Developing Native Herbaceous Seed Mixes

A well-planned seed mix is essential to reconstructing a diverse and stable plant community. Selecting species for any native herbaceous planting involves knowing the physical characteristics of the site (soil type, hydrology, slope, aspect, and sunlight exposure) then choosing the most appropriate native plants for that site. All native plantings should include grasses, sedges, and forbs (both legume and non-legume species). The seed mix should also include annual, biennial, and perennial species to foster both early establishment and maintain long-term diversity.

The cost and availability of the seed is often the primary factor in determining which species and how much seed of a species gets included in a seed mix. Seeding calculators are valuable tools to enable practitioners to develop diverse seed mixes within a seed budget. It is also important to consider the source of seed and the ratio of forb to grass species in the mix. A well-planned seed mix will result in a diverse, weed-resistant plant community that will last a lifetime.

The purpose of this technical note is to provide general information on developing native herbaceous seed mixes. If planning mixes for a planting enrolled in a particular program (EQIP, WRE, CRP, etc.), always refer to the applicable program guidance to ensure the mix adheres to program requirements.

Criteria for Species Selection
Selecting the appropriate species of native plants is one of the first steps in planning a reconstruction project. Each soil type is a unique blend of sand, silt, clay, and organic matter that affects how the soil drains and retains water. Every plant species has evolved to grow within a certain range of soil moisture conditions. Planting species that are best adapted to the soil moisture(s) of the site will ensure their persistence in the planting.

Soil Types/Moisture
There are five general soil moisture categories: wet (hydric), wet-mesic, mesic (moderate), dry-mesic, and dry (xeric). Hydric soils include poorly drained, and very poorly-drained soils that typically have standing water for part or most of the growing season. These areas may harbor herbaceous remnants because they were typically too wet to farm or plant to trees. Wet-mesic soils include somewhat poorly drained lighter colored clay soils. Mesic soils include well drained and moderately well drained, dark loamy soils. Dry-mesic soils include somewhat excessively drained soils. Xeric soils include excessively drained sandy or gravelly soils and shallow loam soils often found on steep slopes and ridges.

Slope and Aspect
The site conditions on a slope and the direction it faces (aspect) affect the establishment of native plants. The upper portion of a slope is usually drier than the lower portion; south and west aspects are relatively more xeric than the north and east aspects at the same elevation. Thus, there is a difference in species along the moisture gradient from top to bottom of a slope and around it as the aspect changes. Roadside rights-of-ways in particular often transition from dry to mesic to wet soils in a small area, and the changes in species composition associated with those soils’ moistures can be dramatic. If the slope is gradual and the changes in moisture conditions can be easily seen, seeding species that match the moisture condition of the soil will improve establishment of those species. If the soil moisture gradient isn’t as apparent, slopes can be “shotgun” seeded with all species; including species in the seed mix that match each moisture condition.

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Species Geographic Distribution
Select species that are native to the region of the planting site. If a species is not present in the region of the planting site, it should be left out of the seed mix.

Species Light Requirements
Prairie species do best in full sunlight but will tolerate some shade (up to 20%). If the planting site is adjacent to or within a woodland and is subjected to reduced sunlight, choose species that are adapted to partial shading. More heavily shaded forests should be seeded to a mix of species adapted to heavy shade conditions. Most seed catalogs group species into three light categories (full sun, partial shade or savanna, and shade or woodland).

Species Diversity
A seed mix that includes species from each plant group (warm- and cool-season grasses, legume and non-legume forbs, and sedges) will result in a stable, weed-resistant plant community and it will attract and sustain a greater array of wildlife. A species-rich planting will deter germinating weed seed by being a better competitor for resources. It may be inexpensive on the front end of the project to plant only a few grass and forb species, but eliminating weeds that have invaded a native planting can be difficult and costly down the road. Species-diverse seed mixes should be strongly considered for all native plantings.

Species Phenology
Plants have evolved to take advantage of available resources throughout the growing season. Some grasses and all sedges germinate, grow, and flower in spring or fall (cool-season plants), while others germinate in late spring, and grow and flower in the summer (warm-season grasses). For a planting to resist non-native weed invasion, the planting must include native species from both cool- and warm-season grasses, forbs, and sedges.

Species Life Span
Most species in a seed mix are perennials. The seed mix should also include a limited number of annuals and biennials (<10% of the mix). These species readily germinate and grow large in the first growing season, covering more bare soil, thereby reducing the potential soil erosion. Their rapid growth may reduce weed abundance in early establishment, too. Perennials will provide long-term diversity and stability in the planting.

Appropriate Seed Sources
Seed derived from multiple remnant sources within the region of the planting site may be better adapted to the climate and soils of a site than seed from distant sources. When ordering native seed, it is highly recommended that source identified seed from the Southeast, Georgia, or more local sources be used, when available. For assistance locating source identified seed sources, contact the Mimsie Lanier Center for Native Plant Studies Conservation Coordinator.

Ecotype or cultivar seed improved for purposes other than habitat restoration should be avoided if native plant community restoration and wildlife habitat are primary objectives. The different types of seed releases, the extent of genetic manipulation, and most appropriate uses (according to NRCS Plant Materials Center manual) of each are:

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Cultivar: An assemblage of cultivated plants clearly distinguished by characters (morphological, physiological, cytological, chemical, other) and when reproduced (sexually or asexually) retains these characters. Typically involves purposeful genetic manipulation (e.g. crossing within species, wide hybridization, recurrent selection, gene transfer), but may also follow “natural” track of no purposeful manipulation. High priority need; commercially available materials do not perform adequately over a broad geographical and ecological area; performance testing, range of adaptation, and conservation value shown over a broad area.

