

# Site Preparation Essential to Obtaining Best Results from Jack Pine Cones

The slash and height of cones above ground can affect the opening of jack pine cones and the dispersal of the seeds. Two years of research was spent investigating this effect in southeastern Manitoba during 1966 and 1967.

*The effect of cone height and slash on jack pine cone opening was studied in southeastern Manitoba in 1966 and 1967. Cone opening and consequently seed dispersal decreased with height of cones above the soil surface. Cones suspended over mineral soil and over slash dispersed greater amounts of seed than cones suspended below slash. Seed was dispersed later in the season as height of cones above ground increased. The study indicates that adequate seed dispersal from cones borne on*

*slash can be obtained provided that the cones are at, or very close to, the soil surface.*

Jack pine (*Pinus banksiana* Lamb.) cones are persistent and generally serotinous. Standing crops of up to 300,000 to 400,000 cones per acre have been reported (Noakes, 1946) in a mature Ontario stand. In Minnesota, Roe (1963) reports 21,000 cones per acre in a 70- to 80-year-old stand while estimates from sampling carried out by the authors in Manitoba stands of similar age averaged approximately 100,000 cones per acre, ranging from 70,000 to 130,000. Since seeds within cones maintain a high viability up to five years

and yields of 20 seeds per cone are not uncommon, it is evident that cones born in the slash of a jack pine cutover represent a considerable supply of seed. If the slash can be manipulated to efficiently disperse this seed, regeneration costs may be significantly reduced by eliminating the necessity of planting or direct seeding.

Cones in merchantable Manitoba stands are predominantly serotinous and in order to disperse seed must be subjected to temperatures of at least 50°C to rupture the resin bond of the cone scales (Cameron, 1953). Preliminary observations in Manitoba showed that in lopped and scattered slash more than 56% of cones were within seven inches of the ground, and that these cones attained significantly higher temperature than those above that height. Therefore in 1966 a study was established to observe the effect on cone opening of slash and height of cones above the soil surface.

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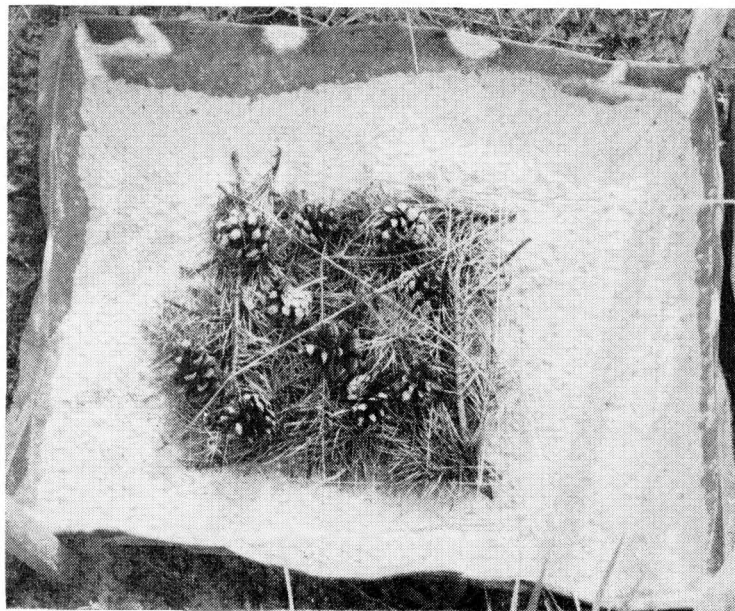


FIG. 1. Ten cones were placed directly on top of the slash at ground level.

