Paper No. 18

Author(s): D. Walker, R.S. Sadasivaiah and J. Weijer

Title of Paper: "The Selection and Utilization of Native Grasses for Reclamation in the Rocky Mountains of Alberta"

ABSTRACT

Disturbed areas in the mountain regions of Alberta often present an environment too harsh for commercially available farm and lawn grasses. Porous soil is very dry and infertile and domesticated grasses often require constant maintenance through periodic fertilizer applications. Native species of grasses, adapted to the prevailing climatic and soil conditions through many thousands of years of selection could be part of a solution to this difficult reclamation problem.

The purpose of this project is to collect, increase and maintain a seed source of grasses native to the Rocky Mountain region of Alberta. And, from this collection, to select the most promising species for reclamation and wildlife range improvement and to improve these species genetically to the point that economical agricultural production is feasible.

Data is presented from a large transplant study. Native grass ecotypes appear to be more widely adapted than previously thought. Seedling establishment is one of the biggest problems confronting the utilization of native grasses. Transplanting container grown native grass plants can be a very effective method of rapidly establishing a ground cover on drastically disturbed areas with extreme climatic conditions.

There are many problems prohibiting the large scale agricultural production of native grass seed. Seed shattering, low yields, hairs and awns, intermittent flowering, low fertility and uneven ripening are factors which will make native grasses expensive to produce. Some of the problems can be solved through genetic improvement and some through agricultural engineering technology.

THE SELECTION AND UTILIZATION OF NATIVE GRASSES FOR RECLAMATION IN THE ROCKY MOUNTAINS OF ALBERTA

D. Walker, R. S. Sadasivaiah and J. Weijer
Department of Genetics, University of Alberta, Edmonton, Alberta, Canada T6G 2E9

INTRODUCTION

Native grass species have adapted to the prevailing climatic and soil conditions of Alberta's Rocky Mountains through many years of natural selection. It is generally accepted that disturbed areas in the mountain regions often present an environment too harsh for commercially available farm grasses. In addition, the farm grasses require constant maintenance through repeated fertilizer applications which adds to the cost of a reclamation program. In view of these points the native grasses are receiving increasing attention in reclamation and range land improvement programs not only in Canada but also in many parts of the world.

We recently initiated our grass project with the following objectives: 1) to collect, increase and maintain a seed source of grass species native to the Rocky Mountain regions of Alberta, and 2) to select the most promising species for reclamation and wildlife range improvement and improve these species genetically to the point that economical agricultural production is feasible.

The concept of applying principles of agriculture and genetics to plants for reclamation is not new. For example, the Soil Conservation Service (a U.S. Department of Agriculture agency encompassing the six Pacific Northwest and Great Basin States) has been in operation for over forty years. The five SCS Plant Materials Centers have three functions: 1) to assemble, evaluate, select and increase grasses and legumes for use in soil and water conservation; 2) to determine reliable cultural and management methods for their use; and 3) to get proved materials into production by farmers, ranchers and commercial growers (Hafenrichter, 1968). They have screened more than 15,000 accessions of plants and produced over forty licensed varieties. By applying the most advanced techniques of agricultural practices and plant genetics, we hope, on a modest scale, to provide the same services as the SCS for Alberta.

Alberta Fish and Wildlife would like to use native grasses to improve the winter ranges of Elk and Bighorn Sheep. During the years of heavy snowfall, wild ungulates are restricted to grazing areas free of snow. These snow-free areas of the province are steep (up to 40°), south facing and wind-swept and present a very harsh environment for vegetation. Reseeding with drought resistant and winter hardy strains of native grass species is a recommended method of improving deteriorated ranges (Cornelius, 1946; Stefferud, 1948).

Parks Canada and Alberta Forest Service are interested in native grasses for alpine and sub-alpine reclamation studies. Porous soil is very dry and infertile and the use of native grasses could be a part of the solution to the reclamation of these disturbed areas.

There appears to be a widespread belief that native plants are intimately adapted to their environments and that their removal to other locales will be unsuccessful. However, the exact narrowness of such adaptability has not been well defined. The preliminary experiments described in this paper were performed to try to answer the very basic question of whether there are any ecological barriers which would limit the movement and utilization of native grass species within the Rocky Mountain regions of Alberta.

MATERIALS AND METHODS

Approximately 1500 specimens representing 25 native grass species were collected from more than 60 regions of Alberta's Rockies and transplanted to experimental plots at Ellerslie during 1974-76. Mortality rate was less than 1 percent.

