

Revegetation Studies in the Peace River Coal Block, 1978



BCEMPR
PAPER
1979-3 EMPR
c. 2
MAI

Province of
British Columbia

Ministry of
Energy, Mines and
Petroleum Resources

PAPER 1979-3

J.C. ERRINGTON
INSPECTION AND
ENGINEERING DIVISION



0005037595

Canadian Cataloguing in Publication Data

REVEGETATION STUDIES

IN THE

PEACE RIVER COAL BLOCK,

1978

1. Revegetation - Peace River district. 2. Reclamation of land - Peace River district. 3. Coal mines and mining - Environmental aspects - Peace River district. 4. Grasses - Peace River district. 5. Legumes - Peace River district. I. British Columbia. Mineral Resources Branch. Inspection and Engineering Division. II. Title. III. Series: British Columbia. Ministry of Energy, Mines and Petroleum Resources. Paper - Ministry of Energy, Mines and Petroleum Resources; 1979-3.

2602.30377 631.6'09711 C79-002163-6

Prepared by

J. C. Errington

British Columbia Ministry of Energy, Mines and Petroleum Resources

Inspection and Engineering Division

525 Superior Street

Victoria, British Columbia

Canadian Cataloguing in Publication Data

Errington, J.C., 1946-

Revegetation studies in the Peace River coal
block, 1978.

(Paper - Ministry of Energy, Mines and Petroleum
Resources ; 1979-3)

ISBN 0-7719-8214-3

1. Revegetation - Peace River district. 2.
Reclamation of land - Peace River district. 3.
Coal mines and mining - Environmental aspects -
Peace River district. 4. Grasses - Peace River
district. 5. Legumes - Peace River district. I.
British Columbia. Mineral Resources Branch. In-
spection and Engineering Division. II. Title.
III. Series: British Columbia. Ministry of Energy,
Mines and Petroleum Resources. Paper - Ministry of
Energy, Mines and Petroleum Resources ; 1979-3.

S605.2C3E77 631.6'097111 C79-092162-6

TABLE OF CONTENTS

	Page
LIST OF FIGURES	5
LIST OF APPENDICES.	7
INTRODUCTION.	9
METHODS	11
Alpine test plots - 1976.	11
Test plots established 1977 and 1978.	11
Layout of general species trials.	14
Layout for trials testing the use of coated seed.	14
Layout for trials testing seeding rates	14
Layout for trials testing the use of fertilizers.	14
Evaluation of plots	15
RESULTS AND DISCUSSION.	17
Alpine test plots - 1976.	17
General species trials - 1977	17
Low elevation sites	17
Alpine sites.	21
Coated seed	24
Seeding rates	24
Evaluation of fertilizer constituents	27
CONCLUSIONS	31
APPENDICES.	33

LIST OF FIGURES

Figure	Description
1.	Location of the Peace River Coal Block.
2.	Location of alpine test plots, 1976.
3.	Location of test plots established 1977 and 1978.
4.	First and second year growth response (% cover) of eighteen grasses to four fertilizer treatments at the low elevation site (site 77-1).
5.	First and second year growth response (% cover) of nine legumes to four fertilizer treatments at the low elevation site (site 77-1).
6.	Second year growth (% cover) of two species' mixes at four fertilizer rates at the low elevation site (site 77-1).
7.	Second year growth (% cover) of eighteen grasses at four fertilizer rates in the spring seeded alpine sites (sites 77-2 and 77-3), and first year growth of the fall seeded alpine site (site 77-4).
8.	Second year growth (% cover) of nine legumes at four fertilizer rates in the spring seeded alpine sites (sites 77-2 and 77-3), and first year growth of the fall seeded alpine site (site 77-4).
9.	Growth (% cover) of two seed mixes at four fertilizer rates in the alpine sites 77-2, 77-3 and 77-4.
10.	Comparison of the average growth (% cover) between fertilized and unfertilized coated grass and legume seed, and fertilized and unfertilized normal seed.
11.	Effect of seeding rate on the first season's growth (% cover) of seed mix B.

LIST OF APPENDICES

Appendix

- A Plot layout to test selected species in the Peace River Coal Block, Ministry of Energy, Mines and Petroleum Resources, test plot 1, 1976.
- B Plot layout to test selected species in the Peace River Coal Block, Ministry of Energy, Mines and Petroleum Resources, test plot 2, 1976.
- C Description of sites used for test plots, Peace River Coal Block, Ministry of Energy, Mines and Petroleum Resources, 1977 and 1978.
- D List of agronomic species tested in plot trials, Peace River Coal Block, 1977 and 1978.
- E Layout I - for general species trials, Peace River Coal Block, Ministry of Energy, Mines and Petroleum Resources.
- F Layout II - trials testing the use of coated seed, Peace River Coal Block, Ministry of Energy, Mines and Petroleum Resources.
- G Layout III - trials testing seeding rates, Peace River Coal Block, Ministry of Energy, Mines and Petroleum Resources, 1977 and 1978.
- H Layout IV - trials testing the use of fertilizers, Peace River Coal Block, Ministry of Energy, Mines and Petroleum Resources, 1977 and 1978.
- I Sketch maps of Ministry of Energy, Mines and Petroleum Resources test plots.
- J Growth on August 18, 1978 of species seeded at site 76-1. Growth is given as a percentage of line covered by species/average height (cm).
- K First-year growth (% cover) of general species trials seeded during the spring of 1977, and evaluated August and September, 1977.
- L Performance of grasses in general species trials, testing four fertilizer rates, evaluated August 1978.

LIST OF APPENDICES (Continued)

Appendix

- M Performance of legumes in general species trials testing four fertilizer rates, evaluated August 1978.
- N Performance of grass and legume species in two species mixes and four fertilizer rates, general species trials, evaluated August 1978.
- O Performance of grass and legume species, coated seed trials, evaluated August 1978.
- P Performance of grasses and legumes in trials testing five seeding rates, evaluated August 1978.
- Q Performance of grasses and legumes in trials testing fertilizer constituents, evaluated August 1978.
- R Chemical analysis of selected soil properties, test plot sites, 1977 and 1978.

INTRODUCTION

The Peace River (Northeast) Coal Block is located in the Rocky Mountain foothills, extending a distance of 240 kilometres from Williston Lake to the Alberta border (Figure 1). This area has received extensive exploration activity over the last few years, with a promise of further development in the future. In general, exploration work has taken place in high elevation alpine and subalpine regions where revegetation is difficult and disturbances are highly visible.

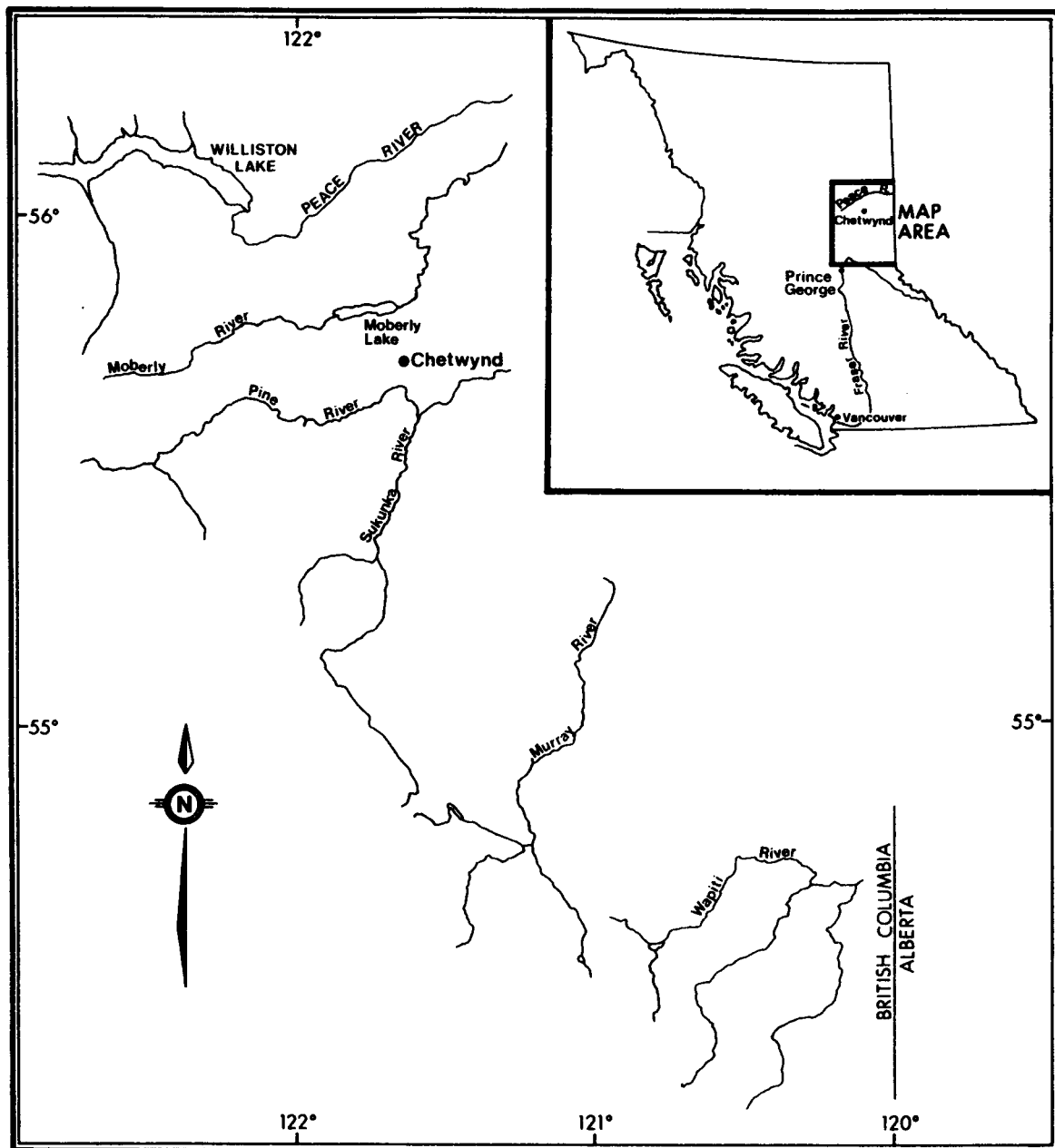
Under Section 8 of the Coal Mines Regulation Act it is the responsibility of the Ministry of Energy, Mines and Petroleum Resources to control reclamation of exploration disturbances. Part of these duties have involved prescribing methods of revegetation. In the Peace River Coal Block it became rapidly apparent that the standard forestry mix applied without fertilizer was not adequate to revegetate disturbances above the treeline. During 1976, 1977 and 1978 a series of test plots were established to allow recommendations to be made on the basis of sound data.

The objectives of these test plots were:

- a) To test species germination, growth and survival under a variety of conditions.
- b) To test fertilizer requirements.
- c) To test the effect of different seeding rates.
- d) To test the use of seed coated with micronutrients.
- e) To test the difference between spring and fall seeding.

FIGURE 1

LOCATION OF THE PEACE RIVER COAL BLOCK



METHODS

Test plots were established during 1976, 1977 and 1978.

ALPINE TEST PLOTS - 1976

The 1976 test plots were established on July 5 and 19 and were laid out in rows in hand-cleared alpine soils. Species and varieties were supplied by Dr. Pringle at Beaverlodge. Site 76-1 was located on Bullmoose Mountain and site 76-2 was located on Mount Gorman near Saxon (Figure 2). The species and layout sequence are presented in Appendices A and B.

The growth of these plots was assessed in late 1976 but, with the exception of a visit in the spring of 1977, early autumn snowfall prevented their assessment during 1977. Site 76-1 was evaluated during August 1978.

TEST PLOTS ESTABLISHED 1977 and 1978

During the spring and fall of 1977 and the spring of 1978, trials to test the performance of agronomic species were set up on disturbances resulting from exploration activity. There were four experimental layouts spread out over eight sites (Figure 3). A description of these eight sites is summarized in Appendix C.

Plot boundaries were laid out with twine and the corners were marked with 15 cm galvanized nails and flagging tape. Representative soils were collected and sent to the Soils Testing Laboratory, Ministry of Agriculture, Kelowna. Legumes were inoculated prior to seeding. All plots were raked, seeded and fertilized, and lightly re-raked. Species used in these trials are listed in Appendix D.

FIGURE 2

LOCATION OF ALPINE TEST PLOTS, 1976

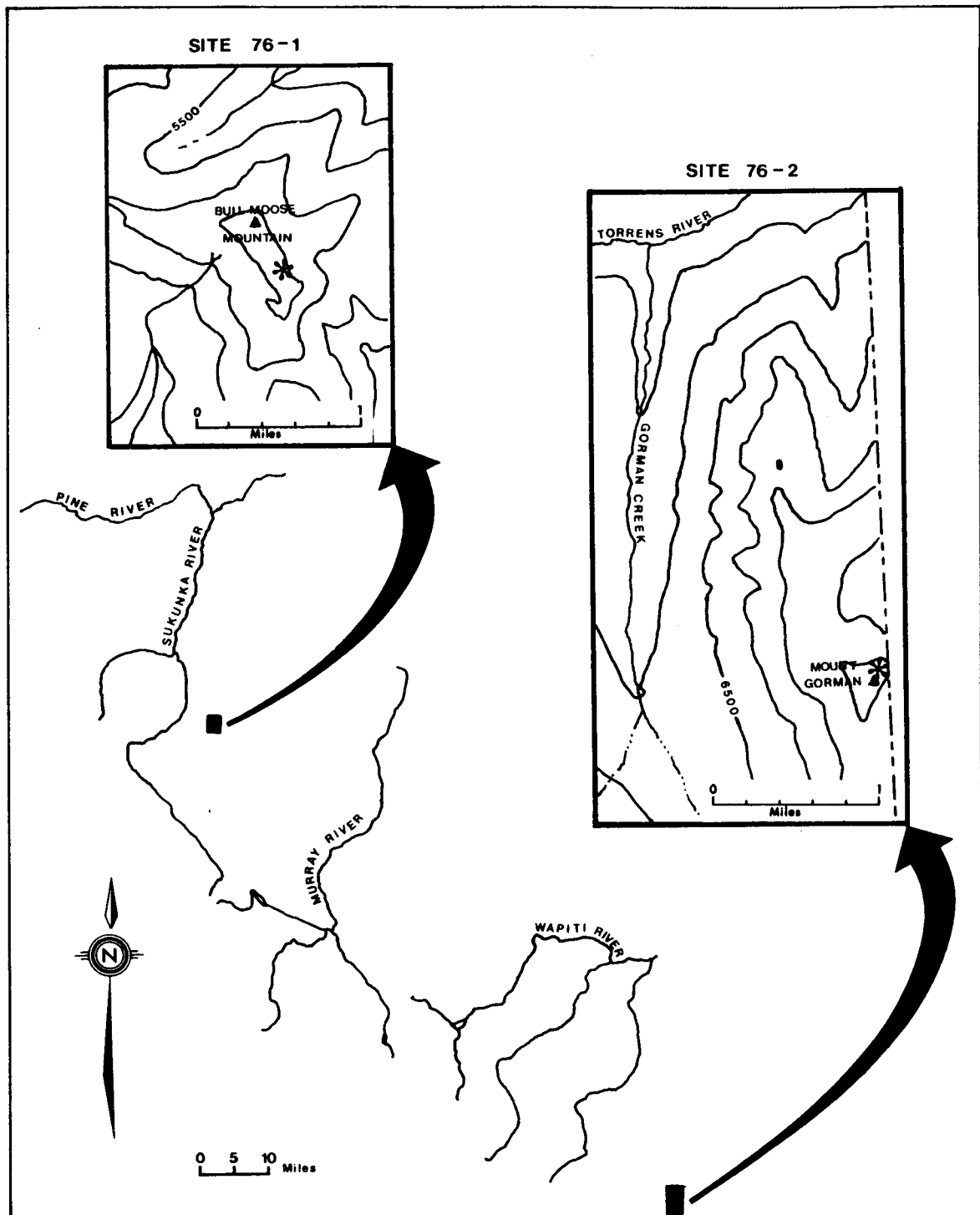
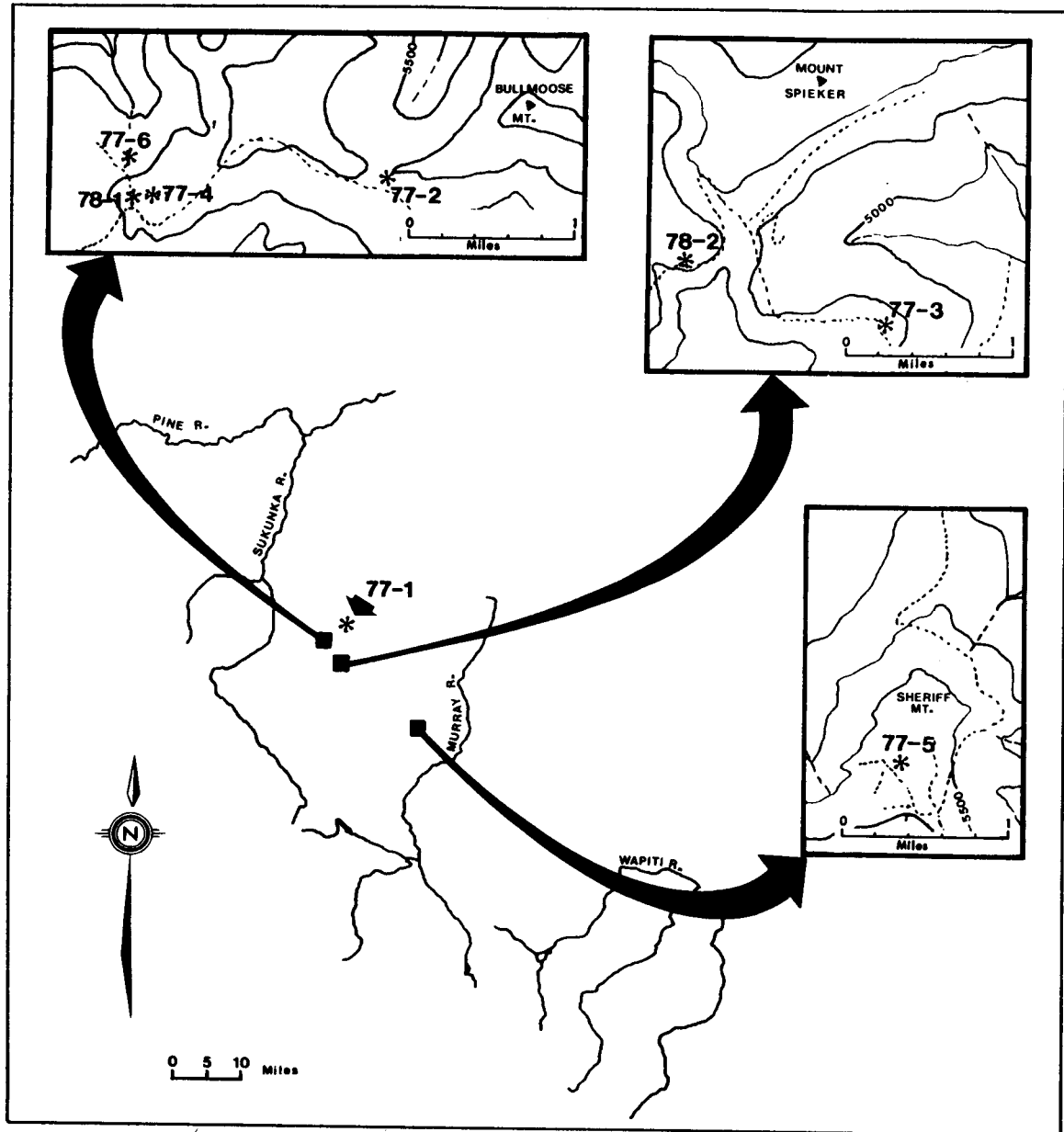


FIGURE 3

LOCATION OF TEST PLOTS ESTABLISHED 1977 AND 1978



Layout for general species trials

This layout (Layout I - Appendix E) was designed to test 27 agronomic species of grasses and legumes as well as two seed mixes. Four sets of this layout were established during 1977 - three in the alpine and one at lower elevation. One alpine set was seeded in September and the others in early July.

