ɔuthwest Great Plains

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Red Turpentine Beetles in Partially Cut Stands of Ponderosa Pine

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The percentage of leave trees infested by the red turpentine beetle (*Dendroctonus valens*) was determined in ponderosa pine stands after they were cut to various growing stock levels. The percentage of red turpentine beetle attacked trees ranged from 0% to 15% on all plots, but mortality of the infested trees was never attributable solely to the red turpentine beetle. Mortality attributable to the red turpentine beetle, *Armillaria* spp., and the mountain pine beetle was less than 36% on any one plot and averaged 6.6% for all plots.

Keywords: Red turpentine beetle, *Dendroctonus valens*, ponderosa pine

The red turpentine beetle (RTB), *Dendroctonus valens* Leconte, is a secondary enemy of pine (Wood 1963). It occasionally attacks and kills apparently healthy trees but generally attacks in conjunction with other more aggressive bark beetles (Wood 1963) such as the mountain pine beetle (MPB), *Dendroctonus ponderosae* Hopkins. In the Black Hills, RTB usually infest the lower boles when inhabiting trees in conjunction with MPB. When operating alone, RTB ordinarily infest freshly cut stumps, injured trees, or fire-scorched trees (Furniss and Carolin 1977, Wood 1963).

RTB rarely kill trees, although repeated attacks in successive years may kill the trees. More often, the attacks may weaken the tree so that it later attracts and is killed by other bark beetles like MPB. Because RTB infest freshly cut stumps and leave trees in partial cutting areas, the beetle could create potential pest management problems for forest managers by either killing the leave trees or attracting the MPB into thinned stands that might not otherwise be infested. This note reports on the incidence of RTB in partially cut stands of various growing stock levels (GSL) and subsequent tree mortality.

Methods

Sets of GSL plots were installed at each of eight locations in the Black Hills of South Dakota from 1985 to 1989. The plots were installed in essentially pure stands of ponderosa pine, *Pinus ponderosa* Lawson, with an occasional spruce or hardwood species present. Before the stands were cut, they had average diameters ≥ 8 inches d.b.h., basal areas of 125 or more ft^2 per acre, and were considered moderate to high hazard stands for MPB infestation. The plots were partially cut to various growing stock levels ranging from GSL 40 to GSL 140. The uncut controls had GSLs ≥ 125. The trees left after cutting were selected for their size, spacing, crown characteristics, and apparent good health. Plot information regarding average tree diameter, basal area per acre, number of trees per acre, and cutting date are listed in table 1.

Recent logging activity within 0.5 mile of the plots was evident prior to cutting of the Bear Mountain I, Brownsville, and Jewel Cave plots. MPB populations were in outbreak status in and around the White House Gulch plots.

The plots were surveyed for RTB attacks, logging damage, and other biotic factors within 1 year of cutting. Thereafter, the plots were surveyed annually in August or September of each year for MPB infestation and other insect activity. The data were summarized and frequency of RTB-infested trees was determined.

Results and Discussion

The percentage of RTB-attacked leave trees was 15% or less on any one plot (table 2). Infestation percentages

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Table 1.—Stand characteristics of the Black Hills growing stock level plots after cutting.

