

## Formosan Subterranean Termite<sup>1</sup>

---

B. J. Cabrera, N.-Y. Su, R. H. Scheffrahn, F. M. Oi, and P. G. Koehler<sup>2</sup>

### Introduction

The Formosan subterranean termite, *Coptotermes formosanus* Shiraki, is one of the most destructive termite species in the world today. In the United States it causes tremendous property damage resulting in enormous treatment and repair costs. It is sometimes referred to as the "Super Termite" because:

- It has large colonies.
- The territory of a single colony can be up to 300 feet.
- It infests a wide variety of structures (including boats and high-rise condominiums).
- It eats wood at a rapid rate.

### Where Did It Come From And Where Is It Now?

The Formosan subterranean termite has been transported worldwide from its native range in southern China to Formosa (Taiwan, where it gets its name) and Japan. Within the last 100 years it has become established in South Africa, Hawaii and the

continental United States. The first record of Formosan termites in the continental United States was in 1957 from Charleston, South Carolina. In 1965 it was found in a shipyard in Houston, Texas and within a few years colonies were discovered in Galveston, Texas, and New Orleans, Louisiana. It is believed that the Formosan subterranean termite was transported to port cities on the Gulf of Mexico and southeast Atlantic coast by ships returning from the Pacific Theater at the end of WWII. Currently, Formosan termites are found in Alabama, Georgia, Florida, Hawaii, Louisiana, Mississippi, North and South Carolina, Tennessee, and Texas, while an isolated population was found near San Diego, CA in 1992 (Fig. 1).

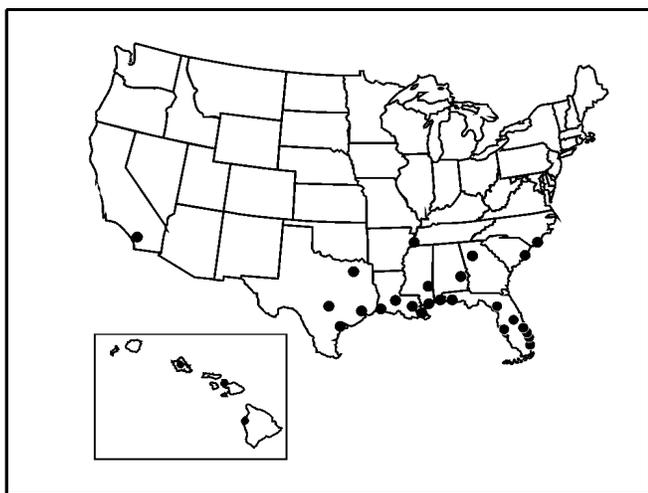
In Florida, they have been found in Crystal River, Dania, Ft. Lauderdale, Hallandale, Hollywood, Jensen Beach, Jupiter, Miami, Orlando, Palm Beach Gardens, Tampa, Tallahassee, Ft. Walton Beach, Pensacola, and several other western panhandle communities (Fig. 2). Within the last two years, they have been discovered in Ocala (Marion Co.), Jacksonville, Trinity (Pasco Co.), Marco Island (Collier Co.), Bonita Springs (Lee Co.) Debarry

- 
1. This document is ENY-216 (MG064), one of a series of the Entomology and Nematology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Publication date: August 1991. First revision: September 2000. Revised: December 2005. Graphics by J. Perrier, Ft. Lauderdale-REC. Please visit the EDIS Website at <http://edis.ifas.ufl.edu>. Additional information on these organisms, including many color photographs, is available at the Entomology and Nematology Department website located at <http://www.ifas.ufl.edu/~entweb/entomolo.htm>.
  2. B. J. Cabrera, assistant professor, Ft. Lauderdale-REC, N.-Y. Su, professor, Ft. Lauderdale-REC, R. H. Scheffrahn, professor, Ft. Lauderdale-REC, F. M. Oi, assistant Extension scientist, Entomology and Nematology Department, P. G. Koehler, professor/Extension entomologist; Entomology and Nematology Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611.

