FOREST HEALTH EVALUATION OF SOUTHERN PINE BEETLE ACTIVITY ON THE NATIONAL FORESTS IN MISSISSIPPI

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by

James R. Meeker [1/]

ABSTRACT

Southern Pine Beetle (SPB) infestations increased on the Homochitto National Forest (NF), from only three spots in 2004 to 61 spots in 2005. In mid September, a Forest Health Protection (FHP) entomologist examined three infestations representative of the SPB activity on the Forest. All three of the infestations were still active, contained all life stages of beetles, and showed evidence of recent spot expansion, and exhibited successful fresh attacks. This forest has a total of 171,394 acres of susceptible host type, resulting in an infestation level of 0.36 spots/1000 acres of host type, which is currently below the outbreak threshold of 1.0 spots/1000 ac. Active SPB infestations also were reported on the Bienville NF and Chickasawhay Ranger District of the De Soto NF in 2005. Based upon current SPB activity, relatively large acreages of susceptible forest type, and the elevated potential for increased activity on this and other Forests/Districts of the National Forests in Mississippi (NFMS), due to the widespread tree damage caused by Hurricane Katrina, FHP recommends initiating a SPB suppression project for the NFMS in FY 2006.

INTRODUCTION

Outbreaks of Southern pine beetle (SPB) have been reported in Mississippi since at least the early 1950's (Price *et al*. 1997). The figure of one multiple tree spot per 1000 acres of susceptible host type has historically been considered the lower threshold of a SPB outbreak (Price *et al*. 1997). Since the late 1960's, SPB populations have fluctuated between enzootic and outbreak levels on the various Forests/Districts of the NFMS (Haley 2002). The most severe SPB outbreak recorded in Mississippi occurred during 1994-95. During this outbreak 84% of the spots on the National Forests occurred on the Homochitto and Holly Springs Forests (Haley *et al*. 1995).

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Beetle populations collapsed over much of Mississippi in 1996. However, in 1997 SPB activity rebounded on the Chickasawhay, De Soto and Tombigbee, and the Bienville experienced its worst epidemic since the summer of 1995 (Haley *et al*. 1997a). SPB populations decreased in late 1998 (Haley *et a1*. 1997 b) and by the 1999 field season, all Forests/Districts in MS were reporting latent (*i.e.*, non-existent) to low levels of SPB infestations. The Bienville and Homochitto Forests reported increased spot counts in 2000 (Haley *et al*. 2000). However, during the following year (2001) only the Bienville reported continued increases in SPB infestations, attaining incipient outbreak levels of 0.54 infestations per 1000 acres of host type (Haley 2002).

In 2002, SPB infestation levels escalated to outbreak proportions on the Bienville (2.34 spots per 1000 acres of host type), as well as on the Homochitto (1.75 spots/1000 ac host type), affecting over 1,600 acres of the NFMS. Attributed to suppression efforts, these outbreaks subsided the following year (2003), when only 63 spots were recorded for all of the NFMS. During 2004, numerous infestations materialized on the Chickasawhay, prompting a suppression project, whereas elsewhere infestation levels were zero or low (Table 1).

Table 1. SPB spots on the NFMS: 2002-2005.

Forest/ District	Number of SPB Spots			
	2002	2003	2004	2005
Bienville	341	47	7	10
Chickasawhay	9	6	99	12
Delta	0	0	0	0
De Soto	0	0	15	0
Holly Springs	0	0	0	0
Homochitto	299	1	3	61
Tombigbee	0	9	0	0
Total	649	63	124	83

The annual spring SPB pheromone trapping survey on the NFMS in 2005 projected increasing populations and high levels of activity on the Homochitto, which began to materialize with the detection of 19 active infestations from their first aerial surveillance flight on June 10. The spring trapping survey also projected that the previously high populations and infestation levels on the Chickasawhay would decline to low levels, which they did. Though the spring trapping survey did not project high levels of beetle activity anywhere but the Homochitto, it did indicate that SPB populations were present at all 21 trap locations on the Forests/Districts of the NFMS (Table 2).

