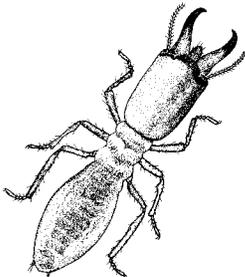
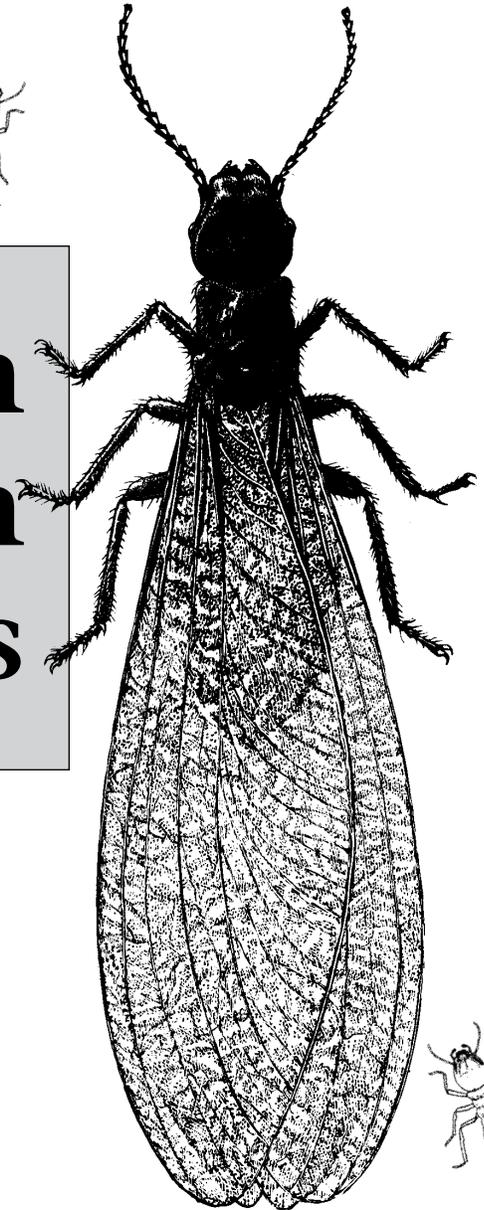


# Eastern Subterranean Termites



PENNSSTATE



College of Agricultural Sciences  
Agricultural Research and Cooperative Extension

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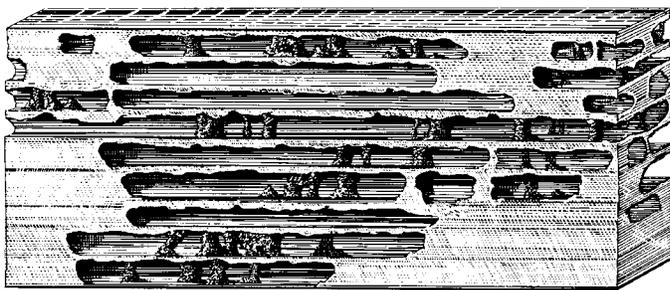
Prepared by Steven Jacobs, senior extension associate,  
entomology.

Illustrations by Chris Jung.

## Introduction

Eastern subterranean termites, *Reticulitermes flavipes* (Kollar), are present throughout Pennsylvania and often damage structural timbers in buildings. When this damage becomes evident (Figure 1), it is usually the result of years of infestation. Thus, damage by termites is not a sudden onslaught that will cause a building to collapse in a few days. Generally, termite problems only occur some years after construction—usually 10 years or more. Many houses in Pennsylvania are unlikely to ever have termites because they are either located where the risk from termites is low or they are constructed to resist termite infestations. The risk of infestations can be reduced by avoiding certain faults or errors in construction, site grading and maintenance, or controlled through the application of soil insecticides or baits.

