Not for publication

PROGRESS ON SEVERAL SILVICULTURAL PROJECTS IN ALBERTA DURING THE 1969 FIELD SEASON

by

J. Soos

FOREST RESEARCH LABORATORY

EDMONTON, ALBERTA

INTERNAL REPORT A-36

CANADIAN FORESTRY SERVICE

DEPARTMENT OF FISHERIES AND FORESTRY

SEPTEMBER, 1970

TABLE OF CONTENTS

GENERAL LEGEND

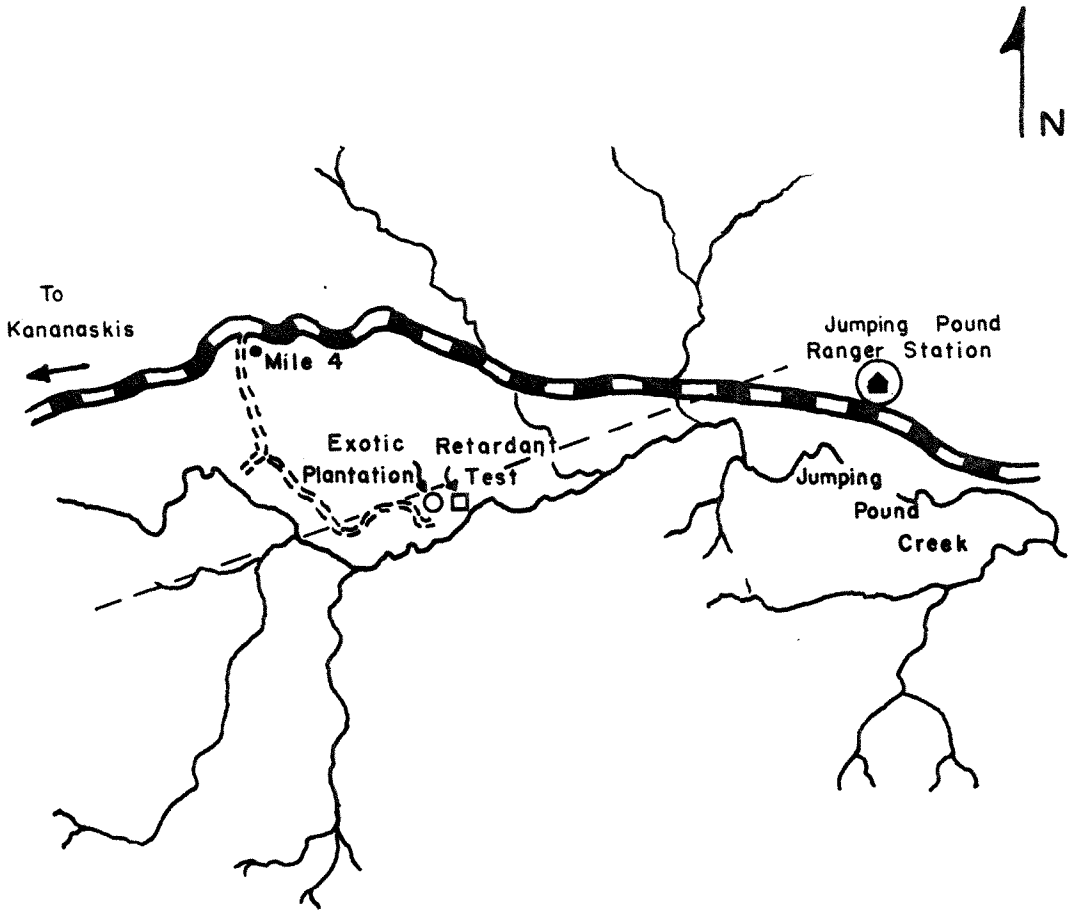
- Paved Highway
- Gravel Road (All weather)
- Logging Road (Dry weather)
- Ungravelled Road (Dry weather)
- Seismic Line
- Power Line
- Pipe Line
- River
- Creek
- Sandbar
- Ranger Station
- Well-Site
- Fire Tower
- Mill Site (M.S.)
- Ditch (Canal)
- Town, or Village

PROJECT LEGEND

- ● Container Planting (Only areas numbered)
- ■ Conventional Planting
- △ Seeding Studies
- ☆ Thinning & Fertilization
- ○ Exotic Plantations
- □ Retardant Studies
- ♦ Phenological Studies
- * Arboretum
- ⊛ Cooperative Demonstration Plots
- Ⓟ Hybrid Poplar Plantations
- ⊕ Gramoxone Test Areas
- ⊡ Fertilization Studies
- ⊠ Dybar Test Area
- \+ Mudpacks

EXOTIC PLANTATION and RETARDANT STUDY

Jumping Pound Ranger Station Area, Bow Forest



SCALE: 1"= 1 Mile

EXOTIC PLANTATION (cut-over area)

Location: Jumping Pound, Bow Forest.

Planted: June 8, 1968. Last date examined: September 4, 1969.

Species	Number of seedlings sampled	Number of dead seedlings	Mortality (%) 1968	1969
Colorado spruce	300	99	8	33
Norway spruce	300	125	28	42
White spruce	300	157	31	52
Scotch pine	300	143	93	48
Lodgepole pine	300	121	55	40
Ponderosa pine	150	55	71	33
Douglas fir	300	108	19	36
Green ash	300	94	40	31
Siberian larch	300	180	--	60

All seedlings that died during 1968 were replaced in the spring of 1969. Mortality in 1969 was still high for all species planted. Some of the mortality was due to cattle grazing. Generally, the mortality of spruce species increased and that of pine species decreased in 1969.

TRANSPIRATION RETARDANT STUDY (cut-over area)

Location: Jumping Pound, Bow Forest.

Planted: June 9, 1969. Last date examined: September 4, 1969.

Retardant used: Rutex Foli-Gard

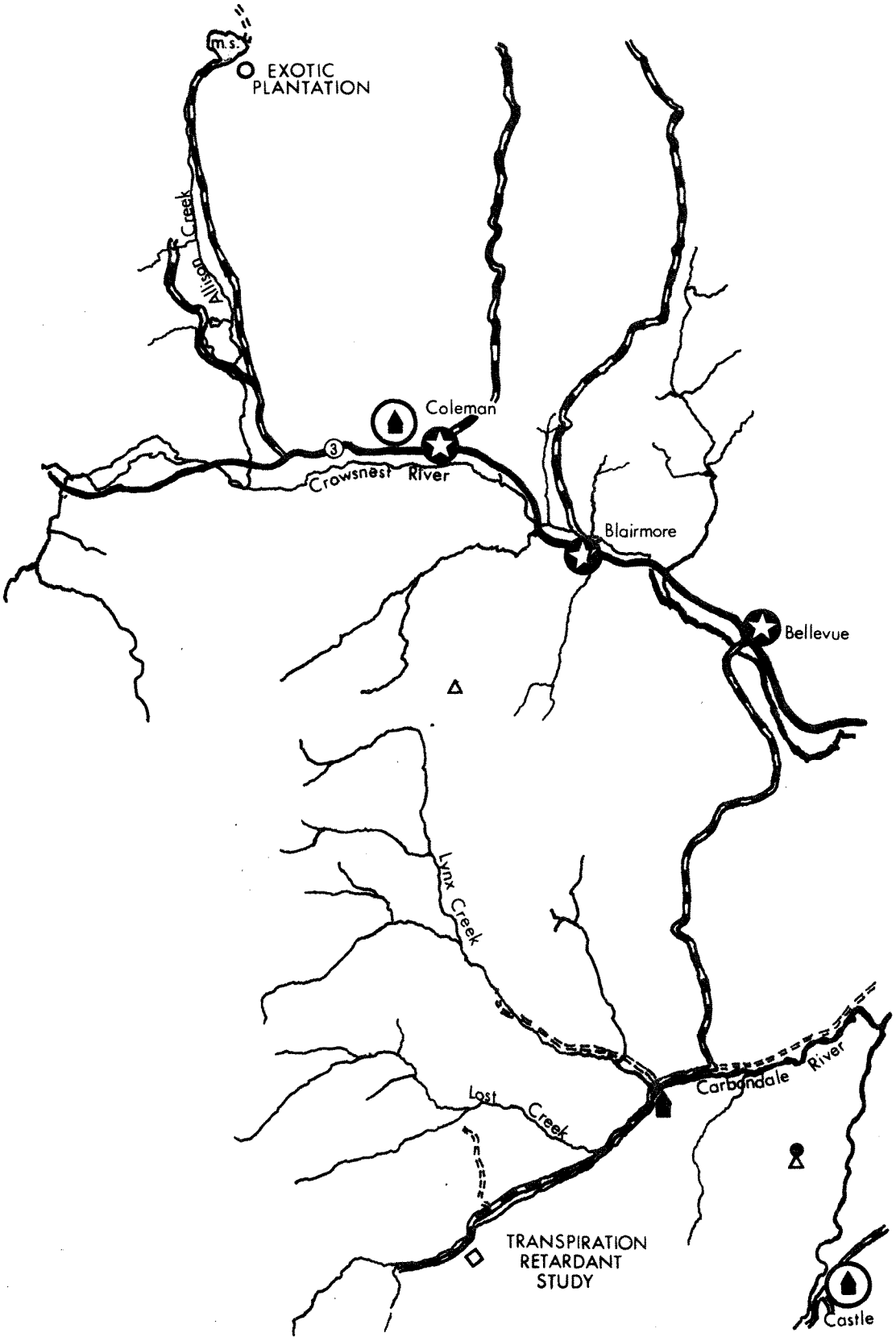
Species	Treatment	Number of samples	Mortality (%) 1968	Mortality (%) 1969	Average total height (inches) 1968	Average total height (inches) 1969
Lodgepole pine	Treated	200	60	88	4.5	4.9
Lodgepole pine	Untreated	200	68	85	4.0	5.1
White spruce	Treated	200	68	93	5.1	5.6
White spruce	Untreated	200	71	95	5.2	7.1

In the 1969 growing season, mortality of both treated and untreated seedlings increased considerably. Treated spruce seedlings had slightly less mortality. Because of the small number of surviving seedlings, no firm conclusions can be drawn from the height differences caused by treatment.

C R O W S N E S T F O R E S T

PROJECT LOCATIONS

CROWSNEST FOREST



EXOTIC PLANTATION (cut-over area)

Location: Mile 8.8 Allison Lake Road, Crowsnest Forest.

Planted: Spring 1969. Last date examined: September 5, 1969.

Species	Number of seedlings sampled	Number of dead seedlings 1969	Mortality (%) 1969
Colorado spruce	300	29	10
Norway spruce	300	24	8
White spruce	300	41	14
Scotch pine	300	68	23
Lodgepole pine	300	32	11
Douglas fir	300	16	5

First year survival was very good for all species planted. Douglas fir and Norway spruce survived the best. Scotch pine had the lowest survival.

TRANSPIRATION RETARDANT STUDY (cut-over area)

Location: Lynx Creek, Crowsnest Forest.

Date Planted: May 2, 1969. Last date examined: September 5, 1969.

Retardant used: Rutex Foli-Gard.

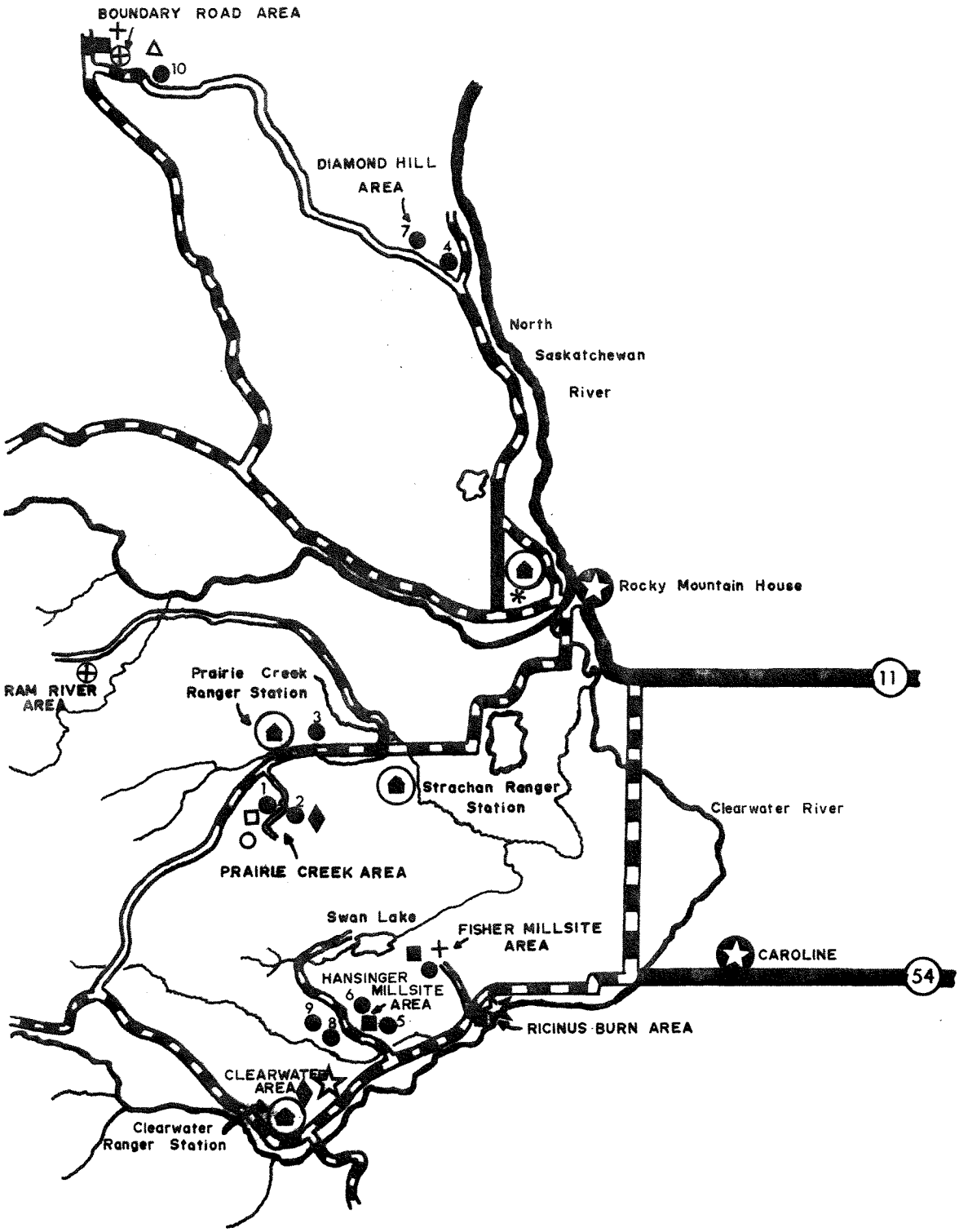
Species	Treatment	Number of samples	Mortality (%) 1969	Average total height (inches) 1969
Lodgepole pine	Treated	200	13	4.7
Lodgepole pine	Untreated	200	17	5.5
White spruce	Treated	200	25	5.3
White spruce	Untreated	200	11	5.1

First year results showed no consistent relationship between treatment and mortality. High moisture content of soil in the spring may have had some influence on the results.

C L E A R W A T E R - R O C K Y F O R E S T

PROJECT LOCATIONS

CLEARWATER-ROCKY FOREST



SCALE: 1" = 8 Miles

HERBICIDE TRIAL (under aspen stand)

Location: Mile 17, Ram River Road, Clearwater-Rocky Forest.

Type of planting: Conventional spruce. Planted: June 1969.

Sprayed: June 20-22, 1969. Herbicide used: Gramoxone.

Last date examined: August 3, 1969.

Herbicide treatment	Number examined	Mortality (%) 1969	Vegetative competition (%) None	Light	Moderate	Heavy	Average total height (inches) 1969
Sprayed	300	14	78	21	1	--	5.7
Unsprayed	300	11	1	5	25	69	6.0

First year results showed no apparent difference in mortality between sprayed and unsprayed seedlings. Gramoxone successfully eliminated competing vegetation. Only 1% of herbicide-treated and 94% of unsprayed seedlings had moderate to heavy vegetative competition.

TRANSPIRATION RETARDANT STUDY (cut-over area)

Location: Prairie Creek, Clearwater-Rocky Forest.

Planted: Spring 1968. Last date examined: August 28, 1969.

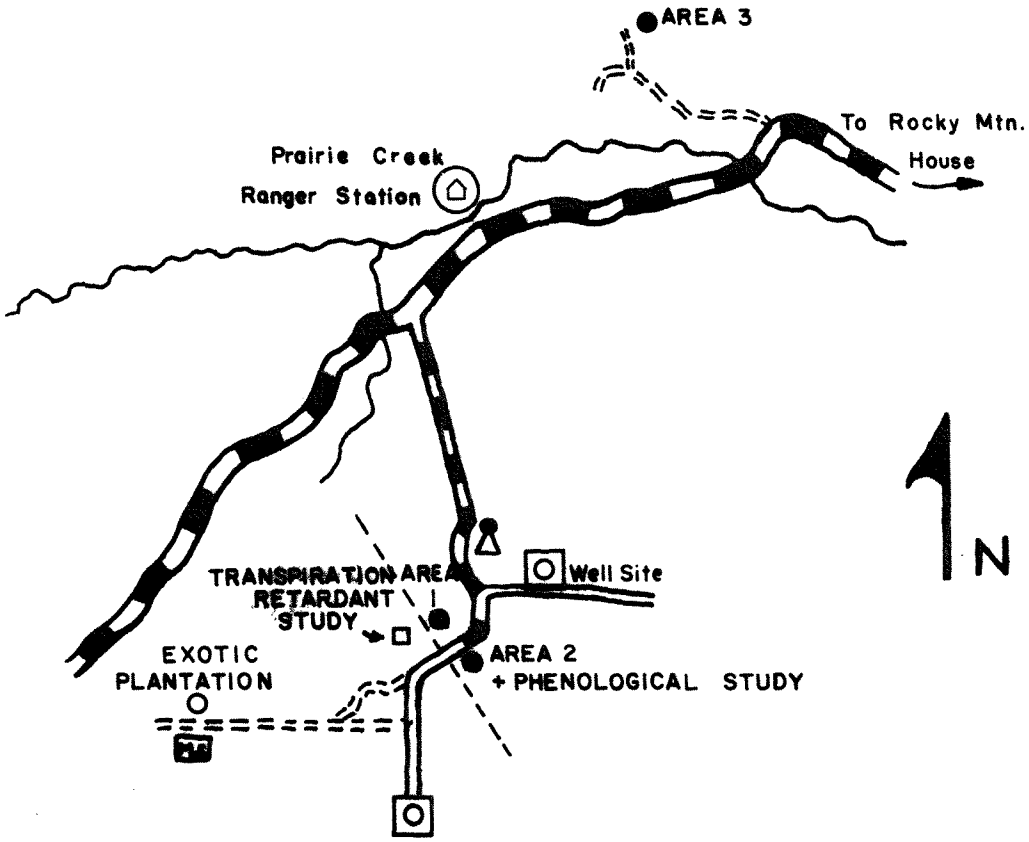
Retardant used: Rutex Foli-Gard.

Species	Treatment	Number of samples	Mortality (%) 1968	Mortality (%) 1969	Average total height (inches) 1968	Average total height (inches) 1969
Lodgepole pine	Treated	200	11	21	8.7	9.8
Lodgepole pine	Untreated	200	21	26	7.4	8.5
White spruce	Treated	200	8	20	6.0	6.6
White spruce	Untreated	200	9	25	5.7	6.3

The 1969 results indicate that Foli-Gard-treated seedlings had approximately 5% less mortality. The height increase for both species in 1969 was the same for both treated and untreated seedlings.

VARIOUS SILVICULTURAL STUDIES

Prairie Creek Area , Clearwater - Rocky Forest



SCALE: 1" = 1 Mile

EXOTIC PLANTATION (cut-over area)

Location: Prairie Creek, Clearwater-Rocky Forest.

Planted: Spring 1967. Last date examined: August 27, 1969.

Species	Number of seedlings sampled	Number of dead seedlings 1969	Mortality (%) 1968	1969
Colorado spruce	330	21	5	6
Norway spruce	580	127	7	22
White spruce	330	20	6	6
Scotch pine	330	86	67	26
Lodgepole pine	330	18	7	5
Ponderosa pine	180	73	37	41
Douglas fir	330	71	12	22
Green ash	330	58	10	18
Siberian larch	380	134	42	35

All dead seedlings from 1968 were replaced in the spring of 1969.

CONTAINER PLANTING (cut-over area)

Location: Prairie Creek, Clearwater-Rocky Forest.

Area 1. Planted: June 18, 1965. Last date examined: August 27, 1969.

Species planted: Lodgepole pine.

Container	Undisturbed area					Disturbed area					Average total height (inches)	
	Number of samples	Mortality (%)				Number of samples	Mortality (%)					
		1966	1967	1968	1969		1966	1967	1968	1969	1968	1969
Phenol	35	46	54	54	54	7	43	43	43	43	9.9	12.0
New plastic	41	7	12	17	17	9	--	--	11	11	6.5	8.0
Edmonton bullet	24	8	13	17	17	3	--	--	--	--	8.3	10.9
Asphalt	41	22	24	24	24	6	--	--	--	--	6.9	8.3
Waxed cardboard	23	26	39	52	52	3	--	33	33	33	5.2	6.0
Four-hole bullet	122	4	10	11	11	17	6	6	12	12	8.8	11.9

Mortality in 1969 showed no change from that in 1968. Seedlings in the plastic containers (new plastic, Edmonton bullet, and four-hole bullet) continued to have better survival than those in the other containers. Seedlings growing in Edmonton and four-hole bullet containers had the greatest height growth in 1969.

CONTAINER PLANTING (cut-over area)

Location: Prairie Creek, Clearwater-Rocky Forest.

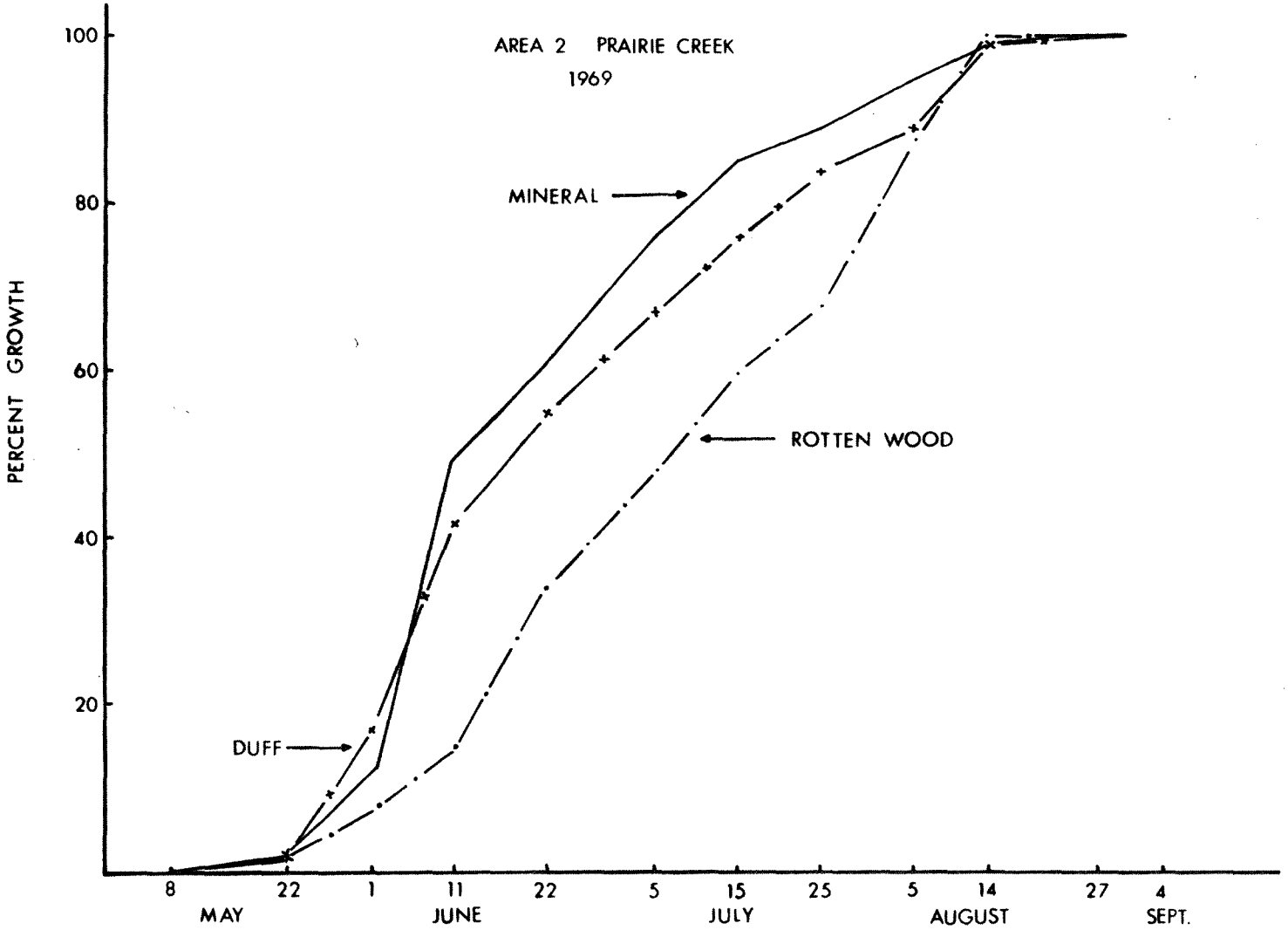
Area 2. Planted: June 21, 1965. Last date examined: August 27, 1969.

