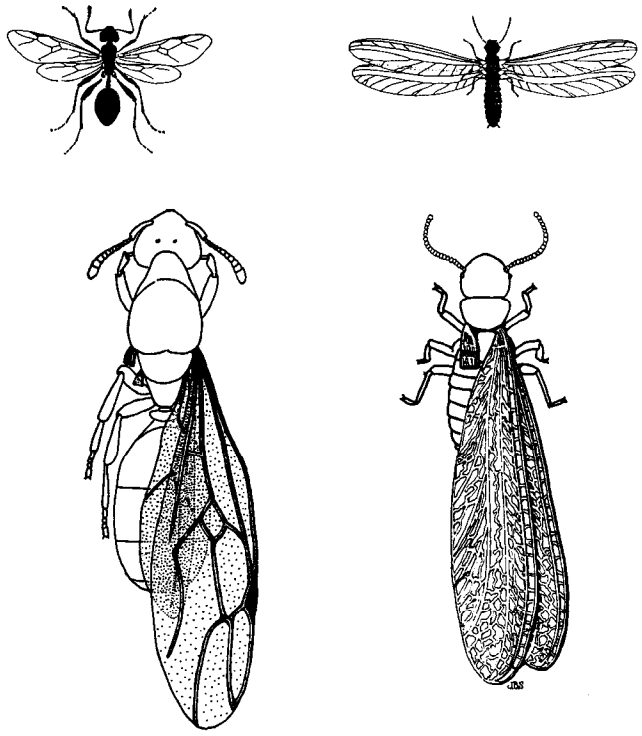
CHAPTER THREE

Termites

On completion of this chapter you will understand the differences between ants and termites, know the families and species of termites common to the Eastern United States and their distribution. You will also know the termite's biology and what signs indicate its presence in a structure.

Classification - Termites belong to the insect order **Isoptera**. The name of this order means equal wings (**iso** means equal; **ptera** means wings). This refers to the fact that the front pair of wings is about the same size and shape as the hind pair. Conversely, among winged ants the hind pair of wings is much smaller than their front pair. The winged form of adult ants and termites are referred to as **alates**.

There are about 2,000 species of termites described worldwide. About 50 species are found in the United States. Termites are believed to be related to cockroaches. A primitive cockroach ***Cryptocercus punctulatus*** is wingless and lives and feeds on the wood of decayed logs. This cockroach is able to digest cellulose with the aid of **protozoans** found in their digestive tract. Many termites also have protozoans in their digestive tract which aid them in digesting wood. Also there is a primitive termite ***Mastotermes darwiniensis*** found in Australia which resembles cockroaches by having an anal lobe or extension of the hind wing and has its eggs in an egg capsule or pod (containing about 20 eggs) similar to the roach **ootheca**.



Swarmer / Alate Comparison

Ant [left]	Termite [right]
Wasp-waisted body	"Cigar"like body
Elbowed antennae	Straight, beaded antennae
Front wing much Larger than hind wing	Front and hind wings of equal length

Figure 3 - 1

Termite species are classified among six families:

Family Mastotermitidae: This family is known mostly from **fossil extinct species.** Only one species, ***Mastotermes darwiniensis*** is left to represent this family. This species is found in northern Australia, have their nests below ground and their colony may consist of more than 1 million individuals.

Family Kalotermitidae: These are the **drywood termites.** They are represented by 16 species in the United States. As their name implies they do not require free moisture for their survival. They do not nest underground nor construct mud tubes. The worker caste is lacking; the nymphal caste does all the work. Flagellate protozoans are present in their intestine helping them to digest cellulose.

Family Termopsidae: These are the **dampwood termites.** Dampwood termites occur in the far western United States and are quite common in Washington State, Oregon and northern California. They also have flagellate protozoans within their intestine.

Family Hodotermitidae: The **harvester termites** include three genera and occur in Northern India, North Africa, Arabia, Iran and Iraq. Flagellate protozoans are present in their intestine.

Family Rhinotermitidae: The **subterranean termites** have nine species recorded from the United States including the Formosan termite ***(Coptotermes formosanus).*** The Eastern subterranean termite ***(Reticulitermes flavipes)*** is also in this family. Flagellates are present in their intestine.

Family Termitidae: This is the largest family of termites. Some of their species construct their nest underground, others nest in trees or on wooden posts and others construct mounds of soil in which they nest. Fourteen species from this family occur in the southwestern United States. Instead of the flagellates being present in their intestine this family has bacteria and enzymes helping them to digest their food.

