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SPOROBOLUS OSCEOLENSIS (POACEAE), A NEW SPECIES FROM PENINSULAR FLORIDA

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ABSTRACT

Sporobolus osceolensis Bridges & Orzell, **sp. nov.** (Poaceae: Chloridoideae: Zoysieae: Sporobolinae), a cespitose, perennial grass with fire-stimulated flowering, is described from pine savannas in northeast and central peninsular Florida. It is a member of the *Sporobolus floridanus* complex and is distinguished from closely similar species (*S. curtissii*, *S. floridanus*, *S. pinetorum*, and *S. teretifolius*) by its 2-4 mm wide flat, erect, yellowish-green leaves, antrorsely scabrous leaf margins, narrow congested panicle with strongly ascending primary branches, and unequal glumes. *Sporobolus osceolensis* can be a dominant or co-dominant species with other groundcover C4 grasses in peninsular Florida.

In 1999, while conducting field surveys in northeast Florida pine savannas burned in a 1998 wildfire, we discovered a *Sporobolus* species previously unknown to us. After making collections from numerous populations in several north Florida counties, we determined it did not fit any species in a recently published treatment (Weakley & Peterson 1998) for the *Sporobolus floridanus* complex. Subsequent field and herbarium studies conducted in Florida and Georgia since 1999 have convinced us that it is an undescribed cryptic species of *Sporobolus*.

Sporobolus osceolensis has been overlooked and has eluded taxonomic recognition for many of the same reasons as noted by others (Weakley & Peterson 1998; McMillan 2002) for *Sporobolus*. It sometimes co-occurs with *S. curtissii* and *S. floridanus* and is easily overlooked when in vegetative condition in unburned sites. As with many species in this complex, it is fire-stimulated, relying on burning to induce prolific flowering. Therefore, it can be difficult to find in fire-suppressed habitats, particularly where there has been conversion of its former habitat to fire-suppressed slash pine (*Pinus elliottii*) plantations, which are widespread in Florida. It can also be confused with or misidentified as other similar sympatric cespitose grass genera when sterile. Despite the abundance of *S. osceolensis* and *S. floridanus* in northeast Florida, there are few herbarium specimens of *S. floridanus* from the region and apparently none of *S. osceolensis* from northeast Florida prior to our collections in 1999. The range maps and citations in Weakley & Peterson (1998) indicate that they saw very few specimens of *Sporobolus* from peninsular Florida. If specimens of *S. osceolensis* had been widely distributed and available to those authors, we believe they would have recognized its distinctive characters.

Our initial search for *S. osceolensis* was facilitated by lightning-ignited wildfires that burned about 500,000 acres (Wade & Grace 1998) in Florida following La Nina drought conditions in 1998. These wildfires stimulated prolific flowering of *Sporobolus curtissii*, *S. floridanus*, and *S. osceolensis* in 1998 and 1999. Our field study of *Sporobolus* may not have been possible without the abundance of recently burned pine savanna habitats throughout a 6-county area in northeast Florida. The