Species planted: Lodgepole pine.

Container	Undisturbed area							Disturbed area						
	Number of samples	Mortality (%)				Average total height (inches)		Number of samples	Mortality (%)				Average total height (inches)	
		1966	1967	1968	1969	1968	1969		1966	1967	1968	1969	1968	1969
Four-hole bullet	92	9	9	10	10	6.3	8.1	26	0	0	0	0	6.7	9.2
New plastic	279	13	22	26	28	5.1	8.4	41	7	7	8	10	4.9	6.2

Seedling mortality in 1969 increased slightly for new plastic containers planted on undisturbed soils. There was no apparent relationship between height growth and container type on disturbed and undisturbed areas.

AVERAGE CUMULATIVE LEADER GROWTH OF CONTAINER LODGEPOLE PINE SEEDLINGS IN VARIOUS SOIL MEDIA



PHENOLOGICAL STUDY ON COMMENCEMENT AND TERMINATION OF LEADER GROWTH OF LODGEPOLE PINE SEEDLINGS

Location: Area 2, Prairie Creek, Clearwater-Rocky Forest.

Age: Four-year-old lodgepole pine seedlings in new plastic containers.

Soil medium at top and bottom of container	No. of samples	Average date of commencement	Average date of termination	Average no. of growing days
Duff-mineral	12	May 15	August 27	104
Rotten wood-rotten wood	7	May 15	August 14	91
Mineral-mineral	9	May 15	August 27	104

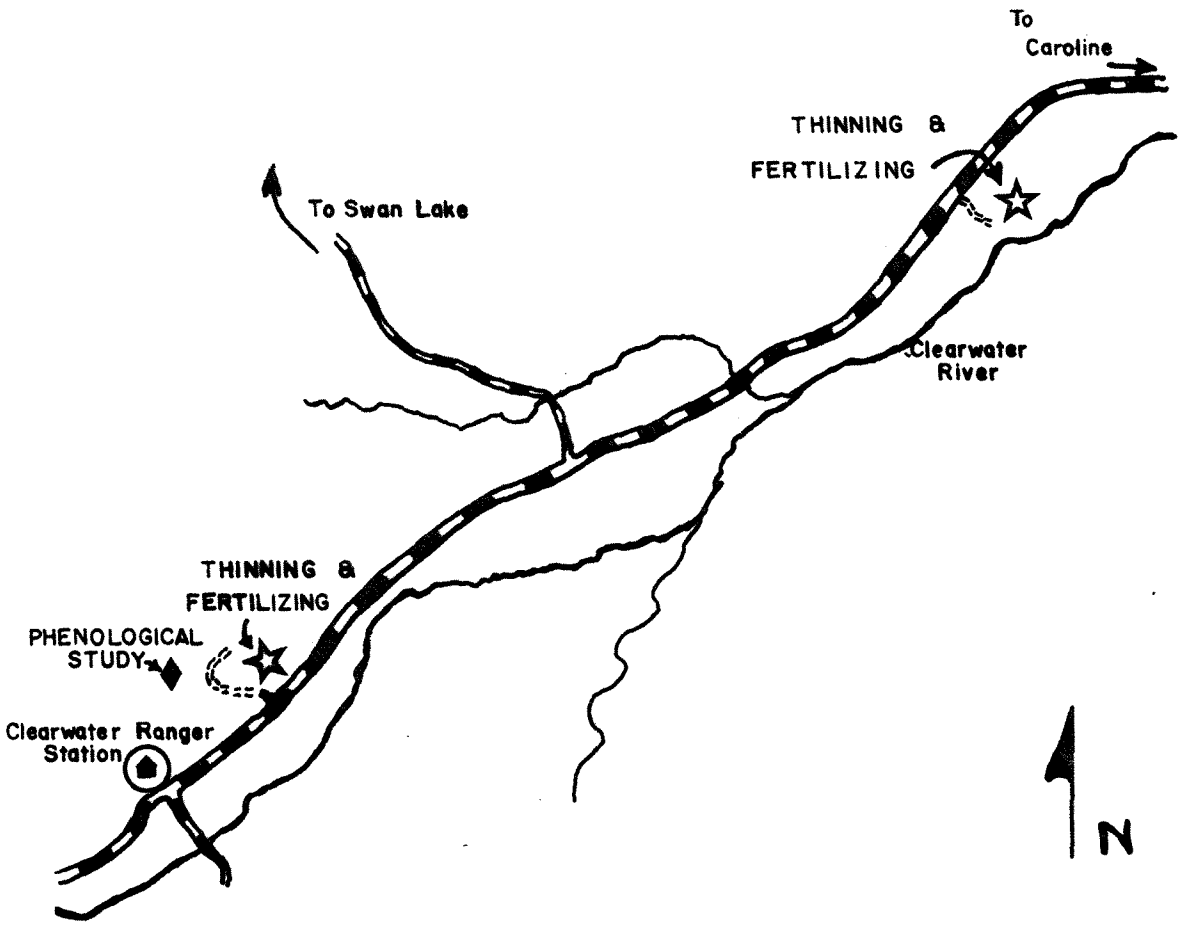
Distribution of periodic leader growth of lodgepole pine seedlings

Soil medium at top and bottom of container	1969 growing season				
	May	June	July	August	September
Duff-mineral	15%	47%	25%	13%	-
Rotten wood-rotten wood	7%	35%	37%	21%	-
Mineral-mineral	11%	59%	22%	8%	-

The average length of growing season was 104 days for seedlings growing in mineral soil and duff, and 91 days for those in rotten wood. The greatest height growth occurred in June and July for all seedlings regardless of growing medium.

VARIOUS SILVICULTURAL STUDIES

Near Clearwater Ranger Station – Ricinus Burn , Clearwater-Rocky Forest

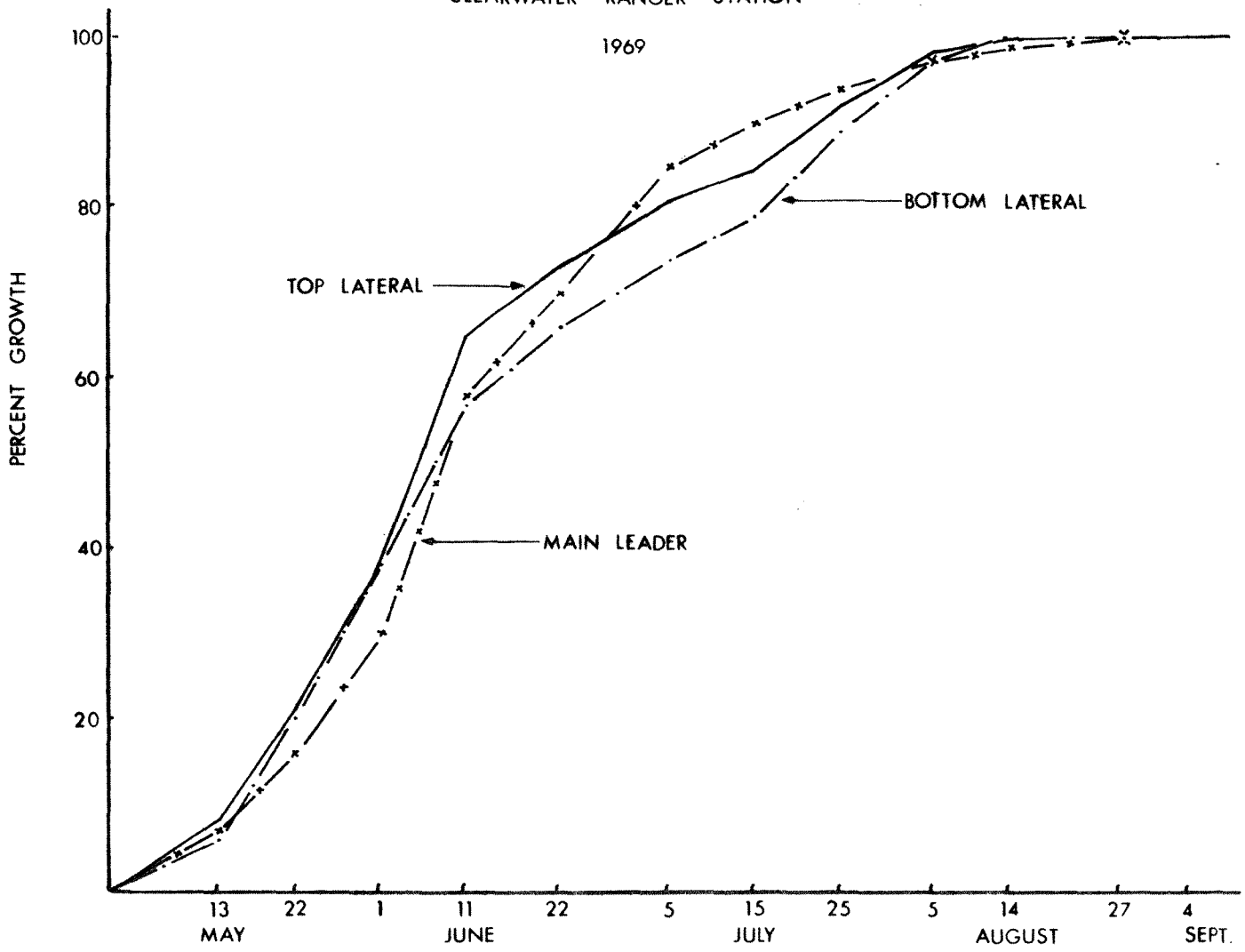


SCALE: 1" = 2 Miles

AVERAGE CUMULATIVE SHOOT GROWTH OF LODGEPOLE PINE SAPLINGS

CLEARWATER RANGER STATION

1969



PHENOLOGICAL STUDY ON COMMENCEMENT AND TERMINATION OF LEADER AND LATERAL GROWTH OF LODGEPOLE PINE SAPLINGS

Location: Clearwater Ranger Station, Clearwater-Rocky Forest.

Age: 12 years old.

	No. of samples	Average date of commencement	Average date of termination	Average no. of growing days
Leader	23	May 8	August 27	111
Top lateral	23	May 8	August 14	98
Bottom lateral	23	May 8	August 14	98

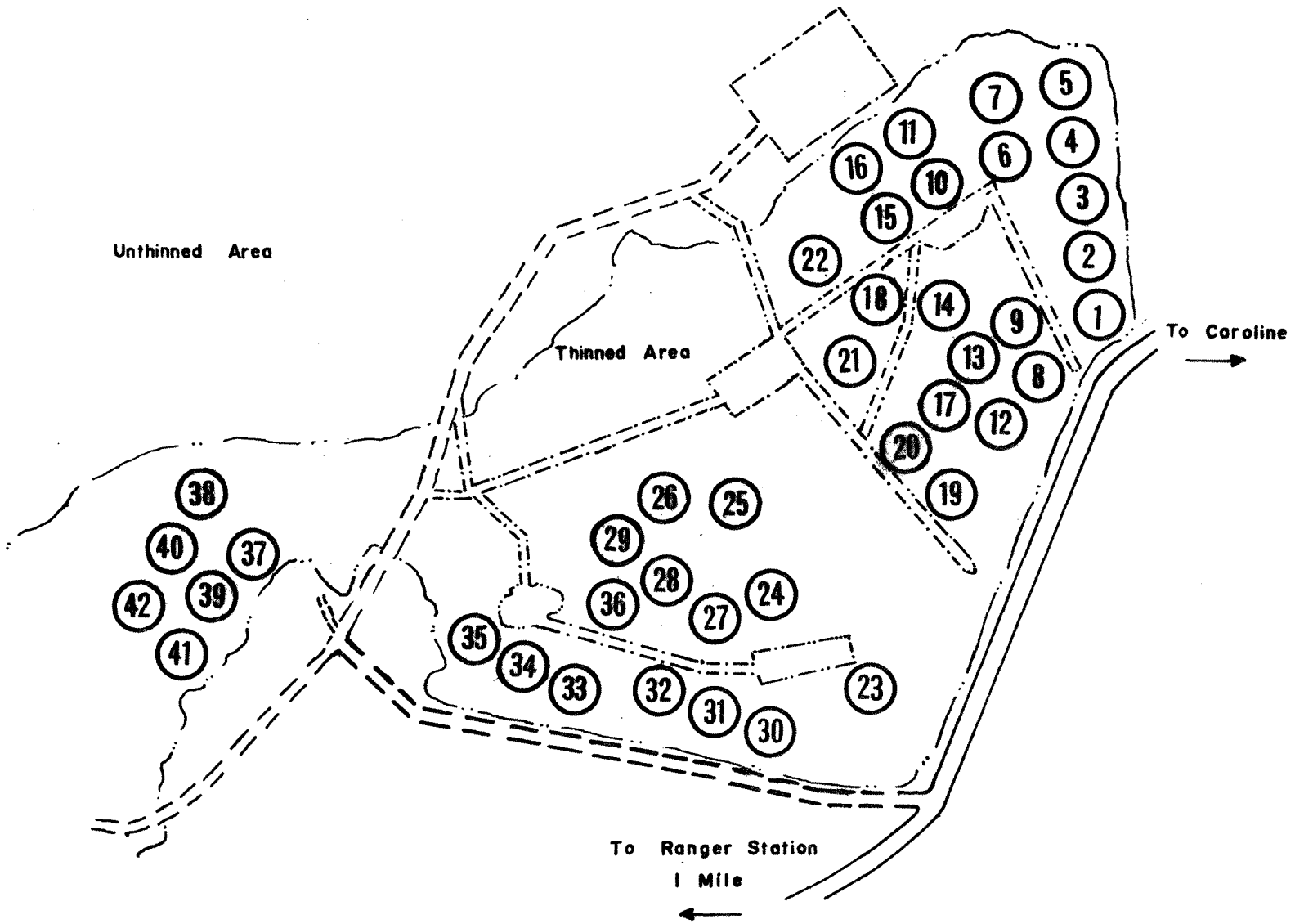
Distribution of periodic shoot growth of lodgepole pine saplings.

	May	June	July	August	September
Leader	28%	51%	17%	4%	-
Top lateral	37%	41%	19%	4%	-
Bottom lateral	37%	34%	23%	6%	-

The average length of growing season was 111 and 98 days for the leader and laterals, respectively. The greatest height growth occurred in June and July, representing 68% of the total height growth. By the end of July, 96% of the cumulative height growth was completed. The average length of growing season for the leaders in 1969 was approximately 7 days longer than in 1968.

THINNING AND FERTILIZATION PROJECT

Clearwater Ranger Station



THINNING AND FERTILIZATION PROJECT

Location: Clearwater Ranger Station, Clearwater-Rocky Forest.

Thinned: 1966-67 winter. Fertilized: September 25, 1968.

Number of plots: 42. Plot size: 1/10 acre. Species: Lodgepole pine. Age (stump height): 68 years.

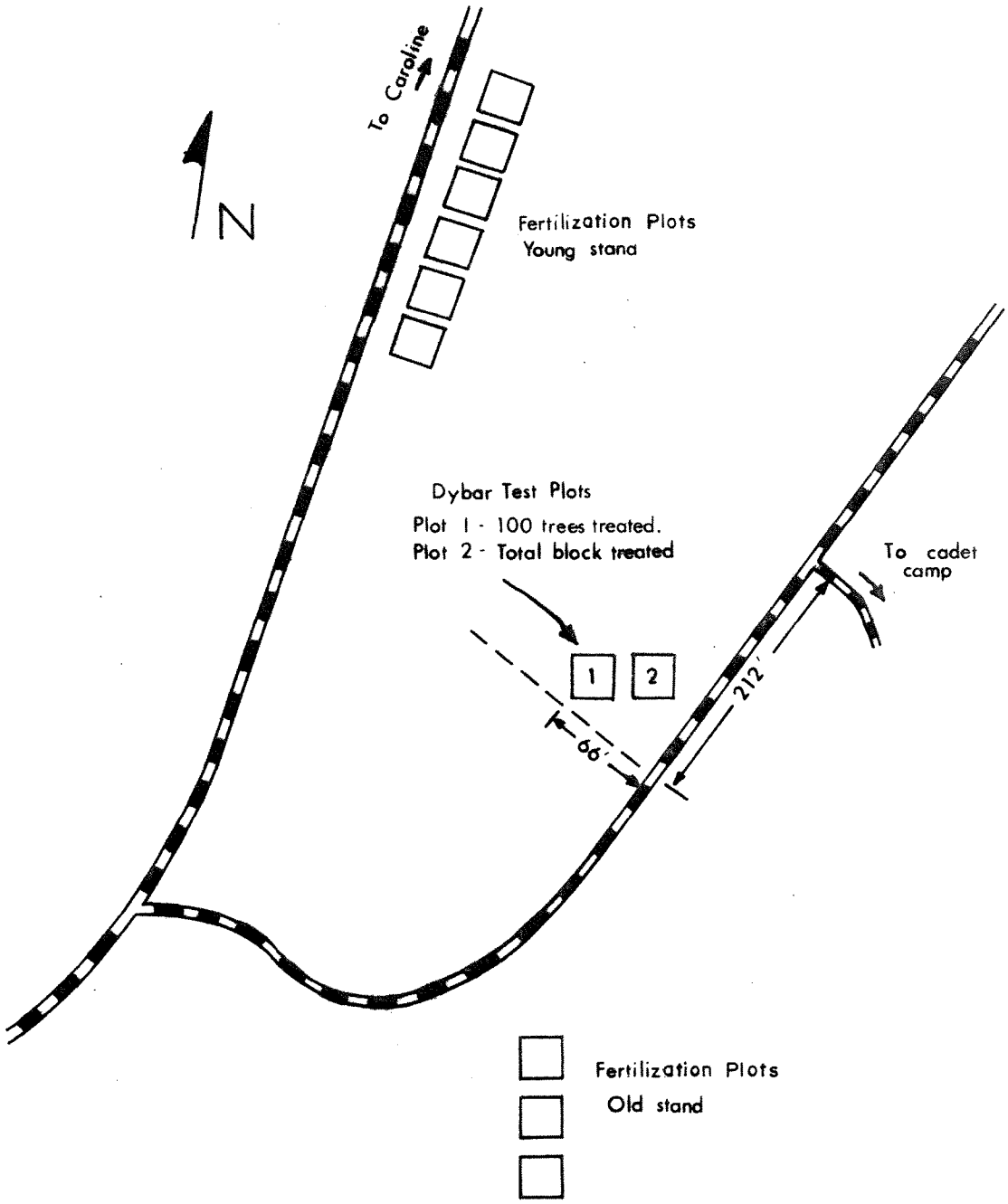
Plot number	Rate of application (lb/acre)	Source of fertilizer and amount (lb.) per plot	Actual total weight per acre (lb.)
1, 23, 33	Control	---	---
2, 12, 41	100-50-0-25	18.0 lbs. of (16-20-0-14), 2.9 lbs. of (11-48-0) and 15.1 lbs. of urea	360
3, 4, 16	0-150-0-0	33.3 lbs. of superphosphate	333
5, 10, 14	100-0-0-0	22.2 lbs. of urea	222
6, 13, 29	600-50-0-25	18.0 lbs. of (16-20-0-14), 2.9 lbs. of (11-48-0) and 126 lbs. of urea	1469
7, 11, 38	600-150-0-25	18.0 lbs. of (16-20-0-14), 23.8 lbs. of (11-48-0) 121.0 lbs. of urea	1628
8, 20, 30	600-150-0-0	31.2 lbs. of (11-48-0) and 125.5 lbs. of urea	1567
9, 19, 36	600-50-0-0	10.4 lbs. of (11-48-0) and 131.0 lbs. of urea	1414
15, 18, 32	100-50-0-0	10.4 lbs. of (11-48-0) and 19.9 lbs. of urea	303
17, 27, 31	600-0-0-0	135.5 lbs. of urea	1355
21, 22, 34	0-50-0-0	11.1 lbs. of superphosphate	111
24, 26, 42	100-50-0-75	53.5 lbs. of (16-20-0-14), 9.0 lbs. of (11-48-0) and 0.9 lbs. of urea	634
25, 28, 39	100-150-0-0	31.2 lbs. of (11-48-0) and 14.7 lbs. of urea	459
35, 37, 40	100-150-0-25	18.0 lbs. of (16-20-0-14), 23.8 lbs. of (11-48-0) and 10.0 lbs. of urea	518

This project was initiated in 1968. Forty-two one-tenth-acre plots were surveyed and laid out during the summer of 1968. Fourteen fertilizer treatments were chosen and replicated three times to randomly chosen plots. Diameter measurements were taken before fertilizers were applied. Fertilizers were applied in late September 1968.

No measurements were taken in 1969.

VARIOUS SILVICULTURAL STUDIES

Ricinus Burn Area , Clearwater-Rocky Forest



CHEMICAL THINNING

Location: Ricinus Burn, Clearwater-Rocky Forest.

Description of stand: Overstocked 15-year-old lodgepole pine.

Chemical used: Dybar. Date of treatment: July 7, 1969.

This experiment was established in 1969 to evaluate the effectiveness of Dybar as a chemical thinning agent. The two treatments on two one-tenth-acre plots were as follows:

1. 100 trees were marked with red tape and Dybar was applied at the rate of ½ teaspoon per inch of diameter of the tree base.
2. Two pounds of Dybar were distributed over the whole plot.

No further observations were made in 1969.

THINNING AND FERTILIZATION PROJECT

Location: Ricinus Burn, Clearwater-Rocky Forest.

Thinned: 1965-66. Fertilized: October 28, 1966. Plot size: 1/10 acre.

Species: Lodgepole pine. Age: 18 years. Fertilizer used: 27-14-0.

No. of sample trees: 5 for each treatment.

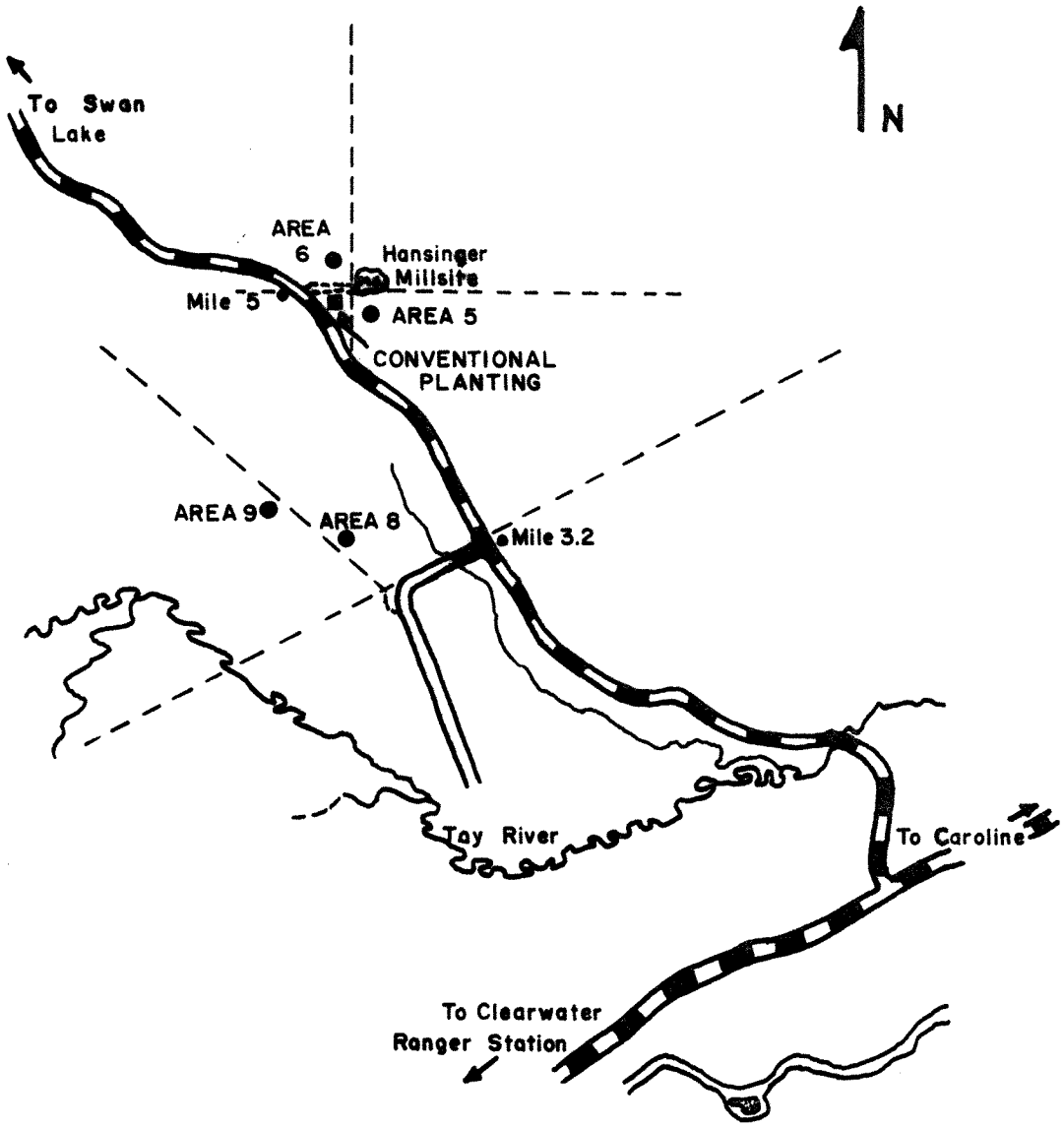
Stem analysis samples collected: February, 1969.

