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Subterranean Termite Identification and Biology

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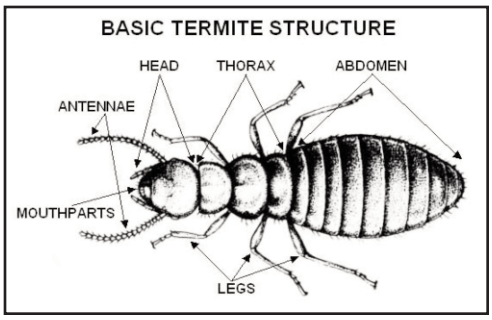
Termites serve an important beneficial function in nature by converting logs, stumps, branches and other plant material into organic matter. However, structural wood in residential and commercial buildings can also be readily used as a food source. Termites are thus considered the most economically important wood-destroying organism in the United States.

Subterranean termites cause more damage to homes than all other natural disasters combined. In the U.S., economic loss to property owners due to subterranean termite activity amounts to greater than three billion dollars annually. This includes the cost of control measures and the cost of repairing structural damage. Proper identification is the first step in the process of managing a termite infestation.

Termite Damage

Identifying Characteristics

Subterranean termites have the basic characteristics common to all insects. The body is divided into three regions: the head, thorax and abdomen. A pair of straight antennae that resemble a string of small beads is located on the head. Antennae, along with other sensory organs on various



parts of the body, are used by the termite to detect smells. The termite has chewing mouthparts as found in grasshoppers and ants. The middle region, or thorax, is divided into three sections with each section bearing a pair of legs. Sexually mature males and females (reproductives or alates) also bear two pairs of wings located on the last two segments of the thorax. The wings are long and narrow, extending at least one-half their length beyond the end of the abdomen. The wings are lost after swarming. Workers and soldiers do not have wings. The abdomen makes up the posterior portion of the termite and consists of a series of similar segments occurring immediately behind the thorax.

Misidentifying termites as another insect can cause improper management and monetary loss. Termites can be easily distinguished from ants by several characteristics:

- Ant bodies appear constricted or pinched in at the waist, while termites do not have the waist constriction and are of similar width from end to end.
- Ants have elbowed antennae, while termites have straight, bead-like antennae.

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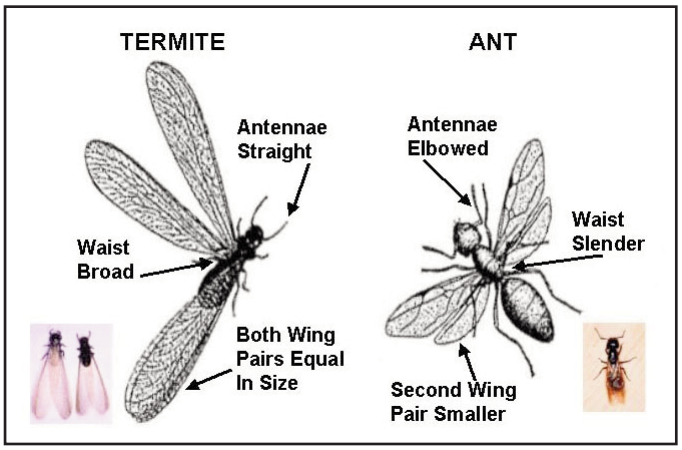


- Ants and termites each have four wings; however, the forewings of ants are much larger than their hindwings. Termite wings are equal in size and shape.
- Ant wings are transparent or brownish, while termite wings are milky-white or grayish and longer than the body.
- Ant wings are firmly attached, while termite wings are easily removed or shed.

Subterranean Termite Biology

Colony Establishment and Swarming

In Arkansas, winged termites or alates (swarmers) may emerge in large numbers inside infested homes or from the soil outside during the daylight hours from March through May. This usually occurs following a rain. A very small percentage of swarming termites survive to initiate new colonies. Alates are preyed upon by other insects, birds, etc., or end up in an environment unsuitable for survival.

Alates emerging inside a structure usually never survive to reproduce; however, it is an indication that an infestation exists. The winged subterranean termites, or alates, are new kings and queens. These reproductive forms pair up during their flight, then land and attempt to establish new colonies. Wings break off shortly after landing, and the new king and queen, if they have landed in a suitable area, begin their new colony by excavating a small chamber in moist soil. When the chamber is large enough, the pair seal themselves inside and mate. The rest of their lives are spent underground.

A successful queen lays her first batch of 6 to 12 eggs within a few days or weeks of mating. Initially, young termites (nymphs) are tended by the king and queen. As the queen's egg-laying capacity increases, the older offspring take over the responsibility of tending the termite young. The colony continues to grow as the number of termites being produced each year increases. The parental king and queen have the longest life span in the colony, often surviving for 10 or more years.

Colonies mature in 6 to 7 years, and size can increase to several hundred thousand individuals. These colonies often become decentralized, occupying multiple nesting sites interconnected by an underground network of tunnels. Termite colonies may issue swarms anywhere from 2 to 6 years after being established.

