Grass Drills

Photo of no-till seed drilling. Seeding natives with a Truax FLXII grass and grain drill. No tillage is necessary prior to seeding because this drill is designed to plant the seed into existing sod.

A grass drill is the best way to plant seed into existing sod or firmly packed bare dirt. Grass drills with no-till attachments can plant seed into grass sod without any pre-tillage. Reduced soil erosion and fewer weeds are advantages of no-till drilling into sod. Grass drills work best if the soil and the vegetation are dry and most of the thatch and standing dead material is removed by burning or haying. When operating properly, a no-till drill moves the thatch with trash plows, cuts a shallow furrow, meters the seed at the selected rate, plants the seed 1/8-inch to 1/4-inch deep, and presses the seed into the soil. In some areas, grass drills can be rented from government agencies. Check with your local Natural Resources Conservation Service for information on renting a grass drill. Note – a grass drill is a very specialized piece of equipment and should be operated by a person experienced in their operation.

To achieve the best performance and outcome with a grass drill, the seed must be properly mixed and calibrated and the drill must be operated correctly. The following are some best practices to optimize the use of a grass drill in planting prairie seed.

» Assign each species to the appropriate box based upon seed size and the extent to which the seed has been cleaned (Figure 1; Table 1). Note: Most species can be mixed together if seed is debearded/deawned and dehulled and can be seeded through the rear cool-season/grain box.

» Consider broadcast seeding (by hand or seeder) the very small seed. Some practitioners will hand broadcast very small seed (100,000 seeds or more per ounce) instead of using the grass drill. It is thought that a grass drill plants very small seed too deep. This may work well for smaller sites. However, hand seeding and getting an even coverage of seed in a large planting may not be possible or practical. In this case we recommend mixing all the very small-seeded species (Table 2) together and mix in an equal amount of scoopable kitty litter. Remove one or two discharge tubes from the front small seed box on the grass drill and add the very small seed mix in the well(s) where the tubes were removed. Seed will randomly fall to the soil surface and will get pressed into the soil by the drill and tractor tires as the units pass over.

To request copies, or for more information, call the Tallgrass Prairie Center at 319.273.3836.

Tallgrass Prairie Center, University of Northern Iowa
Cedar Falls, IA 50614-0294
tallgrassprairiecenter.org — 2018

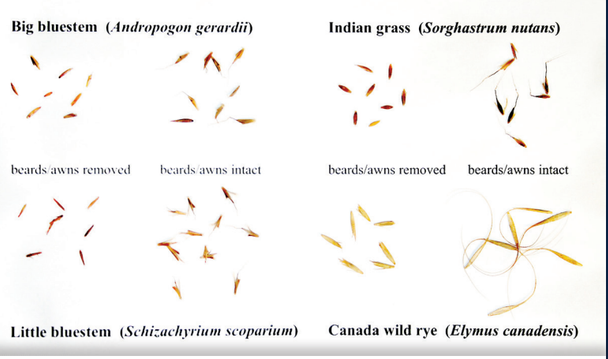
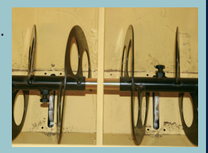


Figure 1. Prairie grass seeds that are debearded and deawned and seeds of the same species with beards and awns intact.

Tips on No-Till Seeding — Drill Seeding

» Add inert material to the seed to increase the volume. Filler should be similar in size to the seed in the mixture. Add scoopable cat litter to the seed that is to go in the front small seed box. For seed in the fluffy seed box, add an equal part of vermiculite. For seed in the cool season/grain box add an equal part of cracked corn.



Closeup of inside of the middle "fluffy" seed box on a no-till drill. The augers and picker wheels are designed to pull apart prairie seed that have their beards and awns intact.

» Calibrate each box separately.

» Always operate a grass drill at the recommended ground speed. Excessive ground speed will cause the drill to improperly plant the seed.

» Adjust the drill when operating. Look for seed not planted in the rows and adjust the drill accordingly.

» Inspect the drill while operating. Avoid drilling in wet conditions. Mud buildup on the depth bands can change the seeding depth. A stiff putty knife works well to remove mud on the depth bands.

» Periodically squeeze and shake the feeder tubes connected to the fluffy and cool-season boxes. Individual compartments within the small seed box should have similar quantities of seed remaining while drilling. A compartment with more seed than the other compartments may indicate a plugged feeder tube.

Different types of filler material that can be mixed with prairie seed to increase its bulk and improve flow through a grass drill.

