NATIVE PLANT REVEGETATION GUIDELINES FOR ALBERTA

February 2001

Alberta
AGRICULTURE, FOOD AND RURAL DEVELOPMENT

Native Plant Revegetation Guidelines For Alberta

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The "Native Plant Revegetation Guidelines for Alberta, July 2000" are endorsed for use.

We wish to acknowledge the dedicated work of the Native Plant Working Group members who were instrumental in completing the guidelines. We confirm our continuing support to work with stakeholders to monitor the implementation of the guidelines and to update them as necessary.

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FOREWORD

The use of native plant materials in Alberta has been increasing steadily. In 1997, two government departments, Alberta Agriculture, Food and Rural Development (AAFRD) and Alberta Environment (AENV), responsible for the management of public land in Alberta, decided that it was important to develop a consistent approach for the use of native plant material in revegetation projects. A number of government departments, industry groups and non-government organizations were invited to participate in the development of guidelines. Those that accepted became part of the Native Plant Working Group.

The current active members of this group (in alphabetical order) are:

Terry Andersen*	Canadian Seed Trade Association
Andy Etmanski	Coal Association of Canada
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The following people had previous involvement with the process, or provided substantial review of the document:

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The following people provided academic review of this document:

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The guidelines can be viewed on the AAFRD website:
http://www.agric.gov.ab.ca/publands/nprg/

Information or hard copies of these guidelines can be obtained from:

Public Lands Division, Alberta Agriculture, Food and Rural Development
Room 200, J.G.O'Donoghue Building
7000-113 St. Edmonton, Alberta T6H 5T6
Telephone: (780) 427-6597 Fax: (780) 422-4244

Alberta Environment Information Centre
Main Floor, 9920-108 St.
Edmonton, Alberta T5K 2M6
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February 2001

1.0 Introduction

1.1 Objectives

These guidelines provide a clear, consistent and integrated information package about using native plant materials throughout Alberta where the revegetation goal is to re-establish a native plant community. The guidelines are not prescriptive; site specific circumstances, including landowner preferences and land use objectives, have to be considered when planning revegetation projects. It is recognized that programs involving revegetation using native species will continue to evolve with better science, technology and sources of native plant materials, and that revegetation approaches can be modified to fit different needs.

The objectives of the guidelines are to:

- encourage the eventual establishment of native plant communities within native landscapes
- promote the use of native species in the revegetation of disturbed sites within native plant communities within the Green and White Areas of Alberta
- promote consistency of native plant material use among regulatory jurisdictions
- acknowledge the site specific role of non-native species to meet short-term revegetation objectives or meet accepted land use needs

1.2 Background

Native plant species are those that are indigenous to a particular region. They have adapted over time in association with landscape and climate. Also, they were in Alberta prior to Euro-American settlement. Native species are recognized for their intrinsic value as part of natural forest, grassland, montane and wetland ecosystems.

Over time, Alberta's native landscapes have been changed by agricultural, industrial, commercial, recreational and residential/urban development. Threats to remaining native landscapes include further fragmentation into increasingly smaller areas and the introduction and expansion of weeds and invasive agronomic species. In these cases, the past use of non-native plants on revegetated sites (e.g., crested wheatgrass) has resulted in the exclusion of native species. Non-native plants can be useful depending on short-term and end land use goals (e.g., interim stabilization, grazing management). However, they also have the potential to alter natural communities when they invade non-disturbed areas. The loss of native plant species may negatively impact the way an ecosystem functions.

Overall, the use of native species for revegetation in Alberta has increased dramatically during the last few years. Native plant materials have been used for revegetation projects in different regions of Alberta since the early 1970s, with native grass cultivars (mainly wheatgrasses) being used to revegetate disturbances since 1985. Numerous agencies and researchers are working to address the factors limiting the availability of native plant materials. These guidelines reflect the combined knowledge and experience of revegetation practitioners.

Revegetation practices vary around the province. Along the fringes of settlement (in the White Area), where conversion of forest to tame pasture for grazing of domestic cattle occurs, the use of native species for revegetation is often limited to areas designated for conservation or areas unsuitable for grazing. These guidelines provide consistent direction about where native species should be used in revegetation.

1.3 Need for Guideline Development

The Alberta government is responsible to ensure the protection and management of the province's natural resources, on a sustainable basis, for the benefit of Albertans. There is an enhanced understanding of the value of maintaining ecosystem function and biological diversity within native landscapes, particularly on public land. The need for consistent guidelines for the use of native species in revegetation projects has been recognized by government land managers, scientists, the seed production industry and practitioners. No comprehensive legislation or formal government policy about using native plant material exists in Alberta. There are specific rules about the collection and use of native tree seed and precedents based on terms and conditions of permits and approvals (see Appendix A).

1.4 Process for Guideline Development

A steering committee was formed to review the issue of revegetation with native plants. Both the Land and Forest Service of Alberta Environment (AENV) and the Public Lands Division of Alberta Agriculture, Food and Rural Development (AAFRD) are represented on the steering committee. In turn, this committee established the Native Plant Working Group (NPWG). Representation to the group comes from other government jurisdictions, various industries and non-government organizations (see Appendix B). The NPWG is responsible for recommending provincial guidelines for the use of native plants for revegetation.

The working group has undertaken an extensive review of the issues, existing legislation, policy and guidelines (see Appendix A). A draft guideline document was sent out for academic and public review in November 1998. The document was then revised by the NPWG and was used on a trial basis in 1999. The working group and steering committee prepared this final version using the comments and recommendations received during the trial period.
A companion book, *Establishing Native Plant Communities*, is currently being developed to

assist revegetation practitioners. This manual includes information about planning projects, various types of plant materials, site preparation, seeding and planting techniques, site management, monitoring and remediation. The book will be available by the spring of 2001 from the Alberta Agriculture, Food and Rural Development Publications Branch (780 427-0391).

1.5 Guideline Implementation

These guidelines will be implemented consistently for Alberta's public lands by provincial land managers in the Green (forested) and White (settled) Areas of Alberta where the revegetation goal is to re-establish a native plant community. Implementation of the guidelines will also be promoted on private and federal land in the province.

Planting native species or alternative revegetation practices compatible with native species re-establishment will be required in legislated protected areas. Native plant materials should be used on all other disturbed natural landscapes on publicly owned lands where re-establishment of the native plant community is consistent with the surrounding landscape. The use of native plant material for revegetating natural landscapes on private land will also be encouraged where appropriate. The rationale for using a particular revegetation strategy must be accepted by the land manager/land owner or other recognized regulator/authority when requested (see Appendix C).

It is anticipated that implementation of the guidelines will be hampered by the following factors that currently limit the use of native plant materials in revegetation projects:

- a lack of seed or other source material for most species
- the high cost of seed production translating to high costs for users
- a lack of information about species characteristics, ecology and agronomy
- difficulties associated with harvesting, cleaning, and planting native seeds
- a lack of information about forage value and palatability (for livestock and wildlife)
- the unpredictable germination for some types of native seed
- the unpredictable survival of transplant seedlings
- a lack of agronomic information on the establishment, and succession of native species

Because of these limitations the selection of specific native species for revegetation by both regulators and project managers should reflect an understanding of these limitations and reclamation objectives. It is important for public land managers and project managers to note that the ability to successfully use native plant materials in revegetation may be compromised by lack of supply and lack of knowledge on species performance and species succession. Proponents also have to meet achieve specific reclamation objectives as defined by Alberta's *Environmental Protection and Enhancement Act* (C&R Regulation 1996), therefore, researchers, land managers and project managers need to be innovative. Land managers need be practical and only require achievable practices, milestones and end-

points.

Existing *Environmental Protection and Enhancement Act* approvals and future amendments may have revegetation goals that conflict with the new guidelines. In such cases, operators are required to meet approval requirements, but they are encouraged to use native plant material where appropriate. New applications should reflect a desire to move toward the use of more native species in revegetation. The application of revegetation practices will be carried out by the operator in accordance with the approved plan.

A major review of the guidelines will be conducted every five years as knowledge and experience are gained. Users are encouraged to make comments on the guidelines by contacting one of the agencies listed at the end of this document.

1.6 Awareness/Education

The guidelines will be distributed to government and non-government organizations including the seed industry, resource industries, agricultural organizations and environmental groups. The stakeholders will ensure that the guidelines are made known to their membership.

Presentations will be made at conferences and other forums to promote the importance of conserving native vegetation and to encourage native revegetation where it is appropriate. As supply improves to meet demand, native plant material will become more available. The development of local seed sources will be encouraged through workshops, conferences and printed materials made available to potential growers.

2.0 Guidelines for the Use of Native Plant Material

Re-establishing native plant communities can be very difficult. This document recognizes the importance of avoiding and minimizing disturbance to natural landscapes wherever possible. Strategies used for revegetation of disturbed native landscapes should be ecologically consistent, technologically and economically feasible, and should take social values and the approved end land use into consideration.

2.1 Planning Native Revegetation Projects

The goals of pre-development and revegetation planning are:

- to ensure that existing native communities are minimally disturbed
- to control erosion
- to conserve native plant materials through salvage where practical
- to use revegetation techniques that re-establish appropriate, functioning native plant communities that meet land use and regulatory objectives
- to identify rare and sensitive plants and plant communities and consider strategies for their conservation
- to identify and address concerns with existing populations of problem plant species
- to have sufficient appropriate materials available

1. The first priority in achieving successful native plant revegetation is minimum disturbance of native communities. Measures taken to achieve this include: avoidance of particularly sensitive areas, the reduction of the area disturbed, use of special equipment and techniques, and careful timing of construction.

2. Revegetation with native plants may exceed any approval requirements for the disturbance. Equivalent capability must be met for specified land as defined by the *Environmental Protection and Enhancement Act* (Conservation and Reclamation Regulation) and associated reclamation criteria.

3. The use of native species should be consistent with local and/or regional land use plans/objectives and with existing or surrounding vegetation.

4. The salvage of existing native plant materials and topsoil is a priority and should be considered in the planning stages prior to disturbance. Examples of materials that can be salvaged and replaced to enhance native revegetation of a disturbed site include:

    - seeds, cuttings, etc.
    - native sod
    - native hay at the seed stage
    - slash
    - topsoil (housing microbes and plant propagules)

5. The use of special techniques may have implications for the construction, operation and reclamation phases of development, therefore these should be carefully assessed on a project by project basis. For example, in some circumstances the use of minimal disturbance techniques for constructing wellsites may affect operational time frames or increase the risk of damage to soils and vegetation from contamination.

6. The revegetation goals of the project must be clearly understood when deciding what type of native plant materials to use, and how and where to use them. Project goals might include one or several of the following: erosion control, sustainable wildlife or livestock foraging, maintenance or development of wildlife habitat, re-establishment of tree cover, control of invasion of problem plant species, maintenance of biodiversity and aesthetics.

7. Revegetation site plans should encourage the eventual establishment of native plant communities of the natural subregion consistent with the approved end land use.

8. Container plants, bare root plants, or other plant materials (e.g., cuttings) are sometimes required for revegetation projects. Production of plants requires varying amounts of time. Lead time of approximately one year is required for the production of most forbs. Generally, lead times for shrubs and trees are longer. Two to three years may be required to produce a suitably sized woody plant. Time for seed collection, if required, should be factored into the revegetation plan.

9. The Alberta Natural Heritage Information Centre (ANHIC) has a database that tracks rare plants, animals, native plant communities and landscapes. Project managers should consult this database to determine if their project has the potential to affect any of these high priority elements. ANHIC can be reached by calling 780- 427-5209 (Fax: 780 427-5980).

2.2 Site Considerations

The degree and size of the disturbance, as well as site conditions, are important considerations when deciding what revegetation strategy to use. These guidelines are not intended to replace site specific evaluation and treatment.

1. For larger scale disturbances, drastically disturbed sites or sites where the risk of accelerated erosion is high, intensive revegetation strategies are recommended. In such cases, revegetation planning may require a phased approach for reaching end land use and native plant community goals. Native or non-native species that are suited to the site conditions can provide interim stabilization, but should be compatible with the long-term establishment of a native plant community.

2. Where rare or sensitive native plant species and communities are present, and where important wildlife habitat must be conserved, the conservation and use of local native plant materials is extremely important.

3. Existing wetlands, dominated by sedges, rushes, cattails or sphagnum moss, do not require seeding if the hydrology of the area is not significantly altered by the disturbance. The native vegetation in these areas generally re-establishes on its own from the seed bank or from root material. Man-made wetlands may require the introduction of native plant material from within the same Natural Subregion.

4. In riparian zones disturbance to native vegetation should be avoided or minimized. Streams, river banks and associated landforms should have native vegetation replaced, including trees and shrubs.

5. For small disturbances a natural recovery (no seeding) option may be a suitable revegetation strategy, where the following conditions are met: erosion potential is low, the topsoil seedbank was salvaged or the surrounding natural landscape can provide a source of native plant material (usually seed). The potential for problem weed invasion should also be low. It must be understood that the time frame for revegetation success may be longer when using this strategy.

