

A BUILDER'S GUIDE TO WOOD-DESTROYING INSECTS

by Stephen Smulski

A look at the bugs that do the most damage to houses

One and one-half billion dollars is spent annually in the U.S. to treat, repair, and replace wood in buildings that has been damaged by wood-destroying insects. Recognizing damage is usually pretty easy, but figuring out who's responsible can be tricky. Since selection of the right remedial treatment depends on knowing who's responsible, it's important to identify the offenders. With this primer on some of wood's six-legged pests, you should be able to figure out who's been eating you and your customers out of house and home.

Termites

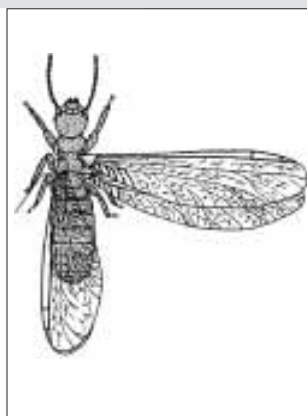
With two thirds of the total annual infestation control bill spent on this insect alone, termites are by far the most economically important pest plaguing wood structures. Though more than 50 species of termites live in the U.S., about 95% of all damage is done by subterranean termites, which nest underground. Other termites of local significance include drywood termites found along America's southern border from California to Florida, dampwood termites of the coastal Pacific Northwest, and a recent exotic arrival in several Gulf states, the Formosan termite.

Lacking the natural antifreeze of other insects, subterranean termites cannot hibernate during freezing weather and must remain active year-round. Concentrated in the Southeast, they have expanded northward only since the early 1900s with the widespread adoption of central heating. These soil-dwellers live in large colonies whose six-legged citizenry is divided into castes of kings and queens, workers, and soldiers. Responsible for reproduction, kings and queens are black or brown, up to 1/2 inch long, and winged. Sterile, eyeless, and wingless, workers are white and 1/4 inch long. Rarely seen because they avoid light, workers maintain the nest and, in foraging for food, destroy wood. Some metamorphose into soldiers who fend off invaders with menacing mandibles.

After several years of colony growth, swarms of winged reproductives will emerge from the soil in spring, usually in daylight and after a rain, and fly off to establish a new colony. Termites stake out new territories based on their need for high



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Termite workers (upper left) are 1/4 inch long and wingless. They avoid light and thus are rarely seen. After several years of colony growth, winged adults (above) emerge briefly and swarm to establish new colonies. Termites will tunnel in all wood and wood products, except for pressure-treated, and can cause serious structural damage (left).

soil moisture and a readily available source of wood from which they derive their diet of cellulose. Once a suitable site is found, reproductives shed their wings and reenter the ground.

In nature, termites feast on downed and dead trees and stumps and may forage for food 100 feet or so from their underground headquarters. In buildings, termites will attack virtually all wood- and cellu-

lose-based building materials. In addition to structural lumber, plywood, flooring, and siding, I've found their damage in woodfiber insulation board sheathing, cardboard forming tubes, wastepaper-based cellulose insulation, and even the paper faces of gypsum wallboard. Though attracted to odors given off by moist or decaying wood, termites will attack wood at a moisture content as low as 8%,

which is typical of the year-round average moisture content of indoor wood across most of the U.S. No species of untreated wood is immune from attack, but wood pressure-impregnated with CCA (chromated copper arsenate) preservative is an effective deterrent.

Termites usually enter structures through existing gaps at or below grade. In the absence of shrinkage and settlement cracks in foundations and slabs and gaps at electrical, plumbing, and septic penetrations, they build shelter tubes of soil and digested wood up the sides of exposed foundations to reach the wood above. Contrary to popular belief, metal shields inserted between foundation and sill won't stop termites from entering, as these beasts will simply build shelter tubes up and over such inconveniences. Shields do, however, force shelter tubes to be built where they are more easily visible, prevent termites from entering sills directly through hollow masonry block foundations, and provide a capillary break between concrete and wood.

Poor building practices that invite termites include burying stumps, cutoffs, and other wood debris during backfilling, failing to remove wood or cardboard concrete forms, using untreated wood in ground contact, extending siding and trim to below six inches of grade, and leaving soil exposed in crawlspaces. Termites' high soil-moisture needs can be met by omitting gutters and downspouts, backfilling with poor-draining soils, or failing to provide adequate foundation and site drainage.

