



## CHAPTER 8

DETECTION, MONITORING DEVICES, TEMPERATURE,  
RELATIVE HUMIDITY AND THRESHOLD LIMITS

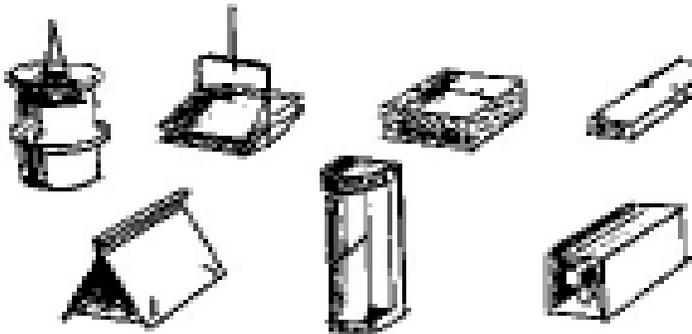
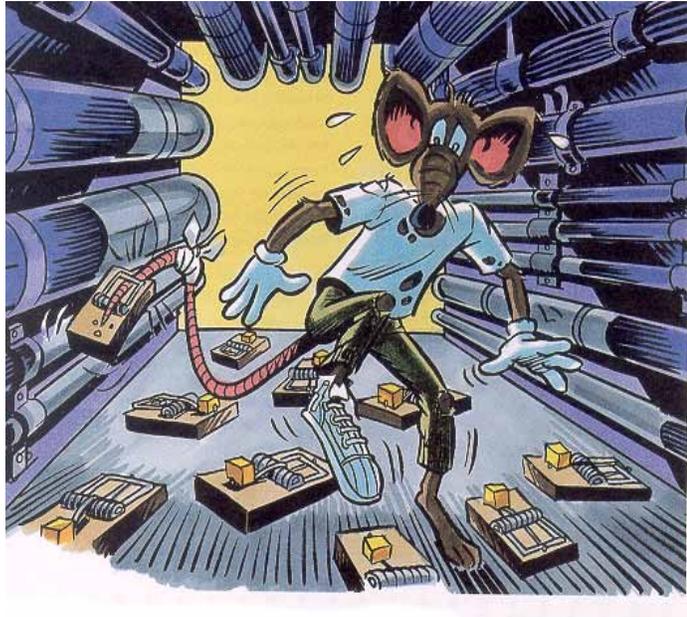
**'Tis education forms the common mind;  
Just as the twig is bent, the tree's inclined.  
(From Pope's Moral Essays)**

## Detection and Monitoring Devices

Different types of simple devices can assist you in trapping, detecting and monitoring many of the pests found in your building. You will need to know the kinds and numbers of pests, where they are located, and what damages they have or may cause before you begin any control.

**Non-specific Sticky Traps.** Non-specific sticky traps such as duct tape, Mr. Sticky™, Roach Motel™, BCS Window™, Trappit™ and Lo-Line™ can be used as basic monitoring devices for rodents and insects such as silverfish, cockroaches, crickets, ground beetles and other crawling insects. These traps do not have any type of attractant other than a general food bait. They earned the nickname “blunder traps” because the insects blunder into them and get stuck. Blunder traps are good for monitoring ingress of crawling pests into a room or building. Placed lengthwise along a wall, they will catch most of the pests as they move along the wall.

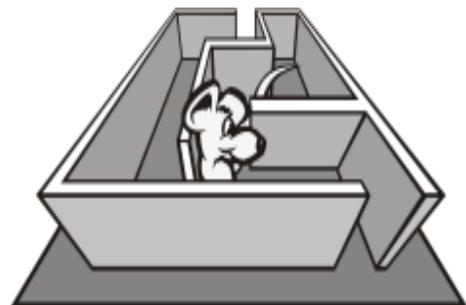
Blunder traps may also be placed just inside of doorways along the walls to catch the pests as they enter a room or traps may be along the walls, on and under shelves, and in other quiet areas. The blunder traps are very successful in catching insects and rodents, but they will normally not give complete control. They should only be used as monitoring devices.