2.3 Plant Species Selection

The use of appropriate plant materials for revegetating natural ecosystems is critical for the successful establishment of a native plant cover. Native species should be selected based on their consistency and compatibility with pre-disturbance plant communities within the Natural Subregion. The use of early successional species or native species that can survive in the altered conditions can be considered in areas where late successional species may be difficult to establish. The use of a particular species should also be technically feasible, economically viable, socially acceptable and consistent with site conditions and approved end land use.

1. A range of native plant materials (e.g., multiple species, varieties and/or age classes) and/or multiple planting events should be used to achieve plant community diversity.

2. The plant species should be selected based on their rooting and ground cover characteristics and establishment rate if erosion control is a major objective.

3. Use higher proportions of short-lived species in the mix when colonization by off-site native species onto the disturbed area is desired.

4. Limit the use of native plant materials (e.g., grass) that out-compete trees when the revegetation goal is to establish tree cover.

5. Select native plant materials that fulfill the life-cycle requirements of wildlife species (within the context of the surrounding landscape) when creation of wildlife habitat is a major revegetation objective.

6. The selection of revegetation species should consider the fact that some species are more palatable than others to livestock or wildlife and may incur over-grazing or over-browsing.

2.4 Sourcing Native Plant Material (see Figure 1)

The use of high quality seed is important for ensuring the success of native revegetation projects. Paying attention to seed purity, germination and source can prevent the introduction of undesirable weeds and invasive agronomic species.

1. The original collection site of native plant material should be as close as possible to the disturbed site (within the same Natural Region). Native plant material collected onsite may be propagated to develop adequate supplies.

2. If suitable local materials are unavailable, only native plant material from a comparable Natural Region in Canada or the United States should be used.

3. If the native plant material has not been tested for performance in Alberta, consideration should be given to performance testing or field testing native plant material onsite or removing the source from the revegetation plan.

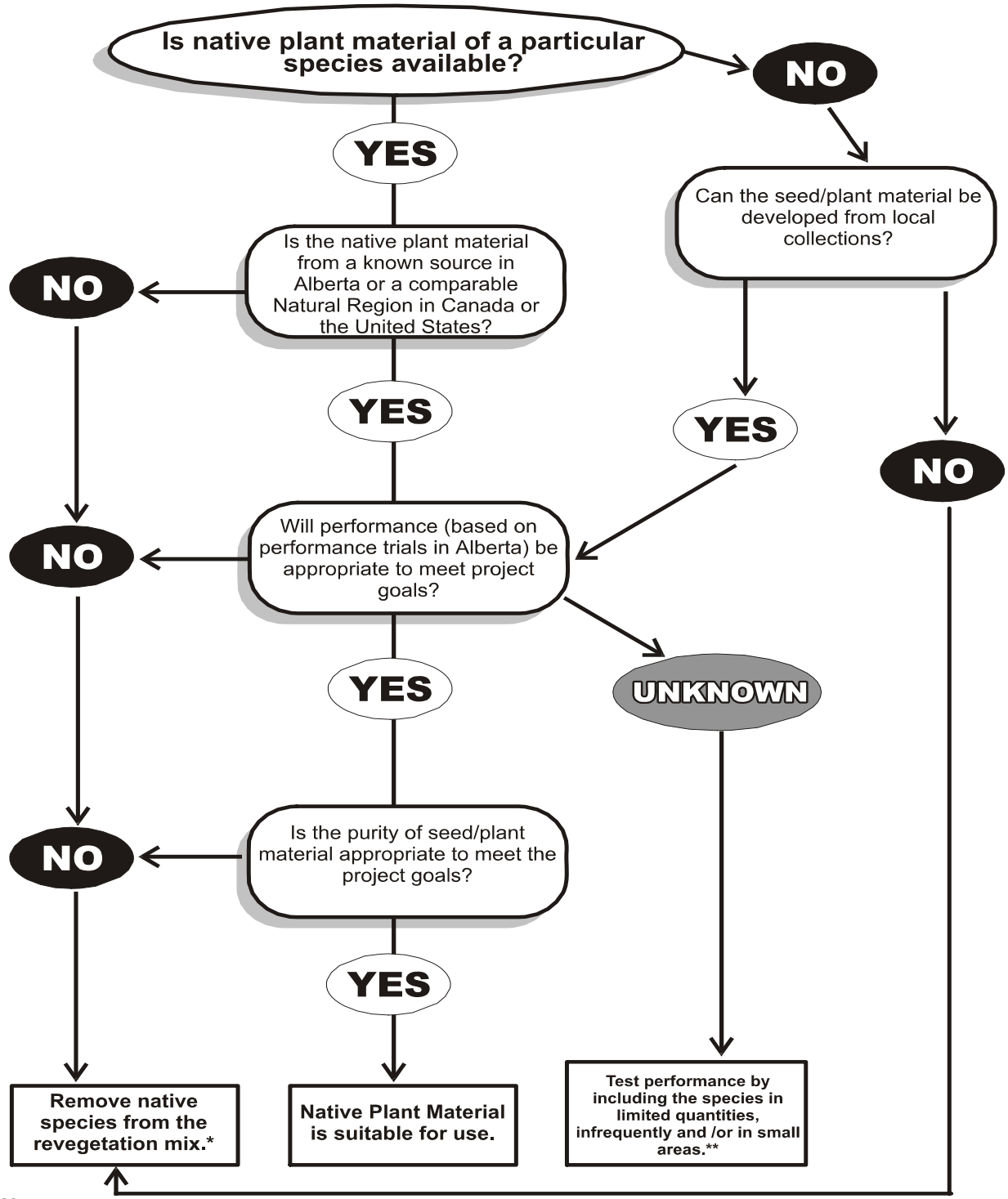
4. If a known source of native plant material is not available, consider modifying the revegetation plan or including the use of plant species that will not persist and become a permanent part of the ecosystem.

5. It is virtually impossible for native seed mixes to be completely contaminant-free. Prior to mixing, a certificate of analysis for each native seed lot must be examined to determine if the seed lot is acceptable (see Appendix D). Native seed lots should be free of prohibited, primary and secondary noxious weeds as defined by the *Canada Seeds Act*. Native seed lots should also be free of restricted and noxious weeds as designated by the *Weed Control Act* or by a local municipality.

6. Seed lots with problem species should not be accepted (see Appendix E) unless their use is consistent with project goals and surrounding land use.

7. If there is a high level of concern about the presence of a problem species within a seed lot purchasers can request that a seed analysis be conducted on a 100g sample of seed, instead of the usual 25g sample. This increases the assurance from 95% to 99% that an impurity is not present. The seed certificate only reflects the purity of the seed sample and not the seed lot.

Figure 1. Decision-Making Chart: Sourcing Native Plant Material



Notes:

*** prior to removing species from the revegetation mix, multiple attempts to secure alternative sources is recommended.**

**** records of procedures and results should be maintained and made generally available.**

2.5 Supply and Demand of Native Plant Materials

Individuals requiring native species for revegetation projects should let suppliers know what they need as early as possible. Some species take up to three years and longer to be made available.

1. A list of native species that are commercially available or currently being developed for use in revegetation programs can be found in Appendix F. This Appendix also identifies key species that are likely to be developed in Western Canada in the near future. These species were selected based on the following criteria:

    - widest application (across several natural regions)
    - potential for providing erosion control
    - dominant plants in the natural community
    - legumes
    - early successional forbs

2. Wild harvesting should be done with care to prevent damage to natural communities. When wild harvesting sufficient seed has to be left to allow native plants to propagate themselves and provide food for wildlife. Whole plants should never be removed. Specific guidelines for this activity are contained in Appendix G.

3. Appendix H is a list of native plant species that are currently available (or are key components of the affected native landscapes and will be available within five years) for revegetating disturbed public land in Alberta. This list should be consulted as a starting point. Other sources of information regarding availability include: the public land manager, seed suppliers and the Alberta Native Plant Council (website: www.anpc.ab.ca).

4. Appendix I provides specific species information (where it is available) for some common native plants, including: seed size, dormancy, germination and seedling performance. This information assists practitioners in designing seed mixes and deciding upon appropriate seeding rates.

2.6 Site Preparation

Site preparation is the one of the most important factors in determining the success of revegetation projects. Inadequate preparation is probably the most common reason for failure of revegetation efforts.

1. Controlling persistent weeds prior to revegetating with native species is critical for ensuring the success of revegetation projects. This may take several years of active control. If forbs, trees or shrubs are planted on a site or recolonization by these plants is desired, care must be taken to use weed control methods that do not have a detrimental effect.

2. When organic material (e.g., straw) is used on a disturbed site, care must be taken not to introduce undesirable plant species or persistent chemical residues.

3. Preparing a firm seedbed when drill seeding ensures good soil to seed contact, enhances germination of many native species, and regulates seeding depth.

4. Creating microsites using equipment that produces ridges and hollows can enhance survival of native plants, particularly in droughty environments.

5. Use of fertilizers is not recommended as a general practice but should be based on a soils analysis recommendation and the goals for revegetation on the site.

6. Cereal cover crops are not recommended as a general practice but can be considered on a site specific basis to help prevent erosion, particularly when the introduction of contaminated straw is a concern. However, cover crops compete with native species for both moisture and nutrients. It should also be noted that crops such as oats and barley are attractants to wild and domestic grazing animals.

2.7 Seeding and Planting

The way that native plant materials are seeded or planted has to consider project goals, intended end land use, previous experiences with proposed methods and specific requirements of the species being used.

1. Care should be taken to balance revegetation goals, such as erosion control and soil conservation versus desire to have off-site plants colonize the area. Seeding rates should match the project objectives.

2. Seed placement is dependent on species requirements, soil moisture and texture. Seeding too deep is a common cause of seeding failure. Requirements (e.g., light) for particular species should be investigated.

3. Plant distribution should simulate off-site occurrence of the species as much as possible. Shrubs, for example, may be planted in clumps depending on the site plan**.**

4. Timing of seeding or planting is recommended to take advantage of better moisture conditions to optimize emergence and survival. Some native species require pre-treatments (e.g., stratification, scarification) to enhance germination.

5. Mycorrhizal fungi and rhizobial bacteria enhance plants' uptake of nutrients and moisture. The addition of these organisms to disturbed sites may be necessary for the successful establishment of certain native species. Mycorrhizae and rhizobia are usually present in salvaged topsoil.

2.8 Management of Revegetated Areas

Effective management of planted native stands is required to ensure that the vegetation is sustainable. Examples of management strategies may include: controlling unwanted plant species, interim protection of establishing plants and the removal of excess litter or dead plant material.

1. Restricted or noxious weeds (e.g., Canada thistle, scentless chamomile) are defined in the *Weed Control Act* (Appendix D) and municipal by-laws. They should be eliminated or controlled using methods that are compatible with the survival of broad-leaved native plants (e.g., spot-spraying, hand weeding).

2. Non-persistent annual weeds (e.g., stinkweed, flixweed) should only be controlled when densities are judged to affect the establishment of desirable native plants or the integrity of adjacent land use. Annual weeds can be beneficial for catching snow and protecting emerging native plants from grazing.

3. Supplemental watering may be required for establishment of container native plant material (e.g., trees, shrubs, forbs).

4. Native plants may need protection from browsing or grazing during the establishment period. Controlled grazing may help to eliminate unwanted plants from the stand.

5. Grazing, mowing or prescribed burning of the revegetated area may be necessary to retain plant vigor and diversity over time.

6. Fertilizers may occasionally be required after the establishment period to meet specific plant or site concerns.

2.9 Assessing Revegetation Success

It is important to include a monitoring program to evaluate revegetation success relative to intended use and to adjust revegetation strategies for future projects.

1. Project planning must incorporate mechanisms for measuring revegetation success. Monitoring is very important. Sharing of assessment results can assist planning for future projects.

2. The establishment of a desired native plant community may be a lengthy process. The demonstration of a successional trend toward a desired native plant community should be considered when determining the success of a revegetation project.

3.0 Future Needs

The successful use of native plants for revegetation must involve the development of key species in commercial quantity and the monitoring of revegetation projects. Through long-term monitoring we will gain knowledge about trends and information that will refine future projects. It is important to share this information through publication, presentations at conferences, etc. Improved technology for propagation, planting and harvesting of native plant materials will also assist plant producers and users.

Plant ecology for many native species, particularly forbs, is poorly understood. Research directed at understanding plant communities and relationships between plant species and their environment will be important. Increased understanding in these areas will help to improve both commercial production of native plant species and their utilization in revegetation projects.

The following are critical areas that require immediate attention:

1. Development of "source-identified" tags to enhance the movement of appropriate native plant materials into revegetation projects. The Canadian Seed Growers Association needs to be involved with this initiative.

2. Development of joint government/industry support for a performance evaluation program for native plants from known sources.

3. Support of on-going native species development programs.

4. Development of knowledge about successional trends, critical for determination of revegetation success.

5. Development of rhizobial and mycorrhizal inoculants for those species that require them for successful establishment and survival.

