



Revegetation Using Native Plant Materials

Guidelines for Industrial Development Sites

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Native species should be used where the revegetation goal is to re-establish a native plant community

Operators of industrial developments on specified land are required to conserve and reclaim disturbances and obtain reclamation certificates. Conservation includes planning and management that protects the essential physical, chemical and biological characteristics of the environment. Reclamation requires the re-establishment of plant species that are compatible with the intended land use. This Fact Sheet gives guidance regarding the use of native plant materials for revegetation.

BACKGROUND

A native plant is defined as a species occurring within its historic range or in an extension of that range bounded by the dispersal potential of the plant and under the condition that the extension of that range is not known to be related to human activities.

Native species are recognized for their ecological function and intrinsic values as part of the natural forest, grassland, montane and wetland ecosystems, and should be conserved. Native plant material is used where the revegetation goal is to re-establish a native plant community, and there are insufficient native plant propagules in the soil or adjacent vegetation to accomplish this.

The use of native species should be consistent with local and/or regional land use plans/objectives and with existing or surrounding vegetation. The publication, *Native Plant Revegetation Guidelines for Alberta*, (Native Plant Working Group, 2001) should be consulted for more information.

GUIDELINES

Planning Revegetation Projects

Some native plant communities (e.g., rough fescue prairie) are very difficult to re-establish. It is very important to avoid disturbance to native plant communities whenever possible. If avoidance is not possible, then minimal disturbance techniques should be employed. Reduction of the area disturbed, use of special equipment and techniques and careful timing of construction can reduce impacts.

The goal of native revegetation is to establish a self-sustaining plant community that is compatible with surrounding land use. Achieving compatibility means meeting one or more of the following objectives consistent with the agreed upon post-disturbance land use: erosion control, provision of livestock forage, wildlife habitat, reforestation, traditional use, control of problem plant species (e.g., weeds, invasive plants), maintenance of biodiversity and aesthetics.

Sites and the surrounding area must be evaluated prior to disturbance to determine the most appropriate revegetation strategy. Species composition and plant community condition need to be recorded.

Rare and sensitive plants and plant communities should be identified and mitigation planned. The Alberta Natural Heritage Information Centre (ANHIC) has a database that tracks rare plants, animals, native plant communities and landscapes. Project managers must consult this database (780 427-5209).

The salvage of existing native plant materials and topsoil is a priority and needs to be considered in the planning stages. This is particularly important for native plant species for which seed is generally unavailable or for species that do not establish readily from seed.

Native species should be selected based on their consistency and compatibility with pre-disturbance plant communities within the Natural Sub-region

Plant Material Selection

The revegetation goals of the project must be identified prior to deciding what types of native plant material to use, and how and where to use them. The revegetation plan should address short, medium and long-term goals within the context of the agreed upon end land use.

Guidelines For Native Plant Selection

- ❑ Native species should be selected based on their consistency and compatibility with pre-disturbance plant communities within the Natural Sub-region.
- ❑ Lists of native trees, shrubs, grasses and forbs suited to various climates, soil types, and moisture regimes can be found in the publication, *A Guide to Using Native Plants on Disturbed Lands* (Gerling et al., 1996).
- ❑ Native species should be selected on the basis of known performance.
- ❑ Only seed species that will not come back naturally from the soil seedbank. For example, wetland areas do not require seeding as these already have a large seedbank of native species.
- ❑ The use of early successional species or native plant species that can survive in altered conditions can be considered in areas where late successional species may be difficult to establish.

Guidelines For Selecting Plant Material For Erosion Control

- ❑ Use a native or non-native cover crop (annual, biennial, short-lived perennial) for early erosion control. Cover crops germinate and establish much more quickly than native species but do not persist in the community. It is important to seed the cover crop very lightly (1/10 of agricultural rate for cereal crops) or mow it so that it won't compete too much with native species for light and water.

- ❑ Seed or plant native species into the stubble of the annual crop or leave for natural recovery from the seed bank.
- ❑ Choose native species that have a range of heights/growth forms and rooting depths/patterns for maximum erosion protection.
- ❑ Use erosion control products (e.g., coir matting) and methods (e.g., water bars, diversion berms) in combination with seeding on erosion prone slopes.

Guidelines For Selecting Plant Material For Maintaining Biodiversity

- ❑ Use a range of native plant materials (e.g., multiple species, varieties and/or age classes).
- ❑ Use different seed mixes and varying seeding rates. Using the same prescription everywhere results in too much uniformity. Keep careful records of what is done and where.
- ❑ Salvage the seedbank for replacement and plant materials such as seed or sod (that might otherwise not be available). For example, on sandy prairie soils where rangeland is in good to excellent condition, it is not necessary to seed needle and thread grass because it will come back from the seed bank.
- ❑ If one of the goals is to maintain biodiversity by encouraging movement of plants from offsite (e.g., on prairie):
 - Keep the proportion of very competitive, short-lived species like slender wheatgrass low
 - Lower the proportion of rhizomatous species (e.g., northern, western and streambank wheatgrass) as these species spread readily

Guidelines For Selecting Plant Material For Sites Returned To Forest Cover

- ❑ Plant native or non-native cover crops for erosion and weed control the first year.
- ❑ Plant tree/shrub seedlings into stubble.
- ❑ Establish a grass cover only if the site has an erosion problem because perennial grass species can out-compete trees.