	Control (thinned)		130 lbs. fertilizer/acre		260 lbs. fertilizer/acre	
	D.b.h. increase 1966 - 1968 (%)	Volume increase 1966 - 1968 (%)	D.b.h. increase 1966 - 1968 (%)	Volume increase 1966 - 1968 (%)	D.b.h. increase 1966 - 1968 (%)	Volume increase 1966 - 1968 (%)
	20	83	28	105	24	106
	18	75	28	109	28	127
	17	61	26	99	31	113
	27	85	24	132	40	163
	27	88	14	75	15	108
Average	22	79	24	104	28	123

Stem analysis was conducted for five sample trees from each treatment. The results show that difference between diameter increase is very small, but volume increase is quite large. Heavy fertilizer application results in substantial volume increase of 44% compared with volume increase of control trees.

CONVENTIONAL and CONTAINER PLANTING

Swan Lake Road - Hansinger Millsite Area, Clearwater-Rocky Forest



SCALE: 1" = 1 Mile

CONVENTIONAL PLANTING (cut-over area)*

Location: Hansinger Mill-site, Swan Lake Road, Clearwater-Rocky Forest.

Planted: Spring 1967. Last date examined: July 30, 1969.

Fertilizer used: Starter tablets (28-8-4). Species planted: White spruce.

Seedling grade	Fertilizer treatment	Number of samples	Mortality (%)			Average total height (inches)		
			1967	1968	1969	1967	1968	1969
1	Fertilized	100	49	73	74	5.7	7.6	8.0
2	Fertilized	100	52	74	74	4.7	6.1	6.7
3	Fertilized	100	38	52	52	4.0	5.6	5.9
1	Unfertilized	100	35	58	58	5.5	7.2	7.8
2	Unfertilized	100	29	58	59	4.4	5.9	6.5
3	Unfertilized	100	19	45	45	3.8	5.1	5.2

* Area is unscarified

Grade 3 seedlings had the lowest mortality regardless of fertilizer treatment. Fertilized seedlings generally had greater mortality than unfertilized seedlings. The poor height growth in 1969 was due to the fact that a new oil road diverted a small creek into some of the plots. These plots were overlaid with silt and mud, which made height difficult to measure at original ground level.

CONTAINER PLANTING (cut-over area)

Location: Hansinger Mill-site, Swan Lake Road, Clearwater-Rocky Forest.

Area 5 Block A & B Planted: 1966. Last date examined: August 4, 1969.

Species	Container	Unscarified area					
		Number of samples	Mortality (%)			Average total height (inches)	
			1967	1968	1969	1968	1969
Lodgepole pine	New plastic	200	45	55	58	2.3	3.3
Lodgepole pine	Acetate	200	76	84	85	1.9	2.4
Lodgepole pine	Phenol	200	87	89	89	3.1	4.0
White spruce	New plastic	200	60	78	80	1.1	1.5
White spruce	Acetate	150	80	93	95	1.2	1.7
White spruce	Phenol	100	96	98	98	.9	1.1

Lodgepole pine seedlings in new plastic containers had the lowest mortality. Height growth was poor considering that these were 4-year-old seedlings. Conclusion: Deep duff is not a suitable planting area for containers regardless of species and type of container.

CONTAINER PLANTING (cut-over area)

Location: Hansinger Mill-site, Swan Lake Road, Clearwater-Rocky Forest.

Area 5 Blocks C & D Planted: July 12, 1967. Last date examined: August 4, 1969.

Species	Container	Planting treatment	No. of samples	Mortality (%)			Average total height (inches)	
				1967	1968	1969	1968	1969
Lodgepole pine	Tube	Litter and duff partially removed	120	29	38	40	2.9	4.1
Lodgepole pine	Tube	Mineral soil exposed	120	9	15	18	2.8	3.5
Lodgepole pine	Tube	Undisturbed	120	23	42	44	2.9	3.9
White spruce	Tube	Litter and duff partially removed	120	43	76	78	0.8	1.0
White spruce	Tube	Mineral soil exposed	120	29	55	58	1.0	1.5
White spruce	Tube	Undisturbed	120	40	73	75	1.1	1.5

Mortality increased for all planting treatments in 1969. Both species had lowest mortality when the mineral soil was exposed. Height growth of seedlings was not related to any specific treatment.

CONTAINER PLANTING (cut-over area)

Location: Hansinger Mill-site, Swan Lake Road, Clearwater-Rocky Forest.

Area 6 Planted: Summer 1966. Last date examined: August 2, 1969.

Species	Container	Scarified area					
		Number of samples	Mortality (%)			Average total height (inches)	
			1967	1968	1969	1968	1969
Lodgepole pine	New plastic	190	4	5	6	3.7	5.1
Lodgepole pine	Acetate	200	24	47	52	3.8	4.8
Lodgepole pine	Phenol	199	37	43	49	4.0	5.3
White spruce	New plastic	200	37	46	49	1.5	2.1
White spruce	Acetate	199	16	48	56	1.3	1.5
White spruce	Phenol	100	86	95	95	1.4	1.9

Best results were obtained with seedlings in new plastic containers for both species. Spruce seedlings had higher mortality than pine seedlings. Lodgepole pine in phenol containers and spruce seedlings in new plastic containers had the best height growth.

CONTAINER PLANTING (cut-over area)

Location: Mile 4, Swan Lake Road, Clearwater-Rocky Forest.

Area 8 Planted: Summer 1967. Last date examined: July 31, 1969.

Species	Container	Unscarified area					Scarified area				
		Number of samples	Mortality (%) 1968	Mortality (%) 1969	Average total height (inches) 1968	Average total height (inches) 1969	Number of samples	Mortality (%) 1968	Mortality (%) 1969	Average total height (inches) 1968	Average total height (inches) 1969
Lodgepole pine	Tube	129	72	75	2.8	3.8	271	55	55	3.2	4.6

In 1969, seedlings planted on scarified areas continued to have lower mortality and better height growth than seedlings on unscarified areas.

CONTAINER PLANTING (cut-over area)

Location: Mile 4, Swan Lake Road, Clearwater-Rocky Forest.

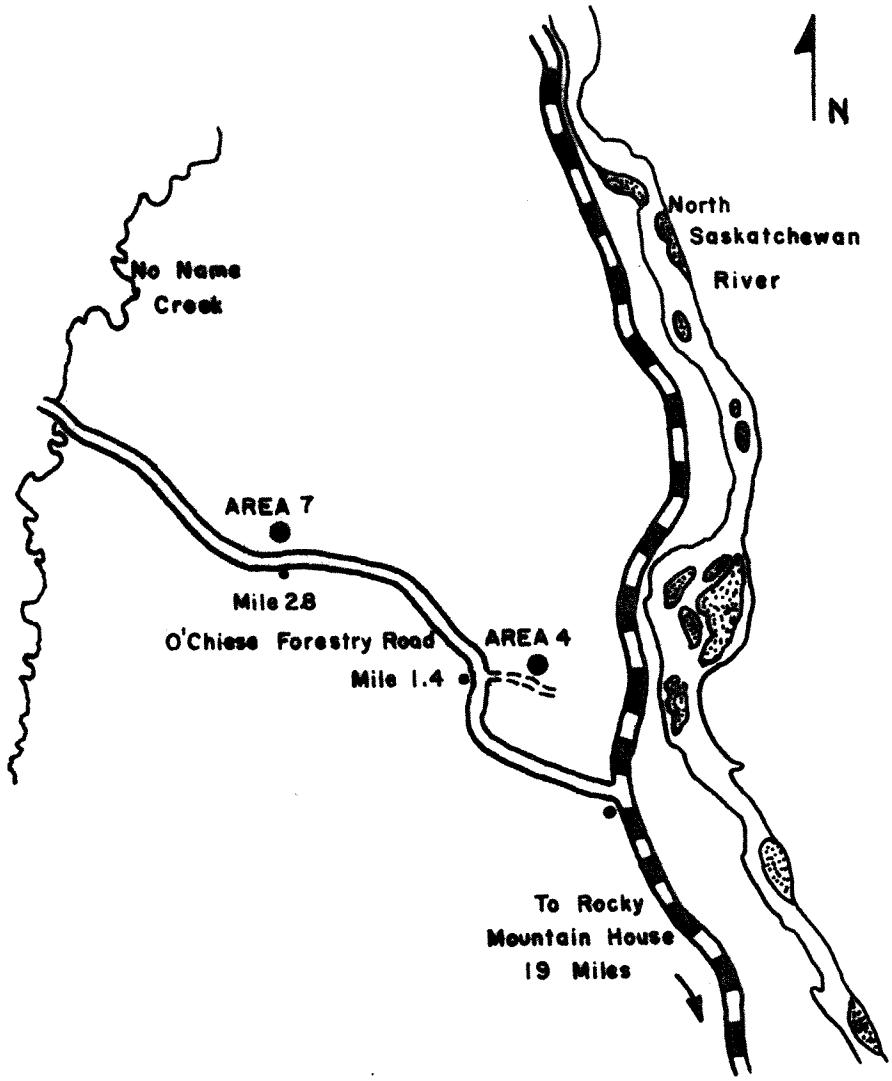
Area 9 Planted: Summer 1967. Last date examined: July 31, 1969.

Species	Container	Unscarified area									
		Number of samples	Mortality (%) 1968	Mortality (%) 1969	Average total height (inches) 1968	Average total height (inches) 1969	Number of samples	Mortality (%) 1968	Mortality (%) 1969	Average total height (inches) 1968	Average total height (inches) 1969
Lodgepole pine	Tube	167	70	71	2.4	3.5	33	73	79	2.1	2.7

Mortality was slightly less for seedlings planted on unscarified areas. Height growth was better for seedlings on unscarified areas.

CONTAINER PLANTING

Diamond Hill Area, Clearwater - Rocky Forest



SCALE: 1" = 1 Mile

CONTAINER PLANTING (under young aspen stand)

Location: Diamond Hill, Clearwater-Rocky Forest.

Area 4 Planted: June 17, 1965. Last date examined: August 1, 1969.

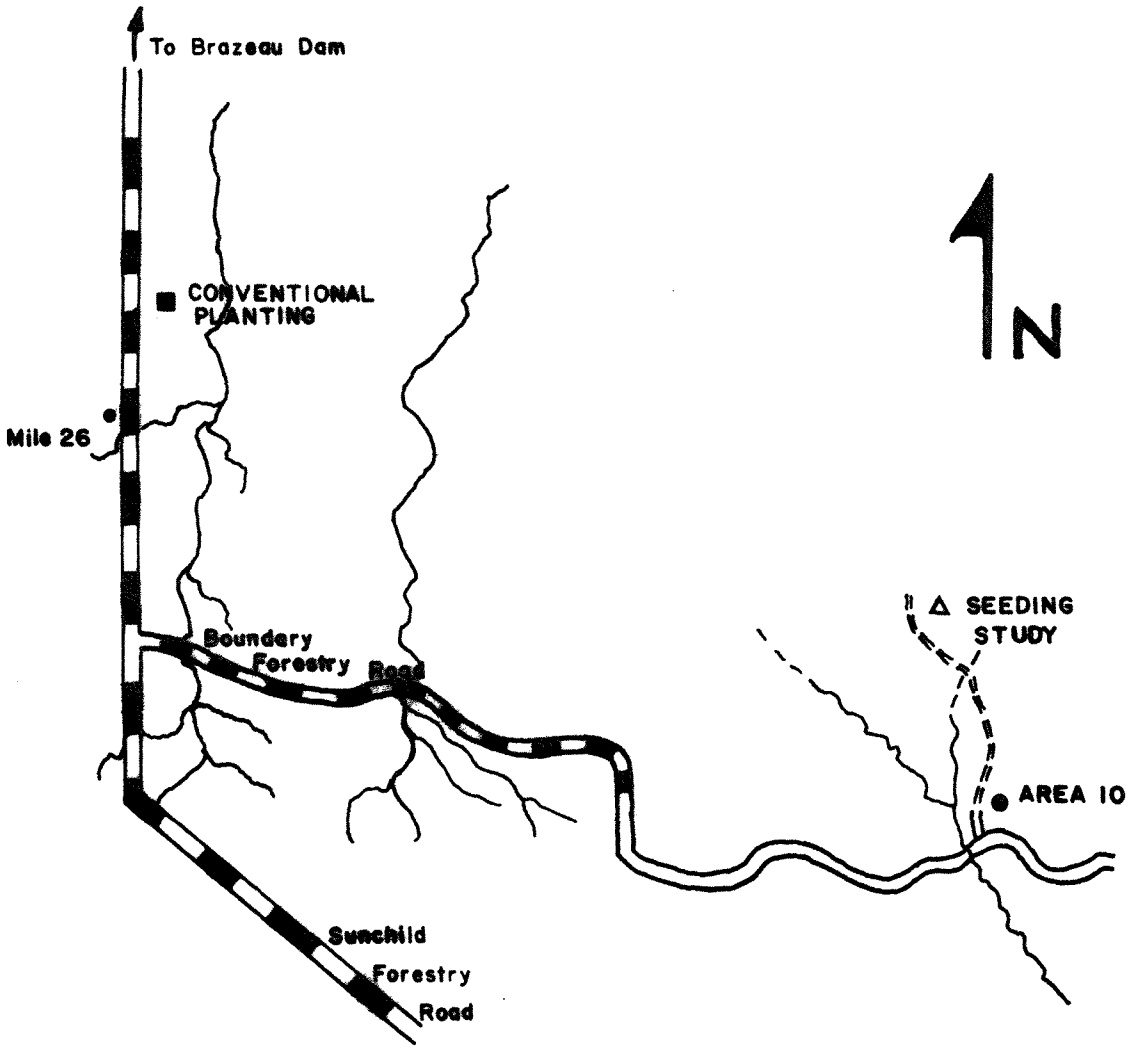
Species planted: White spruce.

Container	Unscarified area							Scarified area						
	Number of samples	Mortality (%)				Average total height (inches)		Number of samples	Mortality (%)				Average total height (inches)	
		1966	1967	1968	1969	1968	1969		1966	1967	1968	1969	1968	1969
New plastic	100	14	46	51	52	2.2	2.8	100	9	20	23	26	2.2	3.0
One-hole bullet	30	13	43	47	50	2.3	3.1	101	15	26	29	32	2.5	3.3

Mortality of seedlings increased slightly in the 1969 growing season. Seedlings on scarified areas had less mortality and better height growth than those on unscarified areas. Mortality of seedlings in both types of containers were roughly similar. Height growth was slightly better for seedlings in one-hole bullet containers.

VARIOUS REFORESTATION STUDIES

Boundary Road Area , Clearwater - Rocky Forest



SCALE: 1" = 1 Mile

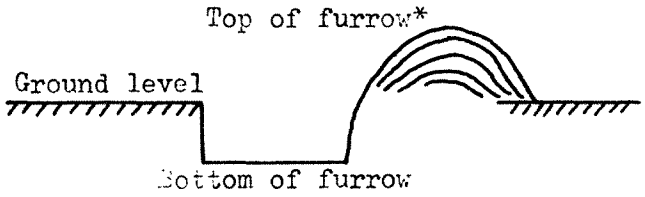
SEEDING STUDY (under aspen stand)

Location: Boundary Forestry Road, Clearwater-Rocky Forest.

Date seeded: Fall 1967. Species: White spruce. Last date examined: August 12, 1969.

Position of seedbed	No. of plots sampled	Total no. of germinants 1968-1969	Average per plot	Total no. of dead germinants 1968-1969	Mortality (%) 1968-1969	Average total height (inches) 1969
Top of narrow furrow	10	35	3.5	19	54	1.4
Top of wide furrow	10	40	4.0	22	55	1.3
Scarified at ground level	13	51	3.9	29	58	1.2
Unscarified at ground level	2	2	1.0	2	100	--
Bottom of furrow	4	23	5.3	9	39	1.4

Diagram of furrow



* Narrow less than 20"
Wide 20" +

The most germinants occurred in the bottom of furrow because the seed was washed down by rain. Mortality of germinants was quite high regardless of their position on the furrow.

CONVENTIONAL PLANTING (under old aspen stand)

Location: Mile 26, Sunchild Road, Clearwater-Rocky Forest.

Planted: June 15, 1968. Last date examined: July 30, 1969.

Species planted: White spruce.

Planting bed treatment	Number of samples	Mortality (%)		Average total height (inches)	
		1968	1969	1968	1969
Control	100	47	82	5.4	6.8
Vegetation removed	100	31	74	5.0	6.6
Mineral soil exposed	100	43	81	5.6	7.3

Lowest mortality occurred on areas where only the vegetation was removed. Height growth appeared to be best when mineral soil was exposed. This study was established on operationally planted area.

CONTAINER PLANTING (under old aspen stand)

Location: Boundary Forestry Road, Clearwater-Rocky Forest.

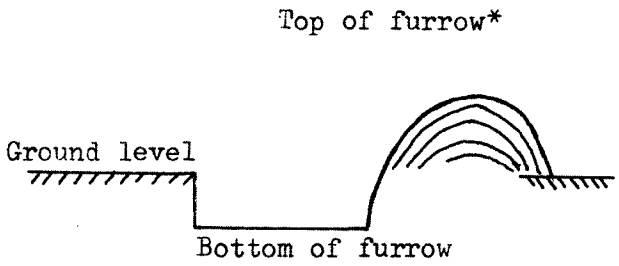
Area 10 Planted: 1967 summer. Last date examined: August 12, 1969.

Species planted: Lodgepole pine. Container type: Tube.

Type of furrow	Number of samples	Mortality (%) 1968	Mortality (%) 1969	Average total height (inches) 1968	Average total height (inches) 1969
Top of wide furrow	18	44	44	2.0	3.7
Top of narrow furrow	64	28	30	2.0	3.6
Ground level	16	13	13	2.0	2.9
Bottom of furrow	17	--	18	1.6	2.9

Furrow diagram

* Narrow furrow = 0-20"
Wide furrow = 20" +



Mortality was lower for seedlings planted at ground level or at the bottom of a furrow. The higher mortality for the containers on top of the furrows was probably due to increased drought exposure.

MUDPACKS (under old aspen stand)

Location: Mile 26, Sunchild road, Clearwater-Rocky Forest.

Planted: May 11, 1969. Last date examined: August 12, 1969.

Unscarified area.

Species planted	No. of samples	Mortality (%) 1969	Average total height (inches) 1968	1969
White spruce	200	2	4.0	6.4

The survival of mudpacks was excellent after the first growing season. Planting of conventional spruce seedlings resulted in 47% mortality after the first year in 1968 on the same area.

HERBICIDE TRIAL (under aspen stand)

Location: Mile 26, Sunchild Road, Clearwater-Rocky Forest.

Date planted: May 12, 1969. Type of planting: White spruce mudpacks.

Sprayed: June 18, 1969. Herbicide used: Gramoxone.

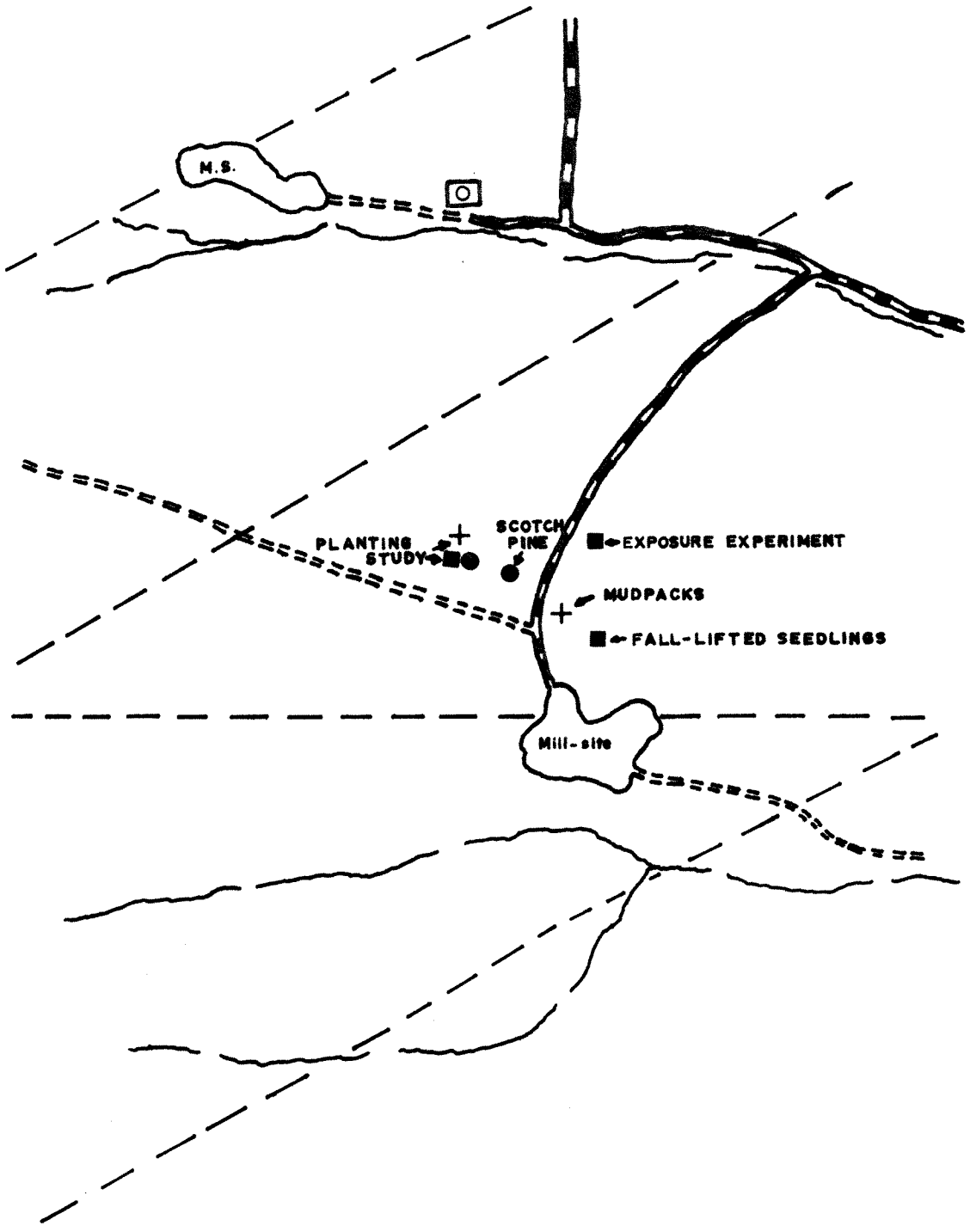
Last date examined: August 12, 1969.

Herbicide Treatment	Number examined	Mortality (%) 1969	Vegetative competition None	Light	Moderate	Heavy	Average total height (inches) 1968	1969
Sprayed	99	1	63	35	1	--	4.8	6.2
Unsprayed	100	2	1	6	49	54	4.7	6.1

Mortality was very low for both sprayed and unsprayed seedlings. Spraying reduced vegetative competition considerably with only 1% of the seedlings having moderate or heavy competition while 93% of seedlings that were not sprayed had moderate and heavy competition.

VARIOUS SILVICULTURAL STUDIES

FISHER MILL-SITE, CLEARWATER-ROCKY FOREST



SCALE: 1" = 20 CHAINS

PLANTING METHODS STUDY (cut-over area)

Location: Fisher Mill-site, Clearwater-Rocky Forest.

Planted: Spring 1969. Last date examined: August 31, 1969.

Planting method and packaging type	Lodgepole pine		White spruce	
	No. of samples	Mortality (%) 1969	No. of samples	Mortality (%) 1969
Conventional, packed with burlap	496	6	495	9
Conventional, packed in plastic bags	504	8	492	7
Conventional, roots mudded with clay	492	4	495	3
Mudpacks with fertilizer	475	50	492	53
Mudpacks without fertilizer	493	7	492	5
Containers (plastic tube)	500	--	492	23
Plugs (plastic tubes removed)	500	1	501	9

This experiment was established in 1969 to study the effects of different packaging methods and planting stock on survival and growth. Mudpacks with fertilizer had very high mortality because of the burning effect of excess fertilizer. First year survival was generally good for all methods and species used.

ROOT EXPOSURE EXPERIMENT (cut-over scarified area)

Location: Fisher Mill-site, Clearwater-Rocky Forest.

Planted: May 8, 1969. Last date examined: August 29, 1969.

