E S T A B L I S H M E N T A N D S U R V I V A L O F G R O U N D C O V E R P L A N T I N S S O F D I S T U R B E D A R E A S I N A L B E R T A

Progress Report No. 2

Revegetation Of Disturbed Sites Such As
Powerline Rights-Of-Way And Strip Mines

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DISTURBED AREAS REVEGETATION STUDIES PROGRESS REPORT #2

Introduction

This the second in the series of progress reports on the non-cultivated disturbed areas revegetation project deals with powerline rights-of-way and to a limited extent strip mines. The previous report delt with pipeline rights-of-way and tar sand mining areas. Powerline rights-of-way were surveyed throughout the province to find out what vegetation was growing on them and if reseeding was required. The Whitewood coal mine at Wabamun was surveyed to determine the sucess of past revegetation projects and the extent of natural revegetation.

Objectives

- To determine the need if any for seeding of powerline rights-of-way.
- To find the native and naturalized species most likely to be useful for seeding when reseeding is required.
- To see which species are likely to be useful within the various soil zones.
- To find those species most likely to be useful in the revegetation of strip mines.
- To make recommendations on which species should be considered for use in which soil zones.

Methods (Powerlines)

Powerline rights-of-way were serveyed at various locations throughout Alberta The sites were selected to provide a representative sample of powerline rights-of-way in the various regions of the province. Site selection was limited to areas of natural vegetation. Cultivated fields, seeded pastures and seeded hay land were not included.

At each site a series of ten $1m^2$ plots was used to sample the vegetation. The plots were located such that the maximum amount of environmental variation at each site was included. Within each plot the ground cover of each species rating greater than 1% was estimated and recorded. All other species within the plot and in the

immediate area of the plot were listed as being present. However, no attempt was made to produce a complete species list for any site. The reason being, that species which occur rarely are not likely to be useful in ground cover plantings, because rare occurrence in a particular habitat indicates that a species is not well adapted to the habitat.

After completion of the field work the data was divided into six groups based on the soil zones as defined by the Alberta Soil Survey. The six zones are brown, dark brown, thin black, black, degraded black and grey wooded. Within each one, certain species were selected for future studies on the basis of their potential for providing ground cover. The data for each zone was then divided into three soil types sandy, silty and organic. The sandy soil type included sandy loams and sands. The silty soil type included loams, silty loams, and clay loams. Finally a comparison was made to see if any of the species chosen was restricted to or excluded from any one soil type.

Methods (Whitewood Mine)

A survey of the vegetation at Whitewood mine[1] in order to determine the sucess of past revegetation projects and any natural revegetation taking place. Study sites were chosen to include undisturbed sites as well as those disturbed by mining. Two of the study sites were sampled by means of a series of 10 one m^2 plots. These were an undisturbed site and a site seeded to a grass legume mixture in 1962. Six other sites including natural revegetation on the mine site and more recent (post 1962) plantings of Medicago sativa (Alfalfa) were sampled by estimating the cover of the various species occurring on the site. Species estimated to cover less than 1% were listed as being present.

1. Thanks to Calgary Power for providing a vehicle and assistance.

Results and Discussion (Powerlines)

Experience along cutlines, and pipeline and powerline rights-of-way has shown that the need for reseeding can be minimized by taking care to disturb the litter and topsoil as little as possible while the construction work is being done. If the topsoil and litter are left essentially undisturbed then the native vegetation usually will recover quickly enough to control erosion and the invasion of weeds. However, if the topsoil and litter are removed or disturbed excessively then the native vegetation cannot recover quickly enough to control erosion and weed invasion. When clearing a powerline right-of-way through a forest, care should be taken to see that only the trees and shrubs are removed and with as little disturbance to the topsoil and litter as possible.

In order to control erosion and weed invasion on a permanent basis a stable community of non-weedy species must be established. The easiest way to do this is, wherever possible, to enable the native vegetation of the area to remain on the right-of-way. If this is not possible then reseeding must be done to establish a permanent community.