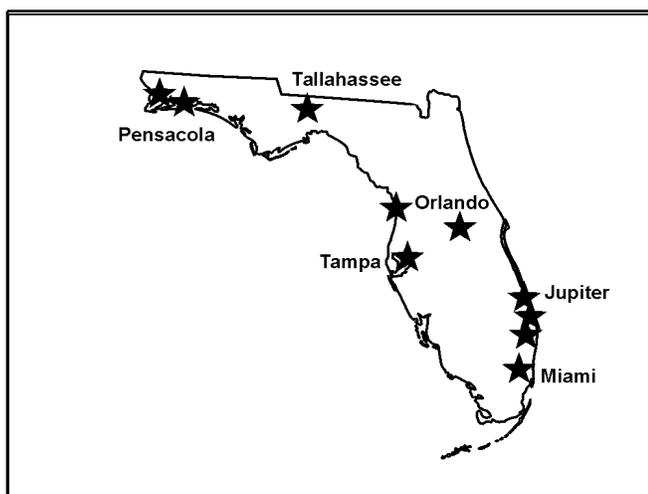
The Institute of Food and Agricultural Sciences (IFAS) is an Equal Opportunity Institution authorized to provide research, educational information and other services only to individuals and institutions that function with non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, marital status, national origin, political opinions or affiliations. U.S. Department of Agriculture, Cooperative Extension Service, University of Florida, IFAS, Florida A. & M. University Cooperative Extension Program, and Boards of County Commissioners Cooperating. Larry Arrington, Dean

(Volusia Co.), Cape Coral (Lee County), and Interlacheon (Putnam Co.).

The Formosan subterranean termite has the potential to spread throughout the whole state. Young colonies living in potted plants, landscape timbers, or infested trees can easily be transported. A good example is given in Louisiana and Georgia where their spread was aided by homeowners who accidentally brought termites to their homes by buying infested railroad ties at home and garden shops. Alates (winged reproductives) also can swarm from infested boats into new locations as the boats travel from place to place.



**Figure 1.** Distribution of the Formosan subterranean termite in the U.S. (Adapted from Su & Scheffrahn, 2000. Formosan subterranean termite. Featured Creatures. <http://creatures.ifas.ufl.edu>).

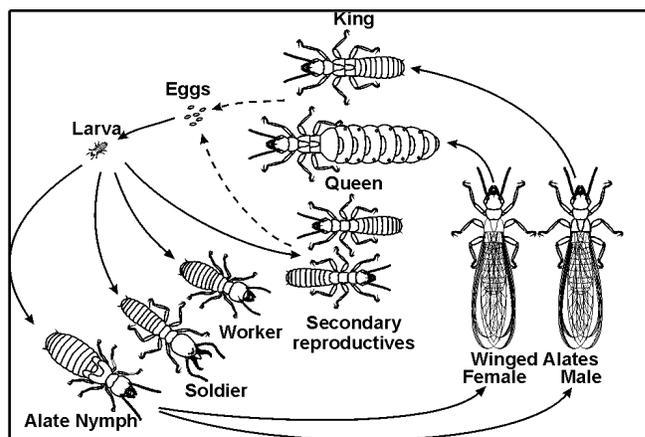


**Figure 2.** Distribution of the Formosan subterranean termite in Florida (Adapted from Su & Scheffrahn 2000. Formosan subterranean termite. Featured Creatures. <http://creatures.ifas.ufl.edu>).

## The Life Of A Formosan Subterranean Termite

In Florida, Formosan termite swarms usually occur from April through July on calm, warm, and humid evenings. Swarms are quite large with up to tens of thousands of alates. The swarmer are attracted to lights and are often found around windows, light fixtures, windowsills, and spider webs in lighted areas. After swarming and landing on the ground, the alates break off their wings and search for a mate. Once a mate is found, the male and female search for a crevice in damp ground or wood, hollow out a small chamber, and crawl inside. The pair, now known as the king and queen, mate and within a few days the queen starts laying eggs. The young, known as larvae, hatch from the eggs and are fed by the king and queen.

A mature colony contains distinct groups called castes (Fig. 3). These castes look different from one another and each has a special duty within the colony. The king and queen are the primary reproductives and are responsible for reproduction. If the queen or king dies or the colony becomes large, secondary reproductives may form and begin reproduction. Soldiers defend the colony against predators and other natural enemies. Workers take care of and feed the larvae, reproductives and soldiers, tend the eggs, build and maintain the nest, and search for food. Alate nymphs become alates when they are fully grown.



