

NATIVE WARM-SEASON GRASSES FOR FORAGE

UofA **DIVISION OF AGRICULTURE**
RESEARCH & EXTENSION
University of Arkansas System



Table of Contents

What Are Native Warm-Season Grasses?	3
What Are the Advantages and Disadvantages of NWSG?	3
Recommended Species	3
Big Bluestem	3
Little Bluestem	4
Indiangrass	4
Switchgrass	5
Eastern Gamagrass	6
Establishment	6
Planting Dates	7
Planting Methods	8
Planting Rates	9
Calculating Pure Live Seed (PLS)	9
Weed Control in the Seeding Year	10
Evaluating Stands	10
Fertilization	10
Harvesting NWSG for Forage	11
Arkansas Demonstration Results	11

Authors

DR. JOHN JENNINGS is Extension professor - forages (Little Rock), **KENNY SIMON** is program associate - forages (Little Rock), **MICHELLE MOBLEY** is county Extension agent - staff chair, Cleburne County (Heber Springs), **HANK CHANEY** is area ANR specialist (Conway), and **DON HUBBELL** is resident director in charge, Livestock and Forestry Research Station (Batesville). All are faculty of the University of Arkansas System Division of Agriculture.

Native Warm-Season Grasses for Forage

By: John Jennings, Kenny Simon, Michelle Mobley, Hank Chaney, and Don Hubbell

What Are Native Warm-Season Grasses?

Native warm-season grasses (NWSG) are tall-growing bunch grasses grown for livestock forage and wildlife cover. These grasses grew native throughout Arkansas before the first settlers arrived and are members of a group commonly known as prairie grass in Kansas and the upper Midwest. NWSG were grazed by bison and elk in pre-settlement days and were later grazed by free-ranging livestock. Over time, they were grazed out in Arkansas pastures and replaced by more grazing-tolerant species like tall fescue and bermudagrass. They can still be seen in summer growing along roadsides and railroads.

What Are the Advantages and Disadvantages of NWSG?

Two primary reasons that more native warm-season grasses are not grown for forage are that they require specific establishment procedures and they do not tolerate abusive grazing or harvest management as well as tall fescue or bermudagrass. However, they are productive and produce good quality forage when well-managed. They can have several advantages over introduced forage species if a producer is willing to manage them correctly. They provide good wildlife cover and fit well in a livestock system where quail and rabbits are of strong interest.

Advantages of NWSG

- Perennial warm-season grasses.
- Good summer production when tall fescue is unproductive.
- Good forage quality, animal gains, and forage yield.
- Forage yield potential is similar to bermudagrass.
- Lower fertilizer requirement than for bermudagrass.
- Adapted to a wide range of soil types.

- Few pest problems.
- Drought tolerant.
- Provides good cover for quail, rabbits, and other ground-nesting wildlife.

Disadvantages of NWSG

- Slow to establish without good management.
- Weed control is imperative during establishment.
- Seed can be expensive.
- Requires attentive management to maintain stands.
- Does not tolerate short, abusive grazing like tall fescue and bermudagrass.
- Good yield potential but short grazing season (May 1-September 15 on mature stands).

Recommended Species

Typical native grasses grown as forage in Arkansas include big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), and eastern gamagrass (*Tripsacum dactyloides*). These grasses are adapted statewide although each may have site-specific requirements.

NWSG should be selected with consideration for its intended use as either pasture or hay production. If NWSG will be used for summer pasture, some consideration should be given to availability of shade, water and possibly cross-fencing, and logistics for moving cattle among pastures at that time of year. Also NWSG, particularly switchgrass, may need to be periodically cut for hay so topography and site roughness should also be taken into account. Some suggested well-adapted varieties are listed below.

Big Bluestem

Big bluestem (Figure 1) is a very leafy forage and may be the best of the NWSG for livestock. Yields are not as high as that of switchgrass, but it has a more



FIGURE 1. Field of big bluestem.

Photo taken August 2014 at the Livestock and Forestry Research Station, Batesville, AR

consistent seasonal growth curve, making it is easier to manage. It tends to mature somewhat later than switchgrass and has less production overlap with typical cool-season grass/clover forages. Big bluestem grows best on well-drained soils and does not tolerate wet sites as well as switchgrass or eastern gamagrass.