Table 2. Recent SPB pheromone trapping survey results and 2005 forecast: NFMS

Forest/District[1]	Spring 2004		Fall 2004		Spring 2005		2005 Prediction
	%SPB	SPB/ trap/day[5]	%SPB	SPB/ trap/day[5]	%SPB	SPB/ trap/day[5]	Trend[6]/Level[7]
Bienville R. D.	26%	25.5	3%	0.1	26%	6.3	D/L
Chickasawhay R.D.	48%	32.8	55%	10.3	27%	14.2	D/L
Desoto R.D.#	66%	87.7	25%	3.7	33%	9.4	D/L
Holly Springs R.D.#	44%	5.1	5%	0.3	56%	11.5	I/L-M
Homochitto R.D.# [4]	36%	13.3	51%	6.9	78%	39.5	I/H
Tombigbee R. D.	39%	13.9	27%	2.5	56%	9.9	S/L-M
AVERAGE	47%	27.9	28%	4.0	46%	15.1	D/L-M

[1] Based on 3 traps per ranger district unless otherwise noted.

[4] Six or more traps per ranger district or county.

[5] Hercules steam-distilled pine turpentine used in 2004-5 surveys

[6] D=Declining, S=Static, I=Increasing

[7] L=Low, M=Moderate, H=High, O=Outbreak

= excessive SPB trap numbers (> 1200 SPB/week) excluded from county and state average, due to suspected attacked tree near trap.

NA = Data not available

At the close of 2005, a total of 83 new infestations were reported on the NFMS during the year, the majority of which occurred on the Homochitto, with lower levels of activity also being reported on the Bienville and Chickasawhay (Table 1). On August 29, 2005 Hurricane Katrina caused widespread and abundant tree damage on the Chickasawhay and De Soto Ranger Districts (Meeker *et al*. 2005) and also directly impacted to lesser degrees, the Bienville, Homochitto, and Tombigbee. Indirect impacts have affected the entire NFMS, including delaying and/or halting SPB suppression project activities for the remainder of FY 2005 and possibly beyond.

METHODS AND MATERIALS

This Forest Health Evaluation was conducted utilizing the following: 1) the Southern Pine Beetle Information System (SPBIS v5.0), which contains a wealth of information/data about the SPB infestations and associated suppression/monitoring activities on the National Forests; 2) the Southern Pine Beetle Economic Evaluation Program (SPBEEP v1.0), which projects future spot growth and associated volume loss, and calculates a benefit cost ratio of a suppression project, based on current market prices for timber, which was provided by District personnel and the SO of the NFMS; 3) results from recent SPB pheromone trapping surveys on the NFMS; 4) field examination and analysis of representative SPB infestations; and 5) results of the 2004 area-wide, stand level SPB hazard rating of the six pine Districts of the NFMS, conducted by FHTET – Fort Collins, utilizing the Continuous Inventory of Stand Conditions (CISC) database for the

NFMS. Professional entomological experience and historical information were then used to interpret and evaluate the technical data and program output, and develop a recommendation.

SPBIS:

A summary of the annual SPB activity on the NFMS in 2005 was obtained from the Status Report generated by SPBIS, for the period of January 1, 2005 to December 5, 2005 (Table 3).

SPBEEP:

Ten SPB spots from the Homochitto were randomly chosen from the SPBIS database on August 29, 2005, for data input into SPBEEP. From the SPBIS database the following data were obtained for each of the spots and entered into SBPEEP: the number of green and red trees containing live brood (*i.e*., green infested trees and red infested trees), the number of vacated trees, pine basal area and total basal area. The SPBEEP program also requires spot data for tree species affected, stand age, average tree height, and average tree diameter at breast height (dbh). Since these variables were not available from the current version of SPBIS, estimates were derived from the general size class of affected timber reflected in SPBIS (i.e., poletimber, sawtimber or mix) and average estimates for such stands were then provided by District personnel. For spots occurring in poletimber: stand age was set at 22 years old; average tree height was set at 70 ft; and average dbh was set at 8.0 inches. For spots in sawtimber size stands: stand age was set at 45 years old; average height was set at 100 ft; and average dbh was set at 18 inches. All of the infestations utilized for SPBEEP were in loblolly pine stands.