Layout for trials testing the use of coated seed

This layout (Layout II - Appendix F) was designed to test if grass seed pre-coated with micronutrients, and legume seed coated with micronutrients and nitrogen-fixing bacteria perform any better than normal seed in the high subalpine to alpine. This layout was replicated three times in September 1977 and twice in June 1978. All sites were in the high sub-alpine to alpine.

Layout for trials testing seeding rates

This layout (Layout III - Appendix G) was replicated three times in September, 1977 and twice more in June, 1978. All sites were high sub-alpine to alpine.

Layout for trials testing the use of fertilizers

This layout (Layout IV - Appendix H) was replicated three times in September, 1977 and twice in September, 1978. All sites were high sub-alpine to alpine.

Sketch maps of all sites are presented in Appendix I.

EVALUATION OF PLOTS

Sites were evaluated during 1976 and 1977 (Inspection and Engineering Division, Ministry of Energy, Mines and Petroleum Resources Paper, 1978-6.)

During August 1978 all sites (except site 76-2 which was inaccessible) were assessed. Species within each plot were evaluated for per cent cover, per cent seed heads and height. Species vigour was assessed according to the following scale:

<u>Class</u>	<u>Description</u>
0	Plants dead
1	Very short for species; extreme chlorosis or necrosis; extreme nutrient deficiency.
2	Less than average height; moderate chlorosis; slight nutrient deficiency.
3	Average height for species; normal colour.
4	Large for species; extremely healthy and vigorous.

Plots were also assessed for the degree of erosion according to: per cent of plot eroded, number of erosion channels and the average depth of erosion channels.

RESULTS AND DISCUSSION

ALPINE TEST PLOTS - 1976

Site 76-1 was assessed in August 1978 (Appendix J). Only seven of the original 23 species were still surviving. Growth of three of these (creeping red fescue - Boreal, chewings fescue - Oasis, Kentucky bluegrass - Park) was poor and growth of the remaining four (reed canarygrass - Castor, Colonial bentgrass - Exeter, timothy - Climax, Russian wild ryegrass - Sawhi) was very poor.

GENERAL SPECIES TRIALS - 1977

Low elevation site

The lower elevation site (site 77-1) established during the spring of 1977, generally exhibited excellent growth (Appendices K, L, M and N). All eighteen grass species grew to some extent and growth generally was improved with an increased application of fertilizer (Figure 4). Growth the second year (1978) was generally better than the first season (1977). Adequate growth (greater than 40% cover for at least one fertilizer treatment) occurred for all species except pubescent wheatgrass, tracentia bentgrass, crested wheatgrass and Russian wild ryegrass.

All nine legumes that were tested survived and grew to some extent. Second year growth of cereus alfalfa and sweet clover was excellent for all fertilizer treatments (Figure 5). Red clover, alsike clover, drylander alfalfa and white clover growth was good, especially at the higher fertilizer rates. Sainfoin growth was moderate at higher fertilizer applications. Cicer milkvetch and birdsfoot trefoil grew poorly at all fertilizer rates.

Both species mixes performed well at all fertilizer rates, although the response of individual species differed greatly (Figure 6). Increased

FIGURE 4

FIRST AND SECOND YEAR GROWTH RESPONSE (% COVER) OF EIGHTEEN
GRASSES TO FOUR FERTILIZER TREATMENTS AT THE
LOW ELEVATION SITE (SITE 77-1)

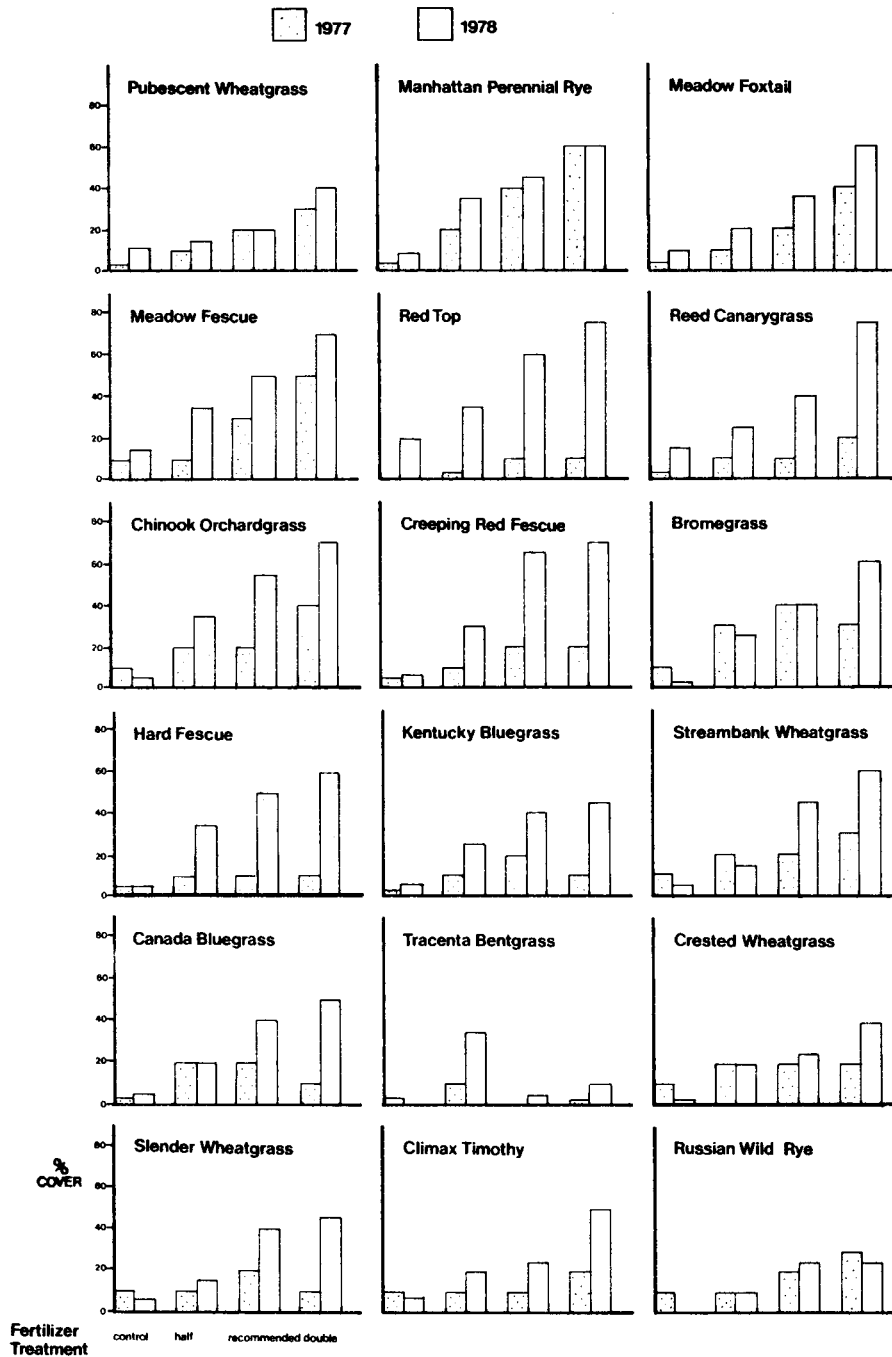


FIGURE 5
FIRST AND SECOND YEAR GROWTH RESPONSE (% COVER) OF NINE LEGUMES TO FOUR
FERTILIZER TREATMENTS AT THE LOW ELEVATION SITE (SITE 77-1)

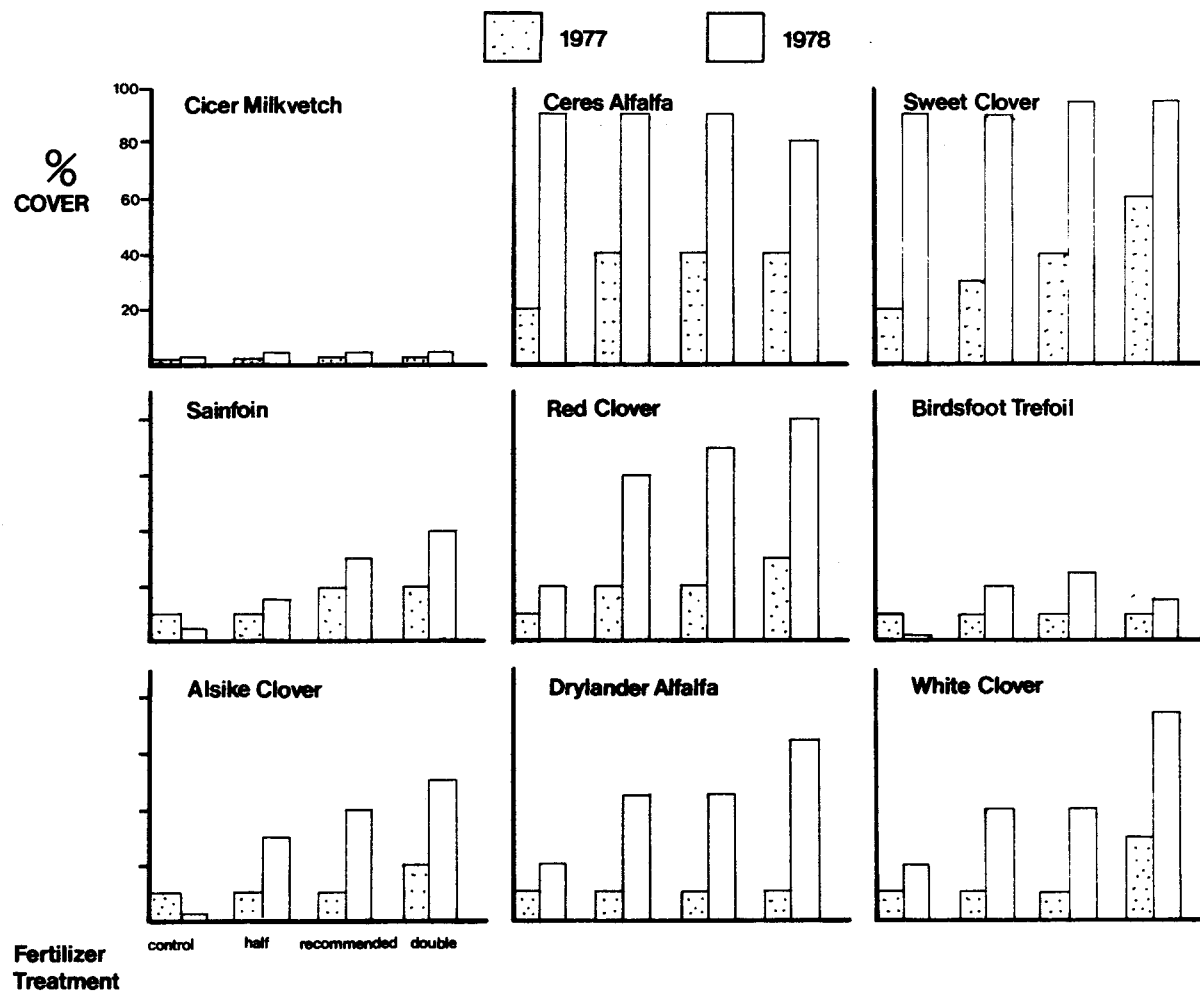
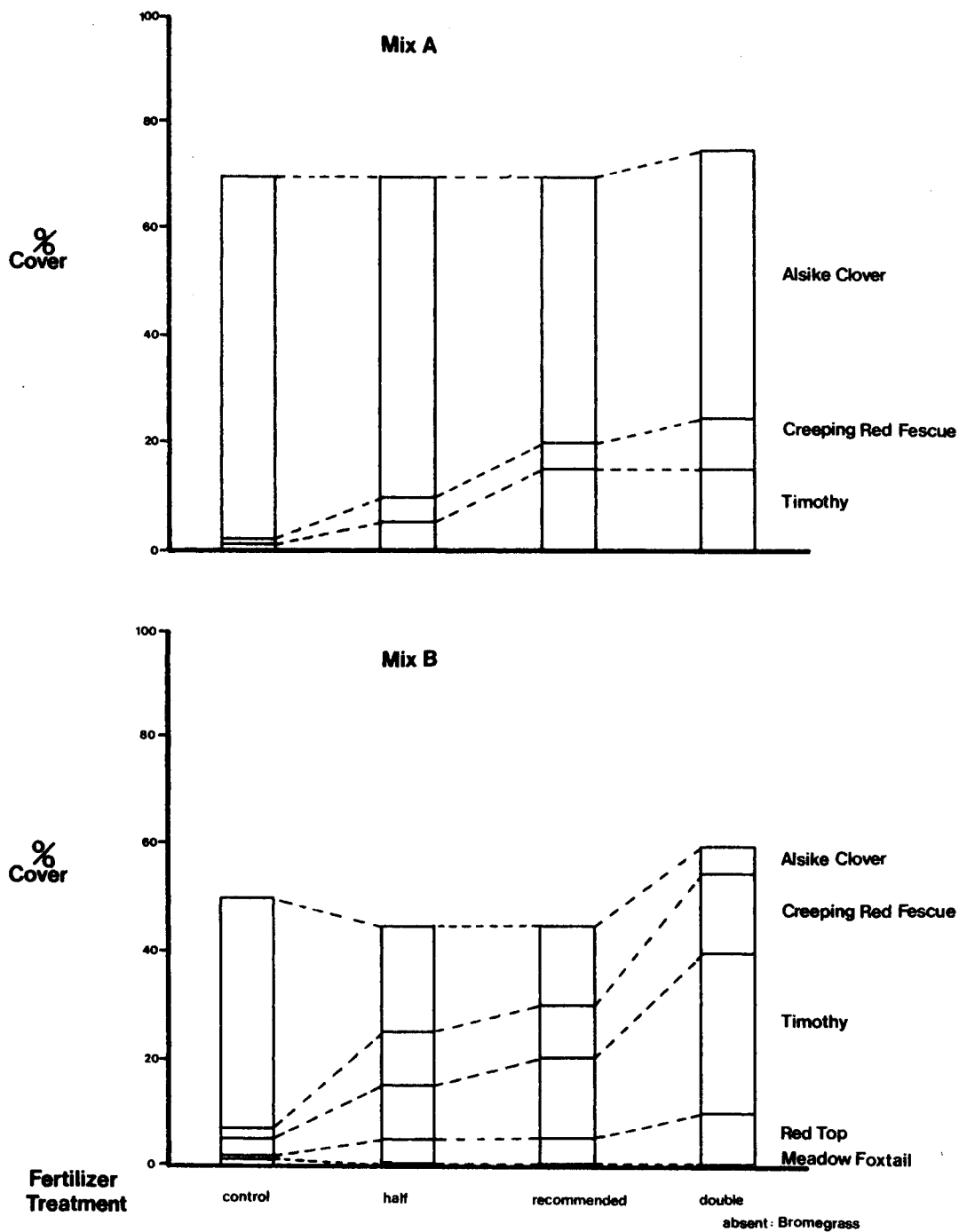


FIGURE 6

SECOND YEAR GROWTH RESPONSE (% COVER) OF TWO SPECIES MIXES
AT FOUR FERTILIZER RATES AT THE LOW ELEVATION SITE (SITE 77-1)



applications of fertilizer promoted the growth of grass species at the expense of legumes.

Alpine Sites

There was a great deal of variation in results from alpine test plots (Appendices K, L, M and N). Growth was considerably better at site 77-2 than at either sites 77-3 or 77-4. At site 77-2, grass species which performed well ($>40\%$ cover for at least one treatment) were meadow foxtail, meadow fescue, hard fescue, tracentia bentgrass, slender wheatgrass and climax timothy (Figure 7). Those that performed moderately well ($<40\%$ $>20\%$ cover) were pubescent wheatgrass, creeping red fescue, brome grass and Kentucky bluegrass. Poor growth ($<20\%$) occurred for the following: Manhattan perennial ryegrass, redtop, reed canarygrass, chinook orchardgrass, streambank wheatgrass, Canada bluegrass, crested wheatgrass and Russian wild ryegrass.

At sites 77-3 and 77-4 the only species to attain covers of 20% were creeping red fescue, tracentia bentgrass and climax timothy.

Most grass species responded to increased applications of fertilizer (Figure 7). Species that appeared to require a lower fertilizer rate to attain reasonable growth were: meadow foxtail, hard fescue, pubescent wheatgrass and brome grass.

Legume growth in the alpine was generally very poor (Figure 8). At site 77-2 all legumes were surviving although growth was slow. Alsike and white clover growth was the best at this site. No legumes had overwintered at site 77-3. First-year growth at site 77-4, seeded during the fall, was also poor although most species were surviving. None were expected to over-

FIGURE 7

SECOND YEAR GROWTH (% COVER) OF EIGHTEEN GRASSES AT FOUR FERTILIZER RATES IN THE SPRING SEEDED ALPINE SITES (SITES 77-2 AND 77-3), AND FIRST YEAR GROWTH OF A FALL SEEDED ALPINE SITE (SITE 77-4)