It is important that native plant material used in revegetation is suitable in terms of performance, purity and potential germination

Guidelines For Selecting Plant Material For Use By Domestic Livestock

- ❑ Choose plant materials that match the surrounding pasture (so that use of the revegetated area can occur at the same time of the year).
- ❑ Do not include native plants in the mix that are known to be toxic to livestock.
- ❑ The success of revegetating grazed areas can only be assured by protecting the site from use by animals in the first year (or until the plants are well established). The grazing rotation can often be changed so that the pasture where the disturbance is located is rested.

Guidelines For Selecting Plant Material For Creation Of Wildlife Habitat

- ❑ Use a holistic approach to revegetation to provide food and habitat for various animal species.
- ❑ Use native plant materials that fulfill the life-cycle requirements of key wildlife species.
- ❑ Use species that are similar to offsite.
- ❑ Plant species in patterns that simulate offsite conditions.

Guidelines For Selecting Plant Material To Compete With Weeds Or Problem Plants

- Sources are either close by or there are large volumes of undesirable seeds in the seedbank.
- ❑ Use a cover crop the first year (or longer) to compete with weeds and allow for weed control. If weeds still come up prolifically, mow and remove the excess prior to seed set (if growth of desirable plants is being inhibited).
 - ❑ Seed native species that are known to be more competitive (e.g., wheatgrasses).
 - ❑ Designing a seed mix with species that have differing growth forms (including roots) enables plants to occupy niches that would otherwise be occupied with weeds, and make more efficient use of resources (light, water). Healthy, desirable plants compete better with weeds.

Seed Sources

It is very important to ensure that native plant material used in revegetation projects is suitable in terms of performance, purity and potential for germination.

- ❑ Use the Decision Making Chart for Sourcing Native Plant Material on page nine of the Native Plant Revegetation Guidelines for Alberta (Native Plant Working Group, 2001).
- ❑ The Alberta Native Plant Council has a listing of available native plant materials on their website, www.anpc.ab.ca.
- ❑ Always ask for preferred species first (no demand means no supply). When preferred species are unavailable, be prepared with alternate choices or to alter the revegetation plan.
- ❑ Use scientific names when ordering seed.
- ❑ Make sure that the genetic source of the seed is from a similar region, otherwise performance can be an issue.
- ❑ Tree seed, seedlings and propagules use must be consistent with the *Management and Conservation Standards for Forest Tree Genetic Resources in Alberta* (Alberta Sustainable Resource Development - Lands and Forest Division, 2003). A seed lot registration number must be provided prior to use on public land.
- ❑ Ask the seed supplier for a Seed Analysis Certificate for each seed lot prior to mixing; check certificates for any weed species or other species of concern (e.g., invasive species like crested wheatgrass), timothy or smooth brome. This certificate indicates the germination potential of the seed which can vary widely and affects seeding rates.
- ❑ Order early (i.e., January) for availability.

Replacing topsoil, relieving compaction, controlling persistent weeds, creating microsites and preparing a firm seedbed are critical steps in preparing a site for revegetation

Site Preparation

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

- ❑ Topsoil and subsoil must be conserved and replaced. Newly constructed landforms require topsoil and subsoil suitable for the type of vegetation chosen.
- ❑ Any compaction that could inhibit root growth must be eliminated prior to seedbed preparation.
- ❑ Controlling persistent weeds/problem plants is crucial for revegetation success. Several years of control may be required to draw down the seedbank of undesirable species.
- ❑ Creating microsites using equipment that produces ridges and hollows (e.g., Kinsella Accuroller, Hodder Gouger) can enhance diversity and plant survival.
- ❑ Preparing a firm seedbed when drill seeding enhances germination by ensuring good soil to seed contact and regulating seeding depth.
- ❑ The use of nitrogen fertilizer is not recommended for most native revegetation projects. Fertilizer tends to promote weed growth and can slow down succession.

Seeding and Planting

The chosen seeding or planting method varies according to project goals, end land use, previous experience and specific requirements of the species being used.

- ❑ Drill seeding is usually preferred over broadcast seeding because it uses less seed and places it in direct contact with the soil.
- ❑ A special drill (e.g., Truax, John Deere Rangeland) is usually required. All seeders must be calibrated for each mix (several times a day) to ensure efficient delivery of seed.

- ❑ Broadcast seeding is used in areas where access for drill seeders is poor. Broadcasting is also used for small seeded species and those that require light to germinate (e.g., June grass). Two to three times the amount of seed needed for drill seeding has to be used. Sites should be harrowed or rolled afterwards to ensure good soil to seed contact.