Location (Year cut)	GSL	Mean d.b.h. (inches)	Basal area ft^2/acre	Trees per acre	Mean age
Bear Mtn. I	60	11.0	60	90	74
(1987)	80	10.1	80	143	72
	100	10.5	100	166	75
	Ctrl	10.0	155	280	72
Bear Mtn. II	100	8.9	97	221	86
(1987)	120	8.8	117	270	84
	140	7.8	125	371	87
Black Hills	40	10.9	41	62	94
Experimental	60	11.9	60	78	112
Forest	80	10.9	81	124	93
(1988)	100	9.2	99	212	91
	Ctrl	8.7	154	370	91
Border	60	11.1	60	92	88
(1987)	80	10.8	80	124	85
	100	10.7	98	156	83
	Ctrl	8.9	193	440	85
Brownsville	60	12.4	61	71	103
(1986)	80	11.5	81	110	114
	100	12.8	101	112	123
	Ctrl	12.7	146	165	105
Crook Mtn.	80	13.9	81	76	99
(1986)	100	12.2	99	120	98
	120	13.9	118	110	102
	Ctrl	12.6	158	179	101
Jewel Cave	60	9.1	59	129	58
(1989)[a]	75	8.9	73	170	71
	90	8.8	85	198	65
	Ctrl	9.2	145	310	71
White House	60	12.5	59	68	86
(1990)	80	11.2	79	115	85
	100	11.6	100	134	89
	Ctrl	10.8	128	199	88

[a]*GSL 60 plot uncut at time of inventory.*

Table 2.—Percentage of leave trees attacked by the red turpentine beetle within 1 year after partial cutting.

	Growing stock level								
Location	40	60	75	80	90	100	120	140	Control
Bear Mountain I		14		13		6			0
Bear Mountain II						4	2	2	
Black Hills Exp. For.	5	1		0		2			0
Border		4		4		3			0
Brownsville		11		9		3			2
Crook Mountain				1		4	4		<1
Jewel Cave		NC	15		10				0
White House Gulch		6		6		4			0

NC = Uncut at time of inventory.

in the plots were apparently influenced by growing stock level, recent logging, and/or MPB activity, although the influence of logging activity is unclear. The percentage of infested trees was greatest in growing stock levels ≤ 90 when those plots were in the vicinity of recent logging activity or MPB infestations. RTB were present in the adjacent, recently cut areas or MPB-infested trees and then were attracted from these areas by the GSL plot cutting. However, RTB infested less than 18% of the skidding-damaged trees on any of the plots; the average for all plots was less than 5%. The lack of correlation between damaged trees and RTB infestation contradicts the previous statement regarding RTB attraction into logging areas. We cannot explain why RTB failed to attack damaged trees except to suggest that, if oleoresin is the main source of attraction, the damage on most trees was not extensive enough to cause major exudation as is the case when trees are cut. The relatively low or zero percentages of RTB-attacked trees in the controls reflect the endemic levels of RTB infestation. RTB in these trees may indicate weakened trees or trees infected by *Armillaria* spp. root disease.

Mortality of RTB-attacked trees on all plots was ≤ 36% of those infested; average mortality was 6.6%. None of the mortality was attributable solely to RTB attack. In all plots, the dead RTB-attacked trees were also infected with *Amillaria*, attacked by MPB or *Ips* beetles, or had both *Armillaria* and bark beetle attacks.

In general, the RTB does not appear to be a significant mortality factor in uncut or partially cut stands. Trees are able to withstand RTB attacks, although the attacks may predispose the trees to bark beetle attacks, particularly MPB and *Ips*. The predisposition is not straightforward, however, because in most of the trees with RTB and other bark beetle attacks, we were unable to determine which came first. In addition, more than half the dead RTB-infested trees also had *Armillaria* infections. Thus, the RTB may have been attracted to trees already affected by *Armillaria*. Because we only examined dead RTB-attacked trees for the presence of *Armillaria*, determining what percentage of the living RTB-attacked trees may also have had *Armillaria* requires further research.

Forest managers can minimize the number of RTB-attacked trees by eliminating logging activities in stands adjacent to recently cut stands and by promoting the rapid harvest of timber within the cutting area. Our data indicate the percentage (or number) of RTB-attacked trees was greater in stands where recent logging activity occurred nearby, and that nearly all RTB-attacked trees were attacked within the first year after logging. Because endemic RTB populations exist in uncut stands, RTB attacks will never be completely preventable in freshly cut stands. However, by harvesting promptly and separating logging areas by a mile or more, potential RTB problems can be minimized.

Literature Cited

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