OZ-70

- OZ-70 was developed from plant material collected from a number of locations in the Mid-South.
- Widely adapted

Rountree

- An older, widely available variety developed from plant material collected in western Iowa.
- It does well in the Mid-South and is probably a better choice than varieties developed in the Great Plains.

Hampton

- Developed at the USDA-ARS Plant Materials Center in Booneville, Arkansas. Seed availability may be limited.

Little Bluestem

Little bluestem (Figure 2) is a much smaller grass that produces less forage than the other NWSG. It can help fill-in stands when planted in mixtures with big bluestem or indiangrass, especially on poor soils. It is more tolerant of poor soils than any of the other NWSG and is easier to establish. After big bluestem, it is the most preferred NWSG by cattle.

Aldous

- Derived from plant material collected in east-central Kansas.
- Widely available and grows well in the Mid-South.

Ozark

- This recently released variety is based on plant material collected from Missouri, Arkansas, and Illinois.
- It should be well-suited for the Mid-South.



FIGURE 2. Little bluestem plant. Note the fine-textured leaves and small plant stature.

Photo taken April 2015 in Faulkner County

Indiangrass

Indiangrass (Figure 3) is the latest maturing of the NWSG so it is seldom grown by itself. It is typically grown in mixed stands with bluestems, but favors better-drained sites than big bluestem. It does well on poor sites where it can be grown effectively with little bluestem. Cattle consume indiangrass almost as readily as big bluestem and perform well on it.

Cheyenne

- This variety was developed in Oklahoma but does well in the Mid-South.

Rumsey

- Probably the most widely used variety in the Mid-South.
- Rumsey was developed from plant material from south-central Illinois.



FIGURE 3. Indiangrass plants with seedheads.

Photo taken August 2009 in White County

Osage

- This variety is later-maturing and was developed from southeast Kansas sources.
- It is a leafy variety well-suited for the Mid-South.

Americus

- Native selection from the Southeast (Georgia and Alabama).
- Adapted to moderately well and well-drained sites.
- An attractive native grass that also shows potential as an urban landscape and restoration plant.

Switchgrass

There are two types of switchgrass: lowland varieties and upland varieties (Figure 4). Lowland varieties are taller, stemmier, and produce greater amounts of biomass. The leafier upland varieties may be more desirable for forage production, but both types are often planted for forage. It can support high stocking rates early in its growing season. Switchgrass and eastern gamagrass are the earliest maturing of the NWSG in this publication. This makes it somewhat challenging to manage them effectively in a fescue-based system due to overlap of forage production.

Alamo

- Lowland type developed from plant material collected in southern Texas.

- Very productive and can reach heights of 10 feet.
- Tolerates wet sites but can be grown on dry sites.
- Can become very stemmy so careful management is needed to ensure optimum forage quality.

Kanlow

- Lowland type developed from plant material collected in Kansas.
- Growth habits, site adaptations, yield, and management requirements similar to Alamo.
- Typically has much higher seed dormancy rates than Alamo and is more cold-hardy.

Cave-in-Rock

- Upland variety developed from plant material collected in southern Illinois.
- Higher yields than other upland varieties.
- High seed dormancy rates.
- Less tolerant of flooding than lowland varieties.



FIGURE 4. Switchgrass plant.

Photo taken August 2009 in Faulkner County

Eastern Gamagrass

Eastern gamagrass (Figure 5) produces very high yields and has the greatest tolerance of the NWSG to wet soils and flooding. It grows on roadsides down to the Gulf Coast and may have some salt tolerance. It begins spring growth sooner than the other NWSG and also maintains growth later in the season than the other species – with the exception of indiagrass. It can support high stocking rates early in its growing season due to its high productivity. A disadvantage is the development of large crowns in older stands that make the field rough for harvesting hay.

Pete

- An older, standard variety, and still one of the most readily available.
- Pete was developed from plant material collected in Oklahoma and Kansas.
- It has been widely planted in the Mid-South.

Highlander

- This recently released variety was developed from plant material collected in Tennessee and Kentucky.



FIGURE 5. Eastern Gamagrass plant.

Photo taken June 2002, Springfield, MO

- It is well-adapted to growing conditions in the region.
- It is generally more productive than Pete but has coarser leaves.

Bumpers

- Developed at the USDA-ARS Plant Materials Center in Booneville, Arkansas. Seed availability is limited.

