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HOUSEHOLD AND STRUCTURAL INSECT CONTROL

DOCUMENT PEST IDENTIFICATION AND HABITS

It is important that pests be accurately identified. An Extension specialist's recommendation(s) for chemical and non-chemical pest control is largely dependent on the pest's identification and a full description of the circumstances surrounding its collection and appearance—i.e., its habits, food, description, where it was found, and what it was found infesting (if anything). In some cases, the chemical control of pests is not needed and of no use. In other cases, only pesticides will solve the problem. Many cases, however, require a combination of both chemical and non-chemical control techniques.

Contact your Cooperative Extension county agent for help in identifying specimens. Call 1-800-ASK-UGA1 to reach your local agent. An Extension agent can identify samples by visual observation or by looking at a photograph. If the homeowner has access to a digital camera, photographs can be taken and emailed to UGA Extension for immediate identification. Specimens can also be collected, placed in a leak-proof vial filled with rubbing alcohol, and mailed to the nearest county Cooperative Extension office.

For help in identifying your pest, see *Management of Pest Insects in and Around the Home* (bulletin #1412) at **extension.uga.edu/publications**.

HIRING A PROFESSIONAL PEST CONTROL COMPANY

It is often best to hire a professional pest control company to tackle pest control problems. It is especially important to select a company committed to customer service, especially if the homeowner is considering entering a long-term service contract. Tips on hiring a pest control company include:

- Ask friends, neighbors, and co-workers about their experiences and interactions with pest control companies. Selecting a professional pest control company is not unlike selecting other service providers, such as electricians and plumbers. Consistently good recommendations are still the most reliable means of selecting a quality pest control professional.
- Avoid selecting a company based solely on an advertisement. Furthermore, do not hire a pest control company based on treatment price alone; a variety of factors should be considered when deciding which company to hire.
- Contact the appropriate state regulatory agency to ensure that prospective companies are licensed. In Georgia, the Department of Agriculture: **www.agr.state.ga.us** is the agency that regulates the pest control industry.
- Ask prospective companies to describe their commitment to the continuing education of their pest control technicians. Although all technicians in Georgia are required to attend state-approved continuing education seminars, some companies provide in-house training or send their employees to university- or state-sponsored training programs and workshops that are above and beyond what is required by the state.
- Ask prospective companies whether they are a member of their state and/or national pest control organization(s). Membership in these organizations suggests that the firm is well-established and that the owners are active in their profession. Membership also suggests that owners and managers attend national and state conferences where insight into key issues facing the pest control industry are highlighted and discussed, and the most recent findings on pest control research and application technology are presented.

HOMEOWNERS AND TERMITE CONTROL

Homeowners should not attempt to self-treat their home for an existing termite infestation. The treatment techniques, products, and equipment needed to rid a home of termites are available only by hiring a professional. The most important challenge confronting anyone attempting to control termites lies in locating and properly treating the area(s) where termites are entering the structure. This goal can best be accomplished by a professional. To learn more about subterranean termites and their control, see Georgia Cooperative Extension publications at extension.uga.edu/publications.

WHERE TO TREAT

Before selecting chemically based pest control measures (see the following tables), a thorough inspection of the

outdoor and/or indoor premises should be conducted to determine the extent of the infestation and to highlight areas where control approaches should be focused. Many indoor infestations of urban pests can be tracked to areas of pest activity (harborage) on the outside of the structure, while still other pests are found only indoors.

MOISTURE MANAGEMENT

Excessive moisture is the most important condition conducive to pest infestation in and around the house. Since all life forms are dependent on moisture, its excess not only attracts pests but allows them to thrive. Common sources of excessive moisture include improper grade/drainage; standing water in the crawlspace; broken drainpipes; roof leaks; interior plumbing leaks; improperly installed flashing around fireplaces, windows, and doors; improper ventilation in the crawlspace; lack of a vapor barrier in the crawlspace; misdirected sprinklers; clogged gutters and downspouts; and downspout exhausts within 5 feet of the structure.

The property owner should ensure that water flows away from structure (i.e., grade is appropriate and gutters and downspouts are operating properly), that the structure is properly ventilated, that water leaks are fixed in a timely manner, and that a vapor barrier is in place in the crawlspace. Homeowners should keep groundcovers, shrubs, vines, and mulch several feet away from outside foundation walls as these horticultural practices often hold excessive moisture close to the structure. For instance, mulch retains moisture in the soil, thereby creating a zone that provides the high-moisture conditions urban pests need to explore and thrive. Although no scientific data specifically addresses the effect that mulch has on pest infestation rates, it is known that mulch placed against a structure's outside walls allows pests easy access.

