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PLANTING SPRUCE AND PINE INTERLAKE AREA, MANITOBA

Project MS-190

by

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INTRODUCTION[1]

In 1957 a planting experiment was begun in the Interlake Area of Manitoba to compare survival and growth of spruce and pine on various sites. Planting has been carried out annually (1958 excepted) with approximately 37,000 seedlings having been planted to 1965. Four species — jack pine (Pinus banksiana Lamb.), red pine (Pinus resinosa Ait.), white spruce (Picea glauca (Moench) Voss), and black spruce (Picea mariana (Mill) B.S.P. — have been planted on sites varying in soil moisture from dry to wet. The 1965 plantings will be the last under this project. Survival counts will be made 1, 3, 5 and 10 years after planting and height measurements will be taken 5 and 10 years after planting.

[1] Additional information on this project is contained in progress reports prepared by Cayford (1958, 1960—1965). One publication (Cayford 1961a) has been prepared.

PLANTING IN 1965

Site Preparation

The 1965 planting was carried out on areas that supported a dense 16-year-old aspen (Populus tremuloides Michx.), stand. Site preparation involved two separate operations; scalping and furrowing. Scalping was done between March 22 and 25 using a D-7 tractor equipped

with a straight blade. The scalped strips were about 11 feet wide and were separated by about 15 feet of undisturbed aspen. Six passes were made on each strip to remove the aerial portions of the vegetation and to provide for mineral soil exposure. On May 3 furrows were ploughed in the centre of each scalped strip with a Middlebuster fireline plough. Costs of scalping were $17.00 per acre, and of furrowing $2.00 per acre, resulting in a total cost of $19.00 per acre. Scalping costs in 1964 were only $4.10 per acre. The higher costs in 1965 were due to the higher snowfall and more passes with the bulldozer were needed to clear each strip. Costs include those required for the operator and equipment, but not for supervision nor for transporting the equipment to the planting site.

Planting Stock

Two species - jack pine and white spruce - were planted. All stock was of Manitoba origin and was obtained from the Manitoba Department of Mines and Natural Resources nursery at Hadashville.

Stock was lifted in the nursery in the early spring and heeled-in. Immediately prior to transport to the planting site it was placed in plastic bags. Upon arrival at its destination, stock was heeled-in until planted. Planting stock measurements, based on 25 plants per species, are summarized in Table 1.

