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Southern Pine Beetle Biology, Prevention, and Restoration

The Southern Pine Beetle (SPB) *Dendroctonus frontalis*, is not much bigger than an eye gnat (Figure 1). It attacks and kills all species of southern yellow pines in



Fig. 1 - Photo by David Almquist,
University of FL

Georgia including white pine. Trees are killed when beetles construct winding S-shaped egg galleries underneath the bark (Figure 2). These galleries effectively girdle the tree and destroy the conductive tissues that transport food throughout the



Fig. 2 - Photo by Ronald Billings,
Texas Forest Service

tree. Furthermore, the beetles carry blue-staining fungi on their bodies that clog the water conductive tissues (wood) that transport water within the tree.

Signs of attack on the outside of the tree are pitch tubes and boring dust, known

as frass, caused by beetles entering the tree (Figures 3 & 4).

Additional signs are egg pits created by a secondary beetle called the southern pine sawyer (Figure 5). Needles turn pale green to yellow to red then brown (Figure 6). Trees under drought stress may not produce pitch tubes when attacked by southern pine beetles and that is why the other signs are important in identifying infested trees.

Southern pine beetles have killed over \$246 million worth of pine trees in Georgia since 1972. That's an average annual loss of \$7,435,802. If the trees



Fig. 5 - Photo by Lacy L. Hyche,
Auburn University

were placed end-to-end, they would reach to the moon eight times. No other insect comes close to causing this much economic damage to Georgia's pine forests.

Based on 32 years of aerial survey data in Georgia, SPB outbreaks are cyclic and

often correspond to weather events of drought or flooding depending on the location within Georgia. The data further suggests that Piedmont populations in-



Fig. 3 - Photo by Tim Tigner,
VA Dept of Forestry



Fig. 4 - Photo by Erich G. Vallery,
USDA Forest Service

crease to epidemic levels every 6-10 years, while those in the Mountain region occur every 12 years, with both being influenced



Fig. 6 - Photo by Gerald J. Lenhard,
LA State University

by drought. Outbreaks occurring in the Coastal Plain are more sporadic and can be triggered by flooding or drought. Outbreaks may persist for 1-3 years.

Pines are most susceptible when they are stressed by drought, flooding, storm



Fig. 7 - Photo by Erich G. Vallery, USDA Forest Service

damage, or by stand conditions such as over crowding, old age, or root disease. Lightning struck trees are particularly vulnerable to attack as are trees damaged by road building or logging activities (Figure 7). All of the above factors help sustain beetles when their numbers are low. But during epidemic years when beetle numbers are sky-rocketing, even the healthiest of trees/stands are killed. Therefore, foresters need to do practices that promote tree vigor while beetle populations are low. This is best achieved by thinning overcrowded pine stands to reduce competition between trees and by selectively removing those that are diseased. Certain pathogens that



Fig. 8 - Photo by Terry Price (retired) GFC

lead to diseases (such as pitch canker, littleleaf disease, and *Leptographium*) can weaken pines and create stands that are especially vulnerable to SPB attack and damage (Figure 8).

Selecting pine species that are less susceptible to SPB is another key ingredient in preventing outbreaks.

Loblolly, shortleaf, and Virginia pines are the three most susceptible species with white, slash, and longleaf pines being the most resistant.

What Can Be Done?

The GFC in cooperation with the US Forest Service, Forest Health Protection Unit is offering a Southern Pine Beetle Prevention and Restoration cost share program to Georgia landowners who want to reduce their risk of an SPB problem or who need to restore stands killed by SPB. The cost share program will help landowners implement various forestry practices that promote tree vigor thus preventing beetle infestations. The program will also assist landowners



Fig. 9 - Photo by James Johnson, GFC

with the restoration of areas killed by SPB. The practices that will be available to landowners are listed below.

Non-commercial thinning (statewide)

Dense, over-crowded pine stands need to be thinned to improve the vigor of remaining trees and to produce a higher value wood product (Figure 9). A properly thinned stand also reduces the rate at which beetles can spread. Stands should be thinned to a basal area of 80 square feet or less.

Chemical or mechanical release of pine stands (statewide)

Hardwood species can compete with pines for water and nutrients and should be eliminated if pine vigor is to be maintained. This can be accomplished by the use of selective herbicides.

Prescribed burning (statewide)

Prescribed burning reduces competing hardwoods and underbrush beneath pines. If done properly, a low intensity



Fig. 10 - Photo by David J. Moorhead, UGA

fire can improve pine vigor, thus reducing the threat of a southern pine beetle infestation (Figure 10).

Pine planting (statewide)

Planting loblolly, slash, shortleaf, and white pine at appropriate stocking levels and managing these stands at proper densities can help with vigor and natural resistance to the southern pine beetle. Matching the correct species to the site is crucial to expect good long term results and your GFC forester can help with this important decision.

Hardwood planting (statewide)

Pine stands that have been killed by southern pine beetles can be converted to desirable hardwood plantings. Most producing species will improve wildlife habitat for many species of game and non-game animals.



Fig. 11 - Photo by James Johnson, GFC

Longleaf pine establishment in specified areas of the State

Longleaf pine is the most resistant pine to southern pine beetle attack. Landowners should consider planting longleaf pine instead of loblolly within its natural range (Figure 11).