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What Are Plant Ecotypes?

Plant Materials Technical Note

Variation in early greenup of switchgrass collections in a common garden plot, Shelly Maher, E. "Kika" de la Garza PMC

Range scientists and agronomists have shown that individual species having a large geographical distribution vary considerably in such characteristics as plant height, growth habits, maturation dates, leaf appearance, and reproductive habits. These characteristics are not distributed randomly throughout the range of the species but are clustered into ecological regions (ecoregions) or seed transfer zones. Plants within these ecological regions are known as **ecotypes**.

Ecotypes were first recognized by scientists as far back as the 1920's. Grass ecotypes assembled in common garden studies revealed that northern ecotypes of sideoats grama flower earlier than more southern ecotypes, resulting in shorter plants. Ecotypes of little bluestem originating from either sandy or clay soils did not do well when placed on soils of the opposite texture. More recently Dr. Danny Gustafson found that genetic, morphological and phenological differences existed between ecoregional sources of big bluestem, Indiangrass and purple prairie clover.

Locally adapted plant materials are widely recommended because of their increased chances of establishment success and genetic compatibility with surrounding populations. However, it is important to consider the isolation and thus the potential genetic inbreeding of limiting oneself solely to localized remnant populations. Frequently people try to simplify what an ecotype is by stating that it is a plant that is within 100-200 miles of its center of origin. But this oversimplifies, and fails to take into account that ecotypes are based on such factors as soil type, elevation, exposure, life form, breeding system, and seed dispersal mechanisms.
In order to avoid restored populations with low genetic diversity and limited potential to evolve to a climatically changing environment, ecotypes have been developed from ecoregions or seed transfer zones. When developed by relating patterns of genetic variation among populations to

environmental factors one can achieve a balance between minimizing unintended consequences of moving plant materials and maximizing seed production efficiency and genetic diversity.

Common gardens have been used to examine genetic differences between populations and to identify environmental factors that may cause local adaptation. In a common garden study, all the plants are grown in the same plot under the same environmental conditions. Thus, differences expressed in the plants morphological and phenological traits are due to their underlying genetics not due to the environment. In a study conducted in Oregon, "Can an Ecoregion Serve as a Seed Transfer Zone?" Evidence from a Common Garden Study with Five Native Species (Miller et al., 2010) four of the five species evaluated had compatible populations for combining under a single ecoregion. Their conclusion from this study was "Ecoregions may be appropriate for some species as seed transfer zones in the absence of genetic data to improve the efficiency, economy, and genetic diversity of seeds produced for restoration. This may be especially valid in regions with little variation in topography or climate. At the same time, seed transfer zones of this scale may guard against outbreeding depression and use of poorly adapted genotypes." It is with this carefully managed ecotype approach combined with selective genetic screening that South Texas Natives (STN) and the E. "Kika" de la Garza Plant Materials Center hope will improve their efforts to release commercial seed that is adapted, diverse and appropriate for the landowners of South Texas.

References:

Gustafson, D. J., D. J. Gibson, and D. L. Nickrent. 2005. Using local seed in prairie restoration—data support the paradigm. Native Plants Journal 6:25–28.

Miller, S. A. et al. 2010. Can an Ecoregion Serve as a Seed Transfer Zone? Evidence from a Common Garden Study with Five Native Species. Restoration Ecology, no. doi: 10.1111/j.1526-100X.2010.00702.x

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