Establishment

At least one or more species of NWSG will be adapted to nearly any site in Arkansas where forage might normally be grown. Establishment is more successful when the past management, fertility, existing sod, weed pressure, and soil characteristics of the intended site are taken under consideration. While each field and each season will be different, there are some consistent patterns that occur when establishing native grasses. Some commonly encountered scenarios are described below

New Ground: Land that has just been cleared of timber normally has very little weed pressure, with low pH and moderate-to-low fertility. As a result, these are ideal sites for establishing NWSG. The site should be cleared of all stumps and timber slash to allow use of planting and harvesting equipment later. Such sites may need substantial applications of lime, phosphorus, and potassium based on soil tests. Tillage will likely be needed to prepare a high-quality seedbed.

Thin, Drought- or Flood-Damaged Pastures: Damaged pastures are often candidates for renovating to NWSG. NWSG species should be matched according to the drought or flood potential of the site. Weed pressure will usually be heavy on these sites since the old sod will be thin.

Old Pastures: Old pastures of either fescue or bermudagrass tend to suppress a large seedbank of various weeds. When the old sod is removed by spraying or tillage, the latent seedbank erupts into a heavy stand of aggressive weeds (broadleaf and grass) that may require a year or more to properly control (Figure 6). To establish NWSG successfully, you must plan ahead to properly address this problem. **Bermudagrass** fields, or fields that simply have patches of bermudagrass or bahiagrass, are



FIGURE 6. Weed invasion in strip missed during pre-emergence herbicide application. Sod had been sprayed three times with glyphosate prior to planting. This emphasizes the amount of dormant weed seed present in old pasture sod. *Photo taken July 2014 in Faulkner County*

more difficult sites for establishment of NWSG. Common bermudagrass is very difficult to control, and it produces seed that could emerge after the NWSG is planted. All of the herbicides that control bermudagrass also control NWSG. Elimination of the bermudagrass may take one or two summers of herbicide treatment before planting NWSG. Getting into a rush and planting into a weed-infested seedbed is almost a guarantee of stand failure. Converting old pastures to NWSG starting in late winter for planting that spring can be accomplished (see Arkansas Demonstration Results at the end of this publication) but requires a very intensive program of repeated herbicide application, possibly burning of thatch, and preemergence herbicide application (only on certain species) after planting the NWSG. Starting the renovation process the year before planting markedly increases the chance of success.

Recommended Sod Renovation: Tillage by itself will not kill fescue, bermudagrass, or bahiagrass. The most reliable method of killing an old pasture sod is to use the spray-smother-spray (SSS) method. The SSS method involves spraying an actively growing sod in spring with a nonselective herbicide (e.g., glyphosate), then planting a summer-annual forage (sorghum/sudan or pearl millet) that serves as a smother crop while providing summer forage. The summer-annual forage provides heavy shade and competition for any remaining bermuda or fescue plants and it can be harvested for hay or grazed. It is best to harvest the last growth of the summer annual in September as hay to leave short, even stubble.

Spray the stubble again to kill any remaining sod, weeds, and summer-annual plants. A small grain (wheat or rye) can be then no-tilled into the sprayed sod for winter forage or the field can be left fallow until spring. **Do not plant annual ryegrass** because natural reseeding from ryegrass will cause severe competition later.

Management for Spring NWSG Planting After Killing the Sod:

If wheat or other small grain was planted in fall:

- By early April, graze the winter-annual forage down to 3 to 4 inches to prevent a large buildup of thatch.
- Apply another herbicide application one to two weeks before the intended date for NWSG planting to kill the small grain and emerging weeds.
- Plant the NWSG in late April/early May. Check for emergence of weed seedlings before planting and be prepared to spray if needed.

If a winter-annual forage was not planted in fall:

- Apply herbicide in late April to kill remaining fescue and winter-annual weeds.
- A second herbicide application can be made two weeks later if needed to kill emerging weeds prior to planting the NWSG in May.
- Late-germinating weeds are troublesome when converting old fescue and bermudagrass pastures. Be sure to allow enough time between herbicide applications in spring for weed germination to occur before the final herbicide application. This is especially important when renovating old bermudagrass pastures because of lack of herbicide options to control any bermudagrass that grows back into the NWSG planting. It is far more preferable to delay planting (even into June if needed) to allow time to adequately control bermudagrass than to plant earlier and find out later the bermudagrass is still present.

