United States
Department of
Agriculture

Forest Service

**Intermountain
Forest and Range
Experiment Station
Ogden, UT 84401**

Research Note
INT-338

December 1983

Strategy for Reducing Mountain Pine Beetle Infestations with Ponderosa Pine Trap Logs

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ABSTRACT

Mountain pine beetles were strongly attracted to ponderosa pine logs in decks. Of 283 logs cut in June and July and placed in decks, 74.9 percent became infested by mountain pine beetles. These observations suggest that ponderosa pine trap logs cut before beetle flight could attract a large proportion of beetles in a stand. The infested logs then could be removed to reduce the beetle population in the area.

KEYWORDS: *Dendroctonus ponderosae, Pinus ponderosa*, trap log

INTRODUCTION

The mountain pine beetle (*Dendroctonus ponderosae* Hopkins) has been epidemic in ponderosa pine (*Pinus ponderosa* Dougl. ex Laws.) on the Escalante Ranger District, Dixie National Forest, in southern Utah since about 1977. District personnel have initiated a harvest and thinning program to place ponderosa pine stands under management and thus reduce losses to the beetle.

Aerial observers noted trees killed by mountain pine beetles in the mid-1960's with a large increase in 1978 (Thier and Beveridge 1979). In 1979, 50 trees per acre (123.6/ha) were infested in the most intense part of the infestation located east of Cowpuncher Guard Station in the Pine Creek drainage (Thier and Beveridge 1979). Trees infested by mountain pine beetles ranged between 2 and 47 inches (5.1 and 119.4 cm) in diameter at breast height (d.b.h.), with trees in diameter classes larger than 20 inches (50.8 cm) killed proportionately at a greater rate than trees in smaller diameter classes (unpublished data, Intermountain Forest and Range Experiment Station, Ogden, Utah).

Stand surveys in the Pine Creek drainage in October 1982 revealed very few freshly attacked trees compared to numbers infested in 1981. The low number of infested trees suggested that beetles may have been attracted to felled trees and then removed as the logs were hauled to sawmill sites outside the area.

Mountain pine beetles have been known to infest windthrown ponderosa pine trees and trap logs, particularly logs freshly cut just before and during the flight period (Beal 1939; Blackman 1931; Hopkins 1905; Parker and Stevens 1979; Weaver 1934). Trap logs have been considered a way to attract beetles and remove them from the forest, thus reducing the beetle population.

Although the mountain pine beetle appears to be strongly attracted to felled ponderosa pine, this does not hold for lodgepole pine. Beetles infest the undersides of windthrown lodgepole pine, but do not show a strong attraction to felled trees, including log decks. Only an occasional beetle will infest lodgepole pine logs; most of the population is strongly attracted to standing green trees.

The purpose of this report is to present data on the incidence of mountain pine beetles infesting ponderosa pine logs in decks and a suggested strategy for trap log cutting and removal to reduce beetle populations.

METHODS

All logs cut in the Pine Creek drainage had been hauled to the sawmill by October 1982. Therefore, the opportunity to survey logs for mountain pine beetle infestation was lost. However, logs had not been removed from the adjacent Blue Springs Creek drainage, which was selected for examination of freshly infested standing trees and infested logs. Several hundred trees infested in the Blue Springs Creek drainage in 1981 had potential to produce many beetles.

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Two strip surveys were conducted for standing infested trees. The first survey was in October 1982 and was for newly infested trees (1982) only. Four observers walked a strip 8 chains wide by 80 chains long (161 by 1 609 m), resulting in coverage of 64 acres (25.9 ha).

The second survey covered a different part of the drainage and was for all infested trees. Two observers walked a strip 2 chains wide by 140 chains long (40 by 2 816 m), resulting in coverage of 28 acres (11.3 ha). Trees were categorized by year of death: 1982, 1981, 1980, and all trees killed before 1980.

Logs in 10 decks, consisting of trees cleared for road construction into the Blue Springs Creek drainage, were examined for bark beetle infestation (fig. 1). Some bark was removed with an ax from logs where beetles were boring to determine the species of beetle involved. Logs that could not be reached, usually those in the bottom of the deck, were checked for boring frass of bark beetles. Frass of *Dendroctonus* sp. generally is coarser than that of *Ips pini*, the other species of bark beetle found in the decks. In addition, logs in two decks and those lying in the forest, which were cut after road construction was completed, were examined for beetle infestation.