Reseeding should be done with a large number of species in the seed mixture to help ensure the community to be a stable one. It also helps make sure of vegetation cover on as many as possible of the various habitats within the area seeded. This is becuase the different species will be adapted to different ranges of habitats and thus will be able to colonize more habitats than a single species could.

The species used in a revegetation program should be native or naturalized to the area being seeded, because these are the species most likely to form a stable plant community in the area. In Alberta several different seed mixtures will be required because of the diversity of habitat types. For example a seed mixture suitable for the brown soil zone in the semi-arid south-eastern portion of the province would not be suitable for the grey wooded soil zone in the sub-humid northern half of the province. Because of the relatively wide range of adaption for most

of the species occurring in Alberta a seed mixture suitable for the brown soil zone will contain many of the same species as a seed mixture suitable for the adjacent dark brown soil zone.

After separating the plots on the basis of soil types it was found that in most of the soil zones the sandy and organic soils were represented by a very small number of plots. Because of this only a rough indication of the usefulness of different species on each of the soil types can be drawn from this data. Information in the literature about the distribution of the various species on different soils can be used to help decide what species are best suited to what soils.

Tables 1 - 6 list the important ground cover species within each soil zone. Only those species which might be useful for reseeding projects are included. Although it contains several important ground cover species the Genus Poa (Bluegrasses) has not been included in the discussion because of the difficulty of identifying the species from their vegetative characteristics. This makes it impossible to tell how many species are involved and what proportion of the Poa cover is provided by any one species.

In the brown soil zone (Table 1. See the soil group map of Alberta for locations of the soil zones.) Agropyron cristatum (Crested Wheat Grass) is the only introduced species of importance. Native species providing ground cover are Stipa spp. mainly S. comata (Needle and Thread. Spear Grass) with some S. spartea var curtiseta (Western Porcupine Grass) and S. viridula (Green Needle Grass) present; Agropyron trachycaulum (Slender Wheat Grass), A. smithii (Western Wheat Grass), Bouteloua gracilis (Blue Gramma Grass), Rosa spp. (Wild Rose) and Koeleria cristata (June Grass). Species which provide significant ground cover but were not considered for future use include Artemisia frigida (Pasture sage) and Hordeum jubatum (Foxtail Barley). The species likely to be useful on sandy soils include Stipa comata, Koeleria cristata and to a lesser extent Agropyron cristatum. Two species not encountered to any great extent during this survey which grow on sandy soils in the brown soil zone are Oryzopsis

hymenoides (Indian Rice Grass) and Calamouilfa longifolia (Sand Grass).

To the north and west of the brown soil zone lies the dark brown soil zone (Table 2). All of the important species of the Brown soil zone are found in the dark brown soil zone. Stipa spartea var curtiseta becomes the predominant Stipa species. Bromus inermis (Smooth Brome) and Symphoricarpos occidentalis (Buckbrush) are also important in this zone. Hordeum jubatum also provides significant ground cover and is not desirable for revegetation projects in the dark brown soil zone.

The thin black soil zone (Table 3) forms the southern and eastern half of the black soil zone as shown on the map. The important ground cover species are Festuca spp. mainly F. scabrella (Rough Fescue), Bromus inermis, Stipa spartea var curtiseta, Symphoricarpos occidentalis and Rosa spp.. One shrub which may be useful on sandy sites is Juniperus horizontalis (Creeping Juniper).

In addition to those species listed for the thin black soil zone, Phleum pratense (Timothy), Agropyron subsecundum (Bearded Wheat Grass) and A. trachycaulum are the important ground cover species in the black soil zone (Table 4). The old coal beds are vegetationally similar to the silty soils. The past disturbance of these sites is indicated by the presence of large amounts of Melilotus spp. (Sweet Clover), Taraxacum officinale (Dandelion) and Tragopogon dubious (Goatsbeard).

Rubus strigosus (Raspberry); Calamagrostis spp. mainly C. canadensis (Marsh Reed Grass) and C. inexpansa (Northern Reed Grass); and Elymus innovatus (Hairy Wild Rye) are the important ground cover species on organic soils in the degraded black soil zone (Table 5). Of these only E. innovatus is likely to be important in revegetation projects. On sandy soils the most important species are Poa spp., Rosa spp. and Elymus innovatus. On silty soils the important ground cover species are Rosa spp., Poa spp., Bromus inermis and Agropyron spp. (Wheat Grasses). Fragaria virginiana (Wild Strawberry) provides a significant amount of ground cover but is not useful for revegetation projects because of the difficulties involved with handling the seed.

