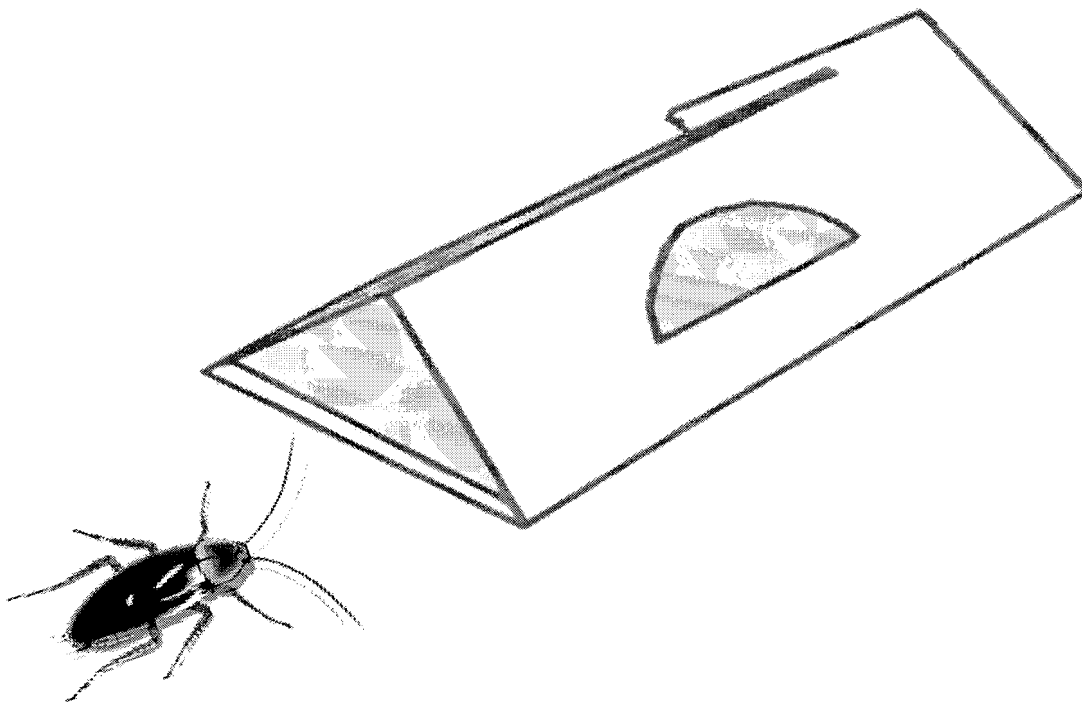


**Supplemental Materials
for
"Introduction to IPM Principles
and Practices"**

**Integrated Pest Management
IPM Training Manual**



**MARYLAND DEPARTMENT OF AGRICULTURE
PESTICIDE REGULATION SECTION
50 HARRY S. TRUMAN PARKWAY
ANNAPOLIS, MD 21401**

ERRATA SHEET AND IMPORTANT NOTICE CONCERNING IPM TRAINING MANUALS AND INFORMATION SHEETS

BACKGROUND

Legislation was enacted in 1997 mandating that Maryland Public Schools (Grades K-12) develop and implement Integrated Pest Management (IPM) plans for managing pests in public schools. The legislation also mandated schools to develop and implement methods for providing notification to parents and or guardians, as well as, school staff of pesticide use in school buildings. In 1999, this legislation was expanded to require public schools to develop and implement IPM plans and notification of pesticide use on school grounds.

In an effort to assist schools in the initial development and implementation of IPM plans and notification and posting formats, the Maryland Department of Agriculture (MDA) produced several manuals and contracted with the University of Maryland to write four additional manuals. These documents were intended for use by the schools for information and guidance. The documents were never intended to supplant the IPM and notification law and regulations but rather to facilitate implementation of the law. However, there are statements in these documents that incorrectly state the requirements of the law. The Department does not have the funds to republish the manuals and therefore has disseminated this errata sheet to all public school systems in Maryland to ensure that all schools are complying with the law.

Please note that the IPM in School manuals contain additional statements or information other than the examples listed below that do not uniformly incorporate and provide detail of the statutory mandate of Maryland's IPM and notification of pesticide use in public school buildings or on school grounds law and regulations. Therefore, if you are reading these manuals for training/guidance purposes or when performing pest control services, make sure you adhere to the definition of Integrated Pest Management found in Maryland's Integrated Pest Management and Notification of Pesticide Use in a Public School Building or on School Grounds law and regulations. For more information or questions, please contact the Maryland Department of Agriculture's Pesticide Regulation Section at 410-841-5710

ERRATA SHEET

PLEASE NOTE AND BE AWARE OF THE FOLLOWING:

1. The IPM in Schools manuals produced by MDA and the University of Maryland contain statements that incorrectly state that IPM is an alternative to pesticide application. An example of such a statement can be found in the Preface of the *Integrated Pest Management in Schools: IPM Training Manual*, where it states "Integrated Pest Management (IPM) is an alternative to pesticide use." This statement is incorrect. **IPM is not an alternative** in Maryland's Public Schools (Grades K-12); **it is the required method** of pest control under Maryland's IPM- in-Schools law and regulations."

2. The IPM in Schools manuals produced by MDA and the University of Maryland contain statements that fail to uniformly affirm the statutory mandate that pesticides be used only when “nontoxic options are unreasonable or have been exhausted.” Examples of statements that fail to affirm the statutory mandate can be found 1) on page 6 of the manual entitled *Guidelines for Integrated Pest Management in Schools*, where it states “Pesticides are a component of an IPM program...” 2) on App. A, page 7 on the manual entitled *Contracting Guidelines for IPM Services in Maryland Public Schools* where it states “A broad definition of IPM is a pest control program that... incorporates different methods of pest control such as...and pesticides, when warranted...” and 3) in same manual on p. 17 where it states that “Pesticides play a limited, but important role in and IPM program.” These statements do not reflect the statutory mandate that pesticides may be used only when nontoxic options are unreasonable or have been exhausted. In fact implementing an IPM program with a proper focus on pest prevention may result in a pest management program that does not include the use of any pesticides.
3. The IPM in Schools manuals produced by MDA and the University of Maryland contain some language that fails to provide the correct notice requirements mandated by the IPM-in-Schools law and regulations. An example of such a statement can be found on page 8 of the manuals entitled *Guideline for Integrated Pest Management (IPM) in Schools*, which states “A voluntary registry of individuals with medical problems or conditions who could be adversely affected by exposure to pesticides shall be maintained at the school health or administrative offices, as well as by the contact person.” **Prior notification is not a voluntary option for schools, nor is it limited to individuals with medical problems or conditions.** Both the law and regulations regarding IPM and Notification in public schools buildings and on school grounds **mandate notification** to all parents, guardians and school staff for elementary schools. Middle and High schools may choose to either notify all parents, guardians and staff members or establish a list of parents, guardians and staff members who wish to be notified of pesticide use. The law requires that all parents, guardians and staff be informed of the notification list so they can opt-in.
4. The IPM in Schools manuals produced by MDA and the University of Maryland contain confusing statements regarding a school’s legal obligations. An example of such a statement can be found on page 4 of the manual entitled *Contracting Guidelines for IPM Services in Maryland Public Schools*. The statement reads “In addition, the Governor’s Pesticide Advisory Council has issued the following policy statement regarding IPM in schools...” This statement references a Council that no longer exists and a policy that is not in law or regulation

Supplemental Materials for "Introduction to IPM Principles and Practices"

Integrated Pest Management IPM Training Manual

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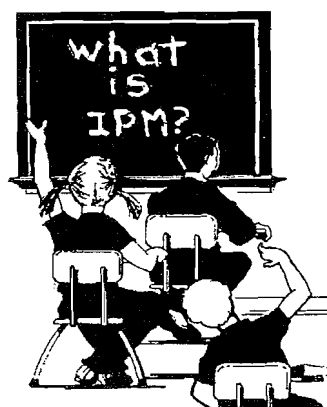
What You Need to Know About IPM

IPM, or Integrated Pest Management, is defined by Maryland law as a managed pest control program in which methods are integrated and used to keep pests from causing economic, health-related, or aesthetic injury through the utilization of site or pest inspections, pest populations monitoring, evaluating the need for control, and the use of one or more pest control methods, including sanitation, structural repair, nonchemical methods, and, when nontoxic options are unreasonable or have been exhausted, pesticides, in order to minimize the use of pesticides and minimize the risk to human health and the environment associated with pesticide applications.

