SITE PREPARATION OF JACK PINE CUTOVERS WITH SHARK-FINNED BARRELS IN SASKATCHEWAN

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ABSTRACT

Site preparation demonstrations conducted in central Saskatchewan using shark-finned barrels on old jack pine cutovers, were successful in creating suitable seedbeds for seeding and planting.

Due to favorable weather conditions in the first year, sowing of 0.45 kg (1 lb) jack pine seed per 0.4 ha (1 acre) provided approximately 70% stocking and over 2,000 established seedlings.

Conventional jack pine seedlings (2 + 2) suffered high mortality in the first growing season due to late planting. The growth performance of heeled-in seedlings appeared to be better than those kept in refrigerated storage. Approximately 1,000 established seedlings per 0.4 ha (1 acre) were found after five years, because of close spacing (1.5 x 1.5 m; 5 x 5 feet).

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INTRODUCTION

Several studies in Canada show that site preparation greatly increases the success of seeding and planting (Cayford 1959, 1961 b, Smithers 1964).

The shark-finned barrel scarifiers developed by the Ontario Ministry of Natural Resources were superior to other equipment in seedbed preparation of old jack pine cutovers in northern Ontario (Brown 1966, Morawski 1966). Its main advantage is the ability to travel over and around obstacles such as stumps, stones and relatively heavy slash.

In the summer of 1967 the Canadian Forestry Service, in cooperation with the Saskatchewan Department of Natural Resources, demonstrated site preparation on old jack pine cutover areas with the barrel scarifiers. This was followed by seeding and planting.

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DESCRIPTION OF AREAS

The demonstration areas are located on two old cutover areas within the B-18a Mixedwood Forest Section of Saskatchewan (Rowe 1959), approximately 17 miles southwest of Prince Albert near Macdowall (Fig. 1).

Both areas supported pure jack pine stands and were logged about ten years before the site preparation. Topography is gently rolling and soils are dry sands, classified as site group D by Jameson (1961).

MATERIALS AND METHODS

The site was prepared with a D-4 crawler tractor pulling four barrels from the drawbar in two rows of two barrels each. Two and three passes were made in the same direction in Block 1 and in Block 2, respectively (Fig. 2). Good mineral soil exposure was achieved with both treatments although the three pass produced considerably deeper furrows than the two pass treatment.

SEEDING

Six acres in Block 1 and two acres in Block 2 were broadcast-seeded with jack pine on April 24, 1968 using a hand-operated cyclone seeder. The seed was treated with Arasan, Endrin and aluminum flakes prior to sowing. The rate of sowing was 1.3 lb/acre in Block 1 and 1.0 lb/acre in Block 2.