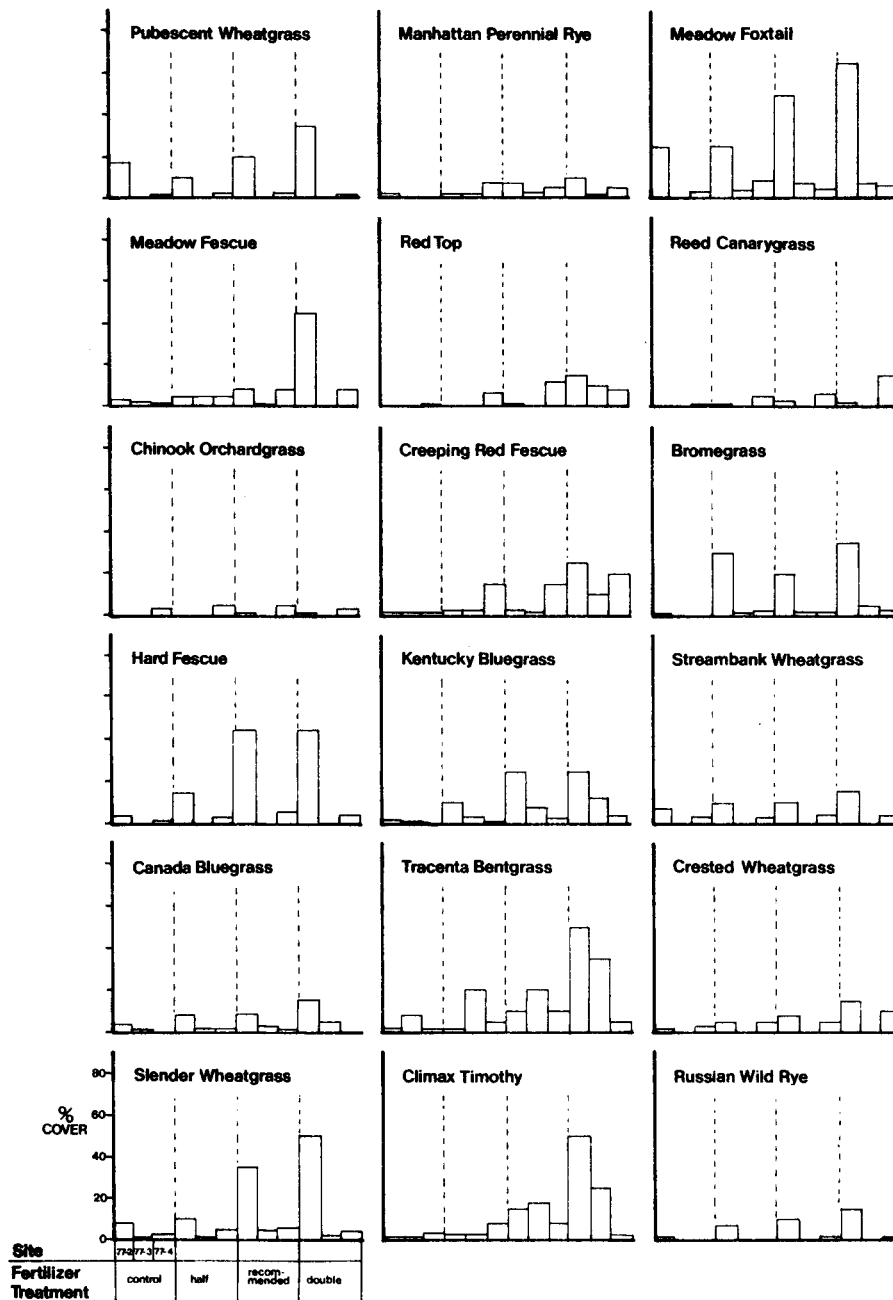
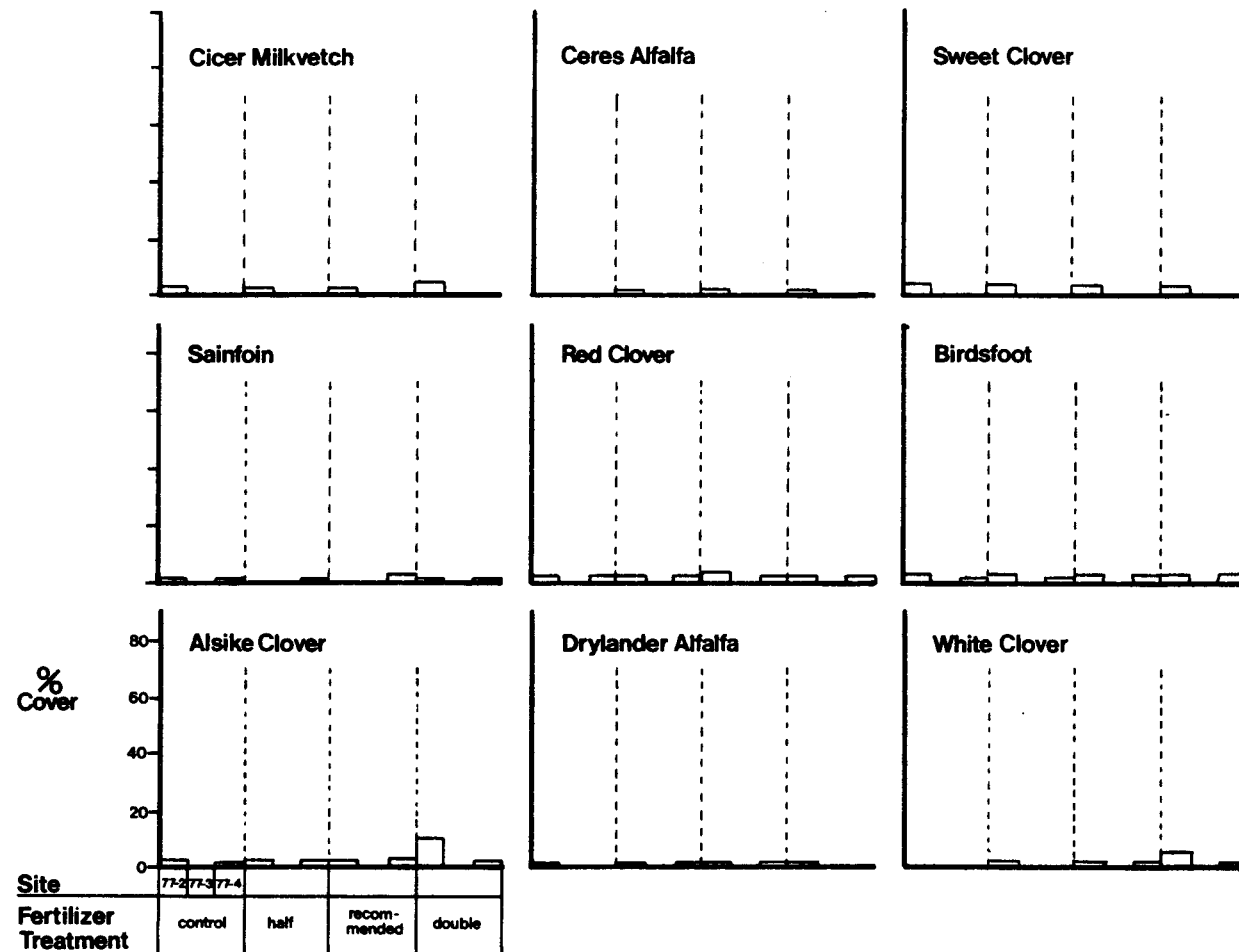


FIGURE 8

SECOND YEAR GROWTH (% COVER) OF NINE LEGUMES AT FOUR FERTILIZER RATES IN THE
 SPRING SEEDED ALPINE SITES (SITES 77-2 AND 77-3), AND FIRST YEAR GROWTH
 OF A FALL SEEDED ALPINE SITE (SITE 77-4)



winter at this site.

Growth of species mixes varied according to the fertilizer rate and site location (Figure 9). In general, growth increased with an additional application of fertilizer. Alsike clover, the only legume component of either mix, generally grew poorly. Site 77-2 was the most favourable site for growth, with all species of both mixes growing to some extent. At site 77-3, alsike clover grew poorly. Creeping red fescue and timothy both survived in each mix but brome grass, meadow foxtail and redtop were not present.

COATED SEED

The first year's growth of seed coated with micronutrients and (in the case of legumes) legume inoculant, was no better than normal seed (Figure 10 and Appendix O). When not fertilized, coated and normal seed both grew poorly. When fertilized, coated seed appeared to be slightly out-performed by normal seed. This apparent difference is primarily due to an error in the initial experimental design which sowed equal weights of coated and normal seed. As no allowance was made for the weight of the coating material, the normal seed was applied at a slightly elevated number of seeds per plot, causing an increased coverage.

This entire experiment was conducted at high elevation and perhaps coated seed could have some use in other situations.

SEEDING RATES

Vegetation cover (after one season) was directly related to seed applica-

FIGURE 9

GROWTH (% COVER) OF TWO SEED MIXES AT FOUR FERTILIZER RATES IN THE
ALPINE SITES 77-2, 77-3 AND 77-4

25

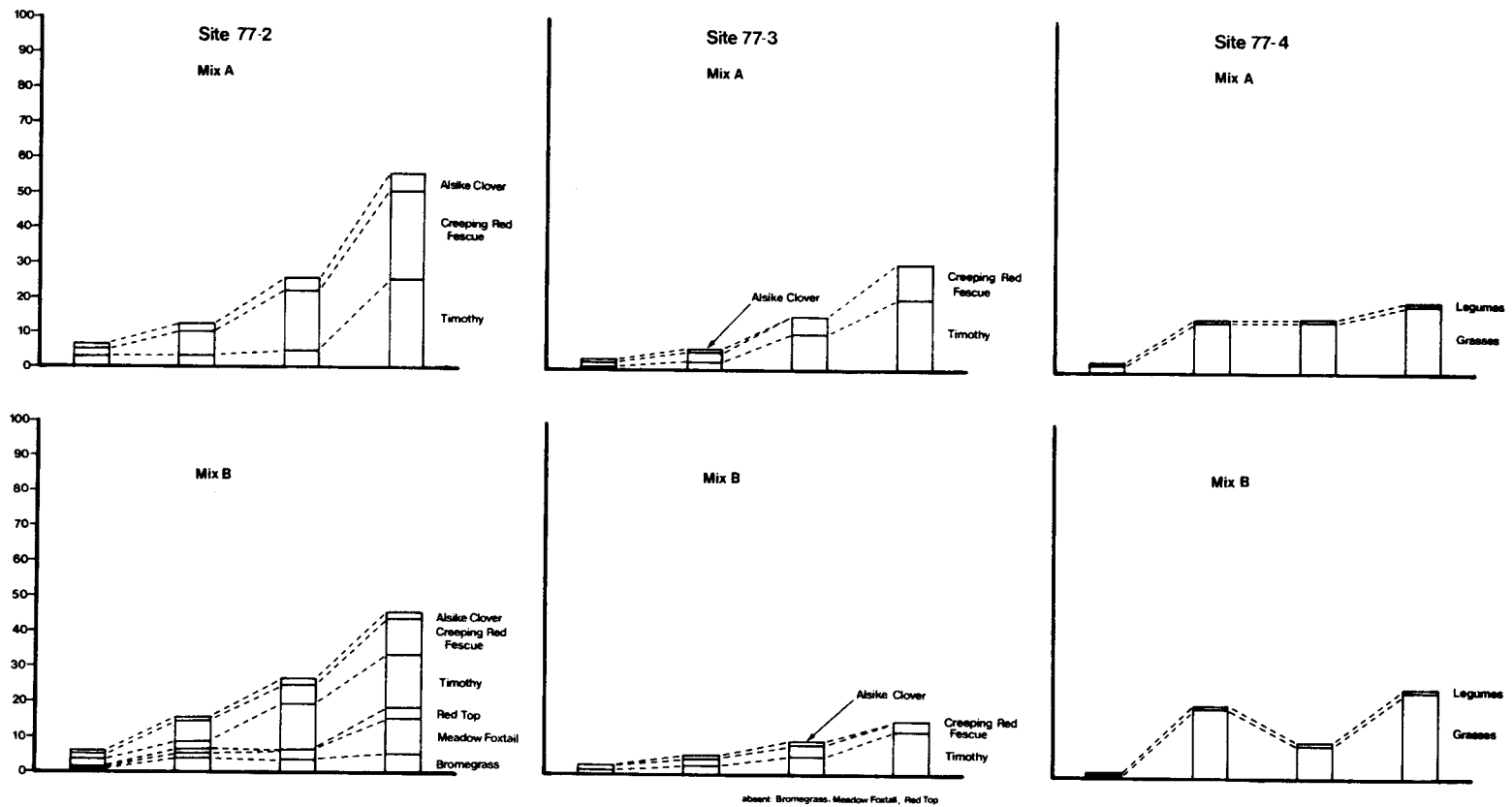
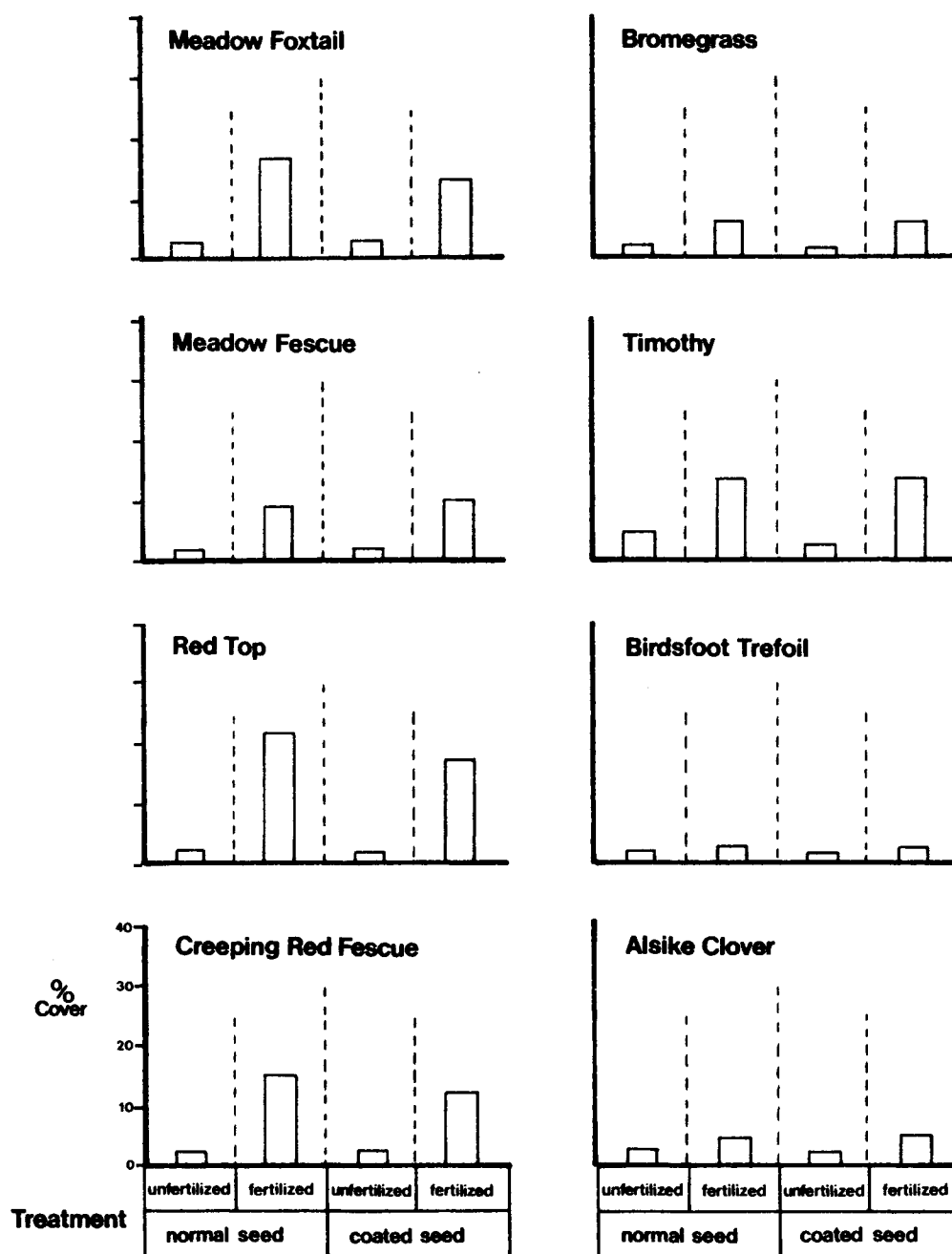


FIGURE 10

COMPARISON OF THE AVERAGE GROWTH (% COVER) BETWEEN
FERTILIZED AND UNFERTILIZED COATED GRASS AND LEGUME
SEED, AND FERTILIZED AND UNFERTILIZED NORMAL SEED



tion rates (Figure 11 and Appendix P). After one season's growth, cover ranged from 14% at 25 lb./acre to 54% at 400 lb./acre on fall seeded plots and 18% at 25 lb./acre to 73% at 400 lb./acre for spring seeded plots. It appears therefore, that spring seeding is superior to fall seeding for overall grass and legume growth.

It also appears that, if a ground coverage of 35% were desired after one season, this mixture should be applied at a rate of 100 lb./acre if fall seeded or 65 lb./acre if spring seeded. Both seed rates require an application of the recommended fertilizer at the time of seeding.

This trial tested a mixture composed of:	%
Creeping red fescue	20
Redtop	20
Meadow foxtail	20
Bromegrass	10
Timothy	10
Alsike clover	20

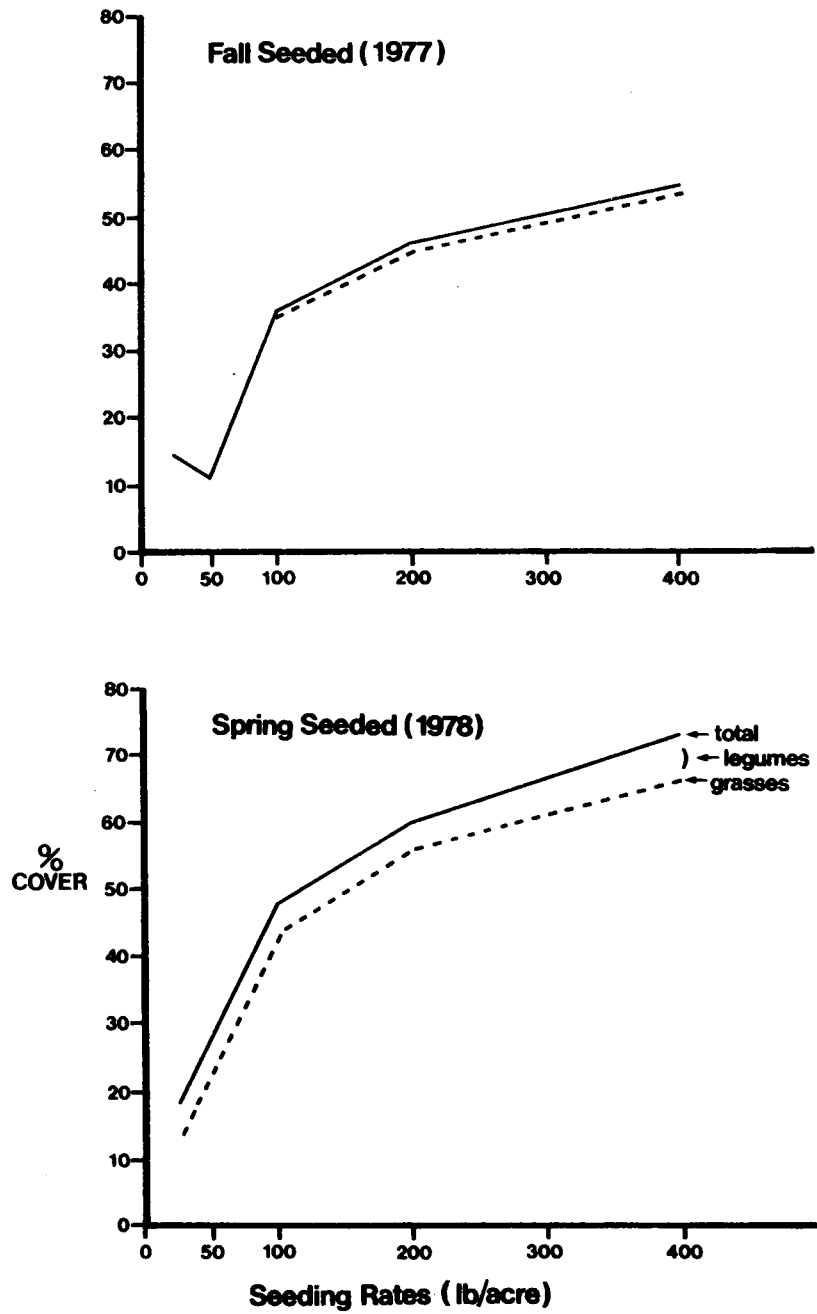
It has been assumed to this point that all species have contributed to the growth of the mix. However, it is known from species evaluations (Figure 7) that several of these species did not grow in other locations. If, for example, bromegrass, meadow foxtail and redtop were absent as was the case at site 77-3, and these three species accounted for half the weight of mix B, then a mixture composed of creeping red fescue, timothy and alsike clover would have been applied, in essence, at half the calculated rate.