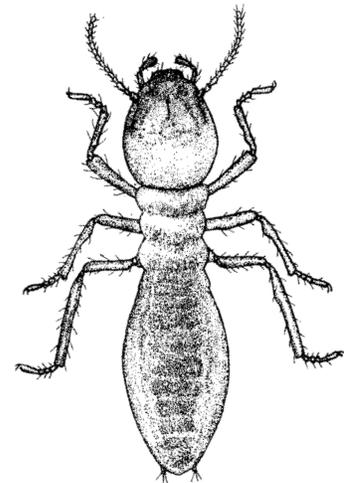
Termites feed upon old roots, tree stumps, fallen tree limbs and branches on the ground, and similar materials. They are beneficial when they aid in reduction of wood and similar cellulose products into compounds that can be used again by other living organisms. Occasionally termites attack living plants, including the roots of shrubs and trees. In buildings, they feed on cellulose materials, such as structural wood, wood fixtures, paper, books, cotton, and related products.



**Figure 1.** Cross section of damage to a structural timber by subterranean termites.

## Description of termites

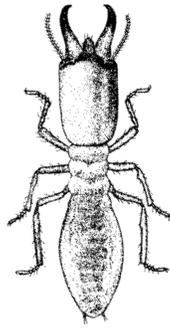
Subterranean termites are social insects that live in colonies within the ground and have specialized castes to perform specific colony functions. The termite colony has three primary castes: workers, soldiers, and the reproductives (kings, queens, and secondaries). The creamy-white workers are seldom seen unless a termite tube or infested wood is broken open (Figure 2). It is the workers that feed on the wood and cause damage. Individual workers are believed to survive for up to five years. Soldiers have elongated yellowish heads with large jaws and are about the same size as the adult worker—a quarter-inch (Figure 3). There are fewer soldiers than their associated workers, and must rely on the workers to feed them. Whenever the colony is invaded or a hole is made in a tube or piece of infested wood, the soldiers will use their jaws to defend the breach. The secondaries are supplementary reproductive females that occur in mature colonies under favorable conditions. The kings and queens (Figure 4) are dark-brown or black and about  $\frac{3}{8}$  to  $\frac{1}{2}$  inch long. They have two pairs of translucent wings of equal length, which break off shortly after swarming (Figure 5). Very often the shed wings are the only evidence that termites are in a building. In Pennsylvania, swarms of winged termites usually emerge between February and June.



**Figure 2.** Eastern subterranean termite worker.

  
ACTUAL SIZE

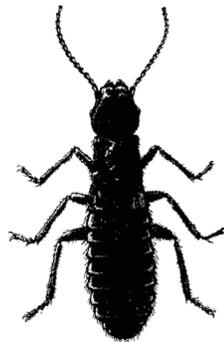
**Figure 3.** Eastern subterranean termite soldier.