Barnhart, S. 2002. Improving pasture by frost seeding. Iowa State University Extension Bulletin. PM-856. Iowa State University. Ames, Iowa.

Hemsath, C. 2007. Quantifying granivory in a reconstructed prairie: affects of season, species, seed predators, sacrificial food, and the chemical deterrent capsaicin. Masters Thesis, Department of Biology, University of Northern Iowa. Cedar Falls, Iowa.

Henderson, K. and C. Kern. 1999. Integrated Roadside Vegetation Management Technical Manual. Roadside Management Program. University of Northern Iowa. Cedar Falls, Iowa.

Meyer, M. and V. Gaynor. 2002. Effect of seeding dates on establishment of native grasses. Native Plants Journal. Fall 2002:132-138.

Riley, J. 1957. Soil temperatures as related to corn yield in Iowa. Monthly Weather Review. Dec. 393-400.

West, D. and D. Undersander. 1997. Spring frost seeding. Proceedings of the Wisconsin Forage Production and Use Symposium. Wisconsin Dells. 93-95.

Table 1 – Seed Drill Box Designations of Selected Prairie Species

		Awns, Beards, Hulls	
Grasses	***Genus-Species***	**Removed**	**Intact**
Big bluestem	*Andropogon gerardii*	Rear Box	Middle or Rear Box
Side-oats grama	*Bouteloua curtipendula*	NA*	Middle or Rear Box
Prairie brome	*Bromus kalmii*	NA	Middle or Rear Box
Copper-shoulder oval sedge	*Carex bicknellii*	Front or Rear Box	Front or Rear Box
Plains oval sedge	*Carex brevior*	Front or Rear Box	Front or Rear Box
long-awned bracted sedge	*Carex gravida*	Front or Rear Box	Front or Rear Box
Field oval sedge	*Carex molesta*	Front or Rear Box	Front or Rear Box
Lance-fruited oval sedge	*Carex scoparia*	Front or Rear Box	Front or Rear Box
Common fox sedge	*Carex stipata*	Front or Rear Box	Front or Rear Box
Brown fox sedge	*Carex vulpinoidea*	Front or Rear Box	Front or Rear Box
Canada wildrye	*Elymus canadensis*	Middle or Rear Box	Middle Box
Virginia wild rye	*Elymus virginicus*	Middle or Rear Box	Middle Box
Switchgrass	*Panicum virgatum*	Front or Rear Box	NA
Little bluestem	*Schizachyrium scoparium*	Rear Box	Middle Box
Indian grass	*Sorghastrum nutans*	Middle or Rear Box	Middle or Rear Box
Prairie cordgrass	*Spartina pectinata*	Middle or Rear Box	Middle or Rear Box
Tall dropseed	*Sporobolus compositus*	Front or Rear Box	Front or Rear Box
Prairie dropseed	*Sporobolus heterolepis*	Front or Rear Box	Front or Rear Box
Porcupine grass	*Hesperostipa spartea*	Rear Box	Middle Box
Forbs			
Wild garlic	*Allium canadense*	Middle or Rear Box	NA
Leadplant	*Amorpha canescens*	Front or Rear Box	Middle or Rear Box
Thimbleweed	*Anemone cylindrica*	Front or Rear Box	Middle or Rear Box
Tall thimbleweed	*Anemone virginiana*	Front or Rear Box	Middle or Rear Box
Swamp milkweed	*Asclepias incarnata*	Front or Rear Box	Front or Rear Box
Butterfly milkweed	*Asclepias tuberosa*	Front or Rear Box	Front or Rear Box
Whorled milkweed	*Asclepias verticillata*	Front or Rear Box	Front or Rear Box
Upland white aster	*Aster ptarmicoides*	Front or Rear Box	Middle or Rear Box
Milk vetch	*Astragalus canadensis*	Front or Rear Box	NA
Partridge pea	*Cassia fasiculata*	Front or Rear Box	NA
Prairie coreopsis	*Coreopsis palmata*	Front or Rear Box	NA
White prairie clover	*Dalea candida*	Front or Rear Box	NA
White wild indigo	*Baptisia alba*	Front or Rear Box	NA
Purple prairie clover	*Dalea purpurea*	Front or Rear Box	Front or Rear Box
Showy tick trefoil	*Desmodium canadense*	Front or Rear Box	Front or Rear Box
Pale purple coneflower	*Echinacea pallida*	NA	Rear Box
Rattlesnake master	*Erynigium yuccifolium*	NA	Rear Box
Joe pye weed	*Eupatorium maculatum*	Front or Rear Box	Middle or Rear Box
Tall boneset	*Eupatorium altissimum*	Front or Rear Box	Middle or Rear Box
Bigtooth sunflower	*Helianthus grosseserratus*	NA	Front or Rear Box
Western sunflower	*Helianthus occidentalis*	NA	Front or Rear Box
Prairie sunflower	*Helianthus pauciflorus*	NA	Front or Rear Box
Ox-eye sunflower	*Heliopsis helianthoides*	NA	Front or Rear Box
Round-headed bush clover	*Lespedeza capitata*	Front or Rear Box	Front or Rear Box
Rough blazingstar	*Liatris aspera*	Front or Rear Box	Middle or Rear Box
Meadow blazingstar	*Liatris ligulistylis*	Front or Rear Box	Middle or Rear Box
Prairie blazingstar	*Liatris pycnostachya*	Front or Rear Box	Middle or Rear Box
Michigan lily	*Lilium michiganense*	NA	Rear Box
Wild lupine	*Lupinus perennis*	NA	Front or Rear Box
Wild bergamot	*Monarda fistulosa*	NA	Front or Rear Box
Dotted mint	*Monarda punctata*	NA	Front or Rear Box
Stiff goldenrod	*Oligonueron rigidum*	Front or Rear Box	Middle or Rear Box
Wild quinine	*Parthenium integrifolium*	Front or Rear Box	Middle or Rear Box
Large Fl. beardtongue	*Penstemon grandiflorus*	NA	Front or Rear Box
Prairie phlox	*Phlox pilosa*	NA	Front or Rear Box
Prairie buttercup	*Ranunculus rhomboideus*	NA	Front or Rear Box
Yellow coneflower	*Ratibida pinnata*	NA	Front or Rear Box
Wild rose	*Rosa spp.*	NA	Middle or Rear Box
Black-eyed Susan	*Rudbeckia hirta*	NA	Front or Rear Box
Sweet coneflower	*Rudbeckia subtomentosa*	NA	Front or Rear Box
Wild petunia	*Ruellia humilis*	NA	Front or Rear Box
Rosinweed	*Silphium integrifolium*	NA	Middle or Rear Box
Compass plant	*Silphium laciniatum*	NA	Middle or Rear Box
Smooth blue aster	*Symphyotrichum laevis*	Front or Rear Box	Middle or Rear Box
New england aster	*Symphyotrichum novae-angliae*	Front or Rear Box	Middle or Rear Box
Purple meadow rue	*Thalictrum dasycarpum*	NA	Front or Rear Box
Prairie spiderwort	*Tradescantia bracteata*	NA	Front or Rear Box
Ohio spiderwort	*Tradescantia ohiensis*	NA	Front or Rear Box
Blue vervain	*Verbena hastata*	NA	Front or Rear Box
Hoary vervain	*Verbina stricta*	NA	Front or Rear Box
Ironweed	*Vernonia fasciculata*	Front or Rear Box	Middle or Rear Box
Heartleaf alexanders	*Zizia aptera*	NA	Front or Rear Box
Golden alexanders	*Zizia aurea*	NA	Front or Rear Box

