Slash Helps Protect Seedlings From Deer Browsing

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FORESTERS and landowners in the northern and eastern states are vitally concerned with the destructive browsing of forest regeneration by large numbers of white-tailed deer (*Odocoileus virginianus*). Attempts to prevent overpopulations of deer have been made through legislative and administrative measures with varying success, but more direct methods of reducing or eliminating browsing damage are also being sought.

Many foresters concerned with the deer problem have noticed that hardwood slash often seems to protect some seedlings enough so they can grow up out of reach of deer, whereas outside the slash, well-developed seedlings may be scarce or absent. In 1923 Pearson (*6*) noted that "brush tends to discourage grazing" (of domestic livestock). Clepper (*2*) observed in 1936 that loppings had been used successfully to protect planted seedlings from deer in Pennsylvania. Little and Somes (*5*) found that pitch pine reproduction in the slash of a cutover area in southern New Jersey suffered less damage from deer browsing than reproduction in slash-free spots.

On the basis of observations such as these, the Pennsylvania Department of Forests and Waters has discontinued its requirement for lopping of tops in state forest timber sales, except along certain roads.

To obtain more precise information as to whether or not slash protects seedlings from deer browsing—and if it does, to what extent—the Northeastern Forest Experiment Station made a study in Wayne County, Pa. The study was designed to: (1) compare the abundance and height of seedlings within and outside slash piles, and (2) compare the frequency of browsing within and outside slash piles.

Methods

A survey of reproduction was made in a 35-acre black cherry-beech-maple stand on the Pocono Experimental Forest near Gouldsboro, Pa., in April and May 1957. The stand had been cut to an 11-inch diameter limit 5 years before, when it was 55 years old. The residual stand had 164 trees, 1,129 cubic feet, and 62 square feet of basal area per acre in trees 5.0 inches d.b.h. and up. At the time of the survey, 26 percent of the study area was covered with slash.

FIG. 1.—Slash pile with reproduction growing up through it. Here there are four black cherry seedlings, one yellow-poplar, and one pin cherry seedling over 5 feet tall, as well as briars and smaller seedlings.

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The survey involved examination of 238 circular milacre plots—half located randomly in slash piles and the other half in the intervening open spaces.

Reproduction of all trees over 1 foot tall was tallied by species, height class, and degree of deer browsing on the previous season's growth. The height classes used were 1 to 3 feet, 3 to 5 feet, and 5 feet to 0.5 inches d.b.h. Seedlings under 1 foot in height were not tallied because browsing on them is not consistent; they may be covered by ferns in the summer and snow in the winter. Stems more than 5 feet tall are out of danger and free from deer browsing. Only four of the stems tallied were stump sprouts, although many of them, especially beech, may have been root suckers.

(No tally of seedlings was made at the time of logging, but it has been reported that there was a good crop of black cherry seedlings at that time.)

Browsing or lack of it was recorded in one of three categories: (1) unbrowsed, (2) only the top (leader) browsed, or (3) top and one or more branches browsed. However, for presentation here, the second and third categories were combined and are shown as "browsed." If side branches were browsed but not the top, the seedling was considered to be undamaged or "unbrowsed." This rarely happens except in seedlings more than 3 or 4 feet tall.

For each slash plot, the effective height of slash was recorded to the nearest half foot. Measurement was taken at the lowest height of the slash adjacent to or surrounding the tallest black cherry, white ash, yellow birch, or red or sugar maple reproduction. These are the merchantable species in this stand that ordinarily are browsed by deer. Beech is scarcely touched by deer in this region.

The reproduction tally plots plus 258 additional milacre plots (a total of 496 plots) were used to estimate the amount of deer use of the study area during the preceding dormant season. Estimation was by the pellet-group count method, as described by Bennett et al. (*1*), and adapted by Eberhardt and Van Etten (*3*). This count was made for possible use in relating this study to others dealing with deer browsing.

The pellet-count survey indicated that deer use of the study area during the preceding dormant season was at the rather high rate of one deer per 13 acres. Rabbit populations were very low.

Results

More seedlings of every species except beech were tallied on the slash plots than on the open plots (Table 1). On a per-acre basis, the stocking of all merchantable species other than beech was 5,814 stems per acre in slash as opposed to 2,218 in the open. The difference was very marked in black cherry over 3 feet tall: 1,034 stems per acre in slash, 84 per acre in the open.

Beech, which is not browsed appreciably, was more abundant in the open than in the slash. Differences were greatest in the 1- to 3-foot size class. This indicates that slash is somewhat detrimental to small beech seedlings and suckers. The absence of any marked differences within the taller classes of beech probably means that these stems were established before the stand was cut. It is reasonable to infer that, with no deer browsing, seedlings of the other species would also be more numerous in the open; i.e., slash probably deters the establishment of all species, but it deters the palatable ones less than browsing by deer does.

The number of stocked milacres was higher in slash than outside (Fig. 1). Differences in numbers stocked with each species and height class were analyzed by chi-square. Those with significant differences at the 5 percent level are shown in Table 2.

There were not enough stocked milacres in many species-height categories to give a good measure of significance; in others (beech 3+ feet and yellow birch 1+ feet), numbers were ample but differences were small. Black cherry, being the most abundantly represented of the palatable species, best shows the protective effects of slash in terms of both total numbers (Table 1) and stocked milacres.