EVALUATION OF FERTILIZER CONSTITUENTS

This experiment was designed to test the response of mix B to a variety

FIGURE 11

EFFECT OF SEEDING RATE ON THE FIRST SEASONS GROWTH
(% COVER) OF SEED MIX B



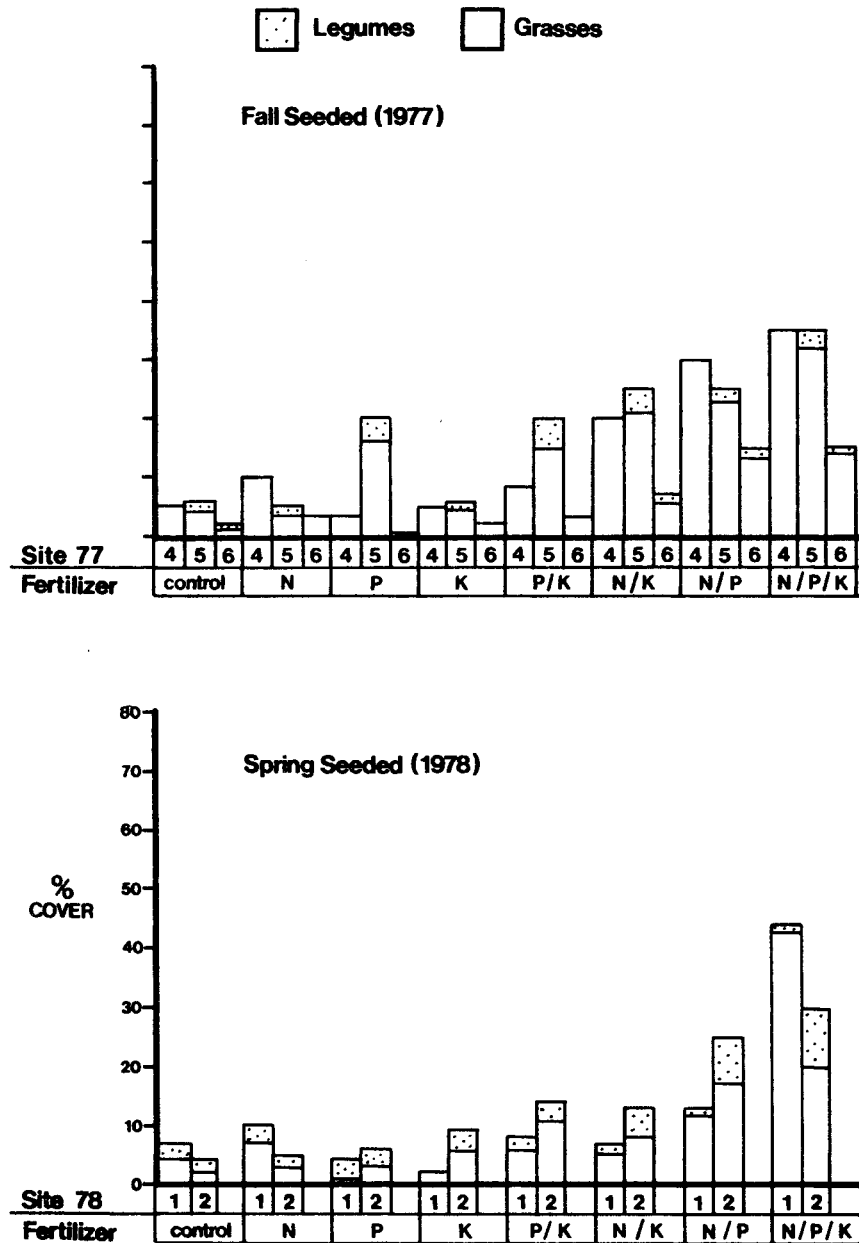
of fertilizer constituents.

Growth response of the three fall seeded sites was similar to the two spring seeded sites (Figure 12 and Appendix Q). At all sites growth of the "complete" fertilizer containing nitrogen, phosphorus and potassium was better than any other combination of these three elements. A fertilizer containing both nitrogen and phosphorus was adequate at most sites.

None of the other combinations are recommended for general use in the Northeast Coal Block.

FIGURE 12

GROWTH RESPONSE (% COVER) OF GRASSES AND LEGUMES TO EIGHT FERTILIZER TREATMENTS ON FALL SEEDED AND SPRING SEEDED SITES. GROWTH WAS EVALUATED IN AUGUST 1978



CONCLUSIONS

In the Peace River Coal Block, the major problems in revegetation occur above the treeline. These problems centre around the poor legume growth on all areas, even the most favourable sites. The climatic conditions above the treeline also reduce the number of grass species available for use in revegetation programs. Site conditions vary considerably in the alpine with some sites supporting good growth of many species, while others contain only the most hardy species. In all instances, applications of fertilizer are required for successful survival of grass species. Ground cover may be improved by seeding in the spring, harrowing, higher seeding rates and increased applications of fertilizer. Seed coated with micronutrients does not appear to be a useful technique in alpine situations.

Sufficient grass species are available to obtain a rapid initial growth on most exploration sites. Species which perform the best in extreme alpine situations are (in descending order of performance): creeping red fescue, climax timothy, tragenta bentgrass, meadow foxtail and Kentucky bluegrass.

Most areas disturbed by exploration activities are small enough that even if there are no agronomic species which will survive, there is good potential for natural colonization on most sites. Rates of natural succession have been studied by the Ministry of Energy, Mines and Petroleum Resources and a separate report is being prepared.

Establishment of permanent vegetation cover on large mining disturbances will ultimately depend upon the culture of native plants, primarily nitrogen-fixing species. It is too early to tell if agronomic grass species will be self perpetuating or under what conditions they will reproduce. Several agronomic grass species were setting seed. However, the availability of this seed has never been determined. It is expected

that most agronomic species will be unable to produce viable seed in alpine conditions.

Only one site was tested on areas below treeline, but it appears that there will be no major problems in choosing suitable agronomic species for revegetation programs.

APPENDICES

APPENDIX A

PLOT LAYOUT TO TEST SELECTED SPECIES IN THE PEACE RIVER COAL BLOCK,
MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES, TEST PLOT 76-1,

1976

Location: Bullmoose Mountain	Slope: 2°
Elevation: 1800 m	Aspect: South
Vegetation zone: Alpine	Date seeded: July 5, 1976
Vegetation type: Dry Tundra	Parent material: Colluvium
	Soil texture: Sandy loam

Species are listed from south to north.

<u>Row number</u>	<u>Common Name</u>	<u>Scientific Name</u>
1	Crested wheatgrass - Fairway	<u>Agropyron cristatum</u>
2	Streambank wheatgrass - Sodar	" <u>riparium</u>
3	Pubescent wheatgrass - Greenleaf	" <u>trichophorum</u>
4	Intermediate wheatgrass - Chief	" <u>intermedium</u>
5	Slender wheatgrass - Revenue	" <u>trachycaulum</u>
6	Bromegrass - Carlton	<u>Bromus inermis</u>
7	Bromegrass - Magna	" <u>inermis</u>
8	Meadow fescue - Miner	<u>Festuca pratensis</u>
9	Hard fescue - Bijant	" <u>ovina</u>
10	Creeping red fescue - Boreal	" <u>rubra</u>
11	Chewings fescue - Oasis	" <u>rubra</u> var <u>fallax</u>
12	Kentucky bluegrass - Park	<u>Poa pratensis</u>
13	Meadow foxtail - Oregon common	<u>Alopecurus pratensis</u>
14	Reed canarygrass - Castor	<u>Phalaris arundinacea</u>
15	Colonial bentgrass - Exeter	<u>Agrostis tenuis</u>
16	Timothy - Climax	<u>Phleum pratense</u>
17	Russian wild ryegrass - Sawki	<u>Elymus junceus</u>
18	Sainfoin - Melrose	<u>Onobrychis vicifolia</u>
19	Birdsfoot trefoil - Leo	<u>Lotus corniculatus</u>
20	Alfalfa - Beaver	<u>Trifolium sativa</u>
21	Alsike clover - Dawn	" <u>hybridum</u>
22	Red clover - Altaswede	" <u>pratense</u>
23	White clover - Nora	" <u>repens</u>

APPENDIX B

PLOT LAYOUT TO TEST SELECTED SPECIES IN THE PEACE RIVER COAL BLOCK, MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES, TEST PLOT 76-2, 1976

Location: Mount Gorman	Slope: 10°
Elevation: 2100 m	Aspect: East
Vegetation zone: Alpine	Date seeded: July 19, 1976
Vegetation type: Mesic Tundra	Parent material: Colluvium
	Soil texture: Sandy loam

<u>Row number</u>	<u>Common Name</u>	<u>Scientific Name</u>
1	Alfalfa - Beaver	<u>Trifolium sativa</u>
2	Alsike clover - Dawn	" <u>hybridum</u>
3	Sainfoin - Melrose	<u>Onobrychis vicifolia</u>
4	Red clover - Altaswede	<u>Trifolium pratense</u>
5	White clover - Nora	" <u>repens</u>
6	Birdsfoot trefoil - Leo	<u>Lotus corniculatus</u>
7	Chewings fescue - Oasis	<u>Festuca rubra</u> var <u>fallax</u>
8	Crested wheatgrass - Fairway	<u>Agropyron cristatum</u>
9	Hard fescue - Bijant	<u>Festuca ovina</u>
10	Meadow fescue - Miner	" <u>pratensis</u>
11	Slender wheatgrass - Revenue	<u>Agropyron trachycaulum</u>
12	Creeping red fescue - Boreal	<u>Festuca rubra</u>
13	Pubescent wheatgrass - Greenleaf	<u>Agropyron trichophorum</u>
14	Timothy - Climax	<u>Phleum pratense</u>
15	Streambank wheatgrass - Sodar	<u>Agropyron riparium</u>
16	Bromegrass - Carlton	<u>Bromus inermis</u>
17	Intermediate wheatgrass - Chief	<u>Agropyron intermedium</u>
18	Bromegrass - Magna	<u>Bromus inermis</u>
19	Kentucky bluegrass - Park	<u>Poa pratensis</u>
20	Meadow foxtail - Oregon common	<u>Alopecurus pratensis</u>
21	Reed canarygrass - Castor	<u>Phalaris arundinacea</u>
22	Colonial bentgrass - Exeter	<u>Agrostis tenuis</u>
23	Russian wild ryegrass - Sawki	<u>Elymus junceus</u>

APPENDIX C

DESCRIPTION OF SITES USED FOR TEST PLOTS, PEACE RIVER COAL BLOCK, MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES, 1977 AND 1978

Site no.	77-1	77-2	77-3
Location	Gas well site N.W. of jcn. of Wolverine and Bullmoose Roads	Old road west slope Bullmoose Mts.	Drill site EB1 S.E. slope, Mt. Spieker
Elevation (m)	1125	1780	1870
Vegetation zone	Engelmann spruce - subalpine fir	Alpine	Alpine
Vegetation type	Lodgepole pine with spruce understory	mesic tundra	mesic tundra
Type of Layout	I	I	I
Slope (degrees)	2	8	3
Aspect (degrees)	30	280	30
Date seeded (d/m/yr)	5/7/77	7/7/77	9/7/77
Parent Material	Till	Colluvium	Colluvium
Soil Texture	very gravelly clay	silt loam	Gravelly silt loam

APPENDIX C (Continued)

Site no.	77-4				77-5			77-6		
Location	N.W. Buttress of Bullmoose Mtn.				W. Slope south-east end of proposed Sheriff Pit			N.W. Buttress of Bullmoose		
Elevation (m)	1720				1745			1700		
Vegetation zone	Alpine				High Subalpine to Alpine			High Subalpine to Alpine		
Vegetation type	Dry tundra above, mesic tundra below				mesic tundra			mesic tundra		
Type of Layout	I	II	III	IV	II	III	IV	II	III	IV
Slope (degrees)	0-4	17-23	0-5	0-5	13	13	13	7	0-5	0-5
Aspect (degrees)	290	290	250	250	260	260	260	20	20	20
Date seeded (d/m/yr)	13/9/77	13/9/77	19/9/77	19/9/77	17/9/77	17/9/77	17/9/77	19/9/77		
Parent Material	Colluvium-Shale				Shale	Shale	Shale	Shale		
Soil Texture	Gravelly sandy loam				Gravelly silt loam			Silty clay loam		

APPENDIX C (Continued)

Site no.	78-1			78-2		
Location	N.W. Buttress of Bullmoose Mtn.			Drill site EB-10, west side of Mt. Spieker		
Elevation (m)	1675			1675		
Vegetation zone	High Subalpine			High Subalpine		
Vegetation type	Mesic Krummholz			Subalpine Meadow		
Type of Layout	II	III	IV	II	III	IV
Slope (degrees)	0-6	0	0	11	11	11
Aspect (degrees)	290	N/A	N/A	360	360	360
Date seeded (d/m/yr)	15/6/78			18/6/78		
Parent Material	Colluviated-till			Colluviated-till		
Soil Texture	Gravelly clay			Gravelly silt loam		

APPENDIX D

LIST OF AGRONOMIC SPECIES TESTED IN PLOT TRIALS, PEACE RIVER COAL BLOCK, 1977

<u>Common Name</u>	<u>Scientific Name</u>
Boreal creeping red fescue	<u>Festuca rubra</u> L.
Meadow fescue	<u>Festuca elatior</u> L.
Hard fescue	<u>Festuca ovina</u> var. <u>duriuscula</u> (L.) Koch
Nugget Kentucky bluegrass	<u>Poa pratensis</u> L.
Canada bluegrass - "rubens" variety	<u>Poa compressa</u> L.
Manhattan perennial ryegrass	<u>Lolium perenne</u> L.
Tracenta bentgrass	<u>Agrostis</u> sp.
Nordan crested wheatgrass	<u>Agropyron cristatum</u> (L.) Gaertn.
Pubescent wheatgrass	<u>Agropyron trichophorum</u> (Link) Richt.
Slender wheatgrass	<u>Agropyron trachycaulum</u> (Link) Malte
Streambank wheatgrass	<u>Agropyron riparium</u> Scribn & Smith
Bromegrass	<u>Bromus inermis</u> Leyss
Chinook orchardgrass	<u>Dactylis glomerata</u> L.
Redtop	<u>Agrostis alba</u> L.
Reed canarygrass	<u>Phalaris arundinacea</u> L.
Russian wild ryegrass	<u>Elymus junceus</u> Fisch
Climax timothy	<u>Phleum pratense</u> L.
Meadow foxtail	<u>Alopecurus pratensis</u>
Ceres alfalfa	<u>Medicago sativa</u> L.
Drylander alfalfa	<u>Medicago sativa</u> L.
Alsike clover	<u>Trifolium hybridum</u> L.
Single cut red clover	<u>Trifolium pratense</u> L.
Broad leaf birdsfoot trefoil	<u>Lotus corniculatus</u> L.
Sweet clover	<u>Melilotus</u> sp.
White clover	<u>Trifolium repens</u> L.
Cicer milkvetch	<u>Astragalus cicer</u> L.
Melrose sainfoin	<u>Onobrychis viciaefolia</u> Scop.

APPENDIX E

LAYOUT I - FOR GENERAL SPECIES TRIALS, PEACE RIVER COAL BLOCK, MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES

		Seed rate	
		lb./acre	kg/ha
LAYOUT I -			
FOR GENERAL SPECIES TRIALS			
PEACE RIVER COAL BLOCK, MINISTRY			
OF ENERGY, MINES AND PETROLEUM			
RESOURCES			
Plot layout at:			
Site 77-1	July 5, 1977		
Site 77-2	July 7, 1977		
Site 77-3	July 9, 1977		
Site 77-4	September 13, 1977		
MIX A			
		%	
Boreal Creeping Red Fescue	40		
Climax Timothy	20		
Alsike Clover	40		
MIX B			
		%	
Boreal Creeping Red Fescue	20		
Redtop	20		
Meadow Foxtail	20		
Bromegrass	10		
Timothy	10		
Alsike Clover	20		
Fertilizer Rate:			
		Double	Recom-
		recom-	mended
		ended	level
		level	Control
N (lb./acre)	64	32	16
(kg/ha)	(72)	(36)	(18)
P (lb./acre)	80	40	20
(kg/ha)	(90)	(45)	(22)
K (lb./acre)	40	20	10
(kg/ha)	(45)	(22)	(11)

APPENDIX F

LAYOUT II - TRIALS TESTING THE USE OF COATED SEED, PEACE RIVER COAL BLOCK, MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES

Plot layout at:

Site 77-4 September 13, 1977
Site 77-5 September 17, 1977
Site 77-6 September 19, 1977
Site 78-1 June 15, 1978
Site 78-2 June 18, 1978

All plots seeded at a rate of:

50 lb./acre (56 kg/ha)

Pretreatment	
Coated	Normal
Meadow foxtail	Meadow foxtail
Meadow fescue	Meadow fescue
Redtop	Redtop
Boreal creeping red fescue	Boreal creeping red fescue
Bromegrass	Bromegrass
Birdsfoot trefoil	Birdsfoot trefoil
Alsike clover	Alsike clover
Climax timothy	Climax timothy

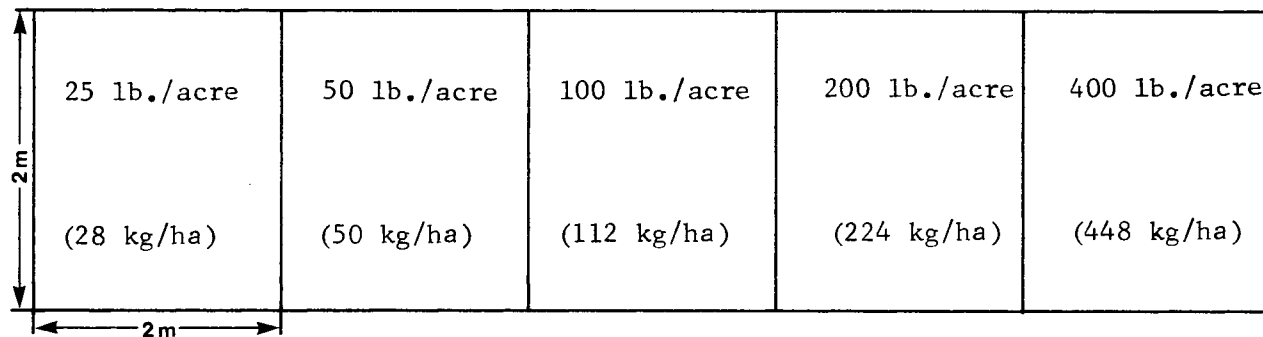
Fertilizer rate

N (lb./acre)	0	32	32	0
(kg/ha)		(36)	(36)	
P (lb./acre)	0	40	40	0
(kg/ha)		(45)	(45)	
K (lb./acre)	0	20	20	0
(kg/ha)		(22)	(22)	

APPENDIX G

LAYOUT III - TRIALS TESTING SEEDING RATE,
PEACE RIVER COAL BLOCK,
MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES

64



All plots seeded with Mix B	(%)
Boreal creeping red fescue	20
Redtop	20
Meadow foxtail	20
Bromegrass	10
Timothy	10
Alsike	20

Plot layout at:

Site 77-4	September 19, 1977
Site 77-5	September 17, 1977
Site 77-6	September 19, 1977
Site 78-1	June 15, 1978
Site 78-2	June 18, 1978

Fertilizer rate	N	32 lb./acre	(36 kg/ha)
	P	40 lb./acre	(45 kg/ha)
	K	20 lb./acre	(22 kg/ha)

APPENDIX H

LAYOUT IV - TRIALS TESTING THE USE OF FERTILIZERS,
PEACE RIVER COAL BLOCK,
MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES

<p>Nitrogen only 32 lb./acre (36 kg/ha) of Urea; 46-0-0</p>	<p>Phosphorus only 40 lb./acre (45 kg/ha) of P₂O₅; 0-18-0</p>	<p>All plots seeded with Mix B</p> <table><tr><td></td><td>%</td></tr><tr><td>Boreal creeping red fescue</td><td>20</td></tr><tr><td>Redtop</td><td>20</td></tr><tr><td>Meadow foxtail</td><td>20</td></tr><tr><td>Bromegrass</td><td>10</td></tr><tr><td>Timothy</td><td>10</td></tr><tr><td>Alsike clover</td><td>20</td></tr></table>		%	Boreal creeping red fescue	20	Redtop	20	Meadow foxtail	20	Bromegrass	10	Timothy	10	Alsike clover	20
	%															
Boreal creeping red fescue	20															
Redtop	20															
Meadow foxtail	20															
Bromegrass	10															
Timothy	10															
Alsike clover	20															
<p>Control</p>	<p>Nitrogen Phosphorus and Potassium 32 lb./acre (36 kg/ha) of N and 40 lb./acre (45 kg/ha) of P₂O₅; 16-20-0 and 20 lb./acre (22 kg/ha) K₂O; 0-0-60</p>															
<p>Nitrogen and Phosphorus 32 lb./acre (36 kg/ha) of N and 40 lb./acre (45 kg/ha) of P₂O₅ 16-20-0</p>	<p>Nitrogen and Potassium 32 lb./acre (36 kg/ha) of N; 46-0-0 and 20 lb./acre (22 kg/ha) K₂O; 0-0-60</p>															
<p>Potassium only 20 lb./acre (22 kg/ha) of K₂O; 0-0-60</p>	<p>Phosphorus and Potassium 40 lb./acre (45 kg/ha) of P₂O₅; 0-18-0 and 20 lb./acre (22 kg/ha) K₂O; 0-0-60</p>															