**Pheromones and Other Attractants.** All pheromone traps are specie specific. The term pheromone was first coined over 20 years ago. It comes from two Greek words: pherin, which means “to carry” and homan, which means “to excite or stimulate”. These signals work much like hormones do in the human body. They are messengers. Natural pheromones are chemicals normally produced by certain insects (and other animals) to affect the behavior of individuals of the same species. Natural pheromones are used by

insects for mating, aggregation, feeding, trail following and recruitment. Synthetically made pheromones mimic the action of natural pheromones produced by some (pest) insects. When used in sticky or spring traps they are useful in attracting and even in controlling or simply monitoring the adult forms of pest moths, certain beetles and weevils, and some species of flies and fruit flies. Other materials are also used as trap attractants. For example, ammonium carbonate or vinegar attracts many different species of flies. Dry ice or carbon dioxide will attract ticks, termites, fleas, and/or mosquitoes. Food and food-like odors will attract other insects and rodents to your traps. Roach Pheromone traps can be used to give control of (even German) roaches if you use enough of them; or remove the attractant and stick it on a glueboard or make an even larger trap, e.g., a 2-liter bottle with the top cut off (like a yellowjacket trap) with Vaseline on the top, then inverted into the bottle like a funnel, then taped with duct tape outside with some dog kibble and the attractant inside.

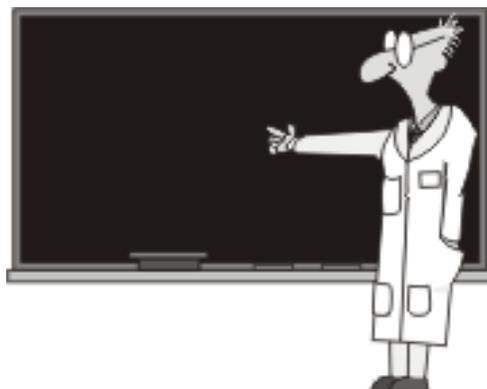
**The effectiveness of your monitoring with attractant traps inside buildings is influenced by the number of traps you use and where you place them.** Traps should be placed where the pest will encounter them and can be caught. In small areas, use one trap to each 250 to 500 square feet of storage space. Larger areas such as warehouses require one trap to every 1,000 to 2,000 square feet. Keep traps away from doors, windows or bright lights, which may attract or repel the target insects. Trap design can also affect the results of the trapping program - some styles appear to work better with certain species of



insects. Check the label, labeling and/or the supplier's recommendations for the most effective monitoring techniques. All traps should be dated, numbered, initialed and clearly noted on a floor plan.

## INTERPRETATION

After you find insects in the traps and identify them correctly, what will this information tell you? First, if the specie is an outdoor pest, then there probably is access into the building. You can find this break by using your trap diagram to locate possible entrances near the trap where the insect was caught. Which direction was the insect headed when caught? The majority of insects caught in traps tend to blunder into them by accident. Determine the direction and backtrack along it to find all possible entrances and fill, seal, caulk or screen them properly. Look at the surrounding traps for similar catches. The location of the highest number of pests caught is probably very close the source of the infestation. Start a localized search. Look at the life cycle of the pest caught to determine where to search. As you become more familiar with the pest, it will enable you to confine your inspections to more specific areas.



**Check all of your traps regularly.** Clean or replace sticky surfaces whenever they become covered with debris. Replace pheromone lures periodically because they lose their ability to attract insects over time.

**Record** the number and stage of pest insects removed from each individual trap each time they are checked on a *map* or floor plan. This will allow you to identify seasonal occurrences, monitor changes in the insect's activity and verify the success of your true IPM control measures and/or devote proper attention to problem areas.. Compare the trap in each location with activity in traps in other locations and with all of your historical notations. Be sure you correctly identify all pests found. Keep all this information in a folder or log book. Don't forget to record the results of all interviews.

**Light Traps.** Light Traps are equipped with ultraviolet lights, or black lights, which will attract several species of flying insects. These traps usually have a container with a funnel-shaped entrance that allows insects to enter easily but blocks their escape. Some light traps have an electrically charged grid that kills insects as they approach the light, but these electrocutor traps are usually used for control rather than for insect monitoring.

