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## Summary

*This report, addressing native grass pastures, is one of a set of seven describing practices supported by the Grasslands Partnership project. Guidelines for establishment of native grass (e.g., big bluestem, switchgrass) pastures including site, species, and cultivar selection. Guidance is also provided for competition control prior to and following seeding, no-till and conventional approaches, seeding rates and dates, herbicide options, and management following the seedling year.*

# NATIVE GRASS FORAGE PRACTICE GUIDELINES

## INTRODUCTION

Native warm-season grasses are bunch grasses indigenous to North America that grow during the warm months of the year (i.e., late April through early September). The optimum temperature for warm-season grass production is 85-95 F. Once established, native grasses' deep root systems (potentially as deep as 8-12 feet) and C<sub>4</sub> photosynthesis allow them to remain productive and survive prolonged drought events. Some species are also tolerant to prolonged flooding. These native grasses are adapted to grow in more acidic and less fertile soils than most introduced forage species. Once established, native grasses work well for grazing and wildlife habitat and provide high-quality summer grazing for many years if managed correctly. Of particular interest is that because of their large root systems, they can transfer large amounts of carbon into the soil and can do so with minimal inputs.

## SPECIES SELECTION AND ESTABLISHMENT PREPARATION

### Species Selection

We focus on two forage options: 1) a 3-way blend of big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), and indiangrass (*Sorghastrum nutans*), and 2) switchgrass (*Panicum virgatum*). Switchgrass will be planted as a single species. While switchgrass can be planted on well drained, upland sites, it is preferable to the big bluestem blend on more poorly drained sites; the blend does not do well on poorly drained sites.

### Seed Characteristics

Because the bluestems and indiangrass seed have long awns that make the seed "fluffy," it may be necessary to use a drill equipped with a specialized "native grass box" or to sow. For bearded bluestems and indiangrass, as well as switchgrass, such a drill will not be necessary. Switchgrass should be planted using the small seed (i.e., "clover") box on most drills.

**Cultivar Selection**

When selecting a cultivar, choose one with an origin close to the planting site. Those from farther south than the planting site will normally perform better than those from substantially (greater than 200 miles) farther north. On the other hand, southern origin plant material moved too far north has increased risk of winter-kill. We will prioritize use of lowland types (e.g., 'Alamo' and 'Kanlow') for switchgrass. While they can do well on drier sites, they have exceptional tolerance to flooding and prolonged soil inundation. Lowland varieties are more robust than the upland types and thus produce more forage and likely more root mass for soil carbon storage.

**Site Selection**

Sites with low potential for weed pressure such as newly cleared forest and land being taken out of row crop production are preferable. If planting into fields with a long history of no-till crop production, attention must be paid to glyphosate-resistant weeds. Old hayfields or pastures are typically more challenging sites because of weed competition. The most challenging sites are those dominated by warm-season perennial grasses such as johnsongrass and bermudagrass.

One other consideration for selecting a site to establish native grasses is its current value for forage production. Marginal sites, those that are very wet, droughty, or have not been productive are all good candidates. Poor, degraded pastures are another good alternative – those that need to be renovated or reestablished regardless of what grasses are planted. Finally, as mentioned above, sites that have not recently been in grass (e.g., newly cleared or former crop ground) are good candidates. No more than 20-40% of a forage base should be planted to warm-season perennials with the greater proportion at the southern end of the fescue belt and the lower proportion at the northern end of this region.

**Controlling Competition from Weeds Prior to Planting**

Native grasses are slow to germinate, have slow initial growth, and put most of their energy into growing strong root systems early in their development rather than substantive amounts of top growth. Therefore, it is critical to be aggressive in reducing competition prior to planting.

Warm-season annual grasses, such as crabgrass, yellow foxtail, and broadleaf signalgrass, must be controlled prior to planting. One option is to use a summer crop rotation (e.g., corn, soybeans) the year prior to seeding. Another strategy is to allow the initial flush of these warm-season annual species to occur and then apply 1.0-1.5 quarts of glyphosate per acre once these annual seedlings are 3-4 inches tall. In fields where severe pressure from these annual grasses is expected, consider allowing a second flush of these summer annual weeds followed by a second application of this rate of glyphosate prior to planting.

If establishing a stand into a site with existing cool-season perennial grass species (e.g., tall fescue, orchardgrass), spray the area in October or November with 1.5 – 2.0 quarts of glyphosate per acre (assuming a 4-pound active ingredient per gallon formulation). Follow this up with another application at the same rate when these cool-season grasses begin significant growth in the spring. Alternatively, you could plant a cool-season annual (but not annual ryegrass) following the fall herbicide application to help suppress the cool-season perennial grasses, prevent erosion and provide a forage crop. In this

situation, the cool-season annual growth should be managed to leave only minimal residue. Therefore, these fields should be grazed aggressively in late winter/early spring or harvested for a hay, baleage or silage crop by mid-April. A second application of glyphosate at a rate of 1.0-2.0 quarts per acre (depending on how many perennial competitors remain on the field) should still be applied to the grazed or harvested field after 7-10 days of regrowth to kill the cool-season annual and any cool-season perennials that may have escaped during the previous fall's spraying. If the site has a mix of cool-season perennials and warm-season perennials, initiate this weed control regimen in August rather than October/November in the year prior to establishment.

