

PACIFIC SOUTHWEST Forest and Range Experiment Station

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CACODYLIC ACID FOR PRECOMMERCIAL THINNING IN MIXED-CONIFER STANDS

shows erratic results

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Killing unwanted hardwoods by injecting silvicides has been an accepted practice for many years. It is inexpensive and relatively safe. But tree poisoning has not been extended to precommercial thinning in conifer stands because the ratio of killed trees to treated trees has been low, bark beetle populations build up in dying trees, and some potential crop trees have been damaged or killed by flashback; that is, silvicide translocates from treated to untreated trees through functional root connections.

An organic arsenical called cacodylic acid has offered some promise in killing conifers while showing few undesirable characteristics. In a small-scale test of thinning mixed-conifer stands in California, we applied a silvicide called Silvisar 510 Tree Killer.¹ The solution consisted of 5.7 lbs. cacodylic acid equivalent per gallon designed specifically for tree injection. The results were erratic.

METHODS

Three stands of small poles in northern California were thinned from below during the 1968 growing season. Two of the stands—Reynolds Basin in Shasta County and Trough Springs Ridge in Colusa County—include a mixture of Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco) and ponderosa pine (*Pinus ponderosa* Laws.). The third stand—on the Latour State Forest² in Shasta County—has a mixture of red fir (*Abies magnifica* A. Murr.) and white fir (*A. concolor* [Gord. & Glend.] Lindl.).

Silvisar 510 was applied to waist-high ax frills according to manufacturers specifications:

- Trees under 8 inches d.b.h.: one frill per 2 inches of d.b.h. and 1 milliliter per frill.
- Trees 8 inches d.b.h. and larger: one frill per inch of d.b.h. and 1-2 milliliters per frill.

ABSTRACT: In a small-scale test, a silvicide consisting of cacodylic acid was injected during the growing season at dosages recommended by the manufacturer. The treatment did not thin adequately two of three mixed-conifer stands. Ponderosa pine and lower crown classes seemed more susceptible to the silvicide than Douglas-fir and upper crown classes. No flashback was recognized. But bark beetles killed leave trees in one stand.

OXFORD: 242:414.1[-174.7 + 174.7 *Pseudotsuga menziesii* + 174.7 *Pinus ponderosa* + 174.7 *Abies magnifica* + 174.7 *A. concolor*].

RETRIEVAL TERMS: *Pseudotsuga menziesii*; *Pinus ponderosa*; *Abies magnifica*; *A. concolor*; precommercial thinning; silvicides; cacodylic acid; Silvisar 510.

The stands were checked 1 month after treatment. One year later d.b.h. and crown class were recorded for each treated tree. And randomly selected trees were rated for response to the silvicide on a five-point scale.³

Rating:

- 1—no visible response
- 2—poor color, but no significant dead foliage
- 3—top five or more whorls of branches defoliated or dead
- 4—most of crown dead, but some live branches; most trees expected to die soon
- 5—entirely dead.

RESULTS

The treated stands responded quickly to Silvistar 510. One month after injection all species showed patches of dead foliage, and needles were falling from many crowns. One year later, the silvicide had killed the top five or more whorls (response rating 3 or higher) on 97 percent of the treated trees. But only at Trough Springs Ridge, where 85 percent of the injected trees were rated 4 or 5, was the percentage of trees dead or dying considered satisfactory. The percentage of trees rated 4 or 5 was only 36 at Reynolds Basin and only 59 at Latour State Forest.

All species were not affected equally (table 1). Ponderosa pine seemed to be more susceptible than

Table 1—Trees dead and dying 1 year after being injected with Silvistar 510, by stand and species

Stand and species	Trees in response ratings 4 and 5 ¹	
	No.	Pct.
Reynolds Basin:		
Douglas-fir	26	21*
Ponderosa pine	86	46*
Trough Springs Ridge:		
Douglas-fir	50	83
Ponderosa pine	12	92
Latour State Forest:		
Red fir	29	67
White fir	29	53

¹Rating 4: most of crown dead, but some live branches; most trees expected to die soon.

Rating 5: entirely dead.

*Statistically significant at 1 percent level.

Douglas-fir to the silvicide, but only at Reynolds Basin was the difference statistically significant. Red and white fir reacted similarly to the silvicide at Latour State Forest.

Crown class tended to influence effectiveness of the silvicide (table 2). Intermediate and suppressed trees were killed more often than dominant and co-dominant crown classes. This relationship was statistically significant for ponderosa pine at Reynolds Basin, Douglas-fir at Trough Springs Ridge, and for red fir at Latour State Forest.

Table 2—Average response rating of each species 1 year after being injected with Silvistar 510, by stand and crown class

Stand and species	Response rating when crown class was: ¹		
	Dominant and codominant	Intermediate	Suppressed
	-----Mode ² -----		
Reynolds Basin:			
Douglas-fir	<u>3</u>	3	<u>3</u>
Ponderosa pine	<u>2</u>	<u>2</u>	<u>5</u>
Trough Springs Ridge:			
Douglas-fir	<u>2</u>	<u>5</u>	<u>5</u>
Ponderosa pine	<u>5</u>	<u>5</u>	<u>5</u>
Latour State Forest:			
Red fir	<u>3</u>	<u>4</u>	<u>5</u>
White fir	<u>3</u>	<u>4</u>	<u>3, 5</u>

¹Rating 2: poor color, but no significant dead foliage.

Rating 3: top five or more whorls of branches defoliated or dead.

Rating 4: most of crown dead, but some live branches; most trees expected to die soon.

Rating 5: entirely dead.

²Modes not statistically significant at 5 percent level are joined by underscoring.

Silvisar 510, injected during the growing season, did not move readily downward in the tree stem. No instances of flashback through functional root connections were recognized in this test. And of five double-stemmed trees with one stem injected, only two non-injected stems were injured (response rating 2 and 3) by the silvicide. Injections were at least 3 feet above the fork. Observations on other trials of Silvisar 510 suggest, however, that the silvicide may flashback occasionally, if applied during dormancy.

Fear that bark beetle population may build up by breeding in dying trees has retarded wide-spread use of chemical thinning. The fear was not allayed by this test. At Trough Springs Ridge, the western pine beetle (*Dendroctonus brevicomis* Lec.) reared broods successfully in the injected trees and attacked and killed six leave trees.

CONCLUSIONS

Two of the three mixed-conifer stands in this test were not adequately thinned by injecting Silvisar 510

at dosages recommended by the manufacturer. A large portion of the injected trees are not expected to die soon. These trees will continue to compete for moisture, nutrients, and crown space. Furthermore, the trees with crowns only partially killed tended to be in the dominant and co-dominant crown classes, and thinning must reach into these crown classes to stimulate diameter growth of the residual trees.

NOTES

¹Manufactured by The Ansul Co., Marinette, Wisconsin. Trade names and commercial products or enterprises are mentioned solely for necessary information. No endorsement by the U.S. Department of Agriculture is implied.

²The cooperation of the California Division of Forestry in providing land at the Latour State Forest for this test is gratefully acknowledged.

³Newton, Michael, and Harvey A. Holt. *Response of Douglas-fir to injected herbicides*. The Ansul Co., Marinette, Wis., Forest. Tech. Bull. 66-1, 2 p. (n.d.)

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