Importance of Seed Source

It is important to select a seed source appropriate for the goals and objectives of the prairie restoration. Selecting an appropriate seed source that balance ecological and economic realities may include the following considerations:

- proximity to remnant prairies that might be negatively impacted by introduced genotypes or species
- objective of the planting, i.e., ecological restoration for habitat, biodiversity, aesthetics vs economic use as forage, biomass
- budget and time constraints of the project (cost)

Local ‘Ecotype’ (Genotype)

The term ‘local ecotype’ implies that unique, possibly adaptive, genetic traits (more properly, genotypes) may exist in a remnant population. Seed harvested locally from the remnant, or from nearby remnants, is a desirable seed source for plantings intended as genetic buffers (e.g. to conserve local gene pool) of existing remnants. The challenge of this approach is harvesting enough quality seed from a remnant in a single year to seed the new planting; therefore, the seeding may need to be done in phases over successive years.

The assumption that local seed is always better adapted to a proposed restoration site than non-local seed should be qualified. A single local seed source may be adequate if a large, genetically diverse population is available and seed is collected from throughout the population. Very small or degraded remnants may lack species or genetic diversity appropriate to the site. Seeds/genetics from other remnant populations, have a broad genetic base that favor the odds that the right genotypes are present to best establish and persist in reconstructed (planted) prairie. Seed-source regions (i.e. provenance zones) based on geography, landforms, water sheds, species range distribution, and political boundaries have been variously defined and applied to restoration efforts around the Midwest.

Regional Seed Sources

In the Midwest, remnant prairies are often small and isolated and there may be no local remnant sources of seed over large areas of the landscape. Regional seed sources, pooled from several remnant populations, have a broad genetic base that favor the odds that the right genotypes are present to best establish and persist in reconstructed (planted) prairie. Seed-source regions (i.e. provenance zones) based on geography, landforms, water sheds, species range distribution, and political boundaries have been variously defined and applied to restoration efforts around the Midwest.

Bulk Harvest

Seed can be bulk harvested from prairie with a combine, seed stripper, or flail vac. Diversity will be limited to species in seed at time of harvest and within the cutting height of the combine/stripper. Bulk harvested material is a mixture of seed, chaff, leaves, and stems. A certified seed test for purity, species composition, and weed content is possible, but tests are costly because of the time required to sort material for analysis. Bulk material harvested from a well-managed stand may contain only 10% to 15% seed by weight, so a seeding rate of 10 lbs seed/acre will require 100 to 150 lbs bulk material to be broadcast per acre. Supplementing bulk-harvested material with seed from very low or high growing species, or those that ripen very early or late, is an important consideration since these species may otherwise be unrepresented in the machine harvest. If purchasing bulk material, request a copy of the seed test analysis to be sure of species composition and lack of noxious weeds.

Commercial Seed Sources

We are fortunate in the Midwest to have many native species commercially available, even for large-scale prairie restorations. Providing enough seed for commercial production usually requires growing out source material in nursery or production fields to increase seed quantity. Larger quantity’s usually translates into lower cost, depending on market demand, which can fluctuate widely from year to year. Source material (foundation seed) for commercial production may be from one or more original sources, or more commonly, regional source material.

Source-Identified Seed

Standards for source-identified, or “Yellow Tag” seed, were developed by the Association of Official Seed Certifying Agencies (AOSCA) in the mid 1990’s. Source-identified standards provide a “fast-track” plant material release procedure for commercial production of native species for restoring specific plant communities (Young 1995). AOSCA’s affiliate state crop improvement associations administer the program for participating commercial native seed producers. Source-identified seed may originate from a single source or from several sources pooled together as a regional source. No intentional selection or testing of traits occurs. Original collection sites are documented, and nursery and production fields are inspected and certified annually. Commercially produced seed is marketed with an official AOSCA yellow certification tag, identifying the source and the producer of the material. Hundreds of native species are now available.

Care for Remnants When Harvesting Seed

Producers of bulk harvest seed must take great care to control exotic and invasive species in the stand since they cannot be cleaned out of the material after harvest. Care should be used in cleaning any kind of machinery used in harvesting remnants to avoid contaminating these sites with invasive or non-native species and outside sources of native species. If harvesting from a native prairie remnant, avoid the use of whole-site annual burns, herbicides, fertilizers, or other questionable practices that are detrimental to the long-term ecology of remnant prairie.

To request copies, or for more information, contact:
Greg Houseal at 319.273.3005 or greg.houseal@tallgrassprairiecenter.org
Tallgrass Prairie Center, University of Northern Iowa, Cedar Falls, IA 50614-0294, www.tallgrassprairiecenter.org

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able as source identified seed (ICIA 2010). As the commercial native seed industry has developed, several Midwest states have adopted source-identified seed programs. Individual states differ in their application of source-identified program guidelines regarding native species, so it’s important to check specific policies for the particular state in question.

