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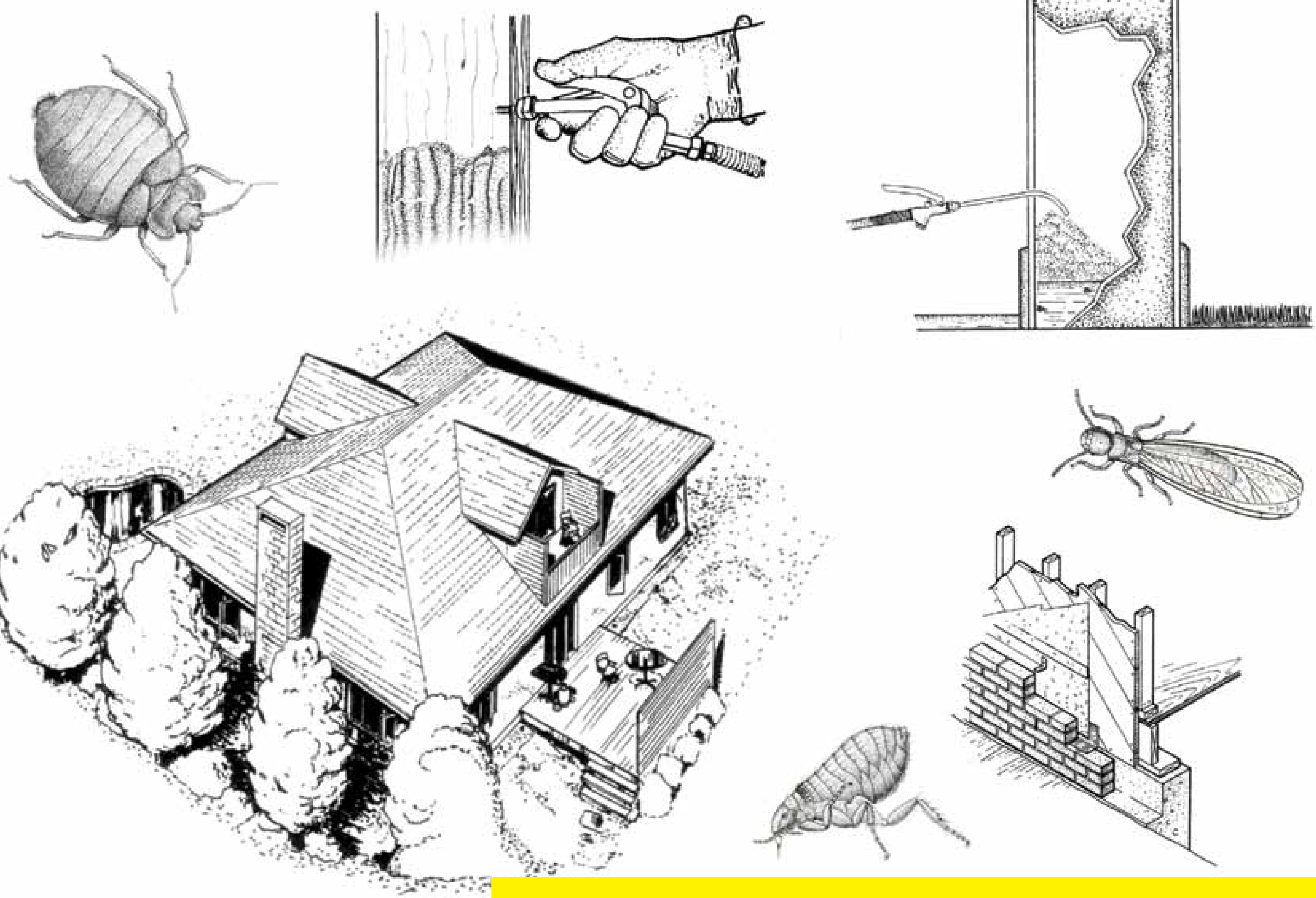

The Service Technician's FIELD MANUAL

A Practical Guide for Pest Control Professionals

PCT MEDIA GROUP

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CHAPTER 1

THE NEXT GENERATION SERVICE TECHNICIAN

Much is already expected of the Service Technician in professional pest control, but the next generation will be expected to know more and do more. The greatest change will be on-the-job decision making: What is the pest? What are the conditions? What control method(s) should be used, if any? What are the expected results? And, what does the customer want or expect to happen? All this must be processed quickly and applied correctly.