Tested: The progeny of plants whose parentage has been tested and has proven genetic superiority or possesses distinctive traits for which the heritability is stable as defined by the certifying agency; seed or plants must be produced to ensure genetic purity and identity from either rigidly controlled and isolated natural stands or individual plants, or seed fields or orchards. Purposeful genetic manipulation may or may not be involved (may follow “genetically manipulated” or “natural” track). High priority need; low number of commercially available, adapted materials; performance testing shown.

Selected: The progeny of phenotypically selected plants of untested parentage that have promise but not proof of genetic superiority or distinctive traits, produced to ensure genetic purity and identity from either rigidly controlled and isolated natural stands or individual plants, or seed fields or orchards. Purposeful genetic manipulation may or may not be involved (may follow “genetically manipulated” or “natural” track. High priority need; lack of (or low number of) commercially available, adapted materials to meet identified need.

Source-Identified: Seed, seedlings, or other propagating materials where no selection or testing of the parent population has been made; produced to ensure genetic purity and identity from either rigidly defined natural stands, seed production areas, seed fields, or orchards. No purposeful genetic manipulation involved (only “natural” track designation). High priority and urgent need; lack of commercially available, adapted materials, to meet need; high potential for immediate use; a local population source exists.

Germplasm: Basic genetic material possessing one or more desirable traits that may be useful in plant improvement, the release of which is in the best interests of U.S. agriculture and the state or agency research program; it should not be expected to enter commercial use. Typically involves purposeful genetic manipulation. Reduced priority for need that initiated evaluation, or material does not meet an NRCS priority and / or has a limitation that NRCS does not wish to overcome

Seed Cost
Deciding how many of the more expensive species to include depends upon the seed budget and the preference of the person paying for the seed. Consider including some expensive forbs in seed mixes; costs can be controlled by lowering seeding rates of the expensive species. We advocate planting for maximum diversity. It is better to include more species in the seed mix and lower seed rates than to plant fewer species with higher seed rates.

Nurse Crops
Nurse crops are usually cereal grains crops that are planted with the natives. The readily germinating seed and quickly maturing plants make nurse crops good competitors against weeds and are effective at holding the soil in place on erodible sites while native seedlings are getting established.
Due to their life history characteristics, nurse crops tend to diminish from the prairie planting by the second or third year.

Nurse Crop Recommendations:

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<thead>
<tr>
<th>Planting Scenario</th>
<th>Nurse Crop</th>
<th>Seeding Rate</th>
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<tbody>
<tr>
<td>Spring planting on a level site</td>
<td>Oats</td>
<td>16 pounds/acre</td>
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<tr>
<td>Spring planting on a sloped site</td>
<td>Oats</td>
<td>32 pounds/acre</td>
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<tr>
<td>Fall planting on a level site</td>
<td>Winter Wheat</td>
<td>15 pounds/acre</td>
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<tr>
<td>Fall planting on a sloped site</td>
<td>Winter Wheat</td>
<td>30 pounds/acre</td>
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Developing a Seed Mix (using the GA NRCS CPA-4 Native Seeding Plan)

High-quality seed of numerous native species is commercially available today. The cost of seed varies greatly by species, but forb seed can be costly. The GA NRCS has developed a CPA-4 Native Seeding Plan to design seed mixes based upon the number of pure live seeds per square foot for each species. Seeding rate is the total number of pure live seeds (PLS) sowed per unit area (seeds per square foot). Go to the GA NRCS eFOTG Section IV Tools folder for a free copy of the Native Seeding Plan. When using the seeing plan, consider the following recommendations.

1. All herbaceous reconstructions should be planted with a minimum of 40 seeds per square foot. Planting fewer than 40 seeds per square foot may result in a weedy plant community. For slopes 3:1 or greater, we recommend 60 to 80 seeds per square foot because of potential loss due to erosion.

2. Always use a nurse crop or mulch on erodible sites.

3. Develop a species-diverse seed mix. Including a minimum of 6 grasses (cool- and warm-season), 3 sedges, and 25 forbs (5 legume and 20 non-legume species) is recommended.

4. A 50:50 mix of grass and sedge to forb seed will produce a planting rich in forbs. Therefore, if the seeding rate is 40 seeds per square foot, 20 seeds per square foot are grass and sedge seed, and 20 seeds per square foot are forb seed.

5. Choose grass, sedge, and forb seed native to your region and most appropriate for the soil moisture conditions of the site.

6. Include annual, biennial, and perennial forb species in the seed mix. Generally, 1 seed per square foot of native annuals and biennials will result in many adult plants. Annuals and biennials should not exceed 10% of the total forb seed. Try to equalize the number of seed per square foot of the perennial forbs as much as your budget will allow.

7. Consider including some expensive species that are appropriate for the site at a seeding rate that you can afford.

8. For a dormant planting, increase the seeds per square foot of warm-season grass species by 25% due to increased seed mortality. For example, if the seed mix contains 20 grass and sedge seeds per square foot for a non-dormant seeding, 30 seeds per square foot should be used for a dormant seeding. A possible exception to this may be switchgrass, which has a hard seed coat that can overwinter. The seeding rate of switch grass need not be changed for a dormant seeding.

9. Planting seed at the proper depth (1/8 to 1/4 inch in most soils, ½-1” in deep sands) and insuring good seed-to-soil contact are essential for any seed to germinate and establish. Proper seed placement is less certain when broadcast-seeding (hydroseeding, hand-seeding, and broadcast/drop seeders). If broadcast-seeding methods re used, seeding rates for grasses, sedges, and forbs should be increased up to 30%.