



# STATE FOREST NOTES

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## FIELD TEST OF LINDANE FOR BARK BEETLE CONTROL

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Prolonged drought conditions during the summer and fall of 1959, created a condition favorable for an epidemic of bark beetles throughout the forests of northern California. Typical of this condition was the Hat Creek drainage in eastern Shasta County where aerial and ground checks revealed individual and group tree killing of ponderosa and sugar pine by the western pine beetle (*Dendroctonus brevicomis*), mountain pine beetle (*Dendroctonus monticolae*) and the California five-spined engraver (*Ips confusus*).

Primary cover type on the area consisted of a typical mixed conifer stand with ponderosa pine predominating on the south slopes and ridges. Terrain was variable with slopes ranging between 5 and 50 percent. Although private and federal foresters were conducting an active salvage program, the large number of small, infested trees made this method of control only partially effective. Therefore, entomologists recommended that a direct bark beetle control program be initiated.

The Pacific Southwest Forest and Range Experiment Station had been conducting laboratory and small field tests of the residual insecticide called lindane in an attempt to control the pine engraver beetle.<sup>2/</sup> Results indicated that successful control could be achieved in the laboratory. Large scale field tests with lindane had not been conducted against any species of bark beetle. It was therefore recommended that lindane be field tested on the Hat Creek project.

The large size of the infested area and snow conditions made a normal ground survey impractical. Since an appraisal and spotting survey was essential to basic planning for control work, a helicopter was used to accomplish this task. Approximately 35,000 acres of intermingled Forest Service and privately owned land were surveyed and spotted in three and one-half hours for a total cost of \$445.00. The area of private land amounted to 24,300 acres. A spot map of infested groups

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<sup>2/</sup> LYONS, Robert L. 1959. Directions for using lindane sprays to control pine engravers. Pacific Southwest Forest and Range Exp. Sta. Misc. Paper No. 33. 5 pp.

was then reproduced for later use by control crews.

#### ORGANIZATION OF CONTROL WORK

Overall administration and technical supervision on this project was assigned to a Forester on the District Deputy State Forester's staff in Redding. Field operations of Division personnel were under the direction of the Shasta-Trinity Ranger Unit. Private industry crews in the field were directed by a professionally trained forester employed by the McCloud River Lumber Company. Entomologists from the Pacific Southwest Forest and Range Experiment Station assisted in conducting a training session prior to commencement of the operation and checking field application of the insecticide.

The area of 24,300 acres of private land was divided into two sectors (fig. 1). The private industry crews were assigned the northern sector because of their familiarity with the intermingled ownership pattern. This sector contained fewer trees; however, they averaged larger in size and it was hoped that most of them could be salvaged at a later date. Division of Forestry crews were assigned the southern sector with its large groups of smaller trees and relatively solid ownership pattern.

A basic crew size of three men was established for this operation. Use of administrative Ranger Unit personnel as crew leaders allowed for maximum individual crew action and minimized the need for frequent checks of the work. When work was conducted on large groups of small trees an additional man and sprayer was added to the crew.

Each crew was equipped with a four-wheel drive vehicle, chain saw, one or more back-pack sprayers and other basic equipment. Both State and private crews used the Hudson "Sprazit," Model 377 E, galvanized 5 gallon pressure back-pack sprayer (fig. 2), designed for use with chemicals and oil materials. This pump was equipped with a 24 inch extension and swivel type, adjustable spray nozzle. Pressure was maintained by means of a pump handle which could be changed to either side of the pump.

#### FIELD OPERATIONS

At the beginning of the operation each crew leader was given a copy of the spotting map. Each group of infested trees on the project area was numbered on the map. Each crew was assigned by number the group it was to treat. Supervisors of both State and private crews did advance spotting to confirm location and access to the groups, and assigned new groups as the work progressed. Technical personnel assisted in spotting during the early stages of the project.

A solution of 1.5 percent by weight of lindane in diesel oil carrier was recommended for the three species of bark beetles present on the project area. This was mixed at the camp in 50 gallon



Fig. 1. Map showing the project area where trees were treated in 1960 within the Hat Creek Zone of Infestation.



Fig. 2. Treating felled trees with lindane using back-pack sprayer.

barrels and then pumped into 5 gallon disposable cans for field use. Both State and private crews were supplied in this manner. Tests performed by the State Department of Agriculture to determine if lindane would remain in solution proved satisfactory.

Two variations of treatment were used, depending upon the size, density and number of trees within the group. The normal procedure was to fell an infested tree and lop it only as much as necessary to reach the bole for spraying. In dense stands where diameters were about 7 inches or less the infested trees were sprayed standing. Although a little more spray material was used per tree when treating by the latter method, the cost was more than offset by a considerable saving in time and labor.