While Integrated Pest Management (IPM) was a good concept for professional pest control, in time it simply came to define what was already practiced or practical for most household pests. It is still useful, but not relevant. Pest control delivered by the next generation of service technicians will be situation specific—the individual technician will be able (and expected) to choose the insecticide, the delivery system, and the amount and location of whatever control agent is used. All these decisions will be made after arrival and based on the conditions and the customer.

Situational specific, an idea borrowed from Industrial Pest Management Specialist Bobby Corrigan's concept of rodent control, will define the next generation of pest control service and the service technician—as well it should. Service technicians are (or can be) trained and capable of making decisions; modern application equipment can deliver precise amounts; and modern insecticides are effective at concentrations as low as 0.01% and some rodenticides at 0.005%. The tools and the control materials are in place for the next generation of technicians to decide what to do with them.

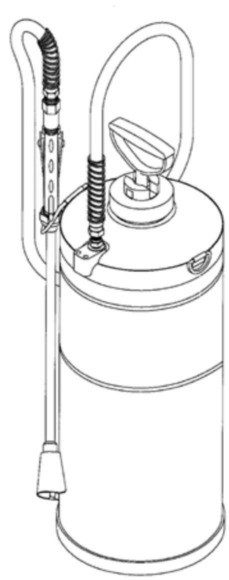
INSECTICIDES

The finished concentration of insecticides has been getting lower and lower with each wave of new classes of chemicals. The first group of household insecticides had a distinct odor and dilutions of 1.0 to 1.5%, the low-odor pyrethroids crossed over the decimal point with dilutions of 0.1% and 0.2%, and now the no-odor diamides and neonicotinoids have gone another step lower with the added benefit of no toxicity to humans.

A major change for the current generation of service technicians is the emergence of the Reduced Risk insecticides, the class of chemicals that, because of their structure, have no toxicity to vertebrates. Indeed, the product labels on some new insecticides carry no signal word, such as "warning" or "caution." The next generation of technicians will know this to be standard for the insecticides they use: the concentration will be low, the efficacy will be high, the amount applied will be small, and the treatment sites will be few.

EQUIPMENT AND DELIVERY SYSTEMS

Without specifically designed application equipment in the hands of knowledgeable technicians, insecticides and rodenticides can not reach the pest to do their part. Modern insecticides will likely become more effective at lower concentrations and amounts, but



Compressed air sprayer

regardless of those qualities, they will depend on accurate delivery. To the residential and commercial customer, equipment is a visible signal of the technology they expect. Insecticides are odorless and applied to leave little or no visible residue, professional equipment is the first signal of efficacy.

The next generation service technician will have to grasp the reality of application economics. Designed into every sprayer, fogger, and bait gun is the capacity for a controlled delivery, and this must be clearly understood and utilized by the applicator. The costs of new insecticides will be justified by their efficacy with limited application, but only if this combination is realized by the technician. The business side of professionalism cannot wait for the next generation service technician to discover application economics; it will have to be taught.

CUSTOMERS

The next generation service technician will realize the influence that Internet access has on the relationship with customers. Various websites provide identification, information, and control methods, as well as the Material Safety Data Sheets (MSDS), and customers can have these before the first treatment.

All of this would be beneficial, except online identifications are often wrong, biological information misinterpreted, and control methods dated or slanted. The technician has to avoid these same pitfalls.

The next generation customer will invariably link successful pest control with knowledge, and knowledge with professionalism. This is an ideal customer. They are most likely not at home during treatment, yet are concerned about exposure to pets, plants, toddlers, and allergic reactions. The dry cleaner will tag a stain that would not come out, the car repair shop will detail the work and return the worn part, the next generation service technician will leave behind details on what was treated, what actions to avoid, and what to expect in the coming days.

