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Managing Pests Around the Home
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Contents

Managing Pests Around the Home

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What are household pests?
Most household pests are insects and are commonly called "bugs." Other organisms such as spiders, scorpions, centipedes, millipedes, ticks, sowbugs, pillbugs, mites, rats, mice, snakes, bats, squirrels, birds, molds and fungi may also enter homes. In Tennessee, one or more of 40 common pests are found in every home at one time or another. Even the most conscientious person cannot always avoid an occasional pest infestation.

Where are these pests found?
Under optimal conditions, large populations of an insect, rodent or other pest can occur in your yard, home, farm or neighborhood. Large numbers of a pest species can develop in trees, stumps, flower beds, mulch, leaf litter, garbage, wood piles, ditch banks, animal carcasses, stored products, spilled materials, sewer lines and other sites. Pests enter homes through openings in the walls, floors, around pipes or cracks, and under doors or windows. Pests seeking shelter build nests or hibernate within the walls, attic or in living quarters.

What attracts them to your home?
Pests are attracted by light, warm air, moisture and food. Odors from a dead bird, rodent, dead insects or nest in a wall, soured mop or spilled materials can also be attractive. They seek protection and shelter in dark cavities in walls or crawl spaces.

What can I do to prevent pest problems in my home?
Luckily, many pests are easily controlled. This publication will explain how to manage the most common household pests found in Tennessee. We have placed special importance on controlling pests by limiting their access to food, water and shelter. Control devices such as vacuums and traps are emphasized. Pesticides are used in a manner to reduce exposure to you, your property and the environment. Always read the entire pesticide label for directions on mixing, applying, safety precautions, storing and disposing of the product before using it. If you are unsure about how to control a household pest after reading this publication, ask your county Extension agent for additional assistance.

When should I contact a professional pest control company?
Some pests, such as termites, require the use of special equipment and knowledge to apply large volumes of insecticides to all possible entry points into the structure. Professionals have the proper equipment and the training, including safety training, to apply the large volumes of pesticides needed to rid your home of termites. Termites can also be managed with baits, but professional training in understanding the biology of the termite is essential to obtain control.

Quite often, professional pest control technicians have access to more effective active ingredients and formulations than the homeowner. The professional is trained in the life cycle, habits and preferences of the pest, as well as the safest and best techniques to control them. In Tennessee, pest control technicians are required to pass a test before they can apply pesticides in your home. Technicians should carry a commercial pesticide applicator certification card verifying they are approved by the Tennessee Department of

Agriculture. They need to attend training sessions to obtain points to keep the card valid. If they do not get enough points within three years, they have to take another test. Also, they must work for a licensed operator if they are charging you a fee. The charter number of their employer's business must appear on their vehicle.

When should you ask for professional help?

Of course that is a decision you as a homeowner must make for yourself. You may want to use a professional:

1) When treating for termites because special equipment and training are needed,
2) When treating for other wood-destroying insects and organisms (especially if you are concerned about reselling the home),
3) If the pest is found in difficult-to-reach locations and requires treatment with special equipment,
4) If you are concerned about pesticide exposure during mixing and applying,
5) If there is not enough time to do it yourself, or
6) If several attempts have failed to control the pest. Professionals need your help to manage pests too. Please perform all the sanitation and exclusion practices they recommend.

Managing Pests and Reducing the Risk of Pesticide Exposure

1. Inspecting and Monitoring

Household pests can be managed with a minimal amount of pesticides by using an integrated pest management (IPM) approach. In an IPM program, regularly scheduled (monthly, quarterly, etc.) inspections are encouraged instead of regularly scheduled pesticide applications. If pests are not present, in most cases, pesticide applications may not be necessary. A flashlight and screwdriver are usually sufficient to inspect a structure. Look for insect pests, signs of insect activity, possible food and water sources, as well as pest nesting or resting sites. Inspect for conditions favorable to insects and rodents: warm temperatures (75-85 degrees F), condensation, moist wood, humid atmosphere, cracks or crevices where insects can hide, plumbing leaks, spilled materials and food left overnight in pet feeding dishes. Pest feces and webbing are often found in infested areas. Inspect for signs of rodent activity: rodent hair, fecal pellets, tracks, rub marks and signs of gnawing and digging. Rodent urine will fluoresce under a blacklight. Monitoring devices such as glue boards and pheromone traps can be useful to detect insects that may have been previously overlooked. Glue boards are very effective in detecting the presence of cockroaches. These should be placed near edges of walls or cabinets near possible shelter, food or water. Glue boards can also be used for detection and control of rodents. Pheromone traps are available for most pantry or stored products insects.

Managing Pests and Reducing the Risk of Pesticide Exposure

1. Scheduled monitoring and inspecting — not scheduled sprays.
2. Identification of pest and damage.
3. Removing pests′ access to food, water and shelter through sanitation and exclusion.
4. Use controls such as traps and vacuums. Reduce pesticide exposure to people and pets by using baits, insect growth regulators, dusts in voids and sprays in cracks and crevices.

2. Identification

After the pest is caught, it must be identified. If you cannot identify the specimen yourself, take it to your county Extension agent. After the pest has been identified, you can determine where it lives, what it prefers to feed on, if it can cause structural damage or is a health threat, or just a nuisance. If it is determined that control is necessary, several approaches may be used, including sanitation and exclusion practices, vacuuming, trapping and the judicious use of pesticides.

3. Modifying the Environment

All pests need access to food, water, shelter and a suitable environment. By removing their access to these necessities, you can prevent or decrease pest populations dramatically. This can be achieved through sanitation and exclusion practices, as well as other modifications of the environment.

Remove Access to Food

Sanitation is a key factor in controlling pests.

Keep a building clean. Sweep or mop to remove spilled food and beverages. Clean soiled wool fabrics, furs and feathers before storing. Storage of items can also affect their vulnerability to pest attack. Date food packages being placed in storage. Use older food items first. Remove broken packages and sweep up spills as soon as possible. In storage areas, allow 18 inches of clearance between stacks (or the wall) and elevate items off the floor to permit inspection for pests, feces, broken packages, etc.

Figure 1. Pet food can be a food source for many pests. Train pets to eat food within ten minutes of placement and then remove the food bowl.

Proper garbage disposal is also important to reduce pest populations. Use garbage cans with tight-fitting lids. Dispose of contents often, at least twice a week, to prevent fly larvae from crawling out of the can. Daily disposal of garbage would reduce the food available to many pests. Clean garbage containers to remove any remaining food materials. Although it is more convenient to place the dumpster or garbage can just outside the kitchen door, dumpsters and garbage cans should be placed away from the structure. For a commercial account, we suggest dumpsters be placed at least 50 feet, and preferably 100 feet, from the structure. In a home, garbage cans should be placed as far away as is practical. If placed too far from the home, residents may let garbage bags accumulate inside rather than walk the long distance to the outdoor receptacle.

Water and Moisture

Most pests can survive a long time without food, but most need to drink water within a few days or they will die (some exceptions include stored products insects and wood-boring insects). Access to water can be limited by fixing leaking plumbing or dripping faucets, sealing pipe penetrations or ventilating wet areas.

Drainage

Foundation drains should move water away from foundations. Drains should be perforated, plastic pipe embedded in coarse gravel at the footing level around the outside perimeter. Drains should empty into a solid pipe to carry water away from the structure.

Crawl Space Ventilation

Dry wood (10-12 percent moisture) is less susceptible to fungus infection, termites, powderpost beetle and carpenter ant infestation. When floor joists, subflooring and insulation are wet with condensate, a fan can be installed in a crawl space access opening as a temporary relief measure. Ventilation openings in foundation walls, beneath buildings with crawl spaces, should be large enough and equally distributed to prevent dead air pockets from forming. Such pockets can give rise to humid conditions conducive to termite activity, powderpost beetles, carpenter ants and wood decay. Openings placed within 3 to 10 feet of corners of buildings usually give the best cross ventilation. Depending on the building code, suggestions for the number of vents in a crawl space are 1 square foot of vent space per 300-1,500 square feet of crawl space if a polyethylene vapor barrier is used. Vents are approximately 60 square inches, so approximately 2.5 vents equals 1 square foot of vent space. Cover 80 percent of the

soil surface in the crawl space area with a 4-6 mil polyethylene (plastic) layer. One way to do this is to cover all of the center of the crawl space area, leaving a 1-foot wide strip of bare soil around the foundation. (A 100 percent crawl space cover could dry hardwood flooring too much and lead to warping.) Moisture rising from the soil around the perimeter will be exhausted through the foundation vents. The plastic cover will prevent moisture rising from the soil from being absorbed by the floor joists, insulation and subfloor. The cross ventilation will lower the moisture content in the wood. If a plastic barrier is not used, it is suggested that 1 square feet of vent space be placed for every 150 square feet of crawl space. Because the plastic moisture barrier is inexpensive, it is more economical to use the plastic barrier than to install more vents for a crawl space without a plastic barrier.

Newer building codes allow for an unvented or enclosed crawl space to control moisture. In this instance, the crawl space is not exposed to the humid outdoor air. The earth is covered with a continuous vapor barrier that overlaps by 6 inches and is taped or otherwise sealed. Vapor barrier edges extend up the stem wall at least 6 inches and should be attached and sealed to the wall. Air is either mechanically vented out of or conditioned air supplied to the area under the floor, and an air pathway to the common area (duct or transfer grille) provided. The perimeter walls are insulated but a 6-inch insulation-free zone is recommended at the top of the foundation wall to allow for termite inspections. Various systems add other components such as dehumidifiers or concrete slabs. Research data indicate a drop in moisture and dewpoint in the crawl spaces using this system in the southern U.S. One concern of the pest control industry is the reduction in visible termite entry routes. These systems have been in place for years now and if issues with termite inspections are to become a reality, they should be evident soon.

Attic Ventilation

Ventilation of attic spaces and roof areas is important in minimizing water vapor or condensation to build up. Even with good ventilation, there is still a need for vapor barriers in ceiling areas. This is especially true of a flat or low slope roof where only a 1- to 3-inch space above the insulation might be available for ventilation. In houses with attic spaces, the use of both inlet and outlet ventilation is recommended. Place inlet ventilators in soffit or frieze board areas of the cornice. Outlet ventilators should be placed as near as possible or on the ridgeline. This placement of ventilators will assure air movement through a stack effect. A combination of attic ventilators may be installed in the gables, soffits, roof or roof ridge line to maintain a flow of air through an attic. Manufacturers' markings or literature tell the number of square inches of attic vents needed per square foot of attic space.
It is important to place corrosion-resistant wire mesh with openings not more than 1/4 inch in any direction behind all vents to aid in excluding pests.

Exclusion

Exclusion is another way to prevent pest populations with minimal pesticide use. Insect, rodent, bird and reptile pests may walk, crawl or fly into your home. Pests are also carried in bags, boxes or on clothing, so examine these items before bringing them into the structure. To prevent occasional invaders (lady beetles, boxelder bugs, centipedes, crickets, millipedes, sowbugs, pillbugs, mites, rats, mice, snakes, bats, squirrels and birds) from entering homes, use exclusion practices. Walk around the perimeter of your structure to determine possible pest entry points. Exclude pests with tight-fitting doors, windows and sealed walls. This may involve adding door sweeps, adding weather stripping to sliding glass doors and windows, caulking openings in window frames, repairing holes in screens, adding screens, etc. If you are unsure whether a door fits tightly, observe the door from outside when it is dark and an interior light is on. If light is seen around the edges of the door, then you don't have a good seal. Mice can enter openings about 1/4 inch, while rats need a 1/2-inch hole. Seal cracks, crevices and holes in the foundation. Screen vent openings in foundation walls and attic.