Treatment	Scots pine		Lodgepole pine		Colorado spruce		White spruce	
	No. of samples	Mortality (%) 1969	No. of samples	Mortality (%) 1969	No. of samples	Mortality (%) 1969	No. of samples	Mortality (%) 1969
Roots untreated, planted immediately	100	29	97	5	97	7	100	6
Roots untreated, exposed 15 min.	100	56	100	22	99	7	100	7
Roots untreated, exposed 30 min.	100	71	100	5	100	10	100	9
Roots mudded, planted immediately	100	25	100	4	100	2	100	15
Roots mudded, exposed 15 min.	100	27	99	6	100	9	98	5
Roots mudded, exposed 30 min.	100	51	100	2	100	11	98	4

If roots were untreated, exposure of roots for longer periods of time resulted in generally higher mortality. When roots were mudded, no relationship was found between exposure and mortality. Mudding of roots generally increased the survival of seedlings.

CONVENTIONAL PLANTING (cut-over area)

Location: Fisher Mill-site, Clearwater-Rocky Forest.

Planted: May 9, 1969. Type of stock: Fall-lifted.

Scarified area. Last date examined: August 29, 1969.

Species	No. of samples	Mortality (%) 1969
White spruce	200	9
Colorado spruce	200	5
Lodgepole pine	100	72

This experiment was initiated in 1969 to study the survival of fall-lifted and winter-stored conventional seedlings. Winter storage resulted in high mortality for lodgepole pine seedlings. Colorado spruce and white spruce showed no adverse effects from winter storage. Seedlings were lifted at the end of October, 1968, and were stored at 34 to 36 F and at 85% relative humidity.

SCOTS PINE PLANTATION (cut-over area)

Location: Fisher Mill-site, Clearwater-Rocky Forest.

Planted: July 18-22, 1969. Type of planting: Plugs (plastic tubes were removed).

Seed source: Various Scots pine trees, Bugnet plantation, Rich Valley, Alberta.

Scarified area. Last date examined: September 3, 1969.

Seed tree number	Seed origin	Total number planted	Number examined	Mortality (%) 1969	Average total height (millimeters) 1969
742	Russian	92	50	4	69
648	"	282	50	2	73
739	"	354	50	10	69
749	"	1175	50	6	67
684	Swedish	90	50	2	54
689	"	164	50	--	74
750	Scottish	45	45	2	71

After the first growing season, survival and height growth of the planted Scots pines from all origins were very good.

MUDPACKS (cut-over area)

Location: Fisher Mill-site, Clearwater-Rocky Forest.

Planted: May 10, 1969. Last date examined: August 29, 1969.

Scarified area.

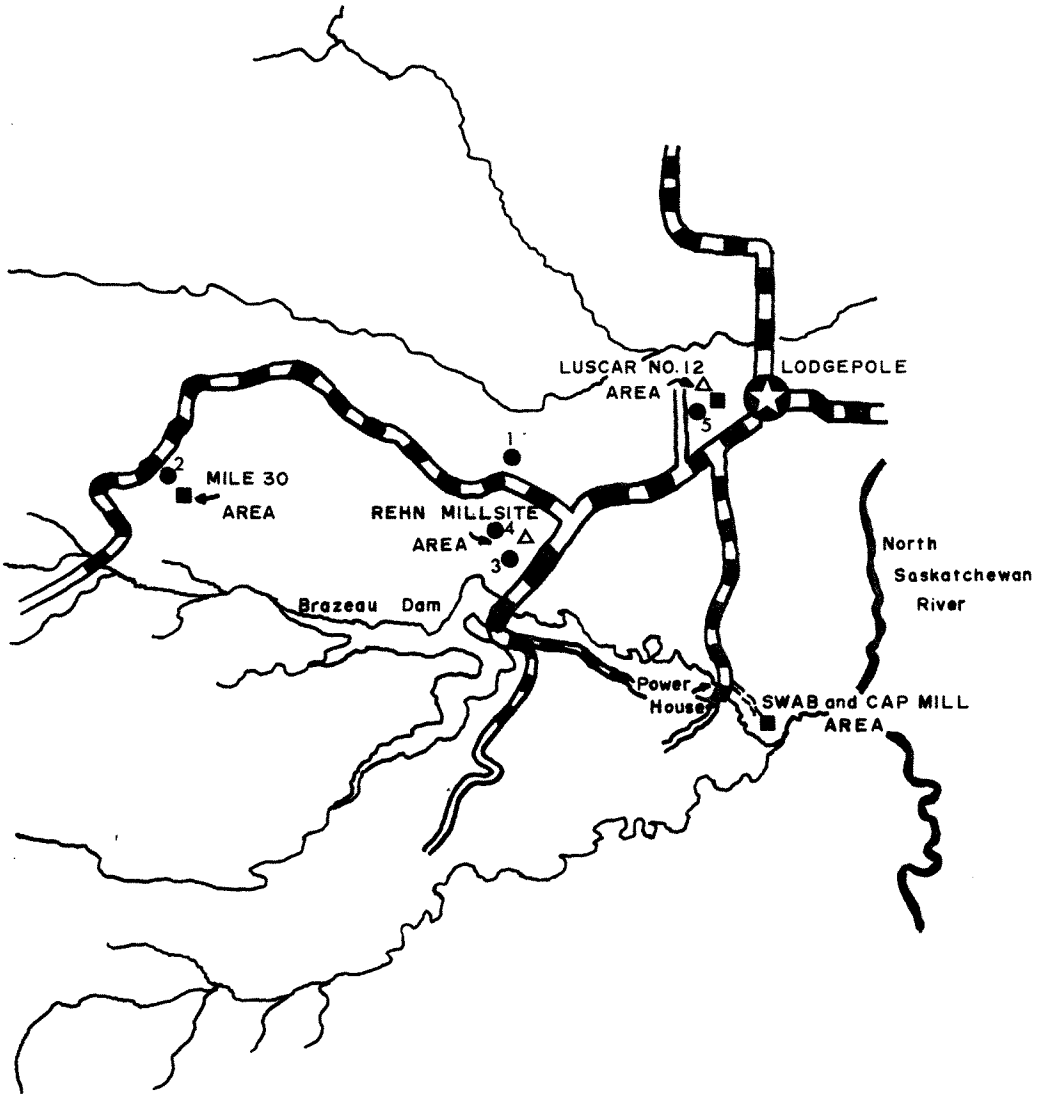
Species	Number of samples	Mortality (%) 1969	Average total height (inches) 1969
White spruce	183	4	4.3
Lodgepole pine	200	5	5.1

Mortality in 1969 was very low for both lodgepole pine and white spruce. Most of the seedlings flushed during summer and appeared to be healthy.

W H I T E C O U R T F O R E S T

PROJECT LOCATIONS

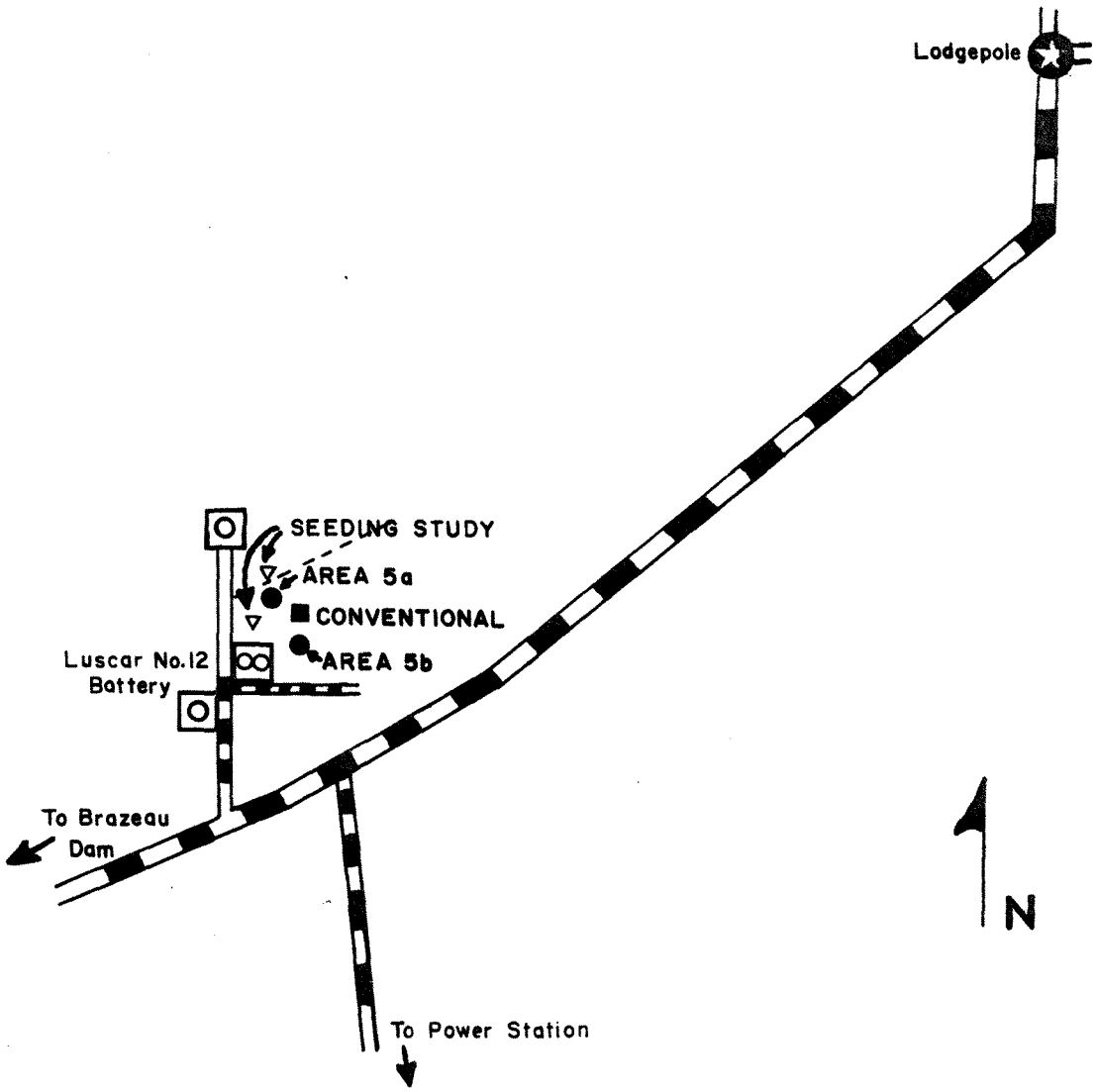
WHITECOURT FOREST



SCALE: 1" = 8 MILES

VARIOUS SILVICULTURAL STUDIES

Luscar No. 12 Battery Area, Whitecourt Forest



SCALE: 2" = 1 Mile

CONTAINER PLANTING (under old aspen stand)

Location: Luscar No. 12 Battery (3 miles west of Lodgepole), Whitecourt Forest Area 5a. Planted: June 14, 1968. Last date examined: August 7, 1969.

Species: White spruce. Container type: tube. Scarified area.

Planting treatment	No. of samples	Mortality (%) 1968	Mortality (%) 1969	Average total height (inches) 1968	Average total height (inches) 1969	Degree of smothering *4 0	1	2	3
Open *	200	2	8	1.0	1.5	37	33	22	8
Stick**	200	3	12	.9	1.5	44	31	20	5
Screen***	200	5	5	1.0	1.5	100	--	--	--

*Seedlings were left uncovered
**A small wooden stick was placed beside container to deflect leaves that may smother the seedling.
***Wire screens were placed over the containers to prevent any leaves from smothering the seedling.

*4 Degree of smothering
0 nil
1 light
2 medium
3 heavy

1969 results indicate that the screens had reduced the mortality of seedlings somewhat. The small sticks did not reduce mortality.

CONTAINER PLANTING (under old aspen stand)

Location: Luscar No. 12 Battery (3 miles west of Lodgepole), Whitecourt Forest.

Area 5b. Planted: July 8, 1968. Last date examined: August 7, 1969.

Species: White spruce. Operational container planting (tubes).

Unscarified area					Scarified area				
No. of samples	Mortality (%) 1968	Mortality (%) 1969	Average total height (inches) 1968	Average total height (inches) 1969	No. of samples	Mortality (%) 1968	Mortality (%) 1969	Average total height (inches) 1968	Average total height (inches) 1969
167	5	16	.8	1.3	33	9	18	.8	1.5

Mortality is similar for seedlings on scarified and on unscarified areas. Height growth is slightly better for seedlings on scarified areas.

CONVENTIONAL PLANTING (under old aspen stand)

Location: Luscar No. 12 Battery (3 miles west of Lodgepole), Whitecourt Forest.

Planted: June 14, 1968 Last date examined: August 7, 1969.

Species: White spruce. Scarified area.

No. of samples	Mortality (%) 1968	1969	Average total height (inches) 1968	1969
200	41	77	7.6	7.8

The mortality of spruce seedlings increased considerably during the 1969 growing season. The living seedlings showed poor quality and very little new growth.

These seedlings were healed in slough water and were received in poor condition at the time of planting. The poor survival shows that wrong pre-planting treatment can cause high mortality to seedlings even if planting is carried out properly.

SEEDING STUDY (Under old aspen stand)*

Location: Luscar No. 12 Battery (3 miles west of Lodgepole), Whitecourt Forest.

Date of Seeding: Fall (October 5, 1967). Seed source: Spruce - (Rocky) Lot 61-98), Pine - (Rocky) Lot 62-4).

Last date examined: August 14, 1969.

Species	Position of seedbed	Treatment	Number of seeds sown	Germination (%) 1968-69	Mortality (%) 1968-69	Success**(%) 1968-69	Average total height (millimeters) 1968	1969
White spruce	High	Screened	200	43	35	28	13	27
		Partially screened	200	27	30	19	16	26
		Open	200	19	55	9	13	25
	Low	Screened	200	39	38	24	12	25
		Partially screened	200	35	41	21	14	26
		Open	200	23	76	6	17	27
Lodgepole pine	High	Screened	200	40	11	36	21	42
		Partially screened	200	14	18	12	19	43
		Open	200	8	19	7	18	38
	Low	Screened	200	32	22	25	24	44
		Partially screened	200	10	37	6	30	56
		Open	200	11	67	4	20	34

* Area was scarified

** Success = $\frac{\text{No. of surviving germinants}}{\text{No. of seeds sown}} \times 100$

SEEDING STUDY (Under old aspen stand)*

Location: Luscar No. 12 Battery (3 miles west of Lodgepole), Whitecourt Forest.

Date of seeding: Spring (May 9, 1968) Seed source: Spruce - (Rocky) Lot 61-98), Pine - (Rocky) Lot 62-4).

Last date examined: August 14, 1969.

Species	Position of seedbed	Treatment	Number of seeds sown	Germination (%) 1968-69	Mortality (%) 1968-69	Success **(%) 1968-69	Average total height (Millimeters) 1968	Average total height (Millimeters) 1969
White spruce	High	Screened	200	26	25	19	18	27
		Partially screened	200	19	29	14	19	26
		Open	200	11	67	4	20	26
	Low	Screened	200	25	43	14	14	26
		Partially screened	200	17	64	6	14	21
		Open	200	14	96	1	10	19
Lodgepole pine	High	Screened	200	20	23	15	23	39
		Partially screened	200	9	44	5	24	40
		Open	200	9	35	6	23	39
	Low	Screened	200	18	42	11	16	30
		Partially screened	200	17	33	11	18	29
		Open	200	10	63	4	18	28

* Area was scarified

**Success = $\frac{\text{No. of surviving germinants}}{\text{No. of seeds sown}}$ x 100

SEEDING STUDIES

(a) Under old aspen stand-Luscar No. 12 Battery

Regardless of species, time of sowing, and position of seedbed the success of seeding was considerably better under the screens because of higher initial germination and less subsequent mortality.

The successes of pine and spruce seeding were similar. Seeding on high grounds resulted in better success than on low areas for both species and sowing dates.

For spruce, fall seeding provided better results than spring seeding. Height growths of germinants were similar for each species under various environmental conditions. Time of sowing (spring or fall) did not seem to influence the height growth of either species.

High mortality of seedlings indicates that seeding under a dense, old aspen stand is not feasible unless herbicide treatment is applied to reduce the smothering effect of aspen leaves.

(b) Cut-over area - Rehn Mill Site

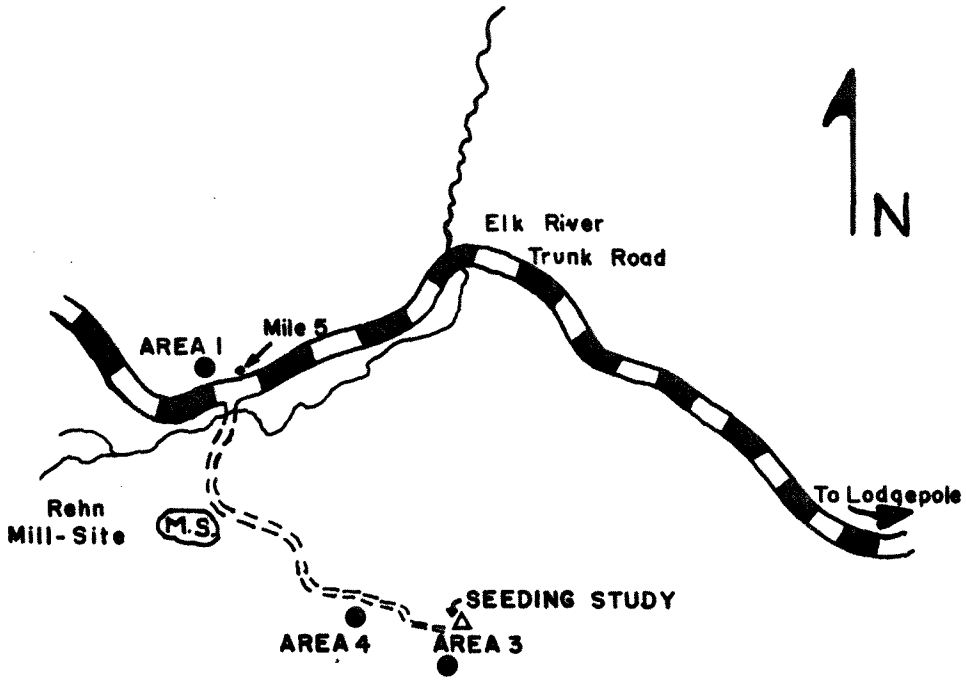
The success of seeding was slightly better under the screens than in the open. Better results were obtained on high than on low area for both species because of flooding on the latter. Time of sowing did not seem to influence consistently the success of seeding for either species. Generally, better survival was observed for lodgepole pine than for white spruce.

Conclusion: Lodgepole seeding can be successfully practised on cut-over areas when seeds are sown on high ground.

Both fall and spring sowing could be successful provided that spring sowing is carried out early and climatic conditions are favorable during the germination period.

VARIOUS SILVICULTURAL STUDIES

Rehn Mill-Site Area, Whitecourt Forest



SCALE: 1" = 1 Mile

SEEDING STUDY (cut-over area)*

Location: Rehn Mill-site, Elk River Trunk Road, Whitecourt Forest.

Date of seeding: Fall (October 5, 1967) Seed source: Spruce - (Rocky) Lot 61-98
Pine - (Rocky) Lot 62-4

Last date examined: August 14, 1969.

Species	Position of seedbed	Treatment	Number of seeds sown	Germination (%) 1968-69	Mortality (%) 1968-69	Success**(%) 1968-69	Average total height (Millimeters) 1968	1969
White spruce	High	Screened	200	24	37	15	23	44
		Open	200	13	48	7	28	38
	Low	Screened	200	25	60	10	16	19
		Open	200	18	57	8	15	19
Lodgepole pine	High	Screened	200	40	12	36	30	76
		Open	200	19	22	15	32	78
	Low	Screened	200	16	56	7	19	49
		Open	200	7	46	4	25	45

* Area was scarified

**Success = $\frac{\text{No. of surviving germinants}}{\text{No. of seeds sown}} \times 100$

SEEDING STUDY (cut-over area)*

Location: Rehn Mill-site, Elk River Trunk Road, Whitecourt Forest.

Date of seeding: Spring (May 9, 1968) Seed source: Spruce - (Rocky Lot 61-98)
Pine - (Rocky Lot 62-4)

Last date examined: August 14, 1969.

Species	Position of seedbed	Treatment	Number of seeds sown	Germination (%) 1968-69	Mortality (%) 1968-69	Success**(%) 1968-69	Average total height (Millimeters) 1968	1969
White spruce	High	Screened	200	25	42	15	19	27
		Open	200	17	70	5	21	26
	Low	Screened	200	7	86	1	15	17
		Open	200	10	95	1	19	11
Lodgepole pine	High	Screened	200	28	13	24	30	70
		Open	200	28	24	21	31	71
	Low	Screened	200	23	52	11	20	38
		Open	200	17	42	10	16	35

* Area was scarified

**Success = $\frac{\text{No. of surviving germinants}}{\text{No. of seeds sown}} \times 100$

CONTAINER PLANTING (cut-over area)

Location: Mile 5, Elk River Trunk Road, Whitecourt Forest.

Area 1. Planted: 1967 summer. Last date examined: August 9, 1969.

Species	Container	Undisturbed area					Disturbed area				
		No. of samples	Mortality (%) 1968	Mortality (%) 1969	Average total height (inches) 1968	Average total height (inches) 1969	No. of samples	Mortality (%) 1968	Mortality (%) 1969	Average total height (inches) 1968	Average total height (inches) 1969
Lodgepole pine	Tube	218	26	29	2.3	3.1	74	17	23	2.9	4.6

Survival and height growth were better for seedlings planted on disturbed areas. Mortality of seedlings continued even after 3 years from planting.

CONTAINER PLANTING (cut-over area)

Location: Rehn Mill-site, Elk River Trunk Road, Whitecourt Forest.

Area 3. Planted: 1967 summer. Last date examined: August 6, 1969.

Container type: Tube. Scarified area

Species	Planting bed treatment	No. of samples	Mortality (%) 1968	Mortality (%) 1969	Average total height (inches) 1968	Average total height (inches) 1969
Lodgepole pine	Scraped *	134	34	38	2.2	4.5
Lodgepole pine	Cat-track **	155	24	30	2.1	4.0
Lodgepole pine	Loose mineral soil***	33	45	48	2.0	4.1
White spruce	Scraped	160	34	48	1.0	1.4
White spruce	Cat-track	97	14	32	1.0	1.4
White spruce	Loose mineral soil	13	23	62	0.9	1.3

*The bulldozer blade scraped off the duff, leaving firm mineral soil.
**Mineral soil compressed by the movement of the bulldozer's tracks.
***A pile of loose mineral soil created by the bulldozer's blade.

Lowest mortality was found for seedlings of both species planted in cat-tracks and there was no appreciable difference in mortality between spruce and pine. When tubelings were planted elsewhere, spruce seedlings had higher mortality than lodgepole pine seedlings. Loose mineral soil on these spots should be avoided.

CONTAINER PLANTING (cut-over area)

Location: Rehn Mill-site, Elk River Trunk Road, Whitecourt Forest. Area 3. Planted: 1967 summer. Last date examined: August 6, 1969. Container type: Tube. Scarified area.

Species	Planting bed treatment	Percentage of heaving					
		None		Intermediate		Total	
		1968	1969	1968	1969	1968	1969
L. pine	Scraped	13	10	66	61	21	29
	Cat-track	31	23	55	57	14	20
	Loose mineral soil	21	12	61	70	18	18
W. spruce	Scraped	15	10	49	44	36	46
	Cat-track	34	21	54	56	12	23
	Loose mineral soil	8	8	53	23	39	69

Both 1968 and 1969 results show that planting in compressed soil (cat-track) results in less heaving. The reduced heaving improved the survival of those seedlings planted in a cat-track. (See page 62 for survival and growth on Area 3.

CONTAINER PLANTING (cut-over area)

Location: Rehn Mill-site*, Elk River Trunk Road, Whitecourt Forest.

Area 4. Planted: 1967 summer. Last date examined: August 9, 1969.

Unscarified area.