TRAINING

For the generation of service technician that is now ending, training and testing was dominated by pest biology and habits—the number of eggs laid, their food preferences, their foraging distance, and how many died during laboratory evaluations. For the next generation, technology is much more important, in fact crucial, for the development of professional pest control. Development of sophisticated equipment and application methods will require more technical training and matching skills. This will not be filled by the current generation of trainers, training sessions, and materials.

Needed now are the materials, the trainers, and training sessions to match the ability with which the next generation of technician was born.

The long-accepted practice of on-the-job training for new technicians provides training on the art of professional pest control from an experienced mentor, but little of the science. Without more science and technology in the training, this industry will stall at the end of the runway.

The next generation of service technician has been raised amid technology and change, cursors and flash drives, and an app for everything. They will look for this in the workplace and accept the challenge—want the challenge.

Training economics will show that acquiring information costs time and money; on-site and off-site training has to show a return on investment for the individual and the company. For too long training has escaped the scrutiny of profitability; for the next generation technician the costs will be weighed. Companies as a whole and individual service technicians responsible for their time-profit margins will evaluate training opportunities in economic terms and will conduct or participate in training if the information is more specific, and not simply more, and as long as the economic benefit exceeds the cost of getting it.

TECHNOLOGY

Inspections, identifications, and applications by the next generation of service technician will be made or assisted by a small electronic hand device. Clipboards, graphs, and guessing will be replaced by electronic pictures, videos, and voice communication between technicians, managers, customers, and websites. On-the-job training will be more accurate, relevant, and repeatable, because it can include a short video from the website of the pesticide or equipment manufacturer. Similarly, on-the-job questions and identifications can be directly answered by the branch manager or technical director.

Inspections, identifications, and applications by the next generation of service technician will be made or assisted by a small electronic hand device.

The performance of the next generation of technicians will be based on the collective strength of the technology used by the next generation of pest control companies.

CHAPTER 2

IPM: PEST DETECTION AND MONITORING

Integrated pest management (IPM) programs are based on having information about the target pest, then making a decision on the control methods to use. Programs typically begin with collecting and identifying the pest, locating the infested harborages, and using chemical or non-chemical control methods. IPM programs continue on the basis of monitoring, with traps or direct observation.

INTEGRATED PEST MANAGEMENT

IPM began in agriculture; it provided an economic basis for decisions to use chemical control on crops. The objective of IPM is to provide an effective and economically efficient approach to pest control. It is based on the concept of reducing the number of pests to a level that does not cause an economic decrease in yield. This is pest management and not pest elimination. In pest management programs a low level of pests and damage are tolerated. IPM is a logical approach for production agriculture because it places pesticide application on a need basis and not on a routine-spray basis. IPM in agriculture also includes biological (non-chemical) methods when they are effective and economical.

The concept of reducing pesticide use and managing pest populations may be considered for household and structural pests. However, applying a traditional IPM philosophy of managing (not eliminating) pests such as cockroaches, fleas, bed bugs, termites, and rodents is not practical. The approach to pest infestations in schools, houses, hospitals, and food facilities must be elimination. Pests in the living environment can not be reasonably managed or suppressed to a low number. This simply would not be acceptable for health or aesthetic reasons. However, the integration of non-chemical methods into a pest control program can contribute to immediate and long-term solutions to pest problems.

IPM is sometimes considered to be the use of only non-chemical methods (no insecticides). However, this is rarely the basis of a successful approach to a pest problem, and ignores the characteristics of modern household insecticides. Many of the current products and formulations have no vertebrate toxicity, and have been granted Minimum Risk and Reduced Risk status by the U.S. Environmental Protection Agency (EPA). The predators, parasites, and other biological methods that can be successful in agriculture have little or limited effect on household pests.

