



Establishing Meadows From Seed in Delaware and the Mid-Atlantic

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Site Identification

Identifying and understanding the dynamics of the meadow site is crucial for success. Sites should have at least 6 hours of sun each day. Meadows can be found in a variety of soil types and are often adapted to varying levels of soil moisture, but the plants found in these conditions will differ. Select native or adapted plant species that fit the sunlight and soil moisture conditions of the site. Altering site conditions can be labor intensive and will likely be temporary, so selecting the right plants is a much better option for meadow success.

Site Preparation

Clear existing vegetation with the use of a non-selective herbicide such as glyphosate. Three to five weeks after an initial application of glyphosate, use a second application to eliminate any surviving vegetation or newly germinated weed seeds. Do not till the area. Tilling will bring existing weed seeds to the surface and has been shown to increase the weed pressure when establishing pollinator habitats (O'Rourke et al., 2017). If possible, remove dead vegetation by a close mowing of the area prior to seeding. Ideally, the site should have 50% or greater bare ground available.

Selecting and Developing a Seed Mix

Numerous seed companies have developed ready-made seed mixes. Pay attention to the site conditions each mix supports. Custom seed mixes can also be easily developed. Seed mixes should contain at least 40% grasses. Studies have shown that using a 1:1 forb to grass ratio in seed mixes are just as efficient in attracting pollinators as mixes that have a ratio of 3:1

forbs to grasses (Meissen et al., 2017). Forb seed is often expensive and can greatly increase the cost of a mix.

Seed mixes are typically calculated in the weight of pure live seeds (PLS) per a given area. Using the weight of PLS compensates for differences in germination and purity of different seed sources. To calculate, take the weight of seed and divide it by the product of the percent purity and the percent germination (e.g., for one ounce of seed at 95% purity x 95% germination, 1.1 ounces will be needed to have one ounce of PLS).

While several methods exist to calculate the amount of seed needed in a mix, the simplest method relies on data from the Natural Resource Conservation Service (NRCS) (Houck, 2009)[1]. A range of seeding rates in pounds of PLS per acre are provided on the plant fact sheets produced by the NRCS. Use the weight needed to establish that species to calculate the amount of that species for the seeded area and then reduce the amount of that species to the percentage they will occupy in the total seed mix. Seeding by up to 2x the recommended rate can have benefits for helping reduce empty space in the meadow that can be colonized by weeds. Do not seed below the calculated seeding rates.

Seeding

Meadow species can differ dramatically in seed size. Some seed will be recognizably larger, while others could be mistaken for dust. To ensure the meadow is seeded evenly, use a carrier. Sawdust works well because it can be spread evenly and once it is moistened, becomes a good germination medium. Additionally, sawdust serves as a mulch and excludes light, reducing the germination of foxtail and crabgrass—two annual weeds often plaguing new

meadows. Use a minimum depth of 1/2" of sawdust. Cat litter and sand are other common carriers.

The outcome of a meadow seeding is heavily influenced in the Mid-Atlantic by the season during which seeding occurs. Fall seeding has been shown to favor grass species, while spring seeding more generally favors forbs. In general, do not seed later than October 31 or May 31 for fall or spring seedings, respectively. Grass seed is generally cheaper and can be seeded over the senescing meadow in the fall if greater grass coverage is desired.

Management and Maintenance

One of the first concerns for a newly seeded meadow is irrigation. Newly seeded meadows should receive between 0.5-2 inches of water weekly for the first month of establishment. Timing the sowing appropriately can allow all water supplied to the meadow to occur through rainfall. Ungerminated seeds are not a concern, as they will wait for sufficient moisture before germinating. Once species begin to establish, less irrigation is required, and supplemental irrigation is only necessary during extreme drought conditions (over two weeks of no measurable rainfall) during the first year of establishment. Once established, no supplemental irrigation is required.