Figures 2a and 2b. Gaps around doors should be sealed.

Caulk or seal holes in outside walls, eaves and other external surfaces. Many pests use wires, pipes, tree limbs and other guidelines to help them move from one area to another. Voids around pipes can be sealed with steel wool or copper gauze (which won't rust) and expandable foam. Rodents will not chew the steel wool or mesh. If rats are entering the structure through the commode, install a "Rat Guard®" (J.T. Eaton) on sewer lines.

Landscaping Practices

Landscaping practices also influence pest populations. Trim branches away from buildings to prevent carpenter ants, roof rats and squirrels from gaining access. One landscaping practice that can dramatically reduce millipede, cricket, sowbug, pillbug and clover mite populations is a 12- to 18-inch bare zone around the base of the structure. The bare zone reduces moisture around the structure which many of these pests are seeking.

Termites need cellulose materials to feed on. Mulches placed over the termiticide-treated soil next to the foundation can give termites access to the structure without contacting the termiticide. This is another reason to keep a 12- to 18-inch bare zone next to the foundation. Landscape timbers will often provide food for termites or shelter for carpenter ants. Other landscaping materials for borders, such as concrete or vinyl, are available that will not degrade as quickly as wood and will not provide food for termites and shelter for other critters.

Figure 3. Holes in the foundation and around plumbing, conduit and wires should be sealed to prevent pest entry.

Construction and maintenance practices also affect a building's susceptibility to termites. In the final grading, allow at least 6 inches of clearance between the top of the soil and the top of the foundation. Foam board insulation and stucco that extend below grade are especially troublesome. When stucco separates from the foundation wall, termites can tube between the wall and stucco and enter the home undetected. If foam insulation is present below grade also, the termites chew through the insulation.

Moisture attracts termites to the home. The finished grade outside the building should slope away from the foundation so water will not collect under the house. Repair plumbing leaks and leaks

in roofs and around windows as quickly as possible. Clean leaves and debris from gutters. Downspouts should empty into drain pipes to conduct water away from structure.

Figure 4. Leave a 12- to 18-inch bare zone (i.e., pull back the mulch next to the foundation to prevent providing a bridge to subterranean termites over the termiticide-treated zone).

Remove debris (firewood, boards and other clutter) from the base of buildings to discourage rodents from nesting; this in turn could reduce snake and tick problems. Firewood can also harbor large cockroaches, carpenter ants, wood-boring beetles, termites and others. Reducing insect populations around or under structures should decrease their predators such as centipedes and scorpions.

Figure 5. Repair plumbing leaks as quickly as possible. Moisture attracts termites to the structure.

Lighting

Many insects are active at night and are attracted to lights. Sodium vapor lights are much less attractive to insects. Use yellow bug lights or sodium vapor lights near doorways, driveways and sidewalks. Use mercury vapor or incandescent lights around the perimeter of the property to lure insects away from buildings.

Exclusion practices are also important indoors. Caulk or seal the edges of wall outlets, fuse boxes, light switches, cabinet edges along walls, any gaps between cabinets, voids below cabinets, the linoleum/bathtub interface and plumbing penetrations to prevent pests from moving along guidelines (wires, pipes, edges of walls) from one area to another. Cockroaches prefer to feel a surface above and below them (space about 3/8 inches high or smaller), so areas where floor tile is loose, wallpaper or other surface is peeling, or Formica is loose on counterparts, all need to be resealed to reduce cockroach harborage.

4. Household Pest Control Measures to Supplement Prevention Measures

Sanitation and exclusion measures can be thought of as prevention. Even though diligent efforts have been applied to reducing pests' access to food, water and shelter, some pests may still occur.

Vacuuming

There are alternative control measures to pesticides. A vacuum can be used to remove occasional invaders. If a pesticide was sprayed, the dead pests would still need to be removed. A wet/dry vac with a soapy water solution may be more useful when pests are very abundant.

Vacuuming can also be used for initial control (cleanout) of cockroach infestations and is especially useful in sensitive environments such as schools and health care facilities. A HEPA or other filter that screens allergens should be used on the vacuum to prevent the allergens from becoming airborne. Vacuuming can also supplement other pest control efforts. Vacuuming areas frequented by pests prior to flea pesticide treatments can remove 60 percent of the flea eggs

and about 27 percent of the larvae. It also removes organic matter and fecal blood the larvae need to feed on to mature. Stimulus provided by the vacuum causes the adult to emerge from the cocoon, and, if not vacuumed, the adult which was protected in the cocoon will now be exposed to insecticide applications. It is important to dispose of the vacuum cleaner bag immediately after use in an outside garbage can with a tight-fitting lid to prevent reinfestation. Clean out bagless vacuums as instructed by the manufacturer.

Figure 6. Use a knee-high stocking over the end of the vacuum tube to catch bed bugs (and other pests) and prevent them from infesting the vacuum.

Traps

Many different types of traps are available to control vertebrate pests ranging from snap traps to multiple catch traps to other live traps (see Extension Publication PB 1624). Mice and rats typically use the edges of the wall as guidelines. The trigger of the snap traps should be placed near the wall. Mouse traps should be placed 10-12 feet apart. Glue boards can also be used to trap and control rodent populations. Fly light traps with sticky boards placed 3-4 feet above corners or along walls where they will not compete with natural lighting are excellent monitoring tools and may also provide control.

Pesticides

Pesticides are often needed to supplement the above procedures. To reduce the risk of exposure from pesticides use baits, insect growth regulators, dusts in voids, and spray formulations in crack and crevices. Spot treatments should be used on a discretionary basis. The use of foggers or space sprays should be discouraged.

Baits are available in tamper-resistant bait stations, gels, pastes and granular formulations. These are very effective in reducing risk of exposure to pesticides for several reasons:

1) They are premixed or packaged, reducing the threat of exposure during mixing,
2) They are usually formulated at low concentrations,
3) Typically they contain slow-acting toxicants with caution signal words,
4) They are placed in cracks and crevices or other protected areas to increase exposure to the pest and to limit exposure to children, pets and other nontarget organisms, and
5) The toxicant is placed in a carrier that attracts the pest and often the pest transfers this bait to other members of a colony.

Why Isn't More Better?

Over-applying pesticides can:

- Damage the plants in the lawn, garden or the treatment site.
- Increase the possibility of exposure.
- Waste money.
- Hurt the environment.

Insect growth regulators (IGRs) are chemicals that either mimic the hormones that occur in insects or prevent the formation of chitin used in the insect's exoskeleton (outer shell). Examples of IGRs are hydroprene, methoprene and pyriproxyfen. Many products containing pyriproxyfen or methoprene have become available to consumers for flea control.

Dusts can be injected into walls and other closed spaces. It is important to apply only a light dusting. Too many puffs can result in a thick layer which could be repellent. Boric acid, silica aerogel and diatomaceous earth are examples of inorganic dusts. Other dusts include pyrethroids. It is important to wear proper safety equipment

when applying dusts. Always follow the label instructions for safety.

Microencapsulated or wettable powder formulations can be used in cracks and crevices. Crack-and-crevice applications can be performed by using a sprayer or aerosol with a plastic tip that fits on the end of the nozzle.

Exposure can be further minimized if the crack and crevice is sealed after the pesticide application. Many of the wettable powders and microencapsulated and newer formulations are available to professionals. Insecticides for homeowners' use are often available in other ready-to-use formulations such as aerosols and pumps.

Selecting the Best Formulation for a Site

Select pest control products that have detailed label directions and **always follow label directions**. Select recommended pesticide formulations and equipment to apply pesticide to the infested area. Select products and methods that are most closely tailored for the particular type of environment. For example, for long residual activity in a dry situation, use a dust or bait; for residual treatments on a porous surface, spray a microencapsulated or wettable powder. Use emulsifiable concentrates where appearance is important. Emulsifiable concentrates tend to penetrate porous surfaces and therefore do not leave much pesticide at the surface. Spot test a small area before applying a pesticide to determine any adverse effects. For a surface application of a residual insecticide where appearance is not too important, use a wettable powder or microencapsulated spray. Wettable powders may leave a white residue on surfaces. Keep solutions and mists away from open flames or sparks. Around electrical installation, use a dust or bait station. On or around plants, use a wettable powder or dust. Few wettable powders are available to consumers.

Ultrasonic Pest Control Devices

Ultrasonic sound waves have been tested extensively for pest control in the laboratory and field; most research results indicate these devices are not effective.

Safety Precautions

Pesticides are poisons, but they are safe to use when properly handled and applied.

Protect yourself when applying and mixing pesticides.

- Wear a hat, long-sleeved shirt, long pants or coveralls, unlined neoprene or rubber gloves (leather or cloth [including linings] absorb pesticides), socks and boots, especially in wet grass, because of increased chance the pesticide will contaminate footwear.
- Read label carefully to determine steps for mixing, applying and storing pesticides and to determine if other protective equipment such as goggles, rubber apron or a respirator is needed.
- Take extra precautions when mixing because the pesticide is more concentrated.
- Mix outdoors in good lighting and fresh air.
- Wash off at once any pesticide spilled on skin.
- Do not touch surfaces that have been sprayed with insecticides until they are dry.
- The pesticide label will recommend time to re-enter the treated site.
- To determine if carpets are dry before entering, place a paper towel on the carpet. With shoes on, step on the paper towel. If a wet spot appears, carpet is not dry. Repeat procedure a few hours later.
- Keep emergency response numbers, such as the National Poison Control Centers (800-222-1222) and medical emergency (911), nearby.
- Use protective gear when cleaning equipment.
- Store all pesticides in a safe place out of reach of children or irresponsible persons.

The following pages list recommended procedures and, if necessary, pesticides to use to control specific pests. Remember to reduce the pest's access to food, water and shelter. This may provide control by itself. If pesticides are needed, they are more likely to provide control if access to these necessities are limited. Pesticides to be used by professionals are printed in bold in this publication. They are not suggested for homeowner use, but are to act as a guide when receiving professional services. More information on pests can be found in the UT Extension publications (SPs, PBs, Ws) listed in the tables by visiting extension.tennessee.edu/Pages/default.aspx and entering the publication number in the search box.

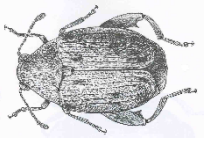
Click on insect name for recommended procedures.