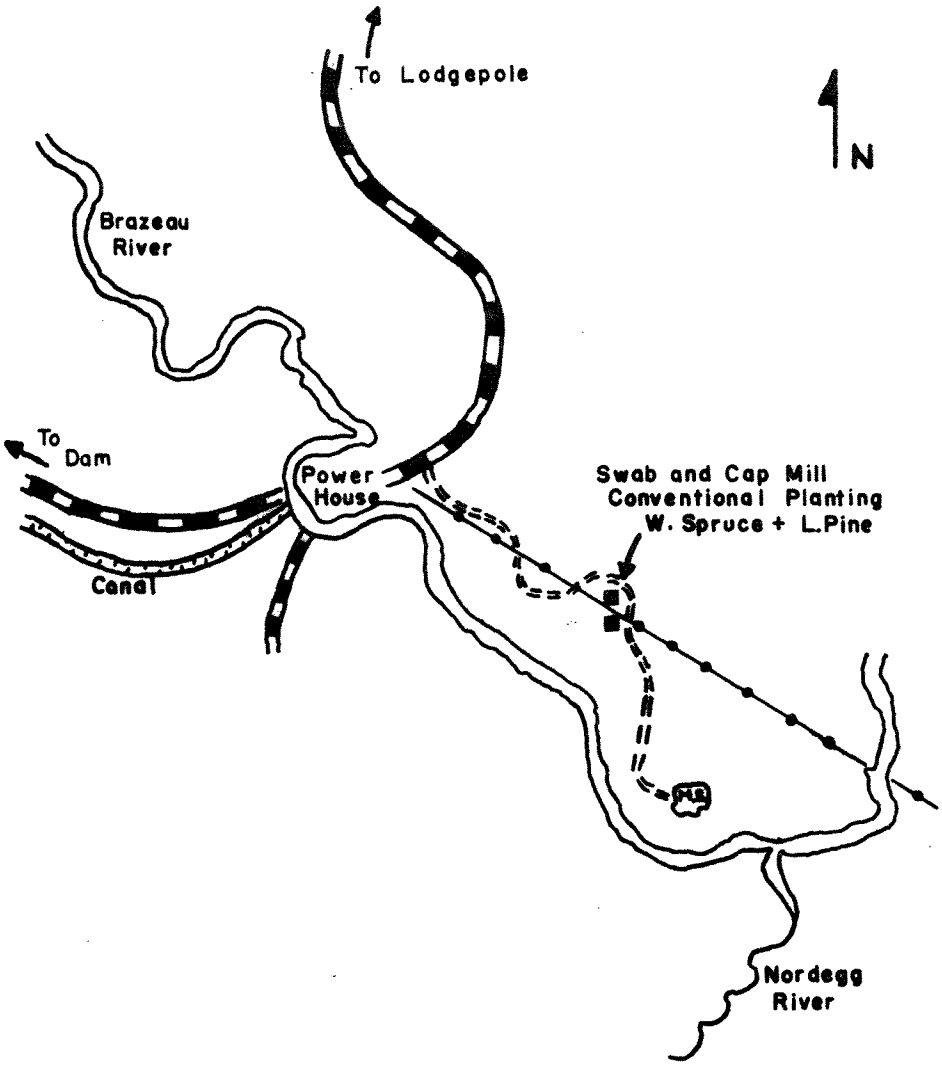
Species	Container	No. of samples	Mortality (%) 1968	Mortality (%) 1969	Average total height (inches) 1968	Average total height (inches) 1969
Lodgepole pine	Tube	125	62	66	1.9	2.6
White spruce	Tube	100	20	48	1.0	1.1

* Tubelings were planted in deep duff on logged-over area.

Lodgepole pine seedlings had higher mortality than white spruce. The 1969 height growth was poor for both species but especially for white spruce.

CONVENTIONAL PLANTING

Swab and Cap Mill, Whitecourt Forest.



SCALE: 1" = 1 Mile

CONVENTIONAL PLANTING (under old aspen stand)

Location: Swab and Cap Mill, Brazeau Power House, Whitecourt Forest.

Planted: Spring 1967. Last date examined: August 10, 1969.

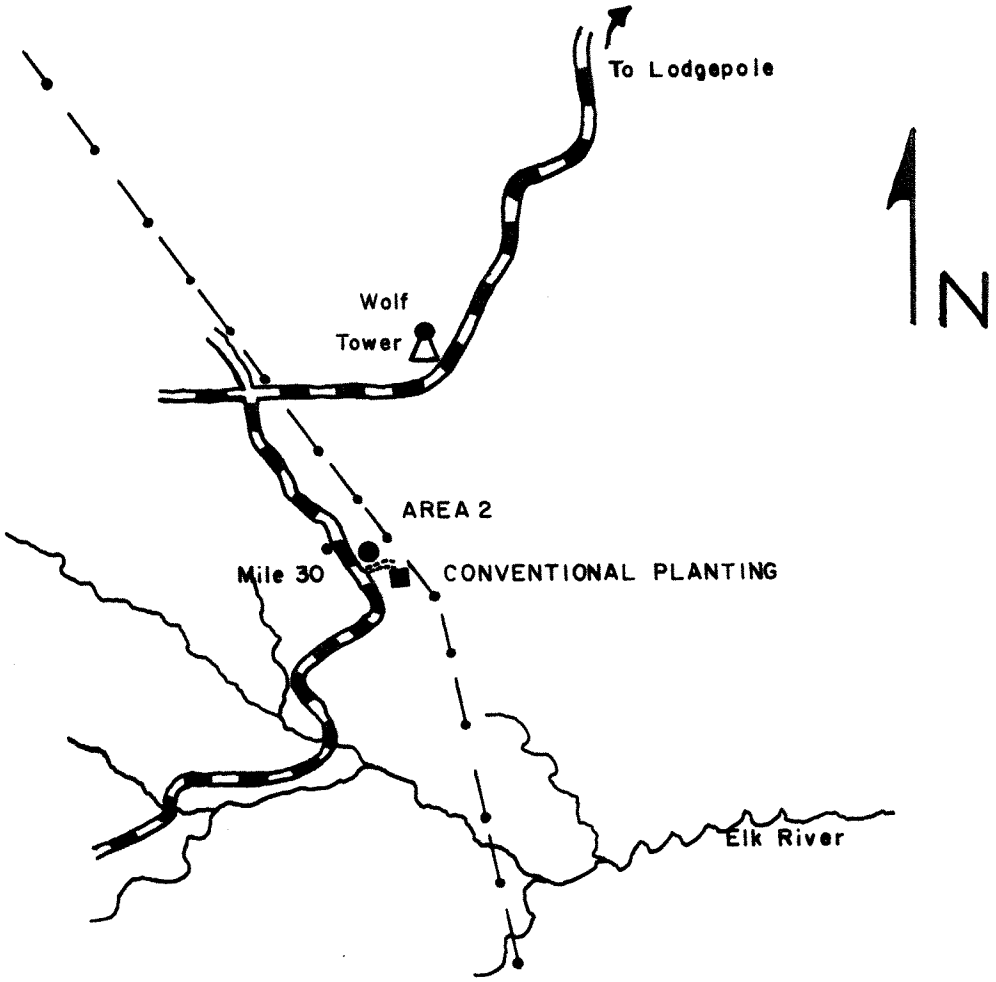
Unscarified area.

Species	No. of samples	Mortality (%)			Average total height (inches)		
		1967	1968	1969	1967	1968	1969
White spruce	350	29	49	55	5.5	7.3	8.8
Lodgepole pine	350	22	34	36	7.4	11.8	15.4

Mortality of both species still increased slightly after 3 years from planting. Height growth of both species was slightly less in the 1969 growing season than in the previous year.

CONVENTIONAL and CONTAINER PLANTING

Mile 30 Area, Elk River Trunk Road, Whitecourt Forest



SCALE: 1"= 2 Miles

CONTAINER PLANTING (under old aspen stand)

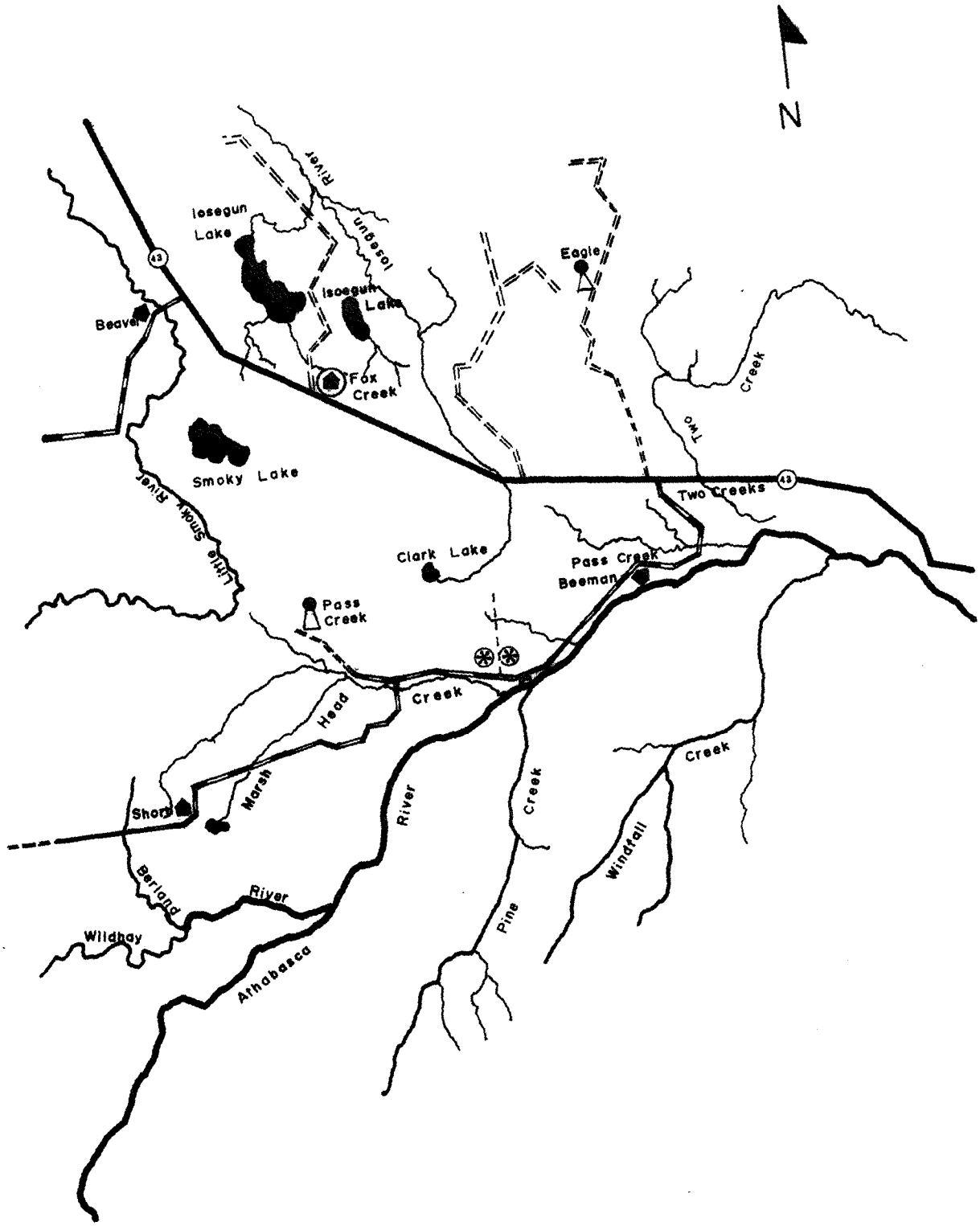
Location: Mile 30, Elk River Trunk Road, Whitecourt Forest.

Area 2. Planted: Summer 1966. Last date examined: August 8, 1969.

Species	Container	Undisturbed area					Disturbed area				
		Number of samples	Mortality (%) 1967	1968	1969	Average total height (inches) 1969	Number of samples	Mortality (%) 1967	1968	1969	Average total height (inches) 1969
Lodgepole pine	New plastic	190	29	34	38	5.2	10	10	20	30	5.5
Lodgepole pine	Acetate	68	6	15	23	5.0	32	16	25	37	5.3
Lodgepole pine	Phenol	83	58	67	72	4.8	17	53	59	59	5.2
White spruce	New plastic	176	27	46	54	3.3	24	42	50	50	3.4
White spruce	Acetate	98	55	71	79	2.0	2	100	100	100	--
White spruce	Phenol	95	13	19	24	3.5	5	20	20	40	3.1

White spruce seedlings had their lowest mortality in phenolformaldehyde containers on both disturbed and undisturbed areas. Best survival of lodgepole pine seedlings was observed on undisturbed areas in acetate containers while in disturbed soils new plastic containers were the best. Generally, slightly better height-growth was found for both species in disturbed soils regardless of container type.

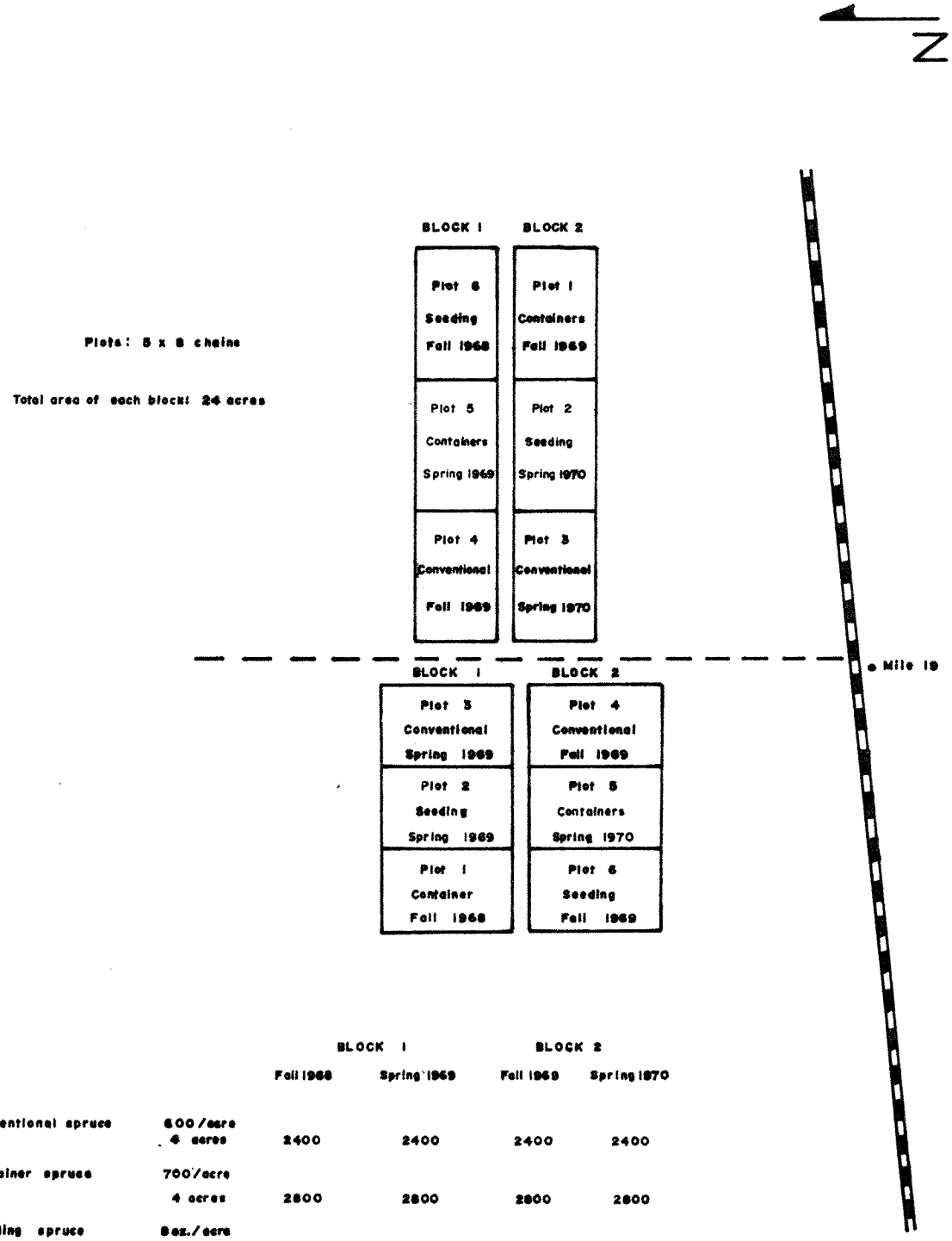
WHITECOURT FOREST



Scale: 1" = 8 Miles

CO-OPERATIVE REFORESTATION TRIAL

MILE 19, PASS CREEK ROAD, WHITECOURT FOREST



Plots: 8 x 8 chains

Total area of each block: 24 acres

		BLOCK 1		BLOCK 2	
		Fall 1968	Spring 1969	Fall 1969	Spring 1970
Conventional spruce	600/acre 4 acres	2400	2400	2400	2400
Container spruce	700/acre 4 acres	2800	2800	2800	2800
Seeding spruce	8oz./acre 4 acres	32 oz.	32 oz.	32 oz.	32 oz.

CO-OPERATIVE REFORESTATION TRIAL (open area)

Location: Pass Creek Road, Whitecourt Forest.

Container planting. Plot #1. Planted 1968 fall.

Last date examined: July 18, 1969.

Species	Container	Number of samples	Mortality 1969	Average total height 1969
White spruce	Tube	400	3%	1.4"

Seedlings showed good survival and growth.

CO-OPERATIVE REFORESTATION TRIAL (open area)

Location: Pass Creek Road, Whitecourt Forest.

Conventional planting. Plot #3. Planted 1969 spring.

Last date examined: July 19, 1969. Scarified area.

Species	Number of samples	Mortality 1969	Average total height 1969
White spruce	400	1%	4.7"

Seedlings planted in the spring showed good survival rate; however, date of planting and survival check were too close to provide a reliable survival estimate.

CO-OPERATIVE REFORESTATION TRIAL (open area)

Location: Pass Creek Road, Whitecourt Forest.

Conventional planting Plot #4, Planted 1968 fall.

Last date examined: July 19, 1969. Scarified area.

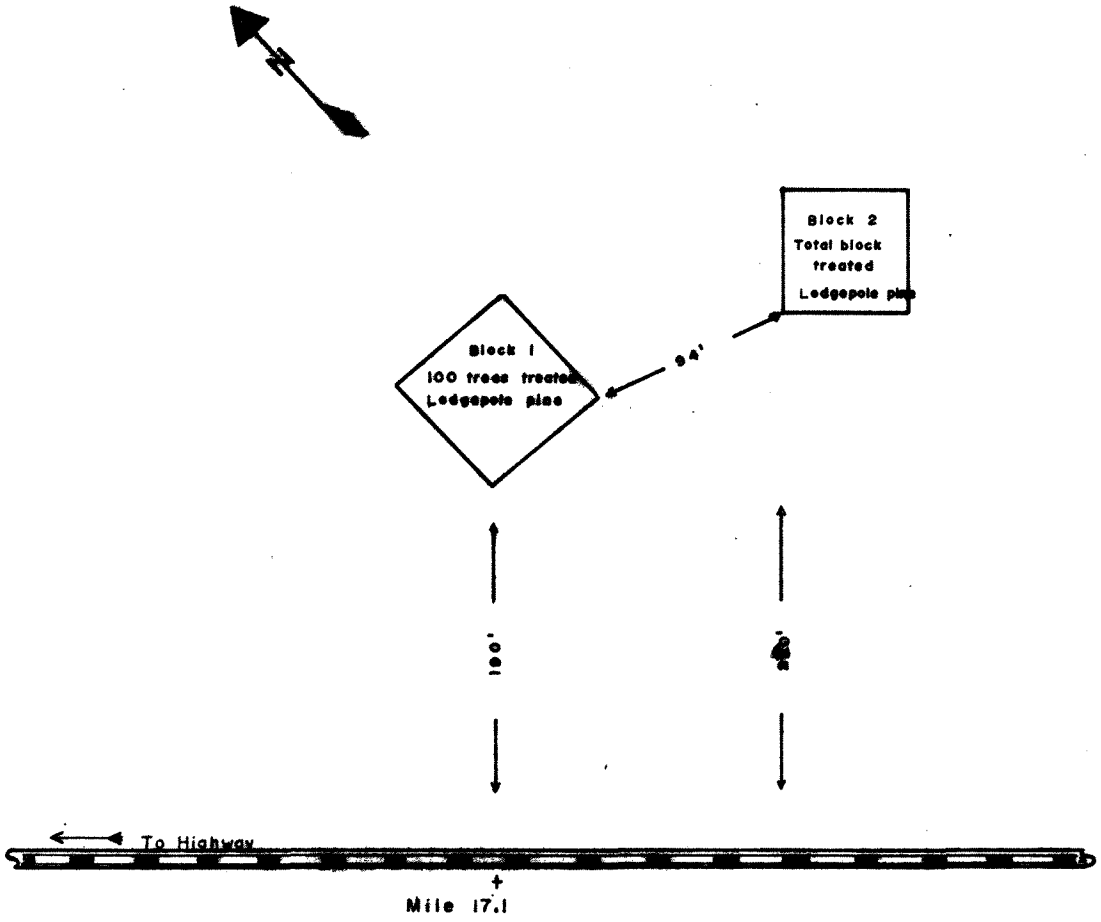
Species	Number of samples	Mortality 1969	Average total height 1969
White spruce	400	33%	5.7"

Seedlings showed good growth rate and fairly high mortality.

DYBAR TEST AREA

PASS CREEK ROAD – WHITECOURT FOREST

Rate of application: 2 lbs per block
Block = 1 chain X 1 chain



CHEMICAL THINNING

Location: Pass Creek Road, Whitecourt Forest.

Description of stand: Overstocked 8-year-old lodgepole pine.

Chemical used: Dybar. Date of treatment: July 7, 1969.

This experiment was established in 1969 to evaluate the effectiveness of Dybar as a chemical thinning agent. Two treatments were applied on two 1/10th-acre plots as follows:

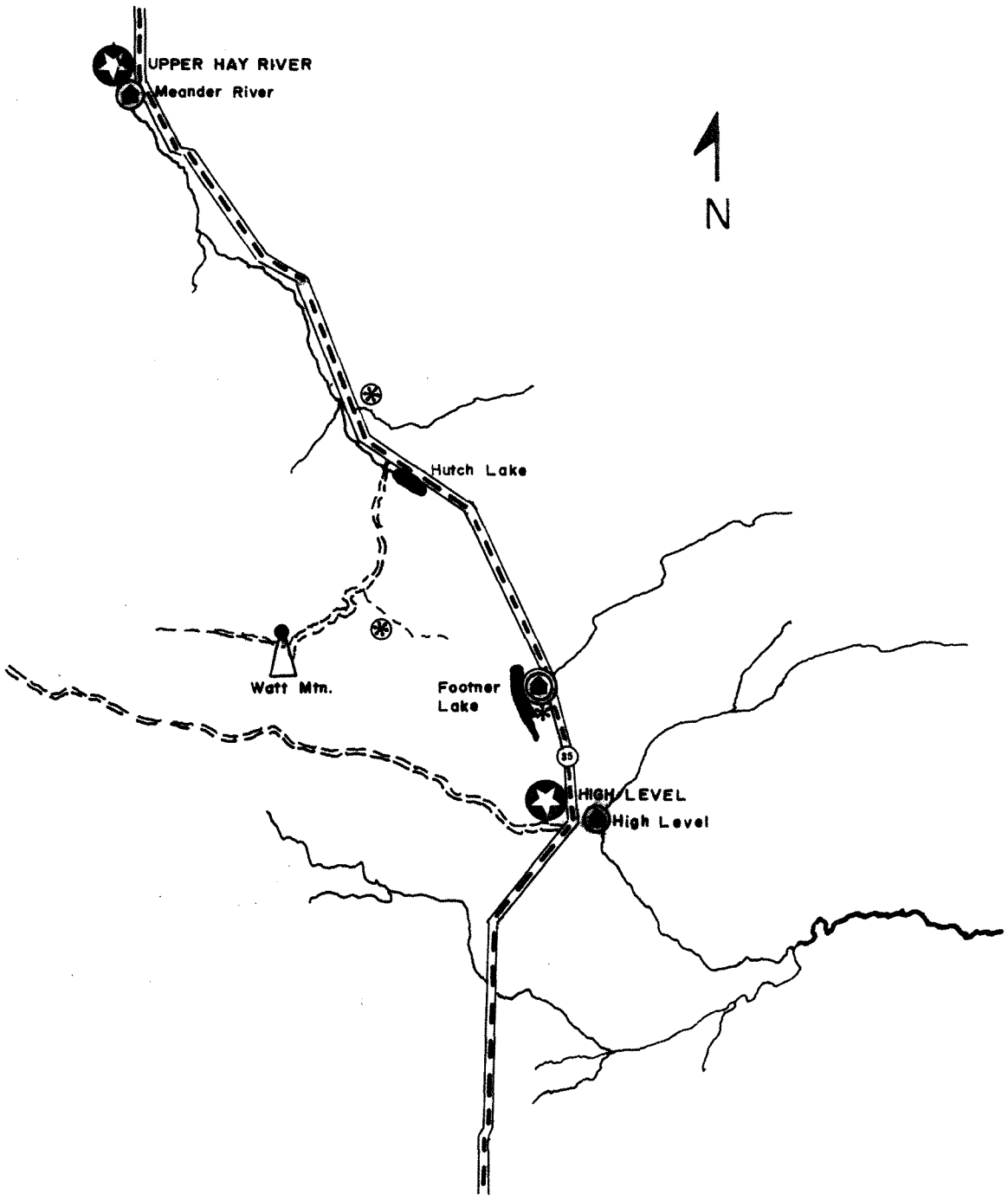
1. 100 trees were marked with red tape and Dybar was applied at the rate of $\frac{1}{2}$ teaspoon per inch of diameter of the tree base.
2. Two pounds of Dybar were evenly distributed over the whole plot.

No further observations were made in 1969.