If the site contains appreciable amounts of bermudagrass, bahiagrass, johnsongrass, or dallisgrass, spray the area in August-September with 4.0 quarts of glyphosate per acre. If there is any regrowth of these warm-season competitors prior to fall dormancy, re-treat these, perhaps with only spot spraying. If there are any of these grasses apparent the next spring, apply another application at the same rate once they begin significant growth.

Herbicides containing imazapic (Plateau, Panoramic and Impose) provide very good control of many of the most problematic grassy weeds and can be used prior to establishment and on newly established stands of big bluestem, little bluestem, and indiagrass. However, it is very injurious to switchgrass. It is best to use boomed sprayers for all pre-plant applications for uniform application.

**Table 1.** Application rates, timing restrictions and classes of weeds controlled for herbicides labeled for use in native warm-season grasses during establishment.\*

Active Ingredient	Herbicide	Rate per acre	Timing Restrictions	Weeds Controlled <sup>1</sup>
2,4-D Amine	2,4-D Amine 4L	1-1.5 pts	> 4 leaf	BL
metsulfuron methyl + chlorsulfuron	Cimarron Plus	0.6-1.5 oz.	> 4 leaf	BL
aminopyralid+2,4-D	GrazonNext HL	1.5-2.6 pts	tillering <sup>2</sup>	BL
aminopyralid	Milestone	4-7 oz.	tillering <sup>2</sup>	BL
triclopyr+fluroxypr	PastureGard	2-3 pts	tillering <sup>2</sup>	BL
imazapic <sup>3</sup>	Plateau, Impose, Panoramic	2-12 oz.	PRE, Established	G, <i>BL</i>
sulfosulfuron	Outrider <sup>4</sup>	0.75-2.0 oz.	Well-established	G, <i>BL</i>
nicosulfuron	Accent 75DF <sup>5</sup>	0.67 oz.	> 4- leaf stage	G, <i>BL</i>

\*Notes: (1) Check label to ensure it is recommended for the species of native grass(es) in the planting. (2) See UT Extension publication SP 731-F *Competition Control in Native Warm-season Grasses Grown for Livestock Forage in the Mid-South* for additional information.

<sup>1</sup> BL=broadleaf, G=grass. If italicized, control is very select or marginal.

<sup>2</sup> Only apply on vigorous seedlings that have developed multiple tillers.

<sup>3</sup> Will cause severe damage or death of switchgrass during establishment and substantial stunting mature switchgrass.

<sup>4</sup> CRP or non-forage or non-crop uses.

<sup>5</sup> Labeled for native grasses in only some areas of Tennessee.

## PLANTING

Native grasses can be effectively established by either no-till or conventional methods. In both cases, the key to success is ensuring a high-quality seedbed with a minimum amount of thatch and weed competition. Competition control is the single most important factor in successfully establishing native grasses. Therefore, care must be taken to ensure it has been conducted thoroughly regardless of which approach to establishment you choose.

### No-till Establishment of Native Grasses

The first step is to manage the existing vegetation through grazing, haying, burning or mowing to remove excessive cover or thatch prior to spraying the first time. The next step is to kill existing vegetation as described above. Starting early (the summer or fall preceding the planting) is always preferable and provides more effective competition control. Whether you spray in fall and again in spring (preferred approach) or spring only, you need to be prepared to make multiple treatments, typically two or three, to ensure adequate competition control. Because this project is focused on increasing soil carbon levels, and tillage reduces soil carbon, no-till is preferred for this project and should be used unless there is a compelling reason not to.

### Establishing Native Grasses Using Conventional Seedbeds

To be effective at suppression of existing perennial grasses, deep tillage is preferable but disking repeatedly (3 or more times) can also work. The last tillage pass should be timed to ensure that summer annual seedlings are destroyed. Another critical issue in using tillage is ensuring that the seedbed is fine textured and firm. A good rule of thumb is that the imprint of your boot should be no more than one-quarter inch deep (Figure 1). To achieve this firmness, you may need to use a cultipacker, possibly two or more passes, prior to seeding. Allowing rainfall to firm up the tilled ground may be effective as well.

