United States Department of Agriculture
Natural Resources Conservation Service

NEW JERSEY AUDUBON SOCIETY

NJ Biology Technical Note: Southern Pine Beetle and Forest Management

Introduction

Southern Pine Beetle (*Dendroctonus frontalis*) is a native bark beetle and a well-known pest of Southern forests. Outbreaks of this pest have historically been less common in New Jersey than in many other states, but the state has experienced an increase in outbreaks since 2001.

Adult male Southern Pine Beetle (Gerald J. Lenhard, LSU, Bugwood.org)

Adult Southern Pine Beetle with wings extended in flight. (Erich G. Vallery, USDA Forest Service - SRS-4552, Bugwood.org)

Impacts of a Southern Pine Beetle (SPB) outbreak can include loss of timber value, loss of wildlife habitat value, increased risk of severe wildfire, and loss of aesthetic and recreational values. In 2011 more than 7,000 acres of New Jersey's forests were impacted by SPB. Trees killed by SPB may lose commercial value. Habitat quality for wildlife may be diminished because of large tracts of dead vegetation. The dense stands of standing dead trees can create a significant fire hazard. SPB outbreaks are not aesthetically pleasing, and may decrease the quality of recreation in an area. There may also be some ecological losses associated with SPB; for example, loss of shade from trees along waterways can elevate stream temperatures and impact aquatic species, and when large numbers of trees in a forest are killed, the potential arises for the entire forest type to change as different tree species become dominant.

SPB can be present in a healthy forest with minimal impacts. Significant tree mortality is usually associated with larger SPB outbreaks, occurring when trees in a forest are already stressed. Some common causes of stress are drought and high forest density. In an overly dense forest, the high number of trees per acre results in competition between trees for limited resources such as sunlight and water. Management practices that reduce forest density lower stress on individual trees, making them more resilient to SPB. A rule of thumb is to maintain pine stands at a basal area lower than 80 square feet per acre.

An outward sign of tree stress that is easily measured by a landowner is the live crown ratio (LCR) of the tree. The LCR is the proportion of the overall tree height that consists of live branches and needles. As a general rule, when the LCR on a pine tree falls below 30 percent, the tree is considered stressed.

The current outbreak of SBP is not the first in New Jersey. Southern New Jersey is within the documented range of SPB, and some research indicates that New Jersey experienced a previous outbreak in the 1930s. It has been suggested that this pest has made a resurgence in New Jersey because of the recent trend of warmer winters and severe drought conditions throughout the 1990s. Due to land use changes and fire suppression efforts over the past few decades, many of New Jersey's pine forests have a high density of trees. These conditions make it possible for SPB to continue to spread through New Jersey's forests.

Signs

The first signs of an outbreak a landowner might see in affected trees are pitch tubes. Pitch tubes start as holes that are created by adult beetles boring into the tree to lay their eggs. A tree responds by exuding natural resins called pitch, in order to fill the hole and encapsulate the beetle in the sticky substance. A healthy tree will produce greater amounts of pitch than a tree under stress, therefore stopping the adults before they can lay eggs. Another symptom of SPB is a change in the color of the needles from a healthy green color to yellow to brown in a relatively short period of time. Upon closer inspection a landowner may find S-shaped galleries or tunnels under the bark of an infected tree. These galleries are where the larvae feed on the living tissue, known as cambium, of the tree. Other signs of a recent attack are the exit holes where adult beetles have emerged, and sawdust from those exit holes at the base of the tree. Other pine bark beetles can create some of the above symptoms, so the unique shape of the SPB galleries may be the best diagnostic tool for assessing if they are present. A trained forester can help differentiate between infestations of SPB and other bark beetles.

Pitch tubes on a pine tree. (James R. Meeker, USDA Forest Service, Bugwood.org)

Infestation of Southern Pine Beetle moving from right to left. (Robert L. Anderson, USDA Forest Service, Bugwood.org)

Spread

SPB uses pheromones, or chemical signals, to spread en masse from one tree to the next. The adult beetles release a pheromone trail that attracts other beetles over relatively short distances between trees. As the distance between suitable trees increases, the pheromone cloud becomes less concentrated and therefore less likely draw other beetles to the area.

Aside from beetle movement from tree to tree, SPB can transmit blue stain fungus along with it as it migrates through a forest. As this fungus builds up within a tree's cambium layer, it impairs water flow between the roots and needles, contributing to the tree's death.

SPB Outbreak Management Options

If an SPB outbreak is found, a landowner has a few forest management options to suppress the outbreak. The first is the "cut and leave" method. When an affected spot is found, the infested trees and a 40- to 70-foot buffer of uninfested tress are felled so that their crowns point in the direction of where the infestation started (see figure A). The other recommended method of suppressing an outbreak is "cut and salvage." In this case, infested trees and a 40- to 70-foot buffer of uninfested trees are cut and removed from the site (see figure B). Each of these plans may require review or permitting by local authorities and for properties within the Pinelands, by the Pinelands Commission. A forester will be able to plan the suppression effort and assist landowners with the permitting process.