Planting Dates

Spring plantings of NWSG are recommended. Earliest planting of NWSG in spring should be after soil temperatures reach 60°-65°, typically the last week of April into the first week of May. At the latest, planting should be finished by June 15. Later plantings have a higher risk of extremely dry summer

conditions and poor establishment before winter. Dormant plantings during winter (December to March) are sometimes made for certain species that have high seed dormancy rates, or on sites too wet for normal spring planting, or for conservation plantings. These dormant plantings can be made into wheat or other small grain. The small grain should be harvested or grazed for forage by the time the NWSG would germinate (late April to early May). Do not plant NWSG into ryegrass or unkilld fescue or bermudagrass sod. Dormant seedings made in killed sod have the disadvantage of weed pressure in winter, spring, and summer so extra weed control measures must be included in the planning process.

Planting Methods

Planting NWSG is similar to planting other forages, but proper site preparation, planter setup, and planting depth are critical. Seed can be drilled or broadcast on a conventional tilled seedbed or planted with a no-till drill on killed grass sod. Drills must be equipped with special seed boxes designed to handle the fluffy/chaffy seed common to most NWSG (Figure 7). Switchgrass and eastern gamagrass seed will flow through standard planting equipment.



FIGURE 7. Fluffy seed of indiangrass (left) and big bluestem (right). Specially designed drills are needed for planting such NWSG seed.

When tillage is used, a smooth, well-tilled, firm seedbed with adequate soil moisture is required for successful establishment. Rough, cloddy seedbeds or poorly tilled fields with strips of sod remaining do not allow good seed-to-soil contact and make it possible for seed to be planted too deep. When preparing a tilled seedbed, proper seedbed firmness is achieved when an adult's footprint in the tilled field is about 1/4 inch deep (Figure 8).



FIGURE 8. Conventionally tilled seedbed with a footprint showing the proper firmness for planting. Also note the lack of thatch and the fine texture of this high-quality seedbed.

Photo taken May 2014 at the Livestock and Forestry Research Station, Batesville, AR

Failing to firm the seedbed adequately before planting can result in excessively deep seed placement and poor seedling emergence. Setting the proper seeding depth and seeding rate calibration is essential whether using conventional or no-till drills. As is the case with any small-seeded crop, shallow planting depths and good seed-soil contact are essential when planting NWSG. For switchgrass, bluestems, and indiangrass, seeding depths should be less than 1/4 inch. Ideally the seed should be just pressed into the soil surface (Figure 9). Eastern gamagrass seed is much larger and should be planted 3/4 to 1 1/4 inches deep. Planting too deep is a common cause of establishment failure.



FIGURE 9. NWSG seed pressed into the soil by no-till drill press wheel illustrating recommended planting depth.

Photo taken May 2014 at the Livestock and Forestry Research Station, Batesville, AR

For broadcast planting on a tilled seedbed, seed is often mixed with a small amount of phosphorus or potash fertilizer or pellet lime and spread on a prepared seedbed. Seed mixed with fertilizer should be planted the same day to avoid damage from prolonged fertilizer contact. Seed will not spread as far as the fertilizer or lime carrier, so the spreader must be driven almost track-to-track to achieve uniform stands. To avoid planting too deep, broadcast seed should not be covered with tillage equipment. The seedbed should only be firmed with a roller or cultipacker before and after broadcasting the seed. The sequence should be roll or cultipack the field, make sure the seedbed is well-firmed, broadcast the seed, then roll or cultipack the field again to cover the seed. Rolling broadcast seed into a loose, soft seedbed will push the seed too deep and will lead to establishment failure.

No-till planting is an option where steep topography or rocky soils are concerns. Wildlife management agencies, such as the Arkansas Game and Fish Commission, often have no-till drills available specially equipped for planting NWSG. Planting dates and seeding depth are the same for no-till as for conventional-tilled plantings. However, existing vegetation must be controlled with herbicides instead of tillage for initial weed control. Thick thatch remaining from the killed sod (>½ inch) can interfere with proper seed placement and subsequent emergence of seedlings. Proper management ahead of time (such as mowing, grazing, or burning) will allow you to avoid this problem. No-till planting requires more advanced planning than conventional methods with regard to weed control and soil fertility. Planning should be

done far enough in advance to reduce the weed seed-bank in the soil and to get perennial weeds under control. This may require multiple applications of herbicide. Lime and fertilizer can only be surface applied in no-till plantings. Surface-applied materials take longer to move into the root zone than when plowed in, so building fertility must be done well in advance of planting.