Light traps may be installed inside schools, warehouses, grocery stores, storage areas, and other enclosed areas for monitoring adult stages of flies, and some stored-product insects such as Indian meal moths and almond moths. Darkened corners of rooms are excellent placement locations for light traps because flying insects can see a corner mounted trap from anywhere in the room. Light traps are not usually effective for monitoring or trapping insects outdoors.

In a large building, use one black-light trap for every 1000 square feet of floor space. Locate traps so the light is visible from all directions, but avoid placing them near windows or doors where the light may actually attract insects into your building from outside. Obviously, the side of the building facing a body of water or farm will be more prone to flying insect invasions.

For monitoring stored-product insects, put your light traps near a food source-but keep all of your traps at least 5 feet away from any food preparation or food processing areas. Keep traps no more than 5 feet above the floor if you are attempting to attract day-flying insects such as house flies.

Clean out black-light traps at least once a week and carefully note the number and identity of all the insects removed from the traps. This information will also help you evaluate control efforts. Black-lights are less effective in bright sunlight or where mercury vapor or sodium vapor lights are being used. Black light tubes should be replaced once a year.

**Sticky flypaper and/or scoops.** You can use flypaper or scoops for monitoring or trapping flies within confined areas. Some manufacturers add a fly attractant pheromone to the sticky coating or imprint a resting fly on the paper to make it more effective. Space several flypaper traps evenly throughout areas being monitored to find out where flies are concentrated. Do not use flypaper in dusty areas because accumulated dust will clog the sticky surface and prevent flies from being caught. Flypaper traps are unsightly, so place them out of sight if at all possible.

Routinely check and replace all fly covered traps frequently. Examine the captured insects to determine their identity. Keep records of the numbers and species of flies that were caught and use this information for selecting and evaluating future IPM control methods.

**Duct Tape, Glue Boards and Sticky Traps.** Duct tape and/or glue boards are occasionally useful for monitoring crawling insects, spiders, mice, and, in some instances, rats. Glue boards and/or duct tape are sometimes used to trap and/or locate areas where cockroaches congregate. By examining individuals caught on the sticky surface, you should be able to identify the species and determine areas that need further attention. Glue boards and/or duct tape may also enable you to identify other types of insect pests within a confined area. Glue boards and duct tape become ineffective when they are cold, age, or become covered with insects, dust, debris or moisture.

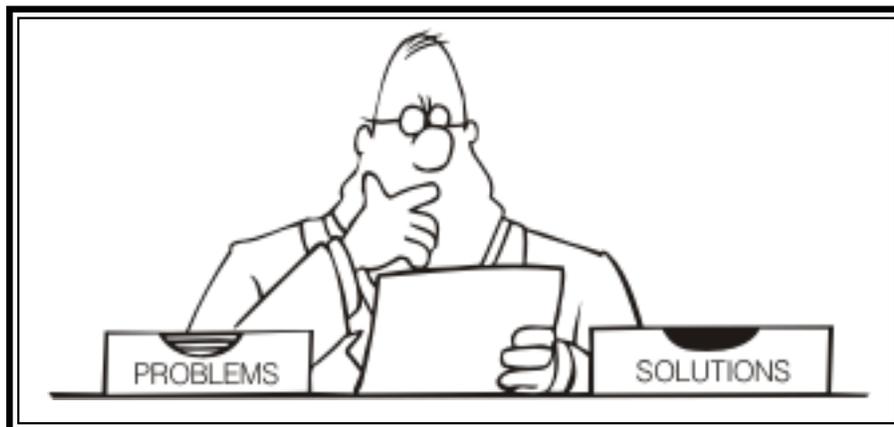
For monitoring cockroaches, place glue boards or sticky traps (with roach frass and/or dried molasses) or duct tape (sticky-side up and held in place with small pieces of masking tape) along travelways next to intersections of walls and floors.