Seeding rate:

50 lb./acre (56 kg/ha)

2m

2m

4m

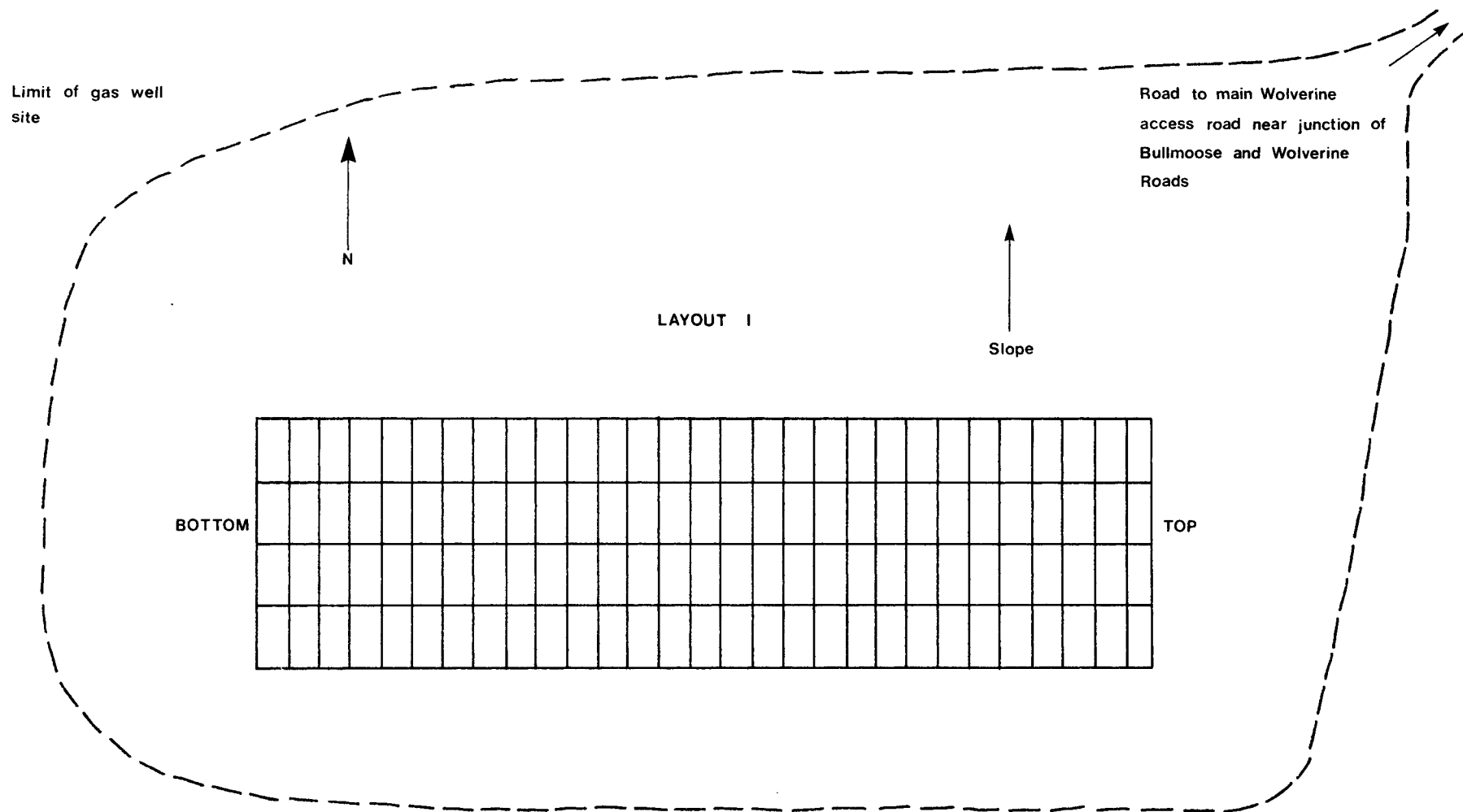
Plot layout at:

Site 77-4	September 19, 1977
Site 77-5	September 17, 1977
Site 77-6	September 19, 1977
Site 78-1	June 15, 1978
Site 78-2	June 18, 1978

APPENDIX I-a

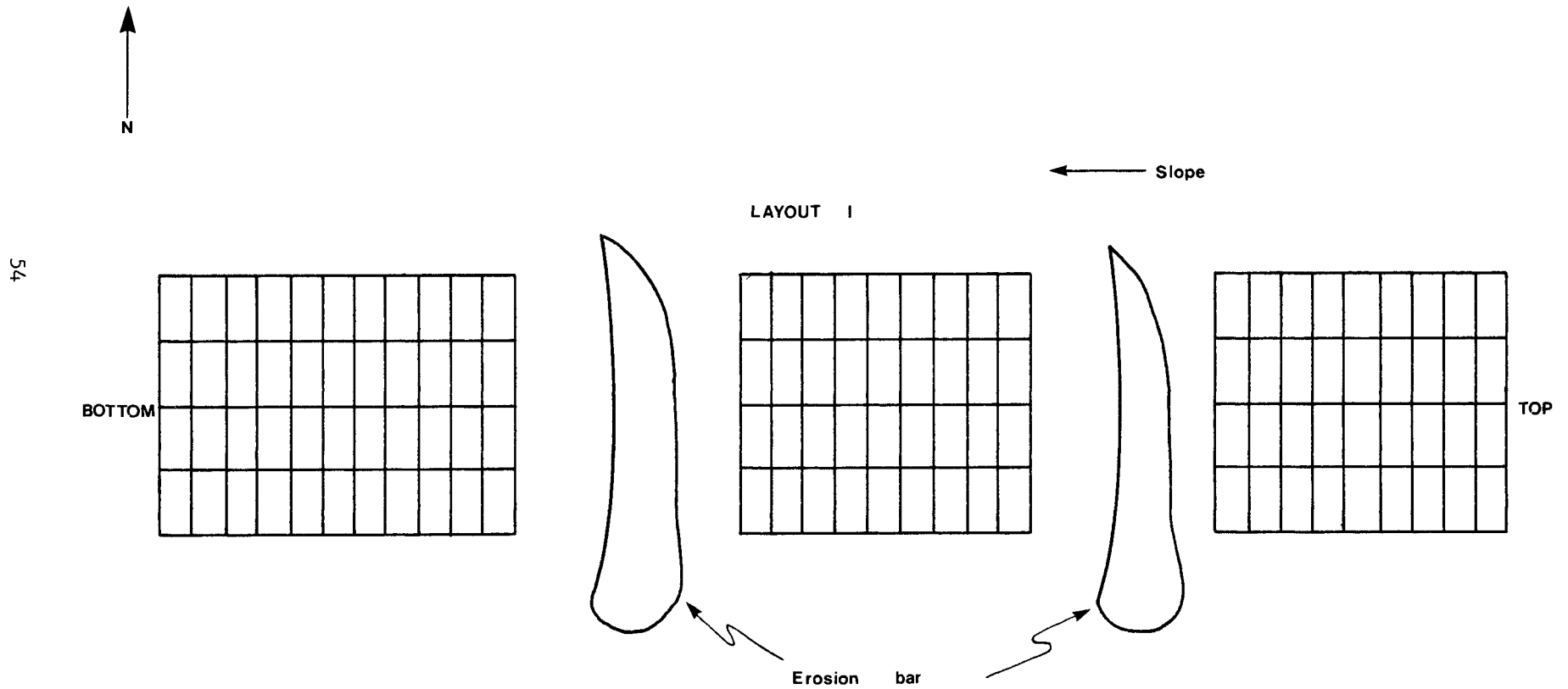
SKETCH MAP OF MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES TEST PLOTS AT SITE 77-1,
BULLMOOSE CREEK VALLEY,
1977

53



APPENDIX I-b

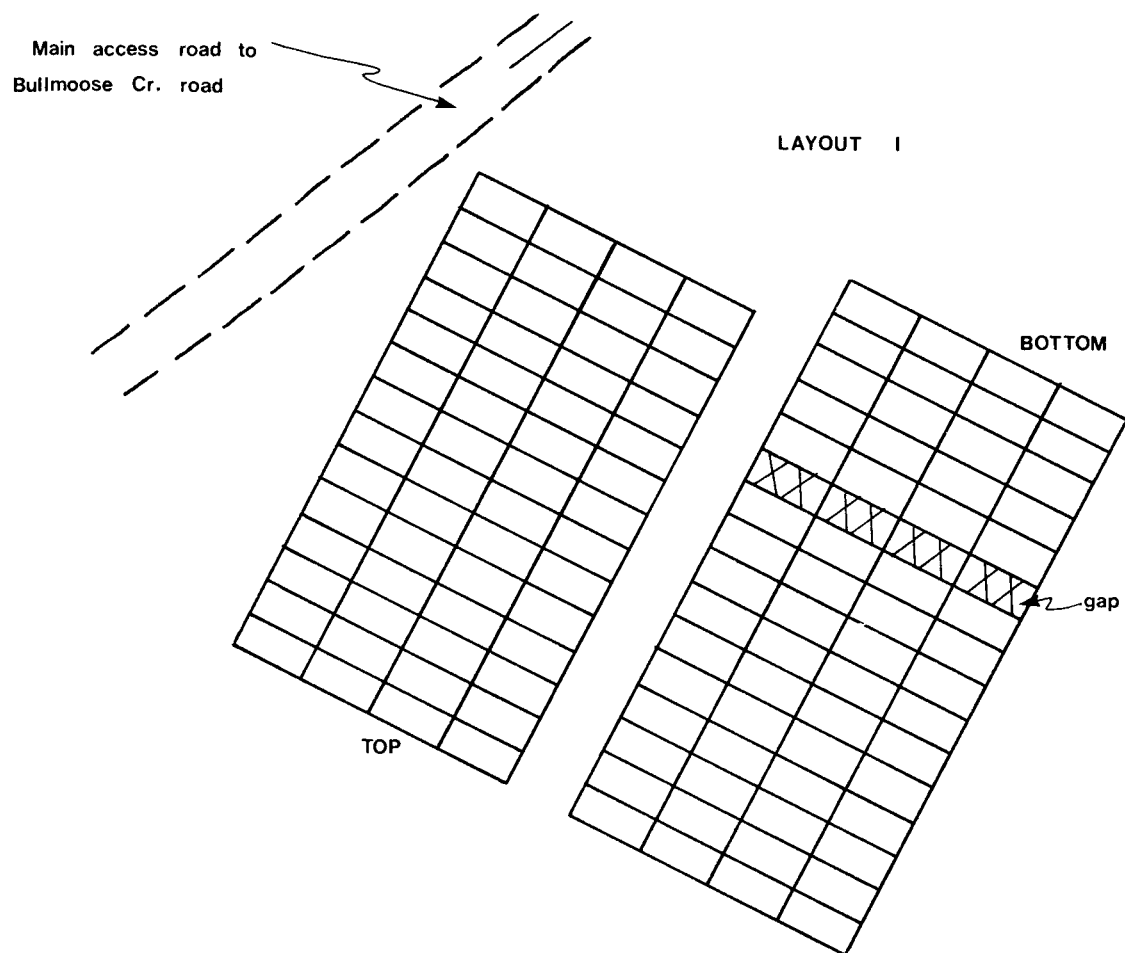
SKETCH MAP OF MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES
TEST PLOTS AT SITE 77-2, BULLMOOSE MOUNTAIN, 1977



APPENDIX I-c

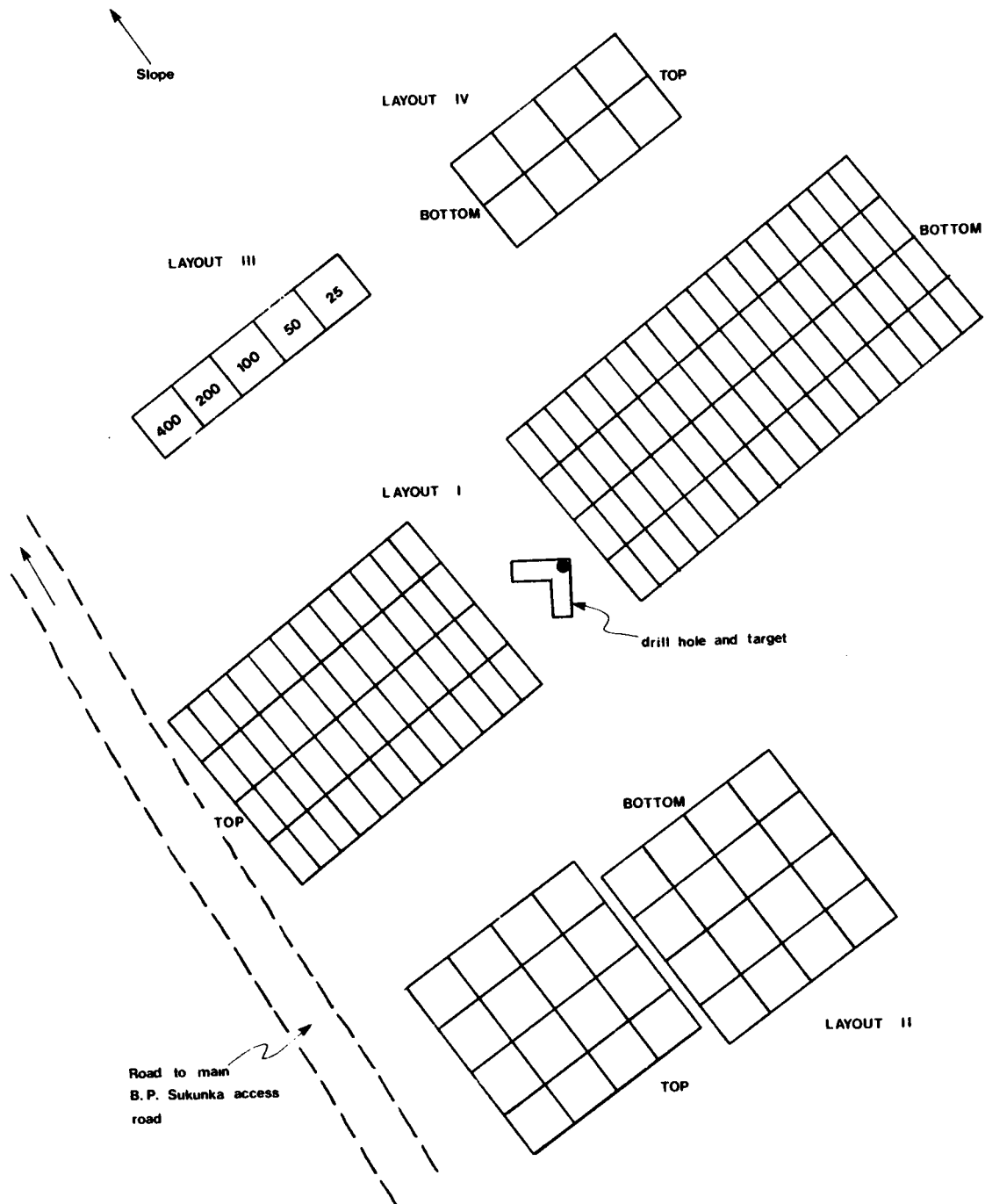
SKETCH MAP OF MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES

TEST PLOTS AT SITE 77-3, MOUNT SPIEKER, 1977



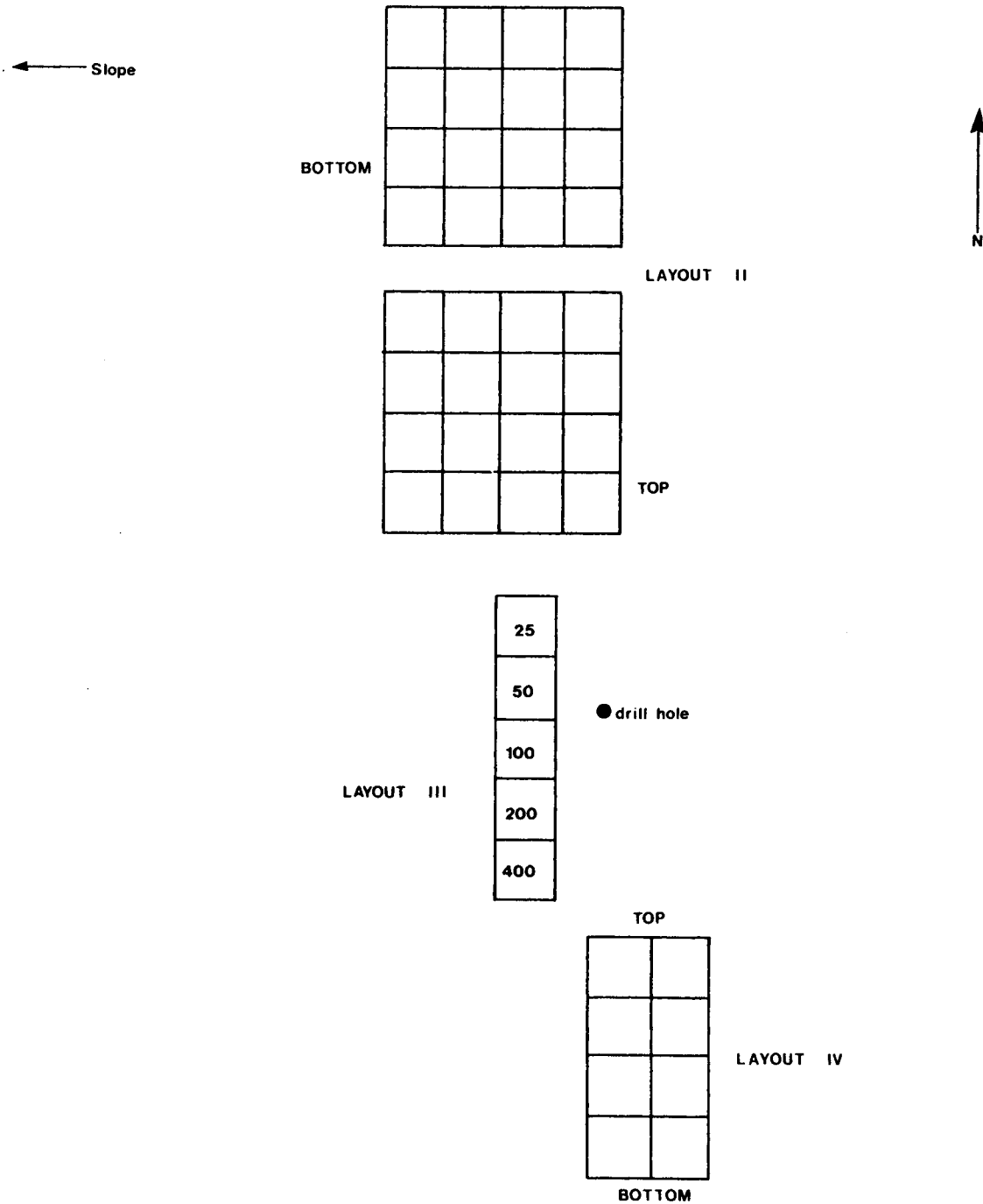
APPENDIX I-d

SKETCH MAP OF MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES TEST PLOTS AT SITE 77-4, BULLMOOSE MOUNTAIN, 1977



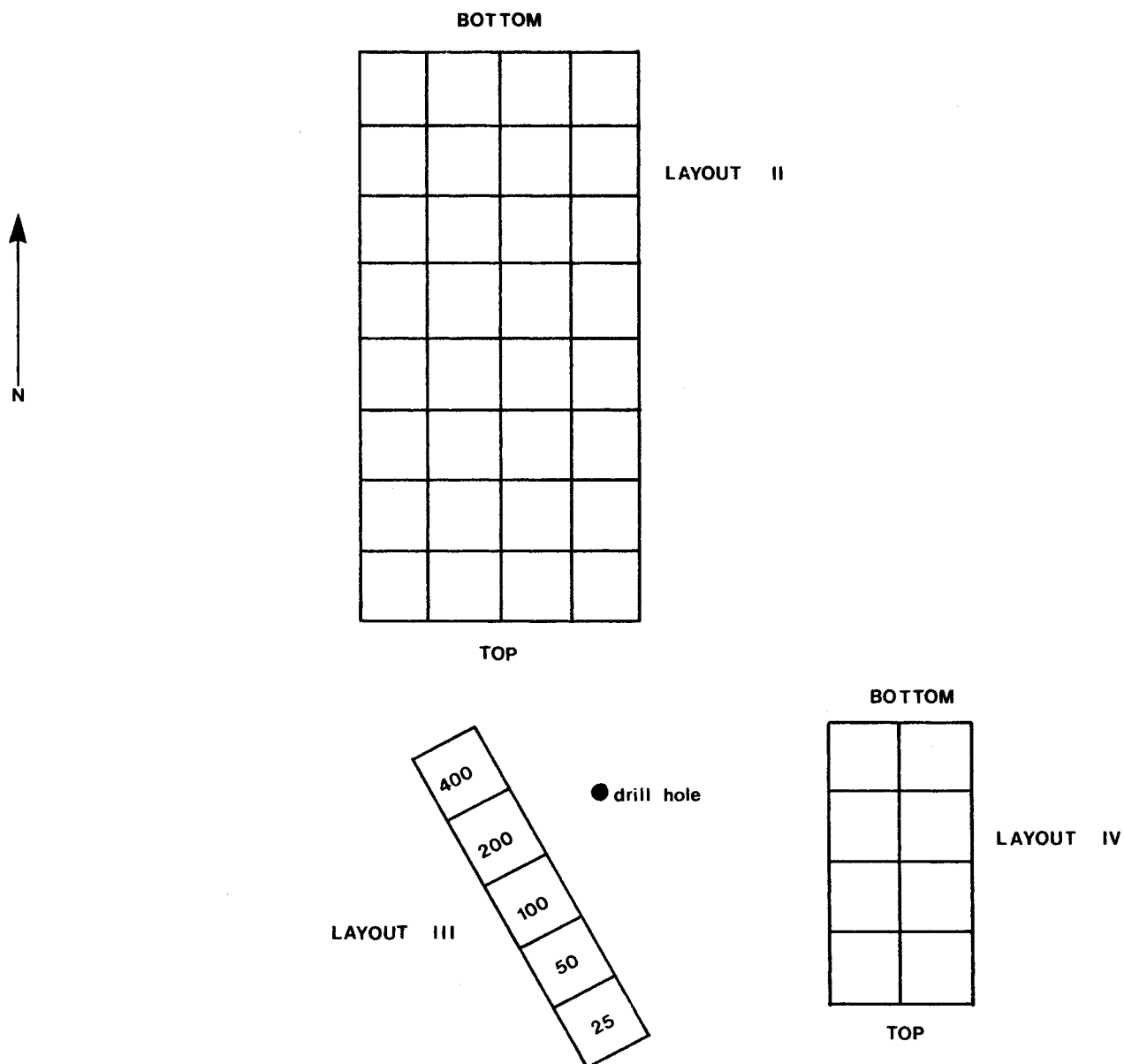
APPENDIX I-e

SKETCH MAP OF MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES TEST PLOTS
AT SITE 77-5, PROPOSED SHERIFF PIT AREA, 1977



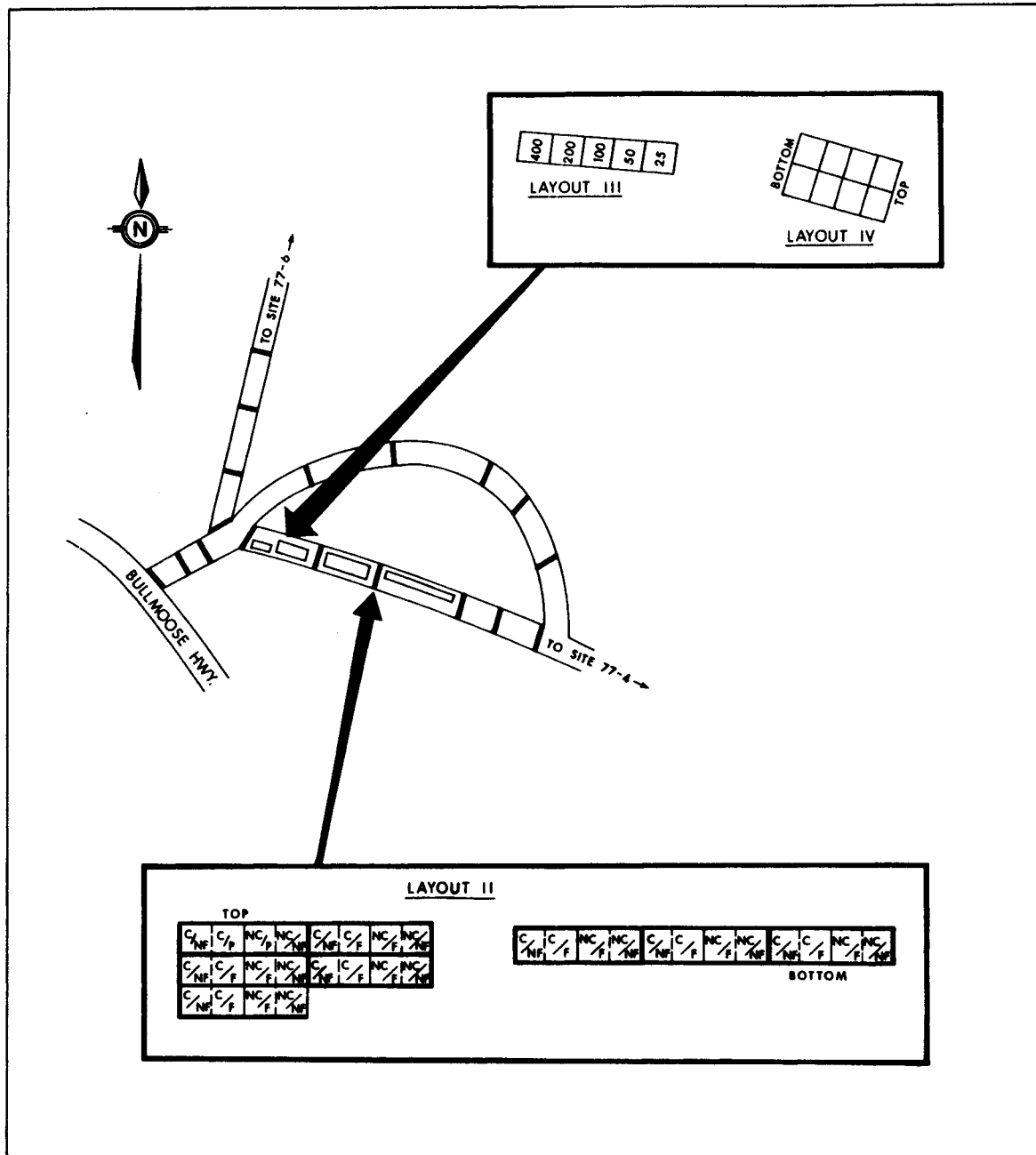
APPENDIX I-f

SKETCH MAP OF
MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES TEST PLOTS AT SITE 77-6,
BULLMOOSE MOUNTAIN AREA, 1977



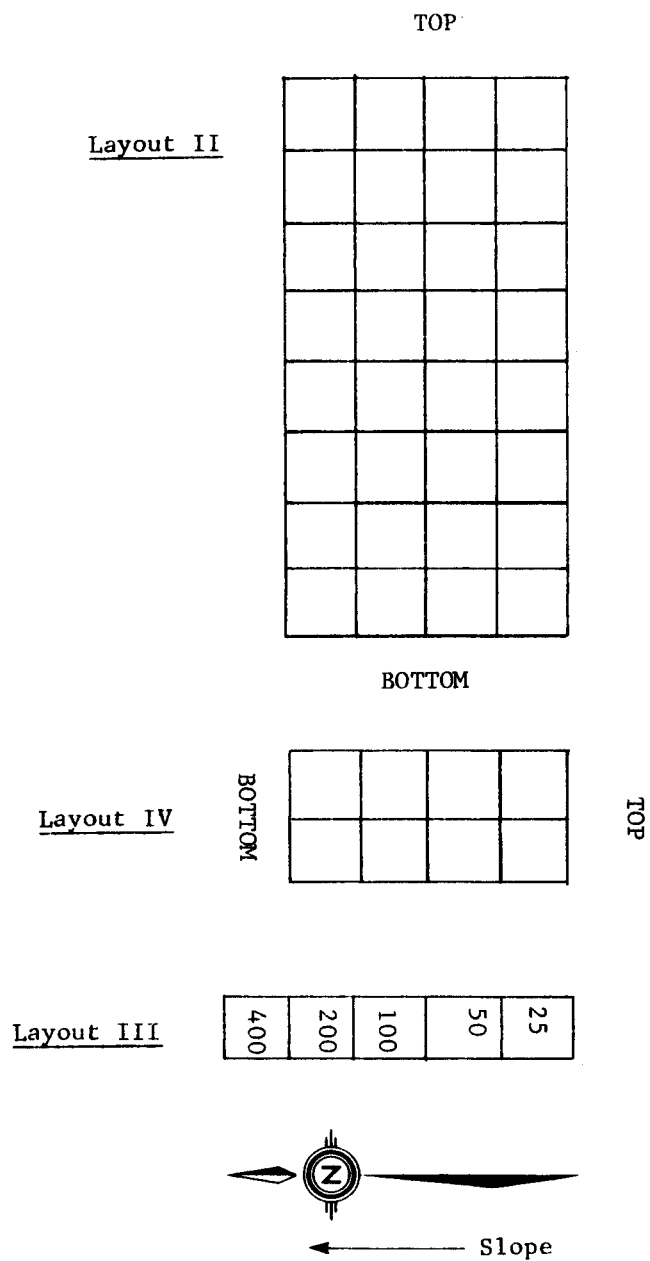
APPENDIX I-g

SKETCH MAP OF MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES TEST PLOTS AT SITE 78-1, BULLMOOSE MOUNTAIN, 1978



APPENDIX I-h

SKETCH MAP OF MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES TEST PLOTS AT SITE 78-2, MOUNT SPIEKER, 1978



APPENDIX J

GROWTH OF SPECIES SEEDED AT SITE 76-1. GROWTH IS GIVEN AS A % OF LINE COVERED BY SPECIES/AVERAGE HEIGHT (cm)

Site	76-1
Elevation (m)	1800
Date seeded (day-mo-yr)	5-7-76
Date assessed (day-mo-yr)	18-8-78
Crested wheatgrass - Fairway	0
Streambank wheatgrass - Sadar	0
Pubescent wheatgrass - Greenleaf	0
Intermediate wheatgrass - Chief	0
Slender wheatgrass - Revenue	0
Bromegrass - Carlton	0
Bromegrass - Magna	0
Meadow fescue - Miner	0
Hard fescue - Bijant	0
Creeping red fescue - Boreal	8/1
Chewings fescue - Oasis	12/2
Kentucky bluegrass - Park	9/1.5
Meadow foxtail - Oregon common	0
Reed canarygrass - Castor	+/-1
Colonial bentgrass - Exeter	+/-1
Timothy - Climax	+/-1
Russian wild ryegrass - Sawki	1/1
Sainfoin - Melrose	0
Birdsfoot trefoil - Leo	0
Alfalfa - Beaver	0
Alsike clover - Dawn	0
Red clover - Altaswede	0
White clover - Nora	0

APPENDIX K

FIRST YEAR GROWTH (% COVER) OF GENERAL SPECIES TRIALS SEEDED
DURING THE SPRING, 1977, AND EVALUATED AUGUST AND SEPTEMBER 1977

Site Layout Elevation Date seeded (d/m/yr) Date assessed (d/m/yr)	77-1 I 1125 5-7-77 30-8-77				77-2 I 1780 7-7-77 29-8-77				77-3* I 1870 9-7-77 15-9-77			
Fertilizer treatment	0	$\frac{1}{2}$	1	2	0	$\frac{1}{2}$	1	2	0	$\frac{1}{2}$	1	2
Creeping red fescue	3	10	20	20	3	10	10	20	+	1	3	3
Meadow fescue	10	10	30	50	10	10	10	30	+	2	1	1
Hard fescue	3	10	10	10	3	10	10	20	+	1	1	2
Kentucky bluegrass	3	10	20	10	3	10	10	10	0	1	1	1
Canada bluegrass	3	20	20	10	3	10	10	10	0	1	2	2
Perennial ryegrass	3	20	40	60	10	30	30	60	1	3	5	4
Tracenta bentgrass	3	10	0	3	3	10	20	30	1	2	2	10
Crested wheatgrass	10	20	20	20	10	20	20	30	3	3	2	5
Pubescent wheatgrass	3	10	20	30	10	10	10	20	1	1	1	1
Slender wheatgrass	10	10	20	10	10	10	20	30	1	1	2	6
Streambank wheatgrass	10	20	20	30	10	20	30	30	1	1	2	3
Bromegrass	10	30	40	30	10	10	20	30	+	1	2	1
Orchardgrass	10	20	20	40	10	20	40	40	1	2	3	4
Redtop	0	3	10	10	10	10	30	40	0	1	2	6
Reed canarygrass	3	10	10	20	0	3	20	10	1	2	2	4
Russian wild ryegrass	10	10	20	30	10	10	10	10	1	3	2	2
Timothy	10	10	10	20	10	10	20	30	1	2	3	5
Meadow foxtail	3	10	20	40	10	20	20	50	+	2	6	10
Alfalfa - ceres	20	40	40	40	20	20	20	40	+	+	0	1
Alfalfa - drylander	10	10	10	10	10	20	20	20	0	0	0	0
Alsike clover	10	10	10	20	10	20	20	30	0	0	0	+
Red clover	10	20	20	30	10	20	40	40	+	1	1	2
Birdsfoot trefoil	10	10	10	10	10	10	10	10	1	1	1	+
Sweet clover	20	30	40	60	20	20	20	30	0	0	0	0
White clover	10	10	10	30	10	30	40	40	1	1	1	1
Cicer milkvetch	3	3	3	3	3	3	3	10	0	0	0	0
Sainfoin	10	10	20	20	10	10	10	10	0	0	0	0
Mix A	10	20	30	30	10	20	30	50	2	4	8	8
Mix B	10	10	20	10	10	20	20	30	0	3	7	7

* This site was inadvertently over-seeded with the forestry mix, therefore, it was difficult to distinguish species.

APPENDIX L

PERFORMANCE OF GRASSES IN GENERAL SPECIES TRIALS, TESTING FOUR FERTILIZER RATES, EVALUATED AUGUST 1978

SPECIES	SITE	DOUBLE RECOMMENDED FERTILIZER						RECOMMENDED FERTILIZER						HALF RECOMMENDED FERTILIZER						NO FERTILIZER										
		% GROUND COVER	% SEED HEADS	% VIGOR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE DEPTH (cm)	% GROUND COVER	% SEED HEADS	% VIGOR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE DEPTH (cm)	% GROUND COVER	% SEED HEADS	% VIGOR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE DEPTH (cm)	% GROUND COVER	% SEED HEADS	% VIGOR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE DEPTH (cm)					
Pubescent Wheatergrass	77-1	40	40	3	70	0	0	0	20	40	2	45	2	1	3	15	30	2	40	5	1	3	12	20	2	30	0	0	0	
	77-2	35	75	2	60	15	2	6	20	20	2	40	20	1	25	10	0	2	20	10	1	10	17	0	2	20	0	0	0	
	77-3	0	0	0	0	0	0	0	0	0	0	0	10	1	5	0	0	0	0	0	0	0	0	0	0	0	10	2	3	
	77-4	2	0	1	4	0	0	0	3	0	1	4	0	0	0	2	0	1	5	0	0	0	1	0	1	5	0	0	0	
Manhattan Perennial Ryegrass	77-1	60	70	3	25	0	0	0	45	70	3	25	0	0	0	35	60	2	25	0	0	0	8	30	1	15	0	0	0	
	77-2	10	10	2	10	10	1	10	8	10	2	10	10	10	2	2	0	2	8	0	0	0	1	0	2	5	0	0	0	
	77-3	2	0	2	5	5	2	5	3	0	2	5	10	2	2	2	0	2	3	10	3	4	0	0	0	0	20	1	3	
	77-4	6	0	1	3	0	0	0	5	0	1	4	0	0	0	8	0	1	4	0	0	0	0	0	0	0	0	0	0	
Meadow Foxtail	77-1	60	30	2	25	0	0	0	35	15	2	15	0	0	0	20	10	2	15	0	0	0	8	0	1	10	0	0	0	
	77-2	65	80	2	65	0	0	0	50	60	2	55	10	1	10	25	25	2	30	25	1	20	25	15	2	20	10	2	4	
	77-3	8	0	2	10	5	1	4	8	10	2	10	0	0	0	4	0	2	10	10	2	4	0	0	0	0	10	1	2	
	77-4	7	0	2	8	0	0	0	5	0	2	8	0	0	0	8	0	2	8	0	0	0	3	0	1	5	0	0	0	
Meadow Fescue	77-1	70	75	3	65	0	0	0	50	50	2	65	0	0	0	35	40	2	50	0	0	0	15	25	2	10	15	1	3	
	77-2	45	65	2	30	0	0	0	8	10	2	12	10	1	10	5	0	2	8	10	1	3	3	0	2	5	0	0	0	
	77-3	0	0	0	0	25	2	4	+	+	0	2	4	25	2	5	0	0	0	0	5	2	2	0	0	0	0	10	1	2
	77-4	8	0	3	6	0	0	0	8	0	3	6	0	0	0	5	0	2	5	0	0	0	1	0	1	1	0	0	0	
Redtop	77-1	75	90	3	60	0	0	0	60	90	3	50	0	0	0	35	80	2	35	0	0	0	20	80	2	30	0	0	0	
	77-2	15	10	2	20	10	1	3	1	0	2	5	5	1	2	0	0	0	0	15	1	10	0	0	0	0	0	0	0	0
	77-3	10	15	3	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	77-4	8	0	3	8	0	0	0	12	10	3	10	0	0	0	7	0	3	8	0	0	0	+	0	1	4	0	0	0	
Reed Canarygrass	77-1	75	15	2	25	0	0	0	40	5	2	15	0	0	0	25	0	2	15	0	0	0	15	0	2	10	0	0	0	0
	77-2	2	0	2	5	10	1	4	3	0	2	5	0	0	0	+	0	2	5	20	2	5	0	0	0	0	0	10	1	5
	77-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	77-4	15	0	3	15	0	0	0	7	0	3	10	0	0	0	5	0	3	5	0	0	0	+	0	1	2	0	0	0	0

APPENDIX L (Continued)