The S-shaped galleries created by Southern Pine Beetle feeding on the cambium. (Ronald F. Billings, Texas Forest Service, Bugwood.org)

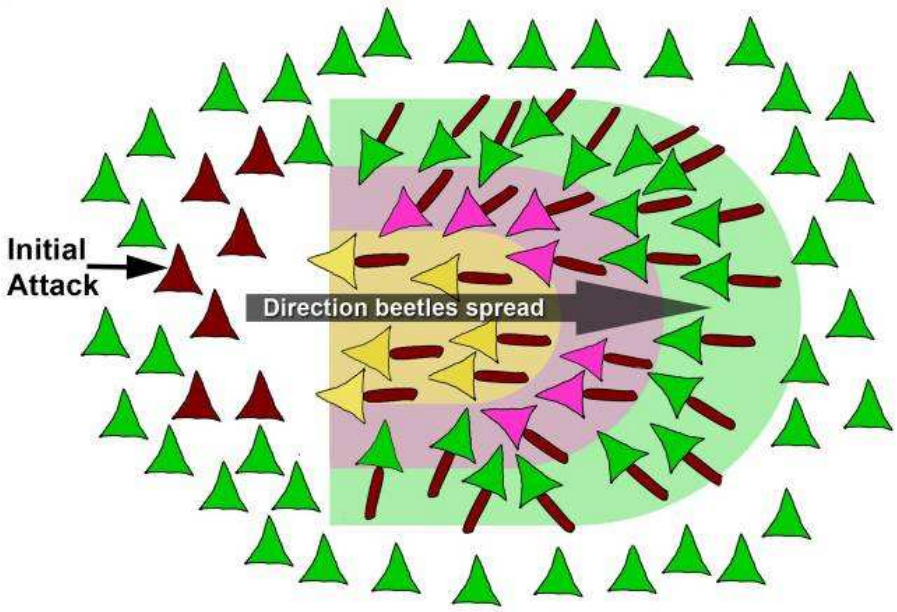

Figure A (left). Cut and leave. In this method of suppression, infested trees and a 40- to 70-foot buffer of uninfested trees are felled toward the initial attack. Green trees are living, brown are dead. Pink and yellow represent different levels of infestation. (From the NJ Southern Pine Beetle Action Kit.)

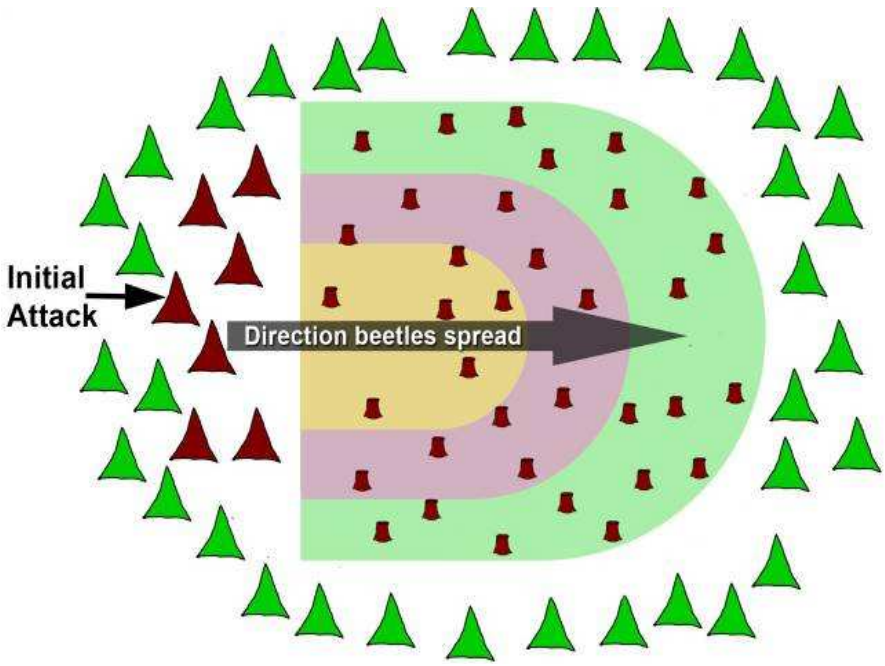

Figure B (left). Cut and salvage. In this method of suppression, infested trees and a 40- to 70-foot buffer of uninfested trees are removed from the site. Green trees are living, brown are dead. Pink and yellow represent different levels of infestation. (From the NJ Southern Pine Beetle Action Kit.)

The New Jersey Department of Environmental Protection and the New Jersey Forest Service have been monitoring the current outbreak of SPB since it began in 2001. More than 30,000 acres in the southern half of New Jersey have been impacted since 2003. The state is actively suppressing outbreaks on public lands. However, private landowners may need assistance to suppress an outbreak on their property. Landowners who have a either a Forest Management Plan or a Forest Stewardship Plan are eligible for cost-share assistance through the New Jersey Forest Service. Emergency funds have been distributed to New Jersey from the U.S. Forest Service for SPB management efforts by private landowners, municipalities, counties, homeowners associations, and other interested parties.

For more about current state-administered financial assistance for SPB suppression visit: www.southernpinebeetle.nj.gov

Prevention of SPB through Responsible Forest Management

The direct methods to suppress an SPB outbreak, like cut and leave, have proven successful. However, many land managers believe that the most effective method of managing SPB is through preventing outbreaks by maintaining healthy forests. A forester can help a landowner maintain or improve forest health by evaluating the existing conditions and developing a written plan of forest management strategies. Active management is often the primary tool for making forests less susceptible to an SPB outbreak.

Forest management practices that are included in Farm Bill programs can be used to enhance forest health and provide some protection against SPB. They also can be used to implement the cutting or removal of a diseased stand.

More detailed information about New Jersey's Southern Pine Beetle outbreak can be found at: www.southernpinebeetle.nj.gov

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