

Southern Pine Beetle

Dendroctonus frontalis (Zimmermann) (Coleoptera: Curculionidae, Scolytinae)

Introduction

The southern pine beetle, *Dendroctonus frontalis* (Zimmermann) (Coleoptera: Curculionidae) is one of the most destructive bark beetles of pines (*Pinus* spp.) in the United States and Central America (Thatcher et al. 1980). It is native to southeastern United States from Pennsylvania and New Jersey to Texas, and Arizona and New Mexico to Mexico and Nicaragua (Fig. 1). Adults and larvae feed on phloem in the inner bark which effectively girdle the trees. It also introduces blue-stain fungi to colonize xylem and block water flow within the trees. Millions of pines trees are killed each year in the native range.



Fig. 1. Distribution of southern pine beetle

Hosts

Principal hosts include shortleaf pine (*P. echinata*), loblolly pine (*P. taeda*), Virginia pine (*P. virginiana*), and pitch pine (*P. rigida*). It also attacks longleaf pine (*P. palustris*) and slash pine (*P. elliottii*).

Identification (Fig. 2)

Eggs: ca. 1.5 x 1.0 mm in size, oval, shiny, opaque and pearly white.

Larvae: 2 to 7 mm long, wrinkled, legless, yellowish-white with reddish-colored head.

Pupae: 2 to 4 mm in size, yellowish-white.

Adults: 2-4 mm long, cylindrical, brown to black in color. Males with a frontal groove on the head, and females with a broad, elevated transverse ridge (mycangium) along the anterior pronotum.

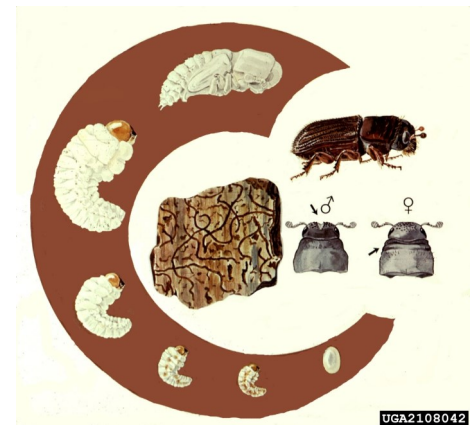


Fig. 2. Southern pine beetle life stages
R.F. Billings, Texas A&M Forest Service

Signs and symptoms

Signs and symptoms of southern pine beetle infestation include needle discoloration throughout the crown (Fig.3), pitch tubes on the trunk (Fig. 4), S-shaped galleries under the bark (Fig. 5), and round exit holes (Fig. 6).

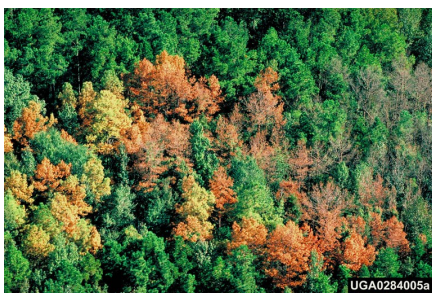


Fig. 3. Needle discoloration
G.J. Lenhard, Louisiana State University

Fig. 4. Pitch tubes
E.G. Vallery, USFS



Fig. 5. S-shaped galleries with larvae
T. Tigner, Virginia Department of Forestry



Fig. 6. Exit holes
L.L. Hyché, Auburn University

Biology and Life Cycle

There are three to nine generations a year for southern pine beetle in its native range. It may take 26 to 60 days to complete one generation from egg to adult (Fig. 7) depending on climate conditions. All life stages (egg, larva, pupa, and adult) can overwinter within the tree (Thatcher et al. 1980).

In the south, overwintering beetles emerge when flowering dogwood (*Cornus florida*) starts to blossom. Adults disperse in search of suitable (lightning-stuck or stressed) pine trees as hosts. Females initiate gallery construction in the inner phloem under the bark. They emit aggregation pheromone (frontalin) to attract males and females soon after the initial attack. Mass-attacking enables the beetles to overcome host defenses such as resin flows (Fig. 8). Mating takes place soon and females start to construct long and winding S-shaped egg galleries. Up to 30 eggs are deposited in niches along each gallery (Thatcher et al 1980).

Eggs hatch in 3-9 days following oviposition. Larvae feed in the inner phloem and construct galleries perpendicular to the egg galleries. As larva develops to the 4th instar, it progressively tunnels towards the outer bark to pupate in a pupal cell. Pupal stage lasts for 5-17 days before it turns into a callow adult. Callow adults remain under the bark for 6-14 days while the cuticles hardens and darkens. Young adults exit the tree by boring round exit holes through the outer bark to start new attacks on other trees (Thatcher et al. 1980).

Outbreaks and Management

Outbreaks of southern pine beetle occur every 6-12 years and generally last for 2-3 years. The average annual tree mortality in the U. S. exceeds 100 million board feet of sawtimber and 30 million cubic feet of pulpwood, resulting >\$1 billion economic losses from 1999-2002. Over 225,000 acres of pine forest in Central America were killed over the same period (Clarke and Nowak 2009).

Natural enemies such as *Thanasimus dubius* (Fig. 9) (Coleoptera: Cleridae) can maintain or reduce population levels. However, effective suppression is achieved by the removal of infested host trees through the cut-and-remove, cut-and-leave, cut-and-hand spray, or cut-and-burn treatment. To prevent southern pine beetle infestation, pine stands should be thinned to < 80 ft² basal area, and pine trees be planted at least 20 ft apart in urban areas (Clarke and Nowak 2009).

Infestation in Pennsylvania

Southern pine beetle was recorded in areas in Bedford, Franklin, and Fulton counties in PA between 1932-1933, with heavy infestations found in Mont Alto State Forest. Pitch, shortleaf, Virginia, table mountain (*P. pungens*), and eastern white (*P. strobus*) pines were all found infested (Knull, 1934). Recent detections include adults trapped from Susquehannock State Park (2014, 2017), Codorus State Park (2017), French Creek State Park (2017), and Goat Hill Serpentine Barrens (2017). An outbreak of >300 acres was also reported in Nottingham Park in Chester County in 2017 (Fig. 10).

References

- Clarke, S.R., and J.T. Nowak. 2009. Southern pine beetle. USDA Forest Service Forest Insect & Disease Leaflet 49.
- Knull, J.W. 1934. The southern pine beetle in Pennsylvania. J. Econ. Entomol. 27: 716-718.
- Thatcher, R.C., J.L. Searcy, J.E. Coster, and G.D. Hertel (eds.). 1980. The southern pine beetle. USDA Forest Service Technical Bulletin 1631.

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Fig. 7. Adult Southern Pine Beetle
E.G. Vallery, USFS



Fig. 8. Pitched out beetle
R.F. Billings, Texas A&M Forest Service



Fig. 9. *Thanasimus dubius* adult
G.J. Lenhard, Louisiana State University



Fig. 10. Outbreak in Nottingham Park
R. Lusk, PA DCNR