4.0 Contacts for Further Information

For public lands:

In the White Area:

Alberta Agriculture, Food and Rural Development
Public Lands Division
200, J.G. O'Donoghue Building
7000-113 Street
Edmonton, Alberta T6H 5T6
Phone: (780) 427-6597 Fax: (780) 422-4244

In the Green Area:

Alberta Environment
Land Administration Division
3rd Floor, 9915-108 Street
Edmonton, Alberta T5K 2G8
Phone: (780) 427-3570 Fax: (780) 422-4251

In Special Areas:

Special Areas Board
Box 820
Hanna, Alberta T0J 1P0
Phone: (403) 854-5600 Fax: (403) 854-5527

For private lands:

Alberta Environment
Environmental Sciences Division
4th Floor, 9820-106 Street
Edmonton, Alberta T5K 2J6
Phone: (780) 427-5883 Fax: (780) 422-4192

5.0 Maps

5.1 Natural Regions and Subregions of Alberta

5.2 Green and White Areas of Alberta

6.0 Glossary

Unless specifically cited, these terms are working definitions for the purpose of this guideline document.

agronomic: introduced annual cereals, forage and turf species**.**

approved end land use: a planned post-disturbance land use that has been accepted as a condition of approval issued under the *Environmental Protection and Enhancement Act*, or otherwise accepted by governing authorities (e.g., municipalities, grazing associations, etc.), land managers and landowners.

biodiversity: the diversity of life in all its forms and all levels of organization (Hunter 1990:7); includes the genetic diversity within a species, the diversity of species within an ecosystem and the diversity of ecosystems within landscapes.

collection site: the geographical location/s of the original site/s from which parent native plant material was collected (prior to field propagation/increase/selection).

cultivar: a plant variety that has undergone genetic selection by plant breeders, has been registered by a certifying agency and is propagated under specific guidelines to maintain its genetic integrity. Generally less variable genetically and phenotypically than native or natural populations.

desired native plant community: a plant community that meets land use and revegetation objectives.

Ecological Reserves: designated under the *Wilderness Areas, Ecological Reserves and Natural Areas Act*. These are lands selected as representative or special natural landscapes and features of the Province of Alberta. They are protected as examples of functioning ecosystems, gene pools for research, and for education and heritage appreciation purposes. Ecological Reserves are managed to permit natural ecological resources to operate with a minimum of external influence.

ecosystem: a system of living organisms interacting with each other and their environment, linked together by energy flows and material cycling.

ecotype: a local population of a particular species, adapted through natural selection to a particular habitat or geographic location.

ecovars: (a trademark used by Ducks Unlimited) the offspring of native species that have been developed from seed stock collected from specific ecological regions. Selection is done with minor emphasis on improving agronomic characteristics. Ecovars have greater genetic diversity than cultivars.

early successional species: a plant species that appears soon after disturbance in the natural sequence of plant communities and makes way for late successional species.

Green Area: a part of Alberta established in 1948 by Order-in-Council 213/48 consists of unsettled forest lands and covers 50.9 percent of the total area of the province. Public lands in the Green Area are managed primarily for forest production, watershed protection, fish and wildlife management, recreation and other multiple uses. Permanent settlement, except on legally subdivided lands, as well as agricultural uses other than grazing, have been excluded; see map on page 17. (Alberta Public Lands, 1988)

introduced species: a species that is not native to a particular area.

known source: collection site (the geographical location/s of the original site/s from which parent native plant material was collected, prior to field propagation/increase/selection).

late successional species: a plant species that appears later in the natural sequence of plant communities, preferring an undisturbed environment.

mycorrhiza: many plants form root associations with specific soil fungi. The resulting root-fungal structures are termed mycorrhizas. These associations usually benefit the plant because the fungi allows them greater access to soil nutrients.

native landscapes: landscapes that contain assemblages of plants and plant communities that are native, but have not been substantially altered by man.

native plant community: a plant community that is dominated by native species

native plant material: seeds, rootstocks and other propagative materials from plants that are indigenous to a particular region.

native species: plant species that are indigenous to a particular natural region; they were in that region prior to the time of Euro-American settlement.

Natural Areas: these are designated under the *Alberta Public Lands Act* or under the *Wilderness Areas, Ecological Reserves and Natural Areas Act*. They are established to represent special or sensitive natural landscapes and features. These areas allow low intensity recreation and opportunities for nature appreciation and education. They may also allow other uses on a site specific basis.

natural recovery strategy: a revegetation option that involves no addition of native plant material to the site. This type of revegetation depends on the plant materials in the replaced soil and those that recolonize from surrounding areas. This strategy can be enhanced by straw crimping or the planting of annuals to provide interim erosion control.

Natural Regions: the land classification system currently used by the Alberta Government (AEP 1994) that divides the province into units that reflect natural features. The purpose of the system is to account for the entire range of natural landscape or ecosystem diversity in Alberta. The Natural Regions system emphasizes overall landscape pattern and best represents the ecosystem and biodiversity elements of importance to conservation. There are six Natural Regions in Alberta.

Natural Subregion: the six natural regions of Alberta are sub-divided into 20 subregions based on recurring landscape patterns relative to other parts of the natural region.

noxious weed: designated by the *Alberta Weed Control Act* (1991), requiring control of its spread, growth, ripening or scattering of seed.

organic material: plant or animal residues or derivatives.

performance: the ability of plants to emerge and survive in a particular environment.

performance trials: scientifically designed trials to test emergence and survivability of plants.

problem species: agronomic or designated weed species that disrupt the functioning and structure of native plant communities.

pure living seed (PLS): calculated by multiplying the percent purity times the percent germination.

purity: the percentage of actual seed of the species requested in the seed lot. It is expressed as a per cent pure seed. The weeds, crops seed and inert plant material are accounted for and expressed as a per cent of the seed lot that is not pure seed.

rare plant: 21-100 occurrences, may be rare and local throughout provincial range, or in a restricted provincial range (may be abundant in some locations or may be vulnerable to extirpation because of some factor of its biology). (Lancaster 2000)

revegetation: the establishment of vegetation which replaces original ground cover following land disturbance. (Powter, 1995)

rhizobial bacteria: small heterotrophic bacteria of the genus *Rhizobium* that fix atmospheric nitrogen through the use of nodules on the roots of leguminous plants. (Powter, 1995)

riparian: of, on, or relating to the banks of a natural course of water. (Hansen et al. 1995)

riparian zone: the interfaces between terrestrial and aquatic ecosystems. Riparian zones are not easily delineated but are comprised of mosaics of landforms, communities and environments within the larger landscape. (Gregory et al. 1991)

seed bank: viable seed and other plant propagules that are found in the soil/thatch layer.

slash: debris left as a result of forest and other vegetation being altered by forestry practices or other land-use activities (e.g., timber harvesting, thinning and pruning, road construction, seismic line clearing). Slash includes materials such as logs, splinters or chips, tree branches and tops, uprooted stumps, and broken or uprooted trees and shrubs. (Dunster and Dunster, 1996)

source identified seed: a term used in the United States denoting seed that is collected from natural stands or testing of the parent population has been made. An inspector verifies the species and a yellow tag is issued to assure the buyer of the source.

Special Places (designated): Special Places is an Alberta government initiative to provide a strategic plan to complete a comprehensive system of protected areas representing the environmental diversity of Alberta's six natural regions and 20 subregions. Designated Special Places are protected areas that are explicitly legislated and managed to preserve significant elements of Alberta's natural heritage.

stratification: a period of cool, moist conditions required for germination.

succession: the natural sequence or evolution of plant communities where each stage is dependent on the preceding one, and on environmental and management factors. (Powter 1995)

successional species (early): a plant species that appears soon after disturbance in the natural sequence of plant communities and makes way for late successional species.

successional species (late): a plant species that appears later in the natural sequence of plant communities, preferring an undisturbed environment.

wetland: an area where the land is saturated by water long enough to promote conditions of poorly drained soils, water-loving vegetation and biological processes suited to wet areas (Beyond Prairie Potholes, Alberta Water Resources, Alberta Environmental Protection)**.**

weed: as defined in Alberta's *Weed Control Act* or in the *Canada Seeds Act*.

White Area: the portion of Alberta that is designated for settlement; see the map on page 17.

wild harvest seed: seed that is collected directly from native species populations in the wild.

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Appendix A: Review of Legislation and Policy on the Use of Native Species

Alberta

- ***Forests Act*** **- Section 4 (k)**
  The lieutenant Governor in Council may make regulations governing the management and use of forest land.

  Timber Management Regulation 60/73 - O.C. 355/97: 144.2
  The Minister may establish rules governing the source and type of tree seed and vegetative propagules used to reforest public land.

  Forest and Prairie Protection Regulations Part II - Section 21(1)
  Where any operations are conducted in a forest, the person conducting the operation shall:

  (c) prevent soil erosion, sedimentation of streams or reduction in watershed capacity caused by the removal of trees, shrubs and other vegetation, disturbance of land surface, or any other cause resulting from the operations and a growth of vegetation sufficient to prevent accelerated erosion shall be re-established and maintained on all bare soil areas unless other-wise approved by the Director.

- **Alberta Forest Service, Alberta Environment - Alberta Forest Seed and Vegetative Materials Policy and Guidelines Manual, Draft 1. June 2000**

  A. Tree Seed Provenance Rules: Current rules for seed use reflect the fact that local seed found in the various regions of the province is best for reforestation. The rules are as follows:
     (a) seed is to be used within 80 km (50 mi) of its origin. Also elevational differences should not exceed 150 m (500 ft.); and
     (b) these rules apply to all species and all regions.

     Note: The seed provenance rule will be phased out commencing April 1, 2000 and will be replaced with a Seed Zonation System by May 1, 2003.

  B. Seed Zonation for Wild Seed: Seed zones are geographic subdivisions of natural ecoregions based on general genetic criteria. They limit seed movement to a conservative area where native trees of all species can be moved without risk of maladaptation or erosion of genetic integrity.

- ***Public Lands Act***
  The Minister may, in a disposition, prescribe terms and conditions to which the disposition is subject. - Section 14

  The Minister may authorize any person to enter and occupy land for a stated period for the purpose of conducting appraisals, inspections, analyses, inventories or other investigations of the natural resources which may exist on the land.....to enter and occupy land for a stated purpose. - Section 19(1)

The Minister may impose any conditions he considers necessary on an authorization granted by him pursuant to subsection (1). - Section 19(3)

Exploration Regulation (1993)
No regulations directing revegetation.

Schedule of Conditions (for Dispositions)
Unless otherwise specified by a departmental officer, the holder shall use only use seed of suitable native plant species in revegetation. The seed mixture must be approved by a departmental officer. The holder shall provide a certificate of seed analysis for each species to the departmental officer prior to seeding approval. - Condition 230

Unless otherwise specified by a departmental officer, the holder shall use only Canada No. 1 certified seed in revegetation. The seed mixture must be approved by a departmental officer. The holder shall provide a certificate of seed analysis for each species to the departmental officer prior to seeding approval. - Condition 231

Geophysical Conditions
Unless otherwise specified by the inspecting officer, you must use native seed if it is available, or Canada No. 1 certified seed for revegetation. Seed mixture must be determined in consultation with the inspecting officer. Upon request, you must provide a seed testing certificate to the inspecting officer before seeding. - Condition 772

A certificate of seed analysis must be presented to the inspecting officer prior to seed application. Seed containing noxious or restricted weeds under the *Alberta Weed Control Act* or municipal legislation will not be accepted. - Condition 773

Natural revegetation is required on this project. Seeding of disturbed areas is not required unless otherwise authorized by the inspecting officer. - Condition 774

■ ***Environmental Protection and Enhancement Act (1993)***
An operator must:

(a) conserve and reclaim specified land, and
(b) unless exempted by the regulations, obtain a reclamation certificate in respect of the conservation and reclamation. - Section 122(1)

Where this Act requires that specified land must be conserved and reclaimed, the conservation and reclamation must be carried out in accordance with:

(a) the terms and conditions in any applicable approval,
(b) the terms and conditions of any environmental protection order regarding conservation and reclamation that is issued under this Part,
(c) the directions of an inspector or the Director, and
(d) this Act. - Section 122(2)

Conservation and Reclamation Regulation

"equivalent land capability" means that the ability of the land to support various land uses after conservation and reclamation is similar to the ability that existed prior to an activity being conducted on the land, but that the individual land uses will not necessarily be identical; - Section 1(e)

The objective of conservation and reclamation of specified land is to return the specified land to an equivalent land capability. - Section 2

The Director may establish standards and criteria for conservation and reclamation of specified land and develop and release information documents respecting those standards and criteria. - Section 3(1)

Wellsite Reclamation Criteria on Grasslands
Minimal disturbance of native grasslands is recommended. Where disturbance occurs, surface soil must be salvaged for replacement. The use of native species is encouraged to revegetate native grassland on public land. On public lands, it is expected that native species will not be fertilized unless the CRI gives approval. Fertilizer use must be documented in the Detailed Site Assessment Report.

Criteria (Species Composition)
Revegetation species and species composition should be compatible with the original or control vegetation or meet reasonable land management objectives.

- ***Mines and Minerals Act (1988)***
  nothing related to revegetation

- **Department of Environmental Protection Business Plan (1999-2000)**
  Goal 3: To protect and manage Alberta's natural heritage for present and future generations.