Ground cover on ogranic soils in the grey wooded soil zone (Table 6) is largely provided by Rosa spp., Fragaria virginiana, Carex spp. (Sedges) and Salix spp. (Willows). Of these only the Rosa is expected to be of much value in revegetation projects. On silty sites the major ground cover species are Poa spp., Elymus innovatus, Rosa spp., Bromus inermis, Trifolium hybridum (Alsike Clover), Phleum pratense and Agropyron dasystachyum (Northern Wheat Grass). Elymus innovatus, Rosa spp., Trifolium hybridum, and Phleum pratense are the major ground cover species on the sandy soils studied in the grey wooded soil zone.

The following is a list of species expected to be useful in revegetation projects and are recommended for future study. The soil zones for which each species is expected to be useful are given by the following code:

Brown Soil Zone	Br
Dark Brown Soil Zone	DBr
Thin Black Soil Zone	TBl
Black Soil Zone	Bl
Degraded Black Soil Zone	DBl
Grey Wooded Soil Zone	GW

Species	Soil Zone
Agropyron dasystachyum	Bl, DBl, GW
A. smithii	Br ⟶ GW
A. trachycaulum	Br ⟶ GW
Agrostis borealis	GW
A. gigantea	Bl, DBl, GW
A. scabra	GW
Amelanchier alnifolia	Br ⟶ GW
Arctostaphylos rubra	GW
A. uva-ursi	Bl, DBl, GW
Astragalus canadensis	TBl ⟶ GW
Bouteloua gracilis	Br, DBr
Bromus pumpellianus	DBl, GW
Cornus stolonifera	DBl, GW
Corylus cornuta	TBl ⟶ GW
Deschampsia caespitosa	Br ⟶ GW
Elaeagnus commutata	DBr ⟶ DBl
Elymus canadensis	
E. innovatus	Bl, DBl, GW
Festuca brachyphylla	GW
F. ovina	DBl, GW
F. scabrella	DBr ⟶ DBl
Glyceria pulchella	DBl, GW
Hedysarum alpinum	TBl ⟶ GW
Hierochloe odorata	TBl ⟶ GW
Koeleria cristata	Br, DBr, TBl
Lathyrus ochroleucus	TBl ⟶ GW
Ledum groenlandicum	GW

Continued...

Species	Soil Zone
Lonicera involucrata	Bl, DBl, GW
Lupinus argenteus	DBl, GW
Medicago falcata	DBl, GW
M. sativa	TBl ⟶ GW
Oryzopsis hymenoides	Br, DBr
O. pungens	Bl, DBl, GW
Oxytropis sericea	Br ⟶ DBl
O. splendens	Br, DBr, TBl
Phleum alpinum	TBl ⟶ GW
Poa alpina	Foothills and Mtns.
P. ampla	Br ⟶ GW
P. compressa	DBl, GW
P. palustris	DBl, GW
P. pratensis	Br ⟶ GW
Potentilla fruticosa	TBl → GW
P. tridentata	GW
Prunus virginiana	DBr → GW
Puccinellia distans	Br → GW
Rosa acicularis	Br → GW
Stipa comata	Br, DBr
S. spartea var. curtiseta	DBr → DBl
Symphoricarpos albus	DBl, GW
S. occidentalis	TBl → GW
Trifolium medium	DBl, GW
Vaccinium myrtilloides	Bl, DBl, GW
V. vitis-idaea	DBl, GW
Viburnum edule	DBl, GW
Vicia americana	DBr ⟶ GW
V. cracca	TBl ⟶ GW

This list does not include naturalized species such as Agropyron cristatum, Agrostis alba, Festuca rubra, Trifolium hybridum and others because the required information on areas of adaptation, seed handling and disease resistance is readily available.