**Figure 3.** Life cycle of the Formosan subterranean termite (Adapted from Su & Scheffrahn, 2000. Formosan subterranean termite. Featured Creatures. <http://creatures.ifas.ufl.edu>). Credits:

Formosan subterranean termite colonies are much larger than those of native subterranean termite species. Some have been estimated to have over 8 million individuals compared with about 1 million termites in large native subterranean termite colonies.

Like many other termites, the Formosan termite feeds on wood and other materials that contain cellulose which is the main structural component of plants. Bacteria and other single-celled organisms live in the termite digestive system and digest cellulose providing nutrition and energy for these termites.

## Do Formosan Subterranean Termites Eat Anything Else Besides Wood?

Although they feed mostly on wood, they will eat other cellulose-containing materials such as cardboard and paper. However, they are known to chew through foam insulation boards, thin lead and copper sheeting, plaster, asphalt, and some plastics.

## Is It True They Eat Concrete?

Contrary to popular myth, **FORMOSAN SUBTERRANEAN TERMITES DO NOT EAT CONCRETE** nor can the soldier's defensive fluid dissolve holes in concrete. These rumors continue because Formosan subterranean termites are always digging through the soil. Because of this continuous activity, they are likely to find cracks and crevices in concrete or mortar and gain entry to a structure. This can fool someone into thinking that Formosan subterranean termites can eat through solid concrete.

## Where Do They Live?

Subterranean termite species, such as the Formosan termite, generally live underground. They tunnel through the soil in search of food. Unlike native subterranean termites, Formosan termites build large nests. These are made of carton, a hard material the workers make from soil, chewed wood or plant matter, and their own saliva and feces. Carton nests are quite impressive - a large, rock-like mass constructed by hundreds of thousands or millions of termites.

Although nesting mostly below ground, some Formosan termite colonies will build above-ground

nests that are not connected to the soil. Nests can be made in structures where the temperature does not get too hot or cold and there is plenty of moisture.

Sources of moisture include:

- plumbing, water heater, and roof leaks
- condensation from air conditioning units
- poor drainage from gutters and flat roofs
- seepage and rainfall on boats and ships
- porches, balconies, rooftops, etc. with plants or landscaping that are frequently watered

## What Do Formosan Subterranean Termites Look Like?

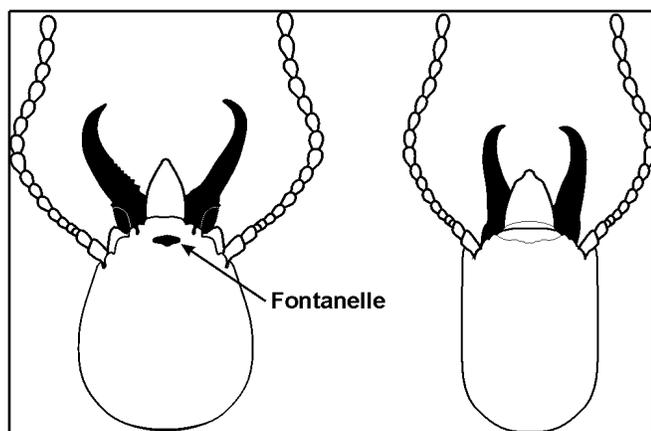
Formosan subterranean termite workers look similar to those of native subterranean species. It is almost impossible to positively identify Formosan termites with just the workers but the soldiers and alates look very different and are easy to identify.

### Soldier

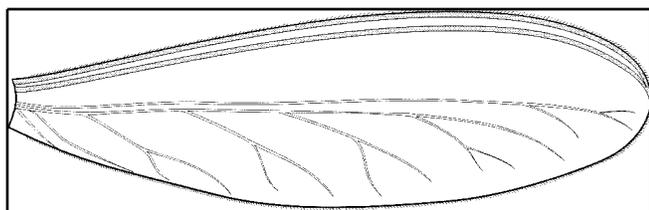
Soldiers have orange-brown, oval-shaped heads that are quite different from the more rectangular, straight-sided head of native subterranean termite soldiers (Fig. 4). There is a small pore, called the fontanelle, on the front of the head. The soldiers produce droplets of a white, glue-like fluid from this pore when they are attacked. This fluid gums up and disables attackers. Soldiers have black, sickle-shaped mandibles (jaws) that can be crossed to form an X. The bodies are yellowish-white and are about 1/5 to 1/4 inches long. Formosan subterranean termite soldiers are very aggressive. They will even attack fingers or tools if provoked, although their bite and fluid is harmless to humans.

