

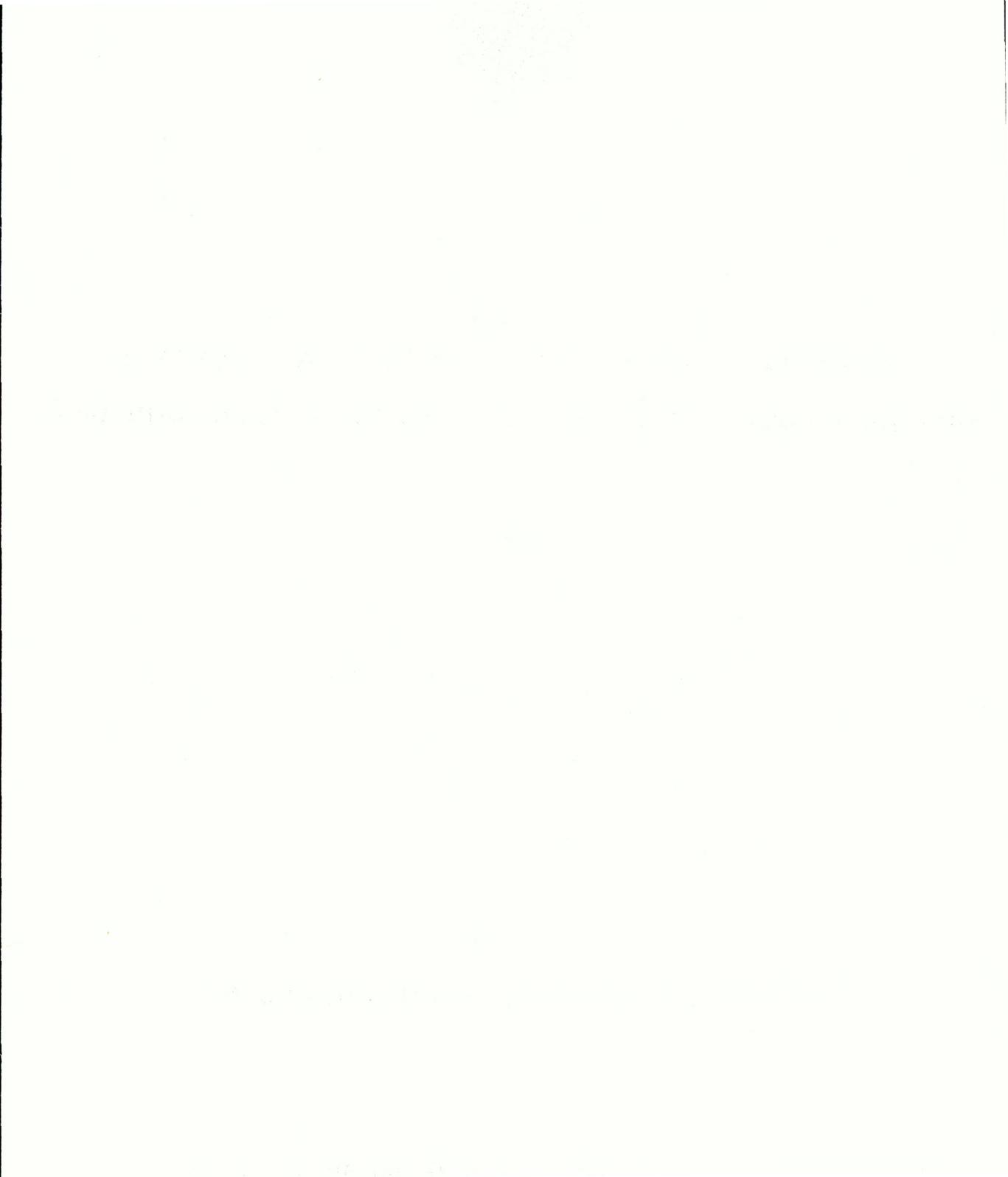


**FURROWING AND SHELTERING TO IMPROVE EARLY SURVIVAL  
OF PLANTED RED PINE ON DRY SITES, SOUTHEASTERN MANITOBA**

by

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## Introduction

In Canada and the United States furrowing has been used to increase survival of seedlings planted on droughty sites. Furrowing destroys vegetation adjacent to the seedlings and thus conserves soil moisture by reducing transpiration (3). In Spain sheltering seedlings with three rocks, placed around their stems at the time of planting, has been responsible for the successful planting of pine on droughty sites. Sheltering reduces surface evaporation, creates a cultivated area around each seedling, reflects heat that would otherwise be absorbed by the soil, and shades the stem of seedlings, reducing the deleterious effects of sun and wind (2).