Table 3 - 1: Comparison between Adult Ants and Termites

ANT	TERMITE
Wing with fewer veins	Wings with many veins
A dark spot or stigma is found on the leading edge of the front wing	The stigma is not present on the front wing.
Antennae are elbowed.	Antennae are straight (not elbowed).
Antennae segments longer than wide.	Antennae segments about as long as wide.
Narrow constriction present between thorax and abdomen	Without a narrow constriction between thorax and abdomen.
Wing scales (remnant of wings which are broken off by swarmers) are not evident.	Wing scales present - easily seen.
Front wings obviously larger than hind wings.	Front and hind wings about equal in size.

SUBTERRANEAN TERMITES

If your inspections are done in the eastern part of the United States, you will commonly come up against representatives from the family Rhinotermitidae (Subterranean Termites) and occasionally damage done by some species from the family Kalotermitidae (Dry wood Termites). The following species of the Rhinotermitidae are found in the eastern region of the United States:

1. ***Reticulitermes flavipes —*** The eastern subterranean termite can be found from southern Canada to the Gulf of Mexico and west as far as Arizona and Utah. Swarms of the eastern subterranean termite normally occurs in April or early May, however, they have been recorded as swarming during any month of the year (usually from buildings with heated slab homes). In addition, they may produce more than one swarm per year.
2. ***R. virginicus —*** The southern subterranean termite can be found from Long Island, New York and Philadelphia south to Florida and west to Texas and Oklahoma This species usually swarms in May or June and can also have some fall swarm in October and November.
3. ***R. arenincola —*** Established in Massachusetts. Usually swarms at night in May.
4. ***R. hageni —*** The light southeastern subterranean termite occurs from the District of Columbia south to Florida and then west to Texas and Kansas. Swarming in the northern most part of its range usually occurs from August to October.
5. ***Coptotermes formosanus —*** the Formosan termite occurs along the Gulf Coast states north to South Carolina. They usually swarm in the spring and summer during the evening hours.
6.

Species	Body Color & Length	Wing Size & Color	Ocelli	Usual Dates of Swarming
Reticulitermes flavipes	Brownish- black to black. Length about 0.3" (8mm)	Wings usually at least 0.26" (6.5mm) long and often over 7mm. Face area grayish to gray-brown in color	Slightly more than their diameter from the compound eye	Mostly April and May
Reticulitermes virginicus	Black body. Length usually under 0.3 (8mm)	Wings usually under 0.24" (6mm) long. Colorless wings	Much less than their diameter from compound eye	March - April
Reticulitermes arenincola	Dark brown to blackish- brown. Over 0.3" (8mm) long	Wings over 0.24" (6mm) long. White to dusky	Less than their diameter from compound eye	May
Reticulitermes hageni	Pale yellow-brown in color. Rarely exceeds 0.3" (8mm) in total length	Usually less than 0.24" (6mm). Brownish	Slightly less than their diameter from compound eye. Very conspicuous	Later summer and early fall
Coptotermes formosanus	Pale yellowish-brown. 0.5- 0.6" (12-15mm) long	Forewing usually 0.4- 0.6" (10 to 14mm) in length. Wings pale rather hairy particularly on leading edge. Front wings have a yellow band of color behind the 2nd wing vein (radial sector)	Slightly less than their diameter from compound eye. Very conspicuous	Swarms at night usually during the summer.

Table 3 - 2

TERMITE BIOLOGY

Termites are social insects. They live together in nests and have various types of individuals that perform various social functions for the colony. Different castes exist in the termite colony. Individuals that are morphologically and functionally different from other individuals in a colony make up a caste. Three castes are commonly found in most termite colonies.

1. The reproductive caste consists of the queen (female) and the king (male) termites, as well as, any supplemental reproductive termites. Supplemental reproductives are those adult termites which are produced within the colony, usually after the death of the king and or the queen. They are also produced when the colony grows so large that many of the termites in it become isolated from the main colony. At that time new reproductives are produced These supplemental reproductives never have full wings (they have short wings or no wing pads at all). They do not have the dispersal flight king and queen swarmers have prior to their establishing new colonies. The king and queen termites also known as the alates, swarmers or primary reproductives. These are not produced by the colony until at least 3-4 years after its inception. Figure 3 – 2 represents de-alated reproductives.

Figure 3 - 2

2. The worker caste are those termites making up the majority of the individuals in a subterranean termite colony (fig. 3-3). The workers usually consist of both males and females. They are wingless, usually without compound eyes or ocelli, and usually unpigmented and thus whitish in color. The workers perform many duties within the colony. They forage for food, feed the queen, soldiers and young, construct and repair the mud tubes, groom the reproductives, soldiers and young. They also help to defend the colony when needed.

