Southern Pine Beetle

Dendroctonus frontalis Zimmermann
Coleoptera: Scolytidae

Billings, R. F. 1988. Forecasting southern pine beetle infestation trends with pheromone traps. In Payne, T. L.; Saarenmaa, H., editors. *Integrated control of Scolytid bark beetles: proceedings of IUFRO Working Party and International Congress of Entomology Symposium*; 1988 July 4; Vancouver, BC, Canada; 295-306.

Objective: To develop an operational monitoring system for predicting the severity of regionally based *D. frontalis* infestation trends.

Abstract: The southern pine beetle, *Dendroctonus frontalis* Zimmermann, is the most damaging bark beetle in the southeastern USA. All species of indigenous pines are susceptible to attack except longleaf pine, *Pinus palustris* Mill., presumably due to its high resin flow. Mature, over-stocked stands of loblolly, *P. taeda* L., and shortleaf, *P. echinata* Mill, pines on poorly drained sites are most susceptible to infestation. During beetle epidemics, groups of host trees are typically killed, and termed "spots" to delineate from other infestations in close proximity.

A method of forecasting infestation trends of *D. frontalis* was developed in Texas and tested in 28 locations throughout the southern USA. Multiple-funnel traps, baited with frontalin and turpentine, were deployed during the early spring to sample *D. frontalis* populations and its major clerid predator, *Thanasimus dubius* (F.). The proportions of *D. frontalis* to *T. dubius*, as well as mean numbers of *D. frontalis* trapped per day, were correlated with county- and state-wide infestation trends that occurred the same year. A risk rating system was developed by plotting the mean number of *D. frontalis* trapped per day against the mean percentage of *D. frontalis* for each location (Fig. 1). Four levels of infestation severity were suggested: low (<6.0 *D. frontalis*/trap/d); declining (trap catches averaged <40 *D. frontalis* regardless of the number per day); increasing or high (trap catches averaged >35 *D. frontalis*/trap/d with *D. frontalis* >40%; and moderate or static (6-35 *D. frontalis*/trap/day with *D. frontalis* >40%).

Severe outbreaks should be expected when early season trap catches exceed 75 *D. frontalis* per trap per day and contain 75% *D. frontalis*. A simple key was provided to forecast infestation levels from trap catch data (Table 3).

Sampling Procedure: Sample flying *D. frontalis* and *T. dubius* with multiple–funnel traps and the aggregation pheromone frontalin (Phero-Tech Inc., Vancouver, BC). Bait each trap with two Eppendorf capsules of frontalin and a rapid-release rate (about 3.6 g/trap/d) of steam distilled turpentine (W. M. Barr Co., Memphis, TN) from loblolly pine. Dispense the turpentine in 250

ml amber bottles with an 18 cm long cotton wick (Fisher Scientific Intl., Springfield, NJ).

Place two multiple-funnel traps in each of 3 separate pine stands located greater than 3.2 km apart within the area of concern in March or April. Collect insects weekly for 4 weeks. Calculate the mean percent *D. frontalis*, (*D. frontalis* / (*D. frontalis* + *T. dubius*) x 100), and the number of *D. frontalis*/trap/day for all traps and sampling dates within each area of concern. Refer to Table 3 to forecast infestation trends based on this data.

Figure and Table:

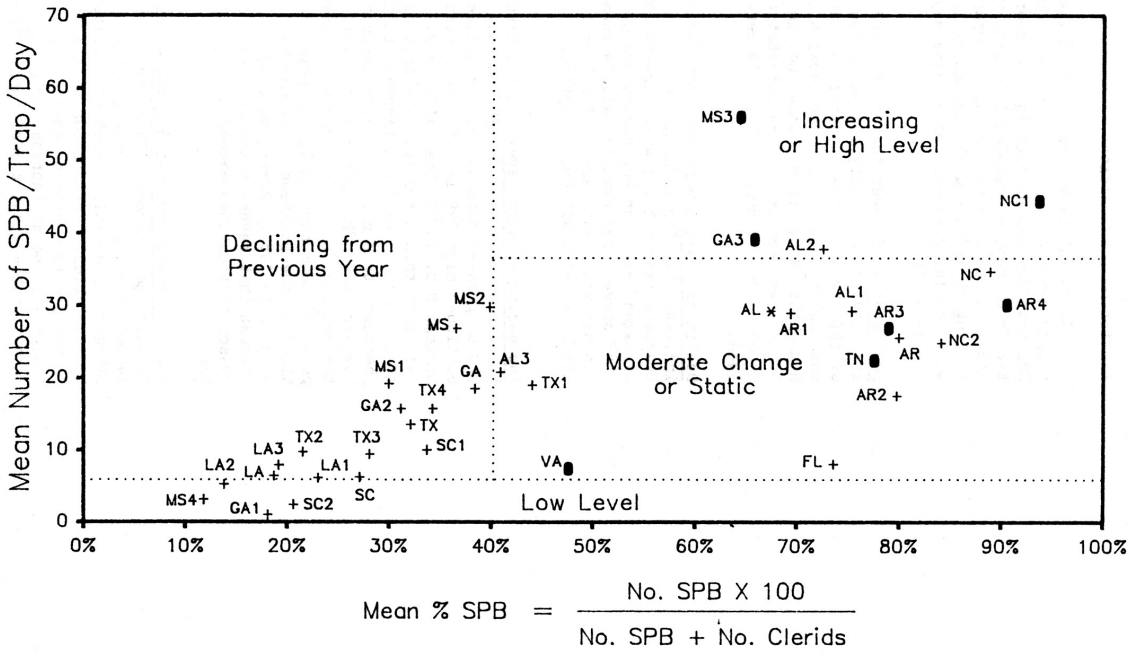

Figure 1: Mean values of SPB/trap/day and percent SPB for 28 localities within 11 southern states derived from early season pheromone surveys in 1987. State averages are indicated by state symbols without numbers, while specific localities are according to codes given in table 2. Data points in form of (+) indicate localities in which SPB infestation levels declined in 1987; (●) indicates those with increasing SPB levels while those marked with (*) remained static, compared to 1986.

Table 3: Guide for forecasting southern pine beetle infestation trends based on early season pheromone trap data.

Required Information: a) Average percent SPB from spring survey,

$$\text{where percent SPB} = \frac{\text{total number of SPB}}{\text{total number of SPB + clerids}} \times 100$$

b) Average number of SPB/trap/day from spring survey.

Optional Information: Average number of SPB/trap/day in last year's spring survey from same general locality.

Answer the following questions to determine SPB infestation trend for the current year.

1.	Is SPB/trap/day less than 6?	If yes, go to 7 If no, go to 2
2.	Is percent SPB less than 40?	If yes, go to 8 If no, go to 3
3.	Is percent SPB greater than 75 and number of SPB/trap/day greater than 75	If yes to both, go to 12 If no to either, go to 4
4.	Is number of SPB/trap/day greater than 35?	If yes, go to 10 If no, go to 5
5.	Is number of SPB/trap/day known for the previous year from the locality?	If yes, go to 6 If no, go to 11
6.	Compute ratio: $\frac{\text{\# SPB/trap/day for current year}}{\text{\# SPB/trap/day for previous year}}$	
	Is the ratio less than 0.75?	If yes, go to 8
	Is the ratio between 0.75 and 1.25?	If yes, go to 9
	Is the ratio greater than 1.25?	If yes, go to 10
7.	The SPB infestation level is predicted to be low.	
8.	The SPB infestation is predicted to decline from last year's level.	
9.	The SPB infestation level is predicted to remain similar to last year.	
10.	The SPB infestation is predicted to increase from last year's level.	
11.	The SPB infestation is subject to moderate change from last year's level, but the trend (increasing or declining) is unpredictable.	
12.	The SPB infestation is expected to increase to severe outbreak level.	

Figure 1 and Table 3 reprinted with permission from Virginia Polytechnic Institute and State University - Blacksburg, January 15, 2001.