### Alate ("Swarmers")

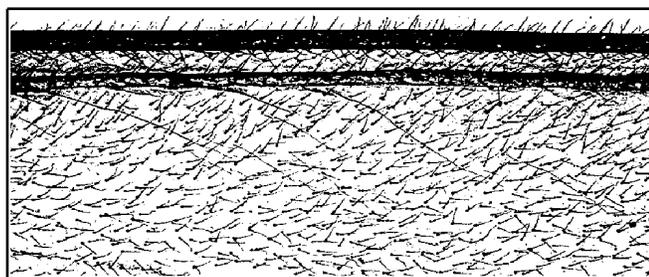
Swarmers are yellowish-brown with golden brown heads, a pair of black eyes and 2 pairs of wings of equal length. They are about 1/2 to 3/5 inch long from head to wingtip. The wings are clear with two heavily thickened veins on the leading edge (Fig. 5) and are covered with small hairs. These hairs are clearly visible under magnification (Fig. 6).



**Figure 4.** Soldier heads of *C. formosanus* (left) and native subterranean termite (right). Credits:



**Figure 5.** Formosan subterranean termite wing (Adapted from Su & Scheffrahn, 2000. Formosan subterranean termite. Featured Creatures. <http://creatures.ifas.ufl.edu>). Credits:



**Figure 6.** Close-up view of wing showing numerous small hairs (Adapted from Su & Scheffrahn, 2000. Formosan subterranean termite. Featured Creatures. <http://creatures.ifas.ufl.edu>). Credits:

## How Can I Get Them Identified?

If you are not sure if the termites you have are Formosan, you can send or bring soldiers and alates to your County Extension office for identification. Here are some tips for sending or bringing your samples:

- Preserve the termites in rubbing alcohol and keep them in a small, non-breakable container with a tight-fitting, leak-proof cap or lid.

- Termites mailed in envelopes or sandwich bags dry out, get crushed, and break apart if they are not first put into a sturdy container. This often makes identification difficult.
- Do not stick termites on tape or tape them to paper. This makes identification difficult.
- Be sure to include the wings if you have alates.

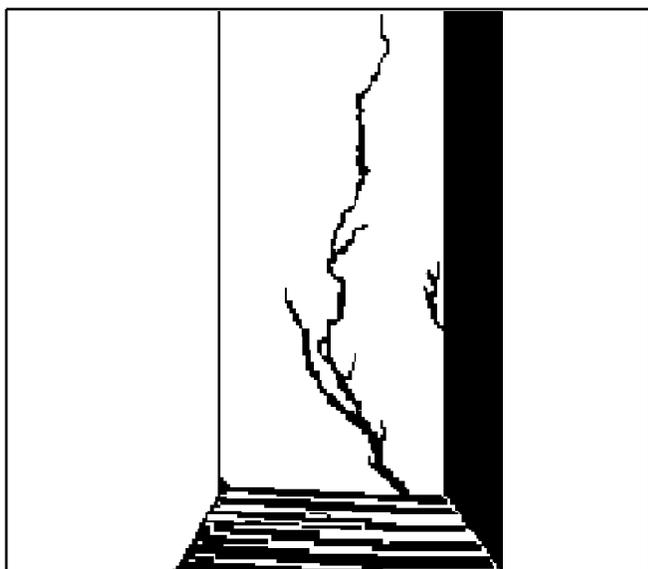
Remember, the better the condition your samples are in, the easier it will be to identify them.

## How Do I Know If My House Is Infested?

Large carton nests in trees, attics, wall voids, etc., are obvious signs of an infestation. Sometimes the damage caused by Formosan subterranean termites is not so obvious. Soft spots, damp or moist patches, bulges, and blistered paint or wallpaper in walls, doors, floors, and other areas may indicate termite activity underneath. Probing these areas with a screwdriver may reveal damaged wood, soil, carton, and live termites. Formosan subterranean termite infestations are recognized by the presence of lots of soldiers.

Subterranean termites crawling above ground build mud shelter tubes because they do not like being exposed in the open to light and air. The tubes keep the termites from drying out and shield them from predators, such as ants, and natural enemies. Shelter tubes are often found on walls coming up from the ground or floor (Fig. 7). They may also be found sticking out or dropping down to the ground in crawl spaces, under porches or stairways, etc. Tubes and carton may be in places where they are difficult to see such as stucco or plaster cracks, tree holes, tree crotches, etc. You can break the tubes open to check for termites.