PLANTING

Conventional jack pine seedlings (2 + 2) were lifted in

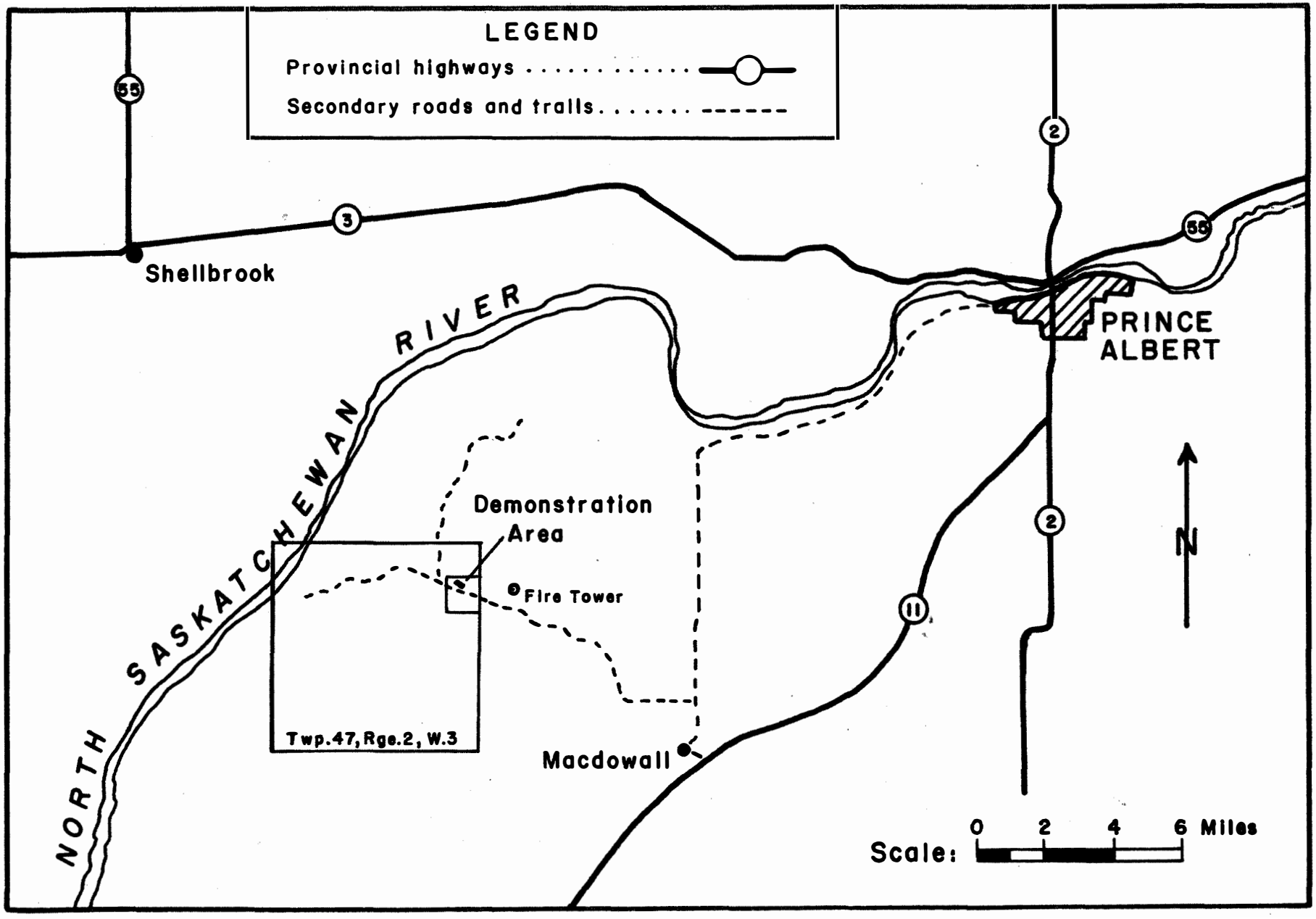

Figure 1. Geographic location of demonstration area.