HOW TO USE VARIOUS PRODUCT TYPES

(See also bulletin #1352, *Insecticide Basics for the Pest Management Professional*, at **extension.uga.edu/publications**.)

BAIT PRODUCTS

Over-the-counter bait products are generally limited to ant, cockroach, rat, and mouse control, and can be used both inside and outside the home. Baits are available in the form of gels/pastes, granules, liquids, stations, or blocks, and most come ready-to-use. Baits kill pests only after being consumed. They are comprised of an active ingredient incorporated into a food source that is preferred by the target species. Since baits contain food materials, they are susceptible to spoilage; read the product's label to determine if the bait has an expiration date. Baits are target-specific, and thus considered more environmentally sensitive than other chemically based control tactics.

When baiting for ants, place baits where ants are seen foraging (inside and/or outside structures) and, if possible, always in the shade when baiting outdoors. Ants do not forage in the direct sun or during the heat of the day but may be found foraging in the same area in shaded locations. It is often advantageous to use several different baits at the same time to discover one that ants will readily consume, since no single bait is consistently eaten by all ant species. Control of ants with bait products can only be achieved if they consume the bait. Baiting species whose colonies are comprised of a large number of ants (such as Argentine ants) requires that a large quantity of bait be offered. In these cases, place several dozen baits or, no matter the type of bait used, throughout the areas where ants are seen. Granular baits, which should only be used outdoors, should be delivered from a number of small piles about the size of a quarter placed on the ground in areas where ants have been seen. During drought or extended periods of moisture stress, liquid baits may be used inside and outside to take advantage of the ants' natural propensity for sweet liquids. To use liquid baits, completely soak a small cotton ball with liquid bait and place it on a piece of foil or wax paper in areas where ants have been seen. Add water every 1–2 days to "recharge" the liquid bait.

When baiting for cockroaches use gel/paste baits and/or bait stations.

When treating for rats and mice use block and/or throw packages of bait granules. Indoors (i.e., for German cockroaches), use a combination of sticky traps (no toxicant) and gel/paste baits and/or bait stations placed throughout each room where German cockroaches are found. German cockroaches are most common in the kitchen, requiring 12–15 strategically placed bait stations in cases of severe infestation. Additionally, gel/paste bait may be used by placing small dabs about the size of a pencil eraser in hidden locations (up to 2–3 dozen sites per baiting). Each dab should be placed in an out-of-sight crack, crevice, or corner where cockroaches live. Whether using gel/ paste bait and/or bait stations, it is often advantageous to introduce a large

number of bait placements throughout the baited room since cockroaches generally do not move far from the areas where they live.

Place baits on flat surfaces in dark locations in corners (e.g., in cabinets and drawers) and along walls. Since research shows that most German cockroaches are found near the garbage can, refrigerator, and under the stove and sink, concentrate bait placement in these areas. Never hang stations vertically or otherwise bait vertically, and never place baits in the middle of a floor or cabinet. Ten to twelve sticky traps can be placed in locations similar to that of baits, checked weekly for the presence of cockroaches and replaced as needed. Since German cockroaches do not move far, traps that consistently catch the largest number of cockroaches often highlight focal points of cockroach infestation.

For large cockroach species (i.e., American, Oriental, and smokybrown) use mainly gel/paste baits. Place bait wherever cockroaches are seen foraging, particularly at night. The breeding site of large cockroach species are those locations characterized by a protected, moist environment—typically crawlspaces or attics with a moisture problem, or outdoors in clogged rain gutters, tree holes, decorative crossties, hollow retaining walls, and similarly protected habitats. Concentrate gel/paste baiting in these areas. Again, it is most advantageous to introduce a large number of small bait placements since cockroaches generally do not move very far from the areas where they live.

GRANULAR PRODUCTS

Granulars are formed by impregnating or coating insecticide onto a small granule of a non-active carrier (e.g., clay, corncob, sand, silica, clay, or sawdust). Granules are applied only on the outside of buildings and are used to control a wide variety of crawling pests by application to places pests live—such as mulch, leaf litter, and lawn. Granular products are sometimes purchased in large bags as a ready-to-use product.

After application, the insecticide is released from the granule by allowing water to wash over it. Thus, granular activation requires lawn-watering or natural rain. Unlike liquid sprays, granular products may remain active for 6–8 weeks. Like liquid sprays, granular products kill pests that come in contact with them and also act as repellants by keeping foraging pests out of treated areas.

The weight of granular products allows the chemical to reach deeper into treated areas than would be expected from a liquid spray treatment applied directly to the surface of the same substrate.

It is important to note that pests do not eat granular products, as they do some baits that are delivered as small granules. In fact, a granular product is never a bait, but bait can be delivered in the form of a granule.