Details concerning collection, planting techniques, procedures used for selection, photo-periodic studies and mountain test sites have been described in our previous reports (Walker and Weijer, 1974, 1975; Walker, Weijer and Sadasivaiah, 1976). Spikes from individual plants were harvested as and when they matured to study the variability with regard to number of productive tillers, seed yield and harvest date. This data was recorded for each plant. The number of plants studied in various species and accessions varied depending on the availability of the material. Results presented in this paper were collected on plants grown in growth chambers and field conditions at Ellerslie during 1974-76.

RESULTS

A. SELECTION PROGRAM

The plant species collected from their natural habitats showing varying degrees of genetic variability for many characteristics. Species and strains of species are being selected on the following criteria:

1. Wide adaptability: It would be a great advantage to have one variety of each species which could grow in all locales.
2. High seed production: To make seed production economical, plants showing above average yield should be selected.
3. High forage value: Strains exhibiting higher winter forage value for wildlife are selected for the Eastern slopes of the Rockies where the wildlife range has been decreasing.
4. Low seed shattering and even ripening: Native grasses depend on wind for seed dissemination. To make seed production economically feasible it is important to select plants which retain their seeds until harvesting has been completed.
5. Large seed size: There is vast variability between plants of a species in the size of their seeds. Larger seeds contribute significantly to successful seedling establishment (Youngner, 1972, Ch. 7).
6. Low biomass production: In some applications it appears desirable to use species which will not create a fire hazard or attract wildlife.
7. Disease free varieties: Plants which exhibit resistance to the various grass pathogens are being selected.

B. PHOTOPERIOD STUDIES IN GROWTH CHAMBERS

Since 1974 the various grass species in our collection have been grown in growth chambers in the Biological Sciences Building at the University of Alberta. In order to induce flowering in plants which has already produced have seeds, the following four pre-treatments were applied to potted plants. 1) Six weeks of 12 hour days plus 4 weeks at 4°C in total darkness. 2) Six weeks of 12 hour days. 3) Six weeks of 12 hour days plus 4 weeks at below 0°C (plants burried in snow). 4) Four weeks at 4°C and total darkness.

After pre-treatment, plants were returned to growth chambers with either 12 or 16 hour daylight periods. To induce flowering, all grasses used in our study required only the 4 week at 4°C total darkness treatment. Sixteen hour day growth period vs. 12 hour days appeared to make no difference to seed production in alpine and sub-alpine grasses.

C. PHOTOPERIODIC STUDIES IN THE FIELD

Data on the growth and maturity habits of approximately 1500 plants representing 29 species (collected from different geographical areas) grown in Edmonton are given in Table 1. Variations in the number of days to ripen seeds can be divided into three types.

1. Intra-plant variations: Some species such as Stipa columbiana and Phleum alpinum have an indeterminant tillering habit in which seed heads ripen one at a time throughout the growing season. This suggests that there is no single day on which the majority of seeds may be harvested and the only solution to this problem, though uneconomical, is a continuous type of harvest. The design of such a harvester is being attempted and is discussed elsewhere. .

   Most other native species have a less severe type of indeterminant tillering habit in which the heads may ripen for a period of a few days to several weeks. This trait varies greatly from plant to plant and presents an opportunity for improvement of the agronomic quality of the species. Plants which exhibit a "tight" harvest period could be grouped with other members of their species which have a similar growing season. Thus the seed loss due to shattering is minimized and seed quality is not reduced by the presence of unripe seed. Data on intra-plant variability is not presented because of the large number of plants sampled.
2. Inter-plant variations within a geographical area: As can be seen from the data presented in Table 1, some species like Poa alpina and Agrostis scabra give two crops in a single growing season. The other species show a great deal of variation within a geographical area with respect to the number of days required to harvest.
3. Inter-geographical variations: With the exception of a very few cases, the growing season seems remarkably similar for all species collected from different regions of the province when they are grown in Edmonton. The variations are certainly no greater than those found within a geographical area.

D. MOUNTAIN TRANSPLANTS

In 1975 a program of field testing native grass species was begun in order to select the most promising species and strains for different climatic and soil conditions. To eliminate the variables of seedling establishment (seeding rate, mulches, etc.) seeds were germinated in growth chambers, transplanted to containers (2·5 cu in. Spencer-Lemaine seedling containers in 1976) and planted in mountain test sites in July. Sixteen plants of each species were spaced 25 cm apart in a one square meter plot. Soil amendments of any kind were not used. Two parameters were monitored biannually in the following years:

plant survival and ability to produce seed heads. Such characters as height, percent cover and vigour were not recorded because the species used were not of one genotype.