To monitor rodent (especially mice) activity, set glue boards with a bait, e.g., a drop of vanilla extract or a Cheerio in the center along known runways and near areas believed to be nesting sites. Be sure to check the traps daily and dispose of any in which a rodent has been caught. Place a known quantity of corn meal in several locations then divide the total consumption in a 24 hour period to estimate rodent populations one rat will eat 15 grams ( $\frac{1}{2}$  ounce) one mouse will eat  $1\frac{1}{2}$  grams ( $\frac{1}{20}$  of an ounce).

Mice and rats can also be monitored with spring-type traps or multiple catch traps. Place traps along their runways and near nesting areas. Check these daily and dispose of any captured rodents. Traps are obviously more effective when they are baited with a substance that attracts rodents, e.g., fresh peanut butter, a drop of vanilla extract, a Cheerio and/or bacon.

**Note:** Comparisons of trap catches over time will show you cyclical trends in pest emergence and invasion. In addition, "hot spots" or problem areas that consistently show pest activity will become clearly evident. These active areas are where you will want to concentrate your true IPM control activities. Comparisons of previous inspections and observations will tell you what is going on, how effective the controls are and what modifications you have to make in your control program(s). This is called monitoring.

**Spatula.** use a spatula to scrape materials from pest infested places; put the materials in a labeled zip-locking bag for analysis later; under a microscope or magnifying glass you can identify parts, cast skins, eggs, frass and other materials.



<b>PEST IDENTIFICATION FORM</b>	
TRAP LOCATION: _____	DATE: _____
INSPECTOR: _____	
PEST IDENTIFICATION: _____	
RECOMMENDATIONS OF AREAS FOR FURTHER INSPECTION: _____	
_____	
CONTROL RECOMMENDATIONS: _____	
_____	

**Non-toxic Tracking Powder.** Non-toxic tracking powders e.g., baby or talcum powder or other fine dusts will also provide you with a visual record of rodent or insect activity. Non-toxic tracking powder offers an alternative to fly papers, glue boards and spring traps, which must be checked daily. These powders are yet another safe way to control many pests and evaluate the success of a true **IPM** control program.

**Talcum or baby powder** can be used for tracking rodents and killing insects, and commercial tracking powders are available that fluoresce under ultraviolet light, making it easier to locate pest trails. Avoid using any powders in areas where they might contaminate food, dishes and/or toys. Spread a paper thin layer of tracking powder evenly over surfaces where pests are known or suspected to occur. Spread the tracking powder on sheets of paper. Look for tracks left in the powder as evidence of pest activity. Lay black paper under beams to monitor powder post beetle and/or carpenter ant activity. Don't forget to carefully inspect and routinely monitor trash collection and storage areas, employee and student lockers, possible moisture problem areas, e.g., kitchens, bathrooms, leaking roofs, plumbing, eaves troughs and equipment, vegetation, firewood and debris removal from the surrounding yard especially any that touches your building, neighboring wildlife, pets and livestock and all employee sanitation practices. Correct all problems and caulk/seal and all cracks and crevices and other openings as soon as you find them. Note: Food-grade DE, baby powder, chalk, talcum powder, medicated body powders with talc, boric acid, eucalyptol and other ingredients also kill or repel ants, spiders, roaches and many other pests even though they are *safe* enough to use on baby. **Please note none of the (safe, but un-registered) products or Pestisafes® that I suggest be used to control or eliminate pests rather than using any (dangerous, but registered) volatile, synthetic pesticide poisons - that do not control pests as well - are registered or tested by EPA and/or warranted by their manufacturers to work as "pesticides".**

**Duct Tape.** Duct tape placed sticky-side up and anchored on the edge(s) with masking tape is an extremely effective "sticky trap". If you put down 2 long strips, you can easily determine exactly from where the insect or arachnid pests are coming. You can even eliminate pest intrusion with enough duct tape, e.g., around the entire perimeter, bed, etc.