The SPBEEP computer program utilized the above spot data to calculate the volume of infested timber on that district based on the total number of uncontrolled SPB spots at the time of the evaluation. The program also incorporates a hazard rating system developed at the Southern Forest Experiment Station (Lorio and Sommers, 1981). The spots are assigned hazard ratings based on their age, DBH, height, basal areas, and major pine component species.

The green infested tree to red infested tree ratio is an important factor in SPBEEP's determination of the projected rate and extent of SPB spot expansion. The number of SPB spots predicted to have additional timber loss and the size of this loss were used to project whether losses to SPB will escalate, remain static, or decline in the future. A large number of SPB spots can be relatively unimportant if projected losses are small. Conversely, a few rapidly expanding SPB spots can cause large timber losses.

Table 3. SPB Status Report for the NFMS from SPBIS, for the period 1-1-2005 to 12-5-2005

	Bienville	De Soto	Homochitto	Chickasawhay	Holly Springs	Tombigbee	Totals/Percents
1. Cumulative Spot Total	14	14	68	45	0	0	141
2. Total Number of New Spots Detected	10	0	61	12	0	0	83
3. Total of Carryover Spots	4	14	7	33	0	0	58
4. Total Number of Inactive Spots	4	0	7	42	0	0	53
5. Total Number of Spots Requiring Control	2	10	24	3	0	0	39
6. Total Number of Spots Suppressed	0	0	7	3	0	0	10
7. Total Spots Suppressed by Cut and Remove	0	0	1	0	0	0	1
8. Percent Spots Suppressed By Initial Cut and Remove	0	0	100	0	0	0	100
9. Total Spots Suppressed by Cut and Leave	1	0	6	3	0	0	10
10. Percent Spots Suppressed By Initial Cut and Leave	100	0	100	100	0	0	100
11. Total Number of Breakouts	0	0	0	0	0	0	0
12. Total Number of Spots with Breakouts	0	0	0	0	0	0	0
13. Total Spots Suppressed by Other Treatment	0	0	0	0	0	0	0
14. Total Number of Currently Active Spots	10	14	61	0	0	0	85
15. Total Number of Monitored Spots	8	6	52	0	0	0	66
16. Total Spots to be Suppressed	2	10	13	0	0	0	25
17. Total Spots Cut and Remove in Progress	0	3	0	0	0	0	3
18. Total Spots Cut and Remove Marked, Not Sold	0	2	0	0	0	0	2
19. Total Spots Cut and Remove yet to be Marked	1	2	10	0	0	0	13
20. Total Spots Cut and Leave in Progress	0	0	0	0	0	0	0
21. Total Spots Cut and Leave to be Assigned/Contracted	1	3	3	0	0	0	7
22. Total Spots to be Suppressed by Other Treatment	0	0	0	0	0	0	0
23. Number of Trees Treated, Cut and Leave	0	0	2115	3	0	0	2118
24. Volume removed (CCF), Cut and Remove	0	0	0	0	0	0	0
25. Volume removed (CCF), Cut and Leave	0	0	0	0	0	0	0
26. Total Volume Removed (CCF)	0	0	0	0	0	0	0
27. Acres Cut and Remove Accomplished	0	0	1	0	0	0	1
28. Acres Cut and Leave Accomplished	0.5	0	14.7	3	0	0	18.2
29. Acres Inactive	2	0	0	46	0	0	48
30. Acres, Treated and Inactive	2.5	0	15.7	49	0	0	67.2
31. Estimated Acres Monitored	0.8	2	54.8	0	0	0	57.6
32. Estimated Acres to be Suppressed	0.2	1	25.8	0	0	0	27
33. Estimated Total Acres Affected	3.5	3	96.3	49	0	0	151.8

Pheromone Trapping Surveys

Since 1986, annual SPB pheromone trapping surveys have been conducted throughout the south (including the NFMS) during the springtime (*i.e*., March –April), to track SPB population trends and forecast expected levels of activity (*i.e*., infestations). Annual predictions of infestation trends have proven to be 75-85% accurate (Billings 2005). In an effort to provide a timelier and potentially more accurate forecast of beetle population trends and infestation levels, a pilot test of fall (*i.e*., October – November) SPB pheromone trapping surveys has been conducted on all

the pine Districts of NFMS in 2004 and 2005. The summary results of recent SPB pheromone trapping surveys on the NFMS are depicted in Table 2.