INSPECTION

A thorough visual inspection of the site is the basic starting point for pest control programs. It requires knowledge of the target pest and experience with residential buildings, food plants, health care, and hospital facilities. Inspections require training and experience, and they take time. However, the time spent on inspection may result in less time in control and a more effective and cost efficient program. Inspections should include:

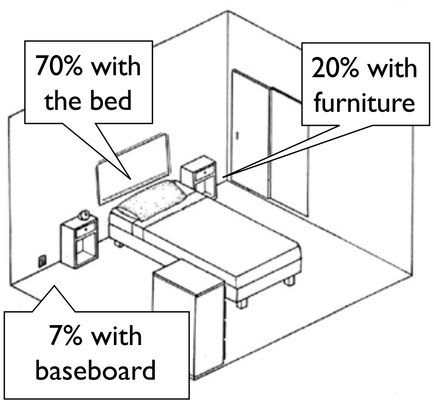
Inspection provides justification for chemical and non-chemical control methods, and a baseline for evaluating programs.

Environmental conditions. Consider all environmental features that can contribute to pest infestation or can influence prevention and control strategies:

- *Indoors.* Carpeting provides harborage for cat flea larvae and localizes their food after it drops from adult fleas feeding on house pets. The humidity of sink drains and garbage disposals attracts fruit flies, while the wet conditions and organic matter in bath drains provides the food for moth fly larvae.

- *Outdoors.* Vegetation surrounding buildings provides the food source for aphids and other insects feeding on plant sap, and the honeydew from these insects is food for many ant species invading buildings. Branches of shrubs and limbs of trees that contact buildings provide a bridge for carpenter ants to forage for food and nest sites. Poor rainwater drainage around buildings can provide favorable conditions for subterranean termites; moisture-damaged wood can provide favorable conditions for carpenter ants.

Distribution. Insect and rodent pests are not evenly distributed in the habitat; there are "focus points" where pest density is high. Inspections can reveal pest activity, and help to justify specific control methods.



Bed bug distribution

- *Indoors.* Bed bugs infesting hotel rooms and residential bedrooms are most concentrated at the bed (70%), in bedside furniture (20%), and behind baseboards (7%) adjacent to the bed. Flea larvae in carpeting are concentrated where the household pet sleeps or rests.

- *Outdoors.* Overwintering boxelder bugs and Asian ladybird beetles gather on surfaces warmed by afternoon sun. Subterranean termite monitors are effective in soil where temperatures are consistent.

Sanitation. Poor sanitary conditions can decrease the effectiveness of pest control programs. Improved sanitation will remove some of the food and harborage that contributes to pest survival and limits control methods. Household clutter can seriously limit the effectiveness of inspections for bed bugs and reduce the residual activity of liquid and dust insecticides. German cockroach infestations are influenced by the availability of food and water, but mostly by water in the habitat. Females can live six weeks without food but only 12 days without water.

Documentation. A complete pre-treatment inspection provides the opportunity to document and report conditions. Attention can be given to sanitation problems and other features that must be corrected, or at least considered, in the control program.

Programs designed for food preparation and packaging facilities require carefully maintained written records. For these sensitive accounts, the initial and subsequent inspections must be recorded, along with the pesticides applied, the findings of monitoring traps, and the sanitation and structural improvements needed.

DETECTION AND MONITORING

Detection is typically done with traps that capture larvae, nymphs, or adults. The efficiency of the detection method, such as feeding blocks for rodents or sticky traps for insects, depends on placement. Each must be placed where it will be encountered by foraging or dispersing pests.

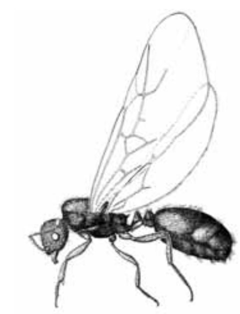
Trapping is commonly used to determine the presence of pests in the habitat prior to control, to monitor control effectiveness after treatment, or to estimate the level of a pest infestation and the need for treatment or retreatment.