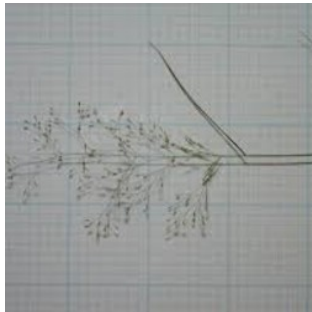

Mow meadows to a height of 6-12 inches to control weeds during the first year of establishment. As weeds begin to outcompete desirable species, mow to just above the height of the desirable species before weeds set seed. Avoid mowing the desirable species if possible. Meadows need periodic disruption to prevent woody species from taking over. In the Mid-Atlantic, meadows eventually transition into deciduous woodland. The easiest way to disrupt a meadow's transition is to mow. Mow meadows to a height of 6-12 inches in either the late fall or early spring before new growth emerges. Early spring mowing allows time for weathering of the meadow, and the vegetation is easier to mow. Some locations are perennially wet in the spring and are better mown the previous fall.






Meadows can also benefit from controlled burns. Controlled burns are typically carried out in early spring to reduce the risk of fires spreading to other areas. Contact your local fire department to discuss



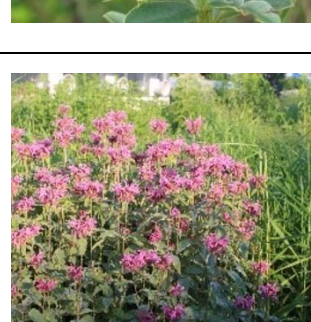


whether a controlled burn is possible or permitted in your area and what precautions should be taken. If the spring is especially wet and plant growth is vigorous, a second mowing in mid-June can be beneficial without reducing fall flowering. Do not mow a meadow more than twice a year after the first year of establishment.

Common Meadow Plants with Proven Success

The following plants have been successful in research at the University of Delaware and Delaware Department of Transportation for meadow use. Species included on this list are tolerant of a wide variety of soil conditions.






	<p>Scientific Name: <i>Agastache foeniculum</i></p> <p>Common Name: Anise hyssop</p> <p>Notes: Highly desirable for honeybees and bumblebees</p>
	<p>Scientific Name: <i>Agrostis perennans</i></p> <p>Common Name: Upland bentgrass</p> <p>Notes: A fall-flowering cool-season grass that establishes well and adds late-season interest</p>
	<p>Scientific Name: <i>Baptisia australis</i></p> <p>Common Name: Blue wild indigo</p> <p>Notes: Baptisias are long-lived and take years to reach flowering size if established from seed. Add to a mature meadow via plugs or plants</p>





	<p>Scientific Name: <i>Chamaecrista fasciculata</i></p> <p>Common Name: Partridge pea</p> <p>Notes: Highly desirable for bumblebees, self-sows yearly into empty spaces</p>
	<p>Scientific Name: <i>Coreopsis lanceolata</i></p> <p>Common Name: Lanceleaf Coreopsis</p> <p>Notes: Many other <i>Coreopsis</i> species are suitable for meadow use as well</p>
	<p>Scientific Name: <i>Echinacea purpurea</i></p> <p>Common Name: Purple coneflower</p> <p>Notes: Many other <i>Echinacea</i> species are suitable for meadow use as well</p>
	<p>Scientific Name: <i>Elymus virginica</i></p> <p>Common Name: Virginia wild rye</p> <p>Notes: A cool-season grass that establishes well and structurally supports meadow communities</p>
	<p>Scientific Name: <i>Festuca rubra</i> ssp. <i>rubra</i></p> <p>Common Name: Creeping red fescue</p> <p>Notes: Commonly used as a turfgrass in shadier areas, provides evergreen coverage throughout meadows</p>