PESTS	DESCRIPTION	CONTROL MATERIALS AND METHODS	REMARKS
ANTS PB 1629 W 473  Argentine ant  Acrobat ant  Odorous house ant  Pavement ant  Pharaoh ant	Ants have elbowed antennae, a thread-like waist with one or two bumps. Unmated reproductives have wings, the front wings are larger than the hind wings. Workers ants are wingless. Ants are social insects. Colonies are usually established by a queen. Workers feed the queen, care for the brood and defend the nest. Workers travel along well-marked trails between the nest and food source.	Do not spray near baits! Baits should contain slow-acting ingredients such as abamectin, hydramethylnon, dinotefuran, fipronil, indoxacarb, disodium octaborate tetrahydrate, boric acids and borax so they are distributed well throughout the colony. Indoors: **Baits:** Most ants feed on sweets, but odorous house ants and Argentine ants don't feed on oils very often, so try Terro Ant Killer II (odorous, Argentine), Combat Ant Killing Gel (Argentine ants), Hot Shot Ultra Liquid Ant Bait (odorous, Argentine), as well as other sweet and protein baits for these ants. Myrmicine ants, such as Pharaoh ants, big-headed ants, little black ants and pavement ants feed on sweet liquid and gel baits listed above and other baits such as Hot Shot Maxattrax Ant Bait2, Raid Ant Baits, and Combat Ant Killing Bait Indoor and Outdoor Use bait stations. Outdoors: **Baits:** Spectracide Ant Shield Outdoor Killing Stakes Hot Shot Maxattrax Ant Bait2 **Barrier Sprays:** bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU beta-cyfluthrin RTU 0.05% gamma-cyhalothrin RTU 0.025%	Professionals have access to more baits and sprays than homeowners and professionals are trained to use them. Call a pest management professional if an ant problem persists. Follow good sanitary and exclusion practices. Exploit the worker caste by using baits. Find foragers and place bait near the foraging trails. Workers then bring the bait back to the nest where it is distributed among all members of the colony. You must kill queen(s) (and all the immatures for Pharaoh ants) to eliminate a colony. Spraying for ants indoors often worsens the problem by causing the colony to split into many smaller colonies. Do NOT spray for Pharaoh ants. If ants are foraging indoors from an outdoor nest, bait outdoors, exclude ants by sealing entry points such as window sills and door steps, and/or spray entry points (barrier spray) into the structure.

ANTS-FIRE

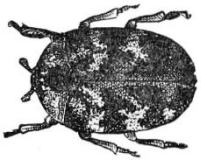
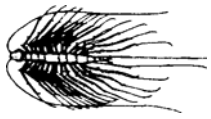
SP 419, PB 1739, PB 1158, PB 1788

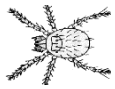
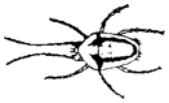
Fire ant infestations on home lawns are often managed with a two-step approach: 1. Broadcast a fire ant bait over the entire lawn or area to be managed first. IGR baits are distributed especially well because they don't affect the worker. 2. After a week to ten days, apply granules, a drench, dust or fast-acting bait (hydramethylnon, indoxacarb, abamectin, or spinosad), to the individual mounds that are likely to be encountered by people. More thorough discussions of IFA management options are provided in the publications listed above. A list of products labeled for fire ants are updated regularly and can be found at fireants.tennessee.edu under Resources and Updates and W 649 and W 652.

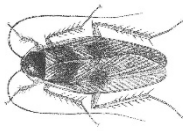
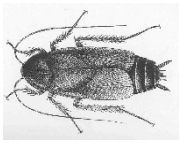
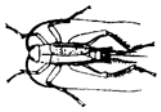
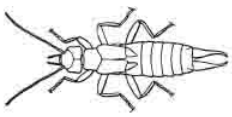
ANTS - CARPENTER PB 1599 	Large, black, red or red-and-black ants that usually nest in damp wood. Wingless workers 1/4 to 3/8 inch long. Winged male and female reproductives swarm from a colony. Carpenter ant workers (wingless ants in the colony) do not eat wood, but excavate smooth galleries in the wood to raise their young. Piles of coarse sawdust or splintered wood indicate a carpenter ant nest nearby. Dead insects falling from a wooden porch may indicate a carpenter ant nest above. Most often carpenter ants are located outdoors and foragers are entering the home in search of water or food. Trim branches away from structure. Seal possible entry points such as doors, windows and areas where pipes and wires enter the structure. If ants are nesting outdoors and foraging indoors, potential entry points can be sprayed.	**Dusts:** boric acid dusts deltamethrin 0.05% D **Sprays:** beta-cyfluthrin RTU 0.05% bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU **Baits:** Apply indoors or outdoors, according to label, where ants are seen. Terro Ant Killer II Combat® Source Kill Max A2 Raid® Ant Gel	**Because carpenter ants can cause structural damage, infestations are best treated by a professional**. Professionals have the knowledge, other pesticides and special equipment needed to successfully treat carpenter ant infestations. Correct moisture problems, repair leaks and ventilate. Find and treat nests in wood parts. Drilling into the wood may be necessary. Dust nests in wall voids. Do not apply sprays near electricity such as electrical outlets or fuse boxes. Some success has been found using ant baits for carpenter ant control, but it is not always a successful technique at this time. Professionals can place baits where ants are actively foraging. Do not spray ants or trails with fast-acting sprays (pyrethoids or insecticides ending in "thrin") if baiting because it will prevent the bait from being brought back to the nest.
BATS PB 1868 	Night-flying creatures invade attics and similar areas.	Treat area with insecticides to control external parasites, including bed bugs, bat bugs, fleas, mites and lice after bats excluded. See flea, bed bug and mites section.	Close entrance holes with wire screening to exclude bats after they have left the resting area. Seal opening with expandable foam.
BEAN WEEVILS 	Small, gray beetles and white worms cut round holes in dried beans and peas. May attack in field or in storage.		Non-chemical control: Either destroy the infested products or salvage them by super heating to 140 degrees F for 1/2 hour, or super cooling in a deep freeze at 0 degrees F for at least four days. Store insect-free beans in containers with tight lids.

BED BUGS PB 1763 PB 1807 PB 1894 SP 761 SP 788 SP 825 	Flat, oval, reddish, wingless insects. Bloodsucking. Night feeders.	Foggers are ineffective. Use a duster to lightly apply silicon dioxide (diatomaceous earth) to cracks and crevices of bed frame and bedroom. **Dust should not be present in piles**. Garden Safe Crawling Insect Killer Harris Diatomaceous Earth Bed Bug Powder Hot Shot Bedbug Killer Dust with Diatomaceous Earth	**Very difficult to control. Use an experienced pest management professional**. If professional treatment is cost prohibitive, residents can help lower bed bug populations by using diatomaceous earth and nonchemical controls. Most of the insecticides available to residents are pyrethroids and there is widespread bed bug resistance to these chemicals. Practice prevention. Launder bedding and clothing (bed bugs must experience 122 degrees F; dry clothing should reach these temps in a dryer for about 20 minutes). Bag clothing in sealed plastic bags after drying. Cover mattresses and boxsprings with bed bug proof encasements (Protecta-Bed, Mattress Safe, etc.). Vacuum all cracks and crevices (use knee-high stockings on end of tube prior to attachment placement to catch bugs, tie off stocking and discard in outdoors trash). Use bed bug monitors like ClimbUp Insect Interceptors, BlackOut Bedbug Detectors, etc. under bed legs and other places. Difficult-to-treat items (appliances, lamps, etc.) can be treated with Nuvan Prostrips in bags but may not kill all bed bugs in protected locations. Infested items that can't be heated or otherwise treated can be removed after wrapping in plastic. Reduce clutter and seal cracks and crevices to reduce hiding places for the bugs.
BOOK LICE 	Small, soft-bodied, cream-colored to grayish or light brown, wingless, fast moving. Feed on molds, fungi. Found in books, cereals, wallpaper, boxes. May damage products which contain starch.	Bengal Insecticide Concentrate	Large numbers of book lice develop under excessive humid conditions, moldy books, papers, bags or cereals. Dry out infested areas. Destroy infested material of little value.

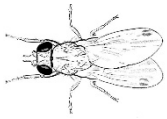
BOXELDER BUGS SP 341-H 	Flat, 1/2-inch long, 1/3-inch wide, dark brownish-black, with three lengthwise redstripes behind the head. Wings leathery at base. Membranous at tip with redveins; abdomen is red. Nymphs are smaller, wingless and bright red.	bifenthrin 0.05% & zeta-cypermethrin 0.0125% RTU beta-cyfluthrin RTU 0.05% gamma-cyhalothrin RTU 0.025%	These insects may be found on buildings in the spring and fall. Large numbers collect on siding, around doors, sunny walls and attics. Use exclusion practices before pests become apparent. Inside, vacuum into a dry vac. Avoid use of spacesprays if bugs found in wall voids. Dead bugs in wall voids could serve as carpet beetle food. Eliminate female (seedpod-bearing) boxelder trees. Outside, vacuum the bugs into water mixed with 1 teaspoon of a liquid detergent per gallon of water in wet/dry vacuum cleaner tank. Treat listed sites on label when bugs are first seen. Professionals have access to insecticides with longer residuals.
BROWN MARMORATED STINK BUG (BMSB) W 779	An invasive pest that feeds on many crops and ornamental plants during the growing season and then continues its pest status as it invades homes to overwinter. BMSB adults are shield shape, about 5/8 inches long, just about as long as wide, mottled brownish-grey with black antennae marked with a whitish band on the next to last segment, dark bands on the membranous part of the wings, and coppery or bluish metallic punctures (small, round depressions) on the head and pronotum). Abdominal segments protruding from the wings are marked with black-and-white bands. See eddmaps.org/bmsb/distribution.cfm?map=distribution for the latest brown marmorated stink bug distribution.	If exclusion methods aren't working completely, they may be supplemented with outdoor treatments. If perimeter treatments are applied, it is best to spray these in the fall before the bugs start aggregating on structures. Insecticides will have limited persistence outdoors in the sunlight and rain and may have limited effectiveness against preventing the brown marmorated stink bug from entering structures. Pyrethroid Perimeter Treatments BioAdvanced Home Pest Control Indoor & Outdoor Insect Killer RTU Enforcer BugMax Home Pest Control Spectracide Bug Stop Home Barrier Indoor Plus Outdoor Insect Control	Pest-proof by late summer using techniques described in PB 1303. If supplemental pesticide applications are deemed necessary, make exterior spot, crack and crevice and/or void applications where these pests may harbor or hibernate, such as cracks and crevices, in weep holes, wall voids, around window and door frames, attic vents and behind siding, in late summer/early fall before the pests arrive. Pyrethroid labels are more restrictive so read label carefully. Indoor light traps may help reduce populations inside and are most effective late winter/early spring when the bugs are leaving the structure. Vacuum bugs found inside into knee-high stocking placed on the end of the vacuum tube prior to attachment placement. After vacuuming, remove stocking, tie off and place in a sealed bag in outside garbage can. If BMSB found on walls in large numbers, they can be removed by removing the top of a capless plastic soda bottle at the widest part of the neck, inverting it and placing back on the bottle to create a funnel trap. When the edge of the modified bottle is moved up the wall towards a BMSB aggregation, the bugs will drop into the trap. Soda bottles can be sealed in a plastic bag and placed in the freezer for a few days. Frozen or drown bugs can be disposed of outdoors in a garbage can or compost pile. Flushing BMSB down the toilet will waste water and is not recommended.