The results of transplants in mountain test sites are presented in Table 3. The survival of all species planted in different test sites was remarkably high and no statistically significant differences between species and sites were observed. The high survival rate observed in these studies clearly suggests that the seedling establishment is the most important problem in the successful utilization of native species. Most sites selected were either devoid or sparsely populated with native pioneer plants and the ease with which the transplanted grasses survived shows that the lack of vegetation could be due to seedling mortality. Other reasons for lack of vegetation on the disturbed sites are lack of seed source and infertile soil. Observations of these plots in subsequent years should give a better indication of how well native species can survive in infertile soils.

Transplanting container grown grass seedlings was found to be a very effective method of obtaining immediate cover on drastically disturbed sites with extreme climatic conditions.

DISCUSSION

The results obtained in this study, though not conclusive, do seem to suggest that populations of native grass species collected from different geographical regions of Alberta's Rocky Mountains are similar with regard to photoperiodic responses. All grass species used in the study flowered after four weeks of treatment at 4°C in total darkness. Following the treatment, the alpine and sub-alpine species grown under 12 and 16 hours day length periods did not show any marked difference in seed production. In contrast to this, Olmsted (University of Chicago) observed that the prairie grass (Bouteloua curtipendula) collected from Canada required longer days than those from Texas (quoted by Billings, 1970). Similarly, Hodgson (1966) reported photoperiodic response for flowering in Alaskan grasses. It is probable that alpine environments have such short growing seasons and widely variable growing conditions (shading from mountains, late and early blizzards, snowhollows, etc.) that a photoperiodic response for flowering is a luxury enjoyed by plants occupying less rigorous and more predictable environments. It appears that temperature is the main limiting environmental factor for flowering.

In the 1920's Gote Turesson of Sweden began some studies, which are now considered to be classic experiments, using the technique of transplanting plant material to uniform environments. He found that local populations were adapted to a given type of environment and possessed similar adaptive characteristics. Gote Turesson used the term ecotype to describe such locally and similarly adapted populations. While each local population within an ecotype varies somewhat within and between local populations, they have greater similarities to each other than they do to populations from other ecotypes of the same species. Although the results of our transplant studies are too premature to base definite conclusions there does appear to be a trend suggesting that plants from different locales can be moved successfully within the mountain regions of Alberta. If this trend continues in subsequent years of plot observation it would then appear that the grass species found in different locales of Alberta's Rocky Mountain region belong to a single ecotype. The lack of photoperiodic flowering response would further substantiate this conclusion.

From a practical stand point, our observations seem to suggest that a single variety of each grass species suitable for reclamation could be developed for use in a wide range of mountainous environments. However, to ensure a wide range of adaptability and to avoid the dangers of monoculture, a multiline variety of each species composed of improved genotypes of several locales is desirable.

A brief comment on the method of planting technique in mountain test sites may be in order. Many techniques have been suggested by several workers to get an initial seedling establishment in mountain test sites. Our results show that transplanting container grown grass seedlings (at least 3-4 tillering stage) would be the most effective method of obtaining immediate cover on drastically disturbed sites in extreme climatic areas. Brown (1976) has made similar observations and suggested their use as a reclamation technique.

CONCLUSION

Local populations of grass species collected from different regions of Alberta's Rockies appear to show similar photoperiodic responses for flowering. The results obtained from transplanting in mountain test sites seem to provide no evidence for the existence of any ecological barrier which limits the utilization of native grass species within Alberta's Rocky Mountain region. It seems that populations of each species have enough genetic flexibility so that plants from different locales can be moved successfully within the mountain region of Alberta. Transplanting container grown grass seedlings was found to be very effective in obtaining immediate cover on disturbed areas.

There are many problems prohibiting the large scale agricultural production of native grass seed. Seed shattering, low yields, hairs and awns which must be removed, intermittent flowering, low fertility and uneven ripening are factors which will make native grasses expensive to produce. An economically feasible production level can be acheived through a judicious selection of species and the application of good agricultural research methods.

ACKNOWLEDGEMENTS

This project is supported by Alberta Environment, Alberta Fish and Wildlife, Alberta Forest Service and Parks Canada. The use of data from Forestry is gratefully acknowledged.