The spray solution was applied to the top, sides, and insofar as possible, the under portion of the felled tree. No attempt was made to turn a tree to expose the underside of the trunk for further treatment. Spray material was applied in a fast sweeping motion until the bark was glistening wet, but not to a point where runoff began. Approximately one gallon of the spray was needed to treat an 18 inch d.b.h. tree. Because it was difficult to tell sprayed from unsprayed material after a short period of time, each tree was marked immediately after treatment with keel or paint. The pressurized canned paint was also useful in marking access routes.

A salvage logging operation was conducted in conjunction with the direct control operation. Since it was not possible to remove most of the logs prior to emergence of beetles, they were skidded to landings and there sprayed and dacked to await improved road conditions. Locations of all salvable treated logs on the State operating area were spotted on maps given to company foresters.

#### STATISTICS AND RESULTS

A daily field record of the number of treated trees by size class was kept by each crew on a 5 x 8 inch card. Space was also provided for entering the number of hours work, mileage, lindane used, chain-saw-hours and group number being treated. This information was entered daily on a summary sheet to provide a continuous record of each day's progress and cumulative total of the entire project. A master map was also kept to check progress. The operation can be briefly summarized by the following statistics:

Period of direct control operation	March 4-April 5, 1960
Total man hours, State and private	2,180
Number of trees treated	4,395
Average d.b.h. of treated trees (inches)	8
Range of treated trees by d.b.h. (inches)	2-64
Lindane concentrate used (gallons)	60
Cost per treated tree	\$2.48
Total cost of project	\$10,760

Effectiveness of the spray formulation as applied in the field was tested by the Pacific Southwest Forest and Range Experiment Station.<sup>3/</sup> Briefly, the results showed an effectiveness ranging from 92 to 100 percent depending on the species of beetle. It was also noted that apparently most of the toxic chemical was absorbed into the bark rather than forming the expected crystalline structure on the bark surface. Consequently, the beetles contacted or ingested the material while boring out.

A fixed-wing aircraft flight and ground checks conducted during the late summer after the project, indicated that while some insect activity was present, there was little evidence of large group killing of trees on the project area.

### OBSERVATIONS AND RECOMMENDATIONS

The following observations and recommendations can be made as a result of this project. It should be emphasized, however, that these observations apply to the conditions present on this operation and varying circumstances will indicate what is applicable to future projects.

1. The short training session, review of the project and field trip for all participants proved to be of great value. If new chemicals or other means of control are to be used, a briefing session and demonstration of application techniques are essential.
2. In general, the three-man crew proved to be very efficient; however, it was found that when working large groups of small trees, an extra man with sprayer increased the number of trees treated per man-day. Therefore, a four or five-man crew would be recommended when such groups are worked. This extra man when not employed with a crew could work with two crews, confirming group location, and marking access to infested trees.
3. An additional chain saw, pump, spare nozzles and other equipment should be available for each two crews. The extra man previously recommended should have this equipment readily available in the field for immediate use.
4. When needed, a small dozer should be available to open up roads and skid trails in advance of the crews. If possible, each four-wheel drive vehicle should be equipped with a winch.
5. Protective equipment, such as a slip-over type poncho, could be used to protect the back of the man using the sprayer in the event some of the material is spilled. Rubber gloves

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<sup>3/</sup> LYON, Robert L., and Boyd E. WICKMAN. Sept. 1960. Mortality of the western pine beetle and California five-spined Ips in a field trial of lindane. Pacific Southwest Forest and Range Experiment Station, Research Note No. 166. 7 pp.

should be provided and a simple type of face respirator could be used when spraying large groups of standing trees. Additional supplies should include solvent and rags to wash off pump and hands if the spray solution is spilled during refilling, and either soap and water or a waterless soap for washing prior to eating lunch.

6. When refilling the sprayers, considerable splashing and spilling occurred because of the filler screens used on this model to keep foreign material out of the tank. To eliminate this, the screens were removed. No clogging of the spray tips was observed because of this action. A second difficulty encountered was that the spray tip assembly had a tendency to come unscrewed from the extension after prolonged use. This required checking and tightening. To eliminate the possibility of lost time, an extra spray tip assembly should be carried by each crew.

#### SUMMARY

In the spring of 1960, a direct control project using lindane against the western pine beetle, mountain pine beetle and California five-spined engraver beetle was conducted in the Hat Creek area of Shasta County, California. This was the first large scale field test of this insecticide for forest insect control in the State. Back-pack sprayers were used by small crews to treat 4,335 infested trees with a 1.5 solution of the toxic chemical in diesel. Cost per tree for the entire project was \$2.48. The operation was successful in reducing losses from these species of bark beetles to an acceptable level.