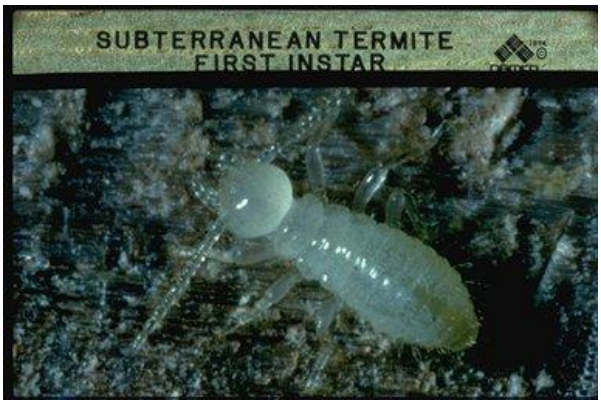


Figure 3 - 3

3. The soldier caste is the caste that functions to defend of the colony. Soldiers of the eastern subterranean termite are easily recognizable by their large heads and mandibles. They use these mandibles to bite any invaders that may attack the colony. Soldiers are not produced in quantity until the colony is fairly far along in its development. Soldiers cannot feed themselves. They are fed by the workers. The soldiers of most termite species are without eyes, however, some species have soldiers with very tiny eyes.

Figure 3 - 4

LIFE CYCLE

Termite life cycles vary according to the termite species being considered. The following life cycle (fig. 3-5) is for the eastern subterranean termite (Reticulitermes flavipes):

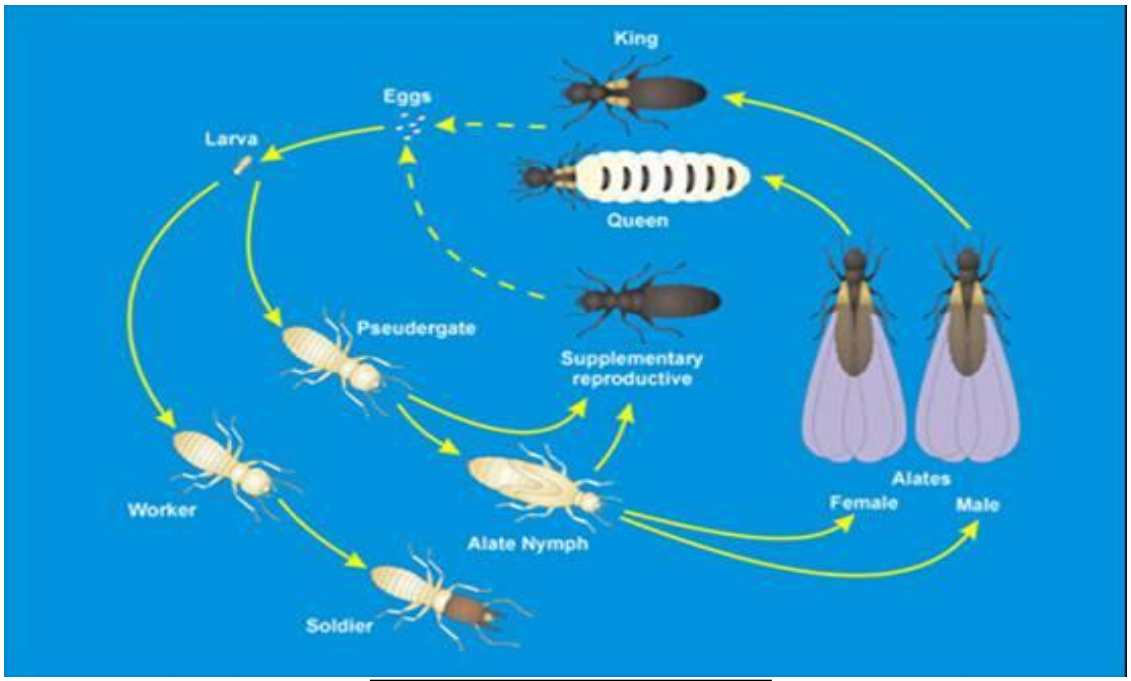


Figure 3 - 5

Swarms of male and female reproductives usually emerge in the Northeast in the spring (March - May), although they may swarm almost anytime during the year. They usually swarm only once per year but multiple swarms can and do occur. Swarms generally occur on a warm day following a rain. This is probably an opportune time in which to swarm since the ground is soft after a rain and the reproductives can easily dig into it. Swarmers usually emerge through specially constructed mud tubes called swarming tubes or swarming castles (fig.3-6).

Figure 3 - 6

After a short emergence flight that may only last a few minutes the swarmers land and break off their wings. Wings are broken off along a naturally occurring suture line or weak area near its base. Figure 3 – 7 shows cast off termite wings.