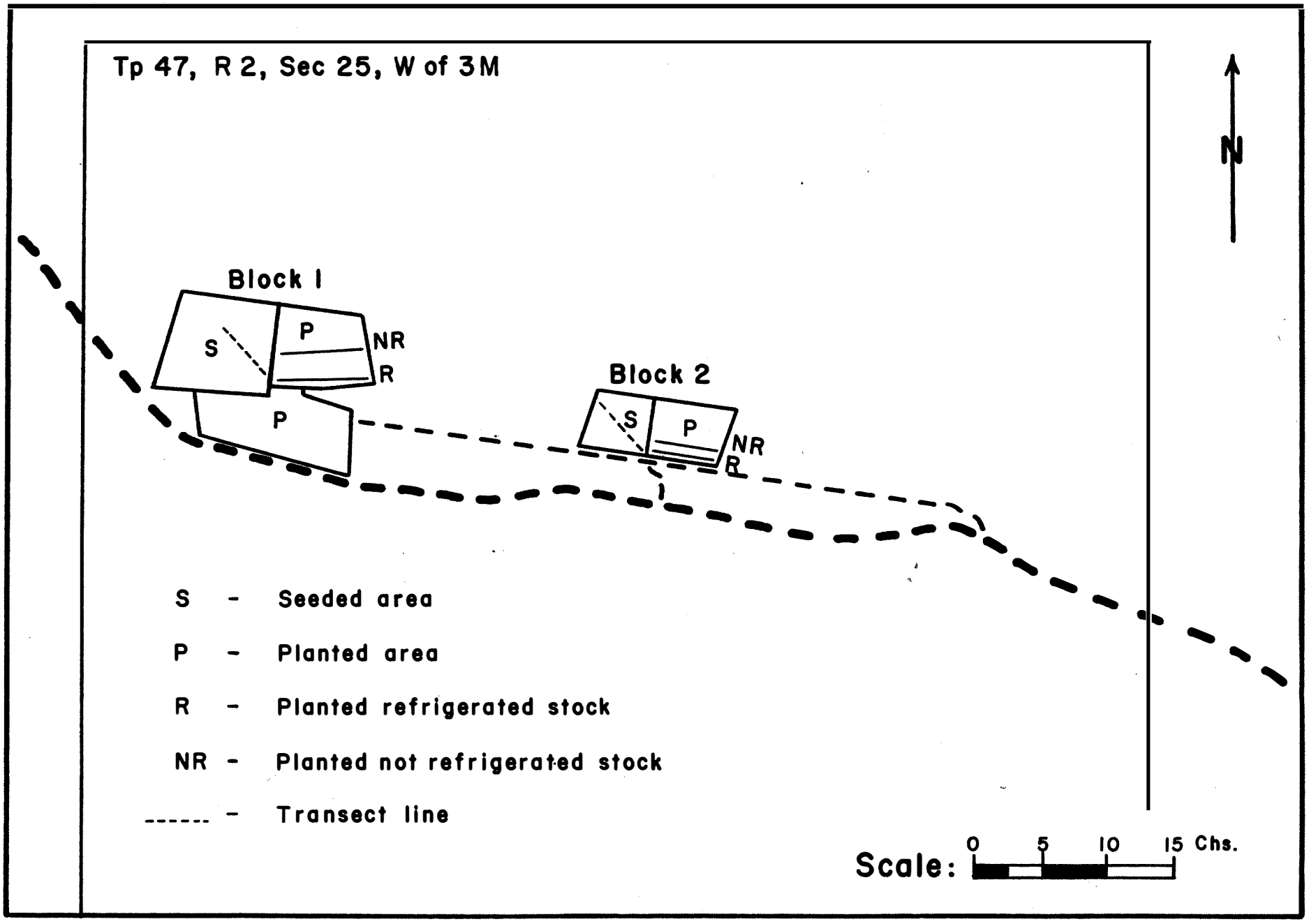

Figure 2. Location of seeding and planting areas.

May 1968, from the Big River Nursery. All were heeled in, except 2,000, which were kept refrigerated. All were hand-planted with spades (in slits) in early July, 1968, on nine acres in Block 1 and on three acres in Block 2. With a spacing of about 5 x 5 feet, 1,750 seedlings per acre were planted in the bottom of furrows. Soil moisture conditions were rated excellent at the time of planting.

ASSESSMENT

One permanent transect line of 50 one-milacre adjoining quadrats was established in the seeded areas of both blocks during the autumn of 1968. All seedlings were marked and counted in every tenth milacre, while in the remaining quadrats only one germinant was marked for future identification. The areas were examined at the end of the first, second, fourth and fifth growing seasons. In addition to mortality and stocking observations, at the end of the fifth growing season, height measurements were also recorded.

Following planting, a permanent row of 100 seedlings was established in each plantation of refrigerated and non-refrigerated stock. The sample rows were examined at the end of the first, second, fourth and fifth growing seasons. Survival, condition and total height of seedlings were recorded at each inspection. At the end of the fifth year a stocking survey was conducted on the entire planting area, noting the presence or absence of planted stock, natural regeneration and advance growth on systematically-arranged one-milacre quadrats.

RESULTS AND DISCUSSION

SEEDING

Table 1 shows that jack pine broadcast seeding resulted in good stocking for both blocks during the first two growing seasons. A considerable reduction (23%) in stocking occurred in jack pine seedlings after five years. Trembling aspen suckering was much heavier in Block 2, because the original stand contained more aspen trees.

The average number of jack pine seedlings was slightly over 5,000 stems per acre during the first two growing seasons. However, at the end of the fifth season the average number of seedlings decreased by 2,500, a 47% reduction (Table 2). Most seedlings were established on mineral soil seedbeds at the bottom of furrows, probably due to lower soil temperatures and better moisture conditions. Visual observations revealed that burial of seedlings with sand transported by rain and wind greatly contributed to seedling mortality. This may be the reason for higher mortality in Block 2, where deeper furrows were created as a result of three scarification passes.

No differences were observed in seedling growth due to scarification intensities. Seedlings established in both blocks were relatively small after five growing seasons. Height distribution of tallest seedlings showed that approximately 60% of seedlings were still in the 3-6 inch height classes (Fig. 3). This slow growth is probably due to the poor site conditions normally associated with dune sand.

Table 1. Percent stocking of seeded areas.

Block No.	Jack pine				Jack pine advance growth	Trembling aspen	All species
	1968	1969	1971	1972	1972		
1	88	84	68	62	12	22	66
2	94	88	78	74	6	50	86
Average	91	86	73	68	9	36	76

Table 2. Number of seedling/acre on seeded areas.