Results and Discussion (Whitewood mine)

Strip mines present special prcblems for revegetation because of the large areas of infertile mineral soil exposed. This means erosion by both wind and water can be a serious problem. To cover unsightly patches of bare ground and control erosion a seed mixture used on strip mines should contain several rapidly developing species which provide ground cover quickly. The use of a single species which provides quick ground cover is not a good practice. Disease or insects may decimate the population allowing accelerated erosion to occur or the establishment of noxious weeds such as Agropyron repens (Quack Grass) and Circium arvense (Canada Thistle). In addition to the species used to provide rapid ground cover the seed mix should contain several species which can provide permanent ground cover, even though these species may be slow to develop.

All species used should be adapted to the areas in which they are being planted. The uselessness of using seeds adapted to another area can be seen in the inclusion of Agropyron cristatum in the seed mixture recommended to Calgary Power for use on the Whitewood mine in 1962. A. cristatum is adapted to the brown soil zone and in that area forms a permanent part of the ground cover. Although it was planted at a rate of 2.7 lb/Ac in 1962 there was none growing in the summer of 1973 when this survey was conducted. In contrast to this Agrostis gigantea (Red Top) a species adapted to this area remains as one of the important ground cover species in an old hay field on the mine site even though it was seeded prior to the opening of the mine (Table 7).

On unreclaimed spoil piles the first invaders are weeds such as Thlaspi arvensis (Stink Weed), Capsella bursa-pastoris (Shepards Purse), Plantago major (Plantain),

and Hordeum jubatum. After a period of time these species are generally replaced by more desirable ones. Spoil piles unreclaimed since 1962 have Agropyron dasystachyum and Melelotis spp. as the major ground cover species (Table 7). Agrostis gigantea, Agropyron trachycaulum, Hordeum jubatum, Sonchus spp. (Sow Thistels) and Equisetum arvense (Field Horsetail) have also established themselves. However natural revegetation such as this is a slow process. Even after eleven years the ground cover is still quite low and large numbers of weeds such as Melilotus spp. and Sonchus spp. are present.

Species recommended for further testing at Whitewood mine would include those species recommended for the degraded black soil zone in the list on pages 7 and 8. In general species considered for use on a strip mine should include those species listed for the soil zone in which the mine occurs plus any of the common introduced species adapted to the area.

Recommended Study Areas

1. Production of seed.
2. Storage and preparation of seed for planting.
3. Seedbed preparation and seeding methods.
4. Early maintenance of the plantings
5. Disease resistance.

TABLE I

Powerline Right-of-Way Vegetation - Brown Soil Zone

Species	Silty 135 Plots	Sandy 15 Plots
Stipa spp.	36 - 41[1]	6 - 3
Agropyron trachycaulum	21 - 40	2 - 5
Bouteloua gracilis	18 - 30	3 - 5
Poa spp.	20 - 21	0 - 3
Agropyron cristatum	15 - 43	3 - 3
Koeleria cristata	11 - 45	3 - 6
Bromus inermis	8 - 19	1 - 0
Agropyron smithii	7 - 26	0 - 3
Rosa spp.	5 - 13	2 - 2
Symphoricarpos spp.	3 - 8	1 - 1
Melilotus spp.	4 - 9	0 - 1
Agropyron subsecundum	1 - 7	0 - 0
Festcua spp.	1 - 3	0 - 2
Medicago sativa	1 - 3	1 - 0
Poa arida	1 - 0	0 - 1
Vicia americana	0 - 0	0 - 1
Calamovilfa longifolia	4 - 2	1 - 0

1 The first number indicates the number of plots in which the species had greater than 1% ground cover. The second gives the number of plots in which the species was listed as being present. The total number of occurences is found by adding the two numbers. Tables 2 - 6 are listed in the same manner.