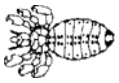
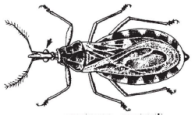
CARPENTER BEES W 876 	1/2- to 4/5-inch long with a blue-black, green or purple metallic sheen. Color and size resemble a bumble bee, but the top of the abdomen is hairless. These bees chew a circular, 3/8-inch entrance hole into wood and nesting gallery 4-6 inches long at a right angle to the entrance hole. Galleries used for several years may extend 10 feet.	Apply dusts into the gallery openings: Apicide (carbaryl 5%) deltamethrin 0.05% D Sprays: Bee/Wasp Killer Aerosols beta-cyfluthrin RTU 0.05% Ortho Home Defense Max Termite and Destructive Bug Killer Concentrate (bifenthrin) Foam: Spectracide Termite Killing Foam 2	Nonchemical or preventive controls include painting or varnishing wood surfaces. Use a straight wire to break up cells in tunnels. Individual bees can be killed with a badminton racquet. In the spring, puff insecticidal dusts into nest holes in the evening when the carpenter bees are at rest. Allow bees access to the nest for at least 24 hours. Seal the hole with 3/8-inch diameter dowel or cork and wood glue to prevent reinfestation. Carpenter bees overwinter in previously used galleries, so the structure should also be inspected in the fall. Repaint sealed area to possibly prevent woodpecker damage.
CARPET BEETLES SP 341-I **Black Carpet Beetle**  **Common; or Furniture; or Varied Carpet Beetles** 	Adult 1/8 inch to 1/4 inch in length; black; brown legs. Larva 3/8 inch in length; carrot-shaped; covered with short hair and has long terminal bristles. Adults 1/8 inch long with white and orange; or yellow, white and black; or white, brown and yellow spots; larva with long black to brown hairs.	Apply spot treatments of insecticides to infested or suspect areas, but not to clothing. See precautionary statements about pesticides staining carpets. beta-cyfluthrin RTU 0.05%, bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU gamma-cyhalothrin RTU 0.025%	Carpet beetles infest carpeting, clothing, fur, upholstered furniture, books, bird nests, milk powders, articles of animal products, feathers, wool, silk and other materials of animal origin. Locate food source and remove, if possible. Use good housekeeping such as cleaning floor and carpets regularly. Dry clean clothes regularly. Stored materials subject to damage should be thoroughly cleaned and stored in tight container with moth crystals. Caution: moth crystals may stain clothing. Treat cracks, crevices and hidden area of walls, closets or stored materials, under carpets, etc.
CENTIPEDES 	Many long, slim legs, long antennae and fast-moving.	Indoors: beta-cyfluthrin RTU 0.05%, gamma-cyhalothrin RTU 0.025% Outside: beta-cyfluthrin RTU 0.05% bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU gamma-cyhalothrin RTU 0.025%	Feed on insects. Can bite. Usually not numerous. Active at night. Nonchemical control: leave a 12- to 18-inch bare zone next to foundation base. Move wood piles and other clutter away from structure. Spot-treat cracks and crevices, door thresholds and moldings where pest may crawl or as directed by label. Residuals may not provide total control. Treatments may need to come into direct contact with pest.

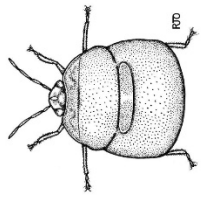
CHIGGERS 	Very tiny mites that get on people and cause blotches and itching. Don't invade homes, but get in yards and wooded areas.	If needed, treat yard with a labeled insecticide every 4-6 weeks, and according to label. cyfluthrin Ready-to-spray 0.75% other synthetic pyrethroid G	Mow lawn regularly. Remove weeds and brambles from fence rows. Using commercial repellents around ankles and waist may provide personal protection. Apply deet repellent to skin and Permanone 0.5% spray to shoes, cuffs and socks 2 hours before wearing.
CLOTHES MOTHS SP 341-J 	Brownish moths, wingspread 1/2 inch long. Larvae are 1/16-1/3 inch long. Gray silken cases or webbing over surface of fabric.	Brush and clean susceptible items periodically. Sweep or vacuum to remove dust or lint to prevent pests. Also vacuum prior to treatment. Dry clean and moth proof clothing with moth crystals in tight sealing container. Do not spray clothes. Any ready-to-use or concentrated liquid spray labeled for this pest. beta-cyfluthrin 0.05%	Adults are not attracted to light and will fly to a dark corner when disturbed. Usually found on infested materials, wool, fur, feathers, hair, upholstered furniture, nonsynthetic carpets, dust and lint. Apply sprays to cracks and crevices in closets and spot-treat other infested areas. See precautions on moth crystals about staining clothing.
CLOVER MITES 	Tiny (1/30 inch) mites, brown to olive green with pair of long front legs.	Household sprays control by contact in home: bifenthrin 0.05% & & Zeta-cypermethrin 0.0125% RTU gamma-cyhalothrin RTU 0.025% Outdoors use: bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU gamma-cyhalothrin RTU 0.025% (perimeter treatment)	Invade homes from the yard in great numbers in fall and leave in spring. Stain walls or fabrics reddish-brown when crushed. Keep grass and shrubs from direct contact with house. Good weed control in turf and a vegetation-free border of 12-18 inches around home will help. Apply sprays to points of entry such as foundations, windows and doors.

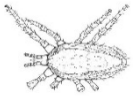
COCKROACHES German Cockroach  Brown Banded or Furniture Cockroach  Oriental Cockroach  American Cockroach 	German cockroach: About 5/8 inch in length, pale brown or tan with two parallel dark streaks on pronotum. Usually most abundant in the kitchen and bathrooms. Most common home-infesting cockroach. Brownbanded cockroach:1/2 inch to 5/8 inch in length, dark brown with two pale bands traversing wings. Widely distributed throughout the house in walls, closets, furnishings and appliances, but abundant in kitchens. Oriental cockroach: 1 1/4 inch in length, dark reddish-brown to black; wings do not surpass end of abdomen. Usually found in lower floors, outdoors or in crawl space. Frequents water meters, floor drains or moist, dark areas. American cockroach: 1 1/2 inch in length, reddish-brown with pale yellow band around pronotum. May be found throughout house, outdoors, in crawl spaces, sewers, water meters and garbage cans.	**Baits in cracks and crevices:** Combat Source Kill Max R3, Hot Shot Ultra Clear Roach & Ant Gel Bait **Baits for small roaches:** Combat Max 12 month Roach Killing Bait for Small Roaches (bait stations), Combat Roach Killing Bait Strips, Raid Double Control Small Roach Baits with Egg Stopper, HotShot Ultra Liquid Roach Bait, BioAdvanced Home Pest Roach Killer Gel, others. Do not spray or dust near baits because cockroaches could be repelled. **Lightly dust voids with insecticidal dusts containing boric acids.** **Sprays:** beta-cyfluthrin RTU 0.05% bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU gamma-cyhalothrin RTU 0.025% Bengal Gold Roach Spray	Prevent access to food, water and shelter. Practice good sanitation in food handling, storage and eating areas. Control moisture, prevent leaks or condensation. Seal off harborage sites such as cracks and crevices with caulk, etc. Also use exclusion practices to prevent cockroach movement. Use glue boards or sticky traps placed along edges in dark places to locate and monitor cockroach populations. Baiting is the preferred method for cockroach control. Apply baits to cracks, crevices, pipes opening into walls, joints of furniture and cabinets, pipe conduits, and elsewhere as indicated by glue board catches. If you choose to spray, use precautions to keep chemicals out of food, spices and off dishes or eating utensils. Do not apply sprays where electrical shorts may occur; use baits or dusts in these areas. Do not use sprays when baiting because cockroaches will be repelled from the baits. Read label carefully; some products may not be labeled for food handling areas.
CRICKETS 	Black or beige jumping insects with long antennae. Cave or camel crickets are humped and brown.	**Sprays** beta-cyfluthrin RTU 0.05% gamma-cyhalothrin RTU 0.025%	May damage clothing. Repeat treatment as needed. Spray entry points into structure. Camel crickets infest damp basements, under slabs and crawl spaces. Ventilate or dry these areas. Active at night. Apply sprays into cracks and crevices where crickets dwell. Use exclusion practices. Glue boards can be used indoors around entry points and other places in basements, etc.
EARWIGS 	Easily identified by pair of pinchers at end of abdomen.	Indoors: bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU gamma-cyhalothrin RTU 0.025% Outdoors: bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU gamma-cyhalothrin RTU 0.025%	Earwigs are incidental invaders. They usually dwell in leaf litter, mulch and woodpiles and are common hitchhikers on vegetables harvested from the garden. Move compost piles away from the house to aid pest control. Insecticidal control is usually unnecessary. If needed, spray possible entry points and mulched area around the house.

FLEAS PB 1596 	Small, 1/16 inch long, reddish-brown, wingless insect. Body compressed laterally (from the sides), legs long and adapted for jumping. Adult fleas prefer to feed on dogs, cats, opossums, foxes and sometimes rats and other urban animals. When pets are not available, humans are attacked. Larvae are worm-like and feed on blood and organic matter in house or yard.	**CATS, KITTENS AND PUPPIES ARE MORE SENSITIVE TO INSECTICIDES! Consult a veterinarian and always read the label prior to treating a pet. Beware of imitation products.** Veterinarian supplied products usually kill fleas within 12-36 hours or sooner and provides 90-95 percent control for about 30 days: see flea control pesticide recommendation at https://extension.uga.edu/content/dam/extension/programs-and-services/integrated-pest-management/documents/handbooks/2021-pmh-home-chapters/Animals.pdf for a thorough listing of veterinarian supplied on-pet products. Spot-treat infested areas and pet resting areas inside Insect Growth Regulators [and adulticides]: pyriproxyfen [and pyrethroid] Bengal Full Season Flea Killer Plus 2 Enforcer Flea Spray for Home Enforcer Flea Spray For Carpets & Furniture XX methoprene [and pyrethroid] Raid Flea Killer Plus Carpet and Room Spray Adulticides: pyrethrins bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU gamma-cyhalothrin RTU 0.025% Outdoor Premise Treatment (when specified on label): pyriproxyfen (Archer and others) Black Flag Flea & Tick Killer Concentrate Yard Treatment 2	**Step 1.** With veterinarian supplied products that are currently available, control of fleas in small- to moderate-sized infestations is likely to occur by using those pet treatment products alone. May take two months to completely break flea life cycle. If pet treatment alone does not provide sufficient control, initiate a complete control program by April. **Step 2.** Vacuum infested areas twice a week and prior to treatment to remove eggs, larvae, adults and organic matter. Dispose of the vacuum cleaner bag immediately after use in an outside garbage can with a tight-fitting lid to prevent reinfestation. Clean out bagless vacuums as instructed by the manufacturer. Steam-cleaning carpet may also reduce populations. Eliminate fleas from pets, bedding and premises before departing on vacation. **Step 3.** Treat pet resting areas indoors and clean or remove pet bedding on the same day. Insect growth regulators are important to break flea life cycle. A combination of an insect growth regulator and an adulticide may be the most efficient formulation to use. **Step 4.** Mow grass, keep weeds down and trim shrubs to expose flea eggs and larvae to lethal dessication. Irrigating areas surrounding buildings, but not against building, may kill fleas by drowning. If fleas are surviving outdoors, apply insecticide to labeled areas. **Keep pets and people out of treated area (indoors and outdoors) until surface sprays dry**.
FLIES Face flies, small cluster flies and blue bottle flies 	Adult flies of these three species hibernate in attics and wall voids. Cluster flies are about 1/3-inch long, dark gray, with checkered black and silver abdomen, with gold hairs on thorax of newly emerged adults. Face fly similar in appearance to the house fly. Adult blue bottle flies have a dull gray thorax and a shiny blue abdomen.	Exclude flies in the fall by sealing entry points, screening behind all vents, sealing holes in walls and attics prior to pest entry in fall. Vacuum or use pyrethrin sprays to kill exposed flies. Use black light trap with sticky surface.	Cluster fly larvae are parasites of earthworms. Face fly larvae develop in cow patties. Adults hibernate in attics and wall voids. Blue bottle fly larvae develop in garbage, decaying meat, dead animals, fish and excrement.