SPECIES	SITE	DOUBLE RECOMMENDED FERTILIZER							RECOMMENDED FERTILIZER							HALF RECOMMENDED FERTILIZER							NO FERTILIZER						
		% GROUND COVER	% SEEDING HEADS	% GROUND SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEEDING HEADS	% GROUND SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEEDING HEADS	% GROUND SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEEDING HEADS	% GROUND SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)				
Chinook Orchardgrass	77-1	70	30	1	15	0	0	0	55	30	1	10	0	0	0	35	10	1	8	0	0	0	5	0	1	5	0	0	0
	77-2	+	0	2	5	10	1	3	+	0	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	20	1	10	
	77-3	0	0	0	0	0	0	0	0	0	0	0	15	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	
	77-4	3	0	2	4	0	0	0	5	0	2	4	0	0	0	5	0	2	8	0	0	0	3	0	1	3	0	0	0
Creeping Red Fescue	77-1	70	80	3	60	0	0	0	65	80	3	55	0	0	0	30	60	2	40	0	0	0	5	0	1	4	0	0	0
	77-2	25	0	3	10	1.5	2	5	3	0	3	10	0	0	0	3	0	2	5	20	1	4	1	0	2	3	10	1	4
	77-3	10	0	2	5	0	0	0	2	0	2	2	0	0	0	3	0	2	0	0	0	0	+	0	1	2	0	0	0
	77-4	20	0	3	8	0	0	0	15	0	3	8	0	0	0	15	0	3	8	0	0	0	1	0	1	2	0	0	0
Brome grass	77-1	60	40	15	60	0	0	0	40	5	1	20	0	0	0	25	5	1	15	0	0	0	2	0	1	5	0	0	0
	77-2	35	50	3	40	10	1	4	20	15	3	30	0	0	0	30	0	2	15	20	1	5	1	0	1	5	25	1	8
	77-3	4	0	2	5	0	0	0	1	0	2	5	0	0	0	+	0	2	5	0	0	0	0	0	0	0	0	0	0
	77-4	2	0	1	4	0	0	0	1	0	1	4	0	0	0	2	0	1	4	0	0	0	0	0	0	0	0	0	0
Hard Fescue	77-1	60	70	3	50	10	1	3	50	70	2	45	10	1	3	35	65	2	40	15	1	2	5	0	1	5	15	1	2
	77-2	45	50	2	12	0	0	0	45	50	2	15	0	0	0	15	20	2	12	0	0	0	3	0	1	3	5	1	5
	77-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	77-4	3	0	3	4	0	0	0	6	0	3	4	0	0	0	2	0	2	2	0	0	0	+	0	1	2	0	0	0
Kentucky Blue Grass	77-1	45	70	3	15	0	0	0	40	70	2	12	0	0	0	25	40	2	10	10	1	5	5	0	2	5	10	1	3
	77-2	25	30	2	8	5	1	8	25	20	2	5	0	0	0	10	0	2	4	10	1	10	1	0	2	2	0	0	0
	77-3	12	10	3	5	0	0	0	8	0	2	4	0	0	0	3	0	2	3	0	0	0	+	0	2	2	0	0	0
	77-4	3	0	2	3	0	0	0	2	0	2	2	0	0	0	1	0	2	2	0	0	0	+	0	1	2	0	0	0
Streambank Wheatgrass	77-1	60	25	2	30	5	1	2	45	10	2	20	15	1	3	15	5	2	10	20	1	4	5	0	1	5	0	0	0
	77-2	15	35	2	40	0	0	0	10	10	2	25	0	0	0	10	10	2	15	0	0	0	8	15	2	15	0	0	0
	77-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	77-4	3	0	1	4	0	0	0	3	0	1	4	0	0	0	2	0	1	4	0	0	0	2	0	1	4	0	0	0

APPENDIX L (Continued)

SPECIES	SITE	DOUBLE RECOMMENDED FERTILIZER								RECOMMENDED FERTILIZER								HALF RECOMMENDED FERTILIZER								NO FERTILIZER							
		% GROUND COVER	% SEED HEADS	WGT (g)	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	WGT (g)	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	WGT (g)	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	WGT (g)	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	WGT (g)	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)		
Canada Bluegrass	77-1	50	80	2	45	0	0	0	40	70	2	25	0	0	0	20	50	2	20	0	0	0	4	0	1	5	0	0	0	0	0		
	77-2	15	20	2	10	0	0	0	8	20	2	10	0	0	0	8	20	2	8	0	0	0	3	0	2	5	0	0	0	0	0		
	77-3	5	15	2	5	0	0	0	2	10	2	5	0	0	0	+	20	2	4	0	0	0	+	20	2	5	0	0	0	0	0		
	77-4	0	0	0	0	0	0	0	+	0	1	1	0	0	0	+	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0		
Tracenta Bentgrass	77-1	10	70	3	15	10	1	2	5	70	2	15	0	0	0	35	30	2	10	0	0	0	0	0	0	0	0	0	0	0	0		
	77-2	50	50	2	5	0	0	0	10	20	2	5	0	0	0	1	0	2	4	10	1	5	+	0	1	2	0	0	0	0	0		
	77-3	35	0	25	4	0	0	0	20	0	2	4	0	0	0	20	0	2	4	0	0	0	7	0	2	3	0	0	0	0	0		
	77-4	5	0	3	3	0	0	0	10	0	3	3	0	0	0	4	0	3	3	0	0	0	+	0	2	2	0	0	0	0	0		
Crested Wheatgrass	77-1	40	50	2	50	10	1	5	25	60	2	20	0	0	0	20	35	2	10	0	0	0	2	0	2	2	0	0	0	0	0		
	77-2	15	90	2	40	10	2	3	8	80	2	35	10	2	3	5	30	2	20	0	0	0	1	0	1	5	0	0	0	0	0		
	77-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	77-4	10	0	2	5	0	0	0	5	0	2	7	0	0	0	5	0	2	8	0	0	0	2	0	1	3	0	0	0	0	0		
Slender Wheatgrass	77-1	45	90	2	60	0	0	0	40	80	2	60	0	0	0	15	60	2	30	0	0	0	7	0	1	8	0	0	0	0	0		
	77-2	50	10	2	30	0	0	0	35	0	2	25	0	0	0	10	0	2	15	0	0	0	8	0	2	8	0	0	0	0	0		
	77-3	2	0	1	3	0	0	0	4	0	15	6	0	0	0	1	0	1	3	0	0	0	1	0	1	3	0	0	0	0	0		
	77-4	4	0	2	7	0	0	0	5	2	2	7	0	0	0	5	0	2	8	0	0	0	2	0	1	3	0	0	0	0	0		
Climax Timothy	77-1	50	70	2	60	30	1	2	25	60	2	50	30	1	4	20	60	2	50	30	1	3	8	5	1	5	10	1	3				
	77-2	50	80	3	30	10	1	5	15	40	2	15	10	1	4	2	10	2	10	20	1	8	+	0	1	5	15	1	10				
	77-3	25	30	2	20	0	0	0	18	30	2	10	0	0	0	2	10	2	10	0	0	0	+	0	1	3	0	0	0	0	0		
	77-4	3	0	1	2	0	0	0	8	0	2	4	0	0	0	7	0	2	4	0	0	0	2	0	2	3	0	0	0	0	0		
Russian Wild Ryegrass	77-1	25	0	1	15	5	1	2	25	0	1	10	0	0	0	10	0	1	8	0	0	0	1	0	1	3	15	1	3				
	77-2	15	0	2	15	0	0	0	10	0	2	15	10	1	8	7	0	2	10	15	1	0	2	0	1	3	15	1	10				
	77-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	2	5	0	0	0	0	15	2	3				
	77-4	+	0	1	1	0	0	0	+	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

APPENDIX M

PERFORMANCE OF LEGUMES IN GENERAL SPECIES TRIALS, TESTING FOUR FERTILIZER RATES, EVALUATED AUGUST 1978

SPECIES	SITE	DOUBLE RECOMMENDED FERTILIZER							RECOMMENDED FERTILIZER							HALF RECOMMENDED FERTILIZER							NO FERTILIZER						
		% GROUND COVER	% SEEDING HEADS	% GOUR SCALE (cm)	% HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE DEPTH (cm)		% GROUND COVER	% SEEDING HEADS	% GOUR SCALE (cm)	% HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE DEPTH (cm)		% GROUND COVER	% SEEDING HEADS	% GOUR SCALE (cm)	% HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE DEPTH (cm)		% GROUND COVER	% SEEDING HEADS	% GOUR SCALE (cm)	% HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE DEPTH (cm)	
Cicer Milkvetch	77-1	4	0	2	10	0	0	0	4	0	2	10	0	0	0	4	0	2	10	0	0	0	2	0	1	3	0	0	0
	77-2	4	0	2	4	0	0	0	2	0	2	3	0	0	0	+	0	2	2	20	1	10	2	0	2	2	0	0	0
	77-3	0	0	0	0	15	3	4	0	0	0	0	10	2	5	0	0	0	0	5	1	3	0	0	0	0	15	2	5
	77-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ceres Alfalfa	77-1	80	25	3	50	0	0	0	90	30	3	60	0	0	0	90	35	3	60	0	0	0	90	40	3	50	0	0	0
	77-2	+	0	2	4	0	0	0	+	0	2	2	10	2	5	+	0	2	2	10	1	10	0	0	0	0	0	0	0
	77-3	0	0	0	0	30	3	4	0	0	0	0	30	3	4	0	0	0	0	20	2	3	0	0	0	0	10	1	2
	77-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sweet Clover	77-1	95	100	3	80	0	0	0	95	100	3	80	0	0	0	90	100	3	80	0	0	0	90	100	3	100	0	0	0
	77-2	3	0	1	4	5	1	2	3	0	1	4	20	1	10	2	0	2	4	30	2	8	3	0	2	3	25	2	15
	77-3	0	0	0	0	20	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	77-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	2	2	0	0	0	0	0	0	0	0	0	0
Sainfoin	77-1	40	100	2	60	0	0	0	30	50	1	30	0	0	0	15	10	1	20	0	0	0	5	5	1	15	0	0	0
	77-2	+	0	2	4	5	1	3	0	0	0	0	0	0	0	0	0	0	0	20	2	3	+	0	1	5	10	1	10
	77-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	77-4	+	0	2	3	0	0	0	1	0	2	3	0	0	0	+	0	2	3	0	0	0	+	0	1	3	0	0	0
Red Clover	77-1	80	90	3	50	0	0	0	70	70	2	30	20	1	5	60	75	2	30	30	1	4	20	10	2	20	0	0	0
	77-2	+	0	1	2	15	2	4	1	0	1	2	0	0	0	+	0	1	1	15	1	10	+	0	1	1	15	1	10
	77-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	77-4	+	0	2	1	0	0	0	+	0	2	1	0	0	0	+	0	2	1	0	0	0	+	0	1	1	0	0	0
Birdsfoot Trefoil	77-1	15	75	2	20	0	0	0	25	60	2	20	0	0	0	20	35	2	10	0	0	0	2	0	2	2	0	0	0
	77-2	1	0	2	3	5	1	3	1	0	2	2	5	2	2	1	0	2	2	0	0	0	1	0	2	2	0	0	0
	77-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	77-4	2	0	3	2	0	0	0	1	0	3	3	0	0	0	+	0	3	3	0	0	0	+	0	2	1	0	0	0

APPENDIX M (Continued)

SPECIES	SITE	DOUBLE RECOMMENDED FERTILIZER								RECOMMENDED FERTILIZER								HALF RECOMMENDED FERTILIZER								NO FERTILIZER							
		% GROUND COVER	% SEED HEADS	% MOOR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	% MOOR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	% MOOR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	% MOOR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	% MOOR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)		
Alsike Clover	77-1	50	80	2	30	20	1	5	40	80	2	30	10	1	3	30	80	1	15	30	1	2	2	0	1	2	30	2	1				
	77-2	10	0	2	2	15	1	5	2	0	2	2	10	1	3	2	0	2	1	20	2	3	2	0	1	1	20	1	3				
	77-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	77-4	2	0	2	1	0	0	0	3	0	2	1	0	0	0	2	0	2	1	0	0	0	1	0	1	1	0	0	0				
Drylander Alfalfa	77-1	65	90	3	4	5	1	3	45	50	3	40	30	1	5	45	50	3	30	10	1	3	20	50	3	30	20	1	2				
	77-2	+	0	1	1	0	0	0	+	0	1	1	10	2	3	+	0	1	1	20	1	5	+	0	1	1	20	2	5				
	77-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	2	3					
	77-4	0	0	0	0	0	0	0	+	0	1	1	0	0	0	+	0	1	1	0	0	0	0	0	0	0	0	0	0				
White Clover	77-1	75	80	3	25	0	0	0	40	80	2	20	0	0	0	40	50	2	20	0	0	0	20	50	2	15	0	0	0				
	77-2	5	0	2	2	0	0	0	2	0	2	2	15	1	8	1	0	2	2	10	1	15	+	0	1	1	15	1	5				
	77-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	2	3	0	0	0	0	25	2	4					
	77-4	2	0	3	3	0	0	0	1	0	3	3	0	0	0	+	0	2	1	0	0	0	+	0	1	1	0	0	0				

APPENDIX N

PERFORMANCE OF GRASS AND LEGUME SPECIES IN TWO SPECIES MIXES AND FOUR FERTILIZER RATES, GENERAL SPECIES TRIALS, EVALUATED AUGUST 1978

SPECIES / MIX	SITE	DOUBLE RECOMMENDED FERTILIZER							RECOMMENDED FERTILIZER							HALF RECOMMENDED FERTILIZER							NO FERTILIZER							
		% GROUND COVER	% SEED HEADS	% VIGOR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)		% GROUND COVER	% SEED HEADS	% VIGOR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)		% GROUND COVER	% SEED HEADS	% VIGOR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)		% GROUND COVER	% SEED HEADS	% VIGOR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)		
MIX A	Mix A Total	77-1	75	-	-	-	0	0	0	70	-	-	-	0	0	0	70	-	-	-	10	1	4	70	-	-	-	0	0	0
		77-2	55	-	-	-	15	3	5	25	-	-	-	25	1	30	12	-	-	-	7	2	3	6	-	-	-	5	3	2
		77-3	30	-	-	-	5	2	2	15	-	-	-	10	2	5	5	-	-	-	10	1	2	2	-	-	-	25	1	15
		77-4	20	0	3	5	0	0	0	15	0	3	5	0	0	0	15	0	2	10	0	0	0	2	0	1	1	0	0	0
	Grasses	77-1	25	-	-	-	-	-	-	20	-	-	-	-	-	-	10	-	-	-	-	-	-	2	-	-	-	-	-	-
		77-2	50	-	-	-	-	-	-	22	-	-	-	-	-	-	10	-	-	-	-	-	-	5	-	-	-	-	-	-
		77-3	30	-	-	-	-	-	-	15	-	-	-	-	-	-	5	-	-	-	-	-	-	2	-	-	-	-	-	-
		77-4	20	-	-	-	-	-	-	15	-	-	-	-	-	-	15	-	-	-	-	-	-	2	-	-	-	-	-	-
	Alsike Clover (Legumes)	77-1	50	90	3	20	-	-	-	50	90	3	20	-	-	-	60	90	3	20	-	-	-	68	90	3	20	-	-	-
		77-2	5	0	2	5	-	-	-	3	0	2	3	-	-	-	2	0	2	2	-	-	-	1	0	2	7	-	-	-
		77-3	0	0	0	0	-	-	-	0	0	0	0	-	-	-	+	0	1	2	-	-	-	0	0	0	0	-	-	-
		77-4	+	0	2	1	-	-	-	+	0	2	1	-	-	-	+	0	2	1	-	-	-	+	0	1	1	-	-	-
	Creeping Red Fescue	77-1	10	30	3	10	-	-	-	5	25	3	10	-	-	-	5	20	3	10	-	-	-	1	0	2	10	-	-	-
		77-2	25	25	2	15	-	-	-	18	10	2	10	-	-	-	7	0	2	7	-	-	-	2	0	2	4	-	-	-
		77-3	10	20	3	15	-	-	-	5	10	2	5	-	-	-	3	20	2	5	-	-	-	1	0	1	4	-	-	-
	Timothy	77-1	15	80	3	45	-	-	-	15	70	3	45	-	-	-	5	70	3	40	-	-	-	1	50	2	15	-	-	-
		77-2	25	70	2	40	-	-	-	4	10	2	10	-	-	-	3	0	2	8	-	-	-	3	0	2	7	-	-	-
		77-3	20	60	3	15	-	-	-	10	50	3	15	-	-	-	2	0	1	3	-	-	-	1	0	1	4	-	-	-

APPENDIX N (Continued)

MIX B

SPECIES / MIX	SITE	DOUBLE RECOMMENDED FERTILIZER							RECOMMENDED FERTILIZER							HALF RECOMMENDED FERTILIZER							NO FERTILIZER						
		% GROUND COVER	% SEED HEADS	% GROUND HEIGHT (cm)	% PLOT NO. OF ERRORED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	% GROUND HEIGHT (cm)	% PLOT NO. OF ERRORED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	% GROUND HEIGHT (cm)	% PLOT NO. OF ERRORED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	% GROUND HEIGHT (cm)	% PLOT NO. OF ERRORED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	% GROUND HEIGHT (cm)	% PLOT NO. OF ERRORED CHAN.	AVE. DEPTH (cm)			
Mix B Total	77-1	60	-	-	0	0	0	45	-	-	0	0	0	45	-	-	0	0	0	50	-	-	0	0	0				
	77-2	45	-	-	15	3	5	25	-	-	10	1	15	15	-	-	5	1	3	5	-	-	0	0	0				
	77-3	15	-	-	0	0	0	8	-	-	10	1	5	4	-	-	10	2	4	2	-	-	30	1	15				
	77-4	25	-	-	0	0	0	10	-	-	0	0	0	20	-	-	0	0	0	1	-	-	0	0	0				
Grassus	77-1	56	-	-	-	-	-	30	-	-	-	-	-	25	-	-	-	-	-	6	-	-	-	-	-				
	77-2	43	-	-	-	-	-	24	-	-	-	-	-	14	-	-	-	-	-	4	-	-	-	-	-				
	77-3	15	-	-	-	-	-	8	-	-	-	-	-	4	-	-	-	-	-	2	-	-	-	-	-				
	77-4	25	-	-	-	-	-	10	-	-	-	-	-	20	-	-	-	-	-	1	-	-	-	-	-				
Alsike Clover (Legumes)	77-1	5	90	3	15	-	-	15	90	3	20	-	-	20	90	3	20	-	-	45	90	2	20	-	-				
	77-2	2	0	2	4	-	-	2	0	2	2	-	-	1	0	2	2	-	-	1	0	1	2	-	-				
	77-3	0	0	0	0	-	-	0	0	0	0	-	-	0	0	0	0	-	-	0	0	0	0	-	-				
	77-4	+	0	2	1	-	-	+	0	2	1	-	-	+	0	2	1	-	-	0	0	0	0	-	-				
Creeping Red Fescue	77-1	15	50	3	30	-	-	10	20	2	30	-	-	10	20	3	15	-	-	2	0	2	4	-	-				
	77-2	10	25	2	25	-	-	6	0	2	8	-	-	6	0	2	5	-	-	1	0	2	5	-	-				
	77-3	3	10	2	5	-	-	3	10	1	5	-	-	2	20	2	10	-	-	1	0	1	4	-	-				
Timothy	77-1	30	100	3	45	-	-	15	90	3	45	-	-	10	80	3	45	-	-	3	0	2	5	-	-				
	77-2	15	60	2	30	-	-	12	25	2	18	-	-	2	0	2	10	-	-	2	0	2	7	-	-				
	77-3	12	30	2	15	-	-	5	10	1	5	-	-	2	20	2	10	-	-	1	0	1	4	-	-				
Redtop	77-1	10	100	3	40	-	-	5	80	3	25	-	-	5	80	3	30	-	-	1	50	2	10	-	-				
	77-2	3	0	2	8	-	-	0	0	0	0	-	-	1	0	2	5	-	-	0	0	0	0	-	-				
	77-3	0	0	0	0	-	-	0	0	0	0	-	-	0	0	0	0	-	-	0	0	0	0	-	-				
Meadow Foxtail	77-1	1	100	2	15	-	-	+	50	2	20	-	-	0	0	0	0	-	-	1	0	2	12	-	-				
	77-2	10	20	2	55	-	-	3	25	2	15	-	-	2	0	2	10	-	-	1	0	2	7	-	-				
	77-3	0	0	0	0	-	-	0	0	0	0	-	-	0	0	0	0	-	-	0	0	0	0	-	-				
Bromegrass	77-1	0	0	0	0	-	-	0	0	0	0	-	-	0	0	0	0	-	-	0	0	0	0	-	-				
	77-2	5	20	2	30	-	-	3	0	2	20	-	-	3	0	2	10	-	-	+	0	2	7	-	-				
	77-3	0	0	0	0	-	-	0	0	0	0	-	-	0	0	0	0	-	-	0	0	0	0	-	-				

