

**TITLE:** Assessing and Projecting Southern Pine Beetle Impacts in the New Jersey Pinelands

**LOCATION:** The New Jersey Pinelands

**DATE:** September 30, 2011

**DURATION:** Year 1 of a 2-year project    **FUNDING SOURCE:** EM Base

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**PROJECT OBJECTIVES:** The objectives of this project are 1) to determine the extent and severity of the southern pine beetle (SPB, *Dendroctonus frontalis* Zimmerman) outbreak in New Jersey; 2) to determine the relationship between stand characteristics and mortality; 3) to characterize the defenses of pitch pine (*Pinus rigida*) against SPB; 4) to assess the strength and character of controls on SPB populations in New Jersey from predators and competitors; 5) to use data from 2-4 above to develop a risk assessment model for the New Jersey Pinelands.

**JUSTIFICATION:**

**a. Linkage to FHM Detection Monitoring:** ADS (from NJ Forest Service in cooperation with FHM) show that SPB has spread northward into New Jersey over the last decade. Approximately 389 potential infestations totaling 14,100 acres were identified in 2010 flights alone, more than twice the damage from wildfire. However, ADS have not yet been subject to systematic ground-truthing, which is necessary to characterize SPB impacts across the Pinelands.

**b. Significance in terms of the geographic scale:** Except for isolated reports from the early 1900s, the New Jersey Pinelands have been beyond the northern range limit of SPB, and have therefore been spared the extensive recurrent outbreaks typical to pine forests in the southern states. A comprehensive assessment of current impacts and future risks in the Pinelands is needed to guide future management of the NJ Pinelands and other areas of pine (e.g., Long Island and southeastern Pennsylvania) that have been historically beyond the distribution of SPB but are now at risk due to amelioration of climatic constraints on northern populations of SPB.

**c. Biological impact and/or political importance of the issue:** Over 40% of NJ is forested. These forests are a valued resource for over 50 million people that live within about 100 miles of the Pinelands. The New Jersey Pinelands represent a unique state-federal partnership designed to preserve and protect over 1.1 million acres of land, the largest area of open space on the eastern seaboard between Richmond and Boston. Established as the country's first National Reserve in 1978, the Pinelands have also been recognized as a U.S. Biosphere Reserve by UNESCO. 43 animal species and 92 plant species within the Pinelands have been identified as threatened or endangered. Virtually all taxa inhabiting the Pinelands—from lichens and mosses, to tree frogs,

soil arthropods, and the trees themselves—can be affected by SPB epidemics. Because the incursion of SPB epidemics represents a dramatic departure from historical conditions in the Pinelands, new data are urgently needed to devise appropriate management plans that can be utilized by the federal, state, and private landowners under Pinelands jurisdiction.

**d. Scientific Basis/Feasibility** – The project leader has extensive experience in SPB research throughout the southern states, and began working with NJFS during 2011. NJFS flies ADS weekly during the summer months, enabling researchers to target potential SPB areas of infestation more efficiently. NJFS is experienced in communicating management recommendations based on scientific findings to private landowners within the Pinelands. The research team assisted NJFS and Rutgers University extension division in public education activities this past summer.

**e. Priority Issues addressed from Request for Proposals.** a) Climate change: While SPB impacts are currently low or moderate throughout the historically vulnerable regions in the southeastern US, they have arisen and persisted in New Jersey; this has been permitted at least in part by warmer winters, which have not been dropping below the lower lethal temperatures for SPB as in the past. New information regarding SPB in this “naïve” system will enable public and private landowners to devise management strategies based on sound science. b) Validating or filling data gaps in insect risk models: Reasonably well validated risk-assessments are available for the southern states, but applicability to NJ is not known. c) Tree mortality: SPB has already done considerable damage in southern counties of NJ, where the forest is quite fragmented by urban and suburban land use. More information is urgently needed on the spread of this insect before the outbreak spreads to the extensive contiguous forests of the central counties.