Remember that Formosan subterranean termites swarm during the evening from April through July. Keep in mind that swarmers outside around your home could be emerging and flying in from somewhere else. Check carefully around the premises to see if they are coming from your property.



**Figure 7.** Shelter tubes going up a wall behind a wood cabinet (Adapted from Su & Scheffrahn, 2000. Formosan subterranean termite. Featured Creatures. <http://creatures.ifas.ufl.edu>). Credits:

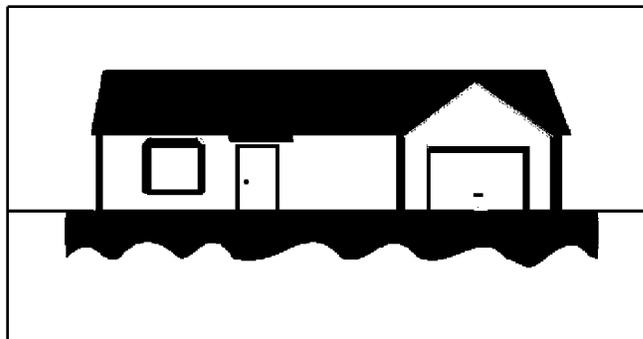
## What Should I Do If I Have Formosan Subterranean Termites?

The best thing to do is to have the infestation professionally treated. There are two types of control available: soil termiticides and baits. The treatment used depends largely on the type and size of the infestation, and which one the homeowner is most comfortable with.

### Soil Termiticides

**Pre-treatment.** Treating soil with a liquid termiticide creates a chemical barrier beneath the structure (Fig. 8). Depending on the chemical, the termites will either avoid tunneling through treated soil or die soon after they come in contact with it. Soil termiticides have been the standard preventive treatment for subterranean termites up until the mid-1990s. Termiticides are applied before the foundation slab of a structure is poured. Under ideal conditions, protection should last from 5 to 7 years; but under less than ideal conditions or because of improper application it can be much less. The slightest break in the protective barrier is all that is needed for termites to reach a structure. They can tunnel through areas in the soil where no termiticide is present. Expansion joints, cracks, and utility and plumbing lines are common termite entry points

through a concrete slab. Termiticide breakdown, soil erosion, improper application, and careless construction practices (such as leaving wooden grade stakes in the slab or disturbing treated soil) are several ways that the chemical barrier can be broken.



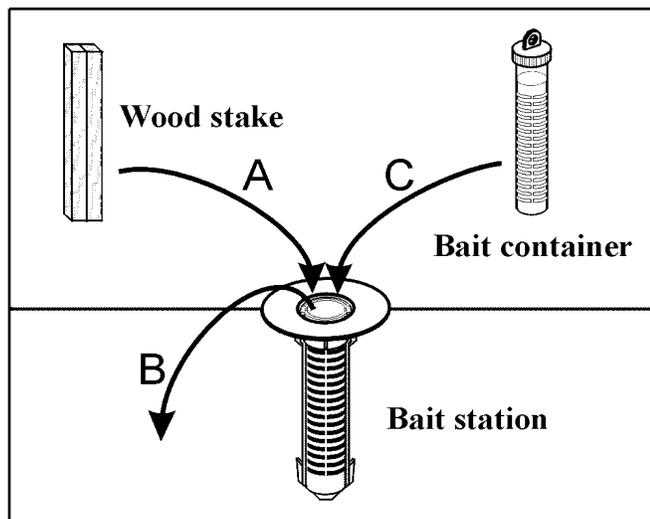
**Figure 8.** Depiction of a termiticide barrier under a home (Adapted from Su & Scheffrahn, 2000. Formosan subterranean termite. Featured Creatures. <http://creatures.ifas.ufl.edu>).

**Post-construction treatment.** When infestations occur after a structure has been built, termiticides are applied by one of three methods: rodding, drilling, or trenching. In the first, termiticide is injected directly into the soil at specific intervals around the perimeter of the house and beneath the slab with a rodder, an injection tool with a long, hollow, metal rod with an open tip. Drilling involves making holes through concrete slabs, walkways, patios, walls, and floors in order to treat the soil beneath the slab or inside wall voids. Trenching involves digging a shallow trench (about 6 X 6 inches) around the base of the home, applying termiticide to the trench and the backfill and then refilling the trench.

