

Southern Pine Beetle

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The pine tree industry is a major contributor to Florida's economy despite the loss of thousands of acres of trees due to recent hurricanes, notably Hurricane Michael in 2018. The pine industry provides trees for timber, pulpwood, pine straw, pine rosin (turpentine), and provides land for conservation and public enjoyment. According to a recent Florida Department of Agriculture (FDACS) publication, the timber and pulpwood industry employs over 70,000 people and annually contributes greater than \$6.5 Billion to Florida's economy. One of the biggest threats to the pine industry is the Southern Pine Beetle.

Southern Pine Beetle

The Southern Pine Beetle (*Dendroctonus frontalis*) is one of the most destructive insect pests of pines. In fact, the scientific name *Dendroctonus* means "tree killer". It is native to the eastern and southeastern United States, and now has been identified as far north as Maine, as far west as Arizona and as far south as Nicaragua in Central America. The beetles will infest all species of Pine trees though they most commonly infest Shortleaf and Loblolly pines.

Biology and Life Cycle

The southern pine beetle (SPB) has four life stages: egg, larva, pupa, and adult. The 2-4 mm long adult is dark red brown to black in color. Adult females live 35 to 60 days and during that time may lay as many as 160 pearly white eggs.

The initial attack is initiated by the female beetle. After finding a suitable host, the female releases

pheromones which aid in attracting a mate as well as attracting additional females. Arriving males also release pheromones which greatly increase the number of insects drawn to the area.

The beetles bore through the outer bark to the tree's vascular layer. Protected by this thick periderm layer, SDB females create winding tunnels which they lay their eggs in after mating within the phloem layer of the tree. As a result of the burrowing, the tree produces characteristic 'pitch tubes' of exuded resin. Once the nutrient rich cambium is reached, the female constructs winding egg galleries. She lays her eggs in niches cut in the gallery walls.

The male follows and tightly packs the galleries with frass, sealing in and protecting the eggs. The eggs typically hatch in less than 1 week but can take as long as 3 weeks. The hatched larvae often develop for about 2 weeks before they pupate but remain in a larval state for as long as 9 weeks. Finally, the pupal stage for SPB lasts for about 1 week. The weather, season, and other environmental factors all greatly influence the time of the development process. There may be as many as 7 generations per year in Florida.

Newly hatched larvae mine away from the gallery in the inner bark. Before they pupate, the larvae move into the outer bark. After pupating, the new adults chew exit holes and emerge. The adults have wings and have been observed flying up to 2 miles in search of new trees to infest. There may be as many as 7 generations per year in Florida.

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Infested areas can range from a few trees to several thousand acres.

Development for SBP occurs throughout the whole year, including through the winter, however, the process and activity significantly decreases in cooler months. Unlike other pine beetles whose populations tend to stay consistent, SPB populations can significantly increase in years of favorable conditions.

For feeding, SPB introduces a symbiotic fungus that grows on the sugar-rich phloem tissue. The growing nutritional fungus serves as the main source of food for the larvae and is not a tree pathogen. However, SPB is often a carrier of various blue-stain fungi which spreads throughout the vascular system of the tree and is considered a fungal pathogen. The blue stain fungus blocks the trees conductive vesicular tissue inhibiting the trees resin production response to defend itself from the infestation.

Signs and Symptoms of Infestation

The female beetle initially begins her attack on the lower 8 – 10 feet of the main trunk of the tree. As the attack progress, the upper parts of the trunk will show signs of infestation. Fresh attacks are characterized by the presence of frass and boring sawdust caught in the crevices of the bark. Pitch tubes, looking similar to white or yellowish popcorn, appear in the crevices between adjacent bark plates as the tree attempts to repel the invaders by suffocating them with resin (Figure 1). As the infestation progresses, the crown of the plant begins to change from green to reddish-brown to brown. This can happen quickly; in the right conditions from start of infestation tree death can occur in just a few weeks. When a tree is heavily infested with SPB, you can even hear the larvae feeding. If a section of the bark is removed, the characteristic winding galleries are visible.



Figure 1. Pitch tubes caused by a southern pine beetle infestation.

Prevention and Management

Trees stressed from drought, lightning strike, construction, disease, etc. emit stress-induced aromatic compounds which attract the female SPB. Taking steps to minimize tree stress and promote good health are the first steps to reduce risk of infestation. Routine inspections noting the overall health of the tree, proper watering, fertilization, and maintenance are important. Preventing damage to the root system of the plant is vital. The root systems of pines are shallow and extremely sensitive to damage and must be protected during construction activity. Heavy equipment compacts the soil and damages the root system. Root raking, trenching and/or cutting of major roots should be avoided.

Preventative chemical treatments are available with a limited efficacy timeframe from three months to two years. It is not economical or environmentally conscious to do so on a large scale tree farm. The application of protective sprays as a preventative is expensive but may be considered for preserving valuable specimen trees in the urban landscape. Contact a certified arborist and/or accredited pest management company to learn more about application options.