**Figure 4.** Winged termite, also known as reproductive, king, or queen.



**Figure 5.** Reproductive termite that has shed its wings.

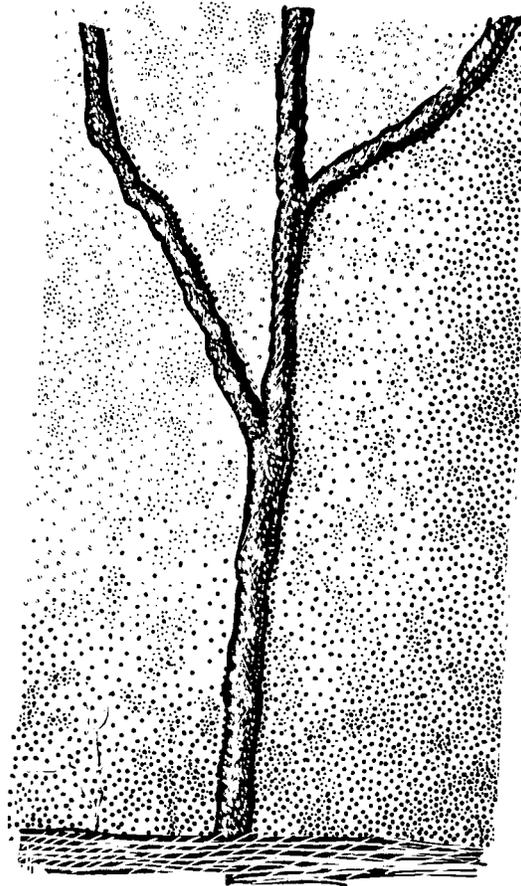


## How to recognize termites and termite damage

The presence of swarming termites or their wings alone is a sure sign that termites are working in a building. Winged termites are often confused with winged ants. Most species of ants in the house are only nuisances and, except for carpenter ants, do not damage wood. For this reason it is necessary to know the differences between winged termites and winged ants. The easiest way to distinguish the two groups is to look at their waists. An ant has a narrow, wasp-like waist; a termite has a broad waist. The antennae or feelers of ants are L-shaped, whereas those of termites are straight. Furthermore, the four wings of termites are of equal length and nearly twice as long as the termite body, while ant wings are approximately equal to the length of the ant, and the fore and hind wings are of unequal length.

## Life cycle

During late winter or early spring, swarms of the reproductive caste may be noticed in infested buildings. These black, winged termites are the stage most commonly seen, since the other castes do not willingly expose themselves to light. Winged termites are attracted to light, and when they emerge within buildings, they swarm about doors and windows. After crawling or fluttering about for a short time, the termites break off their wings and locate a mate. Each pair attempts to locate moist wood in contact with the soil to start a new colony, but few succeed. Although they alarm the homeowner and can be a nuisance, no damage is done by the winged forms.



**Figure 6.** Termite tubes used by termites to reach available wood.

Wood attacked by termites has runways or passages that are coated with an earth-like material glued to the wood. Where the wood has been infested for some time, it may be largely hollowed out with passages and may be rotten in appearance. Upon probing such wood with a screwdriver or similar tool, many of the hidden worker termites may spill out.

Another sign of termites in the house is the presence of termite tubes (Figure 6). Termites make these earth-colored tubes for a number of reasons, primarily as a protected runway from the earth to the wood they feed on. Moreover, these tubes may serve as swarming exits for the winged termites. Look for these tubes on the cellar walls, on wooden posts, wall studs, mudsills, and door and window trim. Wood embedded in earth or in concrete cellar floors is especially susceptible to termites.

### **Where are some of the places you should look if you believe you have termites?**

In Pennsylvania most termite infestations occur in the basement or cellar areas and in the structural timbers immediately above the cellar walls, such as the mudsills, studs, joists, subflooring, and the floors. Wooden posts, steps, door frames, and trim embedded in an earth or concrete floor are especially susceptible to termite infestation. Wood siding, window frames, steps, and similar materials covered by earth or resting on the ground may also be attacked by termites. Where the termite infestation is extensive, the flooring and framework in the walls can be damaged by termites; this is often the case where houses are built on concrete slabs. Termites especially favor areas around furnaces, chimneys, hot water heaters, and hot water pipes that provide warmth during cold months.

The extent of damage to structural timbers and woodwork can be determined by a careful inspection of the building. Although you may choose to make the inspection yourself, we recommend you have a professional pest control operator inspect the building. Licensed pest control

companies have individuals with experience in detecting termite infestations that many laypeople would otherwise overlook.

All woodwork in suspect areas should be probed for soundness and visually inspected for any sign of mud tunnels. An awl, ice pick, screwdriver, or similar instrument is commonly used to probe the wood. After the area and extent of infestation are determined, control measures can be planned.

## **Termite control**

First, contact at least three or more licensed pest control operators to obtain estimates. Be advised that it is common for pest control companies to offer different control treatments and warranties. The Better Business Bureau, neighbors, friends, and colleagues may be able to recommend a reputable firm. Those firms that are members of the National Pest Management Association (NPMA) and the Pennsylvania Pest Management Association have access to specialized training and materials and will generally exhibit a higher degree of professionalism.