Whether you are a technician whose job it is to do IPM, or you are someone who must evaluate the success, failure, and safety of IPM programs, there is a body of knowledge you must learn in order to become proficient:

IPM Theory

- Working definition of IPM
- Benefits and goals of IPM
- How IPM differs from traditional pest control
- Components of IPM
- Action thresholds
- How to evaluate success or failure



IPM Tactics for Major Pest Groups in Your Area

- | | | |
|----------------|----------------------|----------------------|
| Cockroaches | Ants | Rodents |
| Spiders | Fleas | Flies |
| Bees and wasps | Fabric pests | Stored product pests |
| Birds | Occasional pests | Urban wildlife |
| Moisture pests | Wood-infesting pests | |

Monitoring

- Purpose- pest ID, location, population size, sanitation, entry, etc.
- Visual inspections- goals, methods, inspection equipment
- Sticky traps- types, placement, interpretation
- Pheromone traps- types, placement, interpretation
- Flying insect traps- types (jars, ILTs, etc.), placement, interpretation
- Rodents (visuals, tracking patches, etc.)
- Termites and other wood destroyers (monitoring stations, moisture meter, visual)

Communications

Notification and posting—when required, procedures, etc.

How to talk with staff—giving and getting information

IPM service reports—what to include, how to fill out, etc.

How to report special sanitation, structural, or operational problems

How to use an IPM logbook

How to use floor plans/maps for reporting and reviewing IPM data

Nonchemical Pest Management

Pestproofing—caulking, screening, weather-stripping, etc. and who is responsible

Sanitation/housekeeping—reducing pest food, water, harborage

Vacuums—role (direct control, sanitation, inspection) and operation

Power washing—role and proper operation (if applicable)

Rodent traps—snap traps, multicatch, glue boards

Wildlife traps—raccoons, squirrel, skunk, moles, as applicable

Light management—manipulating light to keep insects away from buildings

Insect light traps—as a flying insect control tool

Biologicals—nematodes for fleas, fungus for termites, etc. as applicable

Moisture control—importance, techniques (ventilation, plastic soil covers, etc.)

Repellents—insects, wildlife, domestic animals

Pesticides and IPM

Guidelines on when and how to use pesticides in IPM

Safety issues and how to choose products and application method

Insect baits—uses, techniques, precautions, limitations, etc.

Crack and crevice/void treatments—uses, techniques, precautions, etc.

Other insecticide tactics—as applicable

IGRs and biorationals—as applicable

Rodenticides—safety issues, techniques, guidelines

Monitoring in IPM Programs

Monitoring is a key element of a successful IPM program. Monitoring aids in determining if pests are present, how many, where they are located, and often why the problem occurred. IPM is at its most basic a cycle of monitoring, control actions and evaluation.

The monitoring component of an IPM program is essential to its success. It keeps everyone informed about all aspects of the pest situation and conditions at the site. Monitoring includes the following:

- Identifying and locating pests
- Identifying areas of critical sensitivity (classrooms, infirmary, etc.)
- Estimating size of pest populations
- Identifying the factors that are contributing to the pest problem (poor sanitation, improper storage, holes in walls, etc.)
- Reporting management practices that could affect pest populations or pest management activities (trash pickup, lighting, construction, etc.)
- Identifying nontarget species that could be killed or injured
- Assessing natural enemies and potential secondary pests
- Assessing environmental conditions (temperature, humidity, weather or seasonal changes)

There are three basic components to a monitoring program:

- (1) walk-through visual inspections of all areas of the building including outside, (2) use of various types of monitoring traps, and
- (3) information from personnel working on site, including review of the logbook. All occupants of a building should be encouraged to report pest activity.

VISUAL INSPECTION

In large facilities, IPM technicians should use blueprints or create a floor plan showing all rooms, sensitive areas, points of entry, etc. They need to become familiar with the entire structure. Certain areas are more prone to pests than others and will require more intensive

inspections. Examples include cafeterias and snack rooms, food storage areas, staff lounges, sites with live animals, locker rooms, recycling collection points, and loading docks. Here are some inspection guidelines:

Use a bright flashlight and a magnifying glass (hand lens) during the inspection. Do not look just for the pests themselves, look for other evidence of pests such as droppings (especially from cockroaches and rodents) and frass (from wood borers), gnawing, tracks, and grease marks (from rodents), damage (such as powderpost beetle exit holes), and shed insect skins. The presence of feeding debris or frass is an indication of infestation.



Examine window sills regularly as many pests fly or crawl towards light. Also check inside ceiling light fixtures. Pests may be found behind baseboards, under furniture, behind moldings, in cracks in floors, behind radiators, or in air ducts. Check around door jambs for cockroaches and spider webs. Spiders often spin their webs across gaps around doors to capture insects trying to enter.

Look, too, for conditions that might lead to pest problems. Check for moisture problems, both indoors and out, which may lead to moisture-related pests such as carpenter ants, termites, or mold. Look out for damaged screens, doors, and walls, which could allow pest entry. Note any sanitation problems. Be aware that fresh flowers and potted plants may be infested with insect pests.

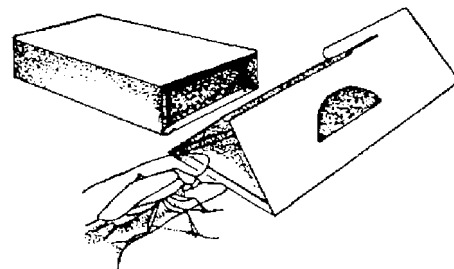
Inspect outdoors, also. Heavy landscaping near the foundation and plants such as ivy growing on walls increases the risk of outdoor pests moving inside. Moisture problems around the foundation, gutters, or air conditioning units can favor moisture-related pests. Bright exterior lights may be attracting insects to the outside of the building, and these insects may be finding their way indoors. Poor management of trash may be attracting rodents, which could find their way inside through utility lines or other openings.

MONITORING TRAPS

While the best inspection tools are our eyes, sometimes pests are hidden from view. Other tools can help find these hidden pests, and sometimes estimate their numbers. There are currently three major types of monitoring traps: sticky traps, which use an adhesive to capture insects; pheromone traps, which use chemical attractants to draw certain species of pests into the trap; and insect light traps (ILTs), which use ultraviolet light to lure and capture certain flying insects.

Sticky Traps in IPM

Sticky traps are simply paper, cardboard, or other materials with one or more surfaces covered with glue. They can be flat, triangular, boxlike, or hanging tapes (for flying insects). They are a simple and inexpensive way to capture cockroaches, ants, and other pests. Sticky traps can tell you a number of things:



- 1. What pests are present.** Obviously, when you capture cockroaches or other pests in a sticky trap, you know that you have pests, and you know the species. But the opposite is not necessarily true. If sticky traps are empty, the area may be pest-free. On the other hand, the traps could be in the wrong place, or the infestation could be in an unusual place. Perhaps there is an isolated heavy infestation 15 feet away behind the refrigerator, but there is no sticky trap there. Sticky traps are good positive indicators of an infestation, but are not accurate in proving that the area is pest-free (unless the area has been saturated with traps, which might be done in a suspected case of delusory parasitosis, for example).
- 2. Where pests are located.** By placing traps in various locations, an IPM technician can locate focus areas or pest entry points. The distribution of pests on the trap can help determine a site of infestation. With cockroaches, for example:
 - A bunch of cockroaches on one side of the trap pretty much tells you they are coming from that direction.

