

# Promoting a Florida Seed Source of Splitbeard Bluestem for Use in Longleaf Pine Plantings in the Deep South

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## Abstract

Splitbeard bluestem (*Andropogon ternarius* Michx.) is a native bunch grass that can be found growing on dry, sandy or gravelly soils in the southeastern US. It is generally not a major component of the understory community in southern pine forests within its native range. However, it is known for its ability to effectively colonize disturbed sites. This should make it an ideal candidate for use on longleaf pine (*Pinus palustris* Mill.) restoration sites, especially those with dry soils that are being converted from former cropland or pasture, where other less competitive native understory species may not be capable of establishment from seed. However, limited commercial availability of splitbeard bluestem seed is one factor that hampers its use on these sites. Staff at the USDA, Natural Resources Conservation Service (NRCS), Brooksville Plant Materials Center (PMC) in Brooksville, Florida recognized this need and collected seed from a population of splitbeard bluestem in Citrus County, Florida in 1995. It was released under the name Fort Cooper Germplasm in 2008. Foundation seed has been distributed to a small number of seed growers; however, we are looking for additional producers that are interested in growing Fort Cooper Germplasm. The PMC also has limited quantities of seed that can be distributed to researchers wishing to plant small demonstration plantings on longleaf pine restoration sites in Florida, Georgia, and Alabama, to field test its establishment potential on these sites and document its range of adaptation. Please contact the author for further information.

## Introduction

Longleaf pine forests once covered more than 90 million acres in the United States (Fig. 1 inset), yet today only about 3.4 million acres of these forests remain. The extremely high level of biodiversity that has been documented in longleaf pine ecosystems, includes 29 threatened and endangered species. The loss of this critical habitat was recognized by the USDA and other federal and state agencies and private conservation organizations as a major resource concern and was the driving force leading to the formation of America's Longleaf Restoration Initiative (ALRI) in 2007. The primary goal of the ALRI conservation plan is to increase longleaf pine acreage in its natural range from the current 3.4 to 8.0 million acres by 2025 (America's Longleaf Regional Working Group, 2009).

The USDA NRCS created the Longleaf Pine Initiative (LLPI) in 2010 to support the ALRI goals of restoring and maintaining this unique ecosystem. Through the LLPI, NRCS and its conservation partners in nine states are helping private landowners improve the sustainability and profitability of longleaf pine ecosystems. NRCS Farm Bill conservation programs provide technical and financial assistance to interested landowners. States involved in the LLPI include Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Texas, and Virginia (USDA, NRCS, 2014). NRCS also maintains a network of PMCs that have studied a wide range of native plants and developed sources of plant materials to solve conservation concerns.

When you compare the map of the historic native range of longleaf pine (Fig. 1 inset) with that of the native range of splitbeard bluestem (Fig. 1), it is immediately apparent that there is a great deal of overlap between the two. Both species are found in parts of the county where there are warm, wet temperate climates characterized by hot summers and mild winters. And, both are best adapted to soils that are sandy, acidic, low in organic matter, and relatively infertile (Boyer, 2004; Walsh, 1994).

Splitbeard bluestem is not an aggressive grass and although it is fairly shade tolerant, it generally is not a primary component of existing longleaf pine ecosystems (Leithead et al., 1971; Newman and Gates, 2006; Walsh, 1994). However, populations of splitbeard bluestem and broomsedge (*A. virginicus* L.) often will predominate disturbed areas and abandoned crop fields in the Southeast (Walsh, 1994). It is a fairly good seed producer (Leithead et al., 1971; Pfaff et al., 2002) and moderate to high germination rates have been achieved depending on conditions under which the seed plants were grown and the amount of post-harvest processing to which the seed lot was subjected (Grabowski et al., 2008). Its moderate fecundity and high germination potential make splitbeard bluestem ideally suited for use in longleaf pine restoration sites planted on old cropland or cutover sites, where it can act as nurse crop for slower establishing native species such as wiregrass (*Aristida beyrichiana* Trin. & Rupr.) (Newman and Gates, 2006).

## Release of Fort Cooper Germplasm Splitbeard Bluestem

Seed was collected in 1995 by Brooksville PMC staff members Sharon Pfaff and Mary Anne Gontar from a population of splitbeard bluestem in Citrus County, Florida. The collection site was located on dry sandhills in the northern portion of Fort Cooper State Park, near the city of Inverness (Section 21, Township 19S, Range 20E) (Fig. 2). The soil at the collection site was a Candler fine sand with 0 to 5 percent slope. Plants growing in association include longleaf pine (*Pinus palustris* Mill.); turkey oak (*Quercus laevis* Walter); sand post oak [*Q. margarettae* (Ashe) Small]; bluejack oak (*Q. incana* Bartram); wiregrass (*Aristida beyrichiana* Trin. & Rupr.); lopsided indiagrass [*Sorghastrum secundum* (Elliot) Nash]; and narrowleaf silkgrass [*Pityopsis graminifolia* (Michx.) Nutt.]. Mean annual precipitation at the collection site is 1321 mm (52 in), average maximum temperatures are 28° C (83° F) and average minimum temperatures are 15° C (59° F), with approximately 300 frost-free days per year (Grabowski et al., 2008).