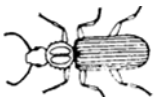
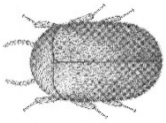
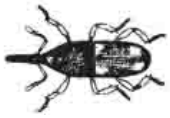
HOUSE FLIES 	About 1/4 inch in length, dull gray color with four longitudinal dark stripes on the thorax.	**Remove larval food sources.** **For temporary relief of adult flies in homes** Victor Fly Catcher Sticky Tape Various light traps OrthoHome Defense Fly Bait Decal for Windows Use pyrethrin aerosol for temporary relief inside home. Apply residual sprays on outside locations where flies rest. beta-cyfluthrin RTU 0.05% gamma-cyhalothrin RTU 0.025%	Larvae develop in warm organic matter of animal or vegetable origin. Remove trash at least twice a week to reduce fly populations in homes. Screen windows and doors. Garbage cans should have tight-fitting lids. Use insect light traps indoors. Sanitation is very important.
BOTTLE FLIES Green Bottle Fly Blue Bottle Fly Bronze Bottle Fly Black Bottle Fly 	1/2 inch in length; green metallic color 1/2 inch in length; blue metallic color 1/2 inch in length; bronze metallic color 1/3 inch in length; shiny grey thorax and dull blue metallic abdomen.	**Remove larval food sources.** See house fly	Bottle flies indoors often indicate a dead mouse or other animal in wall voids, attic, basement, etc. Dispose of dead animal carcasses, animal excrement, etc. Garbage cans should have tight-fitting lids.
FRUIT FLY OR VINEGAR FLY 	1/8 inch long, red eyes, tan head and thorax, abdomen gray-black.	**Remove larval food source**. Traps may aid control. Pyrethrin aerosols for adults.	Egg to adult in 8-11 days. Larvae in decaying fruit, vegetables and garbage cans. Adults around larvae.
MOTH FLY OR DRAIN FLY 	Small, scaly or hairy, moth-like flies. Wing veins parallel	Sanitation. Remove moist organic materials, clean drains with wire brush and reduce organic matter lining drains by applying enzymatic or similar cleaners monthly.	Adults rest on walls or foliage. 3-4 weeks from egg to adult. Breed in drain pipes, sinks and very moist organic solids.

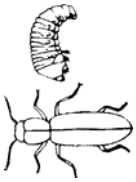
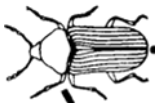
FUNGUS GNATS SP 341-C 	Adults 1/8 to 1/4 inch long. Run rapidly over surfaces. Slender, gray larvae have shiny black head and white thread-like body.	Avoid over-watering plants; let soil dry out somewhat between waterings. Decoy pots of sprouting grain may be used to attract adult females, which lay their eggs in these pots. Remove and dispose of infested decoy pots every two weeks and replace with new decoy pots of sprouting grain. Flying insect sprays will kill adults but not solve problem.	Adults attracted to light. They are often found in windows and soil in potted plants.
HEAD LICE SP 341-S 	Tiny, flat insects found in human hair.	Permethrin (Nix); Pyrethrins 0.3% and piperonyl butoxide 3% (Rid, A-200, R & C, etc.)	Wash infested clothing and bedding with strong soap and very hot water; tumble dry on high heat. Do not share hair brushes, caps, etc. Use special combs to remove nits (eggs). Nits hatch by 10 days, so another application may be needed at this time. Follow label directions. Avoid group "selfies" when head lice present. See cdc.gov/parasites/lice/head/treatment.html for further details. If crawling lice are still seen after a full course of treatment contact your health care provider.
KISSING BUG or CONENOSE BUG W 957 	Two species of kissing bugs exist in Tennessee, *Triatoma sanguisuga* and *Triatoma lecticularia,* **but neither are commonly encountered**. These dark insects are approximately 1 to 1 1/2 inches long in the adult stage, with 12 yellow, red or orange bands around the edge of the abdomen. The head is cone-shaped with large eyes and beak-like mouthparts attached near the front of the head and held under the body at rest. The piercing mouthparts are used to feed on the blood of vertebrate animals including humans. Kissing bugs are the primary vector of the protozoan parasite causing Chagas disease; however, Chagas disease rarely occurs in Tennessee. One local vector-borne human case occurred in Tennessee between 1955 and 2010; however, nine Chagas cases occurred in Tennessee since 2010, of which one was locally acquired, two were acquired outside the country, and the origin of the other six cases was unknown. The protozoan is present in the state; 6.4 percent of canines tested positive in 2008. The parasite is spread to animals via feces rubbed into the kissing bug's bite wound, or an animals eyes, nose or mouth.	Prevention Seal cracks and gaps around windows, walls, roofs and doors. Remove wood, brush and rock piles near your house to eliminate harborage for rodents, other vertebrates and kissing bugs. Remove bird nests. Screen doors, windows and vents, and repair holes or tears. Sleep under fine mesh netting if unable to exclude pests. Ensure exterior lights are not close to the house (lights can attract the bugs) or use sodium vapor lights next to the home. Seal openings and crevices leading to the attic, crawl space and outside. Pets should sleep indoors, especially at night. Reduce clutter inside homes to reduce potential harborage for kissing bugs as is done with bed bugs. Keep your house and any outdoor pet resting areas clean, in addition to systematically checking these areas for the presence of kissing bugs. Synthetic pyrethroids have effectively controlled kissing bug infestations in areas where Chagas disease regularly occurs; however, kissing bugs or conenose bugs are rarely listed on pesticide labels in Tennessee. If an infestation exists, supplement prevention tactics with the application of a pyrethroid (cypermethrin, lambda-cyhalothrin, deltamethrin or cyfluthrin) to entry points and cracks and crevices of potential harborage sites as long as these sites are listed on the label and the label doesn't specifically exclude kissing bugs or conenose bugs.	Kissing bugs are nocturnal feeders found near animal nests or pest resting areas. Hosts include opossums, raccoons, armadillos, birds, bats, rodents, skunks, coyotes, cats and dogs, among others. Many adult kissing bugs of multiple nymphal stages could indicate a breeding population is present. These bugs often establish in homes that are poorly constructed (i.e., not sealed well). If kissing bugs are found indoors, check areas near pet resting sites, rodent infestations and bedrooms, especially around beds and end tables. For more information, see cdc.gov/parasites/chagas/gen_info/vectors/index.html citybugs.tamu.edu/factsheets/biting-stinging/others/ent-3008 kissingbug.tamu.edu/faq entnemdept.ifas.ufl.edu/Creatures/URBAN/Triatoma_sanguisuga.htm

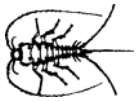
KUDZU BUG W 358 	Adult is 1/5 inch mottled brown, pea-shaped bug. Seeks overwintering sites in the fall and is attracted to light-colored structures. Leaves protected sites in spring to feed primarily on kudzu. The next generation moves to soybean and other legumes and in the fall starts the invasion cycle over again. When crushed, kudzu bug can release offensive odor and stain surfaces in the home and can also cause skin irritation (kudzubug.org/homeowner). First found in Tennessee in 2012. See kudzubug.org/distribution_map.cfm for updated distribution.	If exclusion methods aren't working completely, they may be supplemented with professionally applied outdoor treatments. Products containing indoxacarb, dinotefuran, pyrethroids (such as b-cyfluthrin, bifenthrin, cyfluthrin, deltamethrin and λ-cyhalothrin), or pyrethroids combined with neonicotinoids (imidacloprid, acetamiprid, or thiomathoxam) have been found to be effective against kudzu bug, but don't necessarily list this pest on the label. Insecticides should be applied around windows, doors and other entry points as is done for other occasional invaders. In general, pyrethroids are faster acting than other chemistries; however, new pesticide labels limit professionally applied pyrethroids to 1-inch bands around windows and doors when the surface is over a hardscape. Insecticides will have limited persistence outdoors in the sunlight and rain and may have limited effectiveness against preventing the kudzu bug from entering structures. Enforcer BugMax Home Pest Control Harris Home Pest Control Stink Bug Killer	Keep them out of the structure. Kudzu bugs can be difficult to keep out of homes as they are searching for an overwintering site. Mechanical exclusion is the most effective approach to provide long-term control. Think of all the places that kudzu bugs can enter the home and then deny them entry. Seal cracks around door frames (including crawl space entries), windows, utility penetrations, siding, and wood fascia and other openings with appropriate materials, such as quality silicone or silicone-latex caulk. Weather stripping may be needed around doors and windows to provide tighter seals. If light can be seen under a door, door sweeps may be needed. Repair screens on doors and windows. Screen behind crawl space, soffit and attic vents. Use chimney caps or screens when appropriate and remove window unit air conditioners, if possible, as this is a common entry point. Removal of kudzu bugs can be achieved with a vacuum cleaner, but be prepared for the smell if large numbers are vacuumed at once. Vacuum bugs found inside into knee-high stocking placed on the end of the vacuum tube prior to attachment placement. After vacuuming, remove stocking, tie off and dispose in soapy water. Indoor application of insecticides is discouraged for several reasons. Bugs that die may provide food for other pests such as carpet beetles which in turn could damage woolen clothing and dried, stored products. Foggers may kill bugs that are present at the time but won't provide much control after the room is aerated. Misapplied foggers have resulted in fire or explosions. Sprays directed into cracks and crevices will still allow the bugs to emerge. Instead of treating indoor cracks and crevices where the bugs are emerging, seal them. Remove kudzu patches and plant legumes away from the structure to reduce outdoor kudzu bug populations nearby.