Planting Rates

Typical seeding rates and suggested species mixtures of NWSG grown for forage are shown in Table 1 below. Often the calibration settings issued with the drill or broadcast spreader are not accurate for small-seeded forages. For step by step instructions on calibrating drills or broadcast planters, check with your county Extension agent for publications on calibrating drills and broadcast seeders for small-seeded forages.

Calculating Pure Live Seed (PLS)

When you are ordering seed, always specify Pure Live Seed (PLS). This refers to the proportion of a particular seedlot that is viable, germinable seed. It will always be expressed as a percentage. PLS is calculated as $(\text{Germination \%} \times \text{Purity \%}) / 100 = \% \text{ PLS}$.

Percent germination and purity can be taken directly from a shipping tag or the tag on the bag. You should note the percent germination is made up of two types of seed, that which is ready to germinate

Table 1. Recommended Seeding Rates and Mixtures for NWSG

Species and Mixtures	Seeding Rate*	Notes
Big Bluestem – pure stand	8-10 lbs PLS	Easiest to manage as pure stand for grazing or hay
Big Bluestem, Indiangrass, Little Bluestem	7-8 lbs, 1-2 lbs, and 1-2 lbs PLS	Mixtures suggested for hay or conservation plantings or for variable or droughty sites.
Switchgrass	5-6 lbs PLS	Best planted as pure stand. Can become dominant quickly in mixtures.
Eastern Gamagrass	10-15 lbs PLS	Best planted as pure stand. Growth pattern and site selection not often compatible with other NWSG species.
*All seeding rates given as “pure live seed” basis. Actual bulk seeding rate is usually higher due to most seedlots containing chaff, impurities, or non-viable seed. Seed is purchased on PLS basis. Total seeding rate as pure stand or mixtures usually doesn’t exceed 10 lbs/acre PLS except for eastern gamagrass.		

immediately (“quick germ”) and that which will germinate when stratified (“hard” or “firm”). Purity is 100 percent minus the sum of the percent inert matter and the percent weed seed. Because NWSG seed traditionally could be quite chaffy and/or quite high in dormancy, this calculation is very important. PLS rates for most switchgrass will run in the 80s and 90s, while for bluestems and indiangrass, it will range from the 40s to the 80s in most cases.

Seed Dormancy

Special attention should be paid to dormancy rate. This is particularly true for eastern gamagrass and switchgrass. For switchgrass, this is more often an issue with Cave-in-Rock and Kanlow varieties than with Alamo. It is rarely a concern for bluestems or indiangrass. Reported dormancy rates on NWSG seed tags include seed that requires stratification to induce germination. Thus, a seedlot may be 80 percent PLS but be 80 percent dormant – still viable seed, but requiring a period of cold and wet to break dormancy. Planting such seed in the spring once soil temperatures have warmed and any chance of stratification is past will result in very poor stands.

Always inquire about dormancy when purchasing NWSG seed and be prepared to treat seed having high dormancy rates before planting. While there is no particular threshold that requires treatment, dormancy rates above 50 percent are a concern, as they could potentially cut your effective seeding rate by up to one-half. High-dormancy seed can be “treated” by storing it until the following spring. Dormancy normally drops markedly after such “after-ripening” of the seed. You can often purchase year-old seed from vendors if you encounter this problem. Dormancy can also be reduced by cold-stratification of seed. The seed is soaked in water for 24 hours, drained, then refrigerated at about 45°F for two weeks. Seed should be planted immediately and not allowed to dry out after removal from refrigeration.