In 1961 and 1962 experimental red pine (*Pinus resinosa* Ait.) plantations were set out in the Sandilands Forest Reserve to test the effectiveness of furrowing, sheltering, and furrowing plus sheltering as treatments to increase survival. Soils on the planting areas were medium to coarse sands, and the water table was below the reach of most tree roots. Vegetation was characterized by ericaceous plants. The site was described as Site Group D (1).

## Methods

Nine hundred red pine seedlings (2-2 stock) were planted each year by the slit method, one half in furrows and the other half in unfurrowed ground. Sheltering treatments were applied randomly after planting. One hundred and fifty seedlings were planted by each of the following six treatments: control, rock-shelter, paper-shelter, furrow, furrow plus rock-shelter, and furrow plus paper-shelter.

Furrows, approximately 1 1/2-2 feet wide and 2-4 inches deep, were made with fire-line plows (fig. 1). Shelter was provided by placing three rocks, each about 3 to 6 inches in diameter, around the stem of each seedling, or by placing reinforced laminated building paper, 1 x 1 foot on the ground around each seedling (fig. 2-4); the paper was fastened to the ground at each corner by wooden skewers.

## Results and Discussion

The effects of the rock-shelter and paper-shelter treatments were not significantly different, so their data have been combined.

For the 1960 planting, first-year survival was increased by furrow and furrow-plus-shelter treatments; it was not increased by shelter alone (table 1). After two growing seasons all treatments increased survival over that of the control; best results were obtained from the furrow-plus-shelter-treatment.

For the 1961 planting, both first and second-year survival were significantly increased by the furrow and the furrow-plus-shelter treatments. Shelter alone had no effect.

<sup>1</sup>Contribution 504 from the Forest Research Branch, Department of Forestry.

<sup>2</sup>Research Officers, Manitoba-Saskatchewan District, Forest Research Branch, Department of Forestry, Winnipeg, Manitoba, Canada.



Figure 1.--General view of 1960 red pine plantation set out in furrows made by fireline plow.



Figure 2.--General view of 1960 red pine plantation set out on unfurrowed ground, showing sheltered and control seedlings.



Figure 3.--Close-up view showing three rocks placed around the stem of a red pine seedling planted in 1960 in a furrow.



Figure 4.--Close-up view showing laminated building paper (1 ft. x 1 ft.) placed around base of a red pine seedling planted in 1960 in a furrow; note wooden skewers used to hold paper in place.

Treatment	1960 plantation		1961 plantation	
	Fall 1960	Fall 1961	Fall 1961	Fall 1962
Control.....	92.7 a	40.0 a	0 a	0 a
Shelter.....	95.7 a, b	52.0 b	1.7 a	1.3 a
Furrow.....	99.3 b	53.7 b	69.3 b	56.0 b
Furrow plus shelter.....	98.3 b	67.6 c	69.3 b	54.3 b

<sup>1</sup> Any two results not followed by the same letter differ significantly at the 5-percent level by chi-square tests.

Average rainfall for June, July, and August in the study area is 8.1 inches.<sup>3</sup> During the 3 years that the test has been in progress, summer rainfall varied considerably from the average. It was 9.8 inches in 1960, 4.0 inches in 1961, and 16.1 inches in 1962. The summer of 1961 was one of the driest on record, and the summer of 1962 was one of the wettest.

Sheltering provided only limited benefits. Survival after two growing seasons was increased by 12 percent for the plantation set out in a year of near-average precipitation, and by 1 percent for the plantation set out in a very dry year.

Furrowing provided greater benefits than sheltering. Survival after two growing seasons was increased by 14 percent for the plantation set out in a year of near-average precipitation, and 56 percent for the plantation set out in a very dry year.

### Conclusion

Since the test has shown that furrowing provided greater benefits than sheltering, we conclude that droughty sites in southeastern Manitoba should be furrowed prior to planting.

### Literature Cited

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<sup>3</sup>Weather data obtained from the Sprague weather station in southeastern Manitoba.