



2021 Florida Southern Pine Beetle Forecast

Florida Forest Service, Forest Health Section

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A pheromone trap survey was conducted in March 2021 as part of an ongoing program to monitor the populations of Southern Pine Beetle (SPB) and its associated predators. The purpose is to provide an early season prediction of the potential level of SPB activity in select Florida counties, and identify areas which may be at increased risk for an outbreak. The results of the 2021 survey predict that the **probability of SPB activity is low for Florida Forest Service (FFS) Regions 1, 2 and 3**, and the probability of any major SPB outbreak occurring in Florida is minimal.

Florida SPB Activity Forecast

LOW

1.9%

Predicted % Chance of
Outbreak (>50 spots)

11.4%

Predicted % Chance of
Any Spots (>0 spots)

Background

The Southern Pine Beetle is one of the most destructive forest pests in the southern United States. Since 1995, the FFS has participated in an annual statewide Southern Pine Beetle (*Dendroctonus frontalis*, or SPB) spring trapping survey. This survey monitors numbers of adult SPBs and their clerid beetle predators captured in pheromone-baited flight traps during the SPB primary spring dispersal phase. The results are used as an early-season prediction of SPB population trends and activity levels, allowing forest managers to identify areas of potential SPB activity in advance of aerial detection flights. The survey also provides data for monitoring SPB population levels from year to year.

Methods

The 2021 Florida survey was conducted in 38 counties in North Florida, which includes those that are most likely to experience SPB problems based on historical outbreaks and/or their relative abundance of loblolly pines. One to three traps (Lindgren funnel traps baited with alpha- and beta-pinene and the SPB aggregation pheromone frontalin) were set up in each of those counties. Each trap was set up in or near a different stand of susceptible forest type. *Endo-brevicomin* lures were placed near all traps to boost attractiveness to SPB adults, thereby increasing trap catches and prediction accuracy (based on previous research).

Site Selection: As in previous years, effort was made to place traps in stands containing sawtimber size loblolly pine or areas where loblolly pine is most abundant. Traps were distanced at least 50 feet from any pine tree and checked weekly by foresters in March. Numbers of

SPB and their clerid beetle predator, *Thanasimus dubius*, were counted for each of the six weekly collections per trap.

Data Collection: Florida joined with other southern states to record the SPB trap results in a standardized format survey using the ESRI application Survey123 for ArcGIS. This standardization enables data to be directly accessible and shared with different stakeholders, agencies, and researchers performing SPB prediction modeling in the South.

Prediction Modeling: 2021 was the third year of application using a new model for predicting the risks of SPB damage. This next-generation prediction model is based on several variables that have been determined to work with the survey trapping data collected. Historical SPB data is also used to create the framework for development of the model.

The predictive model generates a forecast that displays the probability for various levels of southern pine beetle spot severity. Out of all the variables tested, the probability of greater than 50 SPB spots (Figure 2) was found to be the most accurate, although various forest professionals may use other benchmarks. Trapping data collected since 2011 were used to build the prediction model.

The probability of an outbreak infestation occurring in each county was generated using the following predictor variables tested : **1)** number of SPB trapped in this year's survey **2)** number of the predator checkered beetles trapped this in year's survey **3)** ratio of SPB/checkered beetles **4)** number of SPB infestations that occurred last year in that area, and **5)** number of SPB infestations two years ago in that area.

Results

Based on the survey results, the forecast model predicts low levels of SPB activity throughout all of FFS's Regions 1, 2 and 3. Overall SPB counts collected from trap locations were lower in Florida this year than in recent years (Figure 1). Additionally, the ratio of the number of the predator checkered beetles (*Thanasimus dubius*) caught in traps far outweighed the amount of SPB trapped (Table 1). Adult checkered beetles eat SPB and are attracted to SPB pheromones. A robust population of checkered beetle predators will keep rising SPB populations in check and at low levels. The high ratio of predator to prey in this year's survey makes it more likely that Florida will not experience any outbreak level SPB infestations this year.

The probability of “**greater than 50 SPB spots**” (considered to be an outbreak level) occurring within the surveyed counties was low (Figure 2). No surveyed county had an outbreak probability greater than 3%, and the probability of “**any SPB spots**” occurring ranged from 3 to 19% for all counties surveyed (Table 1). The low probability of SPB activity that was forecasted from the trapping survey data follows a trend of minimal SPB activity that has occurred in Florida over recent years.