Field Evaluation of Infestations

On September 13, 2005, the author examined three of the SPB infestations on the Homochitto. Observations were noted at each regarding the following factors: the number of freshly attacked trees; success rate of attacks; attack density; reproductive success; spot growth since last date of District ground checking; relative abundance and health of various brood stages; and spot growth potential based on surrounding uninfested stand conditions.

2004 Stand Level Hazard Rating of the NFMS

Site, stand, and tree/host characteristics play an important role in SPB activity (Coster & Searcy 1981). Integrating these environmental conditions into classifications representing the susceptibility of stands to SPB losses is known as hazard rating. Area-wide, stand level hazard ratings can be used for, among other things, assessing the potential for an outbreak and associated losses (Mason *et al*. 1991). Stand conditions contained in the November 2004 CISC database for the NFMS were utilized as a basis for constructing area-wide, stand level hazard ratings for each of the six pine Districts of the NFMS. A weighted-average, rulebase approach was utilized to integrate the CISC data accordingly into the following hazard ratings of: none, low, moderate and high for SPB losses. The resulting stand level hazard ratings were then mapped to spatially display the abundance and distribution of the various degrees of hazard, and the corresponding acres associated with each summarized by District (Table 4).

Table 4. Results of November 2004 SPB Hazard Rating of the six pine Districts of the NFMS. Hazard rating was done utilizing November 2004 CISC data from the NFMS, and applying a weighted-average, rulebase approach to the stand data.

		2004 SPB Hazard Rating							
	Total	High		Moderate		Low		Not Susceptible	
District	(ac)	(ac)	(%)	(ac)	(%)	(ac)	(%)	(ac)	(%)
Bienville	179061	78662	43.9%	62000	34.6%	4648	2.6%	33751	18.8%
Chickasawhay	151024	19039	12.6%	80325	53.2%	40130	26.6%	11530	7.6%
De Soto	355753	24380	6.9%	206581	58.1%	77038	21.7%	47754	13.4%
Holly Springs	140569	42307	30.1%	43348	30.8%	14081	10.0%	40833	29.0%
Homochitto	185712	110193	59.3%	52652	28.4%	8549	4.6%	14318	7.7%
Tombigbee	66804	25733	38.5%	18469	27.6%	1733	2.6%	20869	31.2%
Total	1078923	300314	27.8%	463375	42.9%	146179	13.5%	169055	15.7%

RESULTS AND DISCUSSION

The SPBIS Status Report for the period 1-1-2005 to 12-5-2005 indicated that the NFMS detected 83 new spots in 2005. The NFMS also had another 58 active spots carried over from 2004, yielding a total of 141 SPB spots of concern in 2005. A total of 85 spots were still classified as being active in December 2005, of which 25 spots were identified as spots requiring suppression measures. The remaining 60 or so active spots were targeted for future monitoring, likely due to either their small size, low value of infested resources, and/or their no, low or slow growth. A relatively small number of spots were actively suppressed in 2005 (*i.e.*, 10 spots), though approximately 40 other spots did go inactive on their own. The overwhelming majority of beetle activity and associated suppression efforts occurred on the Homochitto NF (Table 4), where infestation levels (*i.e.*, 0.36 spots/1000 ac of susceptible host) may reflect the incipient stage of a future outbreak (Table 5). Enzootic infestation levels also occurred on the Bienville and Chickasawhay (Table 5); however, suppression plans and activities on all three Forests/Districts were disrupted and/or terminated following Hurricane Katrina on August 29, 2005.

The SPBIS data for 10 randomly selected spots occurring on the Homochitto were utilized, in conjunction with District estimated averages for other stand parameters and current local timber market values, to conduct a SPBEEP run and analysis on August 29, 2005. Average spot parameters and projections for the Homochitto from SPBEEP output illustrate the potential for continued SPB problems (Table 6).