Block No.	1968	1969	1971	1972	Jack pine advance growth 1972	Trembling aspen 1972	All species 1972
1	4,600	5,200	3,400	3,400	200	400	4,000
2	6,000	5,000	3,0000	2,200	200	1,400	3,800
Average	5,300	5,100	3,200	2,800	200	900	3,900

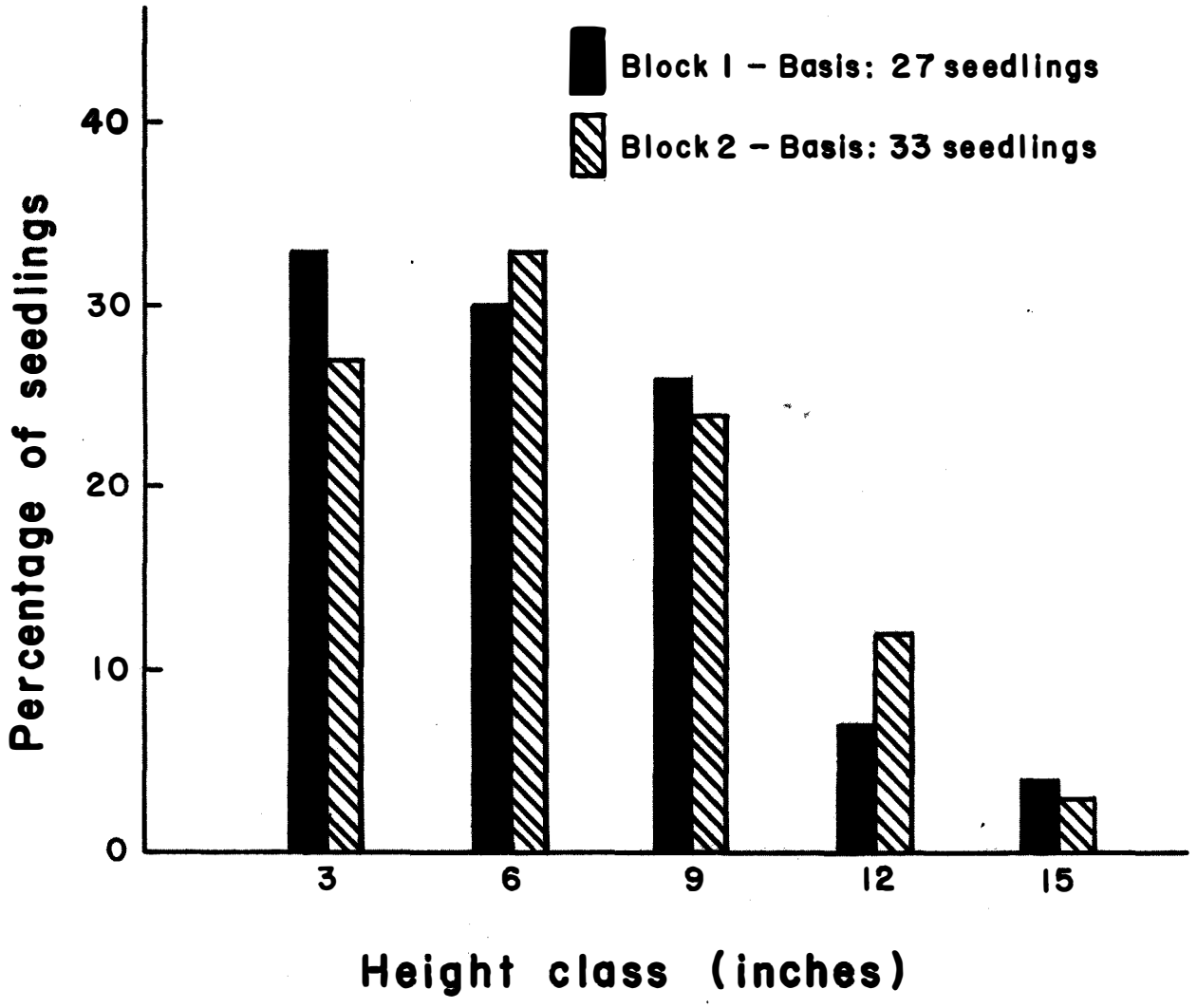

Figure 3. Height distribution of tallest jack pine seedlings originated from seeding after five growing seasons.