- If all stages of the cockroach are captured, you are probably dealing with a large, long-standing population.
 - If only adults or large nymphs are captured, you may have a new infestation that has moved in from a cockroach focus nearby.
 - If mostly small nymphs have been captured, there will be a pocket of infestation within a few feet.
3. **The trend of pest problems.** Sticky traps are good tools to evaluate the success or failure of your IPM program. Are the trap catches decreasing? This suggests control actions are successful. Are they increasing or remaining the same? Someone needs to make some changes. To be sure that the trapping trends are reflecting actual pest populations, technicians need to use the same brand of trap in the same places over the same time periods. Otherwise, trap catches may be affected more by differences between traps than by changes in pest populations.
 4. **Determining when to take control action.** Some IPM programs include “action thresholds,” pest levels that must be reached before a particular control action is taken. Sticky traps are a good measuring tool for action thresholds. For example, insecticide treatment in an IPM program might only be triggered if five or more cockroaches were captured in a sticky trap. Less, and control would be limited to nonchemical tactics.
 5. **Controlling pests.** Sticky traps have generally been considered poor control tools. However they are an option in very sensitive situations where no pesticides are permitted. Cockroach sticky traps are now available with various lures. One type has a pheromone attractant for German cockroaches. In certain situations, placing large numbers of these traps can knock down populations of these pests by as much as two-thirds.

Placing Sticky Traps

Where you place sticky traps will naturally depend on the type of pest. Cockroaches are the most common pest. For them, it is not efficient to place sticky traps evenly throughout an area. Since cockroaches only travel a few feet from hiding places looking for food, you would need large numbers of traps to be effective. Instead, place sticky traps only in the most likely areas of infestation, and in travelways, and in locations where the building can least afford to have pests. In other words, prioritize sticky trap locations based on knowledge of the pest and the site. Here are some other tips:

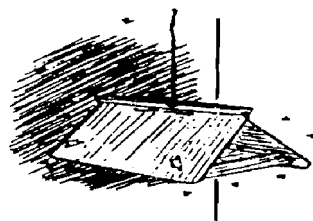
- Avoid placing sticky traps in the open when you can. Cockroaches and certain other crawling pests do not travel in the open if they do not have to. Further, it keeps the traps out of the view and grasp of your customers.
- For cockroaches, think about where you normally find them, and place the sticky traps nearby. Put them inside cabinets, under sinks and stoves, under kitchen equipment, in kitchen drawers, on the floor behind the toilet, and next to trash cans. Whenever possible, place them horizontally against the edges of a wall or other vertical surface, near corners and sites where there has been cockroach spotting. Although it is in the open, one of the best sticky trap sites in a residential kitchen is on the kitchen counter back against the splash board.
- In food storage areas, place sticky traps on or under shelves and approximately ten feet apart. Place them on different levels. Try to create a matrix in the storage area that will pinpoint a new infestation and help you identify the infested goods.
- In large facilities, consider numbering and dating the traps.

In an IPM monitoring program, technicians should replace any traps that have already captured a pest, and record the capture information. They should also replace any trap whose glue has become dusty or dirty, and follow the manufacturer's recommendations on a regular replacement schedule. Three months is probably as long as you can stretch a sticky trap's useful life. Even though it can appear sound, the glue may have lost its holding power.

IPM technicians should be using sticky traps. However, they should not be the only monitoring tool used. If sticky traps are not placed near the primary site of infestation, or if the pests are foraging in another direction, the traps may capture nothing, while there may be a serious pest problem just a few feet away. Sticky traps are a good tool, yes, but no substitute for a hands and knees "eyeball" inspection.

Pheromone traps

Much of what insects do is directed by odors. Various smells tell them where to find food, or a mate, or others of their own kind. Pheromones are the natural scents that insects produce to communicate with each other. Scientists have isolated some of these scents and they can be used in traps to attract certain insect pests. Some are sex attractant pheromones that draw only the male insect. Other pheromone traps use aggregation pheromones that attract both males and females of the same species. Pheromone traps are valuable tools for monitoring certain pests, particularly "stored product pests" such as cigarette beetles and Indianmeal moths, and outdoor pests such as gypsy moths, Japanese beetles, fungus gnats, and many pests of field crops and fruit trees. Pests are strongly attracted to the lures.



There are many different styles of traps, the most common being hanging traps. These have a sticky surface and a small lure that contains the pheromone to attract certain flying insect pests. Another common type of trap is the pitfall, which lures crawling insects into a container filled with oil. Pheromone lures are available for the following stored product and indoor pests:

Angoumois grain moth	Cigarette beetle	Clothes moth (webbing)
Confused flour beetle	Drugstore beetle	Indianmeal moth
Larger grain borer	Lesser grain borer	Powderpost beetle (Anobiid)
Red flour beetle	Warehouse beetle	

Indoors, pheromone traps are used most commonly to detect stored product pests in places like grocery stores, granaries, food warehouses, and seed companies, but they can be used anywhere.

Pheromone traps are most useful as an early warning system. When you find the first insect in a trap, it's time to consider control measures. They also help pinpoint a problem, and the number of insects trapped can help gauge how severe the infestation is. Use of pheromone traps after treatment can help evaluate the effectiveness of an application. Mass trapping using pheromone traps is sometimes even effective as a control measure.

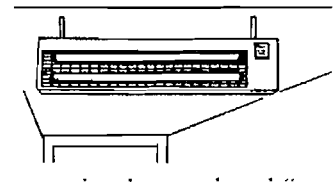
Where pheromone traps are placed depends on the insect, the style of trap, and the type of facility. For instance, while you can easily place traps every 50 feet in a storage facility, a grocery store manager would likely object to that level of visibility. Below are some general guidelines. For specifics, follow the manufacturer's directions.

- In general, pheromone traps are placed in a grid pattern, 20 to 60 feet apart.
- Place traps in areas where there have been pest problems and in hard-to-clean areas where there could be product spillage. Place traps around machinery, in corners, and next to beams. Place traps to avoid air currents and moisture.
- Consider the insects' habits. Traps will catch more moths near the ceiling and more beetles near the ground.
- Don't place traps near doors, windows, vents, or loading docks where they could attract insects from outside.
- If trapped insects might be entering from outdoors, place traps around the outside of the building (but not near doors or windows) to check outdoor populations. This will also intercept migrating insects before they enter the facility.
- Once insects have been captured in a trap, tighten the grid to pinpoint the source of the infestation. For example, place traps every five feet around the one with the catch.
- Number each trap and mark on a map of the facility where you have placed the traps.
- Keep a monitoring record of each trap's location in the grid, the date it was placed, and its catch at each inspection. Some technicians record this information right on the trap itself.
- Check traps on a regular basis, usually weekly, more often if you suspect an infestation. Never let a trap go unchecked longer than a month.
- Replace pheromone lures according to the manufacturer's directions. Replace traps when they become dusty, dirty, or overloaded with insects. Remove used traps from the facility.

Insect Light Traps

Insect light traps (also called ILTs, insect electrocutors, and electronic insect traps) are useful for detecting and controlling occasional flying insects. The traps emit ultraviolet light ("black light") that is very attractive to certain insects, particularly to flies and moths. The insects are drawn into the trap and are either "zapped" (electrocuted on a grid) or fall onto a glue board. Flies can see lights from about 25 feet away, moths up to 100 feet away, depending, of course, on the ambient light present in a room. Only industrial grade traps should be used, not the backyard "bug-zappers" sold in retail stores.

There are many types of traps including ceiling-hung, two sided models, wall mounts, corner mounts, and decorative glue trap ILTs for use in restaurants, cafeterias, and other public areas.



ILT Use as a Monitoring Tool

An ILT not only kills flies and other insects, it is an effective pest monitoring tool and "early warning system" to identify a breakdown in sanitation or control procedures before a pest problem gets out of control. Glue trap ILTs, which capture insects whole, tend to be better monitoring tools than electrocuting ILTs, which often shatter the insects when they are "zapped," but either type of trap can be used. Collecting trays and glue boards should be checked often, usually once a week. Not only does this conform to good monitoring practice, but it avoids the risk that dead and rotting insects will themselves attract dermestid beetles and other scavengers into the area. As technicians empty the tray or remove the glue board (power disconnected, of course), they should also brush out the dead insects from behind the tray/board and from cracks and crevices.

Here are a few examples to show how much information can be obtained from using ILT catches as a monitoring tool:

- If large numbers of house flies suddenly are found in the trap, you can be fairly sure that there is a nearby breeding source either inside, or if outside, then a window or door is being left open.
- If the trap contains dermestid beetles in the winter, there must be an infested site inside the facility. At this point you would try to pinpoint the infested location by using pheromone traps.
- If the trap contains winged ants, there is a nearby nest.
- If the trap suddenly captures mosquitoes, someone is probably leaving a door open at twilight.