Table 5. 2005 SPB infestation levels on the NFMS.

District	Total Acres	Susceptible Acres	Percent Susceptible Acreage	2005 SPB Spots	Spots/ 1000 ac Host Type
Bienville	179061	145310	81.2%	10	0.07
Chickasawhay	151024	139494	92.4%	12	0.09
De Soto	355753	307999	86.6%	0	0.00
Holly Springs	140569	99736	71.0%	0	0.00
Homochitto	185712	171394	92.3%	61	0.36
Tombigbee	66804	45935	68.8%	0	0.00
Totals/Averages	1078923	909868	82.0%	83	0.09

Table 6. Average spot parameters and projections from SPBEEP output for the Homochitto NF: August 29, 2005

District	Average Spot Size (# Infested Trees)	Average Green:Red Ratio	Average Hazard Rating	Average Additional Trees Killed Next 30 Days
Homochitto	100	0.88:1	High	72

The economic analysis from SPBEEP deals only with the impact of SPB on timber resources. The projected volume that will be lost without a suppression project is 10,172 MCF, as opposed to a projected loss of only 2,825 MCF if a project is implemented. Total value lost without a project is projected to be $3,375,881. Total value lost with a project is projected to be $937,745. The benefit-to-cost ratio of funding this suppression project is estimated at 10.03:1. Detailed information regarding the inputs and outputs of the ecological and economical analysis performed utilizing SPBEEP are contained in Appendix II.

On September 13, 2005 the author examined three spots on the Homochitto, including spots #436, #449, and #457. Despite examination during the midst of the typical "summer slump" period for beetle activity in the deep south, all three infestations were recently detected (*i.e.*, late August), still active, and contained abundant brood and emerging beetles. Two of the infestations (#436 and #457) contained successful fresh attacks on previously uninfested trees and the other spot (#449) exhibited successful fresh attacks filling in previously attacked/infested trees. The former two spots had both exhibited spot growth beyond the previously flagged perimeter of the spot head, which was established five days prior to this field examination. All three infestations occurred in high hazard poletimber and/or sawtimber stands with abundant host resources available for continued spot expansion. The two larger infestations (#436 and #457) were slated for suppression measures. The other/third spot was to be monitored, due to its currently small size (approx. 30 trees) and occurrence in a stand consisting predominantly of low value poletimber. Field examination of these infestations supported SBEEP projections of continued SPB activity and spot expansion on the Homochitto.

Spatial analysis of the 83 new SPB spots occurring on the NFMS during 2005 revealed that approximately 93% of the infestations occurred in moderate to high stands (Table 7). Given the acreage of susceptible host type existing on the six pine Forests/Districts of the NFMS, and the relatively high amounts/percentages of moderate to high hazard stand conditions of those susceptible acres (Table 4), current infestation levels and recent beetle activity suggested a potential for outbreak activity anywhere on the NFMS in the near future.

Table 7. SPB spot distribution by stand hazard rating: NFMS 2005.

	2005 SPB Spots				
		Stand Hazard Rating			
District	Total	High	Moderate	Low	Not Susceptible
Bienville	10	8	2	0	0
Chickasawhay	12	0	10	2	0
Homochitto	61	35	22	4	0
Total	83	43	34	6	0
Percent	100.0%	51.8%	41.0%	7.2%	0.0%

RECOMMENDATIONS

FHP anticipates continued timber losses due to SPB in FY 2006 and recommends funding of a SPB suppression project on the NFMS. The probability of increasing SPB activity and impacts for the Homochitto is high, and potentially may increase on any of the other Districts, particularly those where there was widespread and abundant tree damage from Hurricane Katrina (*e.g.*, Bienville, Chickasawhay and De Soto). A detailed description of control alternatives is presented in Appendix III. The cut and remove treatment (Alternative 2) is the preferred method for control of SPB spots. If this is not feasible, cut and leave, cut and hand spray, and pile and burn are other treatment alternatives.

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APPENDIX I

TECHNICAL INFORMATION

SPB is the most destructive insect pest of pine forests in the South. It attacks all species of southern pines. On the National Forests in Mississippi, mature, high basal area (120 BA) stands of loblolly pine, *Pinus taeda* L., and shortleaf pine, *Pinus echinata* Miller are the preferred hosts. Pines can be killed in groups ranging from a few trees to those covering hundreds or thousands of acres.