DUST PRODUCTS

Dust products have the consistency, look, and feel of powder. They are purchased ready-to-use and are applied dry. Dusts are comprised of small particles of active ingredient mixed with equivalently small particles of an inactive carrier material such as talc or clay. Most dusts work because insects ingest the minute particles. Others dusts severely desiccate the insect, causing it to dehydrate and die.

To remedy existing pest problems indoors and to prevent the reinvasion of pests into voids from the outside, dusts should be used only in dry voids, such as behind brick veneer, drywall, electrical switch-plates, and synthetic stucco. For example, if ants can be seen coming from an electrical switch-plate, a small quantity of dust can be applied behind the plate.

Many homeowners make the mistake of over-applying dust. Too much can be repellent, causing insects to avoid dusted areas. Apply dusts so that a very thin film settles in treated voids and on treated surfaces. Ideally, the quantity of dust applied should be only slightly visible in comparison to undusted areas. Some dusts never degrade, while others remain effective for up to a year.

Some dusts contain a high concentration of active ingredient and should never be applied where they can injure or sicken non-target organisms, including the applicator. Misapplication of dusts can result in unnecessary exposure through accidental inhalation. Since dusts are easily airborne, it is advisable to always wear a protective mask and eye protection when applying them.

AEROSOL AND FOGGER PRODUCTS

The contents of aerosol cans and total release aerosol foggers are pressurized, usually contain a propellant and the pesticide(s), and emerge as a fine mist or smoke (i.e., microscopic droplets). Aerosol cans are very popular among homeowners because they result in "revenge"

killing—i.e., direct spraying and the immediate knockdown and killing of the target pest. Although aerosol cans may be effective in the short-term, they should not be relied upon as the sole means of chemical pest control in and around the home.

Some aerosol cans shoot their contents in a jet stream and are a good choice when there is a need to treat pests from a distance (e.g., yellow jackets). Although aerosol cans may be used both indoors and outdoors, the use of foggers is restricted to indoor use, especially when treatment requires that a room is filled with the pesticide for an extended period of time.

If aerosols are used indoors, never use them in voids or near fires. Wet formulations not only damage drywall, insulation, and wood molding, but there is also a danger of electrical shock and/or fire when using liquids around electricity. Furthermore, many aerosols and foggers are flammable.

LIQUID SPRAY PRODUCTS

Liquid spray products most commonly available to homeowners are emulsifiable concentrates (ECs). Emulsifiable concentrates are available as both concentrates that must be diluted with water before use and ready-to-use products that don't require further dilution, and usually come in 1-gallon jugs.

Emulsifiable concentrates are composed of an insecticide dissolved in a petroleum-based solvent, which when mixed with water, forms a milky-white emulsion that can be sprayed. Emulsifiable concentrates do not require shaking. The main hazard with undiluted emulsifiable concentrates is that they are readily absorbed by any unprotected skin.

They do, however, protect against inhalation hazards. Emulsifiable concentrates are readily absorbed by porous materials, making them suitable for treating porous substrates, such as concrete, brick, unpainted wood, and mulch.

Liquid spray treatments are commonly applied to the outside of infested homes in either of two ways. To conduct a perimeter treatment, spray the outside walls 2–3 feet high and spray the ground (including shrubbery, mulch, flower beds, etc.) several feet away from each wall around the entire perimeter of the home. Spray as many areas where pests live or have potentially traveled as possible. Concentrate spray treatments to areas where pests might enter the structure, such as around doors and windows, inside weep holes, and inside wall penetrations such as gas, plumbing, and exhaust pipes.

Perimeter treatments should be reapplied every 4–6 weeks during the summer and within a week following heavy rain. Perimeter treatments may require up to 10 gallons of spray, depending on the size of the structure treated.

SPOT TREATMENTS

Spot treatments are limited to those areas where pests are found living and breeding. Typically, no spot requires more than a quart or so of spray—sometimes less, depending on the severity of the pest infestation. When spot treating, only those areas considered nests and/ or breeding sites or areas where pests are found entering the structure are treated. Breeding sites should be exposed prior to treatment. For example, exposure of breeding sites in mulch can be accomplished by pulling back the mulch with a stiff rake or similar instrument held in one hand while treating exposed nest sites with the other.

Unfortunately, research has shown that liquid-based spray treatments applied outdoors provide only about 30 days of relief against invading pests. Many sprays break down quickly when exposed to intense sunlight, heat, and moisture.