Three species of subterranean termite are found in Arkansas. *Reticulitermes flavipes* (eastern subterranean termite) and *Reticulitermes virginicus* (dark southern subterranean termite) are generally distributed statewide, with the eastern subterranean termite being most common. *Reticulitermes hageni* (light southern subterranean termite) can be found statewide but is the least common species infesting structures.

Subterranean Termite Castes

Primary Reproductives

Mature subterranean colonies, at certain times of the year, will produce large numbers of winged alates (3/8 inch in length) that will eventually become king and queen termites (primary reproductives). These reproductive termites are dark-colored and are the only caste with functional eyes. As previously mentioned, once alates select a mate, they lose their wings. The new king termite remains virtually unchanged after losing his wings. However, as the new queen begins to produce eggs, her abdomen grows larger with the development of her ovaries. As the queen's abdomen stretches, the segments of her body pull farther apart, showing the white membranes between the abdominal segments, giving her a striped appearance. The eastern subterranean termite queen will stretch until she is about ½ inch in length.

A mature queen can lay thousands of eggs each year. During the two-week incubation period, worker termites tend the eggs. The nymph (immature termite) hatches directly from the egg. Attendants feed nymphs regurgitated food for the first two weeks, enabling them through the molting process to become workers, soldiers, primary reproductives or secondary reproductives.

Secondary Reproductives

A termite colony originates from a single pair of reproductive swarmer termites, the king and queen. However, if the king or queen should die, other individuals within the colony will start to develop functional reproductive organs to take their place. These individuals are called secondary reproductives.

Secondary reproductives are light in color, but they are larger than workers and never develop wings. A secondary reproductive caste can develop in mature colonies even though there is still a producing queen present. When this happens, the secondary reproductive caste members will produce the majority of the eggs, causing the colony to grow at a much faster rate. Although no individual secondary reproductive can produce as many eggs as the queen, several hundred of them may exist in a single colony, thus producing thousands of eggs. Secondary reproductives may also develop in satellite nests where a group of workers have become separated from the parent colony. These satellite nests expand the original colony's foraging territory.

Worker Caste

Subterranean termite workers are the caste responsible for all of the labor in the colony. They are the termites found in infested wood. Workers care for the young, repair the nest, build foraging tunnels, locate food, feed and groom the other castes and each other. The youngest termite workers perform the tasks inside the colony like feeding and grooming, while the older, more expendable workers take on the hazardous jobs of foraging and nest building. The termite workers are both male and female, but they are functionally sterile. They are about 1/8 inch long, milky white in color and have no wings or eyes. The body of the termite worker is soft, but the mouthparts are very hard and adapted for chewing wood.

Soldier Caste

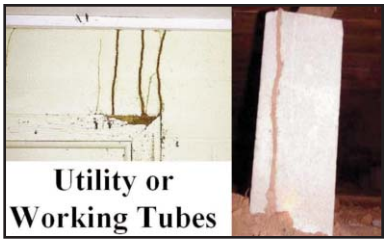
Subterranean termite soldiers function as defenders of the colony and provide protection against all intruders. When foraging tubes or galleries are broken into, the soldiers congregate around the break to stand guard against invaders. Soldiers are similar to the termite workers in that they are blind, soft-bodied and wingless. Soldiers differ from workers in that they are slightly larger and have an enlarged, hard yellowish-brown head that has been modified for defensive purposes. The head has a pair of very large mandibles or jaws that are made to puncture, slice and kill enemies (primarily ants). These large mandibles prevent the soldiers from feeding themselves so they must rely on the workers for food.

Subterranean Termite Behavior

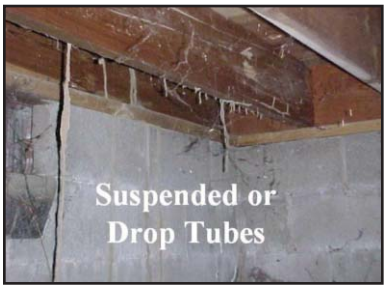
Little is known about the exact mechanism by which subterranean termites locate sources of food, but it is thought that they randomly forage by digging a network of tunnels and locate food sources in the process. A single termite colony's foraging range is difficult to predict. Large colonies may forage over an area the size of a football field, but depending on the season or weather, they may not forage over their entire range at all times. Also, several smaller colonies may cover a greater foraging distance than one large colony.

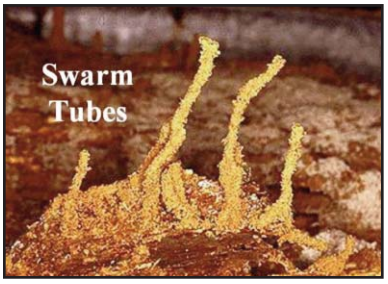
Foraging termites produce a variety of chemicals called **pheromones** that influence their behavior. These pheromones are basically odors that send messages to other termites in the colony. While tunneling underground, the foraging termites lay down a trail of pheromone that is secreted from glands on their abdomen. When a food source is located, the odor trail is intensified to recruit other termites to the feeding site. However, the intensity of the recruitment effort (odor trail) is influenced by soil temperature, moisture and compaction as well as the size and quality of the food source.

