



# Formosan Subterranean Termites



Roger E. Gold, Harry N. Howell, Jr. and Grady J. Glenn\*

**F**ormosan subterranean termites are wood-destroying insects native to the Far East that have been introduced into the United States. They are considered to be the most aggressive and economically important termites in the country. Like other subterranean termites, Formosan termites feed on cellulose-containing materials, but they attack a greater variety of materials at a faster rate. They have an enormous reproductive capacity and large colony size. These characteristics and the unique survival adaptation of building nests above the ground underscore the need for homeowners and professional pest control operators to become familiar with the pest's identification, biology and habits. A thorough knowledge about the insect is important in the management of Formosan termites as they spread inland from coastal areas.

## Distribution

Formosan termites, *Coptotermes* spp. (Isoptera: Rhinotermitidae), are native to China, Formosa and Japan, and have been introduced into Sri Lanka, South Africa, Hawaii and the continental United States. These termites presumably were imported in crated military supplies returning from the Pacific area following World War II. They were identified at a Houston, Texas, shipyard in 1965. In 1966, well-established colonies of Formosan termites were discovered in New Orleans and Lake Charles, La., and Houston and Galveston, Texas. In 1967, they were found in Charleston, S. C., and colonies were located in Florida in 1980.

These termites spread slowly because the reproductives are weak fliers. However, the transportation of infested soil or material such as lumber, wooden crates and other wood products disperses them rapidly. Trade and transportation of wood products and central heating of homes and other structures can create conditions favorable to infestation and survival. Formosan termites may eventually spread along the entire Gulf and southern Atlantic coasts. Severe winter temperatures may limit their movement north.

In Texas, Formosan termites commonly are found along the Houston Ship Channel, including Texas City and Galveston. They are also found in the Beaumont-Port Arthur-Orange area (Fig. 1). Isolated infestations have been reported as far north as Denton County and as far south as Hidalgo County in the Lower Rio Grande Valley.

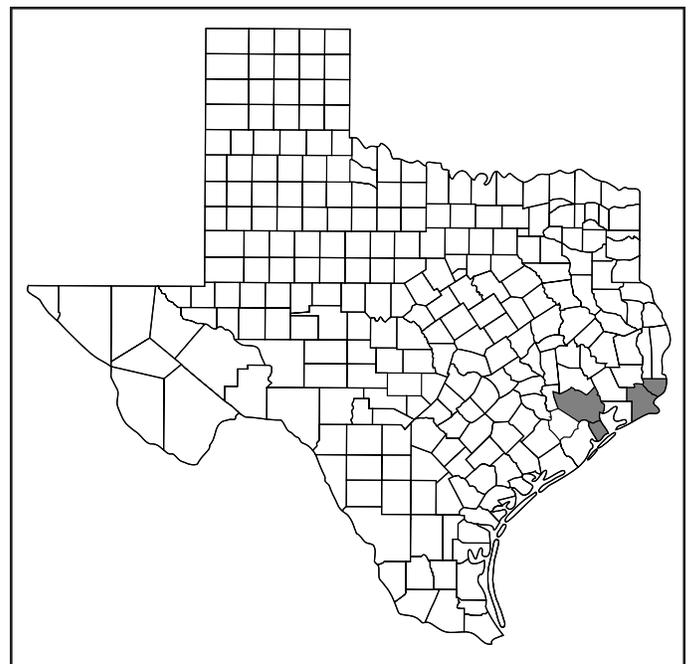


Figure 1. Known distribution of the Formosan termite in Texas.

\*Professor and Extension Specialist in Urban Entomology, Assistant Extension Entomologist, and Research Assistant; Center for Urban and Structural Entomology; The Texas A&M University System.

## Identification

Formosan termites are social insects. There are three forms, called castes, found in the colony: reproductives (winged or wingless), soldiers and workers (pseudergates). Soldiers and winged reproductives (alates) are the castes used for identification purposes (Fig. 2). Formosan termites also build characteristic and easily identifiable nests.