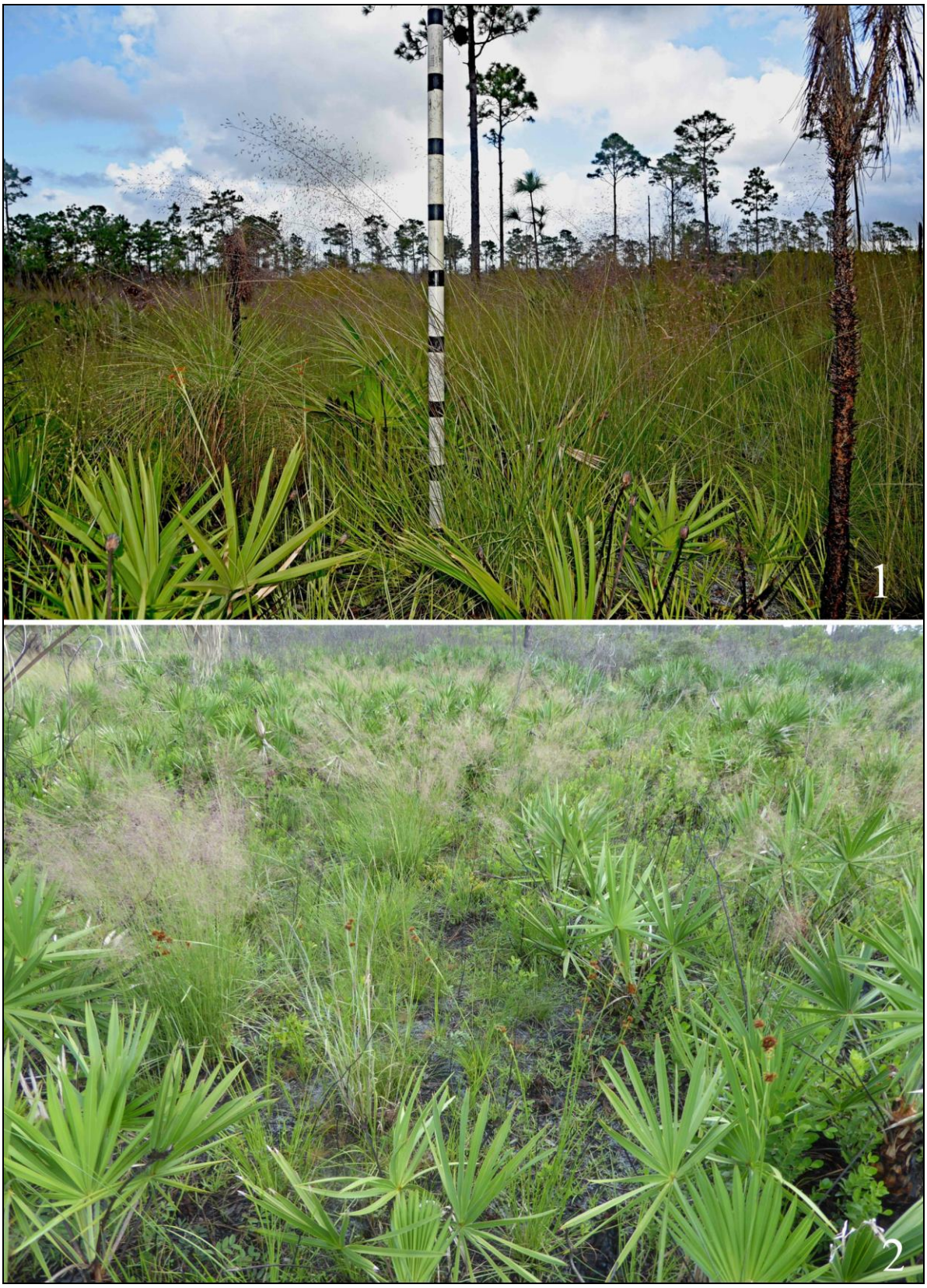
recognition of *S. osceolensis* as a species parallels recent species level recognition of *S. pinetorum* in the *Sporobolus floridanus* complex (Weakley & Peterson 1998) and the earlier description of *S. teretifolius* (Harper 1906), adding another cespitose, perennial grass to the ground cover vegetation of pyrogenic pine savannas on the southeastern Coastal Plain.

SPOROBOLUS OSCEOLENSIS E. Bridges & Orzell, **sp. nov. TYPE: USA. Florida.** Baker Co.: Burned shallow upland depression pond ca. 0.2 mi W of Osceola NF boundary, NE of FS Rd 207B, ca. 4.3 air mi ENE of Olustee; Osceola National Forest, Sanderson South 7.5' Quad., SEQ, NEQ, Sec. 18, T3S, R20E, 30°14'00" N, 82°20'45" W, 13 Sep 1999, *S.L. Orzell & E. L. Bridges 25602* (holotype: FLAS; isotypes: FSU, FTU, NCU, NY, US, USF).

Similar to *Sporobolus floridanus* Chapm., differing in its narrower leaves, more ascending inflorescence branches producing a narrowly pyramidal inflorescence, and strongly unequal glumes. Differing from *Sporobolus pinetorum* Weakley & Peterson by its flat, wider leaves and often glabrous pedicels.