Life Cycle of the Insect

Adult beetles attack living trees. Each pair of attacking beetles constructs a winding s-shaped gallery in the inner bark and the female deposits eggs in the niches along the sides. The galleries meet and cross one another and girdle the tree.

Eggs hatch into whitish crescent-shaped larvae with glossy, reddish-brown heads. Larvae mine in the inner bark and then construct pupal cells just below the surface of the corky outer bark. From April through September, beetle broods complete their development in about a month (approximately 7 generations/year).

When pupation is complete the new brood adults chew exit holes through the bark and invade green trees in the vicinity or fly considerable distances to begin new infestations. A complete description of the biology of the southern pine beetle is available in "Forest Insect and Disease Leaflet 49."

Type of Damage

Damage caused by the southern pine beetle is tree mortality resulting from adult beetles constructing egg galleries in the cambium region of the host tree. Blue staining fungi (*Ophiostoma minus* H. & P. Sydow) introduced by the beetles and secondary insects may accelerate tree death by blocking the vascular system of the tree.

APPENDIX II

Ecological Evaluation

Homochitto

Spot No.	Tree Species	Total Trees Killed	Total Trees Infested	Green Infested Trees	Red Infested Trees	Green/ Red Ratio	Total Vacated Trees	Pine Basal Area	Total Basal Area	Stand Age	Avg. Tree Height	Avg. Tree DBH	SPB Hazard Rating	Add. Trees Killed 30 Days	Merch. Volume Cubic ft.
1	Loblolly	136	108	50	58	0.86 :1	28	180	180	22	70	8.0	High	111	972
2	Loblolly	87	75	50	25	2.00 :1	12	100	100	22	70	8.0	High	39	675
3	Loblolly	140	100	25	75	0.33 :1	40	130	130	22	70	8.0	High	72	900
4	Loblolly	215	200	110	90	1.22 :1	15	180	180	22	70	8.0	High	212	1800
5	Loblolly	95	80	20	60	0.33 :1	15	80	80	22	70	8.0	Medium	32	720
6	Loblolly	140	130	30	100	0.30 :1	10	80	100	22	70	8.0	Medium	72	1170
7	Loblolly	70	70	42	28	1.50 :1	0	90	90	22	70	8.0	Medium	32	630
8	Loblolly	170	150	85	65	1.31 :1	20	130	130	22	70	8.0	High	112	1350
9	Loblolly	40	30	5	25	0.20 :1	10	100	100	22	70	8.0	High	12	270
10	Loblolly	70	60	25	35	0.71 :1	10	90	110	45	100	18.0	Medium	33	4140
Total:		1163	1003	442	561	8.76 :1	160	1160	1200	243	730	90.0	N/A	727	12627
Average:		116	100	44	56	0.88 :1	16	116	120	24	73	9.0	High	72	1262

Sampled Spot Size: CCF

Spot Size ----->	1-25		26-50		51-100		100+	
Age Class	Num.	Vol.	Num.	Vol.	Num.	Vol.	Num.	Vol.
22 - 25			1	270	4	2925	4	5292
26 - 50					1	4140		

Adjusted Spot Size: CCF (68 spots)

Spot Size ----->	1-25		26-50		51-100		100+	
Age Class	Num.	Vol.	Num.	Vol.	Num.	Vol.	Num.	Vol.
22 - 25			7	1836	27	19890	27	35986
26 - 50					7	28152		

Economic Evaluation

Homochitto

Without a Project

Age	Harv Obj.	Volume Lost (MCF)	Spot Growth Rate	Volume Threatened (MCF)	Growth Rate (%)	Age at Harvest	Volume at Harvest (MCF)	Price at Harvest	Value at Harvest	Present Value
1	P/I	1299	3.97	5150	-7.52	25	729	$ 182	$ 132837	$ 49829
1	S/F	3896	3.97	15449	-1.59	75	4657	$ 4902	$ 22826811	$ 1204883
2	S/F	2534	2.63	6664	-0.45	75	4786	$ 4805	$ 22998966	$ 1262529
		7728		27263			10172		$ 45958614	$ 2517241