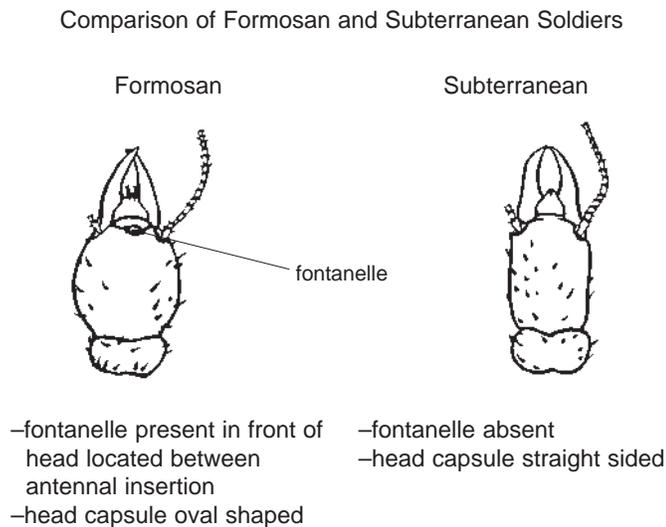
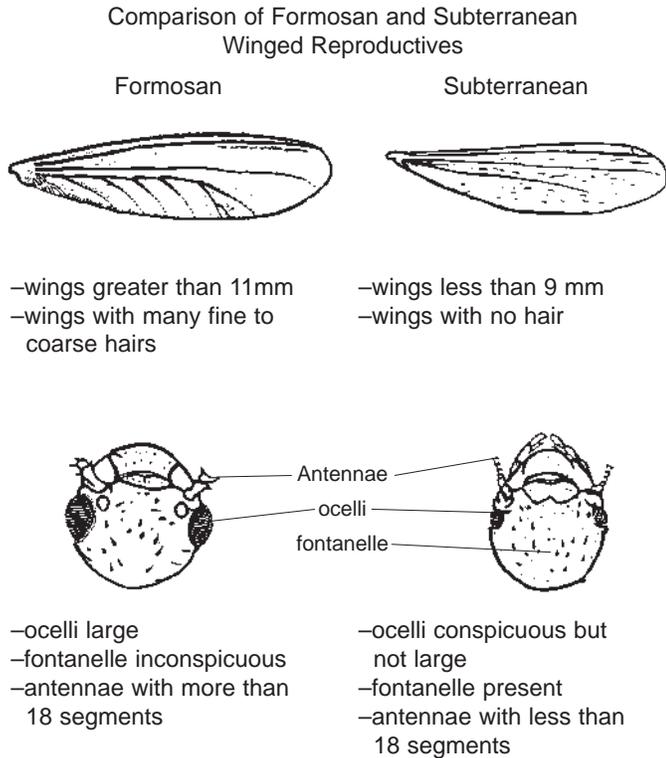


Figure 2. Comparison of Formosan and other subterranean termites.

**Soldiers:** Formosan termite soldiers have tear-dropped or egg-shaped heads that are shorter than the heads of native subterranean termites. In an infested structure or timber, soldiers are more abundant than when compared to native termite infestations. Formosan termite soldiers can make

up 5 to 10 percent of a colony, while native subterranean termite soldiers make up only 1 to 3 percent. Formosan termite soldiers are more aggressive than native subterranean termite soldiers and will attack anything or anyone probing their colony. When disturbed, the soldier exudes a small amount of a white, defensive secretion from a gland, or fontanelle, located on the front of its head. In native subterranean termites, the fontanelle is small and barely visible.

**Winged reproductives:** Winged Formosan termite reproductives are yellowish-brown in color and 12 to 15 mm long (0.5 to 0.6 inch). Native subterranean termite reproductives are 10 mm long (0.4 inch). *Reticulitermes flavipes* and *Reticulitermes virginicus* have black bodies, *Reticulitermes hageni* is about the same color as the Formosan termite. The ocelli, or simple eyes, of Formosan termites are large; they are small on native termites. The antennae of Formosan termites have more than 18 segments; native termite antennae have less than 18 segments. Wings of the Formosan termite are greater than 10 mm long and are covered with dense golden hair. Their wings have two heavily pigmented veins (costa and radius veins) near the front edge and no connecting crossveins. Wings of native termites are less than 9 mm long and are almost bare. (Some drywood termites are also a honey-brown color and are about the same size as Formosan termites. Several species of the family *Termitidae* have wings covered with hair.)

**Workers:** Workers (pseudergates) of Formosan termites are white to off-white in color and are difficult to distinguish from other termite species.

**Nests:** Formosan termites often make aerial nests of chewed wood, soil, saliva, and fecal material (Fig. 3). The material is known as "carton." These nests can be as large as several cubic feet and can be found above ground level without soil contact.