Action Thresholds. Detection action thresholds serve as a component of IPM programs, with the goal of limiting the use of insecticides. This concept is based on initiating control when a specific number of pests is detected in the treatment area. In some IPM programs this number functions as a tolerance threshold or trigger for a control action. Thresholds may be based on the number of pests detected at one location or over time in several locations.

- *For household pests, the IPM concept of action thresholds has limited use.* The tolerance number may be as low as one, because of the potential for the development of a large infestation—as in the case of cockroaches, or the potential for personal injury—as with spiders or stinging insects. The detection of any subterranean termite activity at the perimeter of a structure is usually considered to be a potential threat. For bed bugs, the presence of a single insect or the experience of a single bite is the trigger to begin control.

For ***occasional or seasonal pests***, thresholds must be established within practical limits. It is impractical to expect that commercial and residential buildings will be free of all insects and spiders.

Monitoring: Post-Treatment. Traps can help in the detection of infested harborages before treatment and serve as a monitor of pest activity after treatment. The goal of monitoring in pest management is to document changes in the pest infestation following a control action, and to signal the need for further action.



Winged adult ant

HOUSEHOLD AND STRUCTURAL PESTS

Ants. Ant infestations are often indicated by the presence of winged adults indoors. Infestations can be monitored by using feeding stations baited with a non-toxic food, then, at regular intervals, counting the number of ants visiting each station. Checking monitoring stations at the same time each day can provide information on abundance and colony activity.

The action threshold for ant control is determined by the tolerance level of the residents of a site. In IPM programs for schools, the action threshold for ants in classrooms and kitchens may be as low as one or two. Post-treatment monitoring is usually done by counting the number of complaints from building inhabitants, without regard to the ant species involved.

Most ant control programs start after a report of ants indoors. However, ants in buildings may also be non-infesting species that collect honeydew from insects on plants adjacent to the building.

Bed Bugs. Bed bug infestations can be detected and monitored with:

- *Specially designed traps* which typically utilize a combination of a pheromone lure, heat, and CO_2 to attract adults and nymphs from the immediate area. The insects may be held by a glue board or a pit-fall feature of the trap. The traps serve to confirm the efficacy of control methods and monitor for re-infestations. They are effective in locations where bed bugs are actively seeking a

Bed bug

Sticky traps designed with 30° ramps and sides can be used to capture bed bugs. A ramp-based sticky trap acts as a pit-fall trap, with bed bugs falling onto the sticky surface when they crawl down or fall from the ramp.

Inspection of a typical hotel room may take a skilled technician about 20 minutes, while an inspection by a detection dog may require 2 to 3 minutes.

blood meal. Interceptor traps for bed bugs capture those that attempt to crawl up or down furniture legs.

- *Scent detection dogs* have also been used effectively for inspection and detection of bed bugs. A qualified dog is able to identify small numbers of live bed bugs, and can discriminate live bed bugs and viable eggs from empty egg shells and cast skins from a previous infestation. As with other pest-detection tools, scent detection has limitations and is not always definitive. Scent dogs rely on what they can smell, but sometimes the odor from bed bugs in the location is not available to the dog. The reasons for this usually include location of the bugs, air flow in the room, and room temperature.

Cockroach

Cockroaches. Cockroach infestations can be monitored with sticky traps. Rectangular traps with a low profile can be placed under cabinets and kitchen appliances—out of public view but close to potential harborages. A 30°-angle entrance ramp to the sticky surface significantly increases trap catch. Fewer cockroaches escape these traps, and they are capable of securing adults and nymphs.

It is a common misconception that the infested harborage is in the opposite direction the captured cockroaches are facing in the trap. This assumes that cockroaches walked in a straight line from the harborage to the trap, which is unlikely.

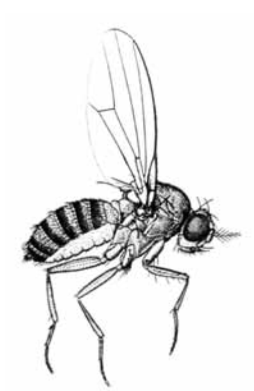
It is recommended that traps be placed flush against surfaces, as those placed just 3/4 inch from walls catch about half as many cockroaches as those placed flush against them. Monitoring in residential and commercial facilities is usually done with two to five traps, which samples about 5% of the infestation in each 24-hour interval.