HOW TO USE THIS TABLE

Use of the following table is based on proper identification of the pest—see previous section, Document Pest Identification and Habits. See the publication *Management of Pest Insects in and Around the Home* (bulletin #1412) at extension.uga.edu/publications for a list of 75 pests, with color photographs, found in and around the home. Once the pest has been identified, locate its name in the table. The table provides a list of product types and names available to homeowners at home improvement, grocery, and consumer warehouses. For additional help, the previous section, How to Use Various Product Types, provides tips and recommendations on how to use the products listed in the table. **Additional information on urban and structural pest biology and control can be found by searching extension.uga.edu/publications.**

PEST	PRODUCT TYPE	*% ACTIVE INGREDIENT* PRODUCT NAME
Ants (including Argentine [i.e., "sugar" ants], odorous house ants and rover ants) Bait both indoors and outdoors at the same time if ants are found in both areas. Often, indoor ant problems originate outdoors. Indoors, bait wherever ants are seen with bait gel, liquid, and stations. Do not use bait granules, sprays, or granulars indoors. If ants are found outdoors, use baits wherever ants are seen (especially next to trails). Use all types of bait products listed. If baiting is not successful within 1 week, apply a perimeter spray and/or spot-treat outside windows, doors, and nest sites. In addition, apply a granular to soil/mulch where ants nest. TIP: The application of many small gel bait spots is preferred to the application of a few large bait spots. If feasible, apply baits in shaded areas. TIP: After applications of granulars, water thoroughly.	Bait Gel	0.05% *dinotefuran* Hot Shot Ultra Clear Roach and Ant Gel
		0.003% *thiamethoxam* Raid Ant Gel Precision Placement Bait
		0.001% *fipronil* Combat Max Ant Killing Gel
	Bait Granules	0.88% *hydramethylnon* Amdro Ant Block Home Perimeter Ant Bait
	Bait Liquid	5.4% *borax* Terro Liquid Ant Bait
		0.05% *dinotefuran* Hot Shot Ultra Liquid Ant Bait
	Bait Station	0.05% *indoxacarb* Spectracide Ant Shield Stakes
		0.05% *indoxacarb* Hot Shot MaxAttrax Ant Bait2
		0.01% *avermectin B1* Raid Ant Baits III
		0.05% *avermectin B1* Raid Max Double Control Ant Baits
	Sprays	*Various active ingredients* Any ready-to-use or concentrated liquid spray labeled for this pest(s).
Bedbugs Capture several bugs, place them in a vial filled with alcohol, and acquire positive identification from an entomologist. If a positive ID is made, contact a pest control professional skilled and experienced in the treatment and elimination of bedbug infestations. Bedbug elimination is very difficult and should be left to an experienced individual. For more information: See publications, Bed Bugs, at entomology.ca.uky.edu/ef636, and Management of Pest Insects in and Around the Home (bulletin #1412) at extension.uga.edu/publications.	Contact Sprays	0.10% *geranial* and 0.20% *cedar oi*l EcoRaider (available on-line; apply directly to live bed bugs)
		3% *lemongrass oil*; 0.75% *cornmint oil* EcoLogic Bed Bug Killer Aerosol (apply directly to live bed bugs)
		cinnamon, geraniol, castor, cornmint, clove Ortho Home Defense Bed Bug Killer with Essential Oils (apply directly to live bed bugs)
	Traps	Blackout Bed Bug Detector (available online). Install and check every 2 weeks for 6 weeks. If no bugs are trapped after 6 weeks, it's a reasonable expectation that the site is bed bug free. Ortho Home Defense Bed Bug Trap (contains aggregation pheromone)

