Executive Summary

It is expected that native plant materials will see increasing use for revegetating disturbed and degraded lands in northern British Columbia and elsewhere. Mixtures of grasses and legumes (and sometimes other graminoid and forb species) are sown for roadside erosion control, the rehabilitation of compacted soils, the reclamation of minespoils, and the restoration of natural grasslands. To provide reliable supplies of herbaceous native plant seed for such applications, it is advisable to grow these plants under cultivation and to harvest the seed they produce. This manual provides instructions for this process, focusing on the biology and management of 31 species of herbaceous plants indigenous to the northern Interior of British Columbia. Information is also provided to guide the process of designing seed mixtures and selecting suitable application rates for using these plants in the revegetation of disturbed soils.

Native plant seed production follows many of the standard practices of agronomy and commercial seed growing. It is recommended that production plots or fields be established on loamy soils that have been kept free of weeds for the previous one or two years, and which can be irrigated (especially during the establishment phase). Stands can be established by starting containerized seedlings in a greenhouse and transplanting them into rows, directly seeding individual or paired rows by hand or with a single-row seeder, or (especially for larger fields) using a tractor-drawn seed drill. Most native plant seeds are relatively small, so sowing depths must be shallow. Inert carriers are sometimes needed to enhance seed flow and to dilute seed concentrations when used in standard agricultural machinery. Multiple applications of fertilizer are recommended each year to offset soil deficiencies, aid in stand establishment, maximize seed production, and prolong stand life. The biggest challenge and cost to native plant seed production is always weed control, which is imperative in order to guarantee a weed-free seed supply as well as to enhance crop seed production. Weed control in seed production plots and fields can be accomplished through a combination of cultivation, mulching, manual weeding, broadcast applications of selective herbicide, or spot application of broad-spectrum herbicide. Even if all weeds cannot be killed, weed shoots or seed heads should be manually removed prior to harvesting the seed crop.

The production of native plant seed in cultivation requires careful attention to the management of genetic diversity in each species being grown. Approaches can include seed increase of single local populations, or the development of broad, regionally adapted seed supplies. In all cases, it is important to retain the variability that is associated with features such as plant stature and the timing of reproduction. This means that several selective harvests are often preferable to a single harvest of seed production stands. Harvesting methods can include: manual picking, clipping and sickles; vacuuming; motorized seed stripping; swathing followed by threshing; or straight combine harvesting. The use of plastic mulch between rows of plants can facilitate the collection of dropped or scattered seeds (providing it is free of debris and weed seeds). Seeds of several species can complete their ripening process if dried in the sun or indoors. If not threshed as part of the harvesting process or if the threshing process is not complete, a stationary threshing machine, rethresher, or rotary flail can be used to extract seeds. The straw generated from the harvesting and threshing process can be baled and used as mulch for weed control in seed production plots, or for erosion control on exposed soils at disturbed sites. This manual provides recommended harvesting and threshing methods for each species, with preliminary specifications for machine settings, but a grower must adjust these guidelines as necessary for each crop.

Seed cleaning and testing is an important component of native plant seed production. Cleaning to remove inert plant debris and non-crop seeds is typically done using a combination of sieving and controlled air-flow separation methods. Recommendations for sieve sizes and shapes, and relative air flow settings, are provided for each plant species. As with threshing, cleaning procedures will have to be adjusted for each seed lot, with the requirement that all non-crop seeds must be excluded and the general guideline that less than 5% of crop seeds should be lost in the process. Once cleaned, seed should be stored in sealed containers under cool, dry conditions. Proper seed lot identification is essential. Each seed lot then needs to be tested for its purity (apparently viable seeds as a percentage of seed lot weight) and viability (the percentage of apparently viable seeds that will germinate). For these northern species, germination should normally be tested under conditions of 25^{o}C days and 15^{o}C nights, and tests may have to extend more than 30 days.

Procedures are described for the revegetation of disturbed or degraded soils, and for the design of suitable seed mixtures to be sown on such sites. Each seeding prescription must undertake a degree of matching species to the site and to other species in a proposed mixture. Consideration should be given to the natural distribution and site preferences of candidate plant species, and to site characteristics such as elevation, slope, soil texture, management objectives, and the composition of nearby natural vegetation. Most seed mixtures will consist of tall and short grass species, a rhizomatous species, a nitrogen-fixing species, and slow and fast germinators. Species proportions and seeding rates should be based on densities of pure live seeds (PLS). A general seeding rate of 1500 PLS/m^2 is suitable for many situations, providing that a balanced fertilizer is applied at the same time. Lower rates can be used for level sites where rapid green-up is not essential, while higher rates are needed for erosion-prone sites. Seed should be applied as soon as possible after soil disturbance, or will benefit from raking, harrowing or decompaction if the soil had settled for a prolonged period of time. Seed can be spread by hand, using a cyclone seeder, or using a seed drill, followed again by raking or harrowing. Hydroseeding can also be used, but because it typically requires much more seed, it is discouraged for use with native plant seed that is often expensive and in short supply.

Most of this manual consists of information on the biology, husbandry and use of 31 herbaceous plant species, including eleven grasses, four sedges and rushes, four legumes, six composites, and six representatives of other plant families. Almost all of these species are perennials, with individual plants expected to persist in fields and in the wild for three or more years. Maps of the range of each species in northern British Columbia are provided, as are photographs of their growth habits and seeds. Information is given on growth form, site preferences, seed size, germination behaviour, techniques for seed production, harvesting and seed processing, and considerations for use in revegetation. It is expected that this information will be relevant to the growth and use of these widespread species in regions beyond northern British Columbia, and that the principles and techniques will apply to other work with native herbaceous species as well.

Though based on several years of research and experience, as supplemented by the published literature, this manual must be considered a first approximation of the knowledge needed to grow and use these plant species. Growers and revegetation specialists who work with these plants are encouraged to try different techniques, to monitor their effectiveness, and to record the results.

Table of Contents

(Table of Contents, continued)