Dust Mites. The presence and level of infestation of dust mites can be determined by several methods, including vacuuming sections of carpeting or using a lint roller on floor surfaces. The presence of dust mites can sensitize humans and cause asthma, rhinitis, and dermatitis.

Action thresholds for programs to reduce mite allergens are difficult to establish. There is a range of human sensitivity to dust mite allergens, and controls may be short lived. Mites can re-infest from other locations, including office buildings, automobile seat covers, and clothing. Dust mite populations in summer can be as much as seven times greater than in winter. To prevent asthmatic symptoms or relieve an existing response to dust mites, the threshold limit is 100 mites per gram of dust.

Flies. The most troublesome indoor fly pests are the red- and dark-eyed fruit flies, and phorid flies. Locating the source or breeding site for these small flies can be achieved by considering the habits of the adults and larvae.

- *Red- and dark-eyed fruit flies.* The red-eyed fruit fly is usually found in residential and restaurant locations; it breeds in decaying fruit and garbage. This is the species that hovers over alcohol drinks and humid sinks. The dark-eyed fruit fly is found in commercial kitchens and breeds in rich, decaying organic matter. It rests on walls and ceilings and does not hover over food. Detecting and eliminating the breeding site will eliminate ongoing infestations.



Fruit fly

Female fruit flies prefer to be in humid locations, such as sinks, and areas with vegetable and fruit odors, such as garbage, but these are usually not their primary breeding sites.

Phorid fly

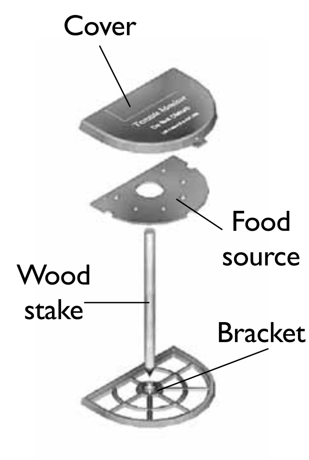
- *Phorid flies.* These small flies are associated with sewage and other organically rich substrates. Their appearance in large numbers is usually an indication of a break or failure in a drain pipe. Flies coming through floor drains may be an indication that there is a break in the sewer line. When there is an infestation in a septic tank, there may be large numbers of adult flies in bathrooms.

Phorid flies are distinguished by the shape of their legs and wings: the legs are long and slender, and the wings have few veins.

Termites. Detection of termite infestations relies on visual inspections. For drywood termites this may be kick-out holes and granular frass. For subterranean termites it may be mud tubes on masonry walls or live termites in ground detectors.

- *Ground detectors.* Termites around a structure are usually detected using wood stakes or other cellulose food sources placed in the ground. The length of the wood stake or plastic station is designed to intercept termite species that tunnel close to the surface and species that tunnel deeper in the soil. Once the food source is encountered by foraging termites, others from the colony will be recruited. Periodic inspection of monitors will reveal termites in the above-ground food source.

  In-ground detectors can be installed any time of the year. Subterranean termites often remain active during winter and may feed in moist soil where the temperature is 40°F or higher. However, termites are more active in spring and fall, when soil moisture and temperatures are high. Soil in sheltered and shaded locations around buildings can have extended periods of moisture, and it may also be protected from seasonal temperature extremes. In open areas, soil moisture is usually low, especially in summer. Dry, hot soil is not a favorable foraging site for subterranean termites.



Ground detector

Termite control programs typically include installation and maintenance of detection stations around and within crawlspaces of treated structures and at perimeter locations.

Detectors can be positioned at the edge of the liquid-treatment zone, where they can monitor the building perimeter and discourage disruption of treated soil.