Figure 3 - 7

The female emits a pheromone or a chemical sex attractant. She then searches for a suitable nesting site. Males are attracted to a female and follow closely behind her. This close following behavior is known as tandem behavior. This behavior may last a few minutes, or last a number of

hours. A number of males may pile up behind the female, but eventually she and the male that is immediately behind her will retire to a nesting site. They dig into the soil and then seal themselves inside. Mating may occur within hours or weeks after the pair are sealed in the nest area. These termites continue to mate for life, unlike ants that mate only once.

The Eastern Subterranean Termite queen initially produces about 20 eggs. As time passes she will become more prolific and produce about 60 eggs per day (fig. 3-8). This is nothing when compared with the tropical mound building termite ***Odontotermes obesus***. The queen of this termite species can produce one egg per second. She can produce 86,400 per day and up to 3l,000,000 eggs per year. The Formosan termite (Coptotermes formosanus) produces about 1,000 eggs per day.

Figure 3 - 8

The eggs of ***Reticulitermes flavipes*** will hatch in about 50 days (Range = 30-80 days) into the first instar immatures.

The growth of the colony is slow for the first few years. Later reproduction will increase either because the queen produces more eggs or secondary reproductives also begin egg laying.

The queen termite will never leave the nest again. She becomes, in essence, “an egg laying machine”. The workers will take care of her — feeding her and grooming her. They remove her eggs as they are produced, and they will assist in moving her body for her, the abdomen of which will become greatly distended.

The eggs hatch into small termites called nymphs. Nymphs are capable of becoming any one of the castes (workers, soldiers, or reproductives). Which caste they develop into is dictated by the needs of the colony. For example, in the early years of colony development, soldiers and reproductives are not produced.

The soldier caste functions in the defense of the colony. They are easily recognizable by their massive heads and large mandibles. They attack any intruders that may enter the nest, and can plug openings in their tunnel system by using their enlarged heads.

Workers carry out multiple functions — such as caring for the queen, foraging for food, constructing the mud tubes, cleaning the nest galleries, feeding the soldiers (soldiers are unable to feed themselves). They produce mud tubes through which other workers can forage. The mud tubes

serve various functions. They keep out enemies, maintain the necessary humidity within the nest and allow foraging workers to cross over concrete, metal or rock.

The reproductive caste as expected is charged with reproduction. In addition to the primary reproductives (the original king and queen) secondary reproductives may be produced. These reproductives are produced if the king or queen dies, or if the colony becomes so widespread that the chemical influence of the primary reproductives can no longer inhibit the development of secondary reproductives. When the primary queen dies the colony often "explodes" numerically because instead of only one female taking her place, multiple secondary reproductives will be produced.

Recent studies have shown that colonies of ***R. flavipes*** may consist of over 3 million individuals while a colony of the Formosan termite may consist of 6.9 million individuals.

The distance over which the Eastern subterranean termites can forage has been found to be over 11,000 square feet, while the Formosan termite is believed to travel over 37,000 square feet. It has been shown that termites are able to detect the volatile compounds that are released by dead wood, and will deviate 4 – 6 inches from their established trails to investigate a potential new food source. The termite inspector should expect to find subterranean termites at almost any time of the year, even in winter. It has been shown that at 32 degrees F, termites can survive for up to 6 weeks, especially if the cooling was gradual, by going into a "thermal coma". Once warmed, they experience only a 10% mortality.

INSPECTING FOR TERMITES

Normally the most noticeable sign of the presence of termites is finding the swarming alates. These termites usually leave the nest on a warm day following a rain. The time of day and the months that swarming occurs varies according to the species (see Table Three - 2).

If you are inspecting a building, chances are that swarming will not occur while you are there. However, there are a number of signs that you may find that will indicate that termites are present inside the building. See Chapter 10 for more tips on inspecting.

1. Mud tubing may be seen on the beams, walls or on concrete (figs. 3-9, 3-10). Examine spaces between two "sistered" pieces of lumber (joined along their long axis), often tubing or mud will be seen there.

Figure 3 - 9

2. Look behind furnaces, wires, stored boxes and cabinets, etc. for the presence of termite wings and/ or their bodies or mud tubes.

Figure 3 - 10

3. Check window sills, patio door tracks, spider webs for signs of termites.

Figure 3 - 11

4. Probe what looks like solid wood for the presence of termites. Termites normally do not eat through the outside surface of wood, however, they will eat through the outside surface of a wooden member if it is pressed against another wooden member, or if it covered with paint, wallpaper, or a veneer (fig.3-11).