Conventional seedbeds allow use of conventional drills, no-till drills (which may need to be adjusted to keep them from being too aggressive in the absence of a sod), drop-type seeders, or with cyclone-type spreaders. However, when sowing, increase the seeding rate by 25 percent. Also, to ensure a more uniform distribution of seed when sowing, consider cross-seeding (at a 90-degree angle) and/or blending the seed with a carrier, such as pelletized lime.

### Planting Depth

Target depth for native grasses is one-eighth to one-quarter inch. Achieving these shallow planting depths reliably will require careful attention to drill settings. A good rule of thumb is that when you walk behind a drill, you should see about 15-20 percent of the length of that drill row, on average, with seed visible on the



*Figure 1. In a well-prepared seedbed, the soil should be so firm that your boot is no deeper than one-quarter inch.*

surface of the ground. Sowing will keep seed shallow—as long as the seedbed is firm—but typically will require covering with very light drag and/or a cultipacker to ensure good soil coverage.

### Seeding Rates

Seeding rate for the big bluestem blend is 10 (drilled) or 13 (sowed) lbs pure live seed (PLS) per acre with a ratio of approximately 6:3:1 of big bluestem, indiangrass, and little bluestem, respectively. For switchgrass, rates are 6 (drilled) and 8 (sowed) lbs PLS per acre. Note that all seeding rates must be based on pure live seed, the proportion of the bulk seed that is germinable and does not include inert matter or weed seeds.

### Seeding Dates

Native grass seed begins to germinate at soil temperatures above 60 F with more rapid germination beginning at soil temperatures above 65 F. Seeding can be successful across a wide range of dates, from January through early July, as long as soil moisture is adequate. Acceptable seedling-year stand densities are most consistently achieved by March plantings. For such stands, control of cool-season weeds during spring must be addressed. However, timing is critical, and spraying must take place before emergence of native grass seedlings (late March-early April). Because of the shallow planting depth of the native grass seed, tillage is not an option for controlling these cool-season weeds.

Although successful stands have been established with seeding dates as late as early to mid-July, such late plantings are riskier with limited soil moisture being the main concern. However, if you have a high-quality seedbed and are prepared to plant at this time of year, it can be quite successful as long as soil moisture is adequate and weather patterns are still favorable.

The wide range of acceptable seeding dates underscores the importance of planting when soil moisture is good but also when competition has been controlled adequately. Put another way, do not get into a rush to plant. Instead, wait to plant until you have done a **thorough** job of weed control.

## FOLLOW UP DURING THE SEEDLING YEAR

During the seedling year, it is critical to control weeds that form a canopy above the native grass seedlings. Clipping with a mower above the seedlings is often the best way to control these weeds. By mid- to late August, unless weed problems are especially severe, it is better to avoid defoliating the seedlings and allow them to conserve their energy for fall dormancy.

A second option is to rapidly graze off the weed canopy within a 24–48 hour period in order to minimize damage to the native grass seedlings. Grazing will be an effective weed control tool only when the plants (“weeds”) to be grazed are readily selected by the grazing livestock, such as crabgrass and seedling johnsongrass. It will be important that grazing occurs when these species are in the vegetative stage and before they become too mature or set seed.

A third option for weed control is herbicides (Table 1). Herbicides should be used only when seedlings are large enough to not be injured by spraying. This threshold varies by the herbicide in question, but in all cases will occur after the four-leaf stage. Once seedlings have developed tillers, seedlings are much

less susceptible to injury. However, one downside to using these herbicides during the seedling year is that they may arrest germination of viable seed that remains in the ground. Because native grasses may continue to germinate and recruit seedlings into the stand even into late summer, applying an herbicide should be avoided unless plant populations are acceptable — or the weed pressure is threatening the success of the planting.

If none of the other options listed above will work, taking a hay harvest could also be considered. This approach is less desirable because of the height at which the native grass seedlings will be cut. Setting the mower to cut to an 8-inch residual height will help but may still result in heavy defoliation of the seedlings.

### **Seedling Year Fertility Management**

As long as levels of phosphorous and potassium are not in the “low” range per soil test, there is no need to amend soils. Do not add any supplemental N either prior to or following planting during the seedling year as this can enhance weed pressure. Finally, native grasses are not as sensitive to acidic soils as many other common forage grasses. Therefore, as long as the pH is above 5.0, lime does not need to be applied.

### **Evaluating Success**

A plant population of at least one plant per square foot is the target. Do not be concerned so much about the size of the seedlings the first season. As long as the plants have tillered, they will survive the first winter and produce a good stand.

Because native grasses may not germinate in any appreciable numbers for three to five weeks after planting (or, in the case of dormant-season plantings, after soil temperature thresholds have been reached), do not be concerned during this early stage in the process. Check the field at the four to five-week mark and again over the next two to three weeks to determine what sort of stand is developing. Seedling numbers should increase during this period (i.e., four to seven weeks post-planting) and, if all goes well, by the eighth week clear drill rows should be apparent. Many producers have given up too quickly on perfectly good stands because they are not prepared for this slow germination and the small initial size of the seedlings. If the stand has less than one plant per 2 square feet, the pasture should be overseeded or re-established entirely.