TABLE 2

Powerline Right-of-Way Vegetation - Dark Brown Soil Zone

Species	Silty 88 Plots	Sandy 19 Plots
Stipa spp.	30 - 9	1 - 3
Poa spp.	24 - 12	3 - 4
Bromus inermis	17 - 9	8 - 5
Bouteloua gracilis	12 - 6	1 - 0
Koeleria cristata	6 - 19	1 - 1
Agropyron cristatum	7 - 10	0 - 4
Rosa spp.	4 - 16	1 - 8
Agropyron trachycaulum	4 - 18	1 - 4
A. smithii	6 - 17	0 - 2
Phleum pratense	5 - 6	0 - 1
Medicago sativa	2 - 4	3 - 1
Symphoricarpos occidentalis	3 - 20	0 - 1
Agropyron repens	3 - 1	0 - 0
Festuca spp.	2 - 0	0 - 1
Agropyron subsecundum	0 - 6	1 - 1
Melilotus spp.	0 - 5	0 - 5
Vicia americana	0 - 5	0 - 3
Elaeagnus commutata	0 - 3	0 - 1
Amelanchier alnifolia	0 - 0	0 - 1
Calamovilfa longifolia	1 - 3	1 - 0

TABLE 3

Powerline Right-of-Way Vegetation - Thin Black Soil Zone

Species	Silty 72 Plots	Sandy 9 Plots
Poa spp.	27 - 16	0 - 0
Bromus inermis	15 - 11	2 - 1
Festuca spp.	9 - 3	0 - 2
F. rubra	2 - 1	0 - 0
F. idahoensis	4 - 0	0 - 0
F. scabrella	3 - 4	0 - 0
Stipa spp.	8 - 14	0 - 1
Juniperus horizontalis	0 - 0	5 - 0
Agropyron smithii	3 - 11	0 - 1
A. repens	2 - 1	0 - 0
A. dasystachyum	0 - 1	1 - 0
A. cristatum	1 - 0	0 - 0
A. spp.	0 - 2	1 - 0
A. subsecundum	0 - 6	0 - 0
A. trachycaulum	0 - 5	0 - 0
Koeleria cristata	2 - 18	0 - 6
Symphoricarpos occidentalis	2 - 23	0 - 0
Phleum pratense	0 - 4	0 - 0
Arctostaphylos uva-ursi	0 - 0	2 - 0
Rosa spp.	0 - 28	0 - 0
Vicia americana	0 - 8	0 - 0
Helictotrichon hookeri	0 - 7	0 - 0
Amelanchier alnifolia	0 - 5	0 - 0
Medicago sativa	0 - 3	0 - 0

Continued...

TABLE 3 (con't)

Species	Silty 72 Plots	Sandy 9 Plots
Melilotus spp.	0 - 3	0 - 0
Bromus ciliatus	0 - 2	0 - 0
Trifolium hybridum	0 - 2	0 - 0
Elymus junceus	0 - 2	0 - 0
Lathyrus ochroleucus	0 - 1	0 - 0
Hedysarum sp.	0 - 1	0 - 0
Symphoricarpos albus	0 - 1	0 - 0
Bouteloua gracilis	0 - 1	0 - 0
Elaeagnus commutata	0 - 1	0 - 0
Calamovilfa longifolia	0 - 0	3 - 1

TABLE 4

Powerline Right-of-Way Vegetation - Black Soil Zone

Species	Silty 104 Plots	Sandy 23 Plots	Old Coal Beds 10 Plots
Poa spp.	51 - 28	10 - 3	5 - 1
Phleum pratense	19 - 17	0 - 3	0 - 4
Bromus inermis	13 - 16	3 - 4	3 - 3
B. spp.	1 - 2		
Festuca rubra	2 - 5		2 - 1
F. scabrella	7 - 1	2 - 0	
F. idahoensis	2 - 0	2 - 0	
F. spp.	5 - 1	2 - 0	
Rosa spp.	7 - 38	0 - 9	1 - 1
Symphoricarpos albus	4 - 7	2 - 0	
S. occidentalis	3 - 25	0 - 5	
Trifolium repens	7 - 7		
T. hybridum	2 - 6	1 - 0	0 - 1
T. pratense	0 - 4		
Agropyron trachycaulum	5 - 7		
A. smithii	5 - 8	0 - 1	
A. cristatum	4 - 1		
A. subsecundum	2 - 15	0 - 4	
A. repens	2 - 2	0 - 1	1 - 1
A. dasystachyum	1 - 2	0 - 1	
A. latiglume	0 - 1		
A. sp.	0 - 1		
Koeleria cristata	2 - 11	2 - 4	
Stipa spp.	2 - 11	0 - 5	

Continued...