Occasionally they may chew through the exterior surface of wood. A wooden member may appear solid but may be completely hollowed out except for a thin veneer on its exterior surface. Probing may disclose such damage.

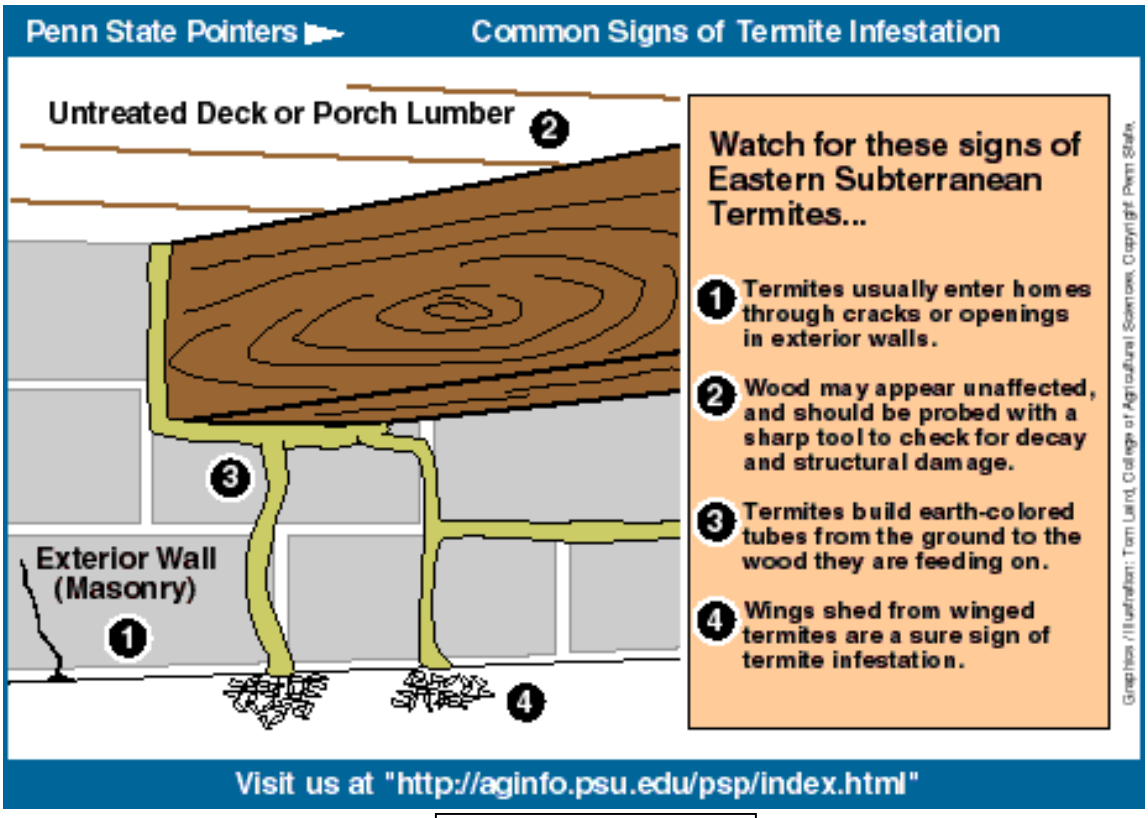


Figure 3 - 12

5. Inspect wood covered with paint that shows “bubbling”. Also check any raised tiles, linoleum or floorboards as well as any areas that indicate past or present water leakage. (fig. 3-13)

Figure 3 - 13

6. Weak, sagging or buckled floors may be indicative of the presence of rot or wood destroying insects. Be suspicious of any oddly placed furniture, rugs or boards. These may be areas of damage that are being covered up.

Figure 3 - 14

7. Wood damaged by subterranean termites will usually show galleries that run parallel with the grain. Occasionally the damaged areas may run across the wood's grain. Galleries will exhibit "mud" or "sandy" deposit within them. Subterranean termites do not excrete solid fecal material. Instead they produce liquid fecal waste. This waste, plus saliva and soil particles make up the "mud" found inside their galleries.

Figure 3 - 15

8. Check behind batt-type insulation, and within and behind rigid foam board insulation. (figs. 3-16, 3-17)

Figure 3 - 16

Figure 3 - 17

9. Drywood termite galleries do not have mud or sandy deposits within them and their tunnels cut across the grain of the wood. Drywood termites have very characteristic solid fecal pellets. They appear “seed-like” are rounded at their ends and are six-sided and dimpled or concave on these six sides (fig 3-18). These pellets are pushed out of the wood through small openings. Finding piles of these pellets below the wood from which they originated signals the presence of drywood termites.

Figure 3 - 18