  Strategy 3.1: Establish acceptable levels of protection for natural resources and ecosystems. This strategy includes developing policies, legislation and management frameworks for protection based on sound science.

- **Department of Agriculture, Food and Rural Development Business Plan (1999-2002)**
  Goal 6: Improved environmental stewardship. Strategies:
  - Increase awareness of potential environmental problems and damage caused by unsound management practices.
  - Strengthen industry commitment to, and care of, the environment.
  - Develop and extend technologies and management practices that protect and enhance soil, water, air and other natural resources.

- **A Coal Development Policy for Alberta**

  Land Surface Reclamation
  The primary objective in land reclamation is to ensure that the mined or disturbed land will be returned to a state which will support plant and animal life or be otherwise productive or useful to man at least to the degree it was before it was disturbed. In many instances the land can be reclaimed to make it more productive, useful, or desirable than it was in its original state; every effort will be made towards this end.

  Land reclamation will include the contouring of mined or disturbed lands, the replacement of the topsoil, revegetation for soil stabilization, biological productivity and appearance, and suitable maintenance of the vegetation or, where appropriate, the conversion of the land to agricultural or other desirable use.

- **Prairie Conservation Action Plan (1996-2000)**
  Goal 3: Adopt land use management practices and protective strategies across the whole prairie landscape that sustain diverse ecosystems.

  Objective 3.4: Actively pursue the reclamation of degraded ecosystems.
  Reclaim all disturbed sites on native prairie lands with reconstruction of landscape, soil and native species assemblages. Encourage the use of native plant species for reclamation or "cover" purposes throughout prairie and parkland Alberta (e.g. road allowances,undeveloped urban parkland). Encourage use of native plant restoration demonstration sites. - Section 3.4.4

- **A Guide to Using Native Plants on Disturbed Lands**
  This 1996 publication provides valuable information on the use of native species but does not provide any specific policy direction.

- **Recommended Native Grasses and Legumes For Revegetating Disturbed Lands in the Green Area**
  The Land and Forest Service of Alberta Environment developed this document. The document states, "The lists apply in the Green Area, excluding a 1-km buffer zone that extends inward from the boundaries with the White Area", but there is no specific sanction of the document as government policy. It is likely that the document is intended for use as a guide for sites in the Green Area.

  •No specific policies (Forestry Circulars, Interim Directives, Policy Directives) have been developed and approved that deal with the use of native species for revegetation on public land.

- **Petroleum Activity on Native Prairie - Guidelines for Surface Disturbances (Special Areas Board, AEUB, AAFRD, AENV)**

  For administrative purposes these guidelines will apply only to petroleum and natural gas exploration, development, production, reclamation, and pipeline activity on native prairie within the area delineated on the attached map. This boundary approximates the extent of the mixed grassland and fescue ecoregions, using administrative and geographically convenient boundaries. It is intended that the guidelines shall apply wherever native prairie is found in Alberta (including portions of the Peace River region). Outside this area the applicability of the guidelines will be determined on a site specific basis.

  A two-fold strategy is required; minimizing industrial disturbance as much as possible and developing practical methods that will minimize vegetation and topsoil losses and degradation. This will allow impacted areas of native prairie to be reclaimed to sound ecological function and restore original vegetation structure.

  Reclamation Guidelines

  Seed mixes which allow re-establishment of native species should be used in reclaiming disturbed areas. To ensure compatibility with surrounding areas commercially available native seed species adapted to local growing conditions may be required to approximate the pre-disturbance diversity of the prairie vegetation.

  Under certain circumstances natural vegetation recovery may be appropriate with consideration to topography, soils, vegetation and moisture.

  For prescribed seed mixes there should be no substitutions without prior consultation with the appropriate regulatory agency and landowner/occupant.

  To ensure species compatibility and identify weed species present the company should obtain a copy of the certificate of seed analysis from the supplier.

  All equipment and materials used in native prairie areas should be cleaned to reduce the transportation of restricted and noxious weed seed in accordance with the provisions of the *Weed Control Act*.

Saskatchewan

- **Restoration of Saskatchewan's Agricultural Crown Rangelands - Guidelines and Procedures for Developers**

  Requirements for Restoration - The following guidelines have been developed for use across Saskatchewan. The main measure of restoration is the comparison to pre-development site conditions including soils, landscape and vegetation criteria.

- No exotic plant materials are to be used for restoration. Where required, cereals for cover crops and weed free straw for crimping are permitted. The use of short- lived species for the quick establishment of cover, where required, is permitted.
- On forested rangelands natural regeneration is favored and no reseeding or other procedures are required as part of site restoration unless erosion prone sites or specific cases are identified by Saskatchewan Agriculture and Food. Restoration plans, however, are still required for all forested areas outlining general landscape, soil type and vegetation cover. The current preferred species for reseeding if needed is slender wheatgrass and /or native tree/shrub plantings.

United States

- ***Surface Mining Control and Reclamation Act of 1977*, Public Law 95-87 (SMCRA)**
  Sec 515. (b)(19) requires: "... a diverse, effective and permanent vegetative cover of the same seasonal variety native to the area of land..." This requirement has to be met for compliance and for the release of the posted bond.

- **U.S. Forest Service Policy**
  To the extent practicable, seeds and plants used in erosion control, fire rehabilitation, riparian restoration, forage enhancement, and other revegetation projects shall originate from genetically local sources of native species. When project objectives justify the use of non-native plant materials, documentation explaining why non-natives are preferred will be part of the project planning process.

  Barriers to utilizing native plant materials include cost considerations, plant material availability and the lack of knowledge regarding plant culture and propagation. These limitations may lead to a decision to use non-native species. Users may consider exotic species that will not persist and become a permanent part of the ecosystem, sterile varieties or short lived annuals make good choices for grass species.

- **Federal Native Plant Conservation Memorandum of Understanding**
  (Bureau of Land Management, National Biological Survey, National Park Service, USDA Agricultural Research Service, USDA Forest Service, USDA Soil Conservation Service and U.S. Fish and Wildlife Service)
  Purpose: Recognizing that native plant species are of aesthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people, the Committee's priorities will be driven by the following vision: for the enduring benefit of the Nation, its ecosystems, and it people, to conserve and protect our native plant heritage by ensuring that, to the greatest extent feasible, native plant species and communities are maintained, enhanced, restored, or established on public lands, and that such activities are promoted on private lands.

Appendix B: Organizations Represented on the Native Plant Working Group

Government Agencies:

Alberta Agriculture, Food and Rural Development, Public Lands Division
Alberta Environment, Land and Forest Service
Alberta Environment, Environmental Service
Alberta Energy and Utilities Board
Alberta Municipal Affairs, Special Areas Board

Non-government Organizations:

Alberta Cattle Commission
Alberta Native Plant Council
Alberta Research Council

Industry Organizations:

Canadian Association of Petroleum Producers
Canadian Energy Pipeline Association
Canadian Seed Trade Association
Coal Association of Canada

Appendix C: Special Applications

1. **Range Modifications**
   On public land under grazing disposition, agronomic species are used to stabilize soils, extend the grazing period, increase carrying capacity and/or prevent encroachment (e.g., on fencelines, approved block clearing and access trails). This is particularly true within the Boreal Natural Region where native grasses and forbs are low in palatability and productivity for livestock. When agronomic species are used on grazing dispositions, they should not invade the surrounding native plant communities. Consideration should be given to using specific native species that provide similar forage value and production, as commercial supplies improve.

2. **Buffer Concept**
   Where disturbed natural landscapes are vulnerable to invasion by invasive introduced species, a buffer of more aggressive native species may offset potential invasion. Research still has to be conducted to test the feasibility of this approach. For example, a new pipeline constructed on native prairie beside an old right-of-way seeded to crested wheatgrass could be seeded to a competitive mix of native species. The new replanted strip may serve as a buffer between the remaining native prairie and the crested wheatgrass. This approach has worked for shrubs, where, for example, native raspberries have been planted as a buffer between islands of native vegetation and non-native vegetation. Where there is doubt about the ability of planted native species to serve as a buffer, new disturbances should be located at a distance from areas planted to invasive non-native species.

3. **Use of Invasive Non-Native Plants**
   The use of invasive, non-native plants (e.g., crested wheatgrass, smooth brome) may be appropriate in situations where the area being revegetated is in the middle of an area already seeded to the same species. Examples include: existing range improvement and teardrops in the centre of old wellsites where part of the wellsite was seeded previously to an introduced species. The land manager has to decide whether to allow the use of a non-native plant species or get the company to remove the introduced species from the whole wellsite and reseed to more appropriate native species. The decision is based on the perceived threat to surrounding native vegetation, age and size of the site.

4. **Seeding of Non-native, Non-persistent Annuals**
   The use of these annuals may be considered as an interim measure for erosion control. Some commonly used annuals include: barley, oats, durum wheat (southern Alberta), triticale and Regreen (a sterile variety: wheat x wheatgrass cross). The choice of a particular annual should be discussed with landowners and land managers (see Appendix H for more information).

5. **Seeding of Non-native, Non-persistent Perennials (short-lived)**
   The use of non-native short-lived perennials should be a last resort and should be accompanied by documentation that outlines the reasons that non-native substitutions were made. Some relatively non-persistent non-native perennials are listed in Appendix H.

Appendix D: Seed Analysis Certificate and Weed Content

Seed Analysis Certificate

- **What is a Seed Certificate?**
  A seed certificate is essentially a picture of a seed lot. The certificate documents two main criteria, the purity of the seed and the germination:

  - **Purity** is the percentage of actual seed of the species requested in the seed lot. It is expressed as a percent pure seed. The weeds, crops seed and inert plant material are accounted for and expressed as a per cent of the seed lot that is not pure seed.
  - **Germination** refers to the percent germination of the seed. It is the number out of 100 seeds that germinate over 4 to 21 days.

  A certificate shows the germination and purity of a seed lot taken at a particular point in time. Germination may change up or down over time. For example, native seed with high dormancy will sometimes increase in germination over time. Generally, seed lots with high germination initially, will have decreased germination over time. With many seed lots germination will be lost over five years. Some plant species maintain the ability to germinate over many years (e.g., legumes can still germinate after decades).

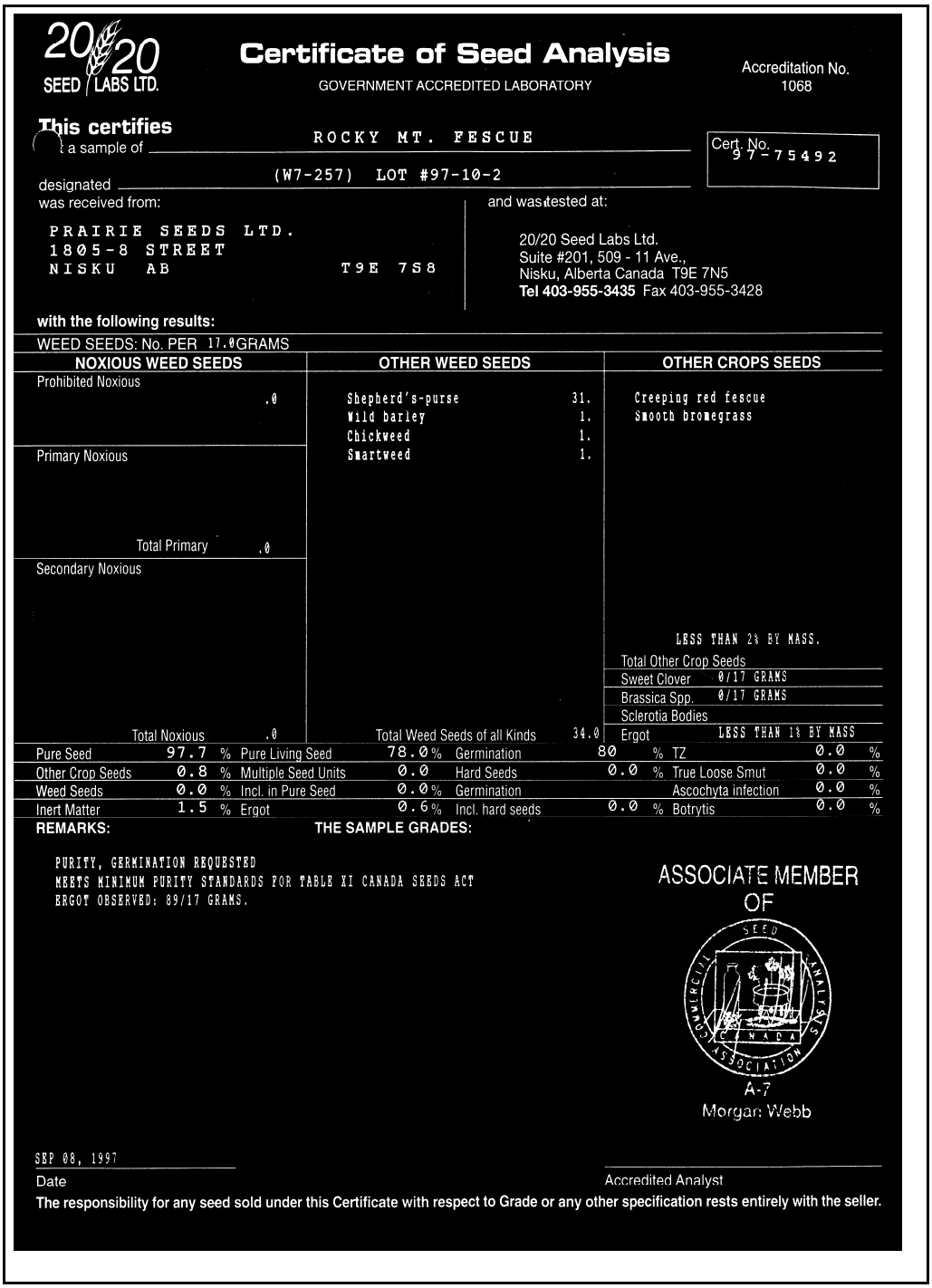
- **Pure Living Seed (PLS)**
  PLS is calculated by multiplying the percent purity times the percent germination (TZ). With native seed, dormancy can prevent immediate germination. In this case, a TZ (tetrazolium) test determines if the seed is live.