TABLE 1: HARVEST DATES IN 1976 AT ELLERSLIE

GENUS AND SPECIES	SOURCE	DATES HARVESTED
Trisetum spicatum	Peyto Lake	June 16, 17, 18
	Whitehorn	June 29
	Mt. Rae	June 29
	Grassy Mtn.	July 12, 20
	Mtn. Park Pass	July 19
	Sunshine	July 19, Aug. 6, 20
	Coal Valley	Aug. 6
Phleum alpinun	Cat Creek	June 30, July 5
	Fortress Mtn.	July 12
	Cat Creek	July 12, Aug. 18
	Barnaby Ridge	July 12, Aug. 18
	Sunshine	July 16, Aug. 20
	Caw Creek	Aug. 20
Festuca saximontana	Grassy Mtn.	July 6
	Sunshine	July 6
	Mt. Rae	July 9, 13, 19
	Barnaby Ridge	July 19
	Pyramid Lake	July 19
	Coal Valley	July 20
Poa alpina	Grassy	July 7, Aug. 19
	Mtn. Park	July 7, Aug. 6, 20
	Coal Valley	July 7, Aug. 6
	Caw Creek	July 8, Aug. 6
	Snow Creek	July 8, Aug. 6
	Sunshine	July 8, 19, Aug. 6, 18
	Pyramid Lake	July 9, 19, Aug. 18
	Ribbon Creek	July 9, 19
	Barnaby Ridge	July 9, 19, Aug. 18
	Forget-Me-Not Mtn.	July 9, 13
	Highwood House	July 9
	Clearwater	July 19
Festuca scabrella	Beauvais	July 9
	Waterton	July 9
	Stavely sub-station	July 9
	Clearwater	July 9
	Ya Ha Tinda	July 9
	Cat Creek	July 9
	Porcupine Hills	July 9
	Whaleback Ridge	July 9
	Snow Creek	July 9
	Caw Creek Ridge	July 9
Poa cusickii	Highwood House	July 12
	Forget-Me-Not Mtn.	July 13

TABLE 1 (cont.)

GENUS AND SPECIES	SOURCE	DATES HARVESTED
Koeleria cristata	Cat Creek	July 12, 19, 27, Aug. 18
	Sheep River	July 12, 27, Aug. 18
	Athabasca Ranch	July 12, 19, 27
	Waterton	July 19
	Ya Ha Tinda	July 19, 27
	Yarrow Creek	July 19
	Beauvais Lake	July 19
	Pincher Ridge	July 19
	Drywood Creek	July 19
	Mt. Stearn	July 19, 27
	Snow Creek	July 19, 27
	Ram Mtn.	July 19
	Devona Lookout	Aug. 20
Agropyron latiglume	Mtn. Park	July 13, 19, 22, Aug. 6, 20
	Caw Creek	July 16, Aug. 6, 19
Festuca idahoensis	Waterton	July 13, 15, 19
	Windsor Ridge	July 14, 15, 19
	Stavely sub-station	July 15, 19
	Porcupine Hills	July 15
Agrostis scabra	Grassy Mtn.	July 15, Aug. 20
Agropyron trachycaulum	Grassy Mtn.	July 15, 20, Aug. 6, 19
	Barnaby Ridge	July 15, 20, 22, Aug. 19
	Mtn. Park	July 16, 20, Aug. 6, 19
	Mt. Stearn	July 20, 28, Aug. 5, 19
	Kootenay Plains	July 28, Aug. 5, 19
	Clearwater	July 28
	Greenock Mtn.	July 28, Aug. 5
	Athabasca Ranch	Aug. 19
	Waterton	Aug. 5, 19
	Porcupine Hills	Aug. 5, 19
Agropyron subsecundum	Kootenay Plains	July 28, Aug. 5, 19
	Clearwater	July 28, Aug. 5, 19
	Rock Lake	July 28, Aug. 5, 19
	Ram River Falls	July 28, Aug. 5, 19
	Greenock Mtdn.	Aug. 5, 19
	Athabasca Ranch	Aug. 5, 19
	Cat Creek	Aug. 5, 19
	Smoky River	Aug. 5, 19
Helictotrichon hookeri	Sheep River	July 15
	Waterton	July 15
	Porcupine Hills	July 15

TABLE 1 (cont.)