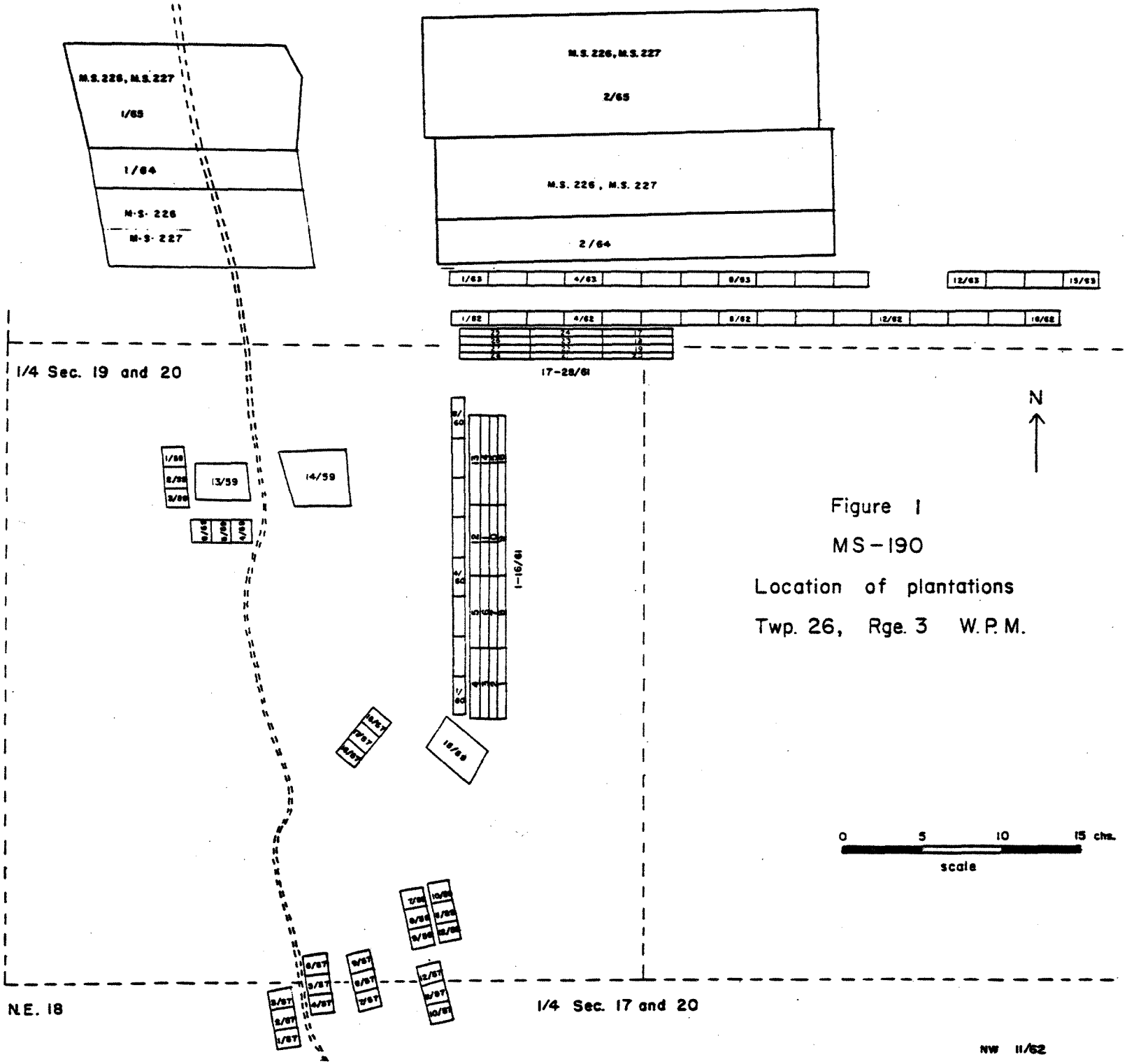

Figure 1

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Location of plantations

Twp. 26, Rge. 3 W.P.M.

TABLE 1

1965 PLANTING STOCK MEASUREMENTS

Species	Average root length (inches)	Average stem length (inches)	Average root weight[1] (grams)	Average top weight[1] (grams)	Root/shoot ratio[1]
White spruce	11.4	6.0	0.82	2.35	0.35
Jack pine	9.1	3.3	0.43	1.15	0.37

[1] Oven-dry weight: dried at 105°C for 48 hours.

Planting Methods and Design

In 1965 planting was carried out in two blocks 1/65 and 2/65 (Figure 1). One was located on a ridge and was characterized by the presence of dry, very dry, and fresh sandy and gravelly soils, while the other was on a lower flat that was characterized by a variety of soil materials that ranged in soil moisture from fresh to very moist.

The areas of the two blocks were 1.0 and 2.0 acres, and within each block there were two prepared strips which were about 13 and 25 chains in length, respectively. One species, selected randomly, was planted on one strip per block. Seedlings were planted in pairs, one in the furrow bottom and the other on the upturned furrow slice. The number of seedlings planted per strip ranged from 256 to 602 and the total number planted was 1,709.

Planting was by the slit method, using planting spades, with trees spaced at 6-foot intervals. Planting was done by a six-man crew provided by the Manitoba Department of Mines and Natural Resources.

Planting Conditions

Planting commenced on May 5 and was completed that day. The day was cloudy and warm. A rain began in the evening and again during the morning of the 6th. Maximum temperature at Gimili on May 5 was 59°F.

On dry and fresh sites, soil moisture appeared to be adequate during planting. However, the moist and very moist sites were flooded and provided difficult planting conditions; particularly on the bottoms of the furrows.

AERIAL SPRAYING

On August 5, 1965 aerial spraying with 2,4-D was carried out on the 1960-1965 plantations. A Super Piper Cub with a capacity of 80 gallons was used. Spray was applied at the rate of 4 gallons per acre and contained 1 lb. acid equivalent 2,4,-D and 1 lb. acid equivalent 2,4,5-T.

Spraying was done between 7 am - 9 am. The day was calm, clear and sunny. A good spray coverage was obtained.

On October 18, 1965 Mr. R.M. Waldron made a visual check of the sprayed area and reported the following results: A good leaf kill of young aspen trees and suckers was obtained; leaf kill was excellent on hazel, willow and lesser vegetation. White spruce, black spruce and red pine planting stock was not affected by the spray; however, damage to jack pine was noted and seemed to be related to age. Seedlings planted in 1965 suffered heavy damage to the top needles and buds; moderate mortality is expected. Needle kill on older seedlings was moderate to heavy, although the buds did not appear to be affected.

SURVIVAL IN 1965 OF 1960 PLANTATIONS

In 1960 four species, white spruce, black spruce, jack pine, and red pine, (total number = 1,993) seedlings were planted in furrows which had been prepared with a Middlebuster plough during the summer of 1959.