- *Swarmers.* The emergence of a large number of winged swarmer termites inside a structure or around the outside is an indication of an infestation. A swarm indicates the presence of a colony that has been developing for many years. In general, the number of swarmers is proportional to the size of the colony. Most subterranean termite colonies produce swarmers by the time they are five years old, but large swarms usually don't occur until the colony is eight to 10 years old. Formosan termite colonies may not produce swarmers until the colony is about 15 years old. Drywood termite colonies produce swarmers after about three years of development.

- *Electronic detectors.* Electronic tools can detect the elevated temperature and humidity that indicate the presence of termites and carpenter ants. Detection radar devices show the extent of activity and the direction from which the termites traveled to get to a particular point. This may permit detection of the entry point and the source of the infestation.

  Thermal imaging cameras detect heat radiation. They process the heat of infrared light and display it on a screen. The higher the object's temperature, the brighter the

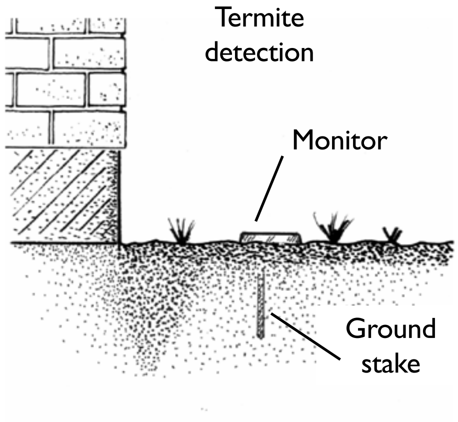


image is on a screen. These cameras can locate termite risk areas but may not confirm the presence of small numbers of termites.

- *Moisture meters.* Wood moisture content is useful in establishing the presence of conditions suitable for decay fungi and subterranean termites. The resistance-type moisture meter measures the electrical resistance between two pins inserted into the wood. These meters are reliable in the moisture content range of 7% to 27%. The number indicated on the meter scale represents the moisture content of the piece to the depth of the pin electrodes. Non-destructive moisture meters (so called because they do not insert pins in the wood) are based on measurements of the impedance of low-frequency signals transmitted into the wood.

- *Detection dogs.* Termite-detection dogs can locate active infestations of subterranean termites. Dogs can detect small numbers of termites in wood behind walls and in inaccessible areas. Their effectiveness as detection tools has limits, but the combination of a dog and an experienced technician is an effective and commonly used strategy.

- *Fluorescent markers.* Termiticide dust formulations can have the added feature of fluorescence. Termite workers that have eaten the cellulose bait can be detected by a yellowish glow using ultraviolet light. This permits tracking of termites that have been exposed to the dust, and possibly determining if those found in close proximity to the treated structure are from the same colony as termites previously exposed to the dust.

Wood-infesting Beetles. Wood-infesting beetles can be detected by:

Adult beetles emerge from May to early July, so marking the surface of infested areas to determine activity should be done in late fall or winter.

- *Exit holes in the surface of wood.* However, the presence of holes, or even frass coming from holes, is not positive evidence of an active infestation. Exit holes persist long after all the larvae complete development or have been killed with an insecticide treatment. Frass may be jarred from feeding tunnels and fall from emergence holes. Covering the wood surface with a thin coat of paint will identify the old and reveal new emergence holes produced the following spring. In areas with only a few emergence holes, each can be individually marked.

- *Chewing sounds.* Full-grown, old-house-borer larvae can be heard feeding in sections of structural wood, such as wall-framing studs or floor or attic joists. However, this sound can also be confused with scratching or gnawing sounds made by mice. Several longhorned beetle species infest pine firewood, and their feeding can also be loud and distinctly heard.

Powderpost beetle larvae can not be heard feeding in wood; these larvae are too small to produce an audible sound.

- *Structural damage.* Establishing an action threshold for anobiid powderpost beetles in pine framing is difficult. Infestations that result in as many as 70 emergence holes per square foot do not significantly weaken the wood. At this density of emergence holes, the modulus of rupture can be reduced 31% to 37% and the