The NRCS accession number 9060084 was assigned to this material for testing. It was included in a research study conducted from 1997 to 2001 that evaluated direct seeding methods to revegetate phosphate minelands in Florida. In this study, 34 accessions of grasses and forbs were evaluated. Accession 9060084 consistently germinated and established better on sand tailings than any of the other species tested. Because of its ability to establish on these extremely dry sites, this collection was released under the name Fort Cooper Germplasm in 2008 (Grabowski et al., 2008). It is currently the only selected release of this species (Newman and Gates, 2006). Thus far, Fort Cooper Germplasm has not been widely planted either throughout Florida or in other states in the Southeast; however, it is likely suitable for use in Georgia and Alabama. Seed of Fort Cooper Germplasm for seed production or small-scale research demonstrations can be obtained by contacting the Brooksville PMC.

Fort Cooper Germplasm does not possess any features that can be used to distinguish it visually from the species. It is a bunch grass with slender, erect, purplish culms 0.7- to 1.2-m tall (Fig. 3). Basal sheaths are flattened, whereas the culm sheaths are rounded; leaf blades are up to 30 cm long and 2- to 3.5-mm wide, purplish in color, glaucous, and usually hairy. Some basal leaves generally remain green throughout the winter. The inconspicuous ligule is membranous. Racemes are paired or occasionally in threes, white, 1.5- to 5-cm long, and densely covered in white hairs (villous) (Fig. 4); rachis joints and pedicels are also densely villous. Spikelets are 5- to 6-mm long, usually longer than the rachis joint; the awn on the lemma is generally slightly twisted and 1.2- to 2.5-cm long (Fig. 5). After the seed disperses, a tuft of silver hairs remains at the base of the raceme from which its alternate common name of paintbrush bluestem is derived (Leithead et al., 1971; Hitchcock, 1971). There is an average of 440,000 seeds/kg (200,000 seeds/lb) (Pfaff et al., 2002).



United States Department of Agriculture

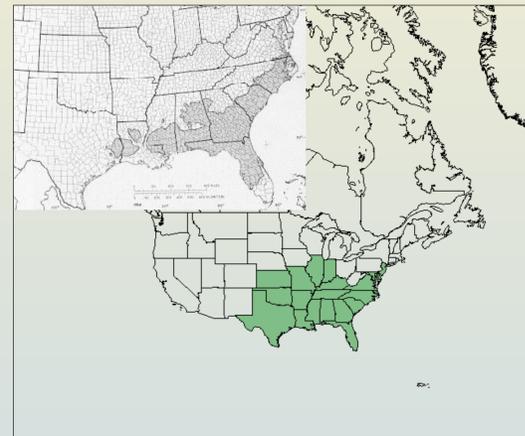


Fig. 1. Native Ranges of Longleaf Pine (inset) and Splitbeard Bluestem

Source: Boyer, W.D. Pinaceae -- Pine family. Longleaf pine (*Pinus palustris*) [http://www.na.fs.fed.us/pubs/silvics\\_manual/Volume\\_1/pinus/palustris.htm](http://www.na.fs.fed.us/pubs/silvics_manual/Volume_1/pinus/palustris.htm)  
Source: USDA, NRCS. 2014. The PLANTS Database. <http://plants.usda.gov>, 1 October 2014. National Plant Data Team, Greensboro, NC 27401-4901 USA

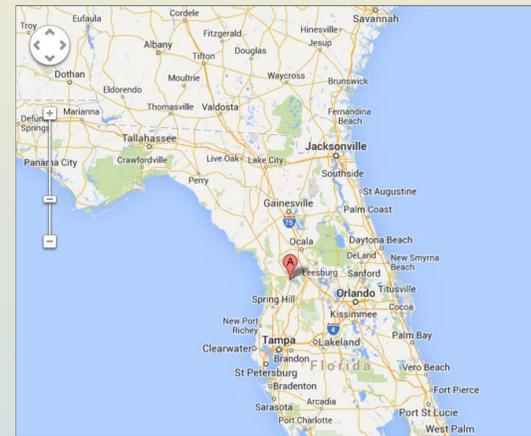


Fig. 2. Location of Fort Cooper State Park Collection Site for Fort Cooper Germplasm