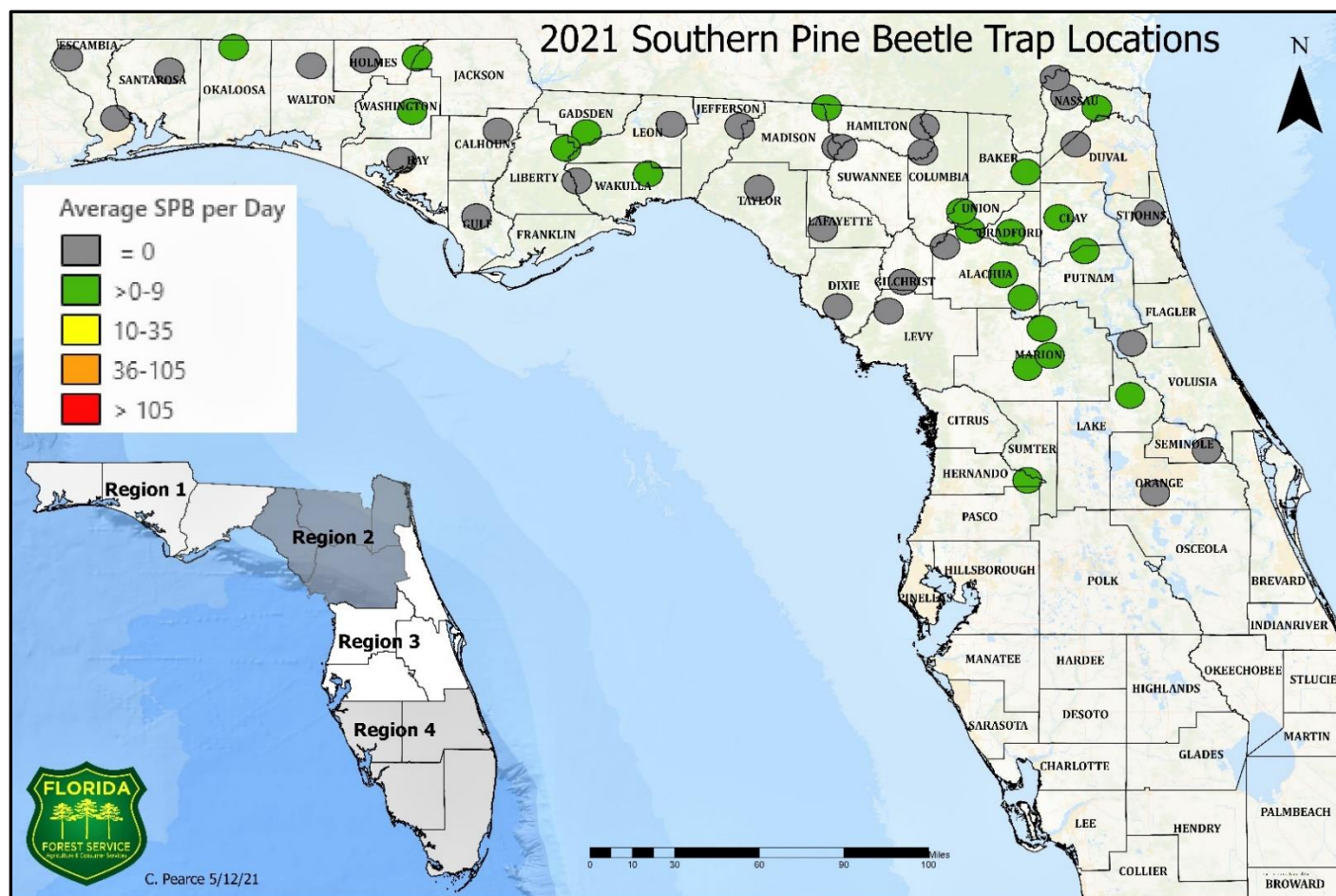


Figure 1: Southern Pine Beetle trap locations (5-mile radius) and the average number of Southern Pine Beetle caught per day in traps over a six-week period.