Perennial stout, densely cespitose grass from hard, knotty bases. **Culms** 80-160 cm tall, erect, nodes all basal; base diameter 1.5-3 mm, flattened; internodes glabrous. **Leaf Sheaths** 8-10 cm long, glabrous to slightly scabrous on the ridges, the base shiny and indurated; margins hyaline; summit (collar) with a short tuft of hairs 0.5-0.8 mm long. **Ligules** a line of fine dense hairs 0.3-0.5 mm long. **Leaf Blades** 45-70 cm long, 2-3 (-4) mm wide, at first strongly ascending, becoming somewhat spreading with age, flat to folded, yellowish-green to green, mostly glabrous above and below, sometimes slightly hairy or scabridulous on the margins near the base, becoming more remotely and finely antrorsely scabridulous towards the apex. **Panicles** (30-) 35-55 cm long, (3-) 5-9 (-19) cm wide, purplish, at first mostly narrow and contracted, narrowly pyramidal (about 6 to 12 times longer than wide), becoming wider with age; main axis multi-costate, antrorsely scabridulous on the ridges; pulvini in axils of primary branches glabrous or slightly scabridulous like the branches, with no longer hairs; primary branches to 20 cm long, strongly ascending at an angle of 25 to 45 degrees from the culm axis, not floriferous on lower 1/3, antrorsely scabridulous; secondary branches at first appressed to primary branches, spreading with age; pedicels 2-14 mm long, usually longer than the spikelets, spreading, glabrous to very remotely scabridulous. **Spikelets** 4.2-6.0 mm long, purplish-brown. **Lower glumes** 2.0-3.5 mm long, purplish, linear-lanceolate, acute to acuminate, membranaceous, 1-nerved. **Upper glumes** 4.0-6.0 mm long, purplish, lanceolate, acuminate to cuspidate, 3-5 nerved, the ratio of lower/upper glume length (0.50-) 0.60-0.70 (-0.80). **Lemmas** 3.5-5.0 mm long, obtuse with a short mucronate tip, stramineous, 1-nerved, glabrous, typically about the same length as the second glume. **Paleas** 3.5-5.0 mm long, narrowly ovate, membranaceous, glabrous; strongly 2-nerved, apex obtuse, sometimes appearing slightly bifid with age. **Stamens** 3, anthers 2.0-2.5 mm long, with bifurcate tips, the free tips ca. 0.5 mm long, dark purplish-black.

Additional collections. **Florida.** Baker Co.: Burned open ecotone above depression swamp N of FS Rd 205, ca. 0.4 mi E of jct FS Rd 286, ca. 10 air mi NNE of Olustee, Osceola NF, Sanderson North 7.5' Quad., NEQ, SWQ, Sec. 13, T2S, R19E, 30°19'02" N, 82°21'55" W, 10 Sep 1999, *Orzell & Bridges 25530* (FLAS, FSU, FTU, NCU, US, USF). Clay Co.: Burned seepage slope at headwaters of tributary NE of North Fork Black Creek, S of Long Branch Rd, 0.7 mi SE of State Forest entrance, ca. 7 air mi NW of Middleburg, Jennings SF - Black Creek WMA, Fiftone 7.5' Quad, NWQ, NEQ, Sec. 18, T4S, R24E, 30°09'23" N, 81°56'33" W, Soils - Rutlege (Typic Humaquepts), 12 Sep 1999, *Orzell & Bridges 25589* (USF). Columbia Co.: Herbaceous ecotone between pine flatwoods and cypress E of FS Rd 234-1, ca. 1.5 air mi N of jct FS Rd 233-2, ca. 6.5 air mi N of jct FL 250 and I-10, ca. 15 air mi N of Lake City, Osceola NF, Compartment 43, Stand 1, Deep Creek 7.5' Quad, SWQ, NWQ, Sec. 4, T2S, R18E, 30°20'45" N, 82°31'25" W, Soils - Olustee (Ultic Haplaquods), 18 May 1999, *Orzell & Bridges 25507* (FLAS); herbaceous ecotone between pine flatwoods and cypress above unnamed drainageway E of Sawgrass Head, E of FS Rd 234-1, ca. 0.3



Figures 1 and 2. *Sporobolus osceolensis*. Habitat in mesic pine savanna, Orange Co. Florida. Pole increments 20 cm apart, horizon at 1 meter. Top photo by James Cheak.

Figures 3-5. *Sporobolus osceolensis* inflorescence. Photos 3 and 5 by James Cheak.