PEST	PRODUCT TYPE	% ACTIVE INGREDIENT PRODUCT NAME
Booklice (Psocids) **Indoors**: The presence of booklice is an indication of excessive moisture. Psocids feed on fungi and mold that grow on substrates such as books, paper, and cardboard. Fungi thrive only in environments where humidity is excessive. As a result, the ultimate remedy to infestation is a reduction in humidity (see section on Moisture Management). **Outdoors**: No treatment needed. See publication *Management of Pest Insects in and Around the Home* (bulletin #1412) at extension.uga.edu/publications.	None	None
Carpenter Ants **Indoors**: At night, when ants are most active, provide them bait. Use any of the gel, liquid, or station baits listed until one is found that the ants will consume. **Outdoors**: Find nests at night—look for trails of big, black ants, especially on the trunk of large trees. If nests are found (they'll most likely be in trees), drench with a liquid spray if feasible. If nests are not found, or treatment is not feasible, at night (when ants are most active), provide them any of the baits listed until one is found that the ants will consume. Place bait next to ant trails. For more information: See publication, *Biology and Management of Carpenter Ants* at **extension.uga.edu/publications**.	Bait Gel	0.05% *dinotefuran* Hot Shot Ultra Clear Roach and Ant Gel
		0.003% *thiamethoxam* Raid Ant Gel Precision Placement Bait
	Bait Granules	0.88% *hydramethylnon* Amdro Ant Block Home Perimeter Ant Bait
	Bait Liquid	5.4% *borax* Terro Liquid Ant Bait
		0.05% *dinotefuran* Hot Shot Ultra Liquid Ant Bait
	Sprays	*Various active ingredients* Any ready-to-use or concentrated liquid spray labeled for this pest(s).
Carpenter Bees **Indoors**: No treatment needed. **Outdoors**: Apply spray or jet aerosol directly into carpenter bee holes. Begin treatment when bees are first seen (March in Georgia). Re-treat every 2 weeks while bees are active. In August, or when all bees have left their nest sites, fill holes with wood filler, sand, and paint, or apply another finish; replace damaged wood as necessary. NOTE: Many over-the-counter insecticides are toxic to all types of bees.	Sprays	*Various active ingredients* Any ready-to-use or concentrated liquid spray labeled for this pest(s).
	Jet Aerosol	*Various active ingredients* Any jet-spray aerosol product that shoots 20–25 feet.
	Foam	0.025% *prallethrin* and 0.01% *lambda-cyhalothrin* Spectracide Carpenter Bee and Yellow Jacket Foam
		0.005% *fipronil* Amdro Carpenter Bee, Ant, and Termite Killer Foam
Carpet Beetles **Indoors**: Find infested article(s) and remove; spot-treat infested area (especially the floor) with a spray while freezing or fumigating article(s); return article(s) and watch for re-infestation. **Outdoors**: No treatment needed. See publication *Management of Pest Insects in and Around the Home* (bulletin #1412) at **extension.uga.edu/publications**.	Sprays	*Various active ingredients* Any ready-to-use or concentrated liquid spray labeled for this pest(s).

PEST	PRODUCT TYPE	% ACTIVE INGREDIENT PRODUCT NAME
Cockroaches **Indoors** (German cockroaches): Use gel baits, bait stations, and sticky traps in areas (mainly kitchen) where German cockroaches are found. In cases of extreme infestation, use a fogger or spray into cracks and crevices where cockroaches live. For details, read about baiting for cockroaches under "How to Use Various Product Types." **Outdoors** (Smokybrown cockroaches): Use gel baits in areas where cockroaches are found (attics, crawlspaces, tree holes, hollow walls, and other voids outdoors). If bait is not effective, spot-treat same areas with a spray. For details, read about baiting for cockroaches under "How to Use Various Product Types." TIP: When using gel baits, the application of many small bait spots is preferred to the application of a few large bait spots. See publication *Management of Pest Insects in and Around the Home* (bulletin #1412) at **extension.uga.edu/publications**.	Bait Gel	0.01% *fipronil* Combat Max Roach Killing Gel
		0.05% *dinotefuran* Hot Shot Ultra Clear Roach and Ant Gel
		0.30% *indoxacarb* Raid Roach Gel
		40% *boric acid* Harris Famous Roach Tablets
	Bait Station	0.03% *fipronil* Combat Max Roach Killing Baits
		0.05% *avermectin B1* Raid Double Control Roach Baits
	Sprays	*Various active ingredients* Any ready-to-use or concentrated liquid spray labeled for this pest(s).
		2% *permethrin* and 0.05% *pyrirpoxyfen* Bengal Gold Roach Spray (aerosol can)
	Traps	Black Flag Roach Motel
Fire Ants **Indoors**: No treatment needed. **Outdoors**: Spread bait granules in late afternoon, when temperatures have cooled, and the ground is dry, to entire yard or sprinkle one handful around (not on top of) the perimeter of each active mound; 10–14 days later, if active mounds remain, either apply granular to entire yard, or treat individual mounds with dust. For more information: See publication, *Managing Imported Fire Ants in Urban Areas* at **extension.uga.edu/publications**. TIP: After applications of granulars, water thoroughly.	Bait Granules	0.036% *hydramethylnon* and 0.0172% *methoprene* Amdro Kills Fire Ants Yard Treatment
		0.73% *hydramethylnon* Amdro Fire Ant Bait Kills Fire Ants
		0.016% *indoxacarb* Spectracide One-Shot Fire Ant Killer
Fleas **Indoors**: Spray small areas (spot treat) or rooms where pets spend the most time. Use products containing pyriproxyfen or methoprene. Concurrently, treat animals with one product containing either lufenuron or imidacloprid or fipronil. Keep pet resting areas clean. **Outdoors**: Concurrent with the above actions, spot-treat infested areas with spray or apply granulars to areas where pets spend the most time. For more information: See publication, *Fleas and the PCO*, and *Management of Pest Insects in and Around the Home* (bulletin #1412) at **extension.uga.edu/publications**. TIP: After application of granulars, water thoroughly.	Sprays	*Various active ingredients* Any ready-to-use or concentrated liquid spray labeled for this pest(s).
	Aerosol Can	0.015% *pyriproxyfen*, 0.40% *tetramethrin*, and 0.30% *sumithrin* Bengal Full Season Flea Killer Plus
		0.14% *pyrethrins*, 0.063% *tetramethrin*, and 0.015% *methoprene* Raid Flea Killer Plus Carpet and Room Spray
		0.005% *gamma-cyhalothrin*; 0.015% *pyriproxyfen* Black Flag Flea and Tick Aerosol
	RTU Spray	0.01% *lambda-cyhalothrin*; 0.01% *pyriproxyfen* Black Flag Flea and Tick Spray Home Treatment
		0.160% *lambda-cyhalothrin*; 0.125% *pyriproxyfen* Black Flag Flea and Tick Yard Treatment
	Trap	Terro Flea Trap (Use as detection device only; trap use alone will not reduce a pest's population.)