#### **DESCRIPTION:**

**a. Background:** The southern pine beetle (*Dendroctonus frontalis* Zimmerman) is a native bark beetle that can kill many millions of board feet of timber during its periodic outbreaks. Though this species has been regularly monitored and targeted for management action in R8, it has recently moved north into New Jersey, which has not historically experienced extensive outbreaks. ADS in New Jersey between 2002 and 2010 show a northward spread of SPB “spots,” or localized infestation. Systematic ground-checking of ADS data has yet to occur, but is vitally important to understanding the true extent of the outbreak. In addition, with the northward movement, SPB transitions from its usual hosts—loblolly and shortleaf pine—to pitch pine. Although pitch pine has been noted as a host species, no previous research has documented the species’ defense mechanisms against SPB, and little is known about potential mortality rates. Anecdotal evidence indicates that unlike those in the southern states, spots in New Jersey often remain active over two or more years. In the south, spots usually die out over winter. Because there are no previous studies of SPB in pitch pine systems, we know little about pitch pine defenses against SPB, and we know little about natural controls on SPB populations from predators and competitors. Rather extensive previous research in the southern states has demonstrated that tree defenses, predators, and competitors exert important controls on SPB in the southern states, where knowledge of these controls has been important for short and long-term predictions of risk and management tactics for suppression and risk aversion. Improved understanding of biological controls on SPB in NJ are crucial to implementing and refining management strategies in the presence of SPB.

**b. Methods:** Working from NJFS ADS, active areas of infestation (“spots”) will be identified. Stand characteristics for each spot will be measured, including: density, tree species

composition, dbh, basal area, height per species, gap light index, understory percent cover and height, soil organic matter depth, and soil moisture. A subset of trees will be measured for age and growth rate. Standard methods will be used to measure constitutive and induced resin flow in pitch pine, to compare its defenses relative to other pine species. Measurements will be taken in both unaffected stands and in affected stands at the active front of the spot. Using protocols as have been employed in the south, we will quantify the abundance of predators and competitive antagonists of SPB (most importantly blue-stain fungus and the mites that propagate the fungus) in the southern Pinelands, where SPB has been established for 10 years, and in the central Pinelands, where SPB has only become abundant in the last two years. The growth vs decline of local SPB populations (spots) will be compared to the local abundance of predators and competitors to parameterize SPB population models that can be employed for risk assessment and compared to relationships known from the southern states.

**c. Products:** A final report including management recommendations will be produced, in addition to at least two peer-reviewed research publications. Cooperators will work together to determine what modes of communication and products will work best for informing public land managers and private landowners of scientific findings and management options. Community outreach activities will continue, incorporating research findings as they are completed.

**d. Schedule of Activities:** Summer 2012: Detailed ground-truthing of SPB spots, sampling of tree resin defenses and abundance of predators and competitors; Fall 12-Spring 13: Data analysis, design of further field sampling and lab experiments for bark community ecology; Summer 2013: Conduct ground-truthing, expand resin sampling, parameterize and validate models relating predators and competitors to SPB population growth; Fall 13-Spring 14: Complete data analysis, write final report and submit manuscripts for publication.

**COSTS:** < Budget estimates for each year of project.>

		<b>Requested EM-</b>	<b>Other Source</b>	<b>Other Source</b>
<b>Year 1</b>		<b>FHM Funding</b>	<b>Funding</b>	
<b>Administration</b>	Salary (2 summer field techs + 1 graduate student)	9,600	23,400	Dartmouth
	Travel	2,200	0	
<b>Procurement</b>	Equipment	0	0	
	Supplies	1,500	0	
	Total Year 1	<b>13,300</b>	<b>23,400</b>	
<b>Year 2</b>				
<b>Administration</b>	Salary (2 summer field techs + 1 graduate student)	9,600	23,400	Dartmouth
	Travel	2,200	0	
<b>Procurement</b>	Equipment	0	0	
	Supplies & Page charges	2,500	0	
	Total Year 2	<b>14,300</b>	<b>23,400</b>	
	Year 1 & 2 Total	<b>27,600</b>	<b>46,800</b>	