GENUS AND SPECIES	SOURCE	DATES HARVESTED
Stipa richardsonii	Pyramid Lake	July 16, Aug. 6
	Cat Creek	July 16, Aug. 5
	Porcupine Hills	July 16
	Grassy Mtn.	July 16, Aug. 6
Stipa comata	Kootenay Plains	July 16, 20, 28, Aug. 5
	Greenock Mtn.	July 20, 28, Aug. 5
Stipa spartea	Greenock Mtn.	July 20, Aug. 5
	Porcupine Hills	July 23
Stipa columbiana	Barnaby Ridge	July 16, 21, 28
	Cat Creek	July 21, 28
	Rock Lake	July 21, 28
	Greenock Mtn.	July 21, 28
Calamagrostis purpurescens	Athabasca Ranch	July 16, Aug. 5
	Plateau Mtn.	July 16
	Clearwater	July 16, Aug. 6
	Kootenay Plains	July 16
	Brule Lake	July 16
	Mtn. Park Pass	July 20, Aug. 20
Danthonia intermedia	Smoky River	July 19
Danthonia parryii	Porcupine Hills	July 19
Oryzopsis hymenoides	Sheep River	July 21
Agropyron albicans	Kootenay Plains	July 21, 23, 27, Aug. 3
	Smoky River	July 26, Aug. 20
	Brule Lake	Aug. 3, 18
	Greenock Mtn.	Aug. 3, 18
Agropyron spicatum	Yarrow Creek	July 21, Aug. 3
	Cat Creek	July 21, 23, Aug. 3, 18
	Windsor Ridge	July 23, Aug. 3
	Waterton	Aug. 3
Agropyron dasystachyum	Ya Ha Tinda	July 23, 26, Aug. 5
	Smoky River	July 26, Aug. 5, 20
	Mt. Stearn	July 26, Aug. 3
	Cat Creek	July 26
	Porcupine Hills	July 27, Aug. 5
	Sheep River	July 27, Aug. 5
	Kootenay Plains	Aug. 3
	Waterton	Aug. 4
	Athabasca Ranch	Aug. 5
	Disaster Point	Aug. 5
	Devona Lookout	Aug. 5

TABLE 1 (cont.)

GENUS AND SPECIES	SOURCE	DATES HARVESTED
Agropyron riparium	Smoky River	Aug. 20
	Kootenay Plains	Aug. 3
	Cat Creek	Aug. 3
Bromus pumpellianus	Disaster Point	July 28
	Athabasca Ranch	July 28
	Rock Lake	July 28
	Kootenay Plains	July 28
	Cat Creek	July 28
	Fortress Mtn.	July 28
Elymus innovatus	Ribbon Creek	Aug. 5
	Ya Ha Tinda	Aug. 5
	Snow Creek	Aug. 5
	Ram Mtn.	Aug. 5
	Coal Valley	Aug. 5
Calamagrostis canadensis	Coal Valley	Aug. 10
Agropyron smithii	Waterton	Aug. 25

TABLE 2: GRASSES USED IN MOUNTAIN TRANSPLANT STUDIES

1975 Establishments

GENUS AND SPECIES	SOURCE	ELEVATION
Agropyron dasystachyum	Exshaw	4500ft.
Deschampsia caespitosa	Whitehorn Mtn.	6000ft.
Stipa columbiana	Pigeon Mtn.	5500ft.
Trisetum spicatum	Mt. Rae	7500ft.
Poa alpina	Mt. Rae	7500ft.
Poa arctica	Whistlers Mtn.	7700ft.

1976 Establishments

GENUS AND SPECIES	SOURCE	
Agropyron dasystachyum	Provincial wide selection	
Agropyron latiglume	Peyto Lake	7200ft.
Agropyron trachycaulum	Banff Flats	4500ft.
Agropyron subsecundum	Kootenay Plains	4500ft.
Bromus pumpellianus	Provincial wide selection	
Festuca saximontana	Caw Creek Ridge	6500ft.
Koeleria cristata	Provincial wide selection	
Phleum alpinum	Peyto Lake	7200ft.
Poa alpina	Whitehorn Mtn.	6000ft.
Poa arctica	Whistlers Mtn.	7700ft.
Stipa columbiana	Pigeon Mtn.	5500ft.
Trisetum spicatum	Mtn. Park Pass	6700ft.