	<p>Scientific Name: <i>Gaillardia pulchella</i></p> <p>Common Name: Indian blanket</p> <p>Notes: Fills in empty spaces readily. Prolific in the first year with less presence as meadow matures</p>
	<p>Scientific Name: <i>Lespedeza capitata</i></p> <p>Common Name: Roundhead bushclover</p> <p>Notes: Attracts a wide variety of bee species during its short flowering time</p>
	<p>Scientific Name: <i>Monarda didyma</i>, <i>Monarda fistulosa</i></p> <p>Common Name: Bee balms</p> <p>Notes: Other <i>Monarda</i> species may be suitable as well</p>
	<p>Scientific Name: <i>Poa palustris</i></p> <p>Common Name: Fowl bluegrass</p> <p>Notes: Establishes quickly and provides strong coverage without overpowering forbs</p>
	<p>Scientific Name: <i>Penstemon digitalis</i></p> <p>Common Name: Foxglove beardtongue</p> <p>Notes: Attracts bumblebees and other native bee species; early flowering</p>

Desirable Species Likely to Colonize Meadows

Save your money and **do not** purchase these species. They will readily colonize the area in time.

	<p>Scientific Name: <i>Pycnanthemum virginianum</i></p> <p>Common Name: Virginia mountainmint</p> <p>Notes: Other <i>Pycnanthemum</i> species may be suitable as well</p>
	<p>Scientific Name: <i>Rudbeckia hirta</i></p> <p>Common Name: Black-eyed Susan</p> <p>Notes: Many other <i>Rudbeckia</i> species are also suitable, though some must mature before flowering. <i>R. hirta</i> flowers in the first year</p>
	<p>Scientific Name: <i>Schizachyrium scoparium</i></p> <p>Common Name: Little bluestem</p> <p>Notes: A common warm-season grass in meadows; may colonize if local populations are nearby</p>
	<p>Scientific Name: <i>Solidago nemoralis</i></p> <p>Common Name: Gray goldenrod</p> <p>Notes: Late flowering; many other <i>Solidago</i> species will colonize themselves</p>
	<p>Scientific Name: <i>Symphotrichum laeve</i></p> <p>Common Name: Smooth blue aster</p> <p>Notes: Late flowering; many other asters will colonize themselves</p>

	<p>Scientific Name: <i>Ageratina altissima</i></p> <p>Common Name: White Snakeroot</p> <p>Notes: A late blooming commonly occurring native</p>
	<p>Scientific Name: <i>Andropogon virginicus</i></p> <p>Common Name: Broomsedge bluestem</p> <p>Notes: A common warm-season grass in the Mid-Atlantic that readily colonizes meadow habitats</p>
	<p>Scientific Name: <i>Asclepias</i> sp.</p> <p>Common Name: Milkweed</p> <p>Notes: There are several species of milkweed that will colonize meadows, nearly all are host plants to specific butterflies.</p>
	<p>Scientific Name: <i>Duchesnea indica</i></p> <p>Common Name: Mock strawberry</p> <p>Notes: This species commonly appears as a groundcover within meadows and is eventually shaded out by taller vegetation</p>



Scientific Name: *Erigeron annuus*

Common Name: Fleabane

Notes: A common annual that will seed into empty spaces in meadows



Scientific Name: *Symphotrichum* sp.

Common Name: Asters

Notes: Many asters will readily colonize meadows, common species include *S. ericoides*, *S. lanceolatum*, and *S. pilosum*



Scientific Name: *Eupatorium* sp.

Common Name: Bonesets

Notes: Many native species that commonly will seed in and hybridize with other species



Scientific Name: *Tridens flavus*

Common Name: Purpletop

Notes: A common warm-season grass that will likely colonize existing meadow spaces



Scientific Name: *Eutrochium* sp.

Common Name: Joe Pye Weed

Notes: Many native species that commonly will seed in and hybridize with other species



Scientific Name: *Verbena stricta*

Common Name: Hoary vervain

Notes: Commonly found in meadows, often in wetter areas



Scientific Name: *Sisyrinchium angustifolium*

Common Name: Narrow leafed blue-eyed grass

Notes: An early blooming species that will colonize meadow spaces



Scientific Name: *Viola sororia*

Common Name: Common blue violet

Notes: Commonly found in lawns and will likely colonize existing meadow spaces



Scientific Name: *Solidago* sp.

Common Name: Goldenrods

Notes: Many goldenrods will readily colonize meadows, these are typically more common species, such as *S. canadensis* and *S. juncea*

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