Browsing damage on existing trees was definitely less in slash than in the open. Again, black cherry best shows the effect: in the 1- to 3-foot height class, 36 percent of the 425 seedlings in slash were browsed, as compared to 51 percent of the 186 in the open. This difference is highly significant.

Yellow birch, a palatable species that is well represented in the 1- to 3-foot class, was browsed about equally in slash and in the open. We cannot explain why slash in this instance failed to show a protective effect. Again, there were

TABLE 1.—NUMBERS OF STEMS TALLIED ON 119 MILACRE PLOTS IN SLASH AND 119 IN THE OPEN

Species	Height class, in feet											
	1 to 3				3 to 5				Over 5			
	In slash		In open		In slash		In open		In slash		In open	
	Not browsed	Browsed	Not browsed	Browsed	Not browsed	Browsed	Not browsed	Browsed	Not browsed	Browsed	Not browsed	Browsed
Black cherry	273	152	91	95	78	20	5	3	25	0	2	0
Yellow birch	76	35	46	17	6	2	0	0	0	0	0	0
Beech	105	0	223	0	76	1	92	0	87	0	75	0
Striped maple	9	14	1	11	4	10	4	5	22	0	7	0
Other species[1]	21	16	6	3	2	0	0	0	2	0	0	0

[1]Red maple, sugar maple, white ash, pin cherry, hornbeam, and serviceberry.

TABLE 2.—NUMBERS OF STOCKED MILACRE PLOTS FOR THE SPECIES AND HEIGHT CLASSES IN WHICH THE EFFECTS OF SLASH WERE STATISTICALLY SIGNIFICANT

Species	Height class[1]	Stocked plots	
		In slash	In open
	Feet	*No.*	*No.*
Black cherry	1+	69	45
Black cherry	3+	28	3
Black cherry	5+	10	1
Yellow birch	3+	6	0
Red maple	1+	11	2
Beech	1+	62	80
Striped maple	1+	29	16

[1]1+ inches all three height classes; 3+ includes two classes.

TABLE 3.—NUMBER OF PLOTS AND NUMBER OF SEEDLINGS 3+ FEET IN HEIGHT FOR ALL SPECIES EXCEPT BEECH, BY HEIGHT OF SLASH

Height of slash (feet)	Plots[1]	Stems per acre
	Number	*Number*
0.5	25	720
1.0	28	893
1.5	22	909
2.0	18	1,389
2.5	16	3,938
3.0	7	1,857
3.5	2	3,500

[1]The total is 118, since the height of slash on one plot was not recorded.

not enough seedlings in other species-height classes to permit valid measures of significance. However, it is obvious from the scarcity of taller stems of palatable species on the open plots (Table 1) that deer have largely prevented these species from growing out of the 1- to 3-foot class. Similar effects of deer browsing have been demonstrated on the Experimental Forest by fenced exclosures (*4*).

The effectiveness of slash piles increased with height up to 2.5 feet, and possibly higher (Table 3). Slash piles that were still 2.0 feet or more in height 5 years after cutting have given the seedlings excellent protection. The somewhat erratic figures for heights above 2.5 feet may be due to either the smaller number of samples or a growth-inhibiting effect of some of the largest and deepest slash piles.

Discussion and Summary

A survey of tree reproduction in relation to logging slash and deer was made 5 years after a heavy cutting in a black cherry-beech-maple stand. The study showed that substantially larger numbers of stems of the commonly browsed species were found in the slash piles than in the intervening openings, and that the incidence of browsing on existing stems was much less in the slash. The obvious conclusion is that slash exerts a definite protective effect.

It follows that, in areas where deer browsing limits reproduction, hardwood slash should be looked upon as a blessing, and not just as a fire hazard. Close utilization of tops for products such as fuelwood would reduce the volume of slash and the protection it affords. In respect to the fire hazard, there is little reason to lop or burn slash in most eastern hardwood regions, particularly in the northern hardwood type. But this study shows that in regions where deer are abundant, there is a good reason not to reduce the slash.

There are some possibilities for deliberately using slash to protect seedlings: trees might be felled into openings where reproduction is desired in such a way that the tops are in groups of 2 or 3, but not on top of each other; or, slash might be piled over wild seedlings as Clepper (*2*) suggested for planted seedlings.

Literature Cited

1. BENNETT, LOGAN J., P. F. ENGLISH, and RANDALL MCCAIN. 1940. A study of deer populations by use of pellet-group counts. Jour. Wildlife Mangt. 4:398-403.
2. CLEPPER, HENRY E. 1936. The deer problem in the forests of Pennsylvania. Pa. Dept. Forests and Waters Bul. 50. 45 pp.
3. EBERHARDT, LEE, and ROBERT C. VAN ETTEN. 1956. Evaluation of the pellet-group count as a deer census method. Jour. Wildlife Mangt. 20:70-74.
4. GRISEZ, TED. 1957. Deer browsing in the Poconos. Pa. Game News 28 (2):7-10. Illus.
5. LITTLE, S., and H. A. SOMES. 1949. Slash disposal in oak-pine stands of southern New Jersey. U. S. Forest Service Northeast. Forest Expt. Sta., Sta. Paper 31. 12 pp.
6. PEARSON, G. A. 1923. Natural reproduction of western yellow pine in the Southwest. U. S. Dept. Agric. Bul. 1105. 144 pp. Illus.