TABLE 3: RESULTS OF MOUNTAIN TRANSPLANTS

1975 Establishments

Site	No. of Plants	% Survivors July, 1977	% Reproducers July, 1977
Bankhead Coalmine 4750ft. near Banff	48	48	12
Bighorn Dam 4400ft. near Nordegg	176	84	48
Caw Creek Ridge 6500ft. near Grande Cache	128	68	58
Highwood Pass 7239ft. near Canmore	96	85	59
Luscar Coalmine 5700ft. near Hinton	96	78	50
Nordegg Coalmine 5500ft. near Nordegg	64	89	50
Racehorse Creek Coalmine 6500ft. near Blairmore	128	68	62
Average of 7 sites	736 Total	74	48

TABLE 3 (cont.)

1976 Establishments

Site	No. of Plants	% Survivors July, 1977	% Reproducers July, 1977
Bighorn Dam 4400ft. near Nordegg	160	94	43
Caw Creek Ridge 6500ft. near Grande Cache	160	99	11
Corral Creek Sheep Range 3700ft. near Grande Cache	160	90	46
Cuthead Creek Roadbed 6080ft. near Banff	160	75	48
Grassy Mtn. Coalmine 6000ft. near Blairmore	160	84	20
Johnston Creek Horse Corral 6460ft. near Banff	160	100	no data
Maligne Canyon Roadbed 4340ft. near Jasper	160	99	32
Mountain Park Coalmine 5900ft. near Hinton	160	96	37
Nordegg Coalmine 5500ft. near Nordegg	160	64	16
Prospect Coalmine 6700ft. near Hinton	160	69	12
Racehorse Creek Coalmine 6500ft. near Blairmore	160	86	52
Snow Creek Pass Roadside 7220ft. near Banff	160	81	22
Tent Mountain Coalmine 7000ft. near Coleman	158	87	30
Average of 13 sites	2078 Total	86	31

REFERENCES

BAKER, H. G., and G. LEDYARD STEBBINS. Eds. 1975. The Genetics of Colonizing Species. Academic Press, p. 588.

BILLINGS, W. D. 1970. Plants, Man and the Ecosystem. Wadsworth Publishing Company, p. 60.

BROWN, R. W. and R. S. JOHNSTON 1976. Revegetation of an Alpine Mine Disturbance: Beartooth Plateau, Montana. USDA Forest Service Research Note INT-206.

CLAUSEN, J., D. D. KECK, and W. M. HIESEY 1940. Experimental Studies on the nature of species. I. Effect of varied environments on western North American plants. Carnegie Inst. Wash. Publ. 520.

CORNELIUS, D. R. 1946. Establishment of some true prairie species following reseeding. Ecology 27: 1-12.

GRANT, VERNE 1971. Plant Speciation. Columbia University Press, p. 432.

HAFENRICHTER, A. L. *et al.* 1968. Grasses and Legumes for Soil Conservation in the Pacific Northwest and Great Basin States. Agriculture Handbook 339. U.S.D.A. 69p.

HESLOP-HARRISON, J. New Concepts in Flowering Plant Taxonomy. Harvard Univ. Press, p. 134.

HODGSON, H. J. 1966. Floral initiation in Alaskan Gramineae. Bot. Gaz. 127: 64-70.

STEFFERUD, A. 1948. Grass. Yearbook of Agriculture 1948. United States Department of Agriculture, p. 892.

TURESSON, G. 1922. The Genotypical Response of the Plant Species to the Habitat. Hereditas, Vol. 3, p. 211.

YOUNGNER, V. B., and C. M. McKELL 1972. The Biology and Utilization of Grasses. Academic Press, p. 426.

PROCEEDINGS

OF

THE SECOND ANNUAL GENERAL MEETING

OF THE

CANADIAN LAND RECLAMATION ASSOCIATION

August 17, 18, 19 & 20 — 1977   Edmonton, Alberta

(Sponsored by the Faculty of Extension, University of Alberta)

P R O G R A M

Canadian Land Reclamation Association

Second Annual General Meeting

August 17, 18, 19, 20, 1977

Edmonton, Alberta

Wednesday, August 17 (Optional Field Trips)

Field Trip No. 1 (Athabasca Tar Sands)

Leader: Philip Lulman (Syncrude Canada Ltd.)

Fee: $100.00 (covers bus and air transportation, lunch, and field trip information pamphlets)

Schedule: 7:30 am.- delegates board bus at Parking Lot T, located immediately south of the Lister Hall Student Residence complex. Air transportation from Edmonton Industrial Airport to Fort McMurray and return. Guided bus tour of surface mining and reclamation operations on Syncrude Canada Ltd. and Great Canadian Oil Sands Ltd. leases. 6:30 p.m.- delegates arrive back at Parking Lot T, University of Alberta campus.