Figure 6. *Sporobolus osceolensis*. Plant base, showing the narrow, ascending yellowish-green to green leaves. Figures 7-9. Spikelets of *Sporobolus osceolensis*, showing the first glume much shorter than the second glume. Photos 6-8 by James Cheak.

air mi N of jct FS Rd 233-2, ca. 14.5 air mi NE of Lake City, Osceola NF, Compartment 50, Stand 38, Deep Creek 7.5' Quad., NWQ, SWQ, Sec. 9, T2S, R18E, 30°19'36" N, 82°31'13" W, Soils - Olustee (Ultic Haplaquods), 9 Sep 1999, *Orzell & Bridges 25525* (FLAS); upper slightly seepy ecotone between pine flatwoods and cypress along Caney Flat Branch, ca. 0.24 air mi W of FS Rd 263-B, ca. 0.8 mi N of FS Rd 263-2, ca. 3.3 air mi NNW of jct FL 250 & I-10, ca. 12.4 air mi N of Lake City, Osceola NF, Compartment 65, Stand 14, Deep Creek 7.5' Quad., NEQ, SWQ, SEQ, Sec.

19, T2S, R18E, 30°17'45" N, 82°32'52" W, Soils - Olustee (Ultic Haplaquods), Community dominated by *Sporobolus curtissii - Ilex glabra - Andropogon cretaceus - Gaylussacia nana*, 11 Sep 1999, *Orzell & Bridges 25550* (FLAS, NCU, NY, USF); herbaceous ecotone between pine flatwoods and cypress on W side of Caney Flat Branch, E of FS Rd 236-1, ca. 0.7 air mi SSE of jct FS Rd 233-2 at Greenfield, Osceola NF, Compartment 65, Stand 4, Deep Creek 7.5' Quad., SWQ, SWQ, SWQ, Sec. 18, T2S, R18E, 30°18'28" N, 82°33'30" W, Soils - Surrency (Arenic Umbric Paleaquults), 13 Sep 1999, *Orzell & Bridges 25597* (FLAS, FTG, FTU, USF). Duval Co.: Burned powerline right-of-way through flatwoods W of Powerline Rd, ca. 0.4 mi S of Big Oaks Rd, N of jct. of Cypress Pond Rd, ca. 3 air mi NE of jct US 301 and FL 119 on S side of Bryceville (in Nassau Co.), Cary State Forest, Bryceville 7.5' Quad., WH, NWQ, Sec. 22, T1S, R24E, 30°24'04" N, 81°53'55" W, 12 Sep 1999, *Orzell & Bridges 25584* (FLAS, FTU, USF); depressional wetlands S of Cypress Pond Rd, ca. 0.5 mi E of Power Line Rd, ca. 3 air mi NE of jct. US 301 and FL 119 on S side of Bryceville (Nassau Co.), Cary State Forest, Bryceville 7.5' Quad., SEQ, NWQ, Sec. 22, T1S, R24E, 30°23'58" N, 81°53'30" W, Soils - Boulogne (Typic Haplaquods), 2 Sep 1999, *Orzell & Bridges 25573* (FLAS, NCU); powerline swath thru slight seepage area, W of Powerline Rd, ca 0.5 mi S of Cypress Pond Rd, ca 3 air mi NE of US 301 7 FL 119 jct on S side of Bryceville (Nassau Co.), Cary State Forest, SEQ, SEQ of Sec. 21, T1S, R24E, Bryceville Quad., 30°23’35” N, 81°54’07” W, elev. 78-80 ft., 12 Sep 1999, *Orzell & Bridges 25564* (FLAS). Hillsborough Co.: Longleaf pine flatwoods association in vicinity of Keystone Lake off Jiretz Rd, 11 Nov 1975. *J. E. Poppleton 620* (USF); several 100 yds S of int of Cockroach Bay & Gulf City Rds., ca 5 mi WSW of Ruskin, sec 21, T32S, R18E, disturbed coastal grassland, clumped grass to 1 meter tall, very similar to Muhlenbergia capillaris except stiffer, inflorescence, pinkish, *Butts s.n.