PEST	PRODUCT TYPE	% ACTIVE INGREDIENT PRODUCT NAME
Flies **Indoors**: Eliminate fly breeding sites. To reduce adult fly populations indoors, use a fogger (keep all doors and windows closed) or trap. **Outdoors**: Find fly breeding site(s) and eliminate. See publication *Management of Pest Insects in and Around the Home* (bulletin #1412) at **extension.uga.edu/publications**.	Traps	Rescue Fly Trap
		Raid Fly Ribbon
		Black Flag Fly Paper
		Terro Fruit Fly Trap
		Black Flag Disposable Fly Trap
		Eliminator Fly Stick
Multicolored Asian Lady Beetle Before lady beetles begin to seek refuge indoors (October & November in Georgia), take action to seal all cracks that are ⅛ inch wide or wider, and apply a spray around all potential entry points. Reapply treatment every 2 weeks through the end of November. It is often best to seek help and advice from a professional pest control operator experienced in lady beetle control. Contact should be made in August or September so that preventative measures are in place before the onset of beetle migration indoors. If beetles get inside, the best solution is to vacuum them; insecticide treatments indoors are not recommended. For more information: See publication, *Multicolored Asian Lady Beetle*, at **https://ipm.osu.edu/popular-projects/lady-beetle-information**	Sprays	*Various active ingredients* Any ready-to-use or concentrated liquid spray labeled for this pest(s).
Perimeter Pests: Boxelder Bugs, Brown Marmorated Stink Bugs, Centipedes, Crickets, Earwigs, Grasshoppers, Ground Beetles, Kudzu Bugs, Millipedes, Pillbugs, Scorpions, Scuds, Sowbugs, Crawling Spiders, and Springtails **Indoors**: No treatment needed. **Outdoors**: Apply granulars to soil/mulch where these pests live and breed. If granulars are ineffective, apply a complete perimeter spray, or spot-treat around windows, doors, and other potential entry points. Place glue boards along the wall-floor interface to trap these pests as they enter. TIP: Reduce moisture in areas where these pests live by directing water away from the house and keeping mulch to a reasonable depth. See the previous section on Moisture Management. Avoid excessive accumulations of leaf litter and all other forms of debris. Store firewood away from the house. Be sure that all exterior doors are equipped with operative door sweeps. TIP: After applying granulars, water thoroughly. See publication *Management of Pest Insects in and Around the Home* (bulletin #1412) at **extension.uga.edu/publications**.	Sprays	*Various active ingredients* Any ready-to-use or concentrated liquid spray labeled for this pest(s).
	Glue Board	Tomcat Household Pest Glue Board
		Real Kill Household Pest Glue Boards
		Victor Hold-Fast Glue Boards
Rats and Mice **Indoor and/or Outdoor**: Bait trap with food that rats and mice like. If food baiting is ineffective, try placing a piece of cotton or several strips of yarn on the trap that these vertebrates will use to line their nest. Place snap traps out of reach of toddlers and young children to avoid injury to fingers. TIP: Place traps along routes that these pests use most.	Snap Traps	None Victor Snap Traps for Mice and Rats
		None Tomcat Snap Traps for Mice and Rats
	Glue Boards and Baits	Not Recommended. Glue boards are inhumane and homeowners have no control over where rodents finally succumb to bait, sometimes resulting in foul smells and/or secondary pest problems, such as flies and carpet beetles.