F O O T N E R L A K E F O R E S T

FOOTNER LAKE FOREST

LOCATION OF PLANTING SITES

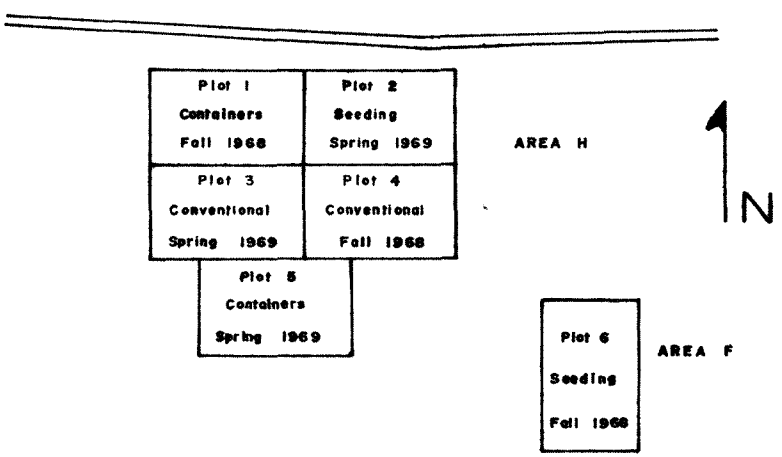


Scale : 1" = 8 Miles

CO-OPERATIVE REFORESTION TRIAL

FOOTNER LAKE FOREST

WATT MOUNTAIN TOWER ROAD, MILE 4.8, AREA H + F

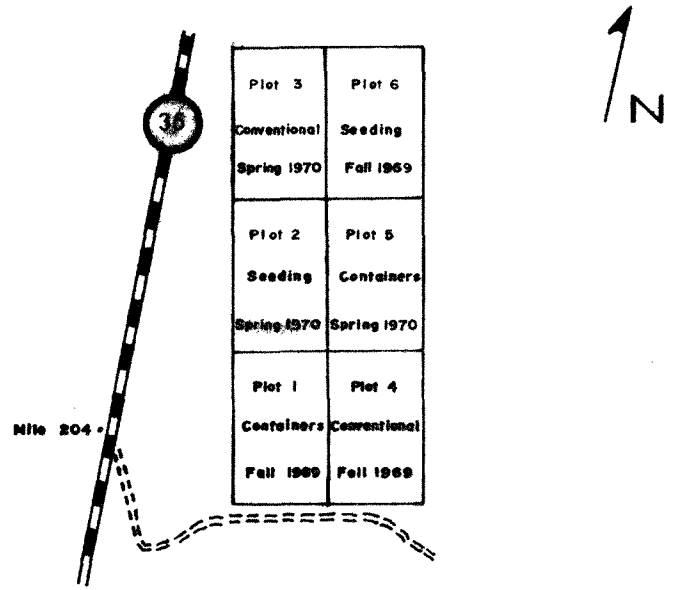


			Fall 1968	Spring 1969
Conventional	spruce 3+0	600/acre 4 acres	2400	2400
Container	spruce	700/acre 4 acres	2800	2800
Seeding	spruce	8 oz./acre 4 acres	32 oz.	32 oz.

Plots: 5 x 8 chains

Total area: 24 acres

HIGHWAY 35, MILE 204, (16.8 miles from forest office).



			Fall 1969	Spring 1970
Conventional	spruce 3+0	600/acre 4 acres	2400	2400
Container	spruce	700/acre 4 acres	2800	2800
Seeding	spruce	8 oz./acre 4 acres	32 oz.	32 oz.

CO-OPERATIVE REFORESTATION TRIAL (cut-over area)

Location: Watt Mountain Tower Road, Footner Lake Forest.

Conventional planting. Plot #4. Planted 1968 fall.

Last date examined: July 6, 1969. Scarified area.

Species	Number of samples	Mortality 1969	Average total height 1969
White spruce	400	15%	4.5"

Fall-planted seedlings showed satisfactory survival rate and good height growth.

ARBORETUM

Location: Alberta Forest Service, Footner Lake Forest.

Planted 1968 spring (under aspen stand). Last date examined: July 6, 1969.

Species	Number of trees planted	Number of trees alive	Number of trees dead	Mortality (%) 1969
Abies concolor	10	2	8	80
Juniperus scopolorum	10	-	10	100
Juniperus virginiana	10	-	10	100
Larix decidua	5	-	5	100
Larix leptolepis	15	-	15	100
Larix sibirica	10	-	10	100
Picea abies	20	5	15	75
Picea omorica	10	-	10	100
Picea pungens	15	12	3	20
Pinus cembra	10	8	2	20
Pinus cembroides edulis	10	-	10	100
Pinus jeffreyi	5	-	5	100
Pinus mugo pumilio	20	-	20	100
Pinus nigra austriaca	10	2	8	20
Pinus ponderosa	30	-	30	100
Pinus strobus	15	-	15	100
Pinus sylvestris	10	2	8	20
Pseudotsuga menziesii	20	6	14	70
Thuja orientalis	10	-	10	100
Thuja orientalis pyramidalis	10	-	10	100
Acer negundo	20	6	14	70
Acer saccharinum	20	5	15	75
Aesculus glabra	10	1	9	90
Alnus glutinosa	5	2	3	60
Cotoneaster acutifolia	5	-	5	100
Crataegus chocolate	20	6	14	70
Fraxinus pennsylvanica lanceolata	20	14	6	30
Lonicera tatarica	20	-	20	100
Prunus padus	20	-	20	100
Prunus padus commutata	10	-	10	100
Quercus macrocarpa	30	16	14	47
Salix pentandra	20	7	13	65
Syringa amurensis japonica	20	-	20	100
Syringa josikaea	20	-	20	100
Syringa prestoniae	5	-	5	100
Syringa villosa	20	-	20	100
Tilia cordata	10	3	7	70
Ulmus americana	30	1	29	97
Ulmus pumila	20	1	19	95

ARBORETUM

Location: Alberta Forest Service, Footner Lake Forest.

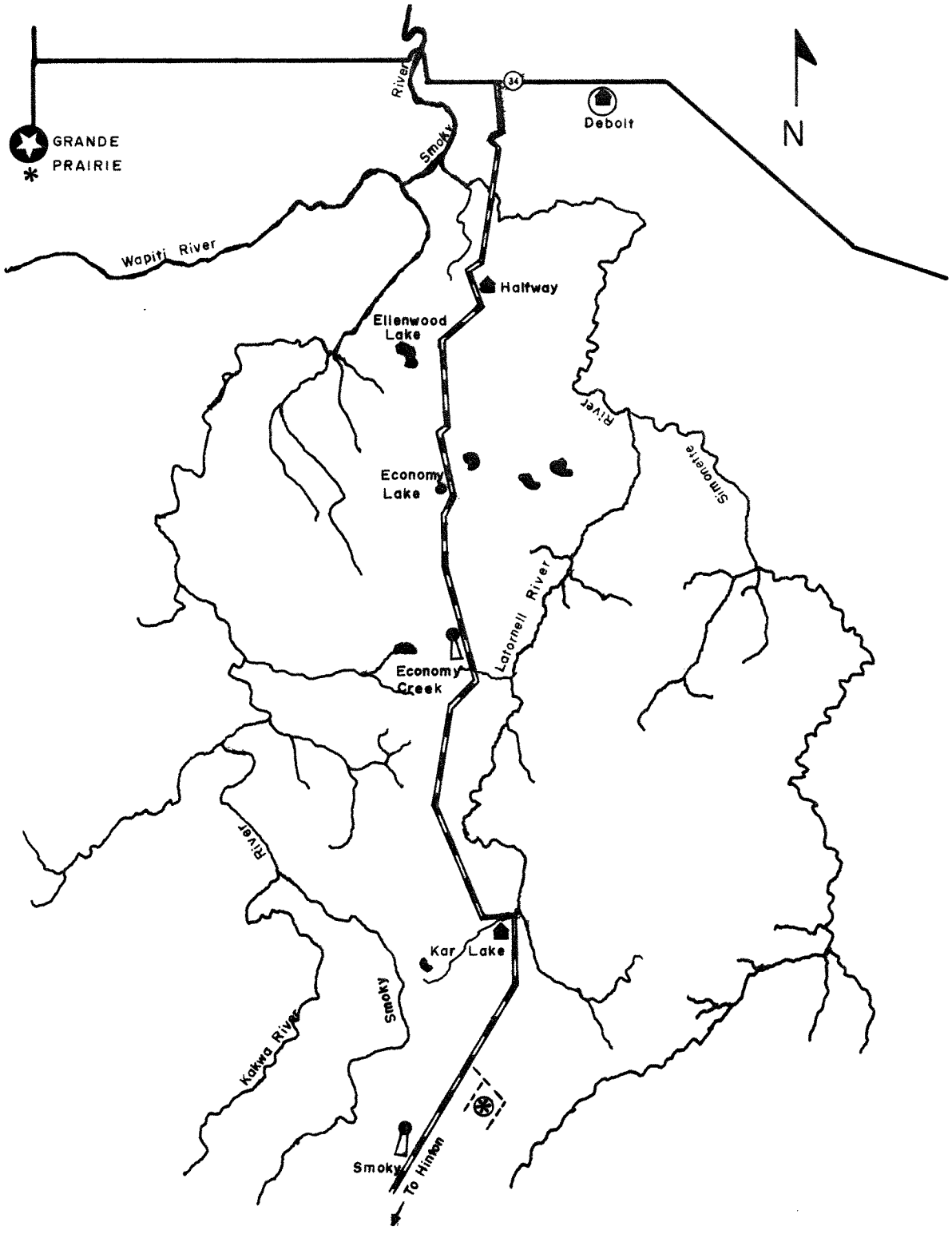
Planted: 1967 Spring (open area). Last date examined: July 6, 1969.

Frost hardiness
1. No frost damage
2 Frozen tips
3 Frozen to snow level
4 Frozen to ground level

Species	Number of trees planted	Frost hardiness (%) 1	2	3	4	Number of dead trees	Mortality (%) 1969
Acer campestre	11	27	18	-	9	5	46
Acer saccharinum	23	-	48	-	-	12	52
Alnus glutinosa	10	60	20	-	-	2	20
Quercus rubra	4	75	-	-	-	1	25
Quercus macrocarpa	14	-	36	14	-	7	50
Tilia cordata	14	100	-	-	-	-	-
Ulmus americana	53	30	44	11	2	7	13
Ulmus pumila	17	88	6	-	-	1	6
Larix decidua	14	7	7	-	-	12	86
Larix leptolepis	11	-	18	-	-	9	82
Picea pungens	25	80	-	-	-	5	20
Pinus aristata	25	24	-	-	-	19	76
Pinus nigra	14	79	-	-	-	3	21
Pinus ponderosa	15	-	7	-	-	14	93
Pinus strobus	15	93	-	-	-	1	7
Pinus sylvestris	15	73	-	-	-	4	27
Pseudotsuga menziesii	54	63	-	-	-	20	37

G R A N D E P R A I R I E F O R E S T

GRANDE PRAIRIE FOREST

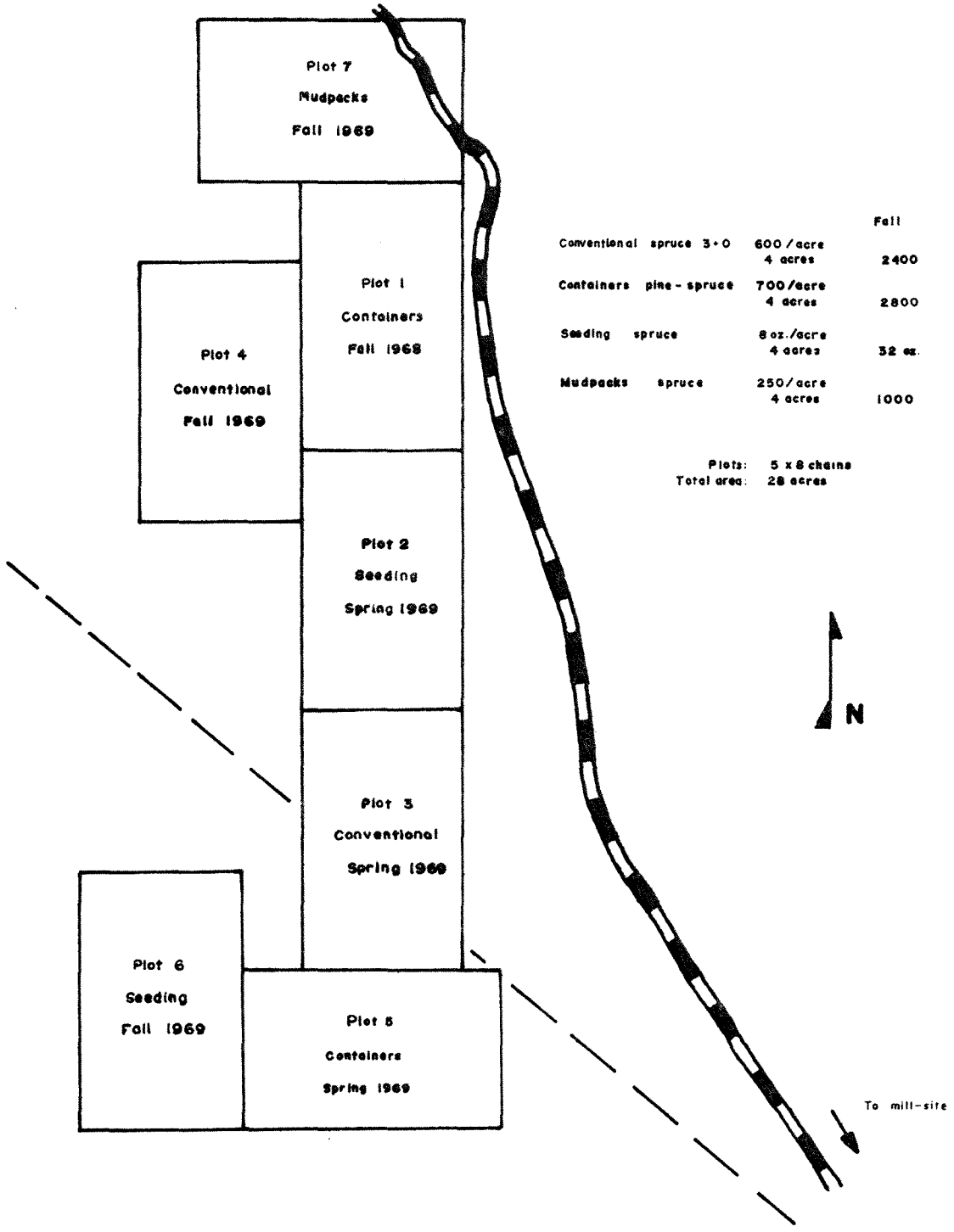


Scale: 1" = 8 Miles

CO - OPERATIVE REFORESTATION TRIAL

C. NORTON'S MILL, MILE POST 66, GODWIN-ENTRANCE TRUNK ROAD

GRANDE PRAIRIE FOREST



			Fall	Spring
Conventional	spruce 3+0	600/acre 4 acres	2400	2400
Containers	pine - spruce	700/acre 4 acres	2800	2800
Seeding	spruce	8 oz./acre 4 acres	32 oz.	32 oz.
Mudpacks	spruce	250/acre 4 acres	1000	—

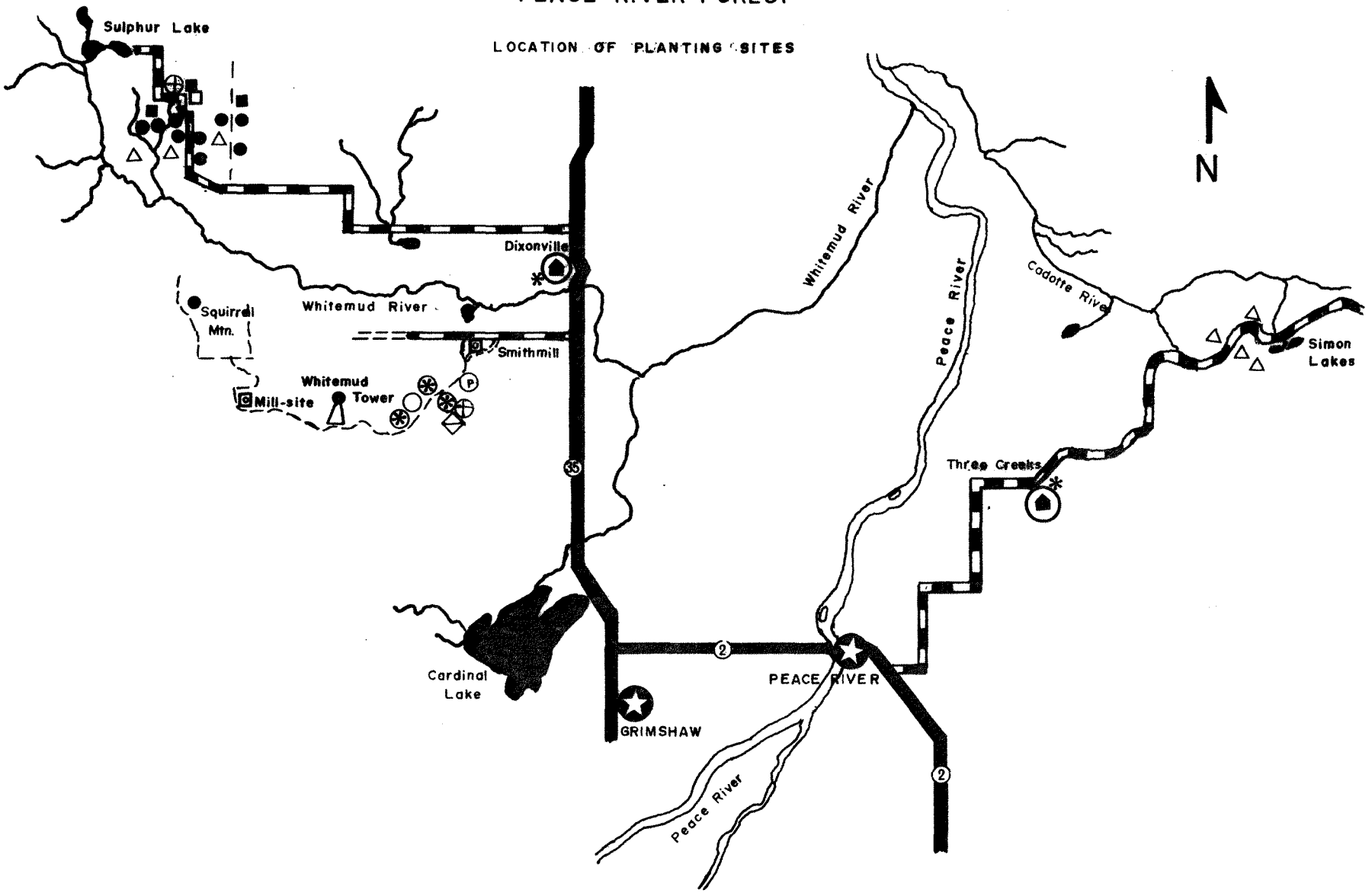
Plots: 5 x 8 chains
Total area: 28 acres

SCALE: 1" = 8 chains

P E A C E R I V E R F O R E S T

PEACE RIVER FOREST

LOCATION OF PLANTING SITES



Scale: 1" = 8 Miles

ARBORETUM

Location: Dixonville Ranger Station, Peace River Forest.

Planted: Spring 1968. Last date examined: September 11, 1969.

BLOCK 1

Species	Number of trees planted	Number of trees dead 1968	Number of trees dead 1969	Mortality (%) 1968	Mortality (%) 1969
Acer negundo	16	2	4	13	25
Acer saccharinum	10	-	1	-	10
Aesculus glabra	7	1	1	14	14
Alnus glutinosa	5	2	2	40	40
Cotoneaster acutifolia	2	1	1	50	50
Crataegus chocolate	18	1	2	6	11
Fraxinus pennsylvanica var. subintegerrima	26	1	4	4	15
Larix decidua	5	5	5	100	100
Larix leptolepis	8	8	8	100	100
Larix sibirica	13	13	13	100	100
Lonicera tatarica	12	4	4	33	33
Picea abies	10	10	5**	100	50
Pinus sylvestris	5	-	1	--	20
Pseudotsuga menziesii	19	8	4**	42	21
Quercus macrocarpa	18	3	10	17	56
Syringa amurensis japonica	25	3	7	12	28
Syringa josikaea	17	14	15	82	88
Tilia cordata	8	-	-	--	--
Ulmus americana	2	-	-	--	--
Ulmus pumila	21	-	6	--	29

BLOCK 2

Species	Number of trees planted	Number of trees dead 1968	Number of trees dead 1969	Mortality (%) 1968	Mortality (%) 1969
Abies concolor	15	6	6	40	40
Juniperus virginiana	9	9	9	100	100
Picea omorica	11	8	10	73	91
Picea pungens (Replanted in 1969)	19	3	-*	18	--*
Pinus cembra	11	5	3**	45	27
Pinus cembroides edulis	9	8	8	89	89
Pinus jeffreyi	5	4	4	80	80
Pinus mugo pumilio	20	19	15**	95	75
Pinus nigra austriaca	7	-	5	--	71
Pinus ponderosa	29	23	24	79	83
Pinus strobus	13	10	12	77	92
Salix pentandra	21	1	1	5	5
Thuja orientalis	5	5	5	100	100
Thuja plicata	19	19	19	100	100

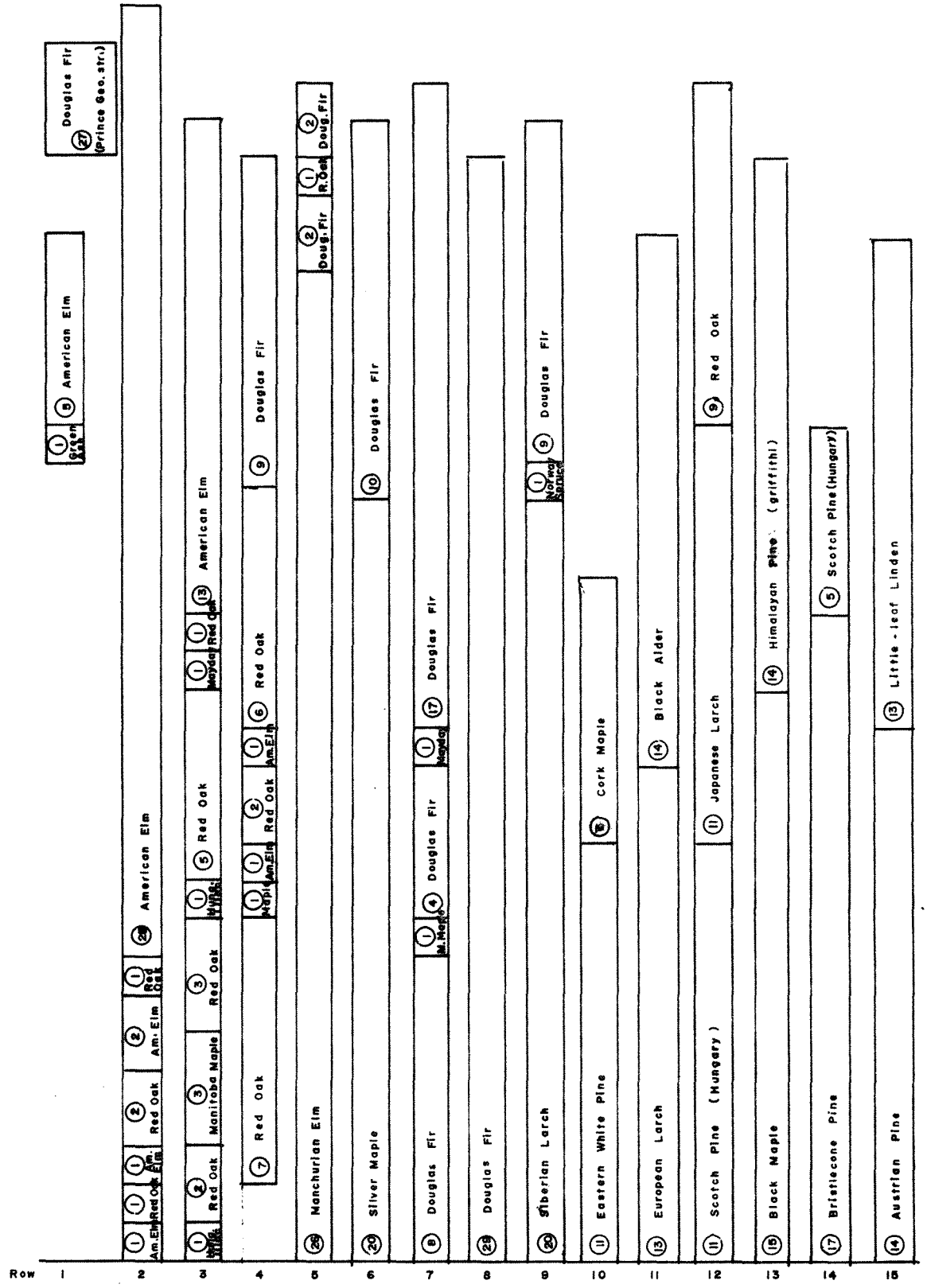
* Dead trees were replaced

** They looked dead in 1968 but were found living in 1969.

PEACE RIVER FOREST

THREE CREEKS RANGER STATION

ARBORETUM



Location: Three Creeks Ranger Station, Peace River Forest.