Subterranean termites also forage above ground for cellulose-containing food sources like the wood in homes and other structures. In order to protect themselves from predation by ants and maintain their connection to the soil while searching for food above ground, termites build long tubes out of mud and fecal material. These mud tubes are called **exploratory tubes**. Termite exploratory tubes are very easy to see and are one of the best ways to identify a potential termite infestation. Once a source of wood has been located, termites build more permanent **utility or working tubes**. The utility tubes serve as highways running from the underground termite galleries directly to the food source. These working tubes can cover long distances over the foundation of a building or along interior/exterior walls to reach the



wood inside. Sometimes subterranean termites build another tube that runs from the structural wood back down to the ground. These tubes are called **drop or suspended tubes**. Drop tubes are often lighter in color than the utility tubes because they contain more of the wood fiber taken from the structure. Subterranean termites construct a fourth type of mud tube in addition to those that facilitate foraging. These are called **swarm tubes**. Swarming tubes are built seasonally, extending only 4 to 8 inches above ground. These tubes provide the exit port for winged swarmers leaving the colony.





Moisture Requirements

Soil has the capacity to hold water for long periods of time enabling termite colonies in the soil to maintain the required level of moisture for survival. Individual termites are also at constant risk of drying out and thus must maintain contact with the moist colony. When termites forage outside the colony, they must maintain their connection to the soil so that the workers and soldiers can return periodically to replenish their body moisture. The mud tubes, described above, provide the termites with this soil connection. If a tube becomes damaged, workers will expend a tremendous effort to repair it. If the tube is beyond repair, the termites located above ground will often die of dehydration. Under certain conditions, subterranean termite colonies can become established above ground but only if the moisture conditions are right. These above-ground colonies are almost exclusively found in structures with chronic moisture problems. Factors contributing to moisture problems that would in turn create a termite supportive environment include flat roofs where dead leaves and moisture have been allowed to accumulate, leaking pipes, areas with no ventilation, leaking or poorly maintained gutters, etc. In such cases, a termite colony can survive without maintaining a connection to the ground.

Feeding and Nutrition

Although subterranean termites can chew through and damage many materials, only materials containing cellulose can serve as a nutrition source. However, subterranean termites cannot digest cellulose on their own. The termite digestive system contains symbiotic microorganisms (bacteria and protozoans) that are necessary for the termite to digest cellulose. Immature termites lack these symbiotic microorganisms and acquire them through a process called **trophallaxis**, in which there is an exchange of food and other secretions between the immatures and more mature termites. If there were no microorganisms in the gut, the termite could eat constantly but still die of starvation. Foraging worker termites feed directly on wood or other cellulose material, then store the food in their gut. They then return to the nest and distribute this food to the immature termites, soldiers and reproductives by the process of trophallaxis.

Immature termites, like all juvenile insects, must periodically go through the molting process in which they shed their skin (exoskeleton) in order to grow. When they do this, they also shed the lining of their hindgut where the wood-digesting microorganisms live. After molting the termite nymphs no longer have their complement of microorganisms and, thus, are unable to digest food. Immature termites replenish their microorganism supply by feeding on hindgut secretions from older termites that contain the necessary microorganisms.

Control Decisions

Protecting or ridding a home of termites requires extensive knowledge of building construction and an understanding of where termites are likely to enter. Many of these potential entry points are hidden and difficult to access. Traditional termite control also requires specialized equipment and the application of large amounts of termiticide. A typical termite job may require 200-plus gallons of termiticide solution injected into the soil, beneath concrete slabs and within foundation walls. Given the substantial financial investment required for home ownership, termite treatment is usually a job for professionals.

Take your time when selecting a termite control company. Termites damage wood slowly enough that the amount of damage caused by an additional day, week or month of continued activity is seldom significant. Avoid firms that try to pressure you into signing a contract immediately with “specials” or scare tactics.

Arkansas law requires that all pest control firms be licensed through the Arkansas State Plant Board, 1 Natural Resources Drive, Little Rock, AR 72205, (501) 225-1598. Membership in the Arkansas Pest

Management Association (www.arkansaspest.org) and/or the National Pest Management Association (www.pestworld.org) suggests that the company is an established firm with access to technical and training information needed to do the job correctly.

As with any service company, references are invaluable. Consider calling at least two to three companies. Requesting inspections and estimates from more than one company will substantiate the extent of your termite problem and allow you to compare services. Companies offer different types of warranties or service agreements. Most offer retreatment of localized areas if the termites return. In rare instances, a no warranty/service agreement may be offered if construction elements such as wells, cisterns, drainage systems or inaccessible crawl spaces make it impossible to treat in accordance with industry standards.

To reduce your home's risk of infestation you should make your own personal annual inspection to ensure that:

1. Water is directed away from the foundation,
2. Wood and other cellulose materials (including mulch) are away from the foundation,
3. The foundation is exposed around the entire house, and
4. The basement (or crawl space) is relatively dry.

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