TABLE 4 (con't)

Species	Silty 104 Plots	Sandy 23 Plots	Old Coal Beds 10 Plots
S. viridula	0 - 4		
Agrostis alba	0 - 1		
A. spp.	4 - 6	0 - 2	
Medicago sativa	3 - 4		
Melilotus spp.			3 - 5
Vicia americana	2 - 13	0 - 4	
Danthonia parryi	1 - 1		
D. spp.	0 - 2	1 - 0	
Arctostaphylos uva-ursi	1 - 1		
Elaeagnus commutata	0 - 8	0 - 2	
Potentilla fruticosa	0 - 4		
Amelanchier alnifolia	0 - 3	1 - 4	
Hedysarum alpinum	0 - 3		
H. spp.	0 - 4		
Cornus stolonifera	0 - 2		
Juniperus horizontalis	0 - 3		
Phalaris arundinacea	0 - 2		
Oxytropis spp.		0 - 2	
Puccinellia sp.	0 - 1		
Muhlenbergia richardsonis	0 - 1		
Lathyrus ochroleucus		0 - 1	

TABLE 5

Powerline Right-of-Way Vegetation - Degraded Black Soil Zone

Species	Organic 12 Plots	Silty 79 Plots	Sandy 20 Plots
Rosa spp.	1 - 5	22 - 32	3 - 10
Poa spp.	2 - 2	26 - 13	4 - 2
Bromus inermis		14 - 21	3 - 0
B. ciliatus	1 - 0		1 - 1
Agropyron dasystachyum		12 - 7	0 - 2
A. trachycaulum		8 - 7	0 - 2
A. repens		2 - 2	
A. spp.		1 - 3	
A. subsecundum		0 - 5	0 - 1
Phleum pratense	2 - 1	4 - 8	0 - 1
Elymus innovatus	4 - 1		2 - 9
Agrostis spp.		3 - 2	0 - 2
Lathyrus ochroleucus	0 - 1	1 - 14	0 - 3
Schizachne purpurascens		1 - 0	1 - 0
Vicia americana		1 - 29	0 - 3
Cornus stolonifera		0 - 4	0 - 0
Trifolium hybridum		1 - 7	0 - 3
T. repens			0 - 1
Symphoricarpos occidentalis		1 - 5	0 - 2
S. albus		0 - 1	
Sheperdia canadensis		0 - 3	1 - 0
Hierochloe odorata		1 - 2	0 - 1
Vaccinium vitis-idaea	0 - 1		1 - 0
Koeleria cristata		1 - 0	

Continued...

TABLE 5 (con't)

Species	Organic 12 Plots	Silty 79 Plots	Sandy 20 Plots
Festuca scabrella		1 - 0	
Medicago sativa		0 - 2	0 - 2
Hedysarum spp.		0 - 1	0 - 2
Stipa spp.		0 - 2	
Bouteloua gracilis		0 - 1	
Oryzopsis pungens			0 - 1
Arctostuphylos uva-ursi			0 - 1

TABLE 6

Powerline Right-of-Way Vegetation - Grey Wooded Soil Zone

Species	Organic 27 Plots	Silty 110 Plots	Sandy 41 Plots
Poa spp.	2 - 7	23 - 43	11 - 21
Elymus innovatus	1 - 0	17 - 9	7 - 7
Rosa spp.	5 16	17 - 57	5 - 21
Trifolium hybridum	2 - 10	12 - 19	4 - 8
T. pratense	0 - 1	0 - 11	1 - 1
T. repens		0 - 4	0 - 2
Bromus inermis	2 - 5	14 - 16	0 - 4
B. ciliatus		3 - 0	0 - 4
B. spp.	0 - 1	1 - 3	1 - 0
Phleum pratense	2 - 2	8 - 18	5 - 7
Agropyron dasystachyum	3 - 5	8 - 17	4 - 2
A. trachycaulum	2 - 2	3 - 7	2 - 7
A. repens	1 - 0	0 - 3	0 - 2
A. subsecundum		0 - 1	0 - 3
A. spp.		2 - 0	1 - 1
Festuca scabrella	2 - 0	1 - 0	2 - 1
F. spp.		3 - 1	1 - 0
F. rubra	0 - 1	0 - 6	1 - 6
Agrostis scabra	1 - 2	2 - 3	
A. spp.		2 - 1	
Vicia americana	0 - 10	0 - 31	2 - 10
Hedysarum alpinum		1 - 4	2 - 1
Lathyrus spp.	0 - 2	1 - 10	0 - 2
Symphoricarpos occidentalis	0 - 3	1 - 2	0 - 1
S. albus	1 - 1	0 - 1	