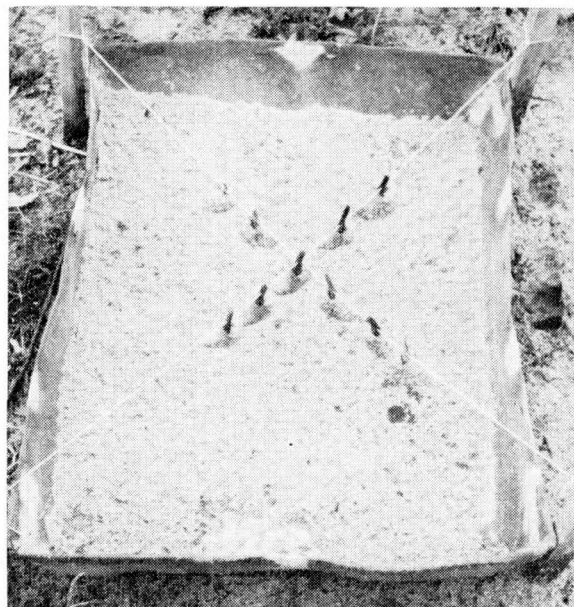


FIG. 2. Cones suspended at the 4-in. level above mineral soil in a seed trap.

## Methods

Seed traps constructed from four-drainer wire (Fig. 2) were filled with sieved sand to a depth of  $\frac{1}{2}$  in. and placed in furrows created by a middlebuster plow. Firm contact was established between the sand in the furrow and trap.

A split plot design with six treatments was used. Three treatments consisted of cones suspended at zero, four, and nine inches above mineral soil. The remaining three treatments consisted of cones suspended as above but screened from the soil by eight-inch squares of hardware cloth completely covered with slash. Cones were suspended two inches above the slash except at ground (zero) level where cones were placed directly on the slash. Ten serotinous jack pine cones from the previous season's cone crop were used in each treatment (Figs. 1 and 2). Eight replications were used in the study.

In the second year three additional treatments, in which slash was suspended two inches above the cones, were added to the study. Otherwise the experimental design remained unchanged.

Cones were suspended over mineral soil since studies (Cayford, 1958; 1966) have shown that such a seedbed must be created if areas are to be regenerated successfully to jack pine. Dispersed seed was collected at monthly intervals from May to October by sieving the soil in each trap.

In order to prevent predation of dispersed seed by rodents, the area was enclosed by a low fence constructed of galvanized sheets of metal (Wagg, 1964). Traps were set in the enclosure to catch any rodents remaining inside.

In the fall of each year the number of seeds dispersed from cones in the various treatments was determined by scale counts. Markings on the under side of cone scales show

TABLE I. Per cent open cones for various slash treatments and cone height above ground.

Year	Treatment								
	No slash			Slash under cones			Slash over cones		
	Height of cones above ground (in.)								
0	4	9	0	4	0	0	4	9	
1966	91	25	6	99	21	0	—	—	—
1967	93	9	0	100	18	0	59	0	0
Avg.	92	17	3	99	19	0	59	0	0

TABLE II. Seed dispersal (seeds per cone) for slash treatment and cone height.

Year	Treatment											
	No slash				Slash under cones				Slash over cones			
	Height of cones above ground (in.)											
	0	4	9	Total	0	4	9	Total	0	4	9	Total
1966	25.7	1.4	1.3	28.4	28.0	1.5	0.0	29.5	—	—	—	—
1967	30.2	0.6	0.0	30.8	26.0	0.4	0.0	26.4	12.6	0.0	0.0	12.6