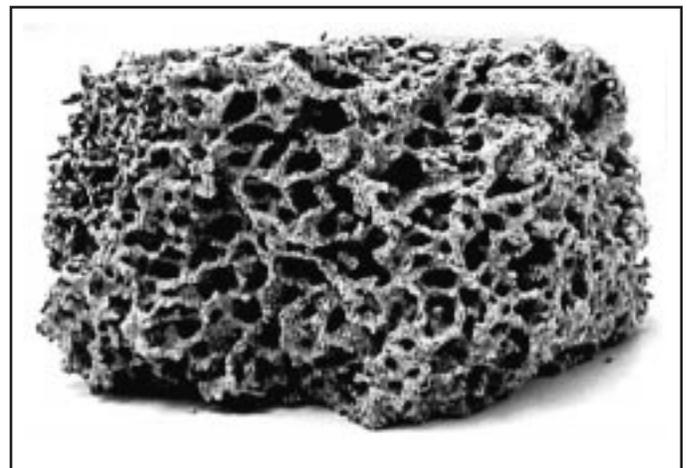


Figure 3. Carton nest of Formosan subterranean termites.



The Formosan subterranean termite alate is yellowish-brown in color.



Formosan termite soldiers (top) have short, egg-shaped heads compared to native subterranean termite soldiers.



Wings of Formosan termite winged reproductives are larger than wings of native termites.

## Biology and habits

Formosan subterranean termites belong to the same family as native subterranean termites (family *Rhinotermitidae*), but there are several differences in their biology. Although subterranean in nature and name, this species is quite active when free of soil contact if enough moisture is present to support the colony. This is made possible by their unique nest-building capability. Formosan termites tend to nest in hollow spaces, in the soil or in hollow heart-rotted trees. They fill the void with "carton," which resembles the above ground portion of a fire ant mound and serves to conserve moisture for the colony. When they infest a human-made structure, they form this carton in the wall voids. Studies in Hawaii show that Formosan termites often live for months or even years on the moisture in the carton material as they work the interior of the walls. If the colony is cut off from its subterranean or soil contact, this aerial nest can still survive.

Formosan termite colonies typically consist of several hundred thousand termites, but colonies of several million are not unusual. They exhibit great reproductive potential and a Formosan termite queen can produce up to 1,000 eggs per day. When new nests and foraging areas are established, the population can expand rapidly. Like other subterranean termites, Formosan termites feed on cellulose, but they attack a greater variety of materials containing cellulose, including living plants. They have been known to attack more than 47 plant species, including citrus, wild cherry, cherry laurel, sweet gum, cedar, willow, wax myrtle, Chinese elm and white oak. While native subterranean termites feed on the softer wood produced during spring growth and leave the summer growth wood, Formosan termites feed on both (Fig. 4). The larger, heavier workers (pseudergates) and larger colonies of Formosan termites consume more wood than native termites. Like other subterranean termites, they also have been known to eat through non-cellulose material, such as thin sheets of soft metal (lead or copper), asphalt, plaster, creosote, rubber, and plastic, searching for food and moisture.

In Texas, Formosan termites swarm from mid-May to mid-June, between dusk and midnight, on still evenings. Large numbers can be seen around light sources, to which they are attracted. By contrast, native subterranean termite swarms typically occur from late January to late May (*R. hageni* swarms September and October), usually during the early part of the day. They are not particularly attracted to lights.

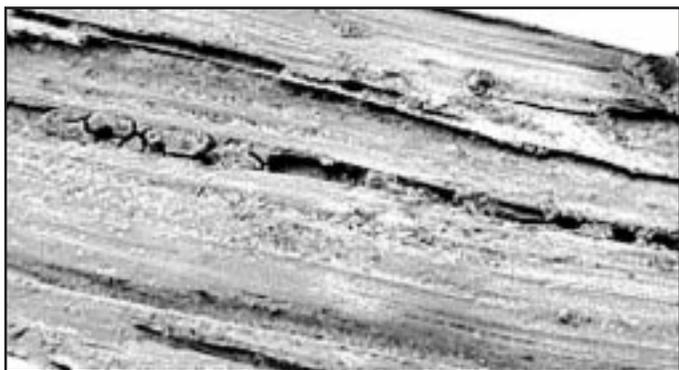


Figure 4. Wood damage caused by Formosan subterranean termites.