- **Accuracy of a Certificate**
  A seed certificate (Figure 2) guarantees the particular seed lot has been tested under the rules and regulations of the *Canada Seeds Act* and that the testing facility is a certified establishment approved by the Canadian Government. Seed tests are carried out on seed that is drawn according to approved sampling procedures. When these procedures are followed the results on the seed certificate are statistically repeatable 95 times out of 100, when a 25 gram sample is analyzed. With a 100 gram sample the accuracy is increased to 99 times out of 100.

- **Seed Grade**
  A seed certificate defines the grade of the seed under the regulations as set out by the *Canada Seeds Act* (See Table 1). The grade of the seed is determined by the number of generations removed from the original breeder seed.

  - Breeder seed is seed of a variety that has been produced under the supervision of a recognized plant breeder.
  - Foundation seed is seed grown from the breeder seed.
  - Certified seed is grown from foundation seed.

Figure 2: Certificate of Seed Analysis



20/20 SEED LABS LTD.

Certificate of Seed Analysis

GOVERNMENT ACCREDITED LABORATORY

Accreditation No. 1068

This certifies that a sample of ROCKY MT. FESCUE

Cert. No. 97-75492

designated (W7-257) LOT #97-10-2

was received from:

PRAIRIE SEEDS LTD.
1805-8 STREET
NISKU AB T9E 7S8

and was tested at:

20/20 Seed Labs Ltd.
Suite #201, 509 - 11 Ave.,
Nisku, Alberta Canada T9E 7N5
Tel 403-955-3435 Fax 403-955-3428

with the following results:

WEED SEEDS: No. PER 17.0 GRAMS

NOXIOUS WEED SEEDS	OTHER WEED SEEDS	OTHER CROPS SEEDS
Prohibited Noxious .0	Shepherd's-purse 31. Wild barley 1. Chickweed 1. Smartweed 1.	Creeping red fescue Smooth bromegrass
Primary Noxious Total Primary .0		
Secondary Noxious		LESS THAN 2% BY MASS.
		Total Other Crop Seeds
		Sweet Clover 0/17 GRAMS
		Brassica Spp. 0/17 GRAMS
		Sclerotia Bodies
Total Noxious .0	Total Weed Seeds of all Kinds 34.0	Ergot LESS THAN 1% BY MASS

Pure Seed	97.7	%	Pure Living Seed	78.0	%	Germination	80	%	TZ	0.0	%
Other Crop Seeds	0.8	%	Multiple Seed Units	0.0		Hard Seeds	0.0	%	True Loose Smut	0.0	%
Weed Seeds	0.0	%	Incl. in Pure Seed	0.0	%	Germination			Ascochyta infection	0.0	%
Inert Matter	1.5	%	Ergot	0.6	%	Incl. hard seeds	0.0	%	Botrytis	0.0	%

REMARKS:

PURITY, GERMINATION REQUESTED
MEETS MINIMUM PURITY STANDARDS FOR TABLE XI CANADA SEEDS ACT
ERGOT OBSERVED: 89/17 GRAMS.

THE SAMPLE GRADES:

ASSOCIATE MEMBER OF

SEED ANALYSIS ASSOCIATION OF CANADA

A-7
Morgan Webb

SEP 08, 1997
Date

Accredited Analyst

The responsibility for any seed sold under this Certificate with respect to Grade or any other specification rests entirely with the seller.

- This certificate may not be accepted because of the smooth bromegrass found under other crop species.
- There is a high number of total weeds, most of these are annual (shepherd's purse) which is generally acceptable.

- Common seed is grown from certified seed or common seed. It is considered too far removed by generations from the breeder seed to have maintained the traits of a specific variety. Non-Canadian sources of varieties not registered in Canada are also listed as common seed.
- Weed content and the percent germination also determine the grade of a seed lot. Each generation from the breeder seed has increased tolerance for weed content.

Weed Tables

■ ***Canada Seeds Act***

The *Canada Seeds Act* lists species that are deemed to be weeds under three different classes. These are listed in Table 1.

- **Class 1** Prohibited noxious weeds, are weed species that are mostly poisonous to livestock, most are perennial and many of them are also native species.
- **Class 2** Primary noxious weeds - are mostly perennial. They are all difficult to control, and they are of concern to agriculture because of the expense for control and costly to production.
- **Class 3** Secondary noxious weeds consist of perennial and annual weeds. They cause yield losses in agriculture crops and are prolific seed producers.

- **Other** Weeds not listed are listed as "Other Weed Seeds" in Figure 2. This group of weeds are of less concern to agriculture and are controlled more easily.

This weed list affects how seed is graded, and bought and sold throughout Canada.

■ ***Weed Control Act***

The *Weed Control Act* deals with the spraying of weeds and control of the weeds on this list once they are growing. The groups of weeds are similar, but not identical (See Table 2). Seed is not bought or sold in Canada according to this Act. The *Weed Control Act* for the province or municipality is exercised once these weeds are growing. The province or municipality can order the removal of these weeds when they are found growing on private property. Municipalities in Alberta can also upgrade the status of a weed (e.g., nuisance to noxious).

Table 1: *Canada Seeds Act 1986*: Weed Classes

Class 1 **Prohibited Noxious**

1. Dodder
2. Field bindweed
3. Halogeton
4. Hoary cress
5. Horse nettle (Bull nettle)
6. Leafy spurge
7. Russian knapweed
8. Tansy ragwort
9. Red bartsia
10. Diffuse knapweed
11. Spotted knapweed
12. Nodding thistle
13. Poison hemlock
14. Death camas*
15. White camas*
16. Western water hemlock*
17. Narrow-leaved milk vetch*
18. Two-grooved milk vetch*
19. Timber milk vetch*
20. Early yellow locoweed*
21. Silvery lupine*
22. Greasewood*
23. Golden-bean*
24. Low larkspur*
25. Tall larkspur*
26. Seaside arrow grass*
27. Jimsonweed
28. Common crupina
29. Yellow starthistle

* native: originally placed on the list because they are considered to be poisonous to cattle

Class 2 **Primary Noxious**

30. Couchgrass
31. Giant ragweed
32. Ox-eye daisy
33. Perennial sow thistle
34. Wild mustard
35. Wild radish
36. Yellow rocket or winter cress
37. Bladder campion
38. Toadflax
39. White cockle
40. Canada thistle
41. Bedstraw (Cleavers)
42. Velvet jar
43. Johnson grass

Class 3 **Secondary Noxious**

44. Chicory
45. Common ragweed
46. Dock
47. Dog mustard
48. False flax
49. Field peppergrass
50. Night-flowering catchfly
51. Ribgrass (narrow-leaved plantain)
52. Stickseed
53. Tall hedge mustard
54. Stinkweed
55. Wild carrot
56. Stinking Mayweed
57. Cow cockle
58. Persian darne
59. Scentless chamomile
60. Wild oats

Table 2: ***Weed Control Act***

1) Restricted Weeds

(18) Red bartsia *Odontites serotina*
(19) Diffuse knapweed *Centaurea diffusa*
(20) Spotted knapweed *Centaurea maculosa*
(21) Nodding thistle *Carduus nutans*
(22) Eurasian water milfoil *Myriophyllum spicatum*
(23) Dodder *Cuscuta spp*
(24) Yellow star-thistle *Centaurea solstitialis*

2) Noxious Weeds

(25) Russian knapweed *Centaurea repens*
(26) Field bindweed *Convolvulus arvensis*
(27) White Cockle *Lychnis alba*
(28) Bladder campion *Silene cucubalus*
(29) Cleavers *Galium aparine & Galium spurium*
(30) Hoary Cress *Cardaria spp*
(31) Knawel *Scleranthus annus*
(32) Perennial sow thistle *Sonchus arvensis*
(33) Cypress spurge *Euphorbia cyparissias*
(34) Leafy spurge *Euphorbia esula*
(35) Stork's bill *Erodium cicutarium*
(36) Canada thistle *Cirsium arvense*
(37) Toadflax *Linaria vulgaris*
(38) Persian darnel *Lolium persicum*
(39) Scentless Chamomile *Matricaria maritima*
(40) Common tansy *Tanacetum vulgare*
(41) Blueweed *Echium vulgare*
(42) Spreading dogbane *Apocynum androsaemifolium*
(43) Field scabious *Knautia arvensis*
(44) Hound's tongue *Cynoglossum officinale*
(45) Oxeye daisy *Chrysanthemum leucanthemum*
(46) Tall buttercup *Ranunculus acris*
(47) Purple loosestrife *Lythrum salicaria*

3) Nuisance Weeds

(48) Dalmatian toadflax *Linaria dalmatica*
(a1) Wild radish *Raphanus raphanistrum*
(49) Creeping bellflower *Campanula rapunculoides*
(b1) Hedge bindweed *Convolvulus sepium*
(50) Bluebur *Lappula echinata*
(51) Downy Brome *Bromus tectorum*
(d1) Tartary buckwheat - *Fagopyrum tataricum*
(52) Wild buckwheat *Polygonum convolvulus*
(e1) Biennial campion *Silene cserei*
(53) Night-flowering catchfly *Silene noctiflora*
(f1) Common chickweed *Stellaria media*
(54) Field chickweed *Cerastium arvense*
(g1) Mouse-eared chickweed *Cerastium vulgatum*
(55) Rough cinquefoil *Potentilla norvegica*
(h1) Cow cockle *Saponaria vaccaria*
(56) Flixweed *Descurainia sophia*
(i1) Green foxtail *Setaria viridis*
(57) Quack grass *Agropyron repens*
(j1) Narrow-leaved hawksbeard *Crepis tectorum*
(58) Hemp nettle *Galeopsis tetrahit*
(k1) Henbit *Lamium amplexicaule*
(l) Lady's thumb *Polygonum persicaria*
(m) Round-leaved mallow *Malva rotundifolia*
(n) Ball mustard *Neslia paniculata*
(o) Dog mustard *Erucastrum gallicum*
(p) Green tansy mustard *Descurainia pinnata*
(q) Wild mustard *Sinapis arvensis*
(r) Wormseed mustard *Erysimum cheiranthoides*
(s) Wild oats *Avena fatua*
(t) Redroot pigweed *Amaranthus retroflexus*
(u) Shepherd's purse *Capsella bursa-pastoris*
(v) Annual sow thistle *Sonchus oleraceus*
(w) Corn spurry *Spergula arvensis*
(x) Stinkweed *Thlaspi arvense*
(y) Russian thistle *Salsola pestifer*
(z) Dandelion *Taraxacum officinale*

Appendix E: Purity of Native Seed Used for Revegetation of Natural Landscapes

Appendix F: Varietal Development of Native Plant Materials

GRASSES/GRASS-LIKE:

Many native species and selections other than those mentioned below are also commercially available. These include June grass, plains and mountain rough fescue, Rocky Mountain fescue, needle and thread grass, fringed brome, mountain brome, fowl bluegrass, and many others. Please contact the Alberta Native Plant Council for a complete list (www.anpc.ab.ca). These species are sold as common seed, and seed supply and genetic origin will vary depending on the commercial supplier. The following is a list of native grass varieties, which are commercially available as **certified seed.**

Species	Canadian Cultivars	Collection Site	Release Site
Agropyron trachycaulum var. *unilaterale*	Hillcrest	Eastern Slopes, AB	ARC[1], Vegreville, AB
Agropyron trachycaulum	Adanac	Mixed Grass, SK	AgCan[2], Saskatoon, SK
	Highlander	Eastern Slopes, AB	ARC, Vegreville, AB
	Revenue	Mixed-Grass, SK	AgCan, Saskatoon, SK
Agropyron dasystachyum	Elbee	Canadian Prairies, AB&SK	AgCan, Lethbridge, AB
Agropyron smithii	Walsh	Canadian Prairies, AB&SK	AgCan, Lethbridge, AB
Agropyron violaceum	Mountaineer	Eastern Slopes, AB	ARC, Vegreville, AB
Poa alpinum	Blueridge	Eastern Slopes, AB	ARC, Vegreville, AB
	Glacier	Eastern Slopes, AB	ARC, Vegreville, AB

Species	US Cultivars	Collection Site	Release Site
Agropyron spicatum	Goldar	Washington	PMC[3], Idaho
	Whitmar	Washington	PMC, Washington
Agropyron trachycaulum	Pryor	Montana	PMC, Montana
	Primar	Montana	PMC, Washington
Agropyron dasystachyum	Critana	Montana	PMC. Montana
Agropyron smithii	Rosana	Montana	PMC, Montana
Beckmania syzigachne	Egan	Alaska	PMC, Alaska
Bouteloua gracilis	Bad River	North Dakota	PMC, North Dakota
Calamovilfa longifolia	Bowman	North Dakota	PMC, North Dakota
	Goshen	Wyoming	PMC, Montana
Deschampsia caepitosa	Peru Creek	Colorado	PMC, Colorado
	Nortran	Alaska & Iceland	AES[4], Alaska
Elymus piperi	Trailhead	Montana	PMS, Montana
	Magnar	Unknown	PMC, Idaho
Elymus canadensis	Mandan	North Dakota	PMC, North Dakota
Festuca idahoensis	Joseph/NezPerec	Wide Native Range	AES, Idaho
Oryzopsis hymenoides	Rimrock	Montana	PMC, Montana
Poa alpinum	Nezpar	Idaho	PMC, Idaho
Poa glauca	Tundra	Alaska	AES, Alaska
Puccinellia nuttalliana	Fults	Colorado	Northrup-King Co., Minnesota
Stipa viridula	Lodorm	North Dakota	AES, North Dakota

1- Alberta Research Council
2 - Agriculture Canada, Research Station
3 - Plant Material Center, USDA
4- Agriculture Experimental Station, USDA

The following is a list of native grasses/sedges that are currently undergoing selection and varietal development.