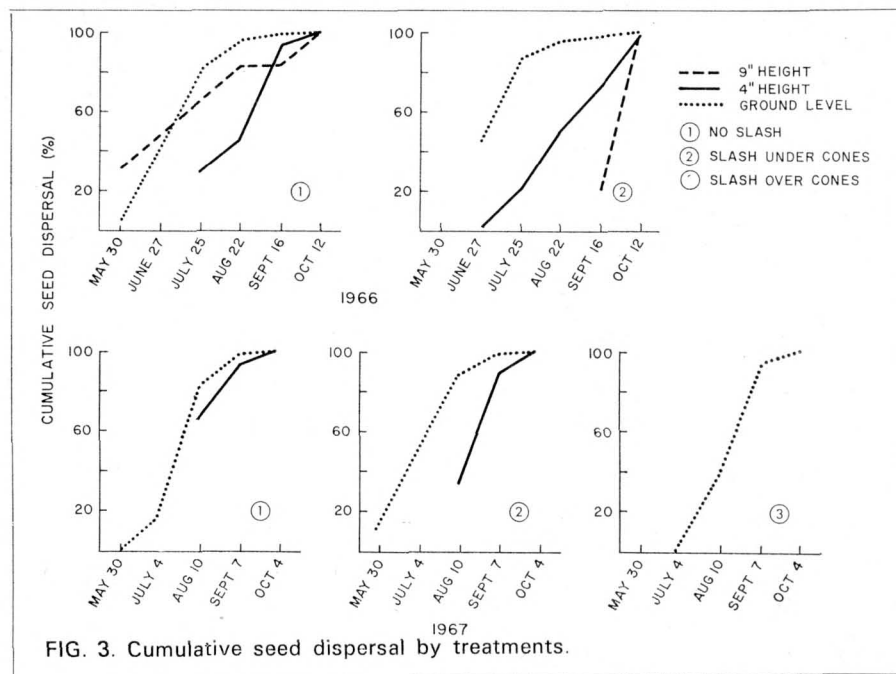


FIG. 3. Cumulative seed dispersal by treatments.

Cones at or very near the ground will open sufficiently to allow adequate seed dispersal, provided they are not shaded by the slash. Four inches above the ground appears to be the optimum height for best seed dispersal.

clearly whether a seed had been present or not when the scale opened.

Weekly maximum temperatures at soil surface in a furrow and in a seed trap were recorded from May 23 to Oct. 10, 1967 and from June 7 to Oct. 18, 1968 using maximum thermometers.

### Results

There was no significant difference (5% level) between maximum temperatures observed in the traps and in the furrow. Weekly maximum soil temperatures in the furrow averaged 39.0°C compared with 40.5°C in the traps.

Percentage of open cones in each height level and slash treatment is shown in Table I. Cone opening decreased as cone height above ground increased. Over 90% of the cones opened in the ground level "no slash" and "slash under cones" treatments and nearly 60% in the ground level "slash over cones" treatments. Cone opening was considerably reduced for the remaining treatments in the study.

Considering slash treatments there was no significant difference (5% level) in percentage of open cones between the "no slash" and "slash under cones" treatments; at ground level 92 and 99% of the cones opened. However, the percentage of open cones in the "slash over cones" treatment was significantly reduced.

The greatest seed dispersal oc-

curred from cones in the ground level class in each treatment, followed by cones in the 4- and 9-in.-above-ground classes respectively (Table II). Comparisons of the "no slash" and "slash under cones" treatments showed seed dispersal to be about equal. In the "slash over cones" treatment however, dispersal was greatly reduced.

Seed dispersal was delayed with increasing height of cones above ground and also by shading of slash (Fig. 3). In the "no slash" and "slash under cones" treatments 80% or more seed was dispersed by late July or early August from cones at ground level. At the four-inch level dispersal of an equivalent amount of seed was delayed until well into September. The latter was also the case at ground level in the "slash over cones" treatment.

### Discussion And Conclusions

The greatest dissemination of seed occurred during mid-summer to early fall, a time when optimum conditions for germination and survival do not usually prevail (Cayford, 1961).

However, field observations by the authors have suggested that seeds sown during this period may germinate early in the following year and a study is currently underway to test this hypothesis.

This study indicates that cones at or very near the ground will open

sufficiently to allow adequate seed dispersal provided they are not shaded by slash. Reduction of cone height to within four inches of the ground might be accomplished by drum chopper or similar equipment. This would greatly increase the seed supply available for regeneration.

P&P

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