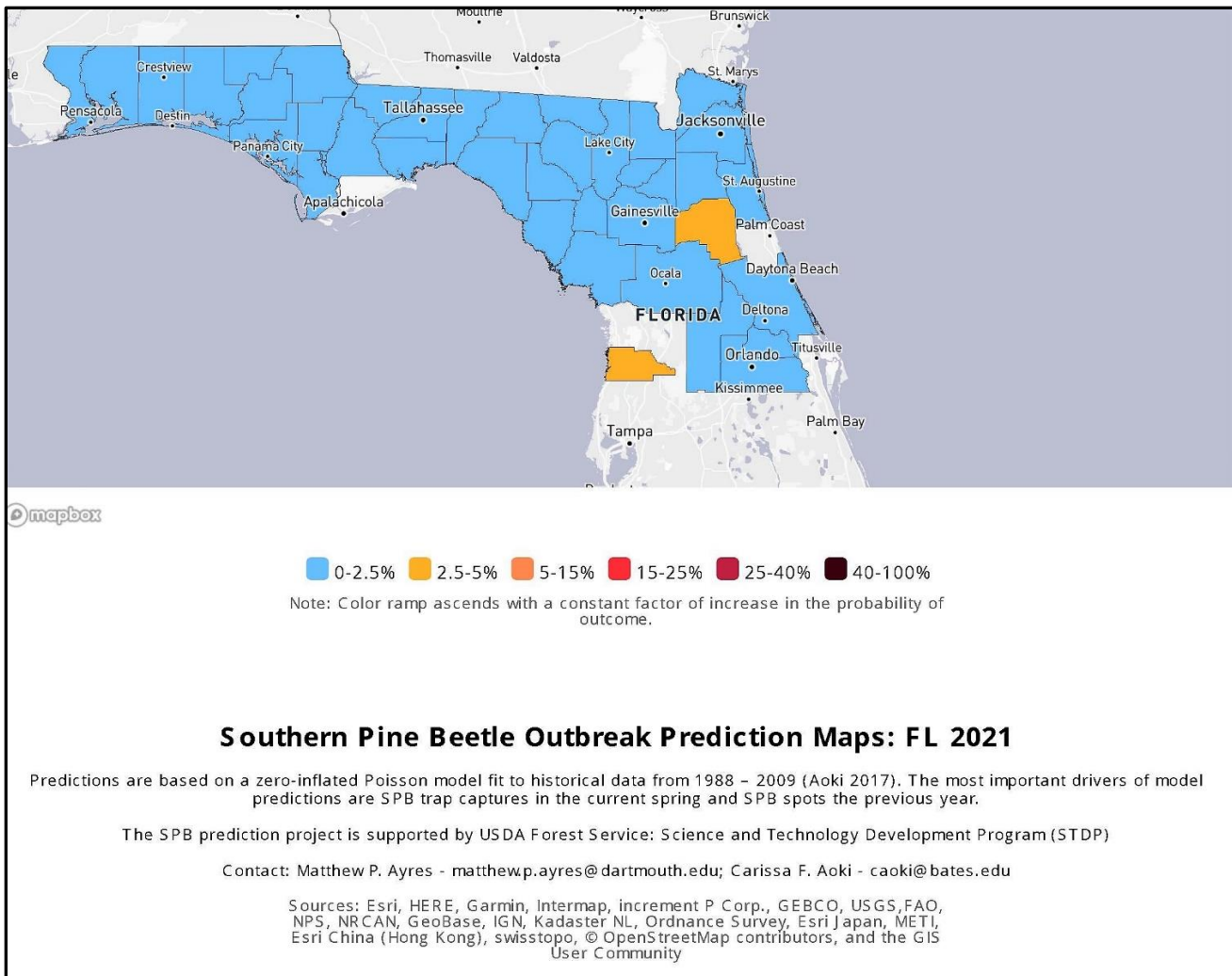


Figure 2: The Southern Pine Beetle Outbreak Prediction Map, showing the probability of “greater than 50 SPB spots” occurring in Florida counties that were surveyed. Counties that are not highlighted were not trapped in the 2021 survey.



- a)** Southern Pine Beetle (*Dendroctonus frontalis*) Length 2-4 mm. Image by Erich G. Vallery, USDA Forest Service.
- b)** Aerial view of SPB spot and infestation. Image by Ronald F. Billings, Texas A&M Forest Service.

Table 1: County-level survey trapping data and variables used to generate SPB activity and outbreak probabilities from the southern pine beetle prediction model. The 2021 survey trapping results resulted in low probabilities for SPB activity in all counties surveyed.