Seeding or Planting Rates

Because native species differ so much in germination, establishment, growth habit and competitive interactions, it is recommended that an experienced revegetation specialist be consulted to design seed mixes.

- ❑ Seeding or planting rates should aim to meet project objectives.
- ❑ The target number of plants per square metre has to be decided.
- ❑ Reforestation guidelines recommend stems per hectare measurement as a guide to how many trees to place in a specific area. For other projects, the following target plant densities (following establishment) are recommended:
 - Grasses: 10 to 15 plants/m²
 - Forbs: 5 to 10 plants/m²
 - Shrubs: 1 to 2 plants/m²
 - Trees: 1 to 2 metres apart
- ❑ For seeding, calculations are made to determine how many pure live seeds (PLS) should be planted per square metre. Adjustments are made according to the relative ability of the species to germinate, establish and spread.
- ❑ Grass seeding rates of 300 seeds/m² are adequate for erosion control on most sites. More seed is not always better. If plants are too crowded, they do not develop robust shoot and root systems that are important for erosion control.
- ❑ If erosion is a concern, it is better to use effective erosion control products in combination with revegetation.

Revegetation is successful when the site is protected from erosion and plant composition and productivity meet end land use goals.

- ❑ On sites where ingress of native species from the surrounding plant community is desired, total seeding rates should be less than 300 seeds/m². Since seed size is extremely variable, kg/ha varies according to the species used. Rates lower than 8 kg/ha are hard to run through a seed drill unless a carrier is used.
- ❑ Where competition from weeds or problem plants is a concern, increasing seeding rates of native species above normal rates can be beneficial.
- ❑ More information about calculating seeding rates and about the germination and establishment of various native species can be found in the publication, *Establishing Native Plant Communities* (Smreciu et al., 2003).

Management of Revegetated Areas

Effective management of established native stands is required to ensure that the vegetation is sustainable.

- ❑ Restricted weeds must be eliminated and noxious weeds and invasive problem plants controlled. Care has to be taken to use methods that are compatible with the survival of desirable native plants in the stand.
- ❑ Non-persistent annual weeds (e.g., stinkweed, flixweed, Russian thistle) should only be controlled if they are inhibiting the growth of desirable native plants. Mowing and removal of excess material is the best approach. These weeds usually disappear from the stand in three to four years.
- ❑ Protection from grazing or browsing is advisable during the establishment period. Controlled grazing may help to eliminate unwanted plants.
- ❑ Grazing, mowing or prescribed burning of the revegetated area may be necessary to retain plant vigour and diversity and to reduce the risk of wildfire by maintaining safe fuel loads.

Assessing Success

The establishment of a desired native plant community can be a lengthy process.

Landscape level assessments that should be made include erosion prevention and compatibility of the revegetated area with surrounding areas or agreed upon end land use. Revegetated areas should be checked several times in the first season and yearly thereafter.

Revegetation is considered successful if:

- ❑ Landforms are stable and there is no evidence of progressive erosion.
- ❑ There are sufficient numbers of plants, cover (live and litter) to ensure protection of the site from future erosion.
- ❑ The revegetated area can be used in the same manner and in conjunction with adjacent lands.
- ❑ The species growing on the site demonstrate that the existing or proposed end land use(s) can be sustained.
- ❑ Restricted or noxious weeds as designated in the *Weed Control Act* (or by the local municipality) are no more abundant than on controls.
- ❑ Eventually, vegetation productivity is equivalent or better than that of vegetation surrounding the disturbed area.
- ❑ Vegetation on the site is growing along expected successional trends.

There are key times that detailed assessments should be made to ensure that plant growth is sustainable:

- ❑ 3 to 6 weeks following seeding (density count to check seeding success; check health of shoots/roots).
- ❑ The end of the first growing season (density count; health).
- ❑ The end of the establishment period. This varies tremendously by species (e.g., one year for grasses; several years for many shrubs or trees). A density and/or cover assessment is carried out depending on the plant species. This assures that target plant densities have been met (e.g., 10 plants/m² for grasses). Health of plants above and below ground is also checked.

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- ❑ For communities that take a longer time to develop (e.g., forests, droughty prairie sites) or on drastically disturbed landscapes (e.g., mine sites), assessment is required until the plant community is considered to be sustainable.
- ❑ For some disturbance types, reclamation criteria have been developed (e.g., wellsites, pipelines, borrow pits). For natural recovery sites, guidance for assessment is provided in C&R/IL/02-3, as amended. The new Range Health Assessment may also be helpful for well-established plant communities.
- ❑ Good record keeping of every step in a revegetation program can help manage a specific site; determine necessary mitigation and assist with planning for future disturbances. The interpretation of successful revegetation is closely tied to the specific revegetation goal(s) for the site.

USEFUL RESOURCES

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CONTACTS

The following can be reached toll free by calling 310-0000 and then dialing the number shown below.

For public lands:

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For all other lands:

Alberta Environment,
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