Figure 1.—*Ponderosa pine log decks of trees felled in June and July during road construction were subsequently infested by mountain pine beetles.*

RESULTS

The 1982 strip surveys revealed a total of 13.3 trees per acre (32.9/ha) killed during the epidemic, but no newly infested trees even though an estimated 2.2 trees per acre (5.4/ha) were infested in 1981 (table 1). Trees infested in 1981 were significantly smaller than those infested in the earlier years of the infestation (12.7 inches versus 10.8 inches [32.3 versus 27.4 cm] d.b.h.), but not significantly smaller than those infested in 1980 (12.0 inches [30.5 cm] d.b.h.).

The 10 log decks contained a total of 283 logs (range 9 to 42 per deck), 8 to 30 inches (20.3 to 76.2 cm) in diameter, and 32 ft (9.72 m) long. Of these, 212, or 74.9 percent, were infested by mountain pine beetles (range 40.9 to 100 percent per deck) (table 2). Two of the decks contained logs infested by *Ips pini* (7.1 and 23.5 percent of the logs, respectively), for a total of seven, or 2.5 percent of the total logs. Logs infested by *Ips* were the smallest, being 8 to 10 inches (20.3 to 25.4 cm) in diameter. Mountain pine beetle and *Ips* brood ranged from egg to third instar larvae.

Log decks consisting of trees felled during the logging operation following road right-of-way construction did not contain bark beetles. Trees felled during the logging operation, but still lying in the forest, also did not contain beetles.

Table 1.—Numbers and average d.b.h. of ponderosa pine trees killed by mountain pine beetles, Blue Springs Creek drainage, Escalante Ranger District, Dixie National Forest, Utah

Year	Trees killed per acre	Average d.b.h. $\bar{x}$	sd	
	Number	*Inches*		
1979 and earlier	8.0	[1]12.7	2.35	(n = 235)
1980	3.1	12.0	2.12	(n = 87)
1981	2.2	[1]10.8	1.93	(n = 61)
1982	0.0	—	—	—
All years	13.3	12.3	2.26	(n = 383)

[1]Means significantly different at 0.05 level (t-test).

Table 2.—Numbers and percents of decked ponderosa pine logs infested in 1982 by mountain pine beetle and *Ips pini*, Blue Springs Creek drainage, Escalante Ranger District, Dixie National Forest, Utah

Log deck	Logs examined	Logs infested by mountain pine beetles		Logs infested by *Ips pini*	
	No.	*No.*	*Percent*	*No.*	*Percent*
1	27	23	85.2	0	0
2	41	37	90.2	0	0
3	17	11	64.7	4	23.5
4	22	9	40.9	0	0
5	9	9	100.0	0	0
6	35	19	54.3	0	0
7	36	19	52.8	0	0
8	42	38	90.5	0	0
9	12	12	100.0	0	0
10	42	35	83.3	3	7.1
Total	283	212	74.9	7	2.5

DISCUSSION

The lack of newly infested trees in the Blue Springs Creek drainage appears to be largely related to mountain pine beetles infesting logs in decks. Trees for the road right-of-way were felled and logs decked during June and early July before mountain pine beetle emergence, but after overwintering *Ips pini* would have emerged and infested trees or slash. Therefore, the logs appear to have provided a strong attraction to mountain pine beetles emerging during the flight period, which occurred from about mid-August to mid-September. Range in beetle stages from egg to third instar suggests a prolonged emergence period for attacking beetles.

Frequent rains and cool temperatures appeared to delay emergence as indicated by beetle cage and trap catches from mid-August to early September (unpublished data, Research Work Unit 2201, Intermountain Forest and Range Experiment Station, Ogden, Utah). Adverse weather during the flight period also could have affected the number of successfully infested trees by prolonging the emergence period (McCambridge 1964).

A prolonged emergence period results in too few beetles emerging at one time to successfully mass attack most standing trees selected for infestation, and results in a high ratio of unsuccessfully to successfully attacked trees. In the adjacent Pine Creek drainage, eight trees were successfully infested and eight were not.

APPLICATION

These data suggest that land managers faced with a large beetle infestation in ponderosa pine could, with proper timing of logging, greatly reduce the beetle population. By felling trees in June and July before beetle flight, downed trees and log decks should attract many beetles, with attack densities comparable to those in standing trees (Blackman 1931; Parker and Stevens 1979). The logs and trees then can be removed from the forest before beetle flight the following year. It is important that infested logs be removed from the forest before beetles complete development and emerge the year following attack.

Logs taken to sawmills should be processed promptly, and infested slabs and cull logs should be burned, debarked, or dried to destroy brood before they mature and emerge. Beetles emerging in urban areas could be expected to infest most species of pine, including exotics (McCambridge 1975; Furniss and Schenk 1969; Smith and others 1981). Without slab and cull treatments at mills in forested areas, emerging beetles may start an outbreak in the vicinity of the sawmill, with the infestation spreading into adjacent stands.

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