### Cultivated Varieties (Cultivars)

The USDA Plant Materials Center’s (USDA-PMC) develops cultivated varieties, commonly known as cultivars, of several native grass and forb species. Traditionally, an entire plant or seeds from a plant that exhibited a desired characteristic, such as vigor, were collected for further testing. These collections are evaluated for desired traits in common gardens. A selection of individuals or populations is then made for further breeding and increase. Desired traits include good germination, establishment, high forage yield, height, vigor, and winter hardiness. Cultivars may be desirable for pasture, forage or biomass production. Generally, they are not recommended for prairie restoration because many have been derived from distant sources or have been selectively bred for specific traits, often competitiveness and vigor, possibly narrowing their genetic diversity. If cultivars must be used for reconstructions, two or three different varieties should be used to increase the genetic diversity of the planting.

More recently, USDA-PMC plant selections have reflected the trend toward broad genetic based regional seed sources. Badlands “ecotype” little bluestem (Schizachyrium scoparium) for example, is a composite of 68 accessions (collections) selected for disease resistance from an initial evaluation of 588 vegetative accessions collected from throughout North and South Dakota (at least state or region) as the site where the new population will be created.

A single number of seeds, or seedling grown transplants, from each collection should be planted in the nursery so that all populations contribute roughly equal amounts to the next generation of seed.

### The Importance of Seed Quality (Pure Live Seed)

Seed quality is critically important to the success of a restoration. Seed quality is measured as pure-live seed (PLS), which can only be obtained from a seed test by a certified seed testing lab. This is essential for calculating seeding rates for each species, allowing for a balanced mix of grasses, forbs, shrubs, and sedges. Fortunately, seed quality has improved dramatically as growers gain experience and acquire better equipment for producing, harvesting, and cleaning native species. Seed dispersal apparatus like awns on grass seed and hairy parachutes on forb seed are routinely removed. This means the seed lot can be cleaned to greater purity and viability and will flow more efficiently through the seeding equipment.

Quality native seed is sold on a pure live seed, or PLS basis. Three factors are used to calculate the percentage of pure live seed: purity, germination, and dormancy. Purity is a measure of pure, unbroken crop seed units as a percent by weight of the seed lot. Percent germination is determined by placing seed in a germination chamber for an approved time period. Many species, particularly forbs, have dormancy mechanisms that require several weeks of cold-moist stratification to break dormancy, allowing germination to occur. For most native species, no standard protocol exists for breaking dormancy for germination testing purposes. Therefore, any remaining non-germinated seed is tested biochemically with tetrazolium chloride (TZ), a clear compound that stains living tissue cherry red. The analyt produces the potential viability of stained seed – non-germinated seed considered viable by a TZ test is counted as dormant. A seed test showing a high percentage of dormancy is common in many native forb species and some grasses. This should be expected of natives, particularly in seed lots harvested within the past year. A high percentage of dormancy means much of that seed won’t germinate until dormancy is broken, either artificially or by natural environmental conditions.

PLS is a measure of the proportion of viable seed per unit weight for a given lot of seed. PLS is normally calculated using percent purity and percent germination for crop species. PLS is a measure of the proportion of dormant, yet viable seed, particularly among forb species. The native seed trade recognizes this fact and uses all three factors – purity, germination, and dormancy – to calculate the PLS of any given native seed lot per below:

$$ PLS = \frac{\text{#PLS} \times (\% \text{ purity}) \times (\% \text{ germination} + 69\% \text{ dormant})}{\text{where % is expressed as a proportion, i.e. } 98\% = 0.98} $$

For example, a 50 bulk-pound bag of seed that is 98% pure seed, with 53% germination and 27% dormant seed, really contains only 38-pounds of pure viable seed (seed that potentially will germinate):

$$ \# PLS = \frac{50 \times 0.98 \times 0.52 + 0.27}{0.98} = 388 \text{ PLS} $$

If however, you request 50-pound PLS bag of that same seed, you would receive a bag weighing 64.58-pound bulk.

$$ \text{bulk pounds} = \frac{\# \text{ PLS} \times (\% \text{ purity}) \times (\% \text{ germination} + 69\% \text{ dormant})}{0.98} = 64.58 \text{ bulk pounds} $$

### Literature Cited:

- **ICIA 2010. Native Seed Directory. Iowa Crop Improvement Association, 4611 Mortensen Road, Suite 101, Ames, IA, 50014.**

### Calculating Pure Live Seed Amounts

**Pure seed**

- 0.00 %

**Inert matter**

- 0.00 %

**Other crop**

- 0.00 %

**Weed seeds**

- 0.00 %

**Germination**

- 63.00 %

**Hard seed**

- 0.00 %

**Total germ and hard seed**

- 63.00 %

**Dormant seed**

- 37.00 %

**Irradation**

- 0.00 %

Sample seed test of butterfly milkweed (Asclepias tuberosa) results noting purity, germination, and dormancy.

### Buying Seed

Hundreds of species can now be purchased commercially, either as individual species or custom-mixed for specific site conditions, from moist to dry sites, and from full to partial sun. It is a good idea to review the list of included species to be sure they are native to your area and are of acceptable source for your restoration goals. Expect your seed to be delivered with seed test results attached. Visit Plant Iowa Natives (www.plantiowanatives.com) for more information on native plants, restoration and management, and where to purchase seed of native species in the Midwest.