Region/District	County	Number of traps	SPB per 2 weeks	Clerid predator beetle per 2 weeks	# SPB spots last year	# SPB spots two years ago	Probability of greater than 50 SPB spots	Probability of any SPB spots occurring
Region 1								
Blackwater D-1	Escambia	1	0	6	0	0	1%	7%
D-1	Okaloosa	1	11	43	0	0	1%	9%
D-1	Santa Rosa	1	0	27	0	0	1%	6%
Chipola D-2	Bay	1	0	5	0	0	2%	11%
D-2	Calhoun	1	0	3	0	0	1%	4%
D-2	Gulf	1	0	3	0	0	2%	11%
D-2	Holmes	1	0	40	0	0	1%	7%
D-2	Jackson	1	13	77	0	0	2%	12%
D-2	Walton	1	0	147	0	0	1%	6%
D-2	Washington	1	13	30	0	0	2%	10%
Tallahassee D4	Wakulla	2	22	8	0	0	2%	12%
D-4	Gadsden	1	16	8	0	0	2%	12%
D-4	Liberty	1	10	23	0	0	1%	7%
D-4	Leon	1	0	0	0	0	1%	7%
D-4	Jefferson	1	0	1	0	0	1%	11%
Region 2								
Perry D-5	Lafayette	1	0	0	0	0	2%	11%
D-5	Madison	1	0	25	0	0	2%	5%
D-5	Dixie	1	0	0	0	0	2%	11%
D-5	Taylor	1	0	4	0	0	2%	11%
Suwannee D-6	Baker	1	1	1	0	0	1%	6%
D-6	Bradford	1	3	7	0	0	1%	6%
D-6	Columbia	2	1	3	0	0	2%	10%
D-6	Hamilton	2	1	4	0	0	1%	6%
D-6	Suwannee	1	0	5	0	0	1%	4%
D-6	Union	1	1	5	0	0	1%	6%
Jacksonville D7	Clay	1	1	14	0	0	1%	7%
D-7	Duval	1	0	0	0	0	2%	9%
D-7	Nassau	3	9	8	0	0	2%	10%
Wakasassa D-8	Alachua	3	2	6	0	0	2%	9%
D-8	Gilchrist	1	0	0	0	0	2%	11%
D-8	Levy	1	0	1	0	0	1%	5%
D-8	Marion	3	14	2	0	0	2%	13%
D-8	Putnam	1	13	1	0	12	3%	19%
Region 3								
Bunnell D-10	St. Johns	1	0	0	0	2	1%	9%
D-10	Volusia	1	0	0	0	0	2%	11%
WFC D-11	Hernando	1	6	0	0	0	3%	14%
D-11	Lake	1	11	16	0	0	2%	12%
Orlando D-12	Orange	1	0	0	0	0	2%	11%
D-12	Seminole	1	0	0	0	0	2%	11%

As in previous years, all counties in FFS Districts/Centers 1-12 will be asked to conduct an initial aerial SPB detection survey. Due to COVID-19 concerns and restrictions, typical aerial surveys to document damage caused by bark beetles may be done differently in some areas.

Because of limited survey inputs, a vast resource of potential habitat, and the limitations of the predictive model, the forecast presented here cannot be expected to be 100% accurate. Low SPB activity predictions do not guarantee that troublesome infestations will not develop on a local or limited basis in some counties. Activity predictions are likely to be more accurate for the 5-mile radius region around each trap than for the county as a whole.

Given the limitations of the forecast, local weather extremes and variations, and the potential for environmental conditions to change after the survey, areas of suspicious pine mortality should be promptly inspected for evidence of SPB in the coming months. The SPB Assistance and Prevention Program has been very successful in reducing available habitat for the beetle by encouraging private landowners to thin overcrowded and stressed pine stands that favor SPB infestations. Foresters are urged to be on the lookout for localized and sporadic infestations on stands that are over-stocked, over-mature, or have poor soil drainage.

Sincere thanks to all the FFS personnel who were involved in installing traps, making weekly collections, and submitting samples for processing. We would also like to acknowledge the continuing support from the US Forest Service, as well as Matthew Ayers (Dartmouth College) and Carissa Aoki (Bates College) for their work on the next generation SPB prediction model. Please forward this report to anyone who may be interested.

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Checkered clerid beetle (*Thanasimus dubius*), predator of the southern pine beetle. Image by Natasha Wright, Bugwood.org.



Lindgren funnel trap used to monitor southern pine beetle populations. Image by Andrew Derksen, USDA-APHIS.



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