**** NA – Not Applicable***

Funded By
Iowa Living Roadway Trust Fund
University of Northern Iowa

8 Seeding

Content by Dave Williams

PRAIRIE RESTORATION SERIES

Deciding when to plant a prairie is a challenge. Some species establish better when spring-planted, other species establish better when fall-planted and some species are hard to establish whenever they are planted. Seeding rates of some species may need to be increased depending on when and how they are planted.

Prairie seed can be planted by broadcast seeding, hydroseeding, and drill seeding. Regardless of the seeding method used, it is essential that seed be planted at the proper depth and with good seed-to-soil contact.

Seeding Time

Tallgrass prairie plants exhibit a wide range of growth characteristics. With adequate soil moisture, cool-season grasses and many forbs germinate in early spring when minimum soil temperatures are between 39° to 45°F (3° to 7°C), while warm-season grasses germinate in late spring when soil temperatures reach 50° to 56°F (10° to 13°C) (Smith et al. 1998). Real-time soil temperatures for the tallgrass prairie region can be found at *www.greencastonline.com/SoilTempMaps.aspx*. Native seed mixes often contain both cool- and warm-season species, and there is no single best time to plant. However, choosing a planting time to maximize germination and establishment depends upon the species selected and their contribution to the seed mix. A seed mix with a strong forb component (50 percent or greater forb seed) should be dormant-seeded. By contrast, a seed mix of mostly warm-season grasses (70 percent or greater grass seed) should be seeded in mid-spring.

