same map that you have been using to monitor, record the date of any pesticide application, the formulation and brand name of pesticide used, and where the pesticide was applied.

Some pesticides are more environmentally friendly than others. Below are listed different chemically based management options. They are listed in the order of most environmentally friendly to least environmentally friendly.

1. Diatomaceous earth can be placed within cracks and crevices where cockroaches enter the structure. Diatomaceous earth is a dust made up of the fossilized remains of diatoms. The dust adheres to the cockroach's protective cuticle, making the cockroach susceptible to desiccation. Silica aerogel can also be applied for the same purpose. These dusts should only be used in dry areas since moisture reduces their effectiveness.
2. Boric acid is a great tool to be used in integrated pest management. Boric acid comes in several different formulations, including bait, dust, and aerosol. These formulations are particularly effective when applied in cracks and crevices. The advantages of boric acid include its long-term residual effectiveness and low toxicity to humans and pets. Boric acid dusts can also be applied into wall voids if cockroaches are present therein.
3. Insect growth regulators (IGR's) are effective pesticides that are safer than more traditional toxicants. Cockroach IGR's are insect hormone mimics that cause reproductive sterility.
4. Cockroach bait is the most common form of chemical management in an IPM setting. Baits are a toxicant that has been formulated with a non-toxic

food source. Baits reduce the overall amount of pesticides used by allowing for precision placement where they are available to cockroaches but not to people or pets.

Below you will find several important factors to think about when using cockroach baits.

- Place baits near the target cockroach infestation. Cockroaches will not travel long distances away from their shelter in order to forage for food. Therefore, the closer to the infestation you place the bait, the more effective the IPM program will be.
- A small amount of bait placed strategically in many places is more effective than placing large amounts of bait in only a few places.
- Place the bait along edges, in cracks and crevices, and between cockroach harborages and foraging sites.
- Make sure the bait is not placed in areas where it will get covered by grease, flour, or dust. This will render the bait less effective. Baits placed in plastic stations should be used in these types of environments.
- Check baits regularly to make sure they are still present and working. Baits may at times dry out, become moldy, or get accidentally removed. Replace baits as needed.
- Do not use other types of pesticides around the bait stations (e.g. sprays or dusts). The pesticides may act as a repellent, driving away the cockroaches from the bait.

RECORD KEEPING

Protect yourself against liability. Record all chemicals applied in a pesticide application IPM logbook on the facility's premises. Include the name of the applicator, the date of the application, the formulation used, and the brand name of the chemical used. Be sure to also document the location of application and the pest problem that initiated the chemical treatment.

Prepared by Marc L. Fisher, School IPM Training Program Assistant, and Dr. Dini Miller, Assistant Professor of Entomology, Department of Entomology, Virginia Tech

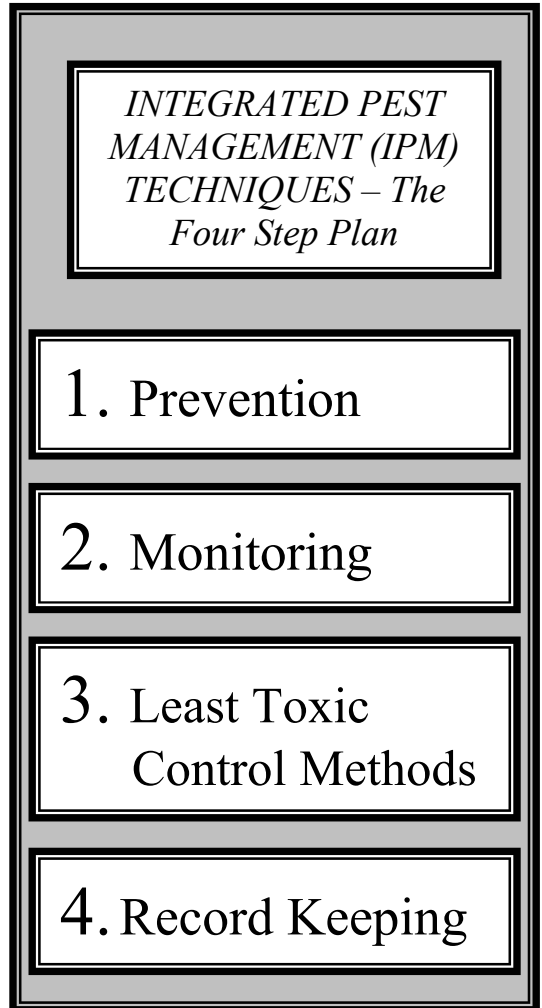
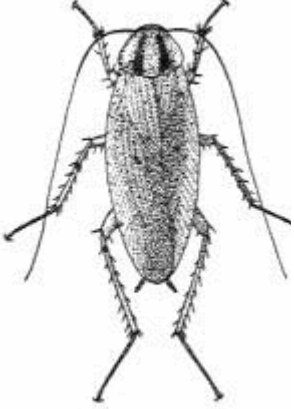

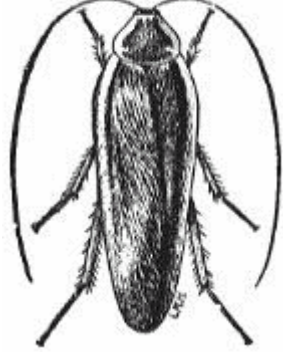
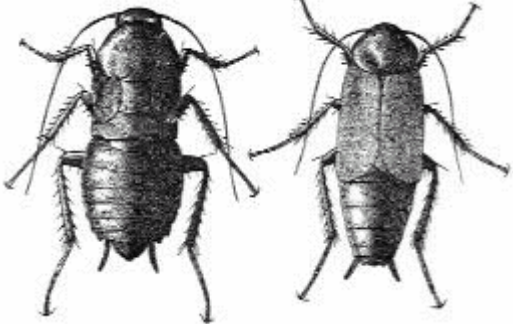
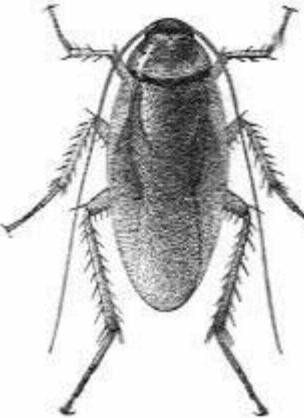


Table 1. Pictorial key to major cockroach pests of Virginia.

 <p><i>German Cockroach</i></p> <ul style="list-style-type: none"> - Adults about 5/8 inch long - Light brown except for the shield behind the head marked with two dark stripes - Egg capsules light tan - Young roaches wingless and nearly black 	 <p><i>Brown-banded Cockroach</i></p> <ul style="list-style-type: none"> - Adults about 5/8 inch long - Light brown to glossy dark brown - Two light, transverse bands across the base of the wings and abdomens - Young roaches wingless and resemble adults
 <p><i>Wood Roaches</i></p> <ul style="list-style-type: none"> - Adults about 1/2 to 3/4 inch long - Brown with outer edges of the wings pale - Young roaches wingless and resemble adults - These are only occasional invaders 	 <p><i>Oriental Cockroach</i></p> <ul style="list-style-type: none"> - Adults about 1 1/4 inch long - Females wingless and males have wings - Dark reddish brown to black color - Young roaches wingless and resemble adults
 <p><i>American Cockroach</i></p> <ul style="list-style-type: none"> - Adults about 1 1/2 inch long - Reddish brown except for a yellowish margin on the body region behind the head - Young roaches wingless and resemble adults 	