### Baits

Baiting systems provide an alternative to liquid termiticides. Developed in the early 1990s, they are also effective against the Formosan subterranean termite. Baiting involves placing bait stations (Fig. 9) in the soil around the outside of the house. The stations contain small pieces of wood (in some products the stations are installed with both wood and bait) and are checked regularly for termites. When termites are found in a station, the wood is removed and replaced with the bait. The bait is either a paper- or cardboard-like material or textured cellulose that contains a substance that slowly kills the termites. The idea behind baiting is that the termites feed on

the bait and get a dose of the active ingredient. Although this does not kill the termites immediately, it gives them enough time to feed the other termites in the colony. Eventually, all the members of the colony are affected. The termites begin dying and the population of the colony is severely reduced or eliminated.



**Figure 9.** Typical baiting procedure: A.) Station containing stake is installed in ground. B.) When termites are found in station the stake is removed and C.) replaced with bait (Modified from Su & Scheffrahn 2000. A system for the elimination of subterranean termite colonies. <http://www.ftld.ufl.edu/termite97.htm>). Credits:

Several different baiting systems are now being used by pest management professionals or are commercially available. Some have insect growth regulators (known as IGRs) as their active ingredient (AI). These are chemical compounds that act like termite hormones and keep the termites from developing normally. Other AIs prevent the termites from getting energy from their food.

Aboveground bait stations are also available and are used when termites are found in walls, doors, posts, flooring, etc. The stations are placed directly on areas where termites are present so that they can begin feeding immediately on the bait.

Advantages of baiting are:

- It is non-invasive (the baits are odorless and no liquid is involved so the soil remains pesticide-free).

- Technicians usually do not need to enter the house (unless in-ground stations are needed indoors).
- Drilling through floors and walls is usually not required.
- There is no exposure to the active ingredient because it is self-contained within the bait station.
- Only a small amount of an active ingredient (sometimes less than 1/20 oz.) is used for an entire treatment.
- The active ingredients are relatively harmless to humans and so little is used it makes it even safer.

The main disadvantage is that control is not immediate. It may take from several months to over a year to rid the home of termites.

### How Can I Keep My Home From Being Infested?

There are numerous ways you can reduce the chance of your home being infested by Formosan and other subterranean termites:

- Remove any wood or cellulose-containing material (such as cardboard) that is in direct contact with bare ground.
- Carefully inspect wooden items, especially railroad ties, for termites before buying them.
- Do not leave wooden items such as planters, tubs, trellises, railroad ties, firewood, and stakes on top of or in bare ground.
- Anchor wooden posts for fences, decks, porches, sheds, etc. in cement so that no wood is contacting bare ground.
- Structural wood at or near ground level should be pressure-treated with a wood preservative. Preservatives mainly protect against wood-decaying fungi but are also effective against termites.
- Maintain a zone of at least one foot around the outside of your home that is clear of plants and other landscaping materials. This reduces soil

moisture and makes it easier to inspect for shelter tubes coming up from the ground.

- Install rain gutters to prevent water from dripping down around the perimeter of your home.
- Keep rain gutters clear so that water drains quickly and does not accumulate and soak the upper walls and roof of your home.
- Fix or replace leaky outdoor faucets and water lines.
- Gutter downspouts and air conditioner condensate lines should empty out at least one foot away from the base of the home.
- The ground next to your home should slope away so that water does not pool next to it.
- Keep sprinklers from wetting the walls of your home.
- Fix leaks in the basement, roof, water heater, appliances, and other sources inside your home. These leaks moisten wood and create damp environments that Formosan and other subterranean termites like to live in.
- Remove all wooden grade stakes, form boards, supports, and scrap wood after finishing construction or remodeling.
- Remove dead trees and plants including the roots and stumps, if possible, from your yard.
- Eliminate or reduce the use of mulch and wood chips around the foundation of your home. This eliminates cooler and moist soil conditions favored by Formosan and other subterranean termites.

Also, as part of the Florida Building Code, a standard Termite Protection Code for new construction requires building designs and construction practices that should reduce termite problems and make it easier to find infestations.