Tallgrass Prairie Center
UNI University of Northern Iowa.
tallgrassprairiecenter.org

Dormant Seeding (Soil temperatures between 32°-38°F, 0°-3.3°C)

A dormant seeding is defined as planting seed during a time when there is the least chance of germination and seed will lie dormant for several months. For most of the tallgrass prairie region, dormant seeding can begin in early November. Early onset of very cold weather in the fall, or cold weather into late winter, can extend the calendar times for dormant seeding. The benefits of dormant seeding are twofold. First, seeding when soil temperatures are below 39°F (3.9°C) ensures that there is no germination of the natives until the following spring when environmental conditions are suitable for germination and growth. Second, dormant seeding benefits forbs by permitting stratification which improves germination. We recommend that dormant seeding be done only if the seed can be planted into the soil (1/8- to 1/4-inch deep) and packed. Seed broadcasted onto ice or frozen ground is not recommended as it will expose the seed to wind erosion and predation. Dormant planting mimics the natural process of seed ripening and autumn/winter dispersal of many prairie species. However, dormant seeding of most native grasses, except switchgrass (*Panicum virgatum*) and Canada wild rye (*Elymus canadensis*) increases seed mortality (Meyer and Gaynor 2002). If the seed mix contains 50:50 forb seed to grass seed or greater, dormant seeding should be considered. Grass seed should be increased by 25 percent if dormant seeded to compensate for seed loss (Henderson and Kern 1999).

Spring Seeding (Late March to Mid-June)

There is a wide range of soil temperatures in spring. Spring soil temperatures (1-inch deep) in Iowa range from 35°F (2°C) in late March to over 70°F (21°C) in mid-June (Riley 1957). The specific time of year the site is seeded will determine which species are favored in the seed mix. Early spring seeding favors cool-season grasses, sedges, and some forbs. The window for germination of cool-season plants diminishes as soil temperatures increase throughout spring. A late spring seeding favors warm-season grasses and some forbs. Spring seeding may not permit adequate stratification for some forbs to break dormancy. Non-germinated seed will remain in the soil until conditions are appropriate for germination.

Summer Seeding (July to September)

Planting mid- and late-summer is risky business. Newly germinated seedlings exposed to excessive heat and drought will perish. In addition, many prairie species require 2–6 weeks to germinate. By the end of the growing season, it is likely that seedlings may be too small to survive the winter. Seeding natives during this time is not recommended.

Seeds on cracked soil. Prairie seeds can become incorporated into the soil by the cracks that are created by freeze-thaw cycles in late winter.

Frost Seeding (February to March)

Frost seeding is a special form of dormant seeding done at the tail-end of winter when temperatures are below freezing at night and above freezing during the daytime. If the soil surface is free of snow or ice, seed can either be drilled or broadcast. The freeze-thaw action creates small cracks in the soil and allows seeds to settle into it. The effect on germination of prairie grass and forb seed by a frost seeding as compared to other seeding times is unknown. However, research on non-native legumes has shown that frost seeding can improve seed germination, but an unusually dry and warm spring can result in poor establishment (Barnhart 2002). In addition, the effect on germination of non-native cool-season grasses that are frost seeded can vary and is not recommended for some species (West et al. 1997). The benefit of frost seeding prairie seed may be related to the length of time the seed remains in the soil before germinating. As compared to a dormant seeding in November, frost seeding reduces the time seed remains in the soil before germination and may reduce seed mortality from pathogens and/or granivory (Hemsath 2007). We believe that frost seeding can be a good time to seed for most native seed mixes. We recommend seeding with a no-till grass drill to maximize seed-to-soil contact. If broadcast seeding is used, the seeding rate should be increased by 25% to compensate for seed loss due to wind erosion and predation (Henderson and Kern 1999). Frost seeding is not recommended on eroded sites with rills and gullies. If the site is prone to erosion, sow oats (up to 1 bushel per acre) with the prairie seed and/or a mulch should be applied and crimped into the soil to keep the seed in place. See guide #7 in this series, "Site Preparation," for more information.