Species	Collection Site	Commercial Supplies Expected
ALBERTA RESEARCH COUNCIL, VEGREVILLE-CULTIVARS		
Festuca brachyphylla	Eastern slopes AB	2000-01
Koelaria macrantha	Eastern slopes AB	2000-01
Festuca saximontana S1	Eastern slopes AB	2000-01
Festuca saximontana S2	Eastern slopes AB	2000-01
Trisetum spicatum	Eastern slopes AB	2000-01
Agropyron subsecundum	East central AB	2005-06
Elymus canadensis	East central AB	2005-06
Bromus anomalus	East central AB	2005-06
Bouteloua gracilis	East central AB	2005-06
Schizachne purpurescens	East central AB	2005-06
Calamovilfa longifolia	East central AB	2005-06
Oryzopsis hymenoides	East central AB	2005-06
Sporobolus cryptandrus	East central AB	2005-06
Bromus anomalus	East central AB	Initial selection
Deschampsia caespitosa	East central AB	Initial selection
Deschampsia mackenziana	Lk.Athabasca AB	Initial selection
Elymus mollis	Lk.Athabasca AB	Initial selection
Hierochloe odorata	Ft. Mac/Slave Lk/East central AB	Initial selection
Agropyron dasystachyum	East central AB	Initial selection
Agropyron smithii	East central AB	Initial selection
Spartina gracilis	East central AB	Nursery
Phleum commutate	Eastern slopes AB	Nursery
Festuca campestris	Southern AB	Nursery
Carex spp. (numerous collections)	East central AB	Seed increase
DUCKS UNLIMITED CANADA (DU) -ECOVARS		
Swift Current, Agriculture Canada		
Agropyron trachycaulum var. unilaterale	Southern AB&SK	2001
Agropyrum dasystachyum	Canadian Prairies	2002
Agropyron smithii	Canadian Prairies, Montana, & North Dakota	2002
Stipa spartea	Canadian Prairies	2004
Festuca hallii A	Fescue Prairie to Central Parkland, AB	2002
Festuca hallii B	Fescue Prairie to Central Parkland, SK	2002
Saskatoon, Agriculture Canada		
Agropyron trachycaulum var. unilaterale	Northern AB&SK	2002
Bromus ciliatus	Parkland AB, SK, MB	2004
Bromus porteri (nodding brome)	Parkland AB, SK, MB	2004
Bromus richardsonii	B.C., Parkland AB	2004
University of Manitoba		
Koelaria macrantha	Manitoba	2003
Andropogon scoparius	Manitoba	2002
Bouteloua gracilis	Manitoba	2003
P. candidum (white prairie clover)	Manitoba	2003

DU Independent Initiatives

Stipa comata	Prairie Canada	2001
Calamovilfa longifolia	North Dakota	2003
Stipa viridula	Alberta	2004
Oryzopsis hymenoides	Alberta	2004
Koelaria gracilis (June grass)	Northern AB&SK	2004

FORBS:

Currently, these are no varieties of native forbs commercially available. In a few instances, there are horticultural varieties, but these are frequently hybrids and are not generally recommended for revegetation purposes. Therefore, forb seed is generally available as common seed. Quantities are often very limited, although the availability of forb seed is slowly changing. Genetic origin will depend on the commercial supplier. Native forbs may be available as plants instead of seed. Commercial suppliers can also be contracted to collect wild harvest seed and/or grow containerized material. Species availability is **not** restricted to the species listed below. Please contact the Alberta Native Plant Council for a complete list.

The following is a list of native forbs that are currently undergoing selection and varietal development.

ARC[1]-CULTIVARS	Collection Site	Commercial Supplies Expected
Vicia americana	Unknown	Seed increase
Monarda fistulosa	East central AB	Initial selection
Rumex venosus	East central AB	Initial selection
Ratibida columnifera	East central AB	Initial selection
Agoseris glauca	East central AB	Initial selection
Anemone multifida	East central AB	Initial selection
Potentilla arguta	East central AB	Initial selection
Heuchera richardsonii	East central AB	Initial selection
Gaillardia aristata	East central AB	Initial selection
Penstemon procerus	East central AB	Initial selection
Penstemon gracilis	East central AB	Initial selection
Heterotheca villosa	East central AB	Nursery
Oxytropis sericeus	Eastern slopes AB	Nursery
Hedysarum alpinum	Eastern slopes AB	Nursery
Hedysarum boreale	Eastern slopes AB	Nursery
Astragalus americanus	Eastern slopes AB	Nursery
Astragalus canadensis	Vegreville AB	Nursery

DU-Ecovars	Collection Site	Commercial Supplies Expected
Hedysarum alpinum var.americanum	AB & SK	2004
Petalostemon purpureus	Canadian Prairies	2002
Petalostemon candidum	Tall Grass Prairie, MB	2004
Lathyrus ochroleucus	Prairie Canada	2003
Lathyrus venosus	Prairie Canada	2003
Helianthus maximilianii	Manitoba	2001
Solidago canadensis	Northern AB& SK	2002
Achillea millefolium	Northern AB & SK	2002

SHRUBS/TREES and COMMERCIAL TREE SPECIES:
Typically, native woody species are collected and grown under contract. Plants are propagated from cuttings, whips, etc. collected from a specified area in the general proximity of the proposed disturbance. Containerized plants, bare root material, and seed may also be generally available for some species; genetic origin of native plant material will vary with supplier. Horticultural varieties are also available for some native woody species, however, these are not recommended for revegetation purposes.

Commercial tree species are usually available as bare-root, burlapped, or containerized material. Current reforestation practices utilize tree seedlings grown from seeds collected from mature forests in the "same" area. Alberta Forest Service sets out provenance limits, which governs the movement of seed and seedlings from their place of genetic origin (or provenance) and the reforestation site. The word provenance is more frequently used than "genetic origin"or local genetically when dealing with commercial tree species. Provenance limits are established on a species-by-species basis.

Commercial availability is **not** limited to the species listed below. Please contact the Alberta Native Plant Council for a complete list.

The following are native shrubs/half-shrubs that are currently undergoing selection and varietal development:

DU-Ecovars	Collection Site	Commercial Supplies Expected
Eurotia lanata (winterfat)	Southern SK	2004
Rosa woodsii	Prairie Canada	2004
Symphoricarpos occidentalis	Prairie Canada	2003

Commonly Available Shrub Species

Alnus spp.
Amelanchier alnifolia
Betula spp.
Cornus stolonifera
Elaeagnus spp.
Juniperus spp.
Sheperdia canadensis
Symphoricarpus occidentalis
Viburnum trilobum
Rosa spp.
Salix spp.
Prunus virginiana

Commonly Available Tree Species

Picea glauca
Betula papyrifera var. *papyrifera*
Pinus contorta var. latifolia
Populus spp.

PRIORITY SPECIES FOR FUTURE DEVELOPMENT:

The following priority species are not all inclusive by any means, and new species will likely be identified as the knowledge-base in this area grows. It is expected that plant development (germplasm but not necessarily cultivars or ecovars) of additional species for site-specific application will naturally occur. Many species appear to have promise for ecological repair but require further evaluation before they can be targeted for extensive development. Species list below (Priority #1), have undergone some initial evaluation and are considered suitable for varietal development. Additional species are also listed that might be suitable for development (Priority #2), but require further evaluation at this time.

Priority #1	Collection Site
GRASSES	
Elymus innovatus	Eastern Slopes & Mixed-Wood Boreal
Bromus ciliatus	Eastern Slopes & Mixed-Wood Boreal
Bromus anomalus	Eastern Slopes & Moist Prairies
Stipa comata	Dry Prairies
Koelaria macrantha	Dry Prairies
LEGUMES	
Vicia americana	Canadian Prairies & Mixed-Wood Boreal
Hedysarum boreale	Dry Eastern Slopes & Parklands
Lathyrus ochroleucus	Eastern Slopes & Mixed-Wood Boreal
Lathyrus venosus	Mixed-Wood Boreal
FORBS	
Achillea millefolium	Prairie & Parkland
Gaillardia aristata	Prairie
Ratibida columnifera	Prairie
Linum lewisii	Prairie, Parkland & Foothills
Monarda fistulosa	Parkland, Foothills & Mountains
Epilobium angustifolium	Eastern Slopes & Mixed Wood Boreal

Priority #2	Collection Site
GRASSES	
Carex obtusata	Prairies & Parkland
Carex filifolia	Dry Prairies
Poa cusickii	Parkland, Foothills
Poa glauca	Foothills
Poa juncifolia	Northern Prairies
Festuca idahoensis	Foothills
Festuca hallii	Foothills
Festuca campentris	Mountains
Danthonia parryi	Boreal
Phleum alpinum	Prairies, Parkland, Foothills
Bromus pumpellianus	Mountains & Boreal
Deschampsia caespitosa	Parkland & Boreal
Danthonia hookeri	Prairie & Parkland
Hierochloe odorata	Prairie & Parkland
Oryzopsis asperifolia	Prairie, Parkland, Boreal
Calamagrosis montanensis	Prairie & Parkland
Elymus canadensis	Prairie & Parkland
Sporobolus cryptandrus	Prairie & Parkland
Calamovilfa longifolia	Prairie & Parkland
Spartina gracilis	Saline meadows
Puccinellia nuttalliana	Saline depressions

Priority #2	Collection site
FORBS	
Anemone multifida	Prairies & Parkland
Anemone patens	Prairies & Parkland
Aster umbellatus	Prairies
Aster ciliolatus	Parkland & Boreal
Erigeron glabellus	Prairies
Erigeron philadelphicus	Boreal
Erigeron speciosus	Foothills & Mountains
Galium boreale	Parkland, Boreal, Foothills
Geranium viscissismum	Foothills & Mountains
Liatris punctata	Prairie
Mertensia paniculata	Foothills, Mountains, Boreal
Potentilla gracilis	Prairie, Parkland, Mountains, & Foothills
Potentilla pensylvanica	Prairie, Parkland & Boreal
Psoralea argophylla	Prairie & Parkland
Solidago canadensis	Parklands, Foothills, Boreal
Solidago missouriensis	Prairie, Parkland, Foothills
Thalictrum venulosum	Parkland, Foothills, Mountains & Boreal
Fragaria virginiana	Parkland and Boreal
SHRUBS	
Arctostaphylos urv-ursi	Mountains, Foothills & Boreal
Lonicera dioica var. *glaucescens*	Boreal
Rubus pubescens	Foothills & Mountain
Sheperdia canadensis	Foothills, Mountain & Boreal
Vaccinium caespitosum	Mountains & Boreal
Vaccinium myrtilloides	Mountains & Boreal
Viburnum edule	Parkland & Boreal

Appendix G: Wild Harvesting of Native Plant Materials

(adapted from Alberta Native Plant Council Guidelines)

Obtaining Permission

- On private or leased land permission to collect native plant materials must be obtained from the landowner or lessee.
- On public land, a Temporary Letter of Authority (TFA), with conditions, is required. Contact the local Public Lands office in the White (settled) Area or the Forest District Office in the Green (forested) Area. A plan is submitted to the appropriate agency detailing the area to be harvested, method of harvesting, timing of harvesting, and the target species. After harvesting, the proponent submits a report to the appropriate field office identifying the actual areas harvested (on a map) and the approximate yield/volume of seed/plant parts.
- On public land the Public Lands Officer or Forest District Officer may request that 10 per cent of harvested seed be returned to the government or to a designated native seed storage facility (e.g., Alberta Research Council, Vegreville 780 632-8220) for use in reclamation, restoration or habitat improvement projects.