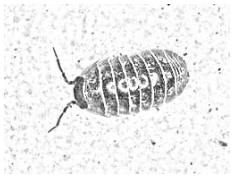
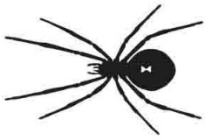
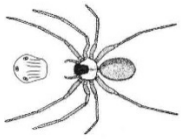
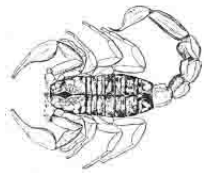
MICE PB 1868 	Adults weigh about 1/2 ounce. Dusky gray color, slender body, prominent ears, tail about as long as head and body. EPA's final risk mitigation decision requires that all rodenticide bait products for sale to consumers be in tamper-resistant bait stations. Loose bait such as pellets will be prohibited as a bait form.	Place snap traps, multiple catch traps and glue boards along paths traveled by mice. Traps or glue boards should be placed every 8-12 ft. Traps can be baited with: whole nuts, peanuts or peanut butter, dry rolled oatmeal, bacon squares, small wads of cotton or gumdrops. Baited traps should be set at right angles to rodent runs. Place trap at right angles to rodent pathway with trigger part of trap against the run.	Mice move in from outdoors in fall as temperatures decline. Exclusion practices needed – mice can fit through an opening 1/4 inch in diameter. Sanitation: remove access to food, water and shelter. Rodents use edges of walls, studs and pipes as guidelines. Remember to set traps where children and pets will not be hurt. Mice are curious and will normally approach traps the first night. If you don't catch a mouse in the first few nights, the trap is in the wrong location.
MILLIPEDES W 357 	Slender, brownish, multi-legged, hardshelled, 1-2 inches long. Two pair of legs per body segment. Invade home from outdoors. Harmless.	Outdoors: bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU beta-cyfluthrin RTU 0.05% gamma-cyhalothrin RTU 0.025%	Usually occasional invaders, but may invade in large numbers. Under these circumstances, nonchemical control may be more effective: remove mulch and other clutter from near the foundation, dethatch lawns and water in the morning. Prune tree limbs to dry their habitat. Use exclusion practices. Treat entry points into structure, shady areas, ivy beds, flower beds and rock walls, leaf-litter or as directed by label. Millipedes will die within 2-3 days after entering a dry structure. Vacuum millipedes found indoors. Millipedes are not insects, so insecticides not always effective. Best control obtained when pest comes in direct contact with the insecticide.
MITES, BIRD or RODENT 	Mites occasionally found indoors because of rodent or bird nest in, on or near structures. Some of these mites may bite people. They are small (about the size of a period) but can usually be seen with the naked eye.	If widespread, space sprays of pyrethrins may be necessary. Cimexa Dust into cracks and crevices. Mites are not usually listed on homeowner labels. Residuals such as those listed for fleas may also work. **Only apply products to areas listed on label as for other pests**. beta-cyfluthrin RTU 0.05% bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU For bird cages pyrethrin sprays such as UltraCare Mite and Lice Spray	The first step in controlling bird or rodent mites is eliminating the host animals and removing their nesting sites. Often, the nests will be found in the attic, around the eaves and rafters or in the gutters or chimney. Gloves should be used when handling dead animals. A respirator should also be worn when removing nest materials to avoid inhaling fungal spores and other potential disease-producing organisms associated with the droppings. Spray crack and crevice around infested area. See chiggers for repellents. If mites entering from outside, place double-sided sticky tape around windows and other similar entry points.

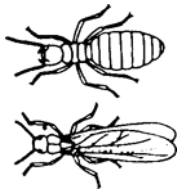
MOLES PB 1868 	Small, furry animals that burrow and tunnel in soil, causing raised ridges in yards.	Use mole traps of choker or harpoon type. Grubs only make up a small amount of the mole's diet. Treating lawn for insects would reduce food available to moles, but probably would not lead to control.	Place trap in main runway. Tramp down runs in several spots. Spots re-raised are in main run. Other ways to identify main runway are to look for straight course for some distance; a runway connecting two mounds or other runways; one following a fence row, concrete path or other border; one that follows an edge of field or yard.
MOSQUITOES SP 503-B W 774 	Delicate insects that bite humans and animals. Larvae and pupae found in water. Adults stay in shady protected locations such as shrubbery, crawl spaces, etc.	**Treat larvae or wrigglers in standing water such as rain pools, intermittently flooded areas, stagnant water, etc. with:** *Bacillus thuringiensis israeliensis* (Bti): Mosquito Bits Mosquito Dunks methoprene Pre-Strike Mosquito Torpedo **Outside of buildings:** use pyrethrin spray for temporary relief as aerosol or fogger; permethrin 0.15% in outdoor fogger. Residual barrier (malathion, permethrin, and other pyrethroids) can be applied to vegetation on perimeter of property that is prone to rapid infestation of mosquitoes. This kills adults feeding on nectar in day and some may act as a repellent. Spray other shady damp areas where mosquitoes rest. To protect pollinators, do not spray when plants in bloom and follow label carefully. **If needed indoors** use flying insect killers for temporary relief.	Eliminate larval sites (standing water) around structure by unclogging gutters, emptying bird baths, children′s pools, pet bowls, flower pot saucers, old tires and other containers around home twice a week. Drain or fill low areas where water collects. Easiest to control mosquitoes in immature stage because confined to water. If unable to remove standing water, treat standing water as allowed with labeled insecticide. Repair screens. Reduce the number of areas where adult mosquitoes can find shelter by cutting down weeds adjacent to the foundation and in yards, and mowing the lawn regularly. People should wear repellents when potentially exposed to mosquitoes. The CDC recommends repellents with these active ingredients: N,N-diethyl-m-toluamide (DEET) Picaridin IR3535 Oil of lemon eucalyptus (OLE) or para-methane-diol (PMD) 2-undecanone Do not use OLE or PMD on children under 3 years of age. Do not use repellents on babies younger than two months old. Mosquito netting can be used over infant carriers, cribs and strollers. Do not apply repellent to skin under clothing. If using sunscreen, apply sunscreen first and insect repellent second. More information on repellents and their safe use can be found at cdc.gov/westnile/prevention/index.html or EPA′s search tool (epa.gov/insect-repellents/find-repellent-right-you) can help you find suitable repellents.

MULTICOLORED ASIAN LADY BEETLE SP 503-C 	Multicolored Asian Lady Beetles (MALB) start searching for overwintering sites, your home, on the first or second day in the fall when temperatures are greater than 65 degrees F after a dramatic drop in temperature, usually to near freezing. This usually occurs about the third week in October.	Spray entry points the third week in September. If the beetles have not flown in three weeks, repeat spray if allowed by label. bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU gamma-cyhalothrin RTU 0.025% deltamethrin RTU 0.02% other pyrethroids	1. Pest-proof: seal entry points before beetles arrive. 2. Treat roof lines or soffits, vertical contrast areas and entry points (around the following outdoor items: windows, doors, vents, pipe penetrations) with pesticides before the beetles arrive. 3. Remove dead beetles as they pile up because they may cause other MALB to aggregate. 4. If the beetles make their way into the home, use HEPA filter vacuum or try a light trap.
PANTRY PESTS Saw-Toothed Grain Beetle  Cigarette Beetle  Indian Meal Moth  Rice Weevil  Confused Flour Beetle  Red Flour Beetle 	Reddish brown to brownish black, 1/8 inch long, flattened with six saw-tooth like projections on thorax. Feeds in a wide variety of stored products, cereals, nuts, dried fruit, cookies, candy, etc. 1/8 inch long, oval, reddish brown, head not visible from above, antennae saw-like. General feeder in tobacco, seasonings especially paprika, cereal, dried flowers and a wide variety of stored foods. 3/8 inch wing span, inner 2/3 of wing grayish, outer 1/3 of wing copper in color. Feeds in coarse grain products, chocolate, nuts, dried fruit. 1/8 inch long. Long snout on head, dark brown with four bright spots on wing cover. Feeds on grains. 1/8 inch long, reddish-brown convex, oval shape, antennae gradually enlarged to end in a club. Cannot fly. Feeds in flour and cereal products. 1/8 inch long, reddish-brown convex oval shape, antennae has a distinct 3-segmented club. Feeds in flour and cereal products.	Locate food source and discard. Place grains, flours, nuts and other stored products in insect-proof containers when they are brought home from store. Pheromone traps can indicate the presence of pests and may provide control without insecticides when populations are low and pests confined. Vacuum cracks and crevices and wipe down pantry to remove pests and food source. Often insecticide applications are NOT necessary.	To prevent infestations: 1) Inspect stored products periodically. 2) Practice good sanitation. 3) Rotate stored product use so older stores are used first and none remain in storage indefinitely. 4) Have adequate ventilation to prevent moisture buildup in storage areas. 5) Use insect-proof package or storage procedures wherever possible. 6) Seal cracks and crevices to reduce pest hiding places in pantry. 7) Pheromone traps can indicate the presence of pests and are available for: Indian meal moth, saw-toothed grain beetle, confused and red flour beetle, cigarette beetle, drugstore beetle, clothes moths and others. See Bean Weevil for non-chemical control.

POWDERPOST AND OTHER WOOD-BORING BEETLES Lyctid powderpost beetle  Anobiid powderpost beetle  Roundheaded borers Old house borers  Others 	Shot-sized holes along with flour-like powder indicate these beetles. Attacks hardwoods such as oak, ash and hickory found in wood paneling, molding, window and door frames, plywood, hardwood floors and furniture. Antennae with 2-segmented club. Head protrudes forward. Reinfests seasoned wood. Attack hardwoods and softwoods. In addition to above, they also attack beams, rafters, joists, studs and other structural framing. Infestations found in moist, poorly ventilated areas such as crawl spaces, basements, etc. Head hidden by pronotum. Reinfest seasoned wood. Presence indicated by large hard-shelled beetles with long feelers. Broadly-oval 1/4 inch emergence hole made by old house borer. Larvae in tunnels packed with frass; three eye spots to left and right of mandibles. Beetle 3/4 inch long, dark brown/black with "V" or "W" shaped markings on wing covers; two bumps on thorax. Reinfests seasoned softwoods (pine). Neat 1/2 inch holes may appear in walls where beetles emerge. Don't usually reinfest seasoned softwoods (pine).	**We do not recommend that homeowners attempt wood-destroying beetle control themselves. Seek a professional!** See POWDERPOST AND OTHER WOOD-BORING BEETLES A Quick Reference Guide to Pesticides for Pest Management Professionals Working in and Around Structures for pesticide suggestions. Any wood-destroying beetle that has pupated before insecticide application may be unaffected and may continue to emerge. Insecticide applications should prevent reinfestation. If an anobiid infestation spread into walls or between floors fumigation may be needed. Fumigation is costly and should only be considered as a last resort. If only small articles infested such as furniture, antiques, etc., they can be fumigated at a lower cost. Only professional pest control operators licensed to fumigate can perform this operation. If all evidence indicates the infestation is localized, wood could be replaced. This is often the option used for lyctids. Watch for new holes in adjacent areas. If crawlspace wood infested with anobiids, decrease moisture in wood through ventilation and moisture barriers. Central heat and air may reduce wood moisture so there is insufficient moisture to support large infestations in living areas. Wood kept below 12 percent moisture should be unsuitable to anobiid powder post beetle reinfestation. Professionals may have a moisture meter.	Determine extent of infestation. Signs for lyctid powderpost beetles are: flour-like frass dropping from pinhead-sized or slightly larger holes, anobiid frass is more gritty than lyctid; adult beetles attracted to light may be found on window sills or foundation vents. Important to determine if infestation active or not. Mark or seal existing holes, vacuum existing sawdust, recheck wood for new holes in spring or early summer. These beetles damage wood slowly. If frass is yellow, caked or covered with dust or debris, that damage is probably old. Old house borers can be detected by hollow sound when wood tapped. Stethoscope can be used to hear large old house borer larvae chewing in spring and summer. Prevention: 1) Don't use old lumber from a barn or wood pile unless it has been treated or kiln-dried. (2) Don't use improperly dried or stored lumber. (3) Inspect firewood prior to bringing into structure. (4) Paint, varnish or otherwise seal wood to prevent exposed edges. (5) Seal previous emergence holes to prevent egg-laying sites. New houses usually infested by use of infested lumber. May also come from firewood. Alternative controls for powder post beetles: small items, such as picture frames, can be heated at 120 to 140 degrees F for six hours to kill existing life stages. Freezing (0 degrees F) infested wood for 72 hours will also kill all life stages.
RATS PB 1868 	Norway rat: 12-18 inches, tail shorter than head and body, body heavy and thick, ears small Roof rat: 12-17 inches, tail longer than head and body, body light and slender, ears larger. Roof rats becoming more common in Shelby County.	When rats are plentiful or where unsanitary conditions exist with shelter, poisoned baits are the best control method. Often community-wide control needed. EPA's final risk mitigation decision requires that all rodenticide bait products for sale to consumers be in tamper-resistant bait stations. Loose bait such as pellets will be prohibited as a bait form.	Exclusion practices needed. Rats can fit through an opening 1/2 inch in diameter. Locate entrance into structure and exclude. Use materials such as galvanized, stainless or other non-rusting metal such as 24-gauge sheet metal or 19-gauge hardware cloth with 1/4 inch or smaller opening; brick, concrete block, tile or glass; steel wool with expandable foam; and