Value of Volume not Salvaged (Lost): $ 858640
Total Value Lost: $ 3375881

With a Project

Age	Harv Obj.	Volume Lost (MCF)	Spot Growth Rate	Volume Threatened (MCF)	Growth Rate (%)	Age at Harvest	Volume at Harvest (MCF)	Price at Harvest	Value at Harvest	Present Value
1	P/I	361	3.97	1430	-7.52	25	202	$ 182	$ 36899	$ 13841
1	S/F	1082	3.97	4291	-1.59	75	1294	$ 4902	$ 6340781	$ 334690
2	S/F	704	2.63	1851	-0.45	75	1329	$ 4805	$ 6388602	$ 350702
		2147		7573			2825		$ 12766282	$ 699234

Value of Volume not Salvaged (Lost): $ 238511
Total Value Lost: $ 937745

Project Benefits:	$ 2438136
Total Project Cost:	$ 243000
Net Present Value:	$ 2195136
Benefit Cost Ratio:	10.03:1
Internal Rate of Return:	>400%
Composite Rate of Return:	7.25 %
Targets (MCF):	
Volume Removed:	6440
Volume Protected:	19690

APPENDIX III

ALTERNATIVES FOR SOUTHERN PINE BEETLE CONTROL

The five alternatives presented here represent current control strategies used for SPB control. The following discussion briefly outlines these alternatives (SPB FEIS 1987). For a more detailed description on conducting control procedures in a SPB suppression project refer to the southern pine beetle handbook series: Belanger and Malac, (1980); Billings and Doggett, (1980); Billings and Hynum, (1980); Billings and Pase, (1979); Swain and Remion, (1980); and Thatcher and Barry, (1982).

Alternative 1 - No Action: SPB populations increase periodically. Under this alternative, it is expected that the present SPB infestation would continue to spread and destroy timber. This may occur over one to several years. If unchecked, the beetles will create large openings of dead snags and scrub brush and greatly reduce the overall pine component. Infestations may spread to adjacent areas of private land or serve as epicenters for population expansion. Standing snags create a safety hazard. Snags will provide nesting sites for some species of cavity-dwelling birds and will provide food, in the form of wood boring insects, for species of snag-foraging birds. Organic matter and nutrients from the dead trees will be returned to the soil ecosystem. A SPB epidemic may result in the killing of cavity trees and essential foraging habitat for the red-cockaded woodpecker, an endangered species.

Alternative 2 - Cut and Remove: When infested and buffer strip trees of merchantable size are accessible, they could be removed by commercial sale. Logging of the infested material should begin immediately. Where needed, a 40 to 125 foot buffer strip should be marked and cut adjacent to and ahead of the most recently infested trees. Trees not infested with SPB should be left standing. The order of priority for removing infested timber will be as follows:

From May to October:

(1) Trees in the buffer strip -- A 40 to 125 foot buffer strip of uninfested green trees around the head of the spot is recommended for removal to halt spot expansion and minimize additional/unnecessary tree losses. The width of the buffer strip should be approximately equal to the average height of the dominant trees in the stand being treated. With weekly monitoring of the spot after control, the buffer strip could be made even smaller.

(2) Infested green trees -- This removes the SPB aggregation pheromone source, potentially re-emerging parent beetles and young brood stages.

(3) Faders -- This removes late brood stages and future sources of new attacking beetles.

(4) Red-topped -- It may not be necessary to remove these trees during the warmer summer months when developmental rates for the SPB are much faster. If brood of the SPB have emerged from these trees, they should be left to conserve the natural enemies of the SPB that are still developing within the trees. These trees provide food for snag-foraging birds, and nesting sites for snag-nesting birds.

From November to April:

(1) Red-topped, faders, and green infested trees -- These trees may contain living brood during the fall and winter. If the trees are actively infested they should be removed since beetles emerging from these trees may disperse and start new infestations.

(2) Trees with fresh attacks.

(3) Trees in the buffer strip.