Undetected, termite damage can lead to serious structural dam-

age and even collapse. Because termites hollow out the interiors of wood members without breaking through the surface, there are few visible signs of their presence. Symptoms include blistered or puckered wood surfaces, crushed and collapsed wood at framing bearing points, and fine soil lining the edges of cracks in concrete and masonry. Termite-damaged wood resounds with a dull thud when tapped with a hammer. When broken open, termite galleries (tunnels) are characteristically messy and often filled with a mixture of fecal matter, soil, and chewed wood that looks like dried oatmeal. Because they prefer to tunnel parallel to the grain in the softer early wood portion of growth rings, damaged wood may appear as a series of concentric shells of late wood. In the absence of live insects, there are a few clues that reveal whether termite damage is ongoing. Clouds of swarming insects and piles of shed wings nearby strongly suggest it; shelter tubes that reappear after being destroyed confirm it.

Creating a toxic moat around your customer's castle by treating soil with a pesticide before footings, foundation, and slab are poured is the best defense against termite invasion in new construction. Infestations in existing buildings can be treated by pressure-injecting pesticide into the soil surrounding the foundation and beneath the slab. Though over-the-counter termiticides are available, treating for termites is best left to reputable professionals.

Carpenter Ants

Carpenter ants, though found throughout the U.S., are primarily a problem in the Northeast and Northwest. Like termites, these

colonial insects live mainly underground. Unlike termites, carpenter ants don't actually eat wood, but tunnel in it only as a place to live. The distinction may seem trivial, but it's not. CCA-treated wood, for example, while immune to termite attack, is still susceptible to carpenter ant destruction because they don't ingest the tainted wood.

Most of the many kinds of native carpenter ants are black or black and dark red. Kings and queens (reproductives) are winged and up to one inch long. Wingless workers are $\frac{1}{8}$ to $\frac{1}{2}$ inch long. Carpenter ants may nest underground, in live and dead trees, in stumps, in stored lumber and firewood, and inside wood buildings. Those nesting outdoors hibernate during freezing weather, while ants cozying up inside heated buildings may be active all year. Workers forage for food up to 150 feet from their nest. Plant juices, "honeydew" secreted by aphids, insects, and household food scraps make up the menu.

Winged carpenter ants swarm from mature nests in spring to establish new colonies, shedding their wings before nesting anew. Often mistaken for termites, and vice versa, it's easy to tell the two apart. Carpenter ants have two pairs of wings of unequal length, a constricted, hourglass waist, and "elbowed" antennae. Both pairs of termites' wings are the same length, and their waists and antennae straight. Color alone tells you that so-called "white ants" are actually worker termites.

Ants enter buildings via the same routes as termites, but they don't build shelter tubes. No untreated wood (not even CCA-treated wood) is safe from ant attack. These hexapods prefer wood whose moisture content is

15% or higher and are especially attracted to decayed wood. As owners of stressed-skin panel homes have learned, carpenter ants will also tunnel in the panels' foam cores. Panel makers now treat the foam with a pesticide and recommend that panel edges near grade be capped with a metal shield.

Carpenter ants excavate an irregular maze of tunnels in wood parallel to the grain, often following softer early wood. Fastidious in habit, their galleries are free of debris, with signature "sandpapered" walls. Extensive tunneling can weaken structural members, but ant infestations are usually detected long before damage becomes serious. A sure sign of activity is the coarse shreds of wood called frass, and occasionally insect parts, that workers dispose of through joints and cracks outside the nests as they tidy their tunnels. In established infestations, ants can sometimes be heard gnawing on wood.

Live ants seen inside a home may or may not mean the building is infested. If, for example, only a few ants show up each day and it's late spring or summer, they're probably workers on a foraging expedition from a nest in a nearby tree or stump. Don't overlook the possibility of ants escaping from firewood brought inside. However, if more than a few are appearing inside daily while the ground is still cold, then a nest hidden in a wall may have gotten the late winter sun's wakeup call. Consistently large numbers of ants seen inside during the winter or winged ants seen inside anytime of year are sure signs of an indoor nest.

Inviting trouble spots include eaves and walls wetted by roof leaks, ice dams, condensation, and overflowing or leaky gutters. Plumbing leaks and within-wall condensation can raise wood moisture content to ant-attractive levels. Exposed soil, wood in ground contact, inadequate ventilation, and poor foundation and site drainage create crawlspace and basement moisture conditions that attract ants. Homeowners can attract ants by leaving crumbs about or by putting pet food in bowls outdoors.

Once a carpenter ant nest has been located, usually by observing the path by which foraging workers travel, it can be easily treated. When a nest behind a wall can't be precisely located, professional exterminators may resort to a "shotgun" approach, spraying pesticide through bored holes in hopes of hitting the hideaway.