Survival in the spring of 1965 is shown in Table 2. The average survival for all species was 46.3 per cent. Survival was best for the red pine and poorest for the black spruce. Survival increased with an increase of soil moisture. Jack pine survival remained the same for both the dry and fresh sites, however, a large proportion of Scots pine (Pinus sylvestris L.) was mixed in with the jack pine at the time of planting; vegetative competition was severe on the fresh site.

The average plantation height for all species is 1.5 feet, five years after planting. The best growth has been obtained by the jack pine and the poorest by the red pine; however, browse damage on the red pine was 62 per cent of all living seedlings on the two sites. All species have shown an increase of growth with an increase of soil moisture.

TABLE 2

PER CENT SURVIVAL AND AVERAGE PLANTATION HEIGHT IN 1965 OF THE 1960 PLANTATIONS

Species	Soil Moisture	Per cent Survival	Average Height (feet)
White spruce	Dry	29.0 (245)	1.3
	Fresh	53.8 (249)	1.6
Black spruce	Dry	1.6 (250)	1.0
	Dry - Moderately fresh	17.2 (250)	2.0
Jack pine	Dry	62.2 (249)	1.9
	Fresh	61.6 (250)	2.7
Red pine	Dry	69.6 (250)	0.7
	Dry - Moderately fresh	75.2 (250)	0.8
White spruce	Dry - Fresh	41.5 (494)	1.5
Black spruce	Dry - Moderately fresh	9.4 (500)	2.0
Jack pine	Dry - Fresh	61.9 (499)	2.3
Red pine	Dry - Moderately fresh	72.4 (500)	0.8
Total		46.3 (1,993)	1.5

Figure in brackets represents number planted.

SURVIVAL IN 1965 OF THE 1962 PLANTATIONS

In the spring of 1962 white spruce, black spruce, jack pine, and red pine were planted on sites ranging from dry to wet. All seedlings were planted in furrows and a total of 4,800 were set out.

The survival three years after planting is shown in Table 3. Overall survival for the red pine (56 per cent) was noticeably lower than that of the other three species which averaged better than 78 per cent. Per cent survival for all species on the dry to moderately moist sites (MR 1 to 4) was 86.8 per cent as compared to 47.5 per cent on the moist to wet sites (MR 5 to 7).

TABLE 3

PER CENT SURVIVAL IN 1965 OF THE 1962 PLANTATIONS

Soil Moisture	Per Cent Survival				
	White Spruce	Black Spruce	Jack Pine	Red Pine	All
Dry	93.3 (75)	93.3 (75)	90.7 (75)	80.0 (75)	89.3 (300)
Moderately fresh	96.0 (75)	94.7 (75)	94.7 (75)	76.0 (75)	90.3 (300)
Fresh	94.4 (375)	97.6 (375)	91.2 (375)	79.5 (375)	90.7 (1500)
Moderately moist	91.0 (300)	80.3 (300)	89.7 (300)	61.3 (300)	80.6 (1200)
Dry to Moderately moist	93.2 (825)	90.7 (825)	90.9 (825)	72.6 (825)	86.8 (3300)
Moist	63.1 (225)	78.2 (225)	82.7 (225)	31.6 (225)	63.9 (900)
Very moist	21.3 (75)	37.3 (75)	48.0 (75)	5.3 (75)	28.0 (300)
Wet	10.7 (75)	36.0 (75)	18.7 (75)	5.3 (75)	17.7 (300)
Moist to wet	44.3 (375)	61.6 (375)	62.9 (375)	21.1 (375)	47.5 (1500)
All	77.9 (1200)	81.6 (1200)	82.2 (1200)	56.5 (1200)	74.5 (4800)

Figure in brackets represents number planted.

SURVIVAL IN 1965 OF THE 1964 PLANTATIONS

Planting in 1964 was carried out in two blocks. One block was on a ridge with soil moisture ranging from very dry to moderately fresh; the other block was on a lower flat with moisture ranging from dry to wet. Seedlings were planted in pairs, one in the bottom of a ploughed furrow and the other on the upturned furrow slice. A total of 3,445 seedlings were planted.

The survival one year after planting is shown in Table 4. Overall survival for the plantation is 59 per cent. Jack pine survival is best, white spruce intermediate and red pine and black spruce the poorest. Survival of all species combined was best on the fresh, moderately moist and moist sites. Individual species showed similar results.

Table 5 shows the survival of each species by the method of planting. Total survival of each species has been better when planted in the bottom of the furrow than on the upturned furrow slice. However, white spruce survival on a moist site has been higher on the ridge while jack pine has remained the same for both the furrow and ridge when individual soil moistures are compared.