Seeding Methods

Planting seed at the proper depth with good seed-to-soil contact is essential. Seed planted too deep will not emerge, resulting in poor stand establishment. Likewise, seed not covered by soil can germinate, desiccate, and die. It's the responsibility of the person(s) actually doing the seeding to ensure that seed is planted correctly. This requires periodic checking of the planted seed and the equipment during seeding.

Broadcast Seeding

Broadcast seeders range from tractor- and ATV-mounted implements to handheld seeders or simple hand-broadcast seeding. This method can be a low-cost way to seed your prairie. An inexpensive handheld fertilizer spreader, available at your local hardware store, can be used for seeding.

To assure that the seed is evenly distributed over the planting site, the seed must be properly mixed and the seeding rate carefully calculated. The seed should be mixed in equal parts with inert material such as vermiculite, cracked corn, or kitty litter. This will increase the volume of the seed. Because of improvements in seed cleaning, the volume of prairie seed needed to plant a smaller site (1 acre (.04 hectare) or less) may not fill a 5-gallon bucket. Mixing any of these materials with the prairie seed will improve the seed flow through the seeder, and will make calculating the seeding rate much easier. Seed can be mixed in a plastic tub by hand or on a concrete slab using a flat shovel. If you use a mechanical seeder, calibrate the equipment before sowing seed and follow the calibration procedure as listed in the owner's manual. If seed is hand broadcasted, divide seed by half and sow each half over the entire site so the site is seeded twice. This will ensure even seed dispersal and distribution over the site. After seeding, seed should be incorporated into the soil to improve seed-to-soil contact. Incorporating seed into the soil can be done by dragging a piece of heavy chain, or a piece of chain link fencing, or using a drag harrow, or raking seed in with a garden rake. Drag, harrow, or rake until the seed disappears. Finally, pack the soil with a cultipacker or lawn roller.

Broadcast seeding with a Viacon fertilizer spreader and dragging a piece of fencing to incorporate the seed into the soil.

Seeding natives with a Brillion grass seeder. Seed is dropped in between two steel wheel gangs - one conditions the soil and the other cultipacks the seed.

Table 2. Seed that Should be Broadcasted

Small-seeded prairie species that can be broadcasted onto the surface without incorporating into the soil.

Grasses/Sedges	*Scientific Name*	Moisture Class*	Seeds/Oz.
Blue Joint Grass	*Calamagrostis canadensis*	W-M	248,880
Brown Fox sedge	*Carex vulpinoidea*	W-M	100,000
Fowl Manna Grass	*Glyceria striata*	W-M	160,000
June Grass	*Koeleria macrantha*	D	400,000
Forbs			
Prairie Sage	*Artemisia ludoviciana*	M-D	250,000
Heath Aster	*Symphyotrichum ericoides*	M-D	200,000
Silky Aster	*Symphyotrichum sericeus*	D	476,000
Harebell	*Campanula rotundifolia*	D	900,000
Bottle Gentian	*Gentiana andrewsii*	W-M	280,000
Sneezeweed	*Helenium autumnale*	W-M	130,000
Great St. Johns Wort	*Hypericum ascyron*	W-M	190,000
Great Blue Lobelia	*Lobelia siphilitica*	W-M	500,000
Foxglove Beardtongue	*Penstemon digitalis*	M	130,000
Common Mt. Mint	*Pycnanthemum virginianum*	W-M	220,000
Grass Leaved Goldenrod	*Euthamia graminifolia*	W-M	200,000
Old Field Goldenrod	*Solidago nemoralis*	D	300,000
Showy Goldenrod	*Solidago speciosa*	M-D	103,600
Culver's Root	*Veronicastrum virginicum*	W-M	800,000

W
Wet soils - Water drains very slowly, resulting in standing water at or near the surface for most of the year.

M
Mesic soils - Water drains readily from the soil but soil remains moist for most of the year.

D
Dry soils - Water drains rapidly, resulting in dry soil for most of the year.

Hydroseeding

Hydroseeding is a unique seeding method where seed is mixed with water, mulch, and tackifier to form a slurry that is sprayed directly on the ground. Many county road departments and some landscaping companies use hydroseeding to seed prairie. While this method of seeding is restricted to professionals, you may decide to hire a local company to hydroseed your prairie. We recommend that your seeding contractor hydroseed with a two-step process. The first step is to broadcast the seed (see the Broadcast Seeding subsection). The second step is to spray the hydromulch slurry (without seed) over the seeded area. This two-step process will help ensure that the seed is not suspended in the mulch where it can desiccate. Additives can be included in the slurry to reduce soil erosion.