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MISTBLOWING A HARDWOOD UNDERSTORY IN WEST VIRGINIA WITH "D-T" HERBICIDE

Abstract.—A 40-pound ahg solution of 2,4-D and 2,4,5-T herbicide was successfully mistblown on an undesirable hardwood understory on a good site in West Virginia. After 2 years, many of the stems 1 to 15 feet tall had been killed or severely damaged. The possibilities of obtaining desirable shade-intolerant reproduction on the site were improved by the application of this "D-T" herbicide backpack mistblowing treatment.

Obtaining desirable reproduction after clearcutting harvest operations is one of the most important challenges in forestry. One research facet of this problem involves determining how a dense undesirable hardwood understory can be substantially deadened at reasonable cost so that desirable reproduction can get started.

Tierson¹ reported on work done over a period of several years in New York State that is applicable to the problem. He developed a means of reducing the effects of dense beech (*Fagus grandifolia* Ehrh.) understories in northern hardwood stands so that, after the clearcut harvesting of the overstory, desirable species such as sugar maple (*Acer saccharum* Marsh.), yellow birch (*Betula alleghaniensis* Britton), white ash (*Fraxinus americana* L.), and black cherry (*Prunus serotina* Ehrh.) had a better opportunity to become established and to develop as the future forest stand. Tierson had excellent success in killing the understories with 2,4,5-T in either oil or water, using both tractor-mounted and backpack mistblowers. With backpack mistblowers, he effectively deadened understory beech up to 20 feet in height at a cost of \$6 to \$7 per acre.

¹Tierson, William C. CONTROLLING UNDERSTORY BEECH BY USE OF MISTBLOWERS. Northern Logger 17(12): 24, 41. 1969.

To test Tierson's methodology under conditions in the mountains of West Virginia, we made a smaller-scale study on a high-quality site near Parsons, West Virginia. Here, in a well-stocked stand, we treated a dense understory composed mostly of sugar maple and beech. Under such conditions the forestry objective would call for striving to obtain a new stand of such light-requiring species as yellow-poplar (*Liriodendron tulipifera* L.), black cherry, and white ash after a clearcutting harvest. In this situation—frequently encountered in the northern Appalachian mountains—the desired species are usually present in the overstory, so a seed source is available.

The results of our study, although based on less work than Tierson did, demonstrated the general effectiveness of using backpack mistblowers for hardwood understory treatments in West Virginia.

The Study

In cooperation with the Monongahela National Forest, we established an understory-treatment study, employing a backpack mistblower and using a herbicide mixture of 2,4-D and 2,4,5-T.

The study area was a 5-acre plot on the Fernow Experimental Forest near Parsons, West Virginia. A 65-year-old, well-stocked stand of mixed hardwoods occupied the area. Species composition was typical for a good-quality site in this location: sugar maple, beech, yellow-poplar, black cherry, white ash, red maple (*Acer rubrum* L.), northern red oak (*Quercus rubra* L.), black locust (*Robinia pseudoacacia* L.), and cucumber-tree (*Magnolia acuminata* L.). The sawtimber-size portion of the stand (trees larger than 11.0 inches d.b.h.) averaged 15,000 board feet (International 1/4-inch kerf scale) to the acre. The understory comprised all living stems between 1 foot tall and 5 inches d.b.h. There were about 11,000 of these stems per acre, of which approximately 75 percent were sugar maple and 13 percent were beech and hornbeam (*Carpinus caroliniana* Walt.). Most of the stems were of seedling origin and were less than 5 feet tall.

The prelogging mistblowing treatment was applied to the understory during the last week in June 1967. (Tierson found that this type of treatment has the best effect if begun after full leaf development and completed at least 2 weeks before the first killing frost.) A 5-horsepower mistblower was used to spray a 40-pound acid equivalent solution of "D-T", at a rate of 7-1/2 gallons per acre (fig. 1). Both the 2,4-D and 2,4,5-T were low volatile iso-octyl esters, each having an acid concentration of 6 pounds per gallon.



Figure 1.— Mistblowing undersirable reproduction established in a mature forest before cutting.

The exact mixture used, on the basis of a 100-gallon mix, was as follows: $6\frac{2}{3}$ gallons of 2,4-D and 2,4,5-T (half and half), $6\frac{2}{3}$ gallons of kerosene, and $86\frac{2}{3}$ gallons of water.