Termite control in a building can involve structural or chemical (soil treatment and/or baiting) methods. Either method when used alone may provide the desired results, but when structural and chemical methods are combined, the most satisfactory results are often obtained.

### **Structural modification methods**

The less suitable the site or structure is for termites, the less likely a colony will become established and flourish. Therefore, the following are considered beneficial in preventing and controlling termites:

1. Remove all wooden debris (stacks of lumber or firewood) from the vicinity of the building. Replace any wooden posts, steps, trellises, etc., that are in contact with the soil with non-cellulose materials or pressure-treated lumber.
2. Replace badly damaged timbers with sound materials. Use pressure-treated wood at places where wood must be in contact with soil. Where possible, do not permit any wood within 18 inches of the soil.

3. Provide adequate drainage for basements, cellars, and crawl spaces. Be certain that the grade level will drain away from the building.
4. Fill all visible cracks and voids in the foundation with concrete or suitable caulking compound.
5. Reduce soil moisture near the structure by directing runoff away from the foundation. Gutters, downspouts, and French drains should be correctly installed and operational; surface drainage should flow away from the structure.

### **Soil treatment/barrier control**

The principle of soil treatment control for termites is to establish a treated barrier of soil between the wood in the building and the termite colony in the soil. Such a chemical barrier will kill or repel any termites attempting to move through it. Treatments may involve the trenching of soil adjacent to the exterior foundation wall down to the footers, and replacement of the soil after it is mixed with the termiticide; soil injection of a liquid termiticide, under pressure, through a hollow rod to saturate the soil adjacent to the foundation; and the drilling of concrete slabs, porches, and patios to reach the soil adjacent to the foundation beneath these structures.

Many different soil termiticides are available. However, because of the great number of variables at any location, it is difficult to predict which chemical will perform best at your site. A partial list of the most recent soil termiticide efficacy tests conducted by the United States Department of Agriculture Forest Service (USDA-FS) is included in this publication for your information (Table 1). The table lists common chemical names, date that the test originated for a particular chemical, the number of years that the treatment was not breached by termites, and the level of termite pressure at a particular site. Note that the control percentages for fipronil (Termidor 80 WG) are low. This occurred because fipronil had an impact on not only the test locations but also on those control sites in the near vicinity. Subsequent USDA-FS trials on fipronil kept the other tests and controls away from the fipronil test site.

**NOTE:** We do not recommend that homeowners attempt to treat their own homes because of the difficulty in obtaining termiticides, the specialized nature (and costs) of the equipment necessary to properly apply these insecticides, and the human experience factor involved in establishing a continuous barrier within the soil.

### **Termite baits**

In recent years, termite baits have gained in popularity. This alternative to liquid barrier treatments is a welcome addition and will assist in the battle against termite infestations. Baiting involves the use of an attractant (wood stakes, cardboard, or other cellulose-based material) to establish termite feeding. The active ingredient (insecticide) is either added after feeding begins, or may be included in the initial baiting. Termites feeding on the treated material will carry the toxicant back to the colony where it adversely affects the colony, possibly eliminating the entire colony.

Baits are especially important in treating structures with wells or springs close to the foundation; drainage tiles around the foundation; air ducts under or imbedded in the slab; or in situations where a perennial high water table makes conventional soil treatment ill advised. Although data suggest they may be valuable as a stand-alone treatment, many of the factors that affect baiting efficacy are poorly understood. As with soil application of termiticides, it is recommended that licensed, experienced pest control companies be hired to provide a baiting service. Baiting, in conjunction with a partial (or complete) soil treatment, may be advisable. The USDA-FS does not perform efficacy tests on termite baits.

**Table 1. USDA-FS termiticide report data.**

Number of years, through 2007, that termiticides remained effective in concrete slab (CS) and ground board (GB) tests at four field sites applying the EPA guideline efficacy rule. Termiticides were applied at label rates as indicated by percent of active ingredient (% ai). Fractions of years occurred when products were installed out of cycle. Control = percentage of all untreated plots attacked over the life of the study as an indicator of termite pressure.