Bulb Replacement

The heart of an insect light trap is the ultraviolet fluorescent bulb that attracts flying insects. But you can't tell by looking at a glowing bulb whether it's working at full strength. The phosphor inside loses 50% of its effectiveness after a year of continuous use; the effective life of the average bulb is 7,000 hours, only about 9 months. Bulbs should be changed at least once a year, or even twice a year if in continuous use, even if they appear to be burning strongly. When the bulbs are changed, the technician should also--

- With the unit unplugged, check for loose electrical connectors, damaged wire, cracked lamp sockets or insulators, scorched ballast unit or transformer (if visible), and other indicators of electrical problems requiring professional servicing.
- Clean the outside grid with a stiff brush. Wash the reflector and exterior with warm soapy water, then rinse and wipe dry.
- Add a strip of tape or a tag to the bottom of the trap with the date that the bulbs were changed.

ILT Installation

How do you determine how many traps will be needed for a particular facility? Unfortunately, there are no hard and fast rules and so the answer will vary for each job. Most flying insects won't respond to lights more than 100 feet away, and flies rarely respond if the light is beyond 25 feet.

Far more important than numbers is trap placement. A single trap in the right location will outperform a half dozen installed in the wrong locations. In schools, for example, insect light traps are most effective in narrow hallways or 15-25 feet inside main entry points. In facilities with loading docks, a good first line of defense is a large ceiling-hung trap mounted 15-25 feet inside loading dock doors.

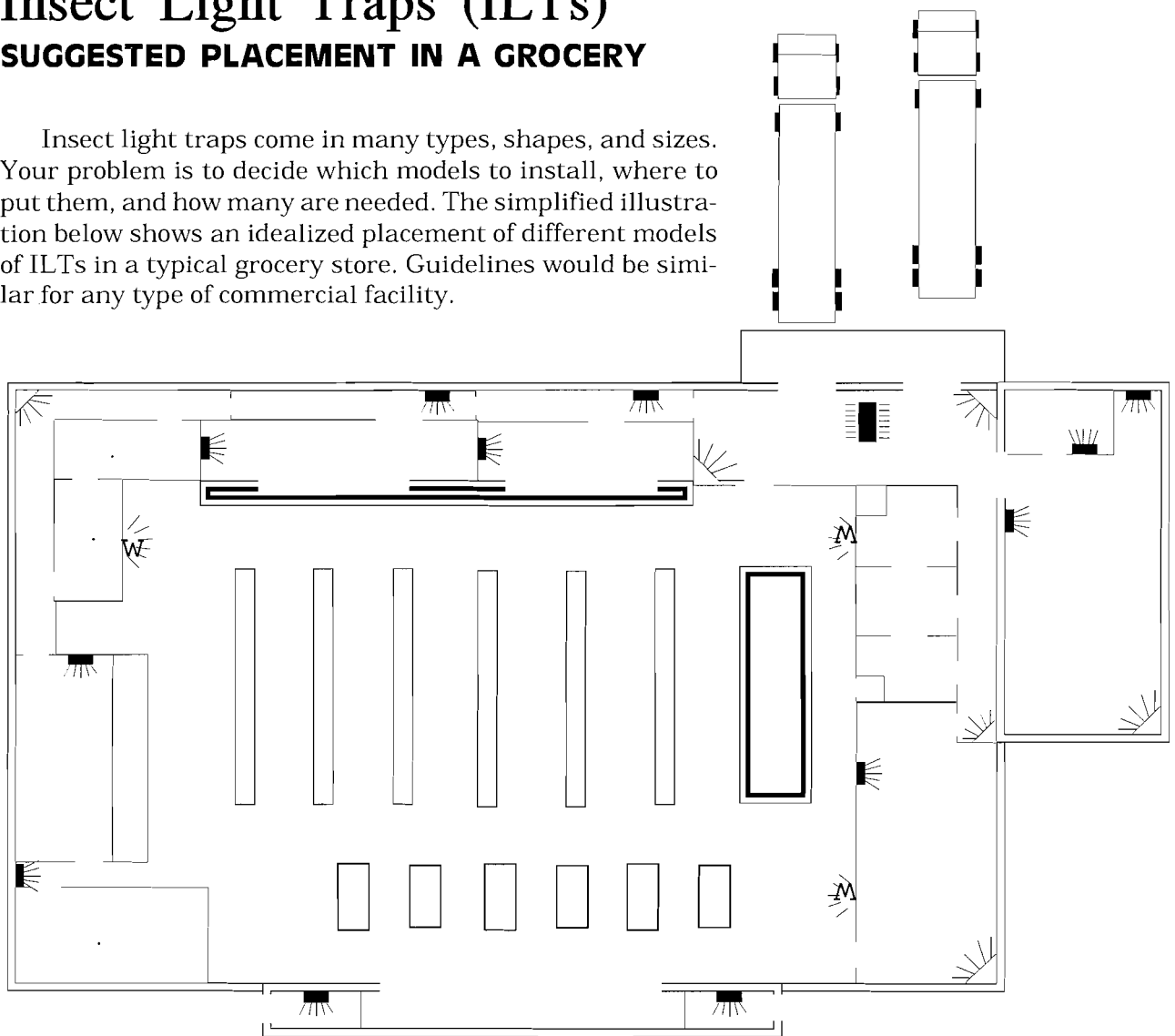
Traps that are low to the ground usually capture more flies than do ceiling-hung traps. Ceiling hung traps capture more moths. The illustration reproduced on the next page (Suggested Placement in a Grocery) shows some typical types of ILT installations.




Use insect light traps indoors only. When placed outdoors, they mostly capture nonpest insects.

Insect Light Traps (ILTs)

SUGGESTED PLACEMENT IN A GROCERY

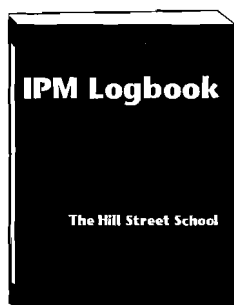
Insect light traps come in many types, shapes, and sizes. Your problem is to decide which models to install, where to put them, and how many are needed. The simplified illustration below shows an idealized placement of different models of ILTs in a typical grocery store. Guidelines would be similar for any type of commercial facility.



-  Ceiling-hung, two-sided ILT should be installed in the receiving area 8-10 feet above the floor, and about fifteen feet inside the loading dock doors. Place it perpendicular to the doors so that the light does not draw insects in from outside. This installation is primarily designed to capture high-flying moths and other night fliers that enter through the loading dock doors.
-  Wall mount ILTs and corner-mount ILTs should usually be installed 3-5 feet from the floor (waist high). House flies primarily fly close to the ground. Install ILTs to capture insects *before* they enter processing rooms and sales areas. ILTs are most effective when installed where insects are funneled into narrow spaces such as hallways and small rooms. Install corner-mount ILTs in the outside corner of intersecting corridors to attract insects from both sides. *Do not install ILTs directly over exposed food or food prep surfaces.* Electrocuting ILTs (in contrast to ILTs using glueboards) cannot be within 5 feet of these surfaces.
-  Decorative glue trap ILTs are the best choice for public areas.

Communications in IPM Programs

Probably the simplest and least expensive, as well as one of the most effective, ways to manage pest problems in IPM is through communication. Many pest problems can be traced to shortcomings in sanitation, operational procedures, and structural deficiencies. Correcting such problems is the best way to control pests for the long-term. Many people do not understand the connection between pests and sanitation, clutter, cracks and holes in walls, etc. Building maintenance and grounds personnel need to understand pestproofing and other steps they can take to keep pests from entering buildings. House-keeping staff can learn to find and give special attention to areas with sanitation problems. Food service workers should understand the connection between inadequate sanitation and pests. Students in schools can help by regularly cleaning leftover food out of their lockers and picking up trash paper. All of this requires good communications. Furthermore, simply having informed individuals who will spot and report pest problems can go a long way toward managing pests.



