

THE AVAILABILITY AND PROCUREMENT
OF NATIVE SEED SOURCES SUITABLE
FOR ALPINE AND MOUNTAIN RECLAMATION

Paper Presented
by

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The interest in the use of indigenous plants for reclamation purposes has created a demand for seed sources of native grasses, legumes and other flowering elements. For the temperate zone of the North American continent not including the mountainous regions, the choice of suitable material for reclamation is considerable. For the more northern region of this continent and especially for alpine elevations, this choice is somewhat restricted, not only by the number of species, but also by the heritable characteristics of hardiness, drought and wind resistance and above all earliness. For example, an *Agropyron* collected at sea level and improved genetically for yield, is lacking the necessary resistance for survival in a boreal environment. Hence, the seed sources necessary for reclamation in these regions are highly specialized. Commercially, these seed sources are not as yet available and what is now produced in the United States for reclamation purposes is of a highly questionable origin and cannot be guaranteed to survive in the mountainous regions of British Columbia and Alberta.

A recent market survey of December 1981 by Jacklin Seed Company rates the immediate supply of reclamation seed as poor to fair for native grasses and cultivars. For legumes a sufficient supply is indicated. No supply was indicated for native grasses suitable for our regions and for high elevation reclamation. As with other commodities in our world, supply is dependent on demand and in the case of native reclamation material it will take still a considerable time before new cultivars suitable for the Canadian reclamation market will become available commercially. Before a seed grower is able to supply the market, several years have to pass before a new variety can be licensed. Our present, most antiquated Canadian licensing procedures make it unattractive to the plant breeder, to devote time and effort to service our agricultural industry. It can be expected that the cost of seed suitable for reclamation and adapted to our harsh climate will be considerably higher than what is presently offered for sale in the U.S.A. The reason for this cost differential finds its origin in the fact that the demand for this specialized material will always be limited when compared to crops suitable for multiple purposes. Recently it has become clear that some of our *Agropyrons* are excellent seed producers in their first year of production but fall off sharply in their yield in subsequent years. From a seed grower's point of view an

early rotation of these grasses (especially *Agropyron subsecundum*) will therefore become necessary. At this moment the Department of Genetics, University of Alberta, under Contract by Alberta Environment and Parks Canada, has developed the following native grasses:

Agropyron dasystachyum
A. latiglume
A. riparium
A. subsecundum
A. trachycaulum
Agrostis scabra
Deschampsia caespitosa
Festuca altaica
F. saximontana
Koeleria cristata
Phleum alpinum
Poa alpina
P. artica
P. cusickii
P. interior
Trisetum spicatum

These-species were selected over a time span of seven years and taking into account that grasses flower in their second year of growth, the total number of selection cycles carried out on these grasses amounts to three. From a genetical point of view three selection cycles for material that is highly heterozygous in nature, is barely adequate. It is clear that some efforts have to be made in the near future to continue with further selection in order to produce highly improved seed material. In this respect, it is not so much seed yield which is important, but the further development of other potential present in these species. Recent observations point to the fact that several of our native grass species not only have a great adaptability toward a boreal environment but also to high alkaline or to acid soil conditions. These latter potentials are of great value to industry which often deal with soil conditions of this nature. Indeed in many reclamation projects, the success of revegetation will be dependent on the development of these cultivars. In this respect, *Deschampsia caespitosa* and *Poa interior* are very promising. The introduction and use of reclamation grasses suitable for this northern region is in need of guidance and in my view it would be most advantageous for industry to

have available to them an organization which pools experiences with this material and makes available to industry their advice and seed for testing. I firmly believe that when one considers the Coal Research Institute as it is funded at this time by the Government of the Province of Alberta and the industry, there is equal justification for a Soil Reclamation Institute which in its ultimate form could develop new species and new varieties and serve as an extension service to the mining industry. Such an institute would be able to contract with the seed growers the necessary supply of reclamation seed for the entire industry. Since it can be expected that new selections may result from such a cooperative effort, a delay of six years, the time necessary for licensing, can be avoided and industry can take immediate advantage of these new seed sources. Canada is late in the development of these types of interactions. Anybody acquainted with the work of Dr. Dewey in Logan, University of Utah, is aware of the great benefits that Institute provides to the reclamation industry. When I read over the present regulations on surface mining in my own Province of Alberta, I find these requirements awesome at least. It requires the industry to reclaim spoils to a standard equal or better than *before* the disturbance was established. Provided that no lip service is given to this requirement, a horrendous responsibility rests with the mining industry. Government as well as industry should be aware that in order to fulfill this requirement, a concerted effort has to be made to provide industry, i.e. the life-line of our economy, with a reclamation extension service. Our governments, Provincial as well as Federal are very anxious to fill their coffers with the tax revenues of our resources, but indeed there is very little willingness on behalf of these governments to put facilities in place for the needs of the provider. In this respect the Federal Government has made inadequate provisions, and it is time to correct this for the benefit of Canada, the mining industry and the population at large. We have also carried out a selection program with legumes and other flowering plants.

We have concentrated on our native *hedysarums*, that is to say *H. sulphurescens*, *H. alpinum* and *H. mackenzii*. These species are useful in the reclamation of disturbances at mountain elevations but are not satisfactory above 6,000'. In addition, lines of *Lupinus argenteus* have been developed for Parks Canada's use in Waterton National Park where this lupine is indigenous. It appears that our Alberta soils are well supplied with the bacteria *Rhizobium*, the necessary symbiont of the native legumes, and seedlings are able to establish themselves without

soil inoculation. The use of these legumes should be promoted because of their unique feature of being able to fix nitrogen. It should be pointed out, however, that the ability of nitrogen fixation is correlated with soil temperature and length of growing season. Unfortunately neither of these two are optimum in mountainous regions. Of all the flowering plants, *Dryas* species seem to have the greatest potential for reclamation purposes. *Dryas hookeriana* is limited on this continent to the Alaska-Yukon region and in our region to high mountains of the Rocky Mountains complex. It can be found on otherwise bare mountain tops and is able to survive the most severe environmental conditions. Its demand for soil and soil texture is minimum. The small seed size of *Dryas* determines the method of its application. Hydro-seeding or broadcasting in pellet form appears to be the most efficient way of seeding. *Dryas drummondii*, is a Mountain Aven of a lower altitude although still alpine. In our National Parks system it often appears as a pioneering species on dry river beds and otherwise denuded locations. Both species, *D. drummondii* as well as *D. hookeriana* are quite fast-growing species forming a very dense mat with excellent erosion abating capacity. *Verbascum thapsus*, the Common mullein, a weed common in British Columbia, and now spreading through Alberta has excellent reclamation possibilities. Its natural habitat is a dry rocky location. A biennial, non-toxic, plant, especially appreciated by our feathered friends, produces very large amounts of organic material during its life cycle. In our trails *Verbascum* encourages the invasion of other flowering elements. In our view an initial establishment of *Verbascum* on a disturbed area might be very helpful for future reclamation by native grasses.