Old House Borers

One type of long-horned beetle common in the mid-Atlantic

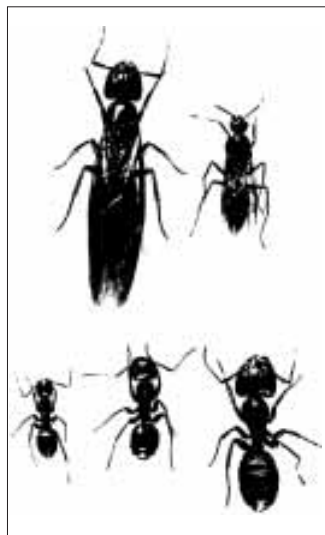


Old house borer larvae, at right, attack the sapwood of structural members. They may feed for three to seven years before emerging from $\frac{1}{4}$ to $\frac{3}{8}$ -inch exit holes as adult beetles, left.

states, the misnamed "old house borer," primarily infests wood that has been in service for ten years or less. This brownish-black $\frac{1}{2}$ - to 1-inch-long beetle has lengthy antennae and twin bumps on its thorax. But it's in the worm-like larval stage that this bugger does damage to attic framing, floor joists over crawlspaces and basements, and other soft-wood structural members.

After larvae emerge from eggs deposited in drying checks or joints between framing members, they immediately bore into wood. Homeowners may hear the faint ticking sound these white, up to $\frac{1}{4}$ -inch-long larvae make when tunneling. Though their attack is limited to the sapwood, it is so thorough that the wood beneath a thin, intact surface layer may be completely pulverized. Oval larval tunnels, running parallel to the grain and up to $\frac{3}{8}$ inches wide, are tightly packed with fine powder and rod-shaped fecal pellets. Walls are characteristically ripple-marked, looking like sand that's been lapped by waves. Larvae feed in wood for three to seven years before emerging as adult beetles sometime between July and October. Adults leave wood through $\frac{1}{4}$ - to $\frac{3}{8}$ -inch oval exit holes previously made by larvae. Occasionally exit holes are chewed through the materials covering infested lumber — wood sheathing, siding, flooring, and even gypsum wallboard. Exit holes are often the first and only sign of infestation seen by homeowners. Fortunately, the majority of infestations die out once adults emerge.

Most old house borer infesta-



Carpenter ant queens and males are winged and up to an inch long. Workers range from $\frac{1}{8}$ to $\frac{1}{2}$ inch long. Carpenter ants don't eat wood, but carve tunnels for nesting — preferring moist decayed wood or foam insulation. Tunnels in wood (right) run parallel to the grain.



Don Jackson

Wood-Destroying Insects at a Glance

	Attacks	Preferred % Wood Moisture Content	Emergence/Bore Holes (in.)	Galleries and Frass	Can Reinfest	Typical Source of Infestation	Remarks
Termite	Softwood, hardwood, sapwood, heartwood, old wood, new wood*	>8	Seldom seen; uses existing gaps, cracks	Messy, packed with excreta, soil, wood fragments	Yes	Enters heated buildings from soil	Seldom seen except when swarming; discarded wings indicate presence
Carpenter Ant	Softwood, hardwood, sapwood, heartwood, old wood, new wood*	>15	Seldom seen; uses existing gaps, cracks	Clean with "sandpapered" walls; insect parts and shredded wood near nest	Yes	Enters heated and unheated buildings from soil	Often seen foraging in building though nest is in nearby tree or stump
True Powderpost Beetle	Hardwood, sapwood, new wood*	6 to 30	Round, 1/32" to 1/8"	Loosely packed with very fine powder	Yes	Brought into buildings in infected furniture, flooring, firewood, etc.	Hardwoods coated with film-forming finishes safe from attack
Old House Borer	Softwood, sapwood, new wood*	10 to 30	Oval, 1/4" to 3/8"	Tightly packed with fine powder and tiny pellets; walls with ripplemarks	Yes	Brought into buildings in infected new and salvaged lumber; can enter from outside	Larvae in wood make rasping, ticking, or clicking sound
Anobiid Beetle	Softwood, hardwood, sapwood, old wood, new wood*	13 to 30	Round, 1/16" to 1/8"	Loosely packed with fine powder and tiny pellets	Yes	Enters damp areas like crawlspaces and basements from outside	Infestations develop slowly; 30 holes per sq. ft. indicates well established infestation

* "New wood" is less than ten years old; "old wood" is more than ten years old.

tions are built into homes during construction when softwood lumber infected during drying or storage or salvaged wood is used. Beetles can infest or reinfest wood older than ten years, providing its nutritional content is still high and its moisture content exceeds 10%. Even professionals find it difficult to determine whether an old house borer infestation is active. Two sure signs of ongoing activity are the sounds made by tunneling larvae and the reappearance of fresh frass on cleaned surfaces. In the absence of exit holes, bulging or blistered wood

surfaces over powder-packed tunnels indicate activity.

