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Development of pre-variety germplasm of Canadian native grassland species

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Introduction Seed of native Canadian grassland species is being increasingly required for conservation and reclamation plantings in the great plains region of Canada. Cultivars of a few grass species have been available since the 1970s, but for most species, seed has often been from non-adapted sources, or simply not available. To rectify this problem, collaborations were established in the early 1990s between a conservation organization, Ducks Unlimited Canada (DUC), and plant breeders at Agriculture and Agri-Food Canada (AAFC) and the University of Manitoba. The goal of this collaboration was to develop genetically diverse germplasms of native Canadian grassland species that were well adapted to the Canadian great plains. The germplasm developed for each species was called an ecological variety or ecovarTM, and is best described as pre-variety germplasm.

Materials and methods Priority species were identified by DUC. The range of adaptation of each species was determined and potential collection sites were identified. Clones or seed were collected from native grasslands by biologists of DUC. Collections of individual species were carried out at various times during the 1990s. Clones or seeds were transferred to the collaborating scientist who grew them in the greenhouse to verify the species and then established a breeding nursery in a research field the following spring. Nurseries were evaluated for two or three years and little selection was carried out. With the exception of plants which produced little or no seed, seed was harvested from surviving plants and bulked to produce generation-0 (G0). Seed was provided to DUC who contracted G1 and G2 seed production and marketing to Proven Seed Co., a Canadian commercial seed company. To verify that this germplasm was genetically diverse and to monitor diversity over seed production generations, molecular markers were used.

Results Seed is now available for seven different species of grass (Table 1) and is under development or seed increase for six other grass and two legume species (Table 2). The seed of the available species has been produced under the regulations for pedigreed seed production in Canada, meeting purity and viability requirements.

Table 1 Species for which pre-variety germplasm is available in Canada in 2007.

Species	Name
<i>Pascopyrum smithii</i>	W. R. Poole
<i>Elymus lanceolatus</i>	AC Polar
<i>Nassella viridula</i>	AC Mallard
<i>Stipa comata</i>	AC Sharptail
<i>Elymus trachycaulus</i>	AC Sprig
<i>Elymus trachycaulus</i>	AC Pintail
<i>Schizachyrium scoparium</i>	Taylor
<i>Bromus porteri</i>	AC Marten

Table 2 Species for which pre-variety germplasm is under development.

Species
<i>Bromus richardsonii</i>
<i>Calamovilfa longifolia</i>
<i>Bouteloua gracilis</i>
<i>Bouteloua curtipendula</i>
<i>Koeleria macrantha</i>
<i>Pseudoroegneria spicata</i>
<i>Astragalus canadensis</i>
<i>Petalostemon purpureum</i>

Genetic diversity studies using molecular markers indicated that AC Pintail (*E. trachycaulus* subsp. *subsecundus*) was more diverse than an available cultivar and lost less than 10% of its diversity after two generations of seed increase (Ferdinandez et al. 2005). Pre-variety germplasm of *Bouteloua gracilis* was found to be more diverse than three other available germplasm sources and no genetic shift was found after two generations of seed increase (Fu et al. 2004).

Conclusions Seed of pre-variety germplasm of seven Canadian native grassland species is available commercially in Canada and germplasm of eight other species is under development. This pre-variety germplasm is more genetically diverse than other seed sources of these species and most of this diversity is maintained over generations of seed increase.

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