Field Trip No. 2 (Aspen Parkland; Forestburg Coal Mine Reclamation)

Leader: George Robbins (Luscar Ltd.)

Fee: $25.00 (covers bus transportation, lunch, and field trip information pamphlets)

Schedule: 8:00 a.m. - delegates board bus at Parking Lot T, located immediately south of the Lister Hall student residence complex. Guided bus tour southeast of Edmonton, stopping at various points of interest (oil spill reclamation field plots; Black Nugget Park [abandoned minesite]; trench plots on Dodds-Roundhill Coal Field; solonetzic soil deep ploughing site) on the way to the Luscar Ltd. Coal Mine at Forestburg. 6:30 p.m. - delegates arrive back at Parking Lot T, University of Alberta campus.

Thursday, August 18

Events:	Opening of Formal Meeting; Presentation of Papers
Location:	Multi-Media Room, located on second floor of Education Building, University of Alberta.
8:00 a.m.	Authors of papers being presented on August 18 meet with paper presentation chairmen and audio-visual co-ordinator (Douglas Patching)
9:00 a.m.	Meeting Opened by Dr. Jack Winch (President of the C.L.R.A.; Head of the Department of Crop Science, University of Guelph). Comments by Dr. Winch.
9:15 a.m.	Welcome to delegates on behalf of the Government of Alberta by the Hon. Mr. Dallas Schmidt, (Associate Minister Responsible for Lands, Alberta Department of Energy and Natural Resources)
9:25 a.m.	Commencement of Paper Presentations. Morning session chaired by Mr. Henry Thiessen (Chairman of the Land Surface Conservation and Reclamation Council and Assistant Deputy Minister, Alberta Department of Environment).
9:30 a.m.	Paper 1. Combined Overburden Revegetation and Wastewater Disposal in the Southern Alberta Foothills by H.F. Thimm, G.J. Clark and G. Baker (presented by Harald Thimm of Chemex Reclamation and Sump Disposal Services Ltd., Calgary, Alberta).
10:00 a.m.	Paper 2. Brine Spillage in the Oil Industry; The Natural Recovery of an Area Affected by a Salt Water Spill near Swan Hills, Alberta by M.J. Rowell and J.M. Crepin (presented by Michael Rowell of Norwest Soils Research Ltd., Edmonton, Alberta)
10:30 a.m.	Coffee Recess
11:00 a.m.	Paper 3. The Interaction of Groundwater and Surface Materials in Mine Reclamation by Philip L. Hall of Groundwater Consultants Group Ltd., Edmonton, Alberta.
11:30 a.m.	Paper 4. Subsurface Water Chemistry in Mined Land Reclamation; Key to Development of a Productive Post-Mining Landscape by S.R. Moran and J.A. Cherry (presented by Stephen Moran of the Research Council of Alberta, Edmonton, Alberta).
12:00 noon	Lunch Recess

1:25 p.m. Continuation of Paper Presentations. Afternoon session chaired by Mr. Philip Lulman (member of C.L.R.A. executive; reclamation research ecologist with Syncrude Canada Ltd.).

1:30 p.m. Paper 5. Coal Mine Spoils and Their Revegetation Patterns in Central Alberta by A.E.A. Schumacher, R. Hermesh and A.L. Bedwany (presented by Alex Schumacher of Montreal Engineering Company Ltd., Calgary, Alberta).

2:00 p.m. Paper 6. Surface Reclamation Situations and Practices on Coal Exploration and Surface Mine Sites at Sparwood, B.C. by R.J. Berdusco and A.W. Milligan (presented by Roger Berdusco of Kaiser Resources Ltd., Sparwood, B.C.).

2:30 p.m. Paper 7. Agronomic Properties and Reclamation Possibilities for Surface Materials on Syncrude Lease #17 by H.M. Etter and G.L. Lesko (presented by Harold Etter of Thurber Consultants Ltd., Victoria, B.C.).

3:00 p.m. Paper 8. The Use of Peat, Fertilizers and Mine Overburden to Stabilize Steep Tailings Sand Slopes by Michael J. Rowell of Norwest Soils Research Ltd., Edmonton, Alberta.

3:30 p.m. Coffee Recess

4:00 p.m. Paper 9. Oil Sands Tailings; Integrated Planning to Provide Long-Term Stabilization by David W. Devenny of E.B.A. Engineering Consultants Ltd., Edmonton, Alberta.