Communication can take place in many ways: informational handouts, service reports, sanitation reports, an IPM logbook, conversations between technicians and staff, and for schools, features in the school newspaper, notes sent home to parents, presentations at school assemblies, PTA and staff meetings. Science teachers may even be persuaded to teach students about IPM, perhaps including hands-on experience. The idea is not simply to teach people about pests, but to involve them in the pest management program. They should understand that they play a part in IPM, and that the success of the IPM program is in their own best interest.

Another communication tool is notification of pesticide application. This can take place either before application, such as notification of parents of certain school children before a pesticide is applied in their school. For the specifics of the notification requirements in Maryland schools, consult the appropriate Maryland Department of Agriculture regulations on school IPM and notification.

Various reports, handouts, and forms can be used to educate people about IPM and to communicate with them about the specifics of an IPM program. Some materials are provided in Appendix B of MDA's *Integrated Pest Management in Schools IPM Training Manual*. On the next eight pages are additional materials; specifically, samples of informational handouts and inspection reports, which were reprinted with permission from other publications.

Problems with Outdoor Mice? Act Now to Keep Them From Becoming Indoor Mice.

How We Can Help

The first cold spell of fall can trigger mice into invading homes, particularly homes located in rural areas or on wooded lots in the suburbs. Once inside, they cause the typical kinds of mouse problems:

- chewing furniture, mattresses, clothing etc. to get nest material,
- feeding on packaged bird seed, pet food, grass seed, and even people food,
- scratching and scrambling in walls and ceilings,
- frightening people by running across the floor.

Call us today so we can control your outdoor mice and prevent them from coming inside. Our pest control expert will determine the extent of your mouse problem, and recommend a control method or methods suited to your particular case:

Whichever control methods we recommend, you can bet that we will be around until the problem is solved. Give us a call today. Let us help keep your home free of mice.

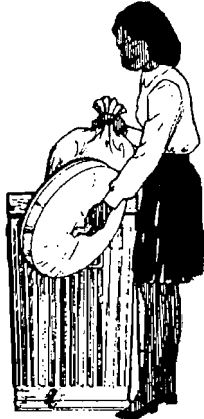
What You Can Do to Reduce Mice Outdoors and Stop Them from Coming In

- Move bird feeders away from your house. Bird seed, and especially sunflower seed, is a favorite food of mice. Use catch trays under feeders.
- Move wood piles, firewood, or debris away from the foundation of the house.
- Do not allow garbage to overflow from trash containers; haul away tires and abandoned vehicles.
- Do not leave pet food outside.
- Trim weeds and grass short near the house.
- Avoid planting heavy seed-bearing plants near the foundation.
- Trim tree branches that are touching outside walls or the roof, since mice can use them to find their way into an upper floor or the attic.
- Seal cracks around the foundation, and around windows and doors, and openings around pipes and utility lines. If you can fit a pencil in a crack, a mouse can squeeze through it!
- Install door sweeps under doors if necessary.
- Call us for professional mouse control.

Beware of Hantavirus

In some areas of the country, hantavirus has become a threat to people where large numbers of field mice, especially deer mice, are living in and around buildings. The disease can be transmitted by breathing dust contaminated with rodent droppings and urine, or by direct contact with infected mice. The disease is rare but deadly. If you have large numbers of mice infesting a shed or a cabin or a basement, please have us check it out. Do not disturb the mice or kick up dust or allow anyone in the structure or room until we can inspect it. If there is a risk of hantavirus, the area can be sprayed with detergents and water or diluted bleach, ventilated, wet-mopped, and the mice eliminated.

Don't Make Life Easy for Roaches ...



... Roaches Need Food, Water, and Hiding Places to Survive



- Take garbage to the dumpster or the trash chute every evening.

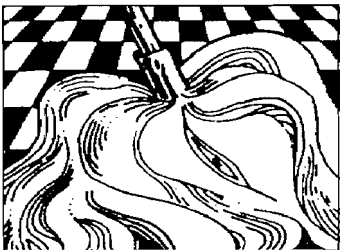


- Do not collect old newspapers, magazines, boxes, or paper bags.

- Store foods in refrigerator or keep them covered or wrapped.

- Clean up food scrapes.

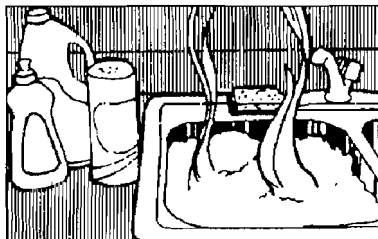
- Keep kitchen counters and shelves clean.



- Clean grease from the stove, range hood, and walls.

- Mop floors regularly.

- Keep pots, pans, and dishes clean.

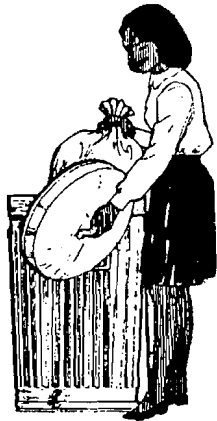


- Don't leave dirty dishes out over night.

Clean Up Kills Roaches!

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No les haga la vida fácil a las cucarachas ...

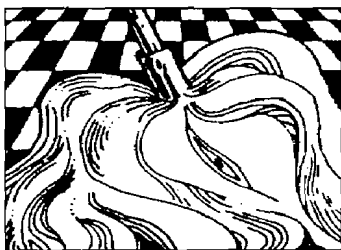


... Las cucarachas necesitan alimento, agua, y un escondite par sobrevivir

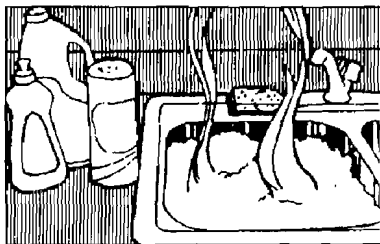
- Ponga la basura en un recipiente con tapa hermética, o en una bolsa de plástico sellada.
- Ponga la basure en el basurero en el vertedero todos los días.



- No guarde periódicos, revistas, cajas o bolsas de papel viejas.
- Guarde los alimentos en el refrigerador, o manténgalos cubiertos o envueltos.
- Limpie los residuos de alimentos.
- Mantenga la superficie de los gabinetes y sus alacenas limpias.



- Limpie la grasa de la estufa, la campana y las paredes.
- Trapee los pisos con regularidad.
- Mantenga las ollas, sartenes y platos limpios.



- No dejes los platos sucios durante la noche.

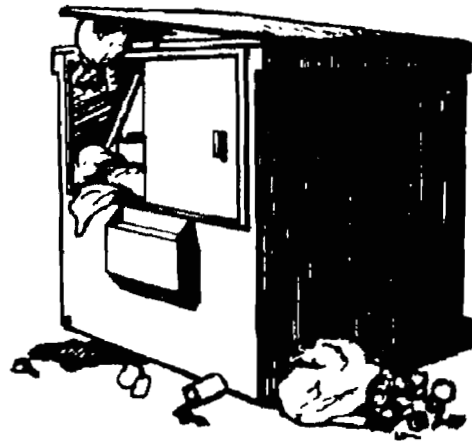
La limpieza mata a las cucarachas!

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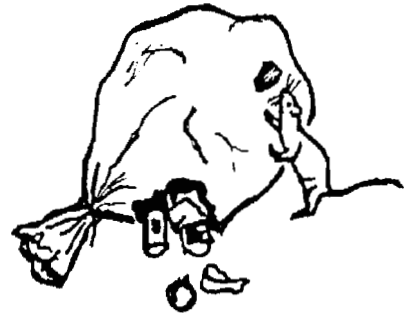
Don't Feed the Rats!!

Rats love the same foods that you do. A kitchen trash bag is loaded with good things for a rat to eat. If trash is tossed on the ground instead of in a trash can or dumpster, the rats will find it. They will also find every french fry or hamburger wrapper tossed on the ground. A basic law of rats is this: the more food, the more rats.