Planted: Spring 1967. Last date examined: September 11, 1969.

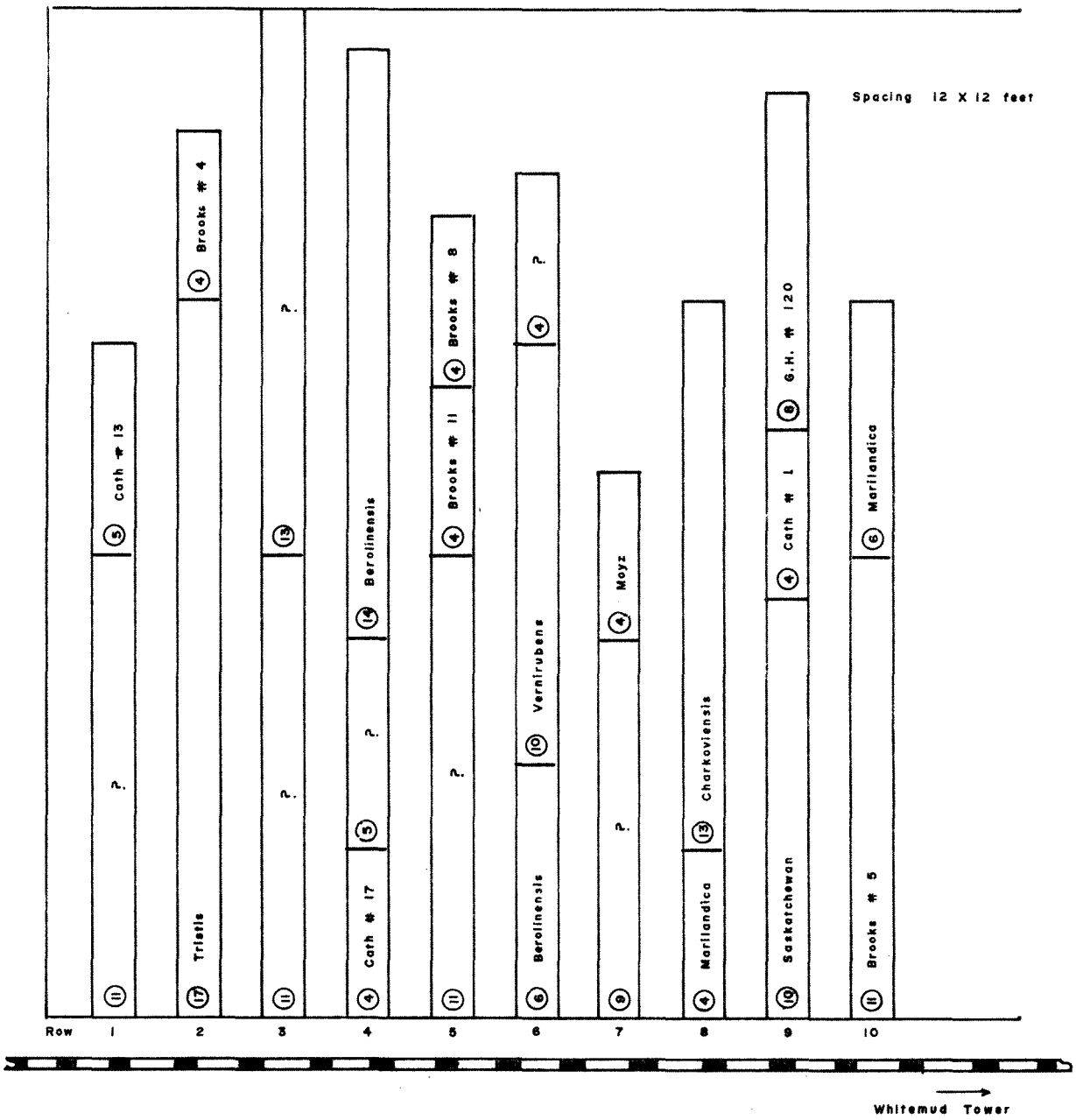
Species	Number of trees planted	Number of dead trees 1968	Number of dead trees 1969	Mortality (%) 1968	Mortality (%) 1969
Pseudotsuga menziesii (Prince George strain)	27	5	6	19	22
Ulmus americana	49	1	4	2	8
Quercus rubra	40	8	11	20	28
Pseudotsuga menziesii	91	30	25*	33	27
Acer negundo	6	1	1	17	17
Syringa josikaea	1	-	-	--	--
Prunus padus commutata	2	-	-	--	--
Ulmus pumila	26	3	2*	12	8
Acer saccharinum	20	1	3	5	15
Larix sibirica	20	13	13	65	65
Picea abies	1	-	1	--	100
Pinus strobus	11	4	4	36	36
Acer campestre	11	6	8	55	73
Larix decidua	13	9	9	69	69
Alnus glutinosa	14	2	6	14	43
Pinus sylvestris (Hungary)	16	9	10	56	63
Larix leptolepis	11	10	9*	91	82
Acer nigrum	15	3	3	20	20
Pinus griffithi	14	14	14	100	100
Pinus aristata	17	16	16	94	94
Pinus nigra	14	11	12	79	86
Tilia cordata	13	-	1	--	8

* They looked dead in 1968 but were found living in 1969.

PEACE RIVER FOREST

SMITHMILL

HYBRID POPLAR PLANTATION



EXOTIC PLANTATION

Location: Whitemud Tower Road., SmithMill, Peace River Forest.

Planted: Spring 1968. Date examined: August 10, 1969.

Replanted: Spring 1969.

Species	Number of trees planted	Number of trees dead		Mortality (%)	
		1968	1969	1968	1969
Colorado spruce	261	54	72	21	28
Scotch pine	290	243	129	84	44
White spruce	273	215	78	79	29
Lodgepole pine	283	261	115	92	41
Norway spruce	278	86	96	31	35
Siberian larch	247	247	--	100	--
European larch (1969 planting)	250	--	114	--	46

Dead trees were replaced in spring 1969.

CONTAINER PLANTING (cut-over area)

Location: Squirrel Mountain, Peace River Forest.

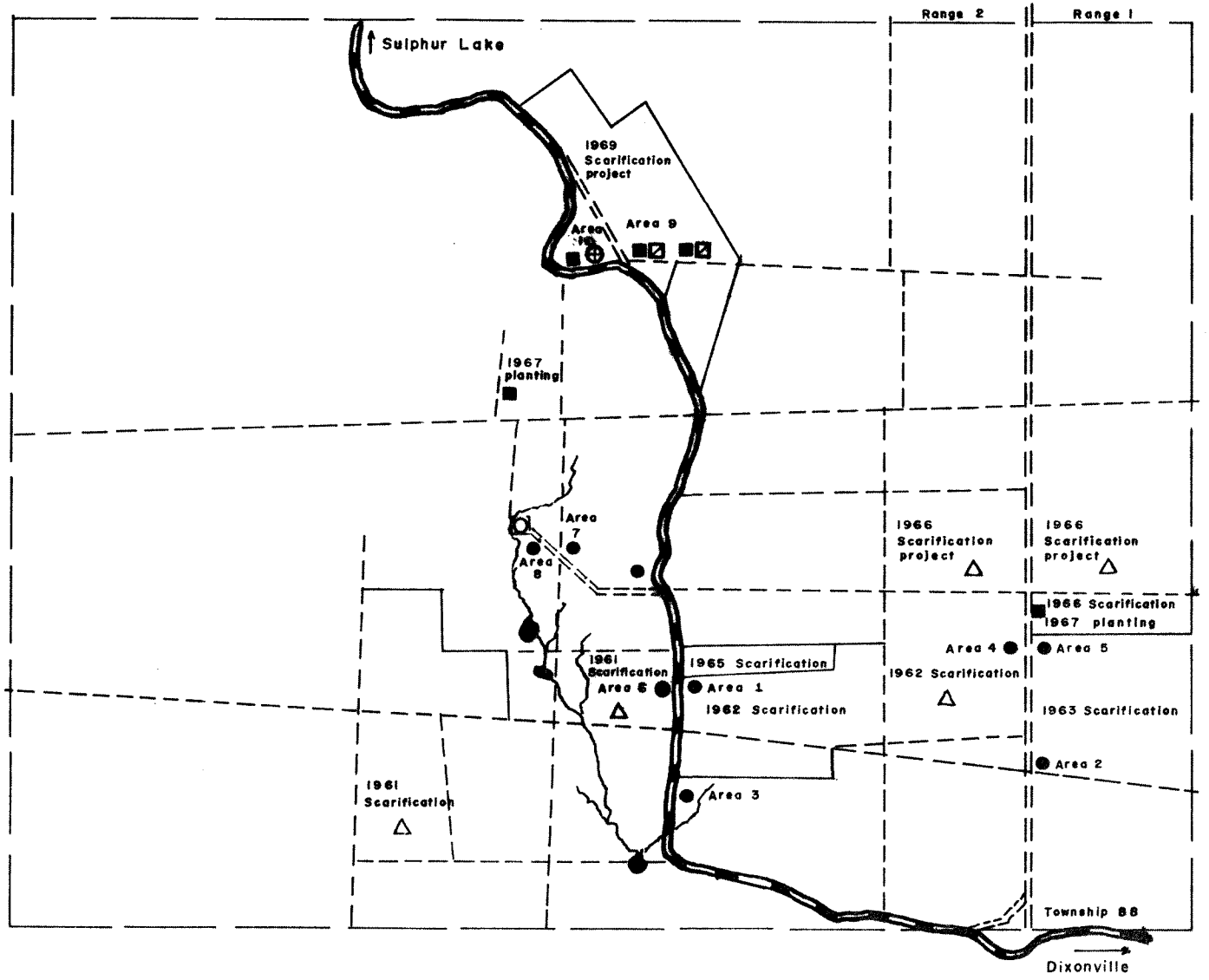
Area 1. Planted 1967. Last date examined: August 6, 1969.

Species	Container	Unscarified area						Scarified area					
		Number of samples	Mortality (%)			Average total height (inches)		Number of samples	Mortality (%)			Average total height (inches)	
			1967	1968	1969	1968	1969		1967	1968	1969	1968	1969
White spruce	Tube	39	5	33	38	1.0	1.5	292	9	22	28	1.1	1.9
Lodgepole pine	Tube	--	--	--	--	--	--	140	1	6	8	2.0	4.3

Spruce seedlings had 10% higher mortality on unscarified areas than on scarified areas. The mortality of lodgepole pine seedlings on scarified areas was considerably lower than the mortality of spruce seedlings. The average height-growth of pine seedlings was about three times that of spruce seedlings in 1969.

LOCATION OF PLANTING SITES

SULPHUR LAKE



Scale: 1" = 1 Mile

CONVENTIONAL PLANTING

Location: Oil Road, Sulphur Lake, Peace River Forest.

Planted: Spring 1967. Last date examined: August 7-8, 1969.

Unscarified area.

	Species	Number of samples	Mortality (%)			Average total height (inches)	
			1967	1968	1969	1968	1969
Open area	White spruce	200	4	37	44	3.7	4.9
Under aspen stand	White spruce	200	4	25	30	3.8	4.8

Mortality of spruce seedlings was lower under the aspen stand than in the open area. The height growth of seedlings was similar under both conditions.

CONVENTIONAL PLANTING (open area)

Location: Unnecessary Mountain, Sulphur Lake, Peace River Forest.

Scarified area. Planted 1967 spring. Last date examined: August 7, 1969.

Fertilizer: 28-8-4.

Species	Fertilized						Unfertilized					
	Number of samples	Mortality (%)			Average total height (inches)		Number of samples	Mortality (%)			Average total height (inches)	
		1967	1968	1969	1968	1969		1967	1968	1969	1968	1969
White spruce	126	25	40	40	6.0	8.4	174	8	21	24	7.1	7.7
Lodgepole pine	38	53	74	79	7.2	10.5	262	44	47	51	5.5	13.3

The mortality of unfertilized seedlings was lower for both species. Fertilizer application appeared to improve the height growth of spruce seedlings and depress the height growth of lodgepole pine seedlings.

CONTAINER PLANTING (under young aspen stand and open area)

Location: Sulphur Lake, Peace River Forest.

Area 1. Planted 1965. Last date examined: August 13, 1969.

Species	Container type	Unscarified area: Number of samples	Unscarified area: Mortality (%) 1966	1967	1968	1969	Unscarified area: Average total height (inches) 1968	1969	Scarified area: Number of samples	Scarified area: Mortality (%) 1966	1967	1968	1969	Scarified area: Average total height (inches) 1968	1969
BLOCK A - open area															
White spruce	New plastic	--	--	--	--	--	--	--	40	16	26	34	40	3.0	3.9
White spruce	Phenol	--	--	--	--	--	--	--	29	90	97	97	97	4.4	5.5
Lodgepole pine	New plastic	--	--	--	--	--	--	--	40	21	34	34	38	3.8	5.6
Lodgepole pine	Phenol	--	--	--	--	--	--	--	40	68	68	70	73	5.3	6.3
BLOCK B - under young aspen stand															
White spruce	New plastic	17	2	5	12	12	2.3	2.8	56	4	9	9	16	2.2	3.0
Lodgepole pine	New plastic	36	28	31	31	36	2.8	3.4	101	34	43	47	54	2.8	3.5

Block A Seedlings in the phenolformaldehyde containers showed higher mortality for both species than those growing in plastic containers. However, better height-growth was observed in the phenol than in new plastic containers for both species.

Block B Lower mortality was observed for seedlings on unscarified areas for both species. Height growth of seedlings was very similar on scarified and unscarified areas for both species.

CONTAINER PLANTING (under young aspen stand)

Location: Sulphur Lake, Peace River Forest.

Area 2. Planted 1965. Last date examined: August 12, 1969.

Species	Container	Unscarified area							Scarified						
		Number of samples	Mortality (%)				Average total height (inches)		Number of samples	Mortality (%)				Average total height (inches)	
			1966	1967	1968	1969	1968	1969		1966	1967	1968	1969	1968	1969
White spruce	New plastic	183	19	22	27	30	2.5	3.4	117	18	23	29	32	2.6	3.5
Lodgepole	New plastic	136	51	56	62	64	2.6	3.3	64	49	51	56	63	2.5	3.5

Pine seedlings had much higher mortality than spruce seedlings on both scarified and unscarified areas and height growth was similar on scarified and unscarified areas for both species.

CONTAINER PLANTING (under young aspen stand)

Location: Sulphur Lake, Peace River Forest.

Area 3. Planted 1966. Last date examined: August 12, 1969.

Species	Container	Unscarified area							Scarified area						
		Number of samples	Mortality (%)				Average total height (inches)		Number of samples	Mortality (%)				Average total height (inches)	
			1966	1967	1968	1969	1968	1969		1966	1967	1968	1969	1968	1969
White spruce	New plastic	99	17	23	30	37	2.3	3.1	101	35	40	47	49	2.3	3.2
Lodgepole pine	New plastic	75	17	23	45	55	2.4	3.1	125	18	23	29	38	2.6	3.4

Spruce seedlings had higher mortality on scarified areas than on unscarified areas. The opposite was found true for lodgepole pine. Height growth of both species was similar on scarified and unscarified areas, and there was no appreciable difference in total height between spruce and pine seedlings.

Both species in the acetate and phenol containers were not observed further owing to their high mortality.

CONTAINER PLANTING (under young aspen stand)

Location: Sulphur Lake, Peace River Forest.

Area 4. Planted 1966. Last date examined: August 12, 1969.

Species	Container	Unscarified area							Scarified area						
		Number of samples	Mortality (%)				Average total height (inches)		Number of samples	Mortality (%)				Average total height (inches)	
			1966	1967	1968	1969	1968	1969		1966	1967	1968	1969	1968	1969
White spruce	New plastic	137	8	25	41	58	1.9	2.5	63	6	25	40	44	1.8	2.4

Mortality of spruce seedlings was higher on unscarified than on scarified areas. Scarification did not influence the height growth of spruce seedlings.

The mortality observations were discontinued for seedlings growing in phenolformaldehyde and acetate containers because of total mortality.

CONTAINER PLANTING (under young aspen stand)

Location: Sulphur Lake, Peace River Forest.

Area 5. Planted 1966. Last date examined: August 12, 1969.

Species	Container	Unscarified area						Scarified area					
		Number of samples	Mortality (%)			Average total height (inches)		Number of samples	Mortality (%)			Average total height (inches)	
			1967	1968	1969	1968	1969		1967	1968	1969	1968	1969
Lodgepole pine	New plastic	171	17	52	59	1.9	2.3	29	27	43	55	1.8	2.3

The mortality of seedlings was slightly lower on scarified than on unscarified areas. Height growth was identical on both areas.

Seedlings in acetate and phenol containers were not observed further owing to mortality.

CONTAINER PLANTING (under young aspen stadn)

Location: Sulphur Lake, Peace River Forest.

Area 6. Planted 1965. Last date examined: August 8, 1969.

Species	Container	Unscarified area						Scarified area					
		Number of samples	Mortality (%)			Average total height (inches)		Number of samples	Mortality (%)			Average total height (inches)	
			1967	1968	1969	1968	1969		1967	1968	1969	1968	1969
Lodgepole pine	New plastic	60	23	25	30	2.8	3.4	40	13	18	30	3.0	3.4
White spruce	New plastic	68	10	12	19	2.5	3.1	32	9	13	19	2.5	3.1

Spruce seedlings had lower mortality than pine seedlings. No difference in mortality was found between seedlings of either species growing on scarified and unscarified areas.

Height growth was similar for both species on scarified and unscarified areas.

CONTAINER PLANTING (open area)

Location: Sulphur Lake, Peace River Forest (Oil Road).

Planted 1968 fall. Last date examined: August 13, 1969.

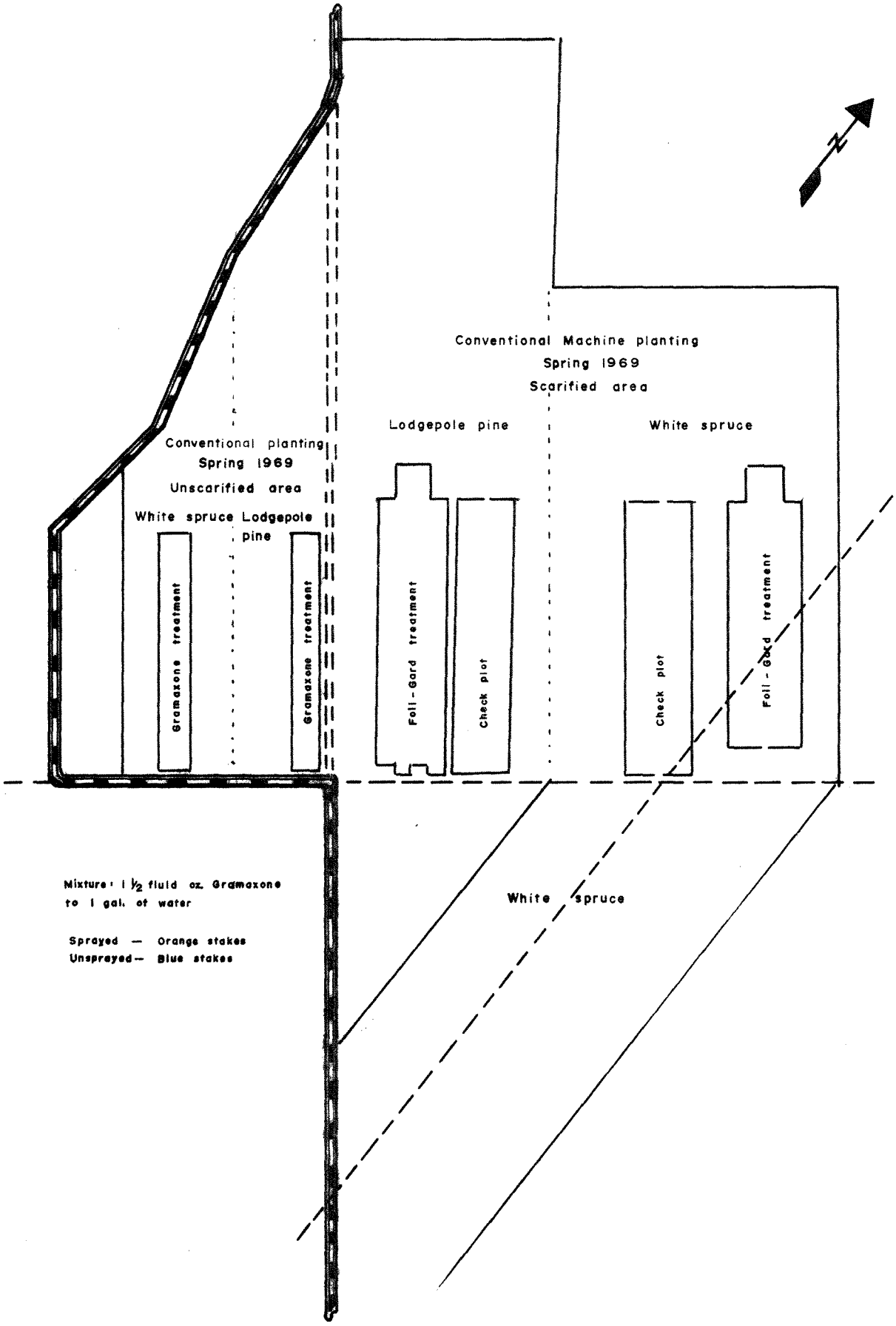
Scarified area.

Area	Species	Container	Number of samples	Mortality (%) 1969	Average total height (inches) 1969
7	White spruce	Tube	300	58	0.1
8	White spruce	Tube	200	55	0.1

Seedlings on both areas had similar mortality and had poor growth (seedlings were very small).

LOCATION OF PLANTING SITES

SULPHUR LAKE



CONVENTIONAL MACHINE PLANTING (under young aspen stand)

Location: Sulphur Lake, Peace River Forest.

Planted: June 1969. Last date examined: August 15, 1969.

Area 9.

Treatment	Species	Unscarified area			Scarified area		
		Number of samples	Mortality (%) 1969	1969 Average height (inches)	Number of samples	Mortality (%) 1969	1969 Average height (inches)
Foli-Gard	Lodgepole pine	101	3	7.3	299	2	7.0
Untreated	Lodgepole pine	102	30	7.5	298	18	7.0
Foli-Gard	White spruce	104	29	7.3	296	9	7.0
Untreated	White spruce	84	33	6.5	316	10	6.5

Pine seedlings treated with Foli-Gard had less mortality than untreated seedlings. Higher mortality was observed for untreated seedlings on the unscarified area than on scarified areas. Height growth was similar for treated and untreated seedlings regardless of whether the area was scarified or not.

Mortality for spruce was similar for treated and untreated seedlings. However, there was less mortality on scarified areas for both treated and untreated spruce seedlings.

CONVENTIONAL PLANTING (under young aspen stand)

Location: Sulphur Lake, Peace River Forest.

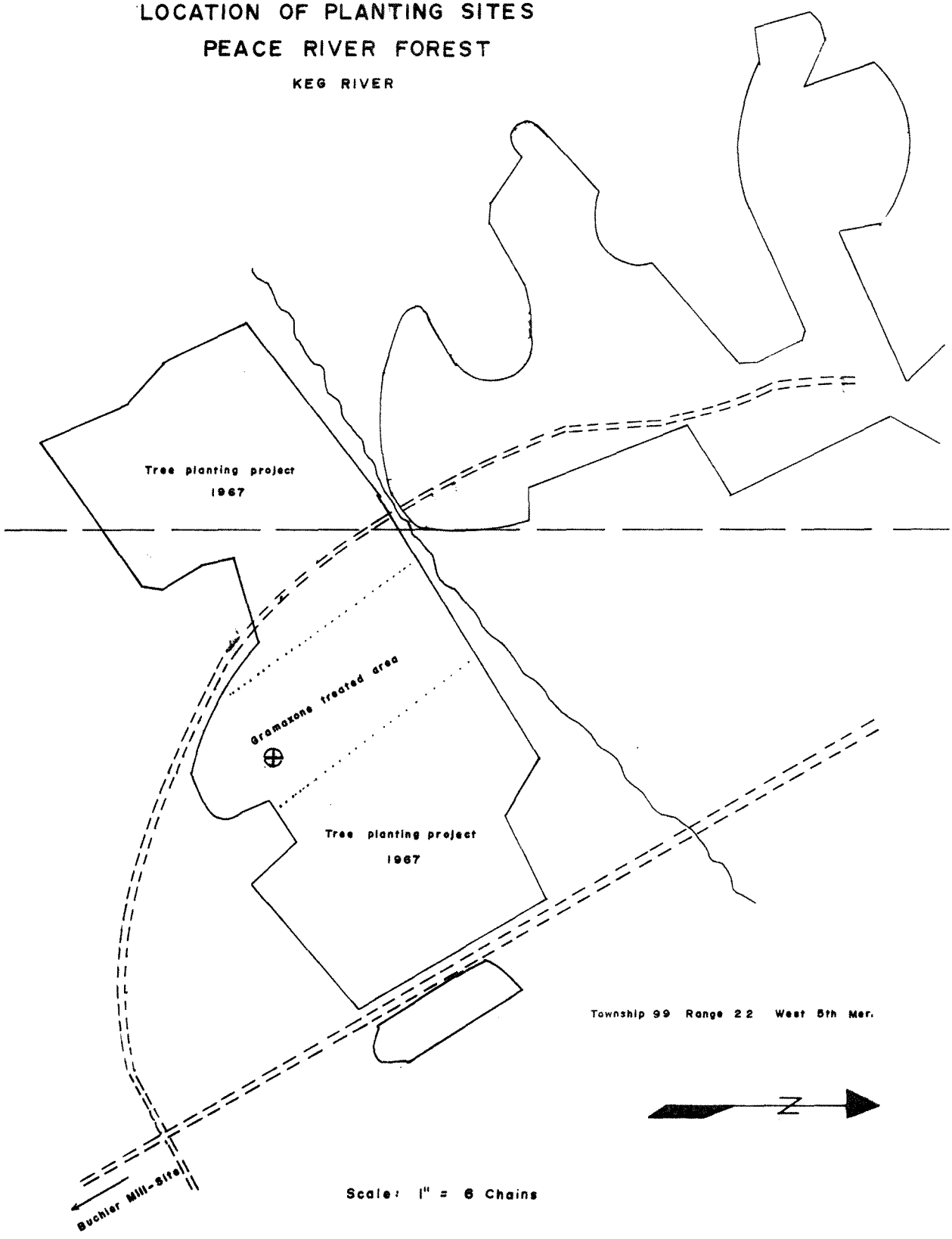
Planted: June 1969. Last date examined: August 13, 1969.