4:30 p.m. Paper 10. Bioengineering. The Use of Plant Biomass to Stabilize and Reclaim Highly Disturbed Sites by H. Schiechtel and K. (Nick) Horstmann (presented by Margit Kuttler).

5:00 p.m. End of August 18 Sessions.

Friday, August 19

Events: Presentation of Papers; C.L.R.A. Annual General Business Meeting; C.L.R.A. Annual Dinner.

Locations: Paper presentations and C.L.R.A. Annual General Business Meeting in Multi-Media Room, located on second floor of Education Building, University of Alberta.
- Annual Dinner held in Banquet Room located on second floor of Lister Hall.

8:00 a.m. Authors of Papers being presented on August 19 meet with paper presentation chairmen and audio-visual co-ordinator (Douglas Patching).

8:30 a.m. Showing of Film Rye on the Rocks. This film depicts reclamation situations at Copper Cliff, Ontario and is being shown for the purpose of introducing delegates to the site of the 1978 C.L.R.A. meeting (Sudbury, Ontario).

8:55 a.m. Continuation of Paper Presentations. Morning session chaired by Dr. J.V. Thirgood (Vice-President of C.L.R.A.; member of Forestry Faculty, University of British Columbia).

9:00 a.m. Paper 11. Reclamation of Coal Refuse Material on an Abandoned Mine Site at Staunton, Illinois by M.L. Wilkey and S.D. Zellmer (presented by Michael Wilkey of the Argonne National Laboratory, Argonne, Illinois).

9:30 a.m. Paper 12. A Case Study of Materials and Techniques Used in the Rehabilitation of a Pit and a Quarry in Southern Ontario by Sherry E. Yundt of the Ontario Ministry of Natural Resources, Toronto, Ontario).

10:00 a.m. Coffee Recess.

10:30 a.m. Paper 13. Amelioration and Revegetation of Smelter-Contaminated Soils in the Coeur D'Alene Mining District of Northern Idaho by D.B. Carter, H. Loewenstein and F.H. Pitkin (presented by Daniel Carter of Technicolor Graphic Services Inc., Sioux Falls, South Dakota).

11:00 a.m. Paper 14. The Influence of Uranium Mine Tailings on Tree Growth at Elliot Lake, Ontario by David R. Murray of the Elliot Lake Laboratory, Elliot Lake, Ontario.

11:30 a.m. Paper 15. Weathering Coal Mine Waste. Assessing Potential Side Effects at Luscar, Alberta by D.W. Devenny and D.E. Ryder (presented by David Devenny of E.B.A. Engineering Consultants Ltd., Edmonton, Alberta).

12:00 noon Lunch Recess.

1:25 p.m. Continuation of Paper Presentations. Afternoon session chaired by Dr. John Railton, (Manager, Environmental Planning, Calgary Power Ltd., Calgary, Alberta).

1:30 p.m. Paper 16. The Distribution of Nutrients and Organic Matter in Native Mountain Grasslands and Reclaimed Coalmined Areas in Southeastern B.C. by Paul F. Ziemkiewicz of the Faculty of Forestry, University of B.C., Vancouver, British Columbia.

2:00 p.m. Paper 17. Systems Inventory of Surficial Disturbance, Peace River Coal Block, B.C. by D.M. (Murray) Galbraith of the British Columbia Ministry of Mines and Petroleum Resources, Victoria, British Columbia.

2:30 p.m. Paper 18. The Selection and Utilization of Native Grasses for Reclamation in the Rocky Mountains of Alberta by D. Walker, R.S. Sadasivaiah and J. Weijer (presented by David Walker of the Department of Genetics, University of Alberta, Edmonton, Alberta).

3:00 p.m. Coffee Recess; Distribution of Proceedings.

3:30 p.m. Commencement of 1977 General Business Meeting of the Canadian Land Reclamation Association. Meeting chaired by Dr. J.V. Winch, C.L.R.A. President.

7:30 p.m. Commencement of C.L.R.A. Annual Dinner in Banquet Room, second floor of Lister Hall.

Guest Speaker: William T. Plass, Principal Plant Ecologist, U.S.D.A. Forest Service, Northeastern Forest Experiment Station, Princeton, West Virginia.

Topic of Speech: Challenges in Co-operative Reclamation Research.

Note: Following the Annual Dinner and Mr. Plass's speech, delegates may retire to the adjacent Gold Room. A bartender will be on service until midnight.