Help us get rid of rats—

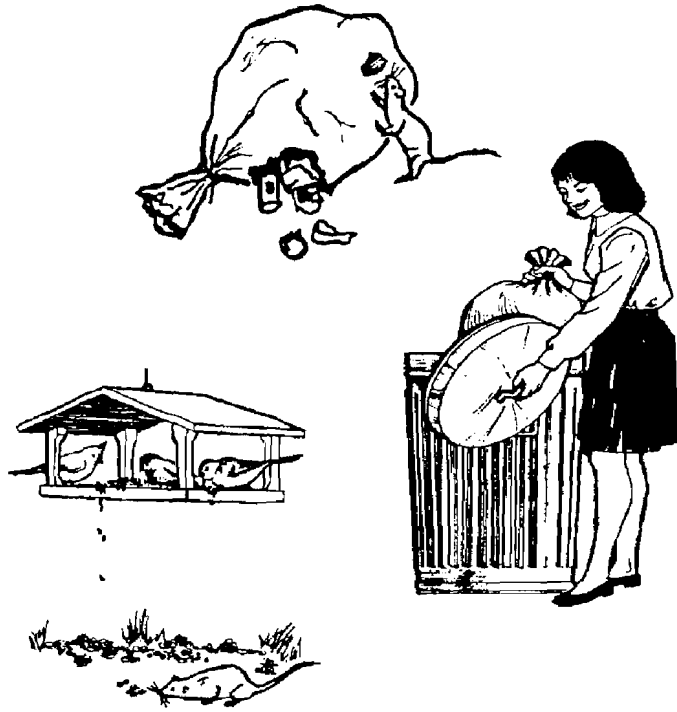
- ◆ Put trash inside the dumpsters.
- ◆ Don't let your children take the trash to the dumpster unless they are big enough to open the doors and put the trash inside.
- ◆ Don't throw food or food wrappers on the ground. Put them in the trash can.
- ◆ If you see a rat, or see trash on the ground, tell the rental office.



We need to work together!

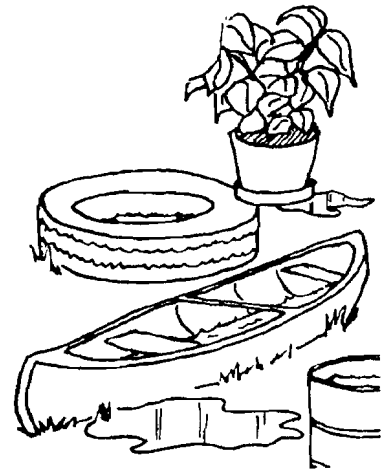
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Tips to Prevent Pests Around Your House



Minimize food sources for pests such as rats, mice, and cockroaches. Don't store garbage outside in plastic bags; put garbage in a container with a tight-fitting lid. Don't allow bird seed to accumulate on the ground, or leave pet food out overnight. Don't leave ripe fruit and vegetables under trees or in the garden to decay. Avoid putting food scraps into unscreened compost piles.

Eliminate pest hiding places and breeding sites. Remove nearby stumps, dead trees and wood and debris piles. Store firewood away from the house. Trim weeds, especially along the foundation, deck, and patio. Eliminate potential mosquito breeding sites by turning over cans and buckets, boats, and wheelbarrows, by removing old tires, by cleaning gutters and bird baths, and by eliminating standing water.

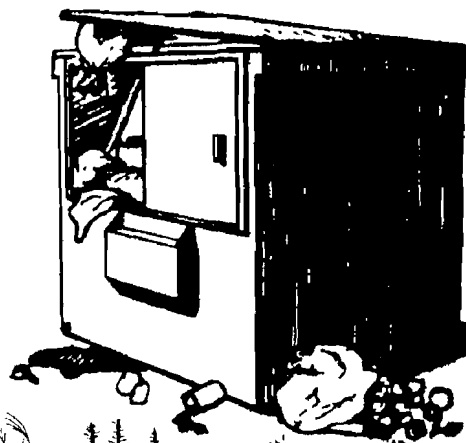


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Help Us Reduce Pests Outside Your Restaurant

Dumpsters and Trash Receptacles

- ◆ Keep dumpsters closed, with drain plugs in place, and steam clean or pressure wash dumpsters regularly
- ◆ Have dumpsters on concrete pad with no shrubbery nearby
- ◆ Clean under and around dumpsters and compactors daily
- ◆ Use wildlife-proof trash cans and clean daily
- ◆ Clean recycling bins once a week



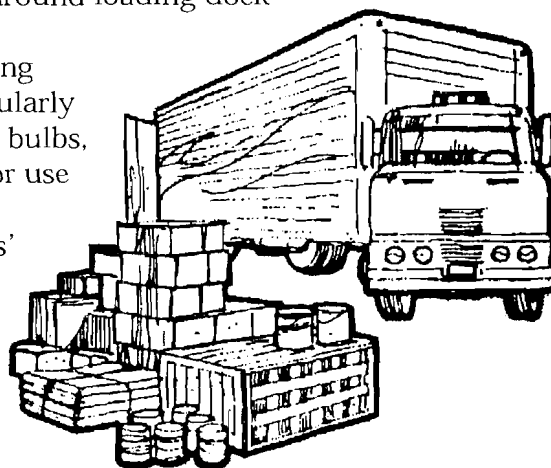
Vegetation

- ◆ Trim grass and eliminate high weeds
- ◆ Establish a vegetation-free strip two feet out from foundation wall (gravel, stone, blacktop, concrete, etc., not bark or other organic mulch)
- ◆ Do not allow shrubs or tree branches to touch building
- ◆ Avoid flowering plants around outdoor eating areas or doorways
- ◆ Choose landscape plants that are pest resistant
- ◆ Avoid dense groundcovers near building



Loading Dock/Delivery Area

- ◆ Remove all food debris from under and around loading dock
- ◆ Hose down area daily
- ◆ Minimize bright lights shining onto loading docks, doorways, and white walls, particularly just after sunset. Substitute less powerful bulbs, install light shields, refractors, or filters, or use high-pressure sodium vapor lights and dichrom yellow lights to reduce the lights' attractiveness to flying insects.
- ◆ Don't store boxes, pallets, etc. near foundation, loading dock, or dumpster



Moisture Control

- ◆ Adjust grade to eliminate standing water
- ◆ Clean gutters and outside drains; make sure water flows away from foundation
- ◆ Repair leaks

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Residential Pest Control Inspection Report

During regular pest control service, our technicians also inspect for problems that might contribute to pests, cause moisture damage, or otherwise cause you concern. We noticed the following potential problems at your home, which you may want to address. If you need more information, please contact our office at the telephone number above, or talk with your technician at the next service visit.

Outdoors

- | | | |
|--|---|---|
| <input type="checkbox"/> Clogged/damaged gutters | <input type="checkbox"/> Clogged/damaged downspouts | <input type="checkbox"/> Missing splashblocks |
| <input type="checkbox"/> Water at foundation | <input type="checkbox"/> Wet stucco/siding | <input type="checkbox"/> "Weepy" or water stained walls |
| <input type="checkbox"/> Carpenter ants | <input type="checkbox"/> Termites | <input type="checkbox"/> Misc. moisture pests |
| <input type="checkbox"/> Woodrot | <input type="checkbox"/> Wood-soil contact | <input type="checkbox"/> Missing/damaged door sweeps |
| <input type="checkbox"/> Damaged weather stripping | <input type="checkbox"/> Spilled trash | <input type="checkbox"/> Missing/damaged chimney cap |
| <input type="checkbox"/> Deteriorated chimney | <input type="checkbox"/> Fascia/soffit damage | <input type="checkbox"/> Planter against foundation |
| <input type="checkbox"/> Branches touch roof | <input type="checkbox"/> Dense shrubbery against house | <input type="checkbox"/> Damaged siding |
| <input type="checkbox"/> Mulch against foundation | <input type="checkbox"/> Inadequate caulking | <input type="checkbox"/> Holes & other pest entryways |
| <input type="checkbox"/> Torn screen | <input type="checkbox"/> Firewood along foundation | <input type="checkbox"/> Poison ivy |
| <input type="checkbox"/> Mosquito breeding | <input type="checkbox"/> Spilled bird seed attracting pests | <input type="checkbox"/> Pet food attracting pests |
| <input type="checkbox"/> Poison ivy | <input type="checkbox"/> Deck damage/rot | <input type="checkbox"/> Wild animal nests |
| <input type="checkbox"/> Other _____ | <input type="checkbox"/> Other _____ | <input type="checkbox"/> Other _____ |

Comments:

Indoors

- | | | |
|---|--|--|
| <input type="checkbox"/> Plumbing leaks | <input type="checkbox"/> Excessive condensation | <input type="checkbox"/> Leaky windows |
| <input type="checkbox"/> Leaky skylights | <input type="checkbox"/> Poor ventilation in crawl | <input type="checkbox"/> Damaged tub grout |
| <input type="checkbox"/> Wet basement | <input type="checkbox"/> Cracks in slab | <input type="checkbox"/> Deteriorated mortar |
| <input type="checkbox"/> Leaky dishwasher | <input type="checkbox"/> Decay in window/door | <input type="checkbox"/> Insulation improperly installed |
| <input type="checkbox"/> Firewood stored inside | <input type="checkbox"/> Trash containers inadequate | <input type="checkbox"/> Food debris/grease |
| <input type="checkbox"/> Fruit fly breeding | <input type="checkbox"/> Pests in paper/plastic bags | <input type="checkbox"/> Unvented attic |
| <input type="checkbox"/> Other _____ | <input type="checkbox"/> Other _____ | <input type="checkbox"/> Other _____ |

Comments:

Technician _____

Date: _____

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Wildlife Survey

Customer name _____

Location address _____

Date of survey _____

Findings:

- | | | |
|---|---|---|
| <input type="checkbox"/> Spilled trash | <input type="checkbox"/> Open/inadequate trash cans | <input type="checkbox"/> Open dumpster |
| <input type="checkbox"/> Construction in area | <input type="checkbox"/> Storm sewer nearby | <input type="checkbox"/> Overgrown plants/weeds |
| <input type="checkbox"/> Tree branches touching roof | <input type="checkbox"/> Shrubbery against building | <input type="checkbox"/> Stacked building materials |
| <input type="checkbox"/> Spilled bird seed | <input type="checkbox"/> Branch piles/debris | <input type="checkbox"/> Compost piles |
| <input type="checkbox"/> Fruit trees | <input type="checkbox"/> Berries | <input type="checkbox"/> Pet food outside |
| <input type="checkbox"/> Wild animal nests | <input type="checkbox"/> Burrows | <input type="checkbox"/> Access under building |
| <input type="checkbox"/> Missing/damaged door sweeps | <input type="checkbox"/> Damaged weather stripping | <input type="checkbox"/> Open chimney |
| <input type="checkbox"/> Fascia/soffit damage | <input type="checkbox"/> Damaged siding | <input type="checkbox"/> Inadequate caulking |
| <input type="checkbox"/> Holes & other pest entryways | <input type="checkbox"/> Torn screen | <input type="checkbox"/> Tree holes (squirrels) |
| <input type="checkbox"/> Nut trees | <input type="checkbox"/> Outdoor eating areas | <input type="checkbox"/> Sighting _____ |
| <input type="checkbox"/> Tracks _____ | <input type="checkbox"/> Other _____ | |

Attractiveness of site to wildlife

- Low Moderate High

Comments:

Inspector _____

Insecticide Baits

In IPM programs, cockroach baits may be the only pesticides allowed on a regular basis, or the only ones allowed without special notification. Hospitals, schools, and office buildings increasingly specify them. They see baits as reducing chemical exposure. Even people who are strongly against the use of pesticides may accept baits, perceiving them as somehow different from “pesticides.” But, of course, they too are pesticides.

Compared to many other insecticide formulations, baits have relatively low toxicities to people. Many baits are designed to be placed in voids, cracks and crevices, further reducing hazard. Bait stations provide their own voids, cracks and crevices. Also, baits do not easily vaporize. They have low volatility. (Volatility is a measure of how fast a pesticide vaporizes, or turns into a gas, when exposed to the air.) The lower the volatility, the less insecticide vapor in the air, the lower the hazard from airborne residues.

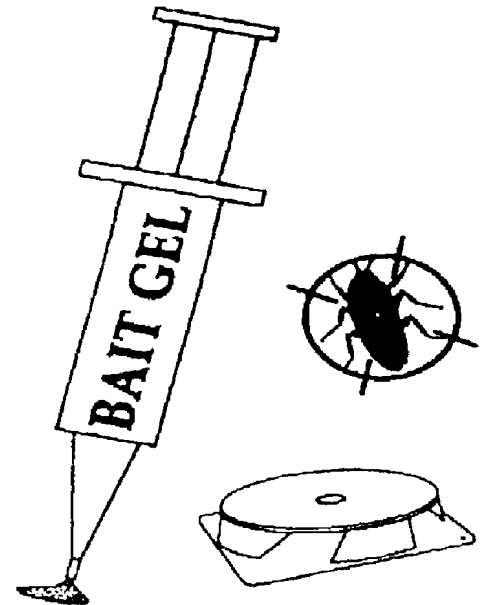
Baits are especially well-suited for sensitive accounts and IPM programs. Since baits pose less hazard, they are ideally suited for use in sensitive sites such as hospitals, schools, public areas, or around children and the elderly. In addition, while some baits have a slight odor up close, bait treatments do not leave behind an odor. Baits are typically not considered a risk by people who are otherwise nervous about pesticides. They come in many forms: bait stations, injectable gels, pastes, granules, and liquids.

Baits are especially effective against German cockroaches, traditionally the number one pest indoors. German cockroaches are not repelled by the insecticides present in baits. They feed on all of the baits used today, sometimes with enthusiasm. German cockroaches are not flushed into the open as happens with many insecticides. And baits are useful in locations where control of German cockroaches has been compromised by resistance. While there have been occasional reports of resistance in German cockroaches to certain cockroach baits, significant field resistance has not been documented.

Baits are also available for ants, termites, crickets, and other pests, with more variable success. With ants, in particular, one bait may work very well against a few species, variably well with some species, and not at all against others. Often, an ant bait’s effectiveness changes from season to season.

Baits are also long lasting. The residual varies with the bait, but can be up to three to six months if not depleted by feeding. Because of the various characteristics of baits, they are ideally suited for use in the following situations:

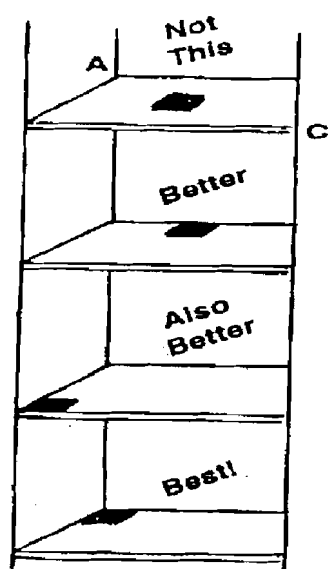
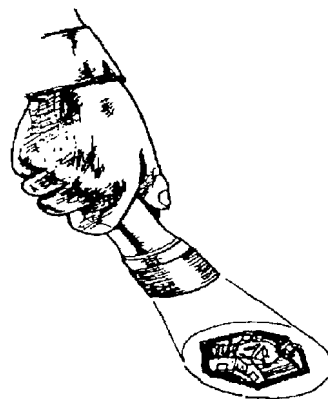
- Any facility with an IPM program
- Any place where people are concerned about pesticides
- Schools (but not containerized baits, because children like to play with them)
- Hospitals, nursing homes, and other medical facilities
- Office buildings with light infestations



INSECTICIDE BAIT STATIONS

Insect bait stations are available to control both cockroaches and ants. Their advantages are that the insecticide is enclosed inside a plastic station, the bait remains effective for long periods, and they are very easy to apply. A disadvantage is that they are often visible and unattractive. Also, children may collect and play with them. When used in schools or around children, they should be hidden inside cabinets, equipment, and other infested sites.

When used against ants, bait stations should be placed along ant travelways, particularly at the intersection of the wall and floor, or countertop and splashboard. Another placement site would be near feeding areas.



Placement is much different for cockroach baits. Cockroaches are cautious and nervous. They prefer dark corners and stay out of sight. Because cockroaches like to have a crack to quickly dart into, they travel along edges whenever possible. For example, given a choice of routes to get from shelf corner A to opposite corner C (see illustration), a cockroach will take the long way around the perimeter, hugging the edges, rather than striking out across an open space.

Does it make sense to place cockroach bait stations smack dab in the middle of a shelf or cabinet side wall? No. Bait stations should be in corners and along edges where traveling cockroaches are more likely to come in contact with the bait.