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PEST	PRODUCT TYPE	% ACTIVE INGREDIENT PRODUCT NAME
Silverfish and Firebrats **Indoors**: With a spray, spot-treat areas where these insects live. **Outdoors**: No treatment needed. See publication *Management of Pest Insects in and Around the Home* (bulletin #1412) at **extension.uga.edu/publications**	Sprays	*Various active ingredients* Any ready-to-use or concentrated liquid spray labeled for this pest(s).
Spiders (Web-Building) **Indoors**: Use a broom and remove spiders and cobwebs without pesticide use. **Outdoors**: Spray areas where spiders live; spray spiders directly. Use long broom and remove spiders and cobwebs without pesticide use. NOTE: Brown recluse spiders do not build webs. Their occurrence in Georgia is limited and largely unknown (see **spiders.ucr.edu**). Control of brown recluse spiders should be conducted only by a licensed pest control firm. If an infestation is suspected, collect a spider and submit to a Cooperative Extension county agent for verification.	Sprays	*Various active ingredients* Any ready-to-use or concentrated liquid spray labeled for this pest(s).
Stored Product Pests **Indoors**: Find spilled and/or infested food (cereal, bird food, etc.) and throw away. Only rarely is pesticide use needed. Place traps in area(s) where moths are seen. **Outdoors**: No treatment needed. See publications at **extension.uga.edu/publications**: *Stored Product Pests in the Home* (bulletin #1378) and *Management of Pest Insects in and Around the Home* (bulletin #1412)	Trap	*Active ingredient is a sex pheromone.* Black Flag Pantry Pest Trap
Subterranean Termites Seek help from a professional termite control company. Do not attempt to treat your own home for termites. The products and treatment equipment needed are not available to the novice. For more information: See *Termite Control Services: Information for the Georgia Property Owner, Biology of Subterranean Termites in the Eastern United States, and Management of Pest Insects in and Around the Home* (bulletin #1412) at **extension.uga.edu/publications**.	Liquid Sprays	18.4% *chlorantraniliprole* Altriset (See **altriset.com** for more information)
		75% *imidacloprid* (0.05% or 0.10% application rate) Premise 75WP (See **backedbybayer.com** for more information.)
		9.1% *fipronil* (0.06% or 0.125% application rate) Termidor SC (See **termidorhome.com** for more information.)
	Bait	0.50% *novaluron* Trelona ATBS (sold to homeowners on-line) Exterra (Isopthor/Labyrinth) (sold to homeowners on-line) (See **ensystex.com** for more information).
		0.50% *noviflumuron* Sentricon/Always Active (not sold to homeowners; see **sentricon.com** for more information).
		0.50% *hexaflumuron* HexPro/Shatter (sold to homeowners on-line; see **dowagro.com/hexpro** for more information). Spectracide Terminate (sold to homeowners OTC)

PEST	PRODUCT TYPE	% ACTIVE INGREDIENT PRODUCT NAME
Wasps, Hornets & Yellow Jackets **Indoors and Outdoors**: Treat nest entrance with jet-stream aerosol spray. Treat at night when insects are least active. If apprehensive, please seek help from a professional pest control company. In the case of yellow jackets, if the nest cannot be found, traps can be placed in areas where yellow jackets forage. It should be noted, however, that research has demonstrated that yellow jacket traps have little to no impact on population reduction. NOTE: A mistake during treatment can result in hospitalization or even death from excessive wasp stings. See publication *Management of Pest Insects in and Around the Home* (bulletin #1412) at **extension.uga.edu/publications**.	Foam	0.025% *prallethrin*; 0.01% *lambda-cyhalothrin* Spectracide Carpenter Bee and Yellow Jacket Foam
		0.02% *prallethrin*; 0.04% *cypermethrin* Black Flag Foaming Wasp and Hornet Killer
		0.005% *fipronil* Amdro Carpenter Bee, Ant, and Termite Killer Foam
	Jet Aerosol	*Various active ingredients* Any jet-spray aerosol product that shoots 20–25 feet.
	Trap	None Rescue Yellow Jacket Trap (disposable)
		None Rescue Trap—W.H.Y. (reusable)
		None Eliminator Yellow Jacket, Wasp and Hornet Trap
Wood-Infesting Beetles Control recommendations, if they are needed, are dependent on whether the infestation is active and, if so, then upon a positive beetle identification, preferably by an entomologist. If treatment is deemed necessary, seek help from a professional termite control company. *Sulfuryl fluoride is a restricted use material that is available for sale and use only to licensed professionals trained in the use of gas fumigants. This reference is provided for informational purposes only. See publication *Management of Pest Insects in and Around the Home* (bulletin #1412) at **extension.uga.edu/publications**	Wood Treatment (preventative)	40% *disodium octoborate tetrahydrate* Bora-Care (available to homeowners on-line) (See nisuscorp.com for more information).
	Fumigant* (remedial only)	99.8% *sulfuryl fluoride* Vikane (See **vikanefumigant.com** for more information) For Old House Borers use 4X the drywood termite rate. For Powderpost Beetles and Death Watch Beetles use 10X the drywood termite rate. NOT available to homeowners.