Guidelines for Collection

Collect first from areas intended for development or disturbance. If collecting has to be done on undisturbed areas, the following apply:

- Avoid rare or fragile habitats.
- Know the plants of the area before collecting; only collect common species or those with a large population.
- Collect undamaged ripe seed or cuttings, not entire plants (unless essential for identification).
- Leave at least 50% of the seed in place to allow natural propagation, and to provide food for insects, birds and small mammals.
- Collect minimal amounts (from no more than 10% of the plants) in areas that may be subjected to further collecting by the general public or where grazing reduces natural regeneration.
- Leave an area to rest for at least two years between collections (longer periods of time may be necessary for some species and locations).
- Avoid the use of heavy machinery to prevent rutting when soils are wet.

Appendix H: Available Native Plant Materials for Use on Public Lands in Alberta

Alberta Agriculture, Food and Rural Development / Alberta Environment June 2000

This listing of native species is based on currently available plant materials, and on plants that are considered to be key components of various ecosystems (and may be commercially available within a five year time frame). The plant lists are subject to revision based on seed availability, and will be updated yearly. **This document should be treated as a starting point only**. The public land manager should be consulted during the planning phase of a project, and prior to purchasing seed, for more specific site requirements. The Alberta Native Plant Council (Garneau P.O. Box 52099, Edmonton, AB T6G 2T5; www.anpc.ab.ca) also puts out an annual listing of available native plant materials. Percentages of plant species to use are not included in this document because of fluctuations in availability and varying site/land use requirements. The scientific names listed are based on Moss (1983).

A detailed listing of native species present on various site types throughout Alberta is available in the publication: "*A Guide to Using Native Plants on Disturbed Lands*". This publication is available from the Alberta Agriculture, Food and Rural Development Publications office (call 1-800-292-5697 (Canada) or 780-427-0391). The guide also has more complete information on suitability of various native species for specific site types, relative percentages of species found on undisturbed sites and detailed information about individual species.

Grassland Natural Region

Notes:

- Shrub replacement may be required where shrub islands have been disturbed.
- Annual nuisance weeds tend to disappear from reclamation sites within 3-4 years.
- If mowing is done, it should be done high enough (15 cm) to avoid damage to re-establishing native plants.

■ Dry Mixedgrass/Mixed Grass Prairie

Dry Mixedgrass/Mixed Grass Prairie - Upland Brown Chernozemic Soils:

needle and thread grass (limited quantity)	*Stipa comata*
northern wheatgrass	*Agropyron dasystachum*
June grass	*Koeleria macrantha*
blue grama grass (limited quantity)	*Bouteloua gracilis*
western wheatgrass	*Agropyron smithii*

Other species, as they become available:

grass/grass-like:	plains reedgrass, Canada wild rye, Sandberg bluegrass, blunt/sun-loving sedges
forbs:	annual sunflower, scarlet mallow, bee plant, prairie asters

Dry Mixedgrass/Mixed Grass Prairie - Upland Dark Brown Soils:

western porcupine grass (limited quantity)	*Stipa curtiseta*
green needle grass	*Stipa viridula*
northern wheatgrass	*Agropyron dasystachum*
western wheatgrass	*Agropyron smithii*
June grass	*Koeleria macrantha*
blue grama grass (limited quantity)	*Bouteloua gracilis*
slender wheatgrass	*Agropyron trachycaulum var.trachycaulum*
American vetch (limited quantity)	*Vicia americana/sparsifolia*
purple/white prairie clover (limited quantity)	*Petalostemon purpureum/candidum*
prairie coneflower (limited quantity)	*Ratibida columnifera*

Other species, as they become available:

grass/grass-like:	plains reedgrass, Sandberg bluegrass, blunt/sun-loving sedges, sweet grass, early bluegrass
forbs:	blue lettuce, scarlet mallow, annual sunflower, prairie asters, blazing star

Dry Mixedgrass/Mixed Grass Prairie - Subxeric to Submesic (sandy):

sand grass	*Calamovilfa longifolia*
Indian rice grass	*Oryzopsis hymenoides*
western wheatgrass	*Agropyron smithii*
needle and thread grass (limited quantity)	*Stipa comata*
sand dropseed	*Sporobolus cryptandrus*
June grass	*Koeleria macrantha*

Other species, as they become available:

grass/grass-like:	blunt sedge, Hooker's oat grass, Canada wild rye, plains reed grass
forbs:	bee plant, blazing star, scurf pea, golden bean

Dry Mixedgrass/Mixed Grass Prairie - Solonetzic Soils:

western wheatgrass	*Agropyron smithii*
northern wheatgrass	*Agropyron dasystachyum*
needle and thread grass (limited quantity)	*Stipa comata*
June grass	*Koeleria macrantha*
blue grama grass (limited quantity)	*Bouteloua gracilis*
Nuttall's alkali grass	*Puccinellia nuttalliana*

Other species, as they become available:

grass/grass-like:	Sandberg bluegrass, blunt sedge, plains reedgrass, alkali bluegrass, Canby bluegrass
forbs:	Scarlet mallow, golden bean, annual sunflower

- **Northern Fescue Grassland**

Northern Fescue Grassland - Mesic Sites:

plains rough fescue (limited quantity)	*Festuca hallii*
western porcupine grass (limited quantity)	*Stipa curtiseta*
green needle grass	*Stipa viridula*
awned wheatgrass (limited quantity)	*Agropyron trachycaulum* var. *unilaterale*
June grass	*Koeleria macrantha*
Rocky Mountain fescue	*Festuca saximontana*
northern wheatgrass	*Agropyron dasystachyum*
western wheatgrass	*Agropyron smithii*

Other species, as they become available:

grass/grass-like:	blunt/sun-loving sedge, Hooker's oatgrass, sweet grass
forbs:	harebell, goldenrod, golden bean, prairie asters, pea vine, yarrow, fleabane, blanket flower, sweet vetches

Northern Fescue Grassland - Sandy Sites:

needle and thread grass (limited quantity)	*Stipa comata*
sand grass (limited quantity of local species)	*Calamovilfa longifolia*
sand dropseed (limited quantity of local species)	*Sporobolus cryptandrus*
western porcupine grass (limited quantity)	*Stipa curtiseta*
June grass	*Koeleria macrantha*
awned wheatgrass (limited quantity)	*Agropyron trachycaulum* var. *unilaterale*
green needlegrass	*Stipa viridula*
plains rough fescue (limited quantity)	*Festuca hallii* (not for **very** sandy sites)
northern wheatgrass	*Agropyron dasystachyum*

Other species, as they become available:

grass/grass-like:	Canada wild rye, blunt/dryland sedge
forbs:	goldenrod, annual sunflower, blanket flower, golden aster, mouse-eared chickweed, fleabane, three flower avens

Parkland Natural Region

- **Foothills Parkland**

foothills rough fescue (limited quantity)	*Festuca campestris*
fringed brome (limited quantity)	*Bromus ciliatus*
mountain brome	*Bromus carinatus*
nodding brome (limited quantity)	*Bromus anomalus*
awned wheatgrass (limited quantity)	*Agropyron trachycaulum var.unilaterale*
June grass	*Koelaria macrantha*
green needle grass	*Stipa viridula*
northern wheatgrass	*Agropyron dasystachyum*

Other species, as they become available:
grass/grass-like: Idaho fescue, Parry oatgrass, sun-loving/blunt sedges, northern awnless brome, California oatgrass, Rocky mountain fescue, sweet grass, alpine timothy
forbs: American sweet vetch, smooth aster, Canada goldenrod, yarrow, northern bedstraw
shrubs: shrubby cinquefoil, smooth/beaked willows

- **Peace River Parkland (Peace River Slopes)**

western porcupine grass (limited quantity)	*Stipa curtiseta*
June grass	*Koeleria macrantha*
northern wheatgrass	*Agropyron dasystachyum*
western wheatgrass	*Agropyron smithii*
awned wheatgrass (limited quantity)	*Agropyron trachycaulum* var. *unilaterale*
green needlegrass	*Stipa viridula*
Rocky Mountain fescue	*Festuca saximontana*

Other species, as they become available:
grass/grass-like: Columbia needlegrass, plains reed grass, blunt sedge
forbs: yarrow, smooth aster, smooth fleabane, Missouri goldenrod, harebell, scarlet mallow
shrubs: snowberry, saskatoon, choke cherry, pin cherry, prairie rose

- **Central Parkland (see Northern Fescue Grassland p. 50)**

Boreal Forest Natural Region (except Dry Mixedwood Subregion)

- **For natural recovery (no seeding) option in the Boreal Forest:**
  - Rollback on majority of areas, especially access and slopes.
  - Where a weed problem exists in the area, access points can be rolled back; the remainder seeded to grass and a weed control program implemented for 2 years prior to leaving bush to encroach.
  - Seeding of cover crops on slopes may be required.

- **Mesic Sites in the Boreal Forest:**

fringed brome (limited quantity)	*Bromus ciliatus*
awned wheatgrass (limited quantity)	*Agropyron trachycaulum* var. *unilaterale*
fowl bluegrass	*Poa palustris*
tufted hairgrass	*Deschampsia cespitosa*
slough grass	*Beckmania syzigachne*
northern wheatgrass	*Agropyron dasystachyum*

Other species, as they become available:
grass/grass-like: hairy wild rye, purple oat grass, blunt/hay sedge, Canada wild rye, spike trisetum, tickle grass, mountain rice grass
forbs: fireweed, cream-coloured peavine, yarrow, smooth fleabane, Canada goldenrod

- **Subxeric-Submesic (Sandy) Sites in the Boreal Forest:**

Rocky Mountain fescue	*Festuca saximontana*
June grass	*Koeleria macrantha*
American vetch (limited quantity)	*Vicia americana*

Other species, as they become available:

grass/grass-like: hairy wild rye, Canada wild rye, spike trisetum, purple oatgrass, plains reed grass, blunt/hay sedge, northern rice grass

forbs: wild strawberry, northern sweet vetch, twin-flower

- **River Banks in the Boreal Forest**

The preference is that these not be seeded to grass, but that shrubs be planted instead. Erosion concerns can be addressed using geotextiles, mulches and vegetated geogrids. Suggestions for shrub plantings in the boreal forest include (see book for other possibilities): dogwood, rose, cranberry, alder, honeysuckle, raspberry, willow.

- **Dry Mixedwood Subregion of the Boreal Forest Natural Region -Mesic Sites:**

nodding brome (limited quantity)	*Bromus anomalus*
fringed brome (limited quantity)	*Bromus ciliatus*
awned wheatgrass (limited quantity)	*Agropyron trachycaulum* var *unilaterale*
June grass (add for sandy sites)	*Koelaria macrantha*
northern wheatgrass (add for sandy sites)	*Agropyron dasystachyum*
Rocky Mountain fescue (add for sandy sites)	*Festuca saximontana*
American vetch (limited quantity)	*Vicia americana*

Other species, as they become available:

grass/grass-like: hairy wild rye, purple oatgrass, mountain rice grass, hay sedge

forbs: fireweed, cream-coloured peavine, smooth fleabane, Canada goldenrod, harebell

shrubs**:** hazelnut, dogwood, rose, cranberry, alder, honeysuckle, raspberry and willow

Foothills Natural Region

- **Lower Foothills:** Same as boreal

- **Upper Foothills - Moister Sites (valley bottoms):**

tufted hairgrass	*Deschampsia cespitosa*
fringed brome	*Bromus ciliatus*
awned wheatgrass	*Agropyron trachycaulum* var. *unilaterale*
fowl bluegrass	*Poa palustris*
American vetch	*Vicia americana*

Other species, as they become available:

grass/grass-like:	hairy wild rye, spike trisetum, tickle grass, sweet grass, sedges *(Carex praegracilis, atherodes, praticola, atrosquama, aurea*)
forbs:	alpine milkvetch, fireweed, yarrow, sweet vetches, alpine aster
shrubs:	willow, shrubby cinquefoil

- **Upper Foothills - Drier Sites (Conifer):**

Rocky Mountain fescue	*Festuca saximontana*
fringed brome	*Bromus ciliatus*
tufted hairgrass	*Deschampsia cespitosa*
awned wheatgrass (limited quantity)	*Agropyron trachycaulum* var. *unilaterale*

Other species, as they become available:

grass/grass-like:	broad-glumed wheatgrass, northern rough fescue, alpine bluegrass, hairy wild rye, bluebunch wheatgrass
forbs:	American vetch, three-flowered avens, alpine milkvetch, fireweed
shrubs:	prickly rose, green alder, juniper, buffaloberry, willow

Rocky Mountain Natural Region

- **Montane (southern)**

foothills rough fescue (limited quantity)	*Festuca campestris*
awned slender wheatgrass	*Agropyron trachycaulum* var. *unilaterale*
Rocky Mountain fescue	*Festuca saximontana*
mountain brome	*Bromus carinatus*
June grass	*Koeleria macrantha*
American vetch	*Vicia americana*

Other species, as they become available:

grass/grass-like:	Idaho fescue, Richardson needle grass, Columbia needle grass, northern awnless brome
forbs:	three flowered avens, American vetch, showy locoweed, yarrow, American sweet vetch, harebell, smooth aster

Note: At higher elevations: also use broad-glumed wheatgrass, spike trisetum, alpine bluegrass. On moister sites: add tufted hairgrass, green needle grass.