RATS CONTINUED	Young rat: 6-7 inches, feet large, head large House mouse: 6-7 inches, feet small, head small Droppings identification Roof rat: pointed, about 1/2 inch Norway rat: blunt, about 3/4 inch House mouse: pointed, about 1/8 inch		others. Remove debris such as piles of waste lumber or trash, used feed sacks, abandoned large appliances, and wood piles from next to structure. Store pet foods and seed in rodent-proof glass or metal containers. Place snap traps, multiple catch traps and glue boards along paths traveled by rats. Of the snap traps, the expanded trigger trap is the most versatile, since it can be baited. Rats are bait shy. Leave baits in place for at least a week before moving. Place trap 90 degrees to rodent pathway with trigger part of trap against the run. Rodents use edges of walls, studs and pipes as guidelines. Snap traps can be baited with whole nuts; raisins or grapes for roof rats; sardines packed in oil for Norway rats; peanuts or peanut butter; bacon squares; or small wads of cotton. **Area-wide effort may be needed if many rats present.**
SILVERFISH AND FIREBRATS SP 341-O 	Grayish, wingless, rapid-moving insects with three long tails. Feed on starchy materials such as bookbinding, wallpaper, cardboard, etc.	bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU beta-cyfluthrin RTU 0.05% gamma-cyhalothrin RTU 0.025%	Treat cracks and crevices where silverfish and firebrats may dwell. Attics many times source of infestation; treatment in attic often necessary.
SKUNKS PB 1868 	Often, these animals live in the ground around or under homes.	Bac-Azap biological odor control or others can be sprayed to eliminate odors.	Trap and remove skunks from property. Seal the foundation to prevent entry under building.
SNAILS AND SLUGS 	Long, grayish, shiny, soft-bodied creatures. Will attack various plants. Leave slime trails on walks and walls.	Snail and slug killer baits containing metaldehyde or iron phosphate. Do not allow product to contact plant material.	Remove boards and plastic or plant debris and dry, damp areas adjacent to foundation.
SNAKES PB 1868 	Snakes of various kinds, den around or invade homes and other buildings.	Place a pile of cool, damp rags in building where snake was last seen. Snake will be attracted and can be removed. Large glue boards can trap snakes.	Mouse-proof building. Mow lawns and field to control grass, weeds and brush. Remove boards, flat rocks, trash piles and other debris that provide harborage for rodents.

SOWBUGS OR PILLBUGS 	Grayish, hard-shelled, many-legged creatures appear on walks and patios. Pillbugs roll up in ball when disturbed. Occasional invaders.	Chemical control usually not necessary for this pest. If needed, apply to infested areas outdoors around perimeter of structure. This stops any invasion into the house. bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU gamma-cyhalothrin RTU 0.025%	Remove leaf piles, grass clippings, old boards, wood piles and other debris from around foundation. Leave a 12-18-inch plant/mulch-free zone next to foundation base. Use exclusion practices: caulk cracks around foundation and screen vents in foundation. Drain and dry area around house.
SPIDERS or SCORPIONS PB 1193  PB 1191  	Many kinds invade homes, basements and roof overhangs from outdoors. Two spider species most dangerous in Tennessee: **Black Widow**: dark black spider with red hourglass shape on bottom of abdomen. More of an outdoor pest along perimeter of buildings. Use outside perimeter treatment with residuals. **Brown Recluse:** light brown spider, with legs reaching to the size of a quarter or half dollar, dark violin shape on back of front portion of head, three pairs of eyes arranged in a semi-circle. **Quite often a professional pest management company should be used.** **Scorpions:** have eight legs, a pair of large pedipalps to catch prey, and a segmented abdomen that ends in a stinger.	**Residual Sprays in cracks and crevices:** bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU beta-cyfluthrin RTU 0.05% gamma-cyhalothrin RTU 0.025% **Indoor cracks and voids** Cimexa dust	Most species are beneficial organisms because they feed on pest insects. They are occasional invaders that can be vacuumed or swept out the door. Remove wood or mulch piles away from house to lower abundance of their insect food source. Apply insecticides to cracks and crevices in crawl spaces, basements, attic, eaves and outdoor areas of home. Clean up debris where scorpions and spiders hide. Replace outdoor lights with yellow bug lights. Scorpions will fluoresce under a black light, so they and their breeding areas can easily be seen at night. Use glue boards to trap spiders and locate infested areas. Glue boards should be placed against walls and other guidelines where spiders are suspected. Efforts to control brown recluse will cause spiders to become more active. Prevent bites by checking shoes and clothing before wearing, by pulling beds away from walls, and preventing bed skirting and bedspreads from touching the floor.
SPRINGTAILS 	Small, jumping insects with a forked spring mechanism.	Treat entry areas, sills, foundations, soil and cracks where insects are found **(according to label for other perimeter pests):** bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU beta-cyfluthrin RTU 0.05% gamma-cyhalothrin RTU 0.025%	Usually found in moist, decaying vegetation and are incidental invaders into houses. There are a few reports of large populations entering homes. Dry out surrounding landscape, water only in morning, etc.

SUBTERRANEAN TERMITES PB 1344 	Termites invade and eat wood and other cellulose material, causing extensive damage in structural parts of a building. Their presence may not be discovered until they swarm, years after infesting a structure. Workers and soldiers: soft-bodied insects 1/8 to 3/16 inch long. Swarmers are honey-brown, dark brown or black with four nearly equal sized and shaped wings. Swarmers are easily distinguished from winged ants by termites' straight antennae, broadly attached thorax to waist and four nearly equal wings. Inspect for signs of termite infestation: irregular earthen tubes constructed across walls, floors and foundation. Hammer or probe timbers with a sharp instrument. Damaged wood will be soft, channeled, unsound and may possibly reveal the termite infestation itself. Use a moisture meter. Active termites will increase moisture reading relative to uninfested areas. Termites commonly enter homes around doors, wooden steps and porches and unexcavated portions of structures. The easiest access points are where wood is in direct contact with the soil. Occasionally, moisture-damaged wood in roofs can support an aerial infestation. No mud tubes will reach to ground. Attic inspection is important, too.	We do not recommend that homeowners attempt termite control themselves. Seek a professional! See TERMITES, SUBTERRANEAN in A Quick Reference Guide to Pesticides for Pest Management in and Around Structures for pesticide suggestions for the professional to use. Soil treatment: Do not apply near (within 100 feet) any body of water, cistern or well. Nonrepellents: Termites do not detect these insecticides and hence walk over the treated soil. Termiticide may be transferred back to colony. Pyrethroids: In general, this group tends to be repellent, thus treatments must be applied to create a continuous barrier. Wood treatment: Termite galleries and wall voids can be treated. May be used to supplement a soil treatment. Disodium octaborate tetrahydrate (DOT) can be applied by a professional as pretreatment barrier or as a second barrier (see labels for more details). Baits: Termites feed on bait and spread bait to rest of colony to eliminate or suppress it. Baits are used as standalone systems or with a termiticide spray application.	Follow correct construction practices. This is the best protection against a termite infestation: (1) Remove all wood materials from around and under the house; (2) Remove all form boards and construction stakes; (3) Construct a termite-proof foundation; (4) Have at least 30 inches of clearance under buildings; (5) Have proper ventilation and light under all parts of the building; (6) Use a moisture barrier in crawl spaces; (7) Drain water away from building; (8) Have no wood in contact with the ground, or treat those timbers that require ground contact with approved preservatives/borates; (9) Make periodic inspection of buildings. **Find a reputable professional to treat.** Collect some swarmers with wings for identification and vacuum the rest. Leave mud tubes in place until a professional pest control person arrives. Effective control measures for a soil treatment should include: 1) Inspect basement and underside of house thoroughly to determine the area and extent of infestation. 2) Inspect attic for termite tubes and damage to joists, rafters, flooring and stored materials. 3) Disrupt and block all termite tubes (unless baiting). 4) Ditch the entire foundation inside and out and treat the soil replaced in the trenches with chemicals. 5) Repair all foundation and basement floor and wall breaks with rich concrete. 6) Break all wood-soil contacts, treat such areas with chemicals. 7) Treat infested timbers and replace those which are badly infested. 8) Treat hollow spaces in the foundation-concrete blocks, piers, chimney bases, spaces behind brick veneer. Ditch and treat inside of porch foundations, under patios, under concrete slabs and the surface of ground under porches and similar dead places. 9) Provide ventilation and drainage beneath house and porches. 10) Remove all scrap wood from beneath house.

TICKS PB 726 PB 1895 W 826 	Grayish or brown, round, hard-shelled, 6- or 8-legged creatures that invade homes, yards and get on pets and people. Exotic Asian longhorned tick now found in eastern and middle Tennessee counties. Females reproduce without males, have high reproductive potential and short generation times. High number of ticks on animals and in pastures. See tnticks.org for more information.	Insecticide applications are most effective when directed into areas where ticks and their animal hosts are likely to frequent. Pay particular attention to borders and fences between wooded or brushy areas and the lawn, around ornamental plantings, beside foot paths, house and dog house. Allow surface to dry before people or pets have access. bifenthrin 0.2% beta-cyfluthrin 0.05% permethrin 0.5%G gamma-cyhalothrin RTU 0.025% and other synthetic pyrethroids. <u>Indoors for brown dog tick:</u> bifenthrin 0.05% & Zeta-cypermethrin 0.0125% RTU gamma-cyhalothrin RTU 0.025% other pyrethroids <u>Dogs:</u> BioSpot and other permethrin containing spot-ons fipronil (Front Line) spot-ons available from veterinarians collars containing amitraz (don't use around small children or dogs that may chew collar) see pesticide recommendations at https://extension.uga.edu/content/dam/extension/programs-and-services/integrated-pest-management/documents/handbooks/2021-pmh-home-chapters/Animals.pdf for a thorough listing of veterinarian supplied on-pet products.	Nonchemical methods for reducing tick problems include mowing the lawn and controlling weeds. This has three advantages – it lowers the moisture in the grass microclimate and allows sunlight to penetrate, which tends to cause ticks to dry out; it discourages rodents (which may serve as hosts) from nesting; and lastly, because there is less plant matter, less pesticide may be needed if a treatment is necessary. Also, removing debris, weeds or clutter from around the house discourages rodents from nesting. Repair entry points into the house to discourage possible tick hosts from entering. Cracks and crevices, both indoors and out, can be sealed to reduce hiding places for ticks. Inspect and clean pets and their bedding frequently. If bedding is infested, it can be cleaned or destroyed. In the home, ticks stay around baseboards and walls. Use insecticides in cracks and crevices in the home for brown dog tick.
WASPS, HORNETS, YELLOWJACKETS SP 290-A SP 341-M 	Many types build paper and mud nests around homes, in ground or in shrubs.	Bee and wasp killer aerosols tetramethrin aerosols beta-cyfluthrin RTU 0.05% Dusts deltamethrin 0.05% D Apicide (carbaryl 5% D) Victor Yellow Jacket Trap	Wait until dark when wasps return to nest and are slow due to cooler temperatures. Apply insecticides to nest opening and seal nest opening if possible. Remove mud nests in winter to destroy overwintering forms. Traps can be used to reduce foraging yellow jacket populations.