* 25 Sep 1995 (USF); boggy flatwoods area adjacent to cypress swamp, Brooker Creek Headwaters Preserve, Lutz, 0.25 mi S of Lutz-Lake Fern Road, 1.75 mi E of Gunn Highway, NEQ, NWQ, Sec. 12, T27S, R17E, 9 Oct 2009, *Dickman s.n.* (USF); flatwoods, Upper Little Manatee River Preserve, 'Rood Parcel', E side of C-579, ca. 1,5 mi S of FL 674 at Wimauma and 2 mi N of Saffold Rd, SWQ, Sec. 22, T32S, R20E, 7 Oct 2009, *Dickman s.n.* (USF); edge of cypress strand, Lake Dan Nature Preserve, 0.6 km S of Pasco County line, 2.1 km E of Pinellas County line, 3 km N of FL 582, Odessa, 28°10'2.0712 N, 82°41'47.1336" W, 1 Oct 2015, *Farid 126* (USF). Levy Co.: In flat woods, not frequent, Ellzey, 3 Sep 1898, *Combs 818* (US); Ellzey, 3 Sep 1898, *Combs 835 1/2* (US). Manatee Co.: Wingate Creek State Preserve, Palea as long as or slightly shorter than lemma, lemmas glabrous, sheaths glabrous, SEQ, SWQ, NEQ sec 7, T35S, R22E, burned mesic flatwoods, 9 Oct 1997, *Becker WC0335* (USF). Nassau Co.: Shallow depression in wet-mesic pine flatwoods NE of Big Oaks Rd, ca. 0.4 mi NW of Fire Tower Rd, ca. 3 air mi NE of jct. US 301 and FL 119 on S side of Bryceville, Cary State Forest - WMA, Bryceville 7.5' Quad., SEQ, SEQ, Sec. 16, T1S, R24E, 30°24'29" N, 81°54'06" W, Soils - Evergreen - Leon (Typic Haplaquods), 12 Sep 1999, *Orzell & Bridges 25579* (FLAS, USF); burned ecotone to depression swamp N of intersection of Fox Squirrel Rd and Chicken Farm Rd, ca. 3 air mi NW of jct. US 301 and FL 119 on S side of Bryceville, Cary State Forest - WMA, Bryceville 7.5' Quad., FLNASS037: SWQ, NWQ & NWQ, SWQ, Sec. 21, T1S, R24E, 30°23'52" N, 81°54'55" W, Soils - Boulogne (Typic Haplaquods), 12 Sep 1999, *Orzell & Bridges 25557* (FLAS). Orange Co.: Recently burned swale in longleaf pine palmetto flatwoods located in the NW section of the campus of Florida Technological University, 27 Apr 1975, *Poppleton s. n.* (USF); wet pine flatwoods near small ditch, University of Central Florida Campus, 1 Oct. 1992, *Taylor s.n.* (USF); wet-mesic longleaf pine savanna with grassy swales, now fire-suppressed, a few plants in flower along trail and areas of soil disturbance, Northwest Parcel of UCF Arboretum, Sec. 3, T22S, R31E, 28°36'32" N, 81°12'03" W, 1 Oct 2003 *Orzell & Stout 26188* (FLAS, FSU, FTU, NCU, USF); burned dry-mesic sandy longleaf pine savanna, in burn unit 11A of the University of Central Florida Arboretum, Oviedo SW 7.5' Quad., SEQ, NEQ, SEQ, Sec. 2, T22S, R31E, 28°36'09" N, 81°11'26" W, 2 Oct 2018, *Orzell & Bridges 27369* (FLAS, FTG, FTU, NY, US, USF). Pasco Co.: Large prairie along Rte 52, E of Hwy 41 in large clumps, 21 Sep 1981, *Correll 52638* (USF); mesic flatwoods, Starkey Wilderness Park, 2.5 NNW of Odessa, SEQ, NWQ, Sec. 9, UTM 17R 0342073, 3124640, 10 Jun 2004, *Ferguson &*