## **SECOND-YEAR MANAGEMENT**

Native grass stands are normally ready to graze the second spring (i.e., approximately 12-13 months after planting). However, weed control measures are often needed in April (cool-season weeds) and/or May (warm-season weeds) for second-year stands. Refer to Table 1 and UT Extension publication SP 731-F *Competition Control in Native Warm-season Grasses Grown for Livestock Forage in the Mid-South* for additional information on herbicide options.

Application of N during the second year can boost yields but should occur only if weed pressure is low and the native grasses dominate the site. Do not apply N until the grasses are actively growing and are

at least 10-12 inches tall, which typically will occur in mid- to late April. Application of more than 60 units of N during the second year will not be cost effective and can lead to increased weed pressure.

Native grasses continue to develop during the second year. In fact, they will achieve only about 70 percent of their potential yield by the end of the second growing season. For this reason, it is critical to be diligent in maintaining minimum canopy heights during grazing (>16 inches) and hay harvest (8-inch residual height; see UT Extension publication *SP 731-I Adjusting Mowing Equipment for Increased Stubble Heights When Harvesting Native Grasses*. Take only a single hay harvest during May (switchgrass) or June (bluestem blend) and end grazing for all species by early August to allow ample rest and enough energy for the stand to complete its maturation process. Excessive pressure, beyond what has been described above, can be very detrimental to the development and long-term productivity of the stand.

## **SECOND-YEAR MANAGEMENT, PRESCRIBED FIRE**

Prescribed fire (also referred to as controlled burning) is another approach to eliminate existing weeds and destroy exposed weed seed. Fire enhances growth of the native grasses through increased nutrient availability and elevated soil temperatures. Timing of the prescribed fire should correspond to dormancy break of the native grasses, typically late March or early April. Additional guidelines are available in the publication [Using Prescribed Fire to Manage Native Grass Forages in the Mid-South](#) developed by the UT Center for Native Grasslands Management.

Each state establishes guidelines or regulations for prescribed fire to maximize safety. All applicable guidelines and regulations in your state and local regulatory authorities must be adhered to. Safety is the top priority in the use of prescribed fire.

## **DATA COLLECTION**

Just following dormancy of the seedling year, a plant count (20 plots of 2.75 sqft each per pasture) is to be completed to document initial stand success. An inventory of plant species will be measured in August annually using the step-point method with a minimum of 30 evaluation locations within each pasture. A running record of number of grazing days within the native grass pasture along with class and approximate weight of animals will be recorded. The full grazing season for both the “business as usual” stocking and rotational stocking systems will be evaluated. Forage height will be periodically measured. Height measurements (in inches) will be done just prior to when livestock rotate from-and-to the pasture. Pictures will be taken throughout the project to support data and shared in a Grasslands Partnership central file. The above data will be recorded in a Grasslands Partnership spreadsheet template that will be provided by the Extension Service Agent who will work in collaboration with the producer to collect data.

## **SUMMARY**

Native grasses require attention to detail for establishment to be successful. Competition control is the single biggest challenge. Be prepared to select sites that are likely to have less weed pressure, begin

weed control measures the summer or fall prior to expected seeding, and continue to address weed canopies through the summer of the seedling year. Other important factors are seeding depth and seed dormancy. All of these are issues that can be handled simply by paying attention to the process and being timely in implementation. Weather is easily the other biggest factor in determining the success of a planting project. Drought or excessive rainfall are problems, but in both cases, are out of our control. However, native grasses are more resilient to extreme weather events than introduced forage species.

## ADDITIONAL RESOURCES

Keyser, P., Hancock, D., Marks, L., Dillard, L. 2019. [Establishing Native Grass Forages in the Southeast](#). PB 1873.

Keyser, P.D. 2021. Native Grass Forages for the Eastern United States. PB 1893, University of Tennessee Extension. [Native Grass Forages for the Eastern US | Center for Native Grasslands Management \(tennessee.edu\)](#).

UT Extension publication SP 731-I. [Adjusting Mowing Equipment for Increased Stubble Heights When Harvesting Native Grasses](#).

UT Extension publication SP 731-F. [Competition Control in Native Warm-season Grasses Grown for Livestock Forage in the Mid-South](#).

UT Extension publication SP 731-J. [Using Prescribed Fire to Manage Native Grass Forages in the Mid-South](#).

UT Center for Native Grasslands Management. *Native Grass College*.  
<https://nativegrasses.tennessee.edu/native-grass-college/>.