TABLE 4

PER CENT SURVIVAL IN 1965 OF THE 1964 PLANTATIONS

Soil Moisture	Per cent survival				
	White Spruce	Black Spruce	Jack Pine	Red Pine	All
Very dry	64.8 (230)	34.9 (238)	75.2 (234)	37.3 (236)	52.9 (938)
Dry	47.6 (42)	20.4 (54)	79.5 (44)	34.1 (44)	44.0 (184)
Moderately fresh	45.3 (86)	26.9 (78)	70.6 (92)	41.2 (102)	46.6 (358)
Fresh	69.2 (214)	45.3 (300)	83.9 (230)	57.2 (264)	62.3 (1008)
Moderately moist	80.3 (132)	69.1 (94)	91.3 (126)	43.8 (114)	72.1 (466)
Moist	73.1 (108)	73.0 (100)	96.4 (110)	39.5 (114)	70.1 (432)
Very Moist	71.4 (14)	69.2 (13)	100.0 (5)	0.0 (9)	58.5 (41)
Wet	27.8 (18)				27.8 (18)
All	65.9 (844)	45.4 (877)	82.6 (841)	44.3 (883)	59.2 (3445)

Figure in brackets represents number planted.

TABLE 5

PER CENT SURVIVAL IN 1965 OF THE 1964 PLANTATIONS BY METHOD OF PLANTING

Soil Moisture	Per cent survival									
	White spruce		Black spruce		Jack pine		Red pine		All	
	Ridge	Furrow	Ridge	Furrow	Ridge	Furrow	Ridge	Furrow	Ridge	Furrow
Very dry	59.1(115)	70.4(115)	23.5(119)	46.2(119)	57.3(117)	93.2(117)	23.7(118)	50.8(118)	40.7(469)	65.0(469)
Dry	23.8(21)	71.4(21)	7.4(27)	33.3(27)	63.6(22)	95.4(22)	4.5(22)	63.6(22)	23.9(92)	64.1(92)
Moderately fresh	20.9(43)	69.8(43)	7.7(39)	46.2(39)	47.8(46)	93.5(46)	23.5(51)	58.8(51)	25.7(179)	67.6(179)
Fresh	44.8(107)	93.4(107)	18.0(150)	72.7(150)	78.3(115)	89.6(115)	55.3(132)	59.1(132)	47.2(504)	77.4(504)
Moderately moist	72.7(66)	87.9(66)	48.9(47)	89.4(47)	85.7(63)	96.8(63)	38.6(57)	49.1(57)	63.1(233)	81.1(233)
Moist	88.9(54)	57.4(54)	56.4(55)	93.3(45)	96.6(58)	96.2(52)	36.9(65)	42.8(49)	68.5(232)	72.0(200)
Very Moist	100.0(7)	42.8(7)	57.1(7)	83.3(6)	100.0(5)		0.0(7)	0.0(2)	61.5(26)	53.3(15)
Wet	44.4(9)	11.1(9)							44.4(9)	11.1(9)
All	56.2(422)	75.6(422)	26.6(444)	64.7(433)	72.3(426)	93.2(415)	35.4(452)	53.6(431)	47.2(1744)	71.5(1701)

Figure in brackets represents number planted.

FUTURE WORK

A schedule of survival counts to be made in the future is given in Table 6. During each survival count seedlings will be recorded as healthy, sick, or dead. Five and ten years after planting the height of each tree will be measured.

TABLE 6

SCHEDULE OF SURVIVAL COUNTS AND HEIGHT MEASUREMENTS,

1957 - 1965 PLANTATIONS

Year of Planting	Survival Counts			Height Measurements	
	1 Year	3 Years	5 Years	5 Years	10 Years
1957	1	2	2	2	1967
1959	2	2	2	2	1969
1960	2	2	2	2	1970
1961	2	2	1966	1966	1971
1962	2	2	1967	1967	1972
1963	2	1966	1968	1968	1973
1964	2	1967	1969	1969	1974
1965	1966	1968	1970	1970	1975

(1) not done

(2) completed

REFERENCES

Cayford, J.H. 1958, 1960, 1961b, 1962, 1963, 1964, 1965. Planting spruce and pine, Interlake Area, Manitoba. Canada, Dept. Northern Affairs and National Resources, Forestry Branch, For. Res. Div., and Canada Dept. Forestry, For. Res. Br., Unpubl. Progress Reports.

Cayford, J.H. 1961a. Furrowing improves first-year survival of planted spruce and pine in Manitoba. United States, Dept. Agriculture, Forest Service, Tree Planters' Notes 48: 13-14.