Weed Control in the Seeding Year

It is critical that weeds not be allowed to form a dense canopy over the NWSG seedlings during the establishment year. This may require use of preemergence or postemergence herbicides, mowing, or both depending on NWSG species and weed pressure. When planting bluestems and indiangrass, imazapic-based herbicides (such as Plateau®, Journey®, and Panoramic®) should be applied preemergence

(preferably immediately after planting) to control a number of weeds, including crabgrass, signalgrass, and seedling johnsongrass (see Arkansas Demonstration Results at the end of this publication). When using imazapic, be careful to avoid overlapping spray patterns when you are using rates that approach the maximum limit for NWSG (maximum rate of 10-12 oz Plateau®/ac). Applications that exceed this rate can kill native grass seedlings. Typical herbicide application rates are half to two-thirds of the maximum rate to reduce effect of potential overlapping spray patterns. Imazapic-type herbicide should not be used on switchgrass or eastern gamagrass because it can kill those grasses. No preemergence herbicides are labeled for switchgrass or eastern gamagrass planted for forage so weed control is limited to pre-planting use of glyphosate and post-emergence broadleaf herbicides such as 2,4-D or metsulfuron after the seedlings become several inches tall.

Evaluating Stands

Establishment can be slow since these grasses invest their growth in the root system rather than top-growth during the first year. A stand with an average seedling density of one or more plants per square foot is your goal. Stands with densities of one per 2 square feet may be of some concern, but will likely be fine. Stands below one seedling per 3 square feet are candidates for reseeding. Drilling through a weak stand after appropriate weed control during the second year can be successful in thickening thin stands. During the seedling year, having acceptable plant populations is far more important than plant size – plants will become robust in another year.

Fertilization

NWSG seedlings are not competitive with other plants and require only moderate fertility levels for establishment. Nitrogen should never be added during establishment, as it will stimulate weed competition. Establishment can be improved if soil phosphorus, potassium, and pH are at optimum levels. Fields should be soil tested for proper fertilizer and lime recommendations. Collect soil samples starting the year before planting NWSG to allow time for soil pH and fertility adjustments. When submitting soil samples for planting NWSG, ask for crop code 126 for “Native warm-season grass establishment” and crop codes 127-130 for “Native warm-season grass hay production” or crop code 211 for “Native warm-season grass pasture maintenance.”

NWSG have lower fertility requirements than fescue or bermudagrass for producing similar yields. They are responsive to nitrogen, but less so than other forages. In most cases for hay or pasture, N rates of 60 lbs/acre are sufficient at a single application. Eastern gamagrass is the most responsive to fertilizer N and can respond to rates up to 150 lbs N/acre. N rates above 60-70 lbs/acre should be applied in split applications for each cutting. Fertilizer application should not be made in spring until night temperatures reach 60°F or more several consecutive days. If fields are grazed or harvested by mid-June, a second N application of 40-50 lbs/acre can be applied for later summer growth. Yield response to the second N application will be dependent on good late-summer growing conditions. Fertilizer P and K should be applied in the spring application according to soil test recommendations for either hay or pasture.

Harvesting NWSG for Forage

NWSG are seldom harvested the year of establishment. In cases where excellent stands develop the seeding year, some grazing can occur in fall near time of frost. Second-year stands can be harvested for hay, grazed, or perhaps both depending on the farm operation.

Hay Management

For optimum quality, NWSG should be harvested in the boot stage. It is very important to not mow these grasses shorter than 8 inches. Mowers should be adjusted accordingly or fitted with skid shoes to maintain proper cutting height. The growing points of the tall native grasses become elevated above the soil making them vulnerable to damage or removal by mowing equipment. Mowing hay to a short stubble removes the growing point in the lower stem and weakens the plants. Repeated mowing at a short height will lead to severe stand thinning and loss of stand. It is possible to harvest NWSG twice in a season if the first harvest is made in the boot stage (by mid-June). Normally when fields are harvested twice in a season, they are only harvested once the following season to maintain stands. This is dependent on stand vigor, fertility, and weed pressure.

Grazing Management

Grazing can begin on NWSG when the average height is above 12 inches. Use rotational grazing or careful set-stocking to maintain a minimum grazing

height of at least 12 inches. Continued short grazing will quickly reduce stand vigor, leading to weed invasion and stand loss. Grazing can often begin by mid-May and continue until early August on second-year stands and until mid-September on third-year and older stands as long as stands are not grazed shorter than the recommended minimum height. Studies have shown that these grasses grow rapidly in late spring to early summer and require heavier stocking to keep up with the forage growth. Growth rate normally slows by July, and high spring stocking rates usually should be reduced by about half for the remainder of the grazing season until mid-August. Livestock will often leave the recommended amount of stubble when grazing if not overstocked or left in a field too long (Figure 10).



