Post planting cultivation aids old field white spruce plantations

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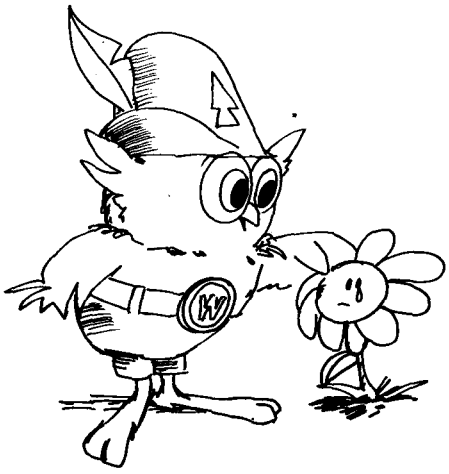
In view of current interest in avoiding unnecessary use of chemicals for grass or herb control, mechanical cultivation should be considered for reducing competition in new plantations. Benefits possible are indicated in an experiment which compared: 1) pre-planting cultivation, 2) pre- and postplanting cultivation, 3) addition of sulphur and fertilizer, and 4) a combination of the latter two treatments. The test species was white spruce *(Picea glauca (Moe*nch) Voss) .

The experiment

The site chosen for the experiment was an old field, uncultivated for many years, with a moderate to dense cover of grasses and herbs and a scattering of small shrubs and trees. It was located about 110 km (68 miles) north of Toronto. The experimental area was plowed and disked in the fall of 1965 and left fallow over winter. In the spring of 1966, the experiment was established in a randomized block pattern with four replications, based on the following treatments.



N-No further treatment (control). Trees planted in cultivated *soil.*

C-Cultivation. Trees planted in cultivated soil, and cultivation continued once a month from May to October in the first year, 1966; and three times during the second year, 1967.

S-Sulphur and fertilizer. Flour of sulphur (1960 kg per hectare) (or 1746 lbs. per acre) and fertilizer (10-10-10; 515 kg per hectare) (or 459 lbs. per acre) were added as a top dressing on April 29, 1966. They were mixed with the soil to a depth of about 15 cm (6 inches).

SC-Sulphur, fertilizer, and cultivation. A combination of the preceding two treatments; soil amendments and post-planting cultivation.

The planting was done by the Wedge method, on May 4, 1966; 100 trees per plot at 1.8 x 1.8 m (or 6 feet) spacing. The stock used was regular 3-0 white spruce shipping stock, from Kemptville Nursery, averaging about 20 cm (8 inches) in top length.

The results were evaluated in terms of first-year survival; second-

year survival, heights and terminal lengths; and fifth-year survival and heights. The pH was sampled in November 1970. Table 1 contains summarized results of the fifth-year measurements; with first and second year data omitted as largely confirmatory.

TABLE 1.—*Fifth-year survival, heights, and pH's (values shown are averages ± standard error of mean).*

Treatment	Survival Percent	Height Cm	pH
N—*Control.* Pre-planting cultivation	31.8 ± 13.0[a]	78.8 ± 1.9[a]	6.3 ± 0.1[b]
C—*Cultivation.* Pre- and Post-planting cultivation	74.8 ± 7.2[b]	89.1 ± 2.2[b]	6.4 ± 0.1[b]
S—*Sulphur and fertilizer.* Pre-planting cultivation	27.5 ± 6.8[a]	77.6 ± 2.1[a]	5.0 ± 0.2[a]
SC—*Sulphur and fertilizer.* Pre- and post-planting cultivation	42.8 ± 5.9[a]	78.4 ± 1.7[a]	5.1 ± 0.2[a]
		[1]	[2]

[1] Significant at 5.0 percent level
[2] Significant at 1.0 percent level
Values in each vertical column not followed by same letter are significantly different at the 5.0 percent level or better.

Post-planting cultivation

T h e post-planting cultivation (treatment C) was the only treatment that obtained a satisfactory survival rate on this site - more than twice that of the control (table 1) . The average heights on the post-cultivated plots were significantly better, by about 20 percent, than those of the control plots. The survival rate of the postplanting cultivation treatment was considerably above the average for this species and age-class in Ontario and the height at 5 years more than double that of many other plantings.

Seedlings in the control planting (those planted in cultivated soil only) had survival rates lower than average for the species, although growth was comparatively good on the remaining trees. Most losses occurred the first year, and were probably due to the rapid invasion of the plots by grasses and herbs, and to the subsequent competition, mostly for water. In the first year, 1966, there was a severe shortage of rain. The combination of the competition and low rainfall resulted in increased moisture stress in an already dry site. Post-planting cultivation apparently reduced the moisture stress, through dry mulching and reduction of competition, therefore more spruce survived. After the first year, the roots extended deeper into the soil to areas of greater moisture availability. The good growth of both control and cultivated trees indicates that the site had a good nutrient status for this species.

Post-planting cultivation of white spruce on a dry site is clearly indicated, with promising benefits in survival and growth. Cost figures were not determined, but about 40 man-hours of work per hectare (16 per acre) were needed over the 2 years.

Acidification and fertilization

Application of sulphur to reduce pH in an earlier study had increased growth of red pine *(Pin us resinosa* Ait.) in the nursery, but there was danger of seedling mortality at high rates of application

(or very low pH) (1). In this experiment, the sulphur and fertilizer treatment effectively reduced pH (table 1) up to 5 years. When compared with the control, the treatment caused no significant reduction in survival rate or in height growth although both were low and unsatisfactory. However, when seedlings were examined in the post-planting cultivation treatment, there was a significant and important reduction in survival rate and a reduction in height growth with the application of sulphur and fertilizer.

In this experiment, white spruce did not benefit from the acidification and fertilization treatment.

Literature Cited

1. Mullin, R. E.
1964. Acidification of a forest tree nursery soil. SSSA Proc. 28 (3) 441-444.