## Establishing a Threshold Limit



**Note: Determining a threshold limit or level is a three-step process.** First you determine how much legal, aesthetic, medical or economic damage can be tolerated. Second you decide how large the pest population can grow before it causes that level of damage. And finally, you establish a control strategy that keeps the pest population in check to a point where they don't cause any unacceptable levels of damage. Remember - one "bug" is not a disaster or even an infestation. Fear of insects is unhealthy - if you spray poisons - remember there will usually be more damage done by the poison than from the pest. If you don't see bugs or rodents you needn't do anything - your true IPM control methods are obviously working.

**Health and Safety Threshold:** At one time DDT ads showed this toxin was so *safe* you could apply it right over baby in the nursery! Health or safety threats may (as a last resort) require fast, extensive, and sometimes costly and even dangerous pest control measures. Several pests associated with structures, stored food products, food preparation facilities, hospitals, schools and other areas may have the potential for causing serious injuries to people (scorpions, mosquitoes, biting bugs, fleas, spiders, bees, and wasps, for example) or transmitting diseases to people or animals (rats and mice, ticks, cockroaches, fleas, flies, and mosquitoes). Some others, such as carpenter ants, fungi, termites, and wood-boring beetles, may eventually cause serious structural damage. Most could have been safely prevented.

Decisions on how to control pests should be based on knowledge of the potential harm they can cause. For instance, one rat chewing on electrical wiring can cause a serious fire. The decision as what infestation level will actually adversely effect safety, health, or property preservation should not be made in haste or individually. Safety is the main (if not only) concern.

### Legal Thresholds

Health codes, marketing orders, and other governmental regulations set limits on the amount of pesticide contamination, pest damage or contamination allowed in food products offered for sale or transported to other areas. Public safety codes often require control of pests in schools, public buildings, governmental housing, food service facilities, and other public structures. Building and safety standards address the control of structural pests as well as the repair of damage caused by them. These legal thresholds will help you decide if and what and when pest control methods should be used, in some rare cases control methods will not be economically justified or the pests may not be causing a obvious hazard to public health or safety. Remember that volatile, synthetic pesticide poisons usually create a greater hazard to the occupants than the pest. For information on laws that regulate pest infestation in certain buildings and on foods, contact your State and local health departments and housing and community development offices.



### Temperature Controls

Unlike man who can live in the Arctic or Sahara Desert, insects can only tolerate a very narrow range of humidity and/or temperature changes so they are very vulnerable to any either high or low temperature change. Every insect species has a fairly well-defined range of temperature and can easily be controlled by slight changes in temperature. Simply raise the temperature for 1 hour to 103° F. and you destroy 100% of all flea larvae, raise it to 116° F. and body lice experience 100% mortality. Roaches flee 95° F. temperatures. Insects have surprisingly little tolerance for temperatures only marginally uncomfortable to humans, e.g., **freezing temperatures kill most pantry pests and roaches.**

Temperatures lower than 55° F. slow insect growth substantially; however, some insects will adapt to lower temperatures.

MINUTES FOR COMPLETE MORTALITY				
TEMPERATURE				
	German Cockroach	Flour Beetle	Drywood Termite Nymphs	Argentine Ants
115°F.	58	123	265	8
120°F.	27	16	33	4
125°F.	16	9	10	2.5
130°F	7	4	6	1

### Relative Humidity

Control of relative humidity is critical to the suppression of insects, fungus, mold and mildew. If the relative humidity goes above 75%, then growth of mildew and other fungi starts. Mold and fungi are wonderful food for insects and support a wide range of species. Consistent control of temperature and relative humidity will prevent mold and discourage insects and many other arthropods or pests. So, properly install and maintain dehumidifiers, air conditioners, dryers, and/or fans.

### Aesthetic or Pest Acceptance Threshold

People have different degrees of acceptance of pests that they are willing to tolerate in their schools, vehicles, homes and workplaces. A pest acceptance threshold can be extremely low due to a person's revulsion or fear of the pest. Acceptance thresholds can be significantly modified if you can provide factual information about the actual potential for pest damage and/or dangers, the beneficial aspects about pests, the various methods of alternative pest control and the dangers of pesticides.