FIGURE 10. NWSG should not be grazed shorter than 12 inches. Fortunately, livestock often stop grazing at that stubble height when stocking rates and grazing periods are properly set.

Photo of big bluestem stubble taken May 2015 at the Livestock and Forestry Research Station, Batesville, AR.

Arkansas Demonstration Results

In 2014, NWSG demonstrations were planted on three sites in Arkansas, in cooperation with the University of Tennessee. Due to a short timeline associated with a grant, initiation of controlling the sod started later than recommended. Therefore, intensive scouting, controlled burning, and herbicide application were used to prepare the sites between February and spring planting in May and June. The sites were located at the University of Arkansas Livestock and Forestry Research Station at Batesville, on a farm near Drasco in Cleburne County, and on a farm near Conway in Faulkner County. The Cleburne and

Faulkner County sites were no-till planted into killed sod, and the Batesville site was planted on a disked, prepared seedbed. Since all three sites had been in pasture for many years, control of the sod was very important – as was additional weed control after planting.

The same seed mix and planting rate was used at all sites.

Variety	Seeding Rate
OZ-70 big bluestem	8 lbs/a PLS
Aldous little bluestem	1 lb/a PLS
Osage indiangrass	1 lb/a PLS
Total seeding rate/acre (PLS)	10 lbs

Batesville

The Batesville site was a 15-acre pasture that consisted of 11 acres of mixed fescue and annual weedy grasses and 4 acres of alfalfa. The entire area was sprayed with 2 qts/acre of glyphosate herbicide in mid-April. A second herbicide application was made May 1. The field was disked and rolled to prepare a clean, firm seedbed and the field was planted on May 22. Planting was done with a Haybuster 107 no-till drill equipped with a native grass seed box designed for planting fluffy native grass seed. The drill was calibrated to deliver 16 lbs/acre of bulk seed which provided a rate of approximately 10 lbs/acre seed on a PLS basis. The seedbed was firmed so that a footprint was ¼ inch deep. The drill was adjusted so that disk openers barely cut the soil, but with more down-pressure on the press wheels. This prevented seed from being placed too deep. The drill dropped the seed into a very shallow cut and the press wheels firmed to seed into the soil surface to achieve good seed/soil contact. Many seed were still visible in the row, but were pressed into the soil surface. The day after planting, fertilizer was applied at a rate of 60 lbs K₂O per acre according to soil test recommendations (Crop code 126 – native warm-season grass establishment). Plateau® herbicide was applied on May 23 at 8 oz/acre to provide preemergence weed control. Overall, weed control was very good with the exception of pigweed. In June, scattered pigweed emerged across the field. The population was not high, but plants became large while the seedling NWSG were still too small to tolerate a broadleaf herbicide application (Figure 11). Therefore, the weeds were mowed in mid-July and a broadleaf herbicide application of 2,4-D was made July 24 when the NWSG seedlings reached the recommended size.



FIGURE 11. Pigweed that was not controlled by post-emergence application of Plateau® herbicide. Similar results occurred on the Cleburne and Faulkner County sites.

Photo taken July 2014 at the Livestock and Forestry Research Station, Batesville, AR

Cleburne County

The Cleburne County site was a 10-acre pasture that consisted of primarily fescue with bermudagrass in scattered hay feeding spots across the field. The entire area was sprayed with 1 qt/acre of glyphosate herbicide in mid-April. A dense population of crabgrass emerged after the first herbicide application. This emphasized the importance of multiple herbicide applications to control existing sod before planting NWSG. A second herbicide application of 2 qts/acre glyphosate was made May 22. Soil test results indicated the field was at optimum levels of P and K, but pH was low, so lime was recommended (Crop code 126 – native warm-season grass establishment). Pelleted lime was applied at a rate of 2,500 lbs/acre on a 7-acre portion of the field, and a 3-acre portion was left unlimed to compare establishment differences. No stand differences were noted between limed and unlimed portions of the field by October. NWSG are reported to be tolerant of low soil pH. The field was planted on May 27 with a Truax no-till drill provided by the Arkansas Game and Fish Commission which was specifically designed for planting NWSG. The drill was calibrated to deliver 14.6 lbs/acre of bulk seed which provided a rate of approximately 10 lbs/acre seed on a PLS basis. The drill was adjusted so that disk openers barely cut the sod, but with more down-pressure on the press wheels. This prevented seed from being placed too deep (Figure 12).