Source: <https://maps.google.com/maps>



Fig. 3. Splitbeard Bluestem Plant in the Early Flowering Stage

Source: USDA, NRCS Brooksville Plant Materials Center

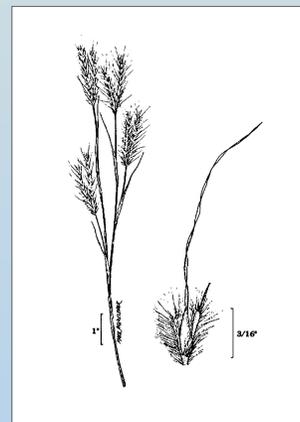


Fig. 5. Detail of Flowering Culm and Spikelet

Source: USDA NRCS. Wetland flora: Field office illustrated guide to plant species. USDA Natural Resources Conservation Service



Fig. 4. Culms of Splitbeard Bluestem Showing Paired Racemes

Source: USDA, NRCS Brooksville Plant Materials Center



Fig. 6. Harvesting Seeds of Splitbeard Bluestem with a Woodward Flail-vac Harvester

Source: USDA, NRCS Brooksville Plant Materials Center



Fig. 7. Seeds Dehulled with a Hammer mill (left) and Intact Seeds (right)

Source: USDA, NRCS Brooksville Plant Materials Center

## Seed Production Recommendations

The planting site should be cultivated or treated with herbicides for one to two years prior to planting to obtain a clean, weed-free seedbed. Production fields in the Deep South can be planted almost year round if irrigation is available. Non-irrigated fields are best planted in the winter to early spring. The long awn and numerous long hairs on the spikelet (Fig. 5) prevent splitbeard bluestem seeds from flowing smoothly through the seed tubes on a drill. The recommended planting method is to use a drill with a fluffy seed box and plant in 60- to 120-cm (24- to 48-inch) rows. The seeding rate for 60-cm rows is 3.4 kg PLS/ha (3 lb/ac) and should be reduced proportionally for wider row spacings. Seeding depth should be 6-mm (0.25-in) or less (Pfaff et al., 2002).

Seed production stands should be fertilized according to soil test recommendations. Nitrogen fertilization is not recommended at planting; but other nutrients should be applied if they are needed. Excessive applications of nitrogen can cause lodging and may reduce the longevity of the production stand; however, if nitrogen is severely deficient 34 to 56 kg/ha (30 to 50 lb/ac) can be applied in the early spring to maintain stand productivity. In the spring, stands should be mowed to a stubble height of 5-cm (2-in) or burned to remove dead tissue (Pfaff et al., 2002).

Seeds mature from late November to early December and will cling to the plant for several weeks, barring high winds. The seeds ripen from the top of the inflorescence downwards, thus allowing multiple harvests. Harvesting should take place during the warmest, driest part of the day. Use of a Woodward Flail-Vac seed stripper (Ag-Renewal, Inc., Weatherford, Oklahoma) mounted on the lift arms of a tractor (Fig. 6) or a similar implement is recommended. Research at the Brooksville PMC has shown that the brush speed should be 400 to 600 rpm. Harvesting at higher speeds causes too much stem tissue to be drawn into the machine. The seed lot should be immediately air dried for 3 to 7 days and then cleaned using an air-screen cleaner. Seeds can also be processed with a hammer mill to extract the bare caryopsis (dehulling) (Fig. 7) and this treatment will allow them to pass more easily through a conventional seed box on a drill (Pfaff et al., 2002). One test at the Brooksville PMC showed that dehulling almost tripled germination rates compared to intact seed (Grabowski et al., 2008); however, the effect on this treatment on viability during storage has not been determined.

## Establishment on Restoration Sites

Establishment considerations on longleaf pine restoration sites are fairly similar to those related above for seed production fields. The planting site should be free of invasive or noxious weeds and it may take a year or more of herbicide treatments or mechanical control to ensure removal of these weeds. If no noxious weeds are present and the existing plant stand is light, close mowing or burning may be sufficient to prepare the site for planting. Dense stands or mats of residue will prevent the splitbeard bluestem seeds from reaching the soil surface and will limit establishment. On sites where these are present, pre-plant disking may be required to expose the mineral soil.

Sites that have existing stands of trees will generally be broadcast planted. However, if trees are planted on a wide row spacing, seeding with a no-till drill may be possible and will generally result in better stands. The recommended planting rate for broadcast seeding is 6.7 kg PLS/kg (6 lb/ac). If dehulled seeds are used, the recommended planting rate is 4.2 kg PLS/ha (3.75 lb/ac). Drill seeding rates are the same as those recommended for seed production fields. Fertilization is not recommended. If the site is to be grazed, animal access should be deferred for the first year or two until the plants become established (Pfaff et al., 2002).

Without periodic burning, splitbeard bluestem populations will decline and be replaced by late successional species (Walsh, 1994); however, annual burning coupled with grazing can eliminate plants from the site (Leithead et al., 1971). The flowering culms will be killed by a growing season burn (Walsh, 1994); however, seed germination in the following year has been shown to increase (Shepherd et al., 2012). Populations of splitbeard bluestem can therefore be expected to increase under prescribed burning regimes commonly utilized for longleaf pine management.

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