Continued...

TABLE 6 (con't)

Species	Organic 27 Plots	Silty 110 Plots	Sandy 41 Plots
Medicago sativa		0 - 1	1 - 0
Sheperdia canadensis	0 - 3	0 - 13	0 - 3
Koeleria cristata		0 - 2	0 - 4
Vaccinium myrtilloides	0 - 2	0 - 2	
Elaeagnus commutata		0 - 4	
Oxytropis spp.	0 - 1	0 - 2	0 - 1
Hierochloe odorata		0 - 2	
Oryzopsis pungens		0 - 1	
Cornus stolonifera		0 - 1	

TABLE 7

Ground Cover Vegetation - Whitewood Mine, Wabamum

Species	Undisturbed Forest 10 Plots	1962 Seeding 10 Plots	1962 Seeding Low Area	1969 Alfalfa Seeding	Old Hay Field
Bromus inermis		10 - 7.3[1]	2[2]		P
Medicago sativa		10 - 3.4	P	30	P
Phleum pratense		3 - P	P		P
Cornus stolonifera		1 - P			
Trifolium hybridum		2 - 0.5	8		P
T. pratense			6		P
Melilotus spp.		2 - 0.3	P		
Festuca rubra			P		
F. spp.		1 - P			P
Agropyron dasystachyum		1 - P			
A. trachycaulum					
A. spp.				P	3
Rosa spp.	8 - 0.3[1]				
Vicia americana	7 - 0.2		P		
Poa spp.	5 - 0.4				5
Lathyrus ochroleucus	6 - P				
Amelanchier alnifolia	1 - P				
Symphoricarpos albus	3 - P				
Lonicera involucrata	1 - P				
Agrostis alba					5

1 These numbers are presented in the same manner as those in tables 1 - 6

2 The number gives a visual estimate of the ground cover of the species in a stand. P indicates presence with a cover less than 1%.

Continued...

TABLE 7 (con't)

Species	Recent	Unreclaimed Areas Recent	Since 1962
Bromus inermis			
Medicago sativa			
Phleum pratense			
Cornus stolonifera			
Trifolium hybridum	P		
T. pratense			
Melilotus spp.		1	3
Festuca rubra			
F. spp.			
Agropyron dasystachyum			3
A. trachycaulum			P
A. spp.			
Rosa spp.			
Vicia americana			
Poa spp.			
Lathyrus ochroleucus			
Amelanchier alnifolia			
Symphoricarpos albus			
Lonicera involucrata			
Agrostis alba			P

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P.O. BOX 8070

EDMONTON 62, ALBERTA

T6H 4P2

July 5, 1974

Dear Sir:

Enclosed please find a copy of the Final Report of Phase I on 'Establishment and Survival of Ground Cover Plantings on Disturbed Areas in Alberta'.

This report concludes Phase I of the project. Phase I was the survey of existing vegetation on disturbed areas. Phase II, the testing of selected ecotypes of native species and comparing them with commercial varieties of grasses and legumes was started in May of 1974. We expect to establish about thirty test sites on disturbed areas in different environments during 1974 and 1975.

We would like to take this opportunity to thank all the agencies and individuals who helped us carry out Phase I of this study, and look forward to continued technical, moral, and financial support to help us to complete and conclude the entire study as planned.

Sincerely yours,

H. Vaartnou, Head
Botany Section
Plant Industry Laboratory

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