### Economic Threshold

In certain instances, the cost of control measures may need to be justified. An economic threshold is a level of pest abundance at which the potential economic loss caused by pest damage is expected to be greater than the cost of controlling the pest. It usually does not consider the *cure's* danger to people and pets or the environment. Pests can be safely prevented, through negative ion plates, exclusion, sanitation, trapping, vacuuming, biological controls, and habitat modification, or they can be temporarily "controlled" by synthetic pesticide poison or least-toxic pesticide poison use. Pests in structures are usually more effectively controlled when a combination of methods are used.

### Sanitation and Habitat Modification are truly the foundation of pest prevention and/or Control

Be sure all inventories are being used following the "first in - first out" principle. Routinely clean with Safe Solutions, Inc. enzyme cleaners and/or borax. A bug's and/or rodent's diet is remarkably similar to ours. Sugar, protein,

starch, and oil. The tiniest smear or crumb is a banquet for them. Food residue must be wiped from every surface, dishes washed daily and food containers and garbage cans tightly sealed. Cockroaches seek water more often than food. Leaks must be repaired and sweating pipes insulated. Clutter where bugs can hide or nest - paper bags, boxes, old newspapers - should be removed. Many bugs forage from outside or are carried inside accidentally. To exclude them, weather-strip doors and windows, seal cracks with caulk, and fill openings where pipes and wires enter walls. Screen vent pipes and floor drains. Check for bugs in items carried into the house: firewood, grocery bags, cut flowers, and garden produce. Outside, trim nearby trees and bushes and store firewood away from the house. Seal trash containers, clean up animal waste and drain away standing water. **Train all of your employees in proper sanitation and habitat modification practices using their native tongue if necessary.**

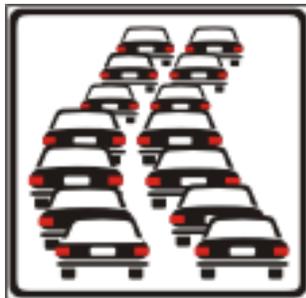


## Habitats

Habitats are specific local areas within your entire building that provide your pest with some or all of its necessary living requirements such as food, water, shelter or harborage, optimum temperatures and humidity, and protection from its natural enemies. A habitat can only accommodate a maximum number of pests due to limitations of one or more of these living requirements, this is known as the carrying capacity. Where large quantities of food are available and shelter and other requirements are ample, the carrying capacity is high. Such a habitat can support an almost unlimited number of individuals of a pest species. If the carrying capacity is limited, however, the population tends to be eliminated or at a minimum to remain fitted in size. Harborage is where they hide; habitat is where they live.

If you only remove pests from their habitat with poisons, trapping, etc. they will be quickly replaced by others unless you reduce or eliminate the carrying capacity at the same time. Vacuum daily or at least weekly; if possible use a water vacuum with a little soap in the water. Then routinely caulk and seal all cracks, crevices, and other openings. A compact electric pressure washing machine with Safe Solutions, Inc. Enzyme Cleaner will really clean all cracks, crevices, and other openings. Still another long-term solution to cockroach infestations is the regular use of steam cleaning, but the routine use of either steam or a pressure washing device will really clean all cracks, crevices and surfaces using only a standard, biodegradable detergent or soap, or better still, Safe Solutions, Inc. Enzyme Cleaner. Many insects will avoid any area or opening where you have sprinkled chalk dust, baby powder, talcum or a medicated body powder that has talc, boric acid, eucalyptol and other ingredients which effectively and quickly kill or repel insects but are *safe* enough to put on baby and/or on injured skin. Reapply as necessary. Note: Safe, effective non-pesticide products (Pestisafes®) and/or Intelligent Pest Management® controls, e.g., borax, talcs, Safe Solutions, Inc. Enzyme Cleaner, food-grade DE, chalk, fans and vacuums and the other techniques in **The Best Control II**® all work cheaper, faster, better and quicker than (registered) dangerous, volatile, synthetic pesticide poisons.

Properly install free-range Guinea fowl outside to help protect your property from many pests.



There are no speed limits on the road to understanding.

“Everything has its limit; iron ore can not be educated into gold.” — Mark Twain