Plateau® herbicide was applied in early June at 8 oz/acre to provide preemergence weed control. Overall, weed control was very good with the exception of pigweed, similar to the Batesville site. Therefore, the weeds were mowed in mid-July and a



FIGURE 12. NWSG seed pressed into the soil surface by no-till drill press wheel in a no-till planting.

Photo taken June 2014 in Faulkner County

broadleaf herbicide application of 2,4-D was made in August when the NWSG seedlings reached the recommended size.

Faulkner County

The Faulkner County site was a 10-acre pasture that consisted of bermudagrass, bahiagrass, fescue, and johnsongrass. The site was control-burned in March. After the sod greened up, the field was sprayed with 2 qts/acre of glyphosate herbicide in mid-April. A flush of existing warm-season grasses and weeds occurred after the first herbicide

application. This emphasized the importance of multiple herbicide applications to control existing sod before planting NWSG. A second herbicide application of 2 qts/acre glyphosate was made May 23. Due to a heavy population of horsenettle, a third glyphosate application (2 qts/acre) was made on June 3. Soil test results indicated the field was at optimum levels of pH, P, and K so no fertilizer or lime was applied (Crop code 126 – native warm-season grass establishment). Approximately 1/3 of the field was planted on June 6, and the remainder was planted June 16 due to rain. A Truax no-till drill, provided by the Arkansas Game and Fish Commission, was used for planting. The drill was calibrated to deliver 14.6 lbs/acre of bulk seed which provided a rate of approximately 10 lbs/acre seed on a pure live seed basis. The drill was adjusted in the same manner as at the Cleburne County site. Plateau® herbicide was applied on June 17 (the day after final planting) at 8 oz/acre to provide preemergence weed control. Pigweed was the only weed not controlled well by the herbicide, and it was managed with mowing and 2,4-D application the same as at the other two sites.

Establishment Costs

Costs for establishing all three sites are shown in Table 2 and averaged \$350 per acre. Some costs, such as sprayer rent, brushhogging, and control burning, were included at custom rates and may be less if a landowner does those practices.

Table 2. 2014 NWSG Demonstration Establishment Costs Per Acre

Item	Location		
	Batesville	Cleburne	Faulkner
Seed	\$150	\$150	\$150
Glyphosate	\$18.75	\$14	\$28.25
Plateau®	\$15	\$15	\$15
2,4-D	\$7	\$7	\$7
Surfactant	\$2	\$2	\$2
Sprayer rental	\$45	\$45	\$60
Burning of residue	\$0	\$30	\$30
Fertilizer	\$30	\$0	\$0
Lime	\$0	\$92	\$0
Tillage/seedbed	\$45	\$0	\$0
Drill rental	\$15	\$15	\$15
Brushhogging	\$15	\$15	\$15
Total per acre	\$343	\$385	\$322
Total Cost	\$5,145 (15 acres)	\$3,850 (10 acres)	\$3,220 (10 acres)

Observations

Good stands of NWSG were established at all sites. Stand counts in October exceeded 90% on all sites (Figures 13, 14, and 15). Rainfall was optimum at all sites until mid-August and contributed to rapid stand establishment. Sod and weed control from the glyphosate and Plateau® were excellent and held very well through most of the summer. The drills used were designed for native grass seed and were key in proper planting.



FIGURE 13. NWSG field in August, three months after May planting in conventional-tilled seedbed.

Photo taken August 2014 at the Livestock and Forestry Research Station, Batesville, AR



FIGURE 14. NWSG field in October, five months after May no-till planting in killed sod.

Photo taken October 2014 in Cleburne County



FIGURE 15. NWSG field in September, three months after June no-till planting in killed sod.

Photo taken September 2014 in Faulkner County

University of Arkansas, United States Department of Agriculture, and County Governments Cooperating

Pursuant to 7 CFR § 15.3, the University of Arkansas System Division of Agriculture offers all its Extension and Research programs and services (including employment) without regard to race, color, sex, national origin, religion, age, disability, marital or veteran status, genetic information, sexual preference, pregnancy or any other legally protected status, and is an equal opportunity institution.

MP538-PD-12-2016N