% ai	Test	Arizona	Florida	Mississippi	S. Carolina
<b><i>Bifenthrin—Biflex TC (est. 1986 = 21 years)</i></b>					
0.062	CS	16	21	7	10
0.125	CS	10	9	2	21
Control	CS	52%	69%	54%	64%
<b><i>Cypermethrin (est. 1982 = 25 years)</i></b>					
0.25	CS	4	10.5	3	4
0.5	CS	4	4.5	7	12
Control	CS	62%	65%	56%	65%
<b><i>Permethrin—Dagnet (est. 1978 = 29 years)</i></b>					
0.5	CS	13	4	5	4.5
1.0	CS	15	15	5	10.5
1.0	GB	9	6	2	0.5
Control	CS	50%	55%	60%	53%
Control	GB	43%	78%	86%	84%
<b><i>Permethrin—Torpedo (est. 1980 = 27 years)</i></b>					
0.5	CS	11	6	3	1.5
1.0	CS	19	25	3	6.5
0.5	GB	4	4	1	1.5
1.0	GB	8	5	2	1.5
Control	CS	62%	65%	56%	65%
Control	GB	74%	76%	87%	90%
<b><i>Imidacloprid—Premise 75 WSP (est. 1992 = 15 years)</i></b>					
0.05	CS	15	6	2	10
0.1	CS	15	15	2	5
0.1	GB	3	2	1	2
Control	CS	33%	77%	75%	36%
Control	GB	40%	95%	96%	70%
<b><i>Fipronil—Termidor 80 WG (est. 1994 = 13 years)</i></b>					
0.0625	CS	13	13	13	13
0.125	CS	13	13	13	13
Control	CS	15%	20%	2%	3%
<b><i>Fipronil—Termidor SC (est. 1999 = 8 years)</i></b>					
0.06	CS	8	7.5	8	8
0.125	CS	8	7.5	8	8
0.06	GB	8	7.5	8	5
0.125	GB	8	7.5	8	8
Control	CS	1%	58%	79%	64%
Control	GB	43%	97%	84%	89%
<b><i>Chlorfenapyr—Phantom (est. 1996 = 11 years)</i></b>					
0.125	CS	11	1	1	6
0.25	CS	11	11	2	5
0.25	GB	9	0	2	5
Control	CS	19%	56%	83%	49%
Control	GB	45%	83%	98%	98%

Source: USDA-FS data by Terry Wagner, Chris Peterson, Joe Mulrooney, and Thomas Shelton and reported in *Pest Management Professional* (February 2008).

### **Termite treatment warranties**

Most licensed pest control companies provide warranties for termite treatments. You should carefully review the conditions, limitations, and yearly costs associated with warranty renewals. Warranties for subterranean termite control will not extend to control of any other wood-destroying organisms such as wood-boring beetles, carpenter ants, or other termite species (e.g., drywood termites). Companies will also limit their liability on buildings that have structural alterations that have disturbed the soil adjacent to the foundation or where additions to the original structure have not been treated.

Probably the most difficult aspect of warranty coverage involves the replacement of items damaged by termites subsequent to treatment efforts. It is understandable that termite companies would not want to be held liable for damages that have occurred before their treatment. However, even

a very thorough inspection of the premises may not uncover all existing damage. Therefore, it is important to have a thorough examination performed before treatment and have an accurate and detailed accounting of all current and past termite activity. Whenever possible, obtain a damage replacement clause with your warranty.

Finally, you should determine the yearly termite warranty renewal fees to maintain your home. It is common for companies to charge a yearly fee of 10 percent of the original treatment price each year to renew the warranty. Obviously, after 10 years you have paid for an additional treatment, but with the current high treatment failure rates (20–30 percent in some areas) for subterranean termites, it may be advisable to keep the warranties in effect for long periods of time. It is advisable to maintain warranties for at least one to two years to determine if control efforts were successful.

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