PLANTING

About 1/3 of planted refrigerated and non-refrigerated seedlings failed to survive the first growing season. This high mortality was attributed to the poor condition of planting stock, due to extended storage and late planting. Mortality of seedlings continued for three years. Table 3 shows that the heeled-in stock averaged better survival than the refrigerated seedlings. Most new leaders of heeled-in seedlings were dead at the end of the first growing season because tender new shoots were present at planting time.

The surviving seedlings eventually recovered; however, browsing by deer became apparent after the third year. Only undamaged seedlings were selected for height measurements. Table 4 shows that percent height increase of non-refrigerated seedlings was greater than those of refrigerated seedlings after five years; 373 and 293%, respectively.

Results of the stocking survey conducted five years after planting show slightly better stocking on those areas treated with two passes (Table 5). This is contrary to the survival results obtained on permanent lines, where lower survival was noted for areas with two passes. This may be attributed to small number of samples or incorrect location of lines. During the five years natural regeneration of jack pine originating from slash borne cones occupied 16% of the area. These cones originated from trees pushed over by the bulldozer during the actual scarification. Hardwood reproduction was evident in both blocks, although Block 2 had approximately twice as much aspen stocking as Block 1.

Table 3. Survival of conventional jack pine seedlings.

Block No.	Type of stock	Number of seedlings	Percent survival			
			1968	1969	1971	1972
1	Refrigerated	100	65.0	56.0	53.0	53.0
	Non-refrigerated	100	64.0	54.0	47.0	46.0
2	Refrigerated	100	64.0	50.0	46.0	45.0
	Non-refrigerated	100	73.0	69.0	68.0	67.0
Total	Refrigerated	200	64.5	53.0	49.5	49.0
	Non-refrigerated	200	68.5	61.5	57.5	56.5

Table 4. Total height and height increase of conventional jack pine seedlings.

Block No.	Type of stock	No. of seedlings measured	Average total height (inches)*				Percent height increase (1968-72)
			At time of planting 1968	1970	1971	1972	
1	Refrigerated	26	7.0	12.3	18.4	26.1	274
	Non-refrigerated	31	5.9	10.8	16.8	24.9	322
2	Refrigerated	26	6.6	12.7	19.9	27.3	314
	Non-refrigerated	31	5.8	13.2	21.7	30.9	433
Total	Refrigerated	51	6.8	12.5	18.7	26.7	293
	Non-refrigerated	62	5.9	12.0	19.2	27.9	373

* Based on seedlings showing no apparant damage or browsing.

Table 5. Percent stocking of area five years after planting.

Block No.	No. of quadrats examined	Percent stocking - 1972 fall					
		Jack pine			All Jack pine	Trembling aspen	All species
		Planted stock	Natural regeneration	Advance growth			
1	275	62	15	6	70	37	82
2	144	56	17	12	69	72	94
Total	419	60	16	8	70	58	86

Table 6 shows that both blocks contain approximately 1,000 established jack pine seedlings per acre. This is quite sufficient for future stand development.

Table 6. Number of seedlings/acre five years after planting.

Block No.	No. of quadrats examined	Jack pine			All jack pine	Trembling aspen	All species
		Planted stock	Natural regeneration	Advance growth			
3	54	815	204	56	1,075	1,685	2,760
2	28	678	179	143	1,000	4,393	6,393
All	82	768	195	85	1,048	2,951	3,999

CONCLUSIONS AND RECOMMENDATIONS

An operational scale demonstration conducted in Central Saskatchewan using shark-finned barrel scarifiers on old jack pine cutover areas was successful in creating suitable seedbeds for seeding and planting of jack pine.

Seeding results of this demonstration indicate that about one lb. of seed per acre provided sufficient stocking and over 2,000 established seedlings. Success was due to favorable weather conditions, cool summer and better than average precipitation in the first year. The height growth of established jack pine seedlings was considered poor after five growing seasons. This was attributed to poor site conditions.

The conventional jack pine seedlings suffered high mortality in the first growing season due to late planting. The growth performance of heeled-in seedlings was better than those kept in refrigerated storage. Plantation stocking was higher on those areas where only two passes were made with barrel scarifiers. Approximately 1,000 established seedlings per acre were found after five years. This is sufficient to produce a merchantable stand. This success results from planting twice as many seedlings per acre, as current reforestation standards would require.

The writers believe that anchor chains may also be used successfully for seedbed preparation on these sites instead of barrels. Planting should be carried out as early as possible in the spring using only 700-800 well-planted seedlings per acre.

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