True Powderpost Beetles

Three distinct insects, true powderpost beetles, false powderpost beetles, and anobiid beetles, are collectively called powderpost beetles, because each reduces wood to a fine powdery frass. Of these, true powderpost beetles and anobiids are the more common.

True powderpost beetles occur throughout the U.S. and are second only to termites in the dollar damage done. From residences in

dead trees, they routinely infest hardwood logs and lumber at sawmills and storage yards. Reddish-brown to black, and at most 1/4 inch long, occasionally-seen adults lay eggs only in the large early wood pores of ring-porous hardwoods, like oak, ash, and elm, that are less than ten years old.

After hatching, these larvae limit their attack to sapwood with a moisture content of 6% to 30%, where they tunnel extensively in search of stored starch. Hidden under a veneer of unaffected wood, galleries are loosely packed with talcum powder-like frass that sifts from drying checks and 1/32- to 1/8-inch round bore holes. Adults emerge from wood between April and September after one to two years. Infestations tend to die out naturally as the carbohydrate content of wood drops over the first few years, but reinfestation can occur if favorable food and moisture conditions persist.

True powderpost beetles most commonly enter homes as eggs or larvae in new hardwood flooring, furniture, and millwork. Tropical hardwood products are frequently a source of infestation because of inadequate wood storage and drying practices in the countries of origin. They may lurk in firewood, antique furniture, and tools recovered from unheated buildings. Hardwoods coated with film-forming finishes are safe from attack, as the coating clogs pores where adults lay eggs. In

many cases, damage is limited to a single piece of flooring or trim, so removal of the affected item solves the problem. Adults and larvae can be killed by freezing or by heat-sterilizing wood at 135°F. If exit holes or adult beetles aren't seen within five years after a home has been built, chances are they'll never show up.

Again, it's difficult to gauge whether or not true powderpost beetle activity is ongoing. One way is to vacuum up all frass and mark existing bore holes. The reappearance of frass and new holes over the next few months confirms activity. Fresh frass is bright and cream-colored like new wood; old frass sifting from an inactive infestation is yellow or brown.

Anobiid Beetles

Anobiids, such as the common furniture beetle and the death-watch beetle, also make their natural home in dead trees. While concentrated in the Southeast, their handiwork can be found in homes in the northeastern, north-central, and Pacific coastal states as well. The least discriminating of the powderpost beetles, anobiids attack the sapwood of softwoods and hardwoods, regardless of age. Attracted to wood with a 13% to 30% moisture content as well as decayed wood, anobiids most often infest framing in damp crawlspaces and basements.

Rarely seen, adults are 1/8 to 1/4 inch long and reddish-black to black. Eggs are deposited in dry-



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Powderpost beetles (left) are no more than 1/4-inch long, and are reddish-brown to black. The larvae attack only the sapwood of porous hardwoods, like oak, ash, and elm. Fresh frass the color of new wood indicates an active infestation (right).

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ing checks, on rough-sawn lumber surfaces, and in joints. Tunnels excavated by larvae are loosely packed with fine powder and lemon-shaped fecal pellets that feel gritty when rubbed between the fingers. Adults emerge after three or more years from $\frac{1}{16}$ - to $\frac{1}{8}$ -inch round exit holes from which frass freely sifts. Anobiid infestations develop so slowly that the few exit holes present may go unnoticed for ten or more years. Thirty or more holes per square foot indicates a well-established infestation. Reinfestation is routine.

Unlike true powderpost beetles, anobiids rarely enter homes via infected wood. Adults fly in directly from the outside, invited by the moist conditions found in crawlspaces and basements lacking soil covers, proper ventilation, and foundation and site drainage. The same techniques for detecting and treating true powderpost beetle infestations are used for anobiids. ■

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checks in wood. The larvae attack the sapwood of hardwood or softwood for three or more years, then emerge as adult beetles from $\frac{1}{16}$ - to $\frac{1}{8}$ -inch round exit holes (enlarged in inset).

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