HOUSEHOLD PESTICIDE DILUTION TABLE

PESTICIDE FORMULATION	(Amount of Pesticide Formulation for One Gallon of Water) PERCENTAGE OF ACTUAL CHEMICAL WANTED IN MIXTURE								
	0.0313%	0.0625%	0.125%	0.25%	0.5%	1.0%	20%	20%	50%
15% WP	2 ½ tsp	5 tsp	10 tsp	7 Tbsp	1 cup	2 cups	4 cups	6 cups	10 cups
25% WP	1 ½ tsp	3 tsp	6 tsp	12 tsp	8 Tbsp	1 cup	2 cups	3 cups	5 cups
40% WP	1 tsp	2 tsp	4 tsp	8 tsp	5 Tbsp	10 Tbsp	1 ¼ cups	2 cups	3 ¼ cups
50% WP	¾ tsp	1 ½ tsp	3 tsp	6 tsp	4 Tbsp	8 Tbsp	1 cup	1 ½ cups	2 ½ cups
75% WP	½ tsp	1 tsp	2 tsp	4 tsp	8 tsp	5 Tbsp	10 Tbsp	1 cup	2 cups
EMULSIFIABLE CONCENTRATE (EC)*									
10%–12% EC 1 lb actual/gal	2 tsp	4 tsp	8 tsp	16 tsp	10 Tbsp	⅔ pt	1 ⅓ pts	1 qt	3 ¼ pts
15%–20% EC 1.5 lb actual/gal	1 ½ tsp	3 tsp	6 tsp	12 tsp	7 ¼ Tbsp	½ pt	1 pt	1 ½ pts	2 ½ pts
25% EC 2 lb actual/gal	1 tsp	2 tsp	4 tsp	8 tsp	5 Tbsp	10 Tbsp	⅔ pt	1 pt	1 ¾ pts
33–35% EC 3 lb actual/gal	¾ tsp	1 1/2 tsp	3 tsp	6 tsp	4 Tbsp	8 Tbsp	½ pt	¾ pt	1 ⅓ pts
40–50% EC 4 lb actual/gal	½ tsp	1 tsp	2 tsp	4 tsp	8 tsp	5 Tbsp	10 Tbsp	½ pt	⅘ pt
57% EC 5 lb actual/gal	7/16 tsp	⅞ tsp	1 ¾ tsp	3 ½ tsp	7 tsp	4 ½ Tbsp	9 Tbsp	14 Tbsp	1 ½ cups
60–65% EC 6 lb actual/gal	⅜ tsp	¾ tsp	½ Tbsp	1 Tbsp	2 Tbsp	4 Tbsp	8 Tbsp	12 Tbsp	1 ½ cups
70–75% EC 8 lb actual/gal	¼ tsp	½ tsp	1 tsp	2 tsp	4 tsp	8 tsp	5 Tbsp	7 ½ Tbsp	13 Tbsp

* Quantity based on a standard weight of 8.3 lb liquid/gal

MILLILTERS OF CONCENTRATE REQUIRED TO PREPARE 1-GAL OF SPRAY USING VARIOUS PERCENT CONCENTRATES

The figures in the table are in milliliters. To convert to fluid ounces divide by 30, to teaspoons divide by 5, or to tablespoons divide by 15.

BY WT LB AI* (%) PER GAL	PERCENT CONCENTRATE DESIRED								
	¼	½	¾	1	2	3	4	5	6
10–12 = 1 lb	78.9	157.8	236.7	315.6	631.1	946.7	1262.2	1577.8	1893.4
15–20 = 1 ½ lb	52.6	105.2	157.8	210.4	420.7	631.1	841.5	1051.9	1262.2
25 = 2 lb	39.4	78.9	118.3	157.8	315.6	473.3	631.1	788.9	946.7
30–35 = 3 lb	26.3	52.6	78.9	105.2	210.4	315.6	420.7	525.9	631.1
40–50 = 4 lb	19.7	39.4	59.2	78.9	157.8	236.7	315.6	394.5	473.3
55–57 = 5 lb	15.8	31.6	47.3	63.1	126.2	189.3	252.4	315.6	378.7
60–65 = 6 lb	13.1	26.3	39.4	52.6	105.2	157.8	210.4	263.9	315.6
66–70 = 7 lb	11.3	22.5	33.8	45.1	90.2	135.2	180.3	225.4	270.5
72–85 = 8 lb	9.9	19.7	29.6	39.4	78.9	118.3	157.8	197.2	236.7