APPENDIX O

PERFORMANCE OF GRASS AND LEGUME SPECIES, COATED SEED TRIALS, EVALUATED AUGUST 1978

SPECIES	SITE	COATED SEED / NOT FERTILIZED							COATED SEED / FERTILIZED							NORMAL SEED / FERTILIZED							NORMAL SEED / NOT FERTILIZED						
		% GROUND COVER	% SEED HEADS	MOOR SCALE (cm)	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	DEPTH (cm)		% GROUND COVER	% SEED HEADS	MOOR SCALE (cm)	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	DEPTH (cm)		% GROUND COVER	% SEED HEADS	MOOR SCALE (cm)	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	DEPTH (cm)		% GROUND COVER	% SEED HEADS	MOOR SCALE (cm)	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	DEPTH (cm)	
Meadow Foxtail	77-4	1	0	1	2	0	0	0	4	0	2	4	0	0	0	6	0	3	5	0	0	0	1	0	1	2	0	0	0
	77-5	1	0	1	2	0	0	0	6	0	2	7	0	0	0	10	0	8	0	0	0	0	2	0	1.5	5	0	0	0
	77-6	2	0	1.5	3	0	0	0	15	0	3	8	0	0	0	17	0	3	8	0	0	0	3	0	2	3	0	0	0
	78-1	7	0	2	2	0	0	0	30	0	3	4	0	0	0	35	0	3	4	0	0	0	5	0	1	2	0	0	0
	78-2	3	0	2	2	0	0	0	10	0	3	5	0	0	0	15	0	3	5	0	0	0	4	0	2	3	0	0	0
Meadow Fescue	77-4	1	0	1	2	0	0	0	3	0	2	4	0	0	0	5	0	3	5	0	0	0	1	0	1	2	0	0	0
	77-5	1	0	1	4	0	0	0	5	0	2	6	0	0	0	7	0	2	6	0	0	0	1	0	1	4	0	0	0
	77-6	3	0	1	3	0	0	0	20	0	3	8	0	0	0	18	2	3	9	0	0	0	5	0	2	4	0	0	0
	78-1	2	0	1.5	2	0	0	0	6	0	2	3	0	0	0	5	0	2	3	0	0	0	2	0	2	3	0	0	0
	78-2	3	0	2	2	0	0	0	8	0	3	5	0	0	0	10	0	3	5	0	0	0	4	0	2	2	0	0	0
Redtop	77-4	+	0	1	1	0	0	0	2	0	2	3	0	0	0	1	0	2	3	0	0	0	0	0	0	0	0	0	0
	77-5	+	0	1	1	0	0	0	4	0	2	5	0	0	0	5	0	2	6	0	0	0	1	0	2	3	0	0	0
	77-6	3	0	2	3	0	0	0	35	3	3	9	0	0	0	45	5	3	10	0	0	0	3	0	2	3	0	0	0
	78-1	3	0	1	2	0	0	0	35	0	3	4	0	0	0	45	0	3	5	0	0	0	3	0	1	1	0	0	0
	78-2	2	0	2	1.5	0	0	0	10	0	3	4	0	0	0	12	0	3	3	0	0	0	4	0	2	1.5	0	0	0
Creeping Red Fescue	77-4	1	0	1	2	0	0	0	5	0	3	4	0	0	0	6	0	3	4	0	0	0	+	0	1	2	0	0	0
	77-5	1	0	2	3	0	0	0	7	0	2	5	0	0	0	8	0	2	5	0	0	0	3	0	2	3	0	0	0
	77-6	5	0	2	4	0	0	0	30	0	3	8	0	0	0	40	0	3	8	0	0	0	4	0	2	4	0	0	0
	78-1	2	0	1	1	0	0	0	8	0	3	4	0	0	0	9	0	3	4	0	0	0	2	0	1	1	0	0	0
	78-2	3	0	2	2	0	0	0	11	0	3	4	0	0	0	15	0	3	4	0	0	0	5	0	2	1.5	0	0	0
Bromegrass	77-4	1	0	1	2	0	0	0	3	0	2	4	0	0	0	2	0	2	3	0	0	0	1	0	1	2	0	0	0
	77-5	1	0	2	3	0	0	0	4	0	2	5	0	0	0	6	0	2	7	0	0	0	1	0	2	3	0	0	0
	77-6	2	0	1	3	0	0	0	10	0	2	10	0	0	0	10	0	2	8	0	0	0	3	1	2	3	0	0	0
	78-1	1	0	1	2	0	0	0	10	0	2	10	0	0	0	3	0	2	3	0	0	0	2	0	2	2	0	0	0
	78-2	2	0	2	2.5	0	0	0	5	0	3	5	0	0	0	10	0	3	5	0	0	0	3	0	2	3	0	0	0
Timothy	77-4	1	0	2	4	0	0	0	1	0	1	3	0	0	0	4	0	3	5	0	0	0	1	0	1	3	0	0	0
	77-5	1	0	2	2	0	0	0	6	0	2	7	0	0	0	5	0	2	7	0	0	0	1	0	2	3	0	0	0
	77-6	2	0	2	3	0	0	0	30	50	3	20	0	0	0	30	50	3	20	0	0	0	4	0	2	4	0	0	0
	78-1	5	0	1	2	0	0	0	18	0	3	4	0	0	0	15	0	3	3	0	0	0	8	0	2	2	0	0	0
	78-2	5	0	2.5	2	0	0	0	12	0	3	3	0	0	0	15	0	3	4	0	0	0	7	0	2	1.5	0	0	0
Birdsfoot Trefoil	77-4	1	0	2	2	0	0	0	2	0	3	3	0	0	0	1	0	3	3	0	0	0	+	0	2	1	0	0	0
	77-5	+	0	2	1	0	0	0	1	0	2	3	0	0	0	1	0	2	2	0	0	0	+	0	2	1	0	0	0
	77-6	1	0	1	1	0	0	0	3	0	3	5	0	0	0	3	0	3	5	0	0	0	1	0	2	2	0	0	0
	78-1	2	0	2	1	0	0	0	3	0	2	2	0	0	0	2	0	2	1	0	0	0	2	0	2	1	0	0	0
	78-2	4	0	2	2	0	0	0	7	0	3	3	0	0	0	8	0	3	3	0	0	0	6	0	2	2	0	0	0
Alsike Clover	77-4	1	0	1	1	0	0	0	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	77-5	1	0	1	1	0	0	0	4	0	2	2	0	0	0	2	0	2	2	0	0	0	+	0	1	1	0	0	0
	77-6	2	0	1	1	0	0	0	8	0	3	5	0	0	0	10	0	3	5	0	0	0	4	0	2	4	0	0	0
	78-1	2	0	1	1	0	0	0	2	0	1	1	0	0	0	1	0	1	1	0	0	0	2	0	1	1	0	0	0
	78-2	5	0	2	1	0	0	0	10	0	3	3	0	0	0	12	0	3	3	0	0	0	6	0	2	15	0	-0	0

APPENDIX P

PERFORMANCE OF GRASSES AND LEGUMES IN TRIALS TESTING FIVE SEEDING RATES, EVALUATED AUGUST 1978

MIX / SPECIES	SITE	400 lb / A					200 lb / A					100 lb / A					50 lb / A					25 lb / A				
		% GROUND COVER	% SEED HEADS	% VIGOUR SCALE	HEIGHT (cm)	% PLOT ERODED	% GROUND COVER	% SEED HEADS	% VIGOUR SCALE	HEIGHT (cm)	% PLOT ERODED	% GROUND COVER	% SEED HEADS	% VIGOUR SCALE	HEIGHT (cm)	% PLOT ERODED	% GROUND COVER	% SEED HEADS	% VIGOUR SCALE	HEIGHT (cm)	% PLOT ERODED	% GROUND COVER	% SEED HEADS	% VIGOUR SCALE	HEIGHT (cm)	% PLOT ERODED
Mix B	77-4	50	-	-	-	0	35	-	-	-	0	25	-	-	-	0	10	-	-	-	0	8	-	-	-	0
	77-5	78	-	-	-	0	68	-	-	-	0	67	-	-	-	0	15	-	-	-	0	15	-	-	-	0
	77-6	35	-	-	-	0	35	-	-	-	0	15	-	-	-	0	8	-	-	-	0	20	-	-	-	0
	78-1	80	-	-	-	0	75	-	-	-	0	65	-	-	-	0	35	-	-	-	0	15	-	-	-	0
	78-2	65	-	-	-	0	45	-	-	-	0	30	-	-	-	0	20	-	-	-	0	20	-	-	-	0
Grasses	77-4	50	0	3	5	-	35	0	3	5	-	25	0	3	4	-	10	0	2	4	-	8	0	2	4	-
	77-5	75	0	2	10	-	65	0	2	10	-	65	1	2	15	-	15	1	2	10	-	15	8	2	10	-
	77-6	35	0	3	15	-	35	10	3	15	-	15	0	3	10	-	8	0	3	4	-	20	0	3	5	-
	78-1	80	0	3	3	-	73	0	3	3	-	63	0	3	3	-	32	0	3	3	-	13	0	3	3	-
	78-2	50	0	3	7	-	38	0	3	7	-	23	0	3	7	-	14	0	3	6	-	13	0	3	6	-
Legumes (Alsike Clover)	77-4	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-
	77-5	3	0	2	1	-	3	0	2	1	-	2	0	2	1	-	+	0	2	1	-	+	0	2	1	-
	77-6	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-
	78-1	1	0	3	1	-	2	0	3	1	-	2	0	3	1	-	2	0	3	1	-	+	0	3	1	-
	78-2	15	0	3	3	-	7	0	3	3	-	7	0	3	3	-	6	0	2	2	-	7	0	3	3	-

APPENDIX Q
PERFORMANCE OF GRASSES AND LEGUMES IN TRIALS TESTING FERTILIZER CONSTITUENTS,
EVALUATED AUGUST 1978

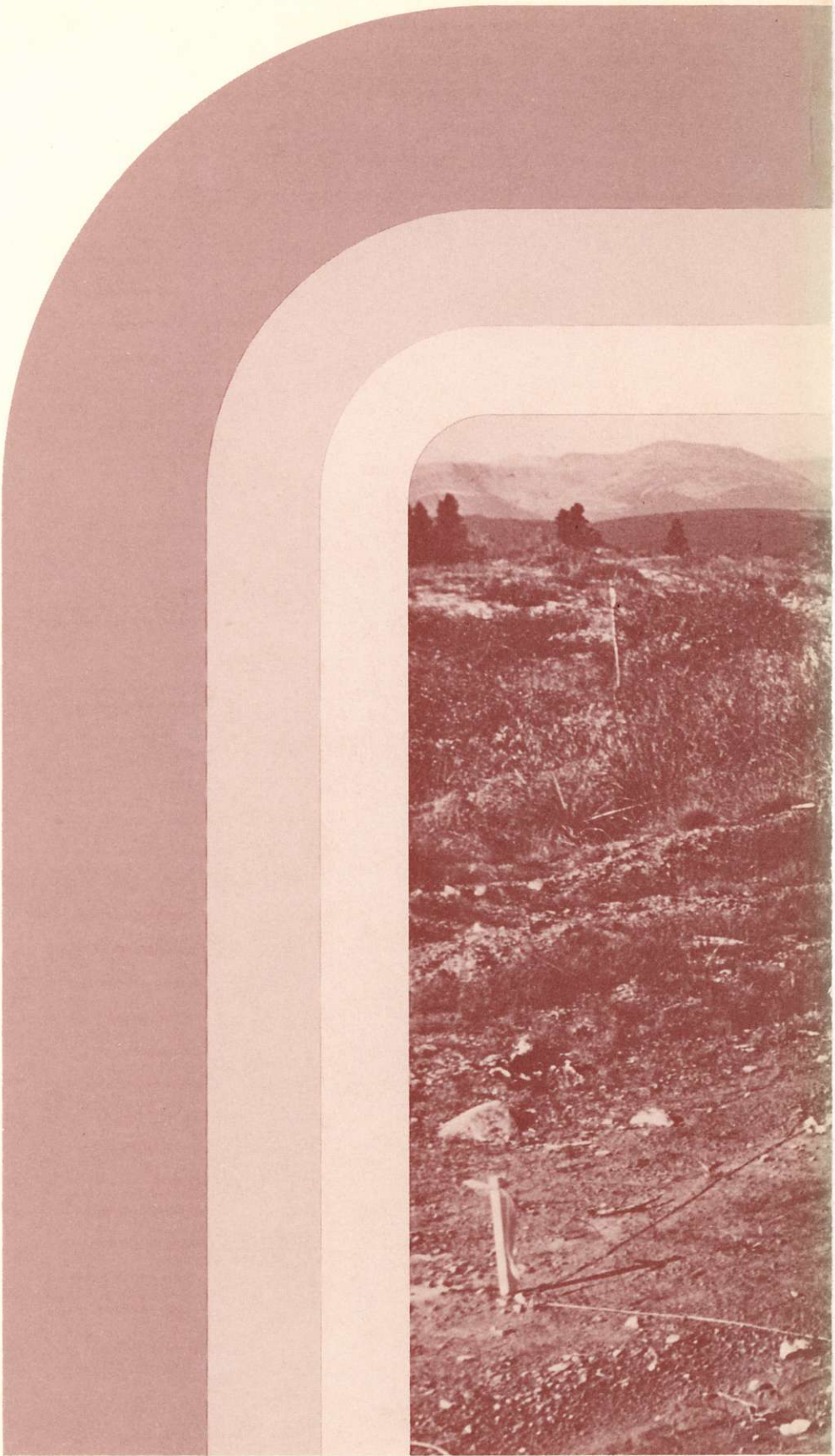
MIX / SPECIES	SITE	CONTROL						NITROGEN						PHOSPHORUS						POTASSIUM					
		% GROUND COVER	% SEED HEADS	% VIGOUR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	% VIGOUR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	% VIGOUR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	% VIGOUR SCALE	HEIGHT (cm)	% PLOT NO. OF ERODED CHAN.	AVE. DEPTH (cm)
Mix B	77-4	5	-	-	-	0	0	10	-	-	-	0	0	3	-	-	-	0	0	5	-	-	-	0	0
	77-5	0	-	-	-	0	0	5	-	-	-	0	0	20	-	-	-	0	0	6	-	-	-	0	0
	77-6	2	-	-	-	0	0	7	-	-	-	0	0	+	-	-	-	0	0	2	-	-	-	0	0
	78-1	7	-	-	-	0	0	10	-	-	-	0	0	4	-	-	-	0	0	2	-	-	-	0	0
	78-2	4	-	-	-	0	0	5	-	-	-	0	0	6	-	-	-	0	0	9	-	-	-	0	0
Grasses	77-4	5	0	1	3	-	-	10	0	2	2	-	-	3	0	1	2	-	-	5	0	1.5	2	-	-
	77-5	4	0	2	5	-	-	3	0	2	3	-	-	16	5	2	7	-	-	4	0	2	4	-	-
	77-6	1	0	1	1	-	-	2	0	2	3	-	-	+	0	1	1	-	-	2	0	1	2	-	-
	78-1	4	0	2	2	-	-	7	0	2	2	-	-	1	0	2	3	-	-	2	0	1	1	-	-
	78-2	2	0	2	2	-	-	3	0	2	3	-	-	3	0	2	3	-	-	6	0	2	2	-	-
Legumes	77-4	+	0	1	1	-	-	+	0	1	1	-	-	+	0	1	1	-	-	0	0	0	0	-	-
	77-5	2	0	2	2	-	-	2	0	2	2	-	-	4	0	2	2	-	-	2	0	2	2	-	-
	77-6	1	0	2	1	-	-	+	0	2	1	-	-	0	0	0	0	-	-	+	0	1	1	-	-
	78-1	3	0	2	1	-	-	3	0	2	1	-	-	3	0	2	1	-	-	+	0	1	1	-	-
	78-2	2	0	2	1	-	-	2	0	2	1	-	-	3	0	2	1	-	-	3	0	2	1	-	-

APPENDIX Q (Continued)

MIX / SPECIES	SITE	PHOSPHORUS / POTASSIUM							NITROGEN / POTASSIUM							NITROGEN / PHOSPHORUS							NITROGEN / PHOSPHORUS / POTASSIUM						
		% GROUND COVER	% SEED HEADS	% VIGOUR SCALE	HEIGHT (cm)	% PLOT	NO. OF	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	% VIGOUR SCALE	HEIGHT (cm)	% PLOT	NO. OF	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	% VIGOUR SCALE	HEIGHT (cm)	% PLOT	NO. OF	AVE. DEPTH (cm)	% GROUND COVER	% SEED HEADS	% VIGOUR SCALE	HEIGHT (cm)	% PLOT	NO. OF	AVE. DEPTH (cm)
Mix B	77-4	8	-	-	-	0	0	0	20	-	-	-	0	0	0	30	-	-	-	0	0	0	35	-	-	-	0	0	0
	77-5	20	-	-	-	0	0	0	25	-	-	-	0	0	0	25	-	-	-	0	0	0	35	-	-	-	0	0	0
	77-6	3	-	-	-	0	0	0	7	-	-	-	0	0	0	15	-	-	-	0	0	0	15	-	-	-	0	0	0
	78-1	8	-	-	-	0	0	0	7	-	-	-	2	1	5	10	-	-	-	0	0	0	44	-	-	-	0	0	0
	78-2	14	-	-	-	0	0	0	13	-	-	-	0	0	0	25	-	-	-	0	0	0	30	-	-	-	0	0	0
Grasses	77-4	8	0	1.5	2	-	-	-	20	0	2	3	-	-	-	30	0	3	5	-	-	-	35	0	3	5	-	-	-
	77-5	15	0	2	6	-	-	-	21	0	2	8	-	-	-	23	5	2	7	-	-	-	32	5	2	10	-	-	-
	77-6	3	0	1	2	-	-	-	6	0	3	5	-	-	-	13	0	3	10	-	-	-	14	5	2	10	-	-	-
	78-1	6	0	2	2	-	-	-	5	0	1.5	2	-	-	-	12	0	2	2	-	-	-	43	0	3	3	-	-	-
	78-2	11	0	2	3	-	-	-	6	0	3	3	-	-	-	17	0	3	5	-	-	-	20	0	2	6	-	-	-
Legumes	77-4	0	0	0	0	-	-	-	0	0	0	0	-	-	-	0	0	0	0	-	-	-	+	0	2	1	-	-	-
	77-5	5	0	2	3	-	-	-	4	0	2	2	-	-	-	2	0	2	2	-	-	-	3	0	2	3	-	-	-
	77-6	+	0	2	1	-	-	-	1	0	2	1	-	-	-	2	0	2	2	-	-	-	1	0	2	2	-	-	-
	78-1	2	0	2	2	-	-	-	2	0	1.5	1	-	-	-	1	0	2	1	-	-	-	1	0	3	1	-	-	-
	78-2	3	0	2	2	-	-	-	5	0	2	1	-	-	-	6	0	3	2	-	-	-	10	0	2	3	-	-	-

APPENDIX R
CHEMICAL ANALYSIS OF SELECTED SOIL PROPERTIES, TEST PLOT SITES,
1977 AND 1978

SITE	TEXTURE	ORGANIC MATTER	pH	SALTS	NITRATES	P	K	Ca	Mg	S
		(%)	(H ₂ O)	mmhos/ cm	lb./ acre	lb./ acre	lb./ acre	lb./ acre	lb./ acre	lb./ acre
77-1	very gravelly clay	1.9	8.0	0.34	3	11	127	5735	382	
77-2	silt loam	18.0	6.6	0.28	12	11	105	6889	1000+	
77-3	gravelly silt loam	4.7	4.5	0.16	< 1	37	74	798	132	
77-4	gravelly sandy loam	2.3	5.0	0.10	1	110	282	919	147	
77-5	gravelly silt loam	2.6	6.5	0.20	< 1	26	154	3266	384	
77-6	gravelly silt loam	3.6	5.3	0.14	< 1	59	168	2017	332	
78-1	gravelly clay	5.0	4.5	0.16	6	38	100	900	120	9.9
78-2	gravelly silt loam	7.6	7.0	0.26	4	13	140	4700	760	7.0



Queen's Printer for British Columbia ©
Victoria, 1979



**Province of
British Columbia**

Ministry of
Energy, Mines and
Petroleum Resources