Area 10. Unscarified area.

Treatment	Species	Number of samples	Mortality (%) 1969	1969 Average height (inches)
Gramoxone	Lodgepole pine	200	16	6.2
Untreated	Lodgepole pine	200	14	7.9
Gramoxone	White spruce	200	34	5.3
Untreated	White spruce	200	44	5.3

Untreated lodgepole pine seedlings had slightly lower mortality and better height growth than treated seedlings. However, untreated spruce seedlings had 10% higher mortality than treated seedlings. Total height of spruce seedlings was identical regardless of herbicide treatment.

LOCATION OF PLANTING SITES
PEACE RIVER FOREST



CONVENTIONAL PLANTING (open area)

Location: Keg River, Peace River Forest.

Planted: June 1967. Last date examined: August 17, 1969.

Date of herbicide treatment: June 11, 1969.

Area: Buchier Mill Site. Scarified area

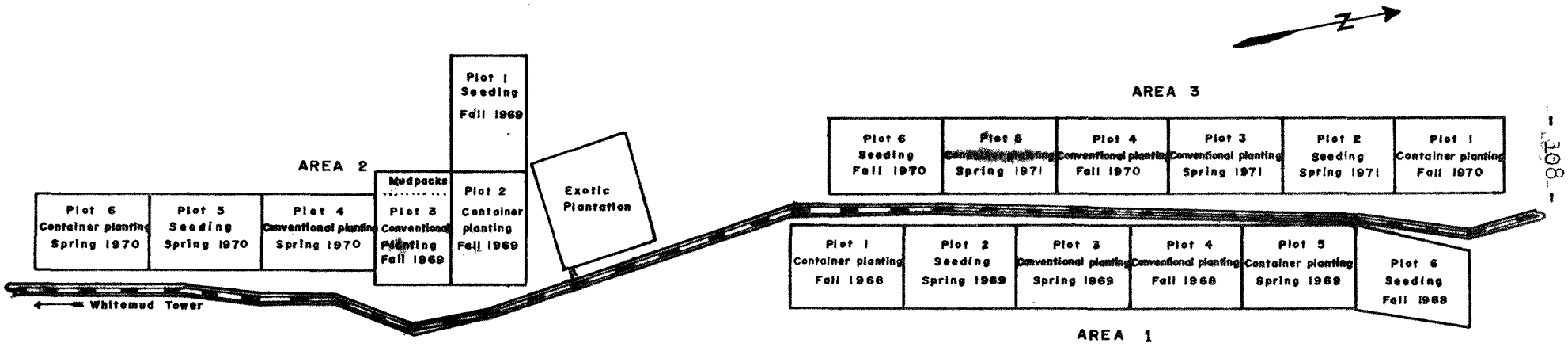
Treatment	Species	Number of samples	Mortality (%) 1969	1969 Average height (inches)
Gramoxone	White spruce	100	--	7.2
Untreated	White spruce	100	1	7.4

The purpose of this experiment was to find out the possible beneficial effect of herbicides on the height growth of spruce seedlings with a decrease in the vegetative cover.

CO-OPERATIVE REFORESTATION TRIAL

SMITHMILL - WHITEMUD TOWER ROAD

PEACE RIVER FOREST



Plots: 5 X 8 chains = 4 acres

Area: 24 acres

				Fall	Spring
Conventional	spruce	3+0	600/acre × 4 acres =	2400	2400
Containers	spruce		700/acre × 4 acres =	2800	2800
Seed	spruce		8 oz./acre × 4 acres =	32 oz.	32 oz.

CO-OPERATIVE REFORESTATION TRIAL (open area)

Location: Whitemud Tower Road, Peace River Forest.

Container planting. Plot #1. Planted 1968 fall.

Last date examined: August 9, 1969.

Scarified area.

Species	Container	Number of samples	Mortality (%) 1969	1969 Average total height (inches)
White spruce	Tube	400	15	0.3

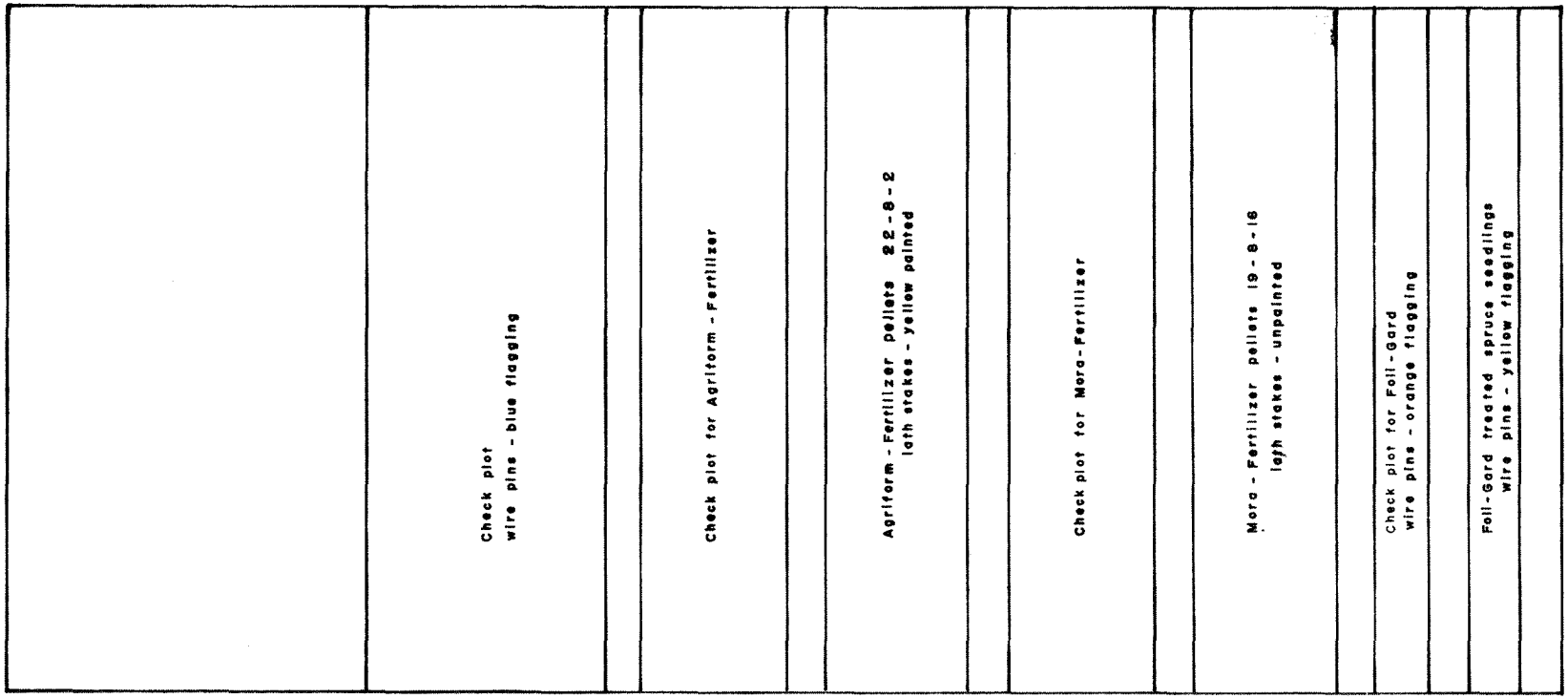
Seedlings had a good survival rate, but they were too small.

CO-OPERATIVE REFORESTATION TRIAL

AREA I - PLOT 3

SMITHMILL – WHITEMUD TOWER ROAD

PEACE RIVER FOREST



CO-OPERATIVE REFORESTATION TRIAL (open area)

Location: Whitemud Tower Road, Peace River Forest.

Conventional planting. Plot #3. Planted June 1969.

Last date examined: August 10, 1969.

Treatment	Species	Number of samples	Mortality (%) 1969	1969 Average total height (inches)
Foli-Gard	White spruce	100	15	3.7
Untreated	White spruce	100	19	3.8

Seedlings treated with Foli-Gard had slightly lower mortality than untreated seedlings. Total height of seedlings was similar for both treatments.

CO-OPERATIVE REFORESTATION TRIAL (open area)

Location: Whitemud Tower Road, Peace River Forest.

Conventional planting. Plot #3. Planted June 1969.

Last date examined: August 10, 1969.

Scarified area.

Treatment	Species	Number of samples	Mortality (%) 1969	1969 Average total height (inches)
Fertilizer pellets Mora-19-8-16	White spruce	300	22	3.7
Fertilizer pellets Agriform-22-8-2	White spruce	300	29	4.0
Check-unfertilized	White spruce	300	24	4.5

Spruce seedlings treated with Mora fertilizer had the lowest mortality and the smallest average total height.

Seedlings treated with Agriform pellets had the highest mortality. The unfertilized seedlings had the best average total-height.

CO-OPERATIVE REFORESTATION TRIAL (open area)

Location: Whitemud Tower Road, Peace River Forest.

Conventional planting. Plot #4. Planted 1968 fall.

Last date examined: August 9, 1969.

Scarified area.

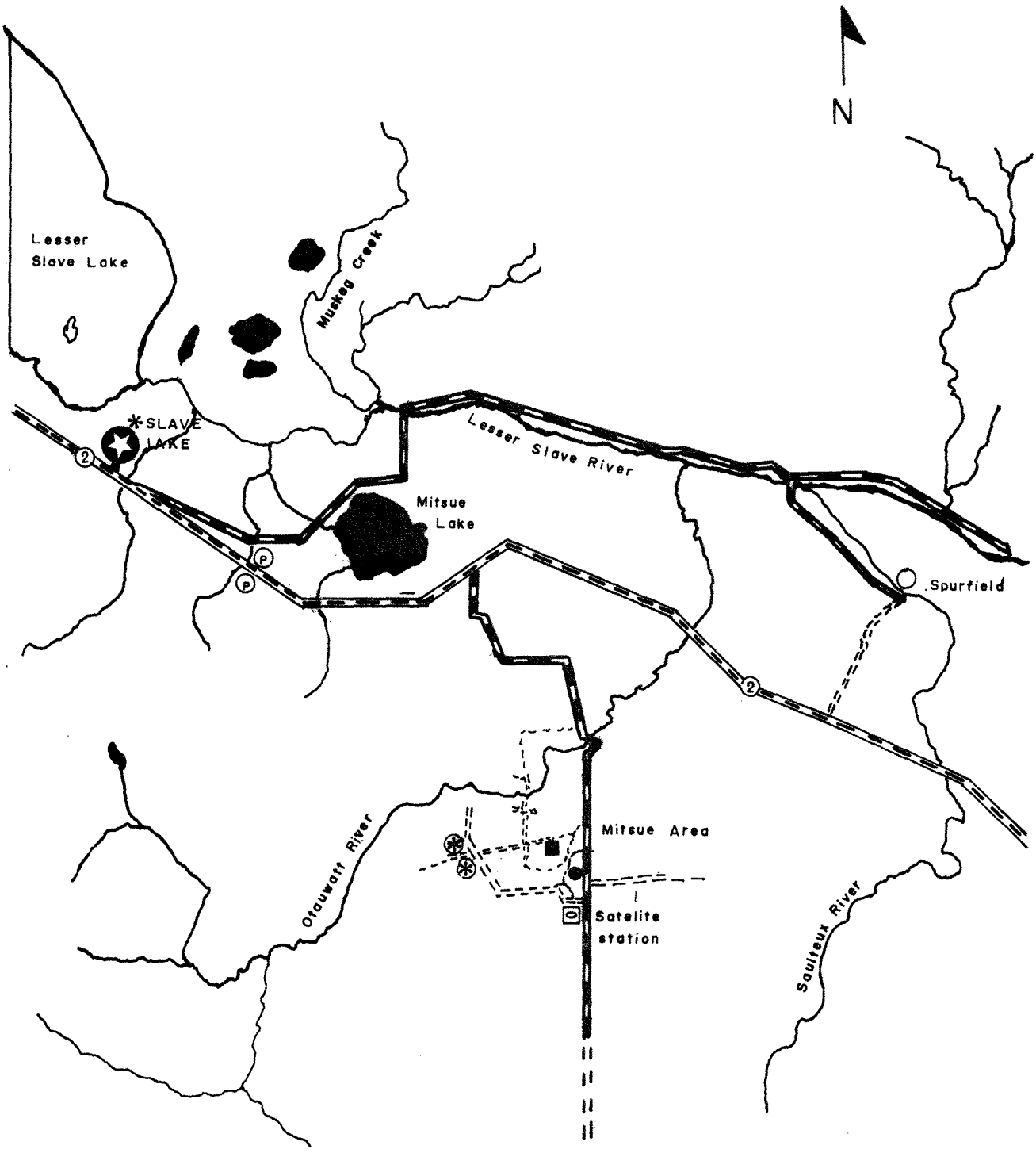
Treatment	Species	Number of samples	Mortality (%) 1969	1969 Average total height (inches)
Gramoxone	White spruce	300	14	5.1
Untreated	White spruce	300	15	5.5

Similar mortality and total height were observed for treated and untreated white spruce seedlings.

S L A V E L A K E F O R E S T

SLAVE LAKE FOREST

LOCATION OF PLANTING SITES



Scale: 1" = 4 Miles

EXOTIC PLANTATION

Location: Spurfield, Slave Lake Forest.

Planted: Spring 1968. Last date examined: July 15, 1969.

Species	Number of trees planted	Number of dead trees		Mortality (%)	
		1968	1969	1968	1969
Colorado spruce	320	25	48	8	15
Scotch pine	320	250	142	78	44
White spruce	320	63	30	20	9
Lodgepole pine	320	235	59	73	18
Norway spruce	320	72	104	23	33
Siberian larch	320	266	--	83	--
European larch	320	--	245	--	77

All dead seedlings were replaced in spring 1969. Siberian larch was not available and was substituted with European larch.

Again, high mortality was observed for European larch although there was only about two months between planting and tallying. Therefore, higher mortality will be expected in spring 1970 because most of the trees were in poor condition at the time of tallying.

ARBORETUM

Location: Alberta Forest Service, Slave Lake Forest.

Planted: Spring 1968. Last date examined: July 16, 1969.

1 Healthy trees
2 Dead leader
3 Dead leader and top branches
4 Bottom branches alive

Species	Number of trees planted	Condition of seedlings (%) 1	2	3	4	Number of dead trees	Mortality (%) 1969
Abies concolor	18	--	5.5	5.5	17	13	72
Larix decidua	19	--	5	--	--	18	95
Larix sibirica	7	29	--	--	--	5	71
Picea abies	25	--	60	12	4	6	24
Picea omorica	7	--	--	--	--	7	100
Picea pungens	22	--	41	36	18	1	5
Pinus cembra	12	33	25	--	--	5	42
Pinus cembroides edulis	9	--	--	--	--	9	100
Pinus jeffreyi	5	--	--	--	--	5	100
Pinus mugo pumilio	15	6	7	7	--	12	80
Pinus nigra austriaca	21	--	5	5	14	16	76
Pinus rigida	9	--	--	--	--	9	100
Pinus ponderosa	18	--	--	6	--	17	94
Pinus strobus	17	--	--	--	--	17	100
Pinus sylvestris	21	--	--	9	24	14	67
Pseudotsuga menziesii	22	--	--	23	45	7	32

ARBORETUM

Location: Alberta Forest Service, Slave Lake Forest.

Planted: Spring 1968. Last date examined: July 16, 1969.

Frost hardiness
1 No frost damage
2 Frozen tips
3 Frozen to snow level
4 Frozen to ground level

Species	Number of trees planted	Frost hardiness (%) 1	2	3	4	Number of dead trees	Mortality (%) 1969
Acer negundo	37	59	16	--	3	8	22
Acer saccharinum	31 *1	--	7	43	33	5	17
Aeculus glabra	10	--	--	10	20	7	70
Alnus glutinosa	9	--	--	--	44	5	56
Cotoneaster acutifolia	6 *5	100	--	--	--	-	--
Crataegus chocolate	21	90	10	--	--	-	--
Fraxinus pennsylvanica lanceolata	27	30	26	22	7	4	15
Lonicera tatarica	43	56	32	5	--	3	7
Prunus padus	35	32	32	3	14	7	20
Prunus padus commutata	6	83	17	--	--	-	--
Quercus macrocarpa	30	7	43	30	7	4	13
Ribes diacanthum	25	28	16	12	--	11	44
Salix pentandra	27	11	22	15	44	2	8
Syringa amurensis japonica	28	--	--	--	61	12	39
Syringa josikaea	8	--	--	12	63	2	25
Syringa prestoniae	8	13	13	50	--	2	25
Syringa villosa	24	--	33	13	25	7	29
Tilia cordata	11	--	9	--	82	1	9
Ulmus americana	10	90	--	--	--	1	10
Ulmus pumila	53 *3	48	20	8	--	12	24

*1, 3, 5 - used for landscaping.

ARBORETUM

Location: Alberta Forest Service, Slave Lake Forest

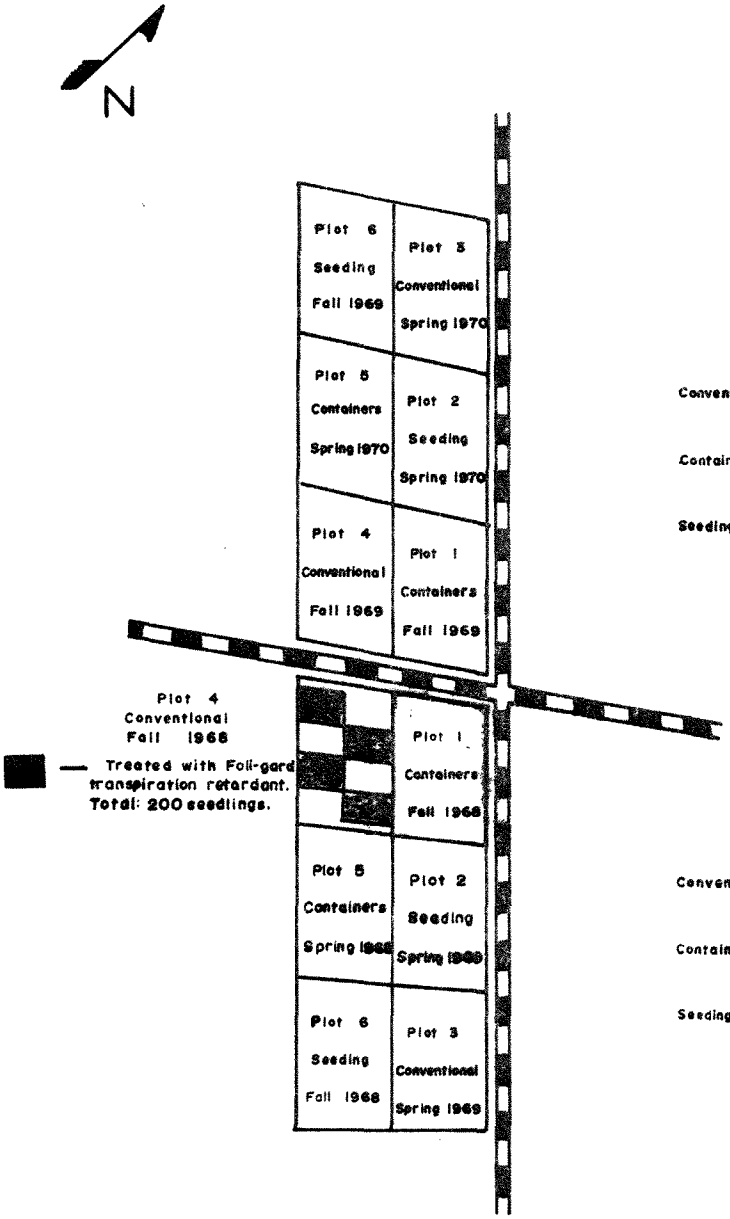
Planted: Spring 1969. Last date examined: June 16, 1969

Frost hardiness
1 No frost damage
2 Frozen tips
3 Frozen to snow level
4 Frozen to ground level

Species	Number of trees planted	Frost hardiness (%) 1	2	3	4	Number of dead trees	Mortality (%) 1969
Acer negundo	26	27	15	27	31	-	-
Fraxinus pennsylvanica lanceolata	27	89	4	--	--	2	7
Populus Brooks #1	29	55	11	17	7	3	10
Populus Brooks #6	31	22	10	10	52	2	6
Prunus padus commutata	32	41	22	15	19	1	3
Quercus macrocarpa	32	53	19	9	3	5	16
Salix (China Willow)	31	23	39	23	16	-	-
Salix pentandra	7	--	71	--	29	-	-
Picea pungens	32	81	13	6	--	-	-

CO-OPERATIVE REFORESTATION TRIAL

MITSUE AREA, SLAVE LAKE FOREST



BLOCK 2

			Fall 1969	Spring 1970
Conventional	spruce	600/acre 4 acres	2400	2400
Containers	spruce	700/acre 4 acres	2800	2800
Seeding	spruce	8 oz./acre 4 acres	32 oz.	32 oz.

Plots: 5 x 8 chains
Total area: 24 acres.

BLOCK 1

			Fall 1968	Spring 1969
Conventional	spruce	600/acre 4 acres	2400	2400
Container	spruce	700/acre 4 acres	2800	2800
Seeding	spruce	8 oz./acre 4 acres	32 oz.	32 oz.

Plots: 5 x 8 chains
Total area: 24 acres

CO-OPERATIVE REFORESTATION TRIAL (under old aspen)

Location: Mitsue area, Slave Lake Forest.

Container planting. Plot #1. Planted: Fall 1968.

Last date examined: July 13, 1969. Scarified area.

Species	Container type	Number of samples	Mortality (%) 1969	Average total height (inches) 1969
White spruce	Tube	400	10	0.6

Seedlings showed good survival rate but they were too small.

CO-OPERATIVE REFORESTATION TRIAL (under old aspen)

Location: Mitsue area, Slave Lake Forest.

Conventional planting. Plot #3. Planted: Spring 1969.

Last date examined: July 14, 1969. Scarified area.

Species	Number of samples	Mortality (%) 1969	1969 Average total height (inches)
White spruce	400	2	5.0

Seedlings showed good survival rate and height growth.

CO-OPERATIVE REFORESTATION TRIAL (under old aspen)

Location: Mitsue area, Slave Lake Forest.

Conventional planting. Plot #4. Planted: Fall 1968.

Last date examined: July 13, 1969. Scarified area.

Treatment	Species	Number of samples	Mortality (%) 1969	1969 Average total height (inches)
Foli-Gard	White spruce	200	18	3.8
Untreated	White spruce	400	12	3.5

Seedlings treated with Foli-Gard had slightly higher mortality than untreated seedlings. Height growth of seedlings was similar for both treatments.

CONVENTIONAL MACHINE PLANTING (cut-over area)

Location: Mitsue area, Slave Lake Forest.

Area 2. Planted: Spring 1968. Last date examined: June 12, 1969

Species	Unscarified area					Scarified area				
	Number of samples	Mortality (%) 1968	Mortality (%) 1969	Average total height (inches) 1968	Average total height (inches) 1969	Number of samples	Mortality (%) 1968	Mortality (%) 1969	Average total height (inches) 1968	Average total height (inches) 1969
White spruce	62	40	71	6.2	6.7	338	33	68	5.3	6.3

Mortality and height growth of spruce seedlings were similar on both scarified and unscarified areas. The mortality increased considerably in the second year (31% on unscarified areas and 35% on scarified areas).