Whether the bait station is horizontally on a shelf or stuck it up vertically on a cabinet wall, it should be flush against the edges. In fact, the more edges the bait station touches, the better. That's why a corner placement that touches three edges is better than one just against the side. And a dark back corner of a cabinet is best of all.

PASTES, GELS, AND OTHER INJECTABLE BAITS

There are now a variety of bait formulations for use inside cracks and crevices, and in small "spots." Insecticide bait may be packaged inside tubes or syringes that you squeeze to apply, or designed to be applied by various types of bait "guns" or with a small spatula or putty knife. The main benefits of injectable baits are (1) the placements are hidden, and (2) the baits are more easily placed inside cracks, crevices, and voids.

Gel baits come in a cartridge, syringe, or special applicator gun and are applied as either a bead or a spot, depending on the site you're treating. Listed below are some typical application sites:

Application Sites in Kitchens:

- along the back bottom edge of cabinets
- on the inside plate of cabinet hinges
- along the runners or in corners behind drawers
- along the back edge of the exhaust hood

- along the underside flange of the sink
- behind refrigerators
- the undersurface of tables

Application Sites in Bathrooms:

- behind the cover plate around pipes and shower heads
- inside the shelf slots or razor blade slots in medicine cabinets
- along the top edge of bathroom mirrors
- in the overflow drain of sinks or tubs

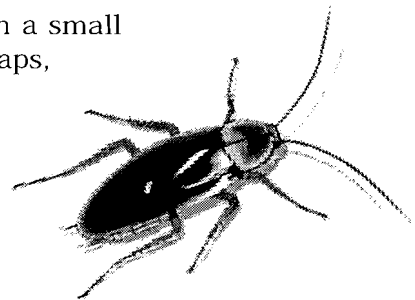
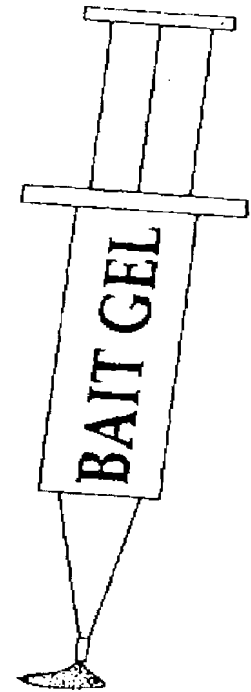
COCKROACH CONTROL WITH BAITS

Cockroach baits are used most often against German cockroaches. There are certain characteristics of this pest that relate to controlling them with baits. First, German cockroaches are not attracted to food beyond a short distance. They must come within a few inches of a bait, sometimes literally bumping into it, before they realize they have found food. German cockroaches usually do not travel far for food. Instead, they learn and remember (yes, they do remember) where food is likely to be found. They travel between nearby daytime hiding places and their regular feeding sites, usually at night.

When German cockroaches travel, they prefer to do so along edges and inside darkened voids. Even if they bump into your bait, they may not feed on it. They may prefer their regular food. If they detect an insecticide deposit, they will be repelled from the area, and change their foraging patterns. If they feed on a bait, but not enough for a lethal dose, they may develop behavioral resistance, and avoid the bait in the future.

Based on these biological and behavioral characteristics, there are certain techniques that technicians should follow to improve the effectiveness of baiting for German cockroach control.

- The more bait placements, the more effective the control.
- Put a small amount of bait at each placement site.
- Place baits in cracks and crevices and voids wherever possible.
- Place bait stations in corners or flush against edges, horizontally whenever possible.
- Areas with cockroach spotting are prime baiting sites.
- Replace bait as needed, following the manufacturer's directions.
- In heavy infestations, replace bait more often or first knock down the population with a traditional insecticide treatment.
- Avoid using other insecticides near bait (except for IGRs-insect growth regulators), and avoid contaminating baits with any chemicals. Look out for chemical residues on your hands.
- Carry baits separately from other insecticides, perhaps in a small tool box or fishing tackle box containing only baits, sticky traps, and other nonchemical tools.
- Enforce sanitation near baiting sites. Baits work much better when roaches are hungry.
- Carefully inspect account at each service visit and change baiting sites to reflect recent cockroach activity.
- Remove old bait stations when replacing new ones or cockroaches may live inside them after the bait is gone.



Cockroach Baits in Commercial Kitchens

In most cases, cockroach bait gels and bait stations can be used interchangeably in food handling establishments. Each has certain advantages. Bait stations protect the bait from cleaning products, other pesticides, grease, and dust. But bait stations don't stick well to surfaces that are already greasy or dirty. Bait stations serve as monitoring devices as well since they can be dated and numbered and checked to see how much bait has been consumed.

Bait gel is placed directly into tiny cracks and crevices where roaches hide and where there would not be room for a bait station. Gels are less noticeable to customers than bait stations. Both gels and bait stations can be used in cold storage areas (as long as the temperature is above -10° F). However, neither gels nor bait stations should be applied to any surface where the temperature may be hotter than 130° F since the gel may melt and drip.

Bait stations are useful in these sites:

- on the floor in corners, where shelves meet walls
- on the floor under storage racks
- behind appliances
- on the bottom surface of stainless steel shelves
- under and behind wash stations
- on the underside or inside edges of food and beverage carts
- undersides of storage pallets

Gel bait is useful in these sites but in cracks and crevices only :

- around the flange where equipment legs meet the floor
- around drip trays under refrigeration units
- behind stoves where splashback meets the wall
- along inside corners of stainless steel hanging pot racks
- where hanging shelf rods meet the ceiling
- around flange where exhaust duct enters ceiling
- on the undersides of shelves, pot and pan racks, and bakers' racks
- around wall-mounted fixtures such as soap dispensers or signs
- behind sink faucets
- around flange where pipes enter walls, floor, or ceiling
- under table tops
- behind countertop splash guards
- where electrical conduits enter walls or ceiling
- in cracks or missing grout in ceramic tile

ANT CONTROL WITH BAITS

Indoor ant baits come in prepackaged plastic bait stations, gel tubes, squeeze bottle, liquids, or as a concentrate to be mixed with a food bait. No matter which bait formulation chosen, placement determines success. In addition to baiting travelways and wherever ants have been seen, technicians should bait near these locations as well:

- Water sources, such as around sinks, tubs, toilets, water fountains, air conditioners, dishwashers, potted plants, aquariums, and in laundry rooms.
- Food sources, such as near pet food, kitchen counters, stoves, pantry shelves, microwaves, vending areas, break areas, and on windowsills where ants feed on dead insects.
- Heat sources, such as near light fixtures, electrical boxes, heat ducts, hot water heaters, radiators, and near appliances such as refrigerators.

Baits should be checked and replaced often. Baits that have no activity should be moved. With an extensive infestation, surveying and prebaiting with a nontoxic bait will save time and the unnecessary use of bait. Once the technician is satisfied that there are a number of active baiting sites, the nontoxic food baits are replaced by the toxic bait formulation.

Frequently Asked Questions About Ant Baits

How long will it take to get rid of these ants?

Don't expect immediate results when baiting ants. We want the ants to feed on the bait and then take it back to the rest of the colony. The bait is then shared with the larvae, queen, and other workers, eventually eliminating the colony. If the worker ants died before returning to the colony, the colony wouldn't be destroyed. You should start seeing fewer ants in about one week.

Why don't we just spray instead?

Spraying only temporarily solves the problem. Sprays kill some of the foraging worker ants but will not affect developing ants back in the colony. Baits can eliminate the entire colony. Also, ants are extremely sensitive to pesticides and will avoid areas where they have been sprayed. Don't spray anywhere near the baits because the spray will repel the ants away from the baits. The presence of pesticide sprays will even cause some ants to break up their colony into several smaller colonies, making control more difficult. With bait, there is no odor and no pesticide in the air or on surfaces for people to come in contact with.

I still have plenty of ants around, but they don't seem to be interested in the bait. What gives?

There are a few reasons why that could happen. There may be competing food sources. If the ants are already feeding on an available food, like pet food for example, they may not be interested in foraging for other foods. If you've sprayed any insecticide or used any strong cleaning products around the bait, that could repel the ants. At certain times of the year, ants switch their feeding preferences from sweets to proteins or vice versa. We may need to try a different type of food bait and see if we get better results.