List of Products Available to the General Public, Sorted by Chemical Name

Chemical Name	Trade Name	Website
avermectin (in bait) and hydroprene	Raid Double Control Small Roach Bait Plus Egg Stopper	S.C. Johnson https://www.raid.com/en-us/products
avermectin	Raid Ant Baits$_{III}$	S.C. Johnson https://www.raid.com/en-us/products
acetamiprid	Ortho Home Defense Fly Bait Decal for Windows	The Ortho Group http://www.ortho.com
Bacillus thuringiensis israelensis	Mosquito Bits, Mosquito Dunks	Summit Chemical http://www.summitchemical.com
bifenthrin 0.2%	Hi-Yield Bug Blaster II	VPG https://www.fertilome.com/product/hi-yield-bug-blaster-ii-bifenthrin-24
bifenthrin 2.4%	Ortho Home Defense Max Termite and Destructive Bug Killer Concentrate	The Ortho Group https://www.ortho.com/sites/g/files/oydgjc116/files/asset_files/T020001005_32600_LB7646_090916_cfl%20%281%29.pdf
bifenthrin 0.05% & zeta-cypermethrin 0.0125%	Ortho Home Defense Insect Killer for Indoor and Perimeter$_2$ RTU	The Ortho Group http://www.ortho.com
borax	Terro Ant Killer II	Senoret http://www.terro.com
carbaryl 5% D	Apicide	Mystic Chemical Company http://www.apicide.com
cyfluthrin Ready-to-Spray 0.75%	BioAdvanced Complete Brand Insect Killer for Soil and Turf Ready-to-Spray	SBM Life Science Corp. https://bioadvanced.com/complete-brand-insect-killer-for-soil-and-turf-i.html
beta-cyfluthrin RTU 0.05%	BioAdvanced Complete Brand Insect Killer	SBM Life Science Corp. https://bioadvanced.com/complete-brand-insect-killer.html
deltamethrin 0.02% RTU	Bonide Household Insect Control	Bonide https://bonide.com/
deltamethirn 0.03% RTU	Enforcer BugMax Home Pest Control	Enforcer https://www.kellysolutions.com/ok/showproductinfo.asp?Product_Name=Enforcer+Bugmax+Home+Pest+Control&EPA_Id=40849%2D80
deltamethirn 0.03% RTU	Harris Home Pest Control Stink Bug Killer	Harris https://pfharris.com/products/kudzu-bugs

Chemical Name	Trade Name	Website
deltamethrin 0.05% D	Enforcer BugMax Insect Powder	Zep https://zep2.zep.com/product/enforcer/bugmax-insect-powder
dinotefuran 0.05%	Hot Shot Ultra Clear Roach & Ant Gel Bait	Hot Shot http://www.hotshot.com
dinotefuran 0.05%	Hot Shot Ultra Liquid Ant Bait	Hot Shot http://www.hotshot.com
esfenvalerate	Bengal Insecticide Concentrate	http://www.kellysolutions.com/erenewals/documentsubmit/KellyData/OK/pesticide/Product%20Label/68543/1021%2D1641%2D68543/1021%2D1641%2D68543%5FBengal%5FInsecticide%5FConcentrate%5F5%5F23%5F2016%5F12%5F26%5F38%5FPM%2Epdf
fipronil	Combat bait stations Combat Max 12 Month Roach Killing Bait (bait station)	Combat Insect Control Systems http://www.combatbugs.com
fipronil 0.01%	Combat Roach Killing Bait Strips	Combat Insect Control Systems http://www.combatbugs.com
fipronil	Combat Source Kill Max R3 (Roach Killing Gel)	Combat Insect Control Systems http://www.combatbugs.com
fipronil	Combat Source Kill Max[A1] (Ant Gel)	Combat Insect Control Systems http://www.combatbugs.com
fipronil	Combat Source Kill Max[A2]	Combat Insect Control Systems http://www.combatbugs.com
fipronil	Combat Ant Killing Bait Strips	Combat Insect Control Systems http://www.combatbugs.com
gamma-cyhalothrin 0.025% RTU	Spectracide Bug Stop Home Barrier Indoor Plus Outdoor Insect Control	Spectrum Group, United Industries https://www.spectracide.com/
hydramethylnon	Combat Ant Killing Bait Indoor and Outdoor Use bait stations	Combat Insect Control Systems https://www.combatbugs.com
indoxacarb	HotShot MaxAttrax Ant Bait$_2$	Hot Shot http://www.hotshot.com
indoxacarb	Spectracide Ant Shield Outdoor Killing Stakes	Spectracide http://www.spectracide.com
imidacloprid 2.15%	BioAdvanced Home Pest Roach Killer Gel	SBM Life Science Corp https://www.bioadvanced.com
lambda-cyhalothrin 0.16%	Cutter Backyard Bug Control Spray Concentrate	Cutter http://www.cutterinsectrepellent.com
methoprene	Pre-Strike Mosquito Torpedo	Starbar https://www.starbarproducts.com/products/commercial/pre-strike-mosquito-torpedo

Chemical Name	Trade Name	Website
permethrin 0.5% G	Hi-Yield Kill-A-Bug II Lawn Granules	VPG https://www.fertilome.com/product/kill-a-bug-ii-lawn-granules-20-lbs
0.15% permethrin 0.15% PBO	Black Flag Fogging Insecticide II	http://www.kellysolutions.com/erenewals/documentsubmit/KellyData/OK/pesticide/Product%20Label/53853/1021%2D1866%2D53853/1021%2D1866%2D53853%5FBlack%5FFlag%5FPropane%5FPowered%5FInsect%5FFogger%5F2%5F2%5F2009%5F3%5F44%5F45%5FPM%2Epdf
0.15% permethrin 0.15% PBO	Cutter Backyard Bug Control Fogging Insecticide	United Industries https://www.cutterinsectrepellents.com/
2% permethrin 0.05% pyrirpoxyfen	Bengal Gold Roach Spray	Bengal https://www.bengal.com
0.025% Prallethrin 0.010% Lambda-Cyhalothrin	Spectracide Terminate Termite Killing Foam[2]	Spectrum Group, United Industries http://www.spectracide.com
0.01% pyriproxyfen (Nylar) 0.25% permethrin	Enforcer Flea Spray for Homes	Enforcer http://www.enforcer.com
0.015% pyriproxyfen 0.400% tetramethrin 0.300% phenothrin.	Enforcer Flea Spray For Carpets & Furniture XX (aerosol)	Enforcer http://www.enforcer.com
0.015% pyriproxyfen 0.4% tetramethrin 0.3% sumithrin	Bengal Full Season Flea Killer Plus 2	Bengal Products http://www.bengal.com
pyrethrins 0.03%	Ultra Care Mite and Lice Spray for Birds	http://www.kellysolutions.com/erenewals/documentsubmit/KellyData%5COK/Pesticide/Product%20Label/87703/87703%2D2/UltraCare%5FMite%5F%5F%5FLice%5FBird%5FSpray%5F3%5F16%5F2018%5F10%5F26%5F48%5FAM%2Epdf
0.14% pyrethrum 0.0664% tetramethrin 0.015% pyriproxyfen, others	Raid Flea Killer Plus Carpet and Room Spray	Raid, SC Johnson Brands https://www.raid.com/en-us
silicon dioxide 85%	Hot Shot Bed Bug Killer Dust with Diatomaceous Earth	Hot Shot https://www.hotshot.com/products/bed-bug-control/bed-bug-flea-killing-powder.aspx
silicon dioxide 85% from diatomaceous earth	Garden Safe Crawling Insect Killer	GardenSafe http://www.gardensafe.com
silicon dioxide 85% from diatomaceous earth	Harris Diatomaceous Earth Bed Bug Powder	Harris https://pfharris.com/collections/bed-bug
thiomethoxam	Raid Ant Gel	SC Johnson https://www.raid.com/en-us

Further References for Household Pest Identification:

Manuals:

Bennett, G.W., J.M. Owens, and R.M. Corrigan. 1997. **Truman's Scientific Guide to Pest Control Operations**. 5th edition. Edgell Communications, Duluth, MN

Mallis, A. 1997. **Handbook of Pest Control - the Behavior, Life History and Control of Household Pests**. 8th edition. Franzak and Foster Co. Cleveland, Ohio. (216)961-4130

Koehler, P. **Pests In and Around the Home**. IFAS Publications, P.O. Box 110011, University of Florida, Gainesville, FL 32611- 0011 or (352)392-1764 or if using the World Wide Web http://gnv.ifas.ufl.edu/~entweb/publicat.htm

Handbooks for identification and control of specific pests. These are inexpensive and very useful. Most pesticides mentioned are for professional use.

Hedges, S. Pest Control Technology Field Guide for the Management of Structure-Infesting Ants. Franzak and Foster Co., Cleveland, Ohio.

Hedges, S. Pest Control Technology Field Guide for the Management of Structure-Infesting Flies. Franzak and Foster Co., Cleveland, Ohio.

Hedges, S. Pest Control Technology Field Guide for the Management of Urban Spiders. Franzak and Foster Co., Cleveland, Ohio.

Hedges, S. and M. Lacey. Structure-Infesting Beetles. Volume 1: Hide and Carpet beetles/Wood- Boring Beetles .Franzak and Foster Co., Cleveland, Ohio.

Hedges, S. and M. Lacey. Structure-Infesting Beetles. Volume 2: Stored Product Beetles/Occasional and Overwintering Beetles. Stoy Franzak and Foster Co., Cleveland, Ohio.

Smith, E and R. Whitman. 1992. NPCA Field Guide to Structural Pests. NPCA, Dunn Loring, VA.

Images from
University of Florida Featured Creatures, dark-winged fungus gnat, tropical fowl mite, pillbug (http://entnemdept.ufl.edu/creatures/)
University of Kentucky, chigger (https://entomology.ca.uky.edu/ef630)
Russ Ottens, University of Georgia, Bugwood.org (kudzu bug),
Pictorial Keys to Arthropods, Reptiles, Birds, and Mammals of Public Health Significance (https://www.cdc.gov/nceh/ehs/publications/pictorial_keys.htm),
Insects in Oregon (https://www.oregon.gov/ODA/shared/Documents/Publications/IPPM/InsectsInOregon.pdf fruit fly),
Utah Pests Fact Sheet Brown Marmorated Stink Bug (https://digitalcommons.usu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2785&context=extension_curall) and
Insect and Mite Pests in Food (https://www.ars.usda.gov/ARSUserFiles/2863/pdfdocuments/Gorham%201991%20V2.pdf).

PRECAUTIONARY STATEMENT

To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store, or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label and registered for use in your state.

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DISCLAIMER STATEMENT

This publication contains pesticide recommendations that are subject to change at any time. The recommendations in this publication are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The label takes precedence over the recommendations found in this publication. Use of trade or brand names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others which may be of similar, suitable composition, nor does it guarantee or warrant the standard of the product. The author(s), The University of Tennessee Institute of Agriculture and the University of Tennessee Extension assume no liability resulting from the use of these recommendations.

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