- **Subalpine (north of Highway #1)**

Rocky Mountain fescue	*Festuca saximontana*
fringed brome	*Bromus ciliatus*
alpine bluegrass	*Poa alpina*

Other species, as they become available:
grass/grass-like: broad-glumed wheatgrass, spike trisetum, northern rough fescue, hairy wild rye
forbs: alpine milk vetch
shrubs: alder, willow, buffaloberry, blueberry, bog cranberry

- **Subalpine (south of Highway #1)**

alpine bluegrass	*Poa alpina*
foothills rough fescue (limited quantity)	*Festuca campestris*
fringed brome	*Bromus ciliatus*
Rocky Mountain fescue	*Festuca saximontana*
mountain brome	*Bromus carinatus*
American vetch (limited quantity)	*Vicia americana*

Other species, as they become available:
grass/grass-like: broad-glumed wheatgrass, spike trisetum
forbs: alpine milkvetch, three flowered avens, showy locoweed,
shrubs: alder, willow, buffaloberry, blueberry, bog cranberry

- **Alpine Subregion**

alpine bluegrass	*Poa alpina*
Rocky Mountain fescue	*Festuca saximontana*

Other species, as they become available:
grass/grass-like: spike trisetum, broad-glumed wheatgrass, bog sedge
forbs: alpine milk vetch, sweet vetches
shrubs: mountain heather, willow, low bilberry, red elderberry, prickly rose, yellow mountain avens

Acceptable Native Plant Substitutions

Every effort should be made to secure supplies of appropriate native plant materials. It is not advisable to mix native cultivars with native species that have not undergone genetic selection for agronomic characteristics, as the native cultivars are more competitive and will dominate the stand. Substitutions should only be made when the desired native species are not available and should be accompanied by supporting documentation.

1. Northern/western/streambank wheatgrasses all right to substitute for each other; note that western wheatgrass is out of range in the boreal forest, except on Peace River slopes (northern/streambank persist for at least 8 yrs in the boreal forest).

2. Green needle grass all right to substitute for needle and thread grass and western porcupine grass (until supplies of latter species improve). Be aware that green needle grass is adapted to moister conditions.

3. Mountain brome (native to Southwestern Alberta, Montana and Cypress Hills; out of range in northern Alberta and may not perform well): all right to substitute for fringed brome.

4. Fowl bluegrass okay to substitute for rough hair grass/tickle grass; source: Peace River area.

Notes:

- Maximum percent (PLS) of rhizomatous wheat grasses should be 20% especially on prairie sites; up to 50% may be all right if the site is not fenced and being grazed. Slender wheatgrass is very competitive and should be seeded at <10% PLS of the mix.
- Light weight seed should be broadcasted (and pressed into the ground) following drilling of heavy seed. 6-8 kg/ha (drill seeded) is currently being recommended for prairie; may require a specialized drill; often requires use of a carrier (chick starter, sand, etc). Where the seed mix has less than 40% large seeded species (less than 500 seeds/gram, e.g., wheat grasses), the seeding rate for drilling can be increased to 10-12 kg/ha. Rates should be doubled for broadcasting.

Natural Recovery (no seed)

This option is becoming more accepted by industry and regulators for small disturbances where the potential for erosion is low. Natural recovery (no seeding) can be applied with the permission of the landowner or inspector. On the mixed grass prairie, native species will move onto a disturbed site at the rate of 3 to 5 metres per year (with adequate moisture). Some points to consider when deciding to use this option include:

- The preferred seed for an area is unavailable.
- The percent of non-native species in the surrounding vegetation is not significant.
- Restricted or noxious weeds in the area are not known to be a problem.
- Range condition surrounding the disturbed area is good to excellent.

Non-Native Substitutions

The use of non-natives (other than as a cover crop) should be a last resort when trying to establish a native plant community, unless there is scientifically valid data that shows that the species being used will not persist in the long term. Any use of non-native species should be accompanied by documentation that outlines the reasons that the non-native species are being used, and evidence of the unavailability of the preferred native plants. Though the species listed below are not considered invasive at this time, some may be persistent when planted in native plant communities. It should be noted that mixing competitive non-native species with native species is also not recommended.

Acceptable Non-Invasive Non-Native Perennial Substitutes

1. Sheep's fescue- persistent though not invasive; suitable for dryland through parkland; drought tolerant; low growing bunch growth habit.

2. Dahurian wild rye (biennial)- suitable for dryland as a substitute for slender wheatgrass; short-lived (3-4 years) except in wetter areas; can be persistent because of prolific seed production.
3. Intermediate wheatgrass- not persistent under grazing pressure; used as a substitute for native wheatgrasses in mixed grass prairie.

4. Pubescent wheatgrass-a form of intermediate wheatgrass; considered to be better adapted to droughty and saline sites.

5. Redtop- used as a substitute for hair grass/tickle grass in moister areas.

6. Perennial rye grass- considered to be too competitive unless used at very low percentages; winter kills but does reseed; >10% in a mix inhibits germination of other species.

7. Cicer milkvetch- considered the least aggressive of the introduced legumes but is persistent on foothills grassland and in the Boreal Forest; should be used in small percentages (5-10%).

8. Alsike clover- this species is too competitive with tree seedlings but may be used elsewhere.

9. Alfalfa- may be used in site-specific circumstances, e.g. sandy sites where no suitable native legume is available, if it can be shown that it will not persist on the site past 5-7 years.

Acceptable Non-Native Annuals

Non-native annuals are generally used to provide interim erosion control on erodible slopes while slower-growing native perennials are becoming established. Annuals should not be used where they compete with native plants for moisture or nutrients. Seeding of annuals is also not recommended for early spring grazed pastures in southern Alberta.

1. Annual ryegrass- likes moist conditions; use <10% in mix, otherwise too competitive.

2. Regreen (a cross between wheat and western wheatgrass)- has sterile heads; small survival of plants to second and third years; gets as tall as grain and has same palatability. Regreen is a relatively new product, and has not undergone extensive field testing under Alberta conditions.

3. Barley- can attract grazers.

4. Oats- can attract grazers.

5. Winter wheat (southern Alberta) or durum

6. Flax

Appendix I: Specific Species Information

Grass Species	Variety	Alternative	Seeds/g	Emergence/Seedling vigour/Growth
Agropyron dasystachyum (northern wheatgrass)	Elbee	none	290-400	10-20% dormant; moderate/ moderate/rhizomes
Agropyron smithii (western wheatgrass)	Walsh	Rosanna	240-275	25-50% dormant; poor/ poor/rhizomes
Agropyron spicatum (bluebunch wheatgrass)	common	none	300	
Agropyron subsecundum (bearded wheatgrass)	Hillcrest	none	345	excellent/excellent/----
Agropyron riparium (streambank wheatgrass)	Sodar	none	345	10-20% dormant; moderate/ moderate/rhizomes
Agropyron trachycaulum (slender wheatgrass)	Adanac	Revenue	290-370	excellent/ excellent/ competitive in 1st few years
Agropyron violaceum (broadglumed wheatgrass)	Mountaineer	Highlander	225-350	10-20% dormant; moderate/ good/----
Agrostis scabra (hairgrass)	common	none	11000	good/good/----
Bouteloua gracilis (blue grama grass)	common	none	1820-1900	sporadic/weak
Bromus anomalus (nodding brome)	common	none	255	moderate/good/good
Bromus carinatus (mountain brome)	common	Bromar	150-200	good/good/competitive
Bromus ciliatus (fringed brome)	common	none	300	good/good/competitive
Bromus pumpellianus (northern awnless brome)	common	none	280	
Calamovilfa longifolia (prairie sandreed)	Goshen	ND95	600	poor/good/excellent
Danthonia parryi (Parry's oatgrass)	common	none	220	
Deschampsia cespitosa (tufted hairgrass)	common	none	3500-5500	good/moderate/excellent
Distichlis stricta (saltgrass)	common	none	1150	
Elymus canadensis (Canada wild rye)	common	none	200-250	good/good/ competitive in 1st few

				years
Elymus innovatus (hairy wild rye)	common	none	390	
Festuca altaica (northern rough fescue)	common	none	655	
Festuca campestris (foothills rough fescue)	common	none	600	good/moderate/slow growth
Festuca hallii (plains rough fescue)	common	none	890	good/moderate/slow growth
Festuca idahoensis (Idaho fescue)	common	none	950	poor/depends on seed lot/---
Festuca saximontana (Rocky Mtn. fescue)	common	none	1050-1800	good/weak/ not competitive
Hierochloe odorata (sweet grass)	common	none	1670	poor/moderate/ spreads readily by rhizome
Koeleria macrantha (June grass)	common	none	3500-5000	moderate/weak/----
Oryzopsis hymenoides (Indian ricegrass)	Nezpar	none	300-400	80%+dormancy; good/ moderate-good/----
Poa alpina (alpine bluegrass)	Blueridge	Glacier	2100-2200	good/excellent/slow
Poa canbyi (Canby bluegrass)	Canby	none	2050	
Poa cusickii (early bluegrass)	common	none	2000	
Poa juncifolia (alkali bluegrass)	Sherman	none	2022	
Poa palustris (fowl bluegrass)	common	none	2000-2300	good/good/----
Puccinellia nuttalliana (Nuttall's alkaligrass)	common	none	4648	good/good/----
Sporobolus cryptandrus (sand dropseed)	common	none	11700	may be dormant/good/ moderate
Stipa comata (needle and thread grass)	common	none	250	50-80% dormant; poor/good/----
Stipa curtiseta (western porcupine grass)	common	none	180	
Stipa viridula (green needlegrass)	Lodorm	none	360-400	50-80% dormant; poor/ good/competitive in 1st few years

Forb species-next page

Forb Species	Variety	Alternative	Seeds/g	Emergence/Seedling vigour/Growth
Achillea millefolium (yarrow)	common	none	580	good/good/good
Anemone multifida (cut-leaved anemone)	common	none	600	poor/----/----
Aster ericoides (tufted white prairie aster)	common	none	1590	good if stratified/good/ ----
Astragalus alpinus (alpine milk vetch)	common	none	590	moderate if scarified/ good/good for several years; rhizomes
Astragalus americanum (American milk vetch)	common	none	240	poor (even if scarified)/ poor/poor
Astragalus flexuosus (slender milk vetch)	common	none	500	moderate if scarified/ moderate/----;rhizomes
Astragalus pectinatus (narrow-leaved milk vetch)	common	none	230	moderate if scarified/ weak/moderate
Astragalus striatus (ascending purple milk vetch)	common	none	700	moderate if scarified/ good/----
Campanula rotundifolia (harebell)	common	none	1570	good/weak/excellent; rhizomes
Gaillardia aristata (blanket flower)	common	none	400	good/good/good
Geum triflorum (three flowered avens)	common	none	1700	moderate/moderate/ good
Glycyrrhiza lepidota (wild licorice)	common	none	140	moderate if scarified/ moderate/good; rhizomes
Hedysarum alpinum (American sweetbroom)	common	none	230	moderate if scarified/ moderate/good
Hedysarum boreale (boreal sweetbroom)	common	none	200	moderate-good if scarified/excellent/good
Hedysarum sulphurescens (yellow sweetbroom)	common	none	165	moderate if scarified/ poor/poor
Heterotheca villosa (golden aster)	common	none	2500	moderate/moderate/ good
Lathyrus ochroleucus (white peavine)	common	none	70	moderate if scarified/poor/moderate
Liatris punctata (dotted blazing star)	common	none	300	good/good/moderate
Linum lewisii (wild blue flax)	Lewis (U.S.)	none	620	good/good/good

Oenothera biennis (common evening primrose)	common	none	3300	good/good/good; biennial
Oxytropis cusickii (alpine loco-weed)	common	none	350	good if scarified/ moderate/----
Oxytropis deflexa (reflexed loco-weed)	common	none	1100	moderate if scarified/ moderate/good
Oxytropis monticola (late yellow locoweed)	common	none	800	good if scarified/ good/good
Oxytropis sericea var. *spicata* (early yellow locoweed)	common	none	550	good if scarified/good/ good
Oxytropis splendens (showy locoweed)	common	none	770	moderate-poor if scarified/good/good; good spread by seeds
Penstemon nitidus (smooth blue beardtongue)	common	none	750	poor/moderate/slow
Petalostemon purpureum (purple prairie clover)	common	none	420	moderate/moderate/ good
Ratibida columnifera (prairie coneflower)	common	none	3000	good/good/moderate
Solidago canadensis (Canada goldenrod)	common	none	2000	poor due to dormancy/ good/excellent; spreads rapidly by rhizomes
Thermopsis rhombifolia (golden bean)	common	none	70	moderate if scarified/ good/good; rhizomes
Vicia americana (American vetch)	common	none	75	good if scarified/ moderate/weak

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