After a short flight, Formosan alates drop to the ground, shed their wings, and pair off. If a suitable site with moist wood is found, the pair forms a chamber and mates, and the female begins laying eggs. It usually takes three to five years to develop a mature colony. Formosan termites can attack all types of structures—piers, pilings, posts, logs, utility poles and timber—contacting the soil. They generally invade structures from the ground and enter through expansion joints, cracks and utility conduits or plumbing access openings in slabs. Foraging galleries lined with carton material are constructed to the food source.

Formosan termites do not always require ground contact. If a pair of alates successfully finds adequate food and moisture sources in a building, an aerial colony can begin. This species of termite can initiate aerial infestations on the flat roofs of high rise buildings if portals of entry and sufficient moisture from rain or other sources exist. More than 25 percent of the infestations in urban southeastern Florida are caused by aerial colonies. Colonies also can obtain moisture from plumbing leaks, foam insulation that is installed below grade or soil line, and stucco. Termites also have been known to penetrate asphalt and gravel roofs in order to funnel water to the colony.

## Management

### Preventive management

The best management of Formosan termites involves preventive measures. The best time to protect against any termite species is prior to construction. Pretreat the soil under and around the perimeter of the slab or piers with recommended insecticides. All wooden form boards and reinforcing grade stakes must be removed after the foundation is completed. During construction, avoid putting any siding or insulation material below soil grade. There should always be a 4- to 6-inch gap on the foundation between soil grade and building materials. It is also critical to locate and eliminate all sources of moisture that termites

can use to maintain their carton or aerial nests. Thorough annual inspections for evidence of termite activity should be made.

### Remedial treatment

As with all subterranean termites, the first step in treatment is to establish a barrier of treated soil around the foundation's perimeter, and at the point of any penetrations through slab-on-grade construction. Spot treatments may not prevent Formosan termites from gaining access elsewhere in the structure. A thorough treatment around the foundation perimeter and all plumbing penetrations may not be successful if the termites find possible entry points that termites might use. Formosan termite colonies are large and cover much ground, and they are persistent about gaining access. Also, structures should be thoroughly inspected to discover and eliminate all moisture sources that these termites could use to maintain aerial nests. The aerial nests, or carton, should be located and a chemical treatment applied into them. A moisture meter is a valuable tool in locating aerial nests and the use of termiticide foam is helpful in treating these nests in wall voids.

Fumigation is a tool used in conjunction with termiticide soil barriers. Because of the high moisture content of the aerial nests, control by fumigation may be difficult. Professional pest control operators have the choice of two fumigants registered for the control of Formosan termites: Vikane® (sulfuryl fluoride) and Brom-O-Gas® (methyl bromide). Follow label directions carefully. When fumigation is completed and the structure is vented, no residual pesticide remains for future termite control or prevention. The use of fumigation alone, with no soil treatment, does not prevent re-entry of termites from the soil.

Termite baiting systems also are available for the control of subterranean termites, including Formosan termites. There are several below-ground and above-ground choices in baiting systems. They have an active ingredient impregnated into a cellulose matrix that the foraging termites consume and transfer to the other members of the colony. Use of this technology requires that a pest control operator have specific knowledge of termite biology and behavior to apply the baits correctly. This method also demands diligent monitoring. Some baiting systems are used in combination with liquid termiticide applications in a systematic or integrated termite control system. Other baiting systems are designed to be used alone. In general, baits require several trips to a site for installation and monitoring. Control may take from a few weeks to more than one year.

## **Treatment of infested trees**

Trees infested by Formosan termites also require treatment. The surface application of termiticides onto the plants will not work. These termites usually hollow out the center of trees and make their carton nests in the voids. To manage Formosan termites in a living tree, drill the tree above the soil line where carton is located and inject termiticide into the void. The use of foaming termiticide is a valuable tool in these treatments; the expansion characteristics of foam contribute to thorough application to void spaces in the tree.

## **Key to management**

The key to management of Formosan subterranean termites involves several important steps:

- Accurate, positive identification of the soldiers or winged reproductives.
- Thorough knowledge of their biology and behavior.
- A comprehensive inspection based on that knowledge.
- A thorough treatment, making every effort to create a barrier between the structure and the termites.
- Meticulous annual inspections for evidence of termite activity.
- Preventive management measures such as maintaining a gap between soil grade and building materials, as well as eliminating all sources of moisture.
- Proper use of these techniques can lead to the management of these termites that are known for their large colony size, persistence in seeking out man-made structures for their own survival, and significant potential for structural damage.

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