Alternative 3 - Cut and Hand Spray: Effective insecticides registered for remedial use against the SPB are currently not available. In the past, Lindane 20 EC and various brands of chlorpyrifos 4E were appropriately labeled and registered for such use, and effective at controlling emerging beetles from infested host material. Possession of appropriately labeled stocks of these materials that are no longer registered, allows for their continued use as labeled, until existing supplies are exhausted. Consult with an FHP Entomologist before using any other/new insecticide that is, or may become registered and labeled for remedial treatment of SPB infested host material. See also the Precautionary Statement following this section, regarding any insecticide use. Formulation mixtures and instruction for insecticide use against SPB will be contained on the labels. Cut, limb, and buck all infested trees into workable lengths. Spray the infested bark surface thoroughly. A hand-held compressed air sprayer is an ideal applicator. Infested logs should be turned three times to insure complete treatment of the infested bark.

The following additional procedures are recommended for chemical control.

(1) Identify and mark all infested trees. Do not mark a buffer strip or vacated trees.

(2) Trees containing advanced broods (late larvae, pupae, and adults) should be treated first.

(3) A buffer strip should not be cut. To reduce the possibility of "breakouts", every effort should be made to locate and treat all green infested trees during the chemical control operation.

(4) Trees from which the brood has emerged will not be sprayed, so that natural enemies of the SPB can complete their development.

For more detailed information on chemical control, refer to the SPB EIS (SPB EIS 1987).

Alternative 4 - Cut and Leave: Cut and leave is designed to disrupt spot growth in small to medium-sized spots by: physically displacing emerging beetles further away from uninfested hosts; disrupting the chemical communication system of the beetles, necessary for successful attacks and infestation growth; and causing some brood mortality through solarization of upper surfaces of felled, infested timber. The following procedure is to be followed when cut and leave is applied.

(1) Identify all active trees within the spot.

(2) Fell all active trees toward the center of the spot.

(3) Fell a horseshoe-shaped buffer strip of green, uninfested trees around the most recently attacked trees at the head of the spot and leave them lying on the ground with crowns pointed toward the center of the spot. The buffer should be as wide as the average height of the trees in the spot.

(4) Dead trees from which all SPB have emerged need not be felled. These trees provide development sites for parasites and predators of SPB. Cut-and-leave treatments, for best results, should be applied during the summer months (June-October). In spots > 50 active trees where the preferred cut and remove method cannot be used, pile-and-burn or chemical control treatments are preferred over cut-and-leave treatment during winter months. If cut-and-leave is the only treatment option, cut-and-leave can be administered at any time during the year; however, an entomologist should be consulted and each spot treated should be checked at least two times.

Alternative 5 - Pile and Burn: Felling, piling, and thoroughly burning the bark of infested trees is one of the oldest methods of controlling SPB. The entire bark surface must be thoroughly burned to insure effective control. The order of priority for cutting, piling and burning infested trees, particularly in large spots, is the same as stated above under removal of infested trees by commercial sale. Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts", every effort should be made to locate and treat all green infested trees during the piling and burning operation. Burning should not be done if it will result in soil erosion.

Selection of one or several of these strategies is possible in the control of SPB infestations. Individual alternatives or combinations of alternatives (2-5) should be determined on a site-by-site basis, considering site specific, silvicultural and entomological control constraints.

PRECAUTIONARY STATEMENT

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in their original containers under lock and key out of reach of children and animals, and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish and wildlife. Do not apply pesticides when there is danger of drift, when honeybees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear appropriate protective clothing.

If your hands become contaminated with a pesticide, wash them immediately with soap and water. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove the clothing immediately and wash skin thoroughly. After handling or spraying pesticides, do not eat or drink until you have washed with soap and water.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicide from equipment, do not use the same equipment for insecticides or fungicides that you used for herbicides.

Dispose of empty pesticide containers promptly, in accordance with forest and state laws.

NOTE: Some states have restrictions on the use of certain pesticides. Check your state and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your county agricultural agent or State Extension specialist to be sure it is still registered for the intended use. For further information or assistance, contact Forest Health Protection, 2500 Shreveport Hwy, Pineville, LA 71360 (318-473-7284).