In applying the spray, the nozzle was elevated at about 45 degrees. Spray lines were about 20 feet apart, and the spacing of spray lines was easily maintained on this small area by the wet-glossy appearance of the foliage sprayed on the previously treated strip. No attempt was made to thoroughly soak the whole area—that is, all understory vegetation—because we recognized that the benefits from a complete kill would probably not compensate for the extra cost.

Results

The results, measured 2 years after treatment, generally supported the work done by Tierson. We killed or severely damaged (to the point where we judged their competitive potential was practically eliminated) 75 percent of the sugar maple, 94 percent of the beech, and between 85 and 100 percent of the other species, with the exception of white ash and black cherry. As in Tierson's work, beech proved more susceptible to treatment than sugar maple.

Table 1.—Number of pretreatment stems and percent of stems severely damaged or killed as a result of mistblowing

Species	Stem height class													
	1-5 feet tall			6-10 feet tall			11-15 feet tall			15+ feet tall to 5.0 inches d.b.h.			Total	
	No. per acre	Percent damaged or killed	No. per acre	Percent damaged or killed	No. per acre	Percent damaged or killed	No. per acre	Percent damaged or killed	No. per acre	Percent damaged or killed	No. per acre	Percent damaged or killed	No. per acre	Percent damaged or killed
Sugar maple	8,349	76	14	79	46	39	99	26	8,508	75				
Beech	803	96	26	92	29	79	29	55	887	94				
Hornbeam	546	89	4	100	2	100	35	57	587	87				
Black cherry	333	59	—	—	—	—	—	—	333	59				
Red maple	152	100	3	100	3	67	37	32	195	87				
Striped maple	152	90	—	—	2	100	—	—	154	90				
Hickory	136	88	—	—	—	—	2	100	138	88				
White ash	136	44	—	—	2	0	6	0	144	42				
Others	288	90	6	100	12	100	59	83	365	90				
Total	10,895	78	53	91	96	61	267	47	11,311	77				

The effectiveness of treatment decreased with increasing stem size: we killed or severely damaged only about half the stems in the class 15 feet tall to 5.0 inches d.b.h. (table 1). This was somewhat less effective than Tierson's work in New York State, where spray applied with backpack mistblowers deadened beech up to 20 feet in height.

Using a labor cost of \$2.00 an hour and the appropriate 1967 cost of materials, the total treatment cost per acre of applying 7-1/2 gallons of spray was \$5.50 (travel time to and from the area not included). Though this cost was determined for only 5 acres, it compares closely to Tierson's cost of \$6 to \$7 per acre.

Of the species heavily represented in the understory, the following were especially susceptible to the spray treatment: beech, hornbeam, red maple, striped maple (*Acer pensylvanicum* L.), and hickory (*Carya* sp.).

Two years after treatment, the dense stand of small stems was almost leafless. Closer examination showed that the heavily damaged sugar maple stems were beginning to recover by putting out new shoots from the lower stem. The heavily damaged beech, on the other hand, appeared to be dying.

Discussion

Results of this work show that a mistblown understory spray will greatly reduce the density of the small stems beneath the main stand. Where this understory is composed of undesirable species, and where a seed source of the desired species is available, this treatment should greatly improve the chances of obtaining reproduction of the desired species.

The mistblowing should be done in the summer, one or two seasons before the harvest cutting. The big advantage of spraying 2 years before logging is to give new black cherry and yellow-poplar seedlings a chance to get started in the absence of dense forest-floor competition. Spraying earlier than two growing seasons before cutting would give many of the damaged understory sugar maples a chance to recover their competitive position; it would also provide time for other undesirable tolerant vegetation to build up.

This treatment is not applicable to all situations. Two particular examples come to mind. In oak stands where oak reproduction is the objective, this treatment, applied a couple of years before a clearcut harvest, would in most cases preclude obtaining a new oak stand. Oak reproduction is usually either on the ground when a stand is cut, or it is not ob-

tained because of the erratic periodicity of oak seed crops. Another case where this treatment is not applicable is where the understory is composed mostly of saplings over 15 feet tall. Here a basal spray, or some other type of sapling treatment, is called for.

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