Kunzer 887 (USF); mesic flatwoods, Starkey Wilderness Park, 2.5 NNW of Odessa, NEQ, SEQ, Sec. 9, UTM 17R 0342766, 3124132, 17 Sep 2004, *Ferguson & Kunzer 863* (USF); mesic flatwoods, Starkey Wilderness Park, 2.5 NNW of Odessa, 29 Sep 2003, *Ferguson & Coleman 431* (USF). Polk Co.: Grassy slash pine flatwoods area next to pasture, frequent, Saddle Blanket Scrub Preserve, NW corner, 27.67109° N, 81.58022° W, 18 Feb 2007, *Corogin SB260* (FLAS); wet-mesic longleaf pine savanna E of Durden Rd, ca.4.8 mi SW of jct Old Bravo Rd and Alpha Rd, Avon Park Air Force Range, Lake Arbuckle NE 7.5' Quad., FLPOLK206F, SEQ, NWQ, SEQ, Sec. 35, T32S, R30E, 27 39'03' N, 81 17'30" W, elev. 74-80 ft., Soils - Valkaria (Spodic Psammaquents), 30 Sep 2010, *Orzell & Bridges 26412* (FLAS, FTU, NCU, USF), 4 Oct 2010, *Orzell & Bridges 26413* (FSU, FTG, NY, US, USF).

Etymology

Sporobolus osceolensis is named for Osceola, *Asi-yahola* in Creek (1804-1838), born into the Muscogee (Creek) nation in Alabama, who took refuge in Florida after the Creek Wars and became an important leader of the Seminole nation. A leader of the resistance to removal of the Seminole from Florida to Indian Territory, he was captured by deceptive tactics during the Second Seminole War and died shortly after being imprisoned. Our first collections of this species were in the Osceola National Forest, which was named in his honor.

Taxonomic relationships in the *Sporobolus floridanus* complex

The *Sporobolus floridanus* complex as recognized by Weakley & Peterson (1998), consists of five species (*S. curtissii, S. floridanus, S. pinetorum, S. silveanus,* and *S. teretifolius*), each endemic to narrow geographic regions of the southeastern USA Coastal Plain. All but *S. silveanus,* which extends from the longleaf pine savannas into grassland regions of eastern Texas and southeastern Oklahoma, are restricted to fire-maintained pine savannas. They are cespitose perennials with hardened cartilaginous basal sheaths, open pyramidal to ovate panicles with ascending branching when mature, and primary branches that are not floriferous on the lower third. The spikelets are purplish-brown with the lower glume linear-lanceolate to lanceolate with an acuminate apex, with fusiform to obovoid grains. Our work closely follows but expands on the Weakley & Peterson's taxonomic treatment of the *S. floridanus* complex (Poaceae: Sporobolinae) by providing supplemental information on *S. curtissii*, *S. pinetorum*, and *S. floridanus* and by the description of the new species *S. osceolensis.*

For several decades in the 1800s, the only species described in this group was *Sporobolus floridanus*, this name first used by Chapman in 1860 from type material near Apalachicola, Florida. *Sporobolus curtissii* was first named as a variety of *S. floridanus* in 1896 from Curtiss specimens collected near Jacksonville, Florida, and elevated to species status only a year later in 1897. Neither of these were explicitly reported as occurring outside of Florida until Harper found *S. floridanus* in Sumter Co., Georgia, in 1900 (Harper 1901) and then collected *S. curtissii* in Lowndes Co., Georgia, in 1902. Being familiar with these, Harper then realized that some of his specimens differed from both of the previously named species, and he described *Sporobolus teretifolius* from the Coastal Plain of Georgia (Harper 1906). Gradually over the decades, collections were made which expanded the range of each of these, and eventually some of the northern records which had been referred to one of these three was described as *Sporobolus pinetorum* (Weakley & Peterson 1998). Without the sorting of existing records and clarification of descriptions and ranges provided by this paper, we may have easily overlooked our first collections of *S. osceolensis.*

The *Sporobolus floridanus* complex is a group of closely similar species, recently placed in subsect. *Floridani* of sect. *Calamovilfa* (Peterson et al. 2014). As with *S. pinetorum, S. osceolensis* is somewhat intermediate between *S. floridanus* and *S. curtissii*. *Sporobolus osceolensis* is readily distinguished from *S. teretifolius* by its wider, not terete, leaf blades and antrosely scabrous leaf margins. *Sporobolus osceolensis* differs from *S. pinetorum* in its flat (at least when fresh) slightly

wider leaves, and its glabrous spikelet pedicels. Fertile *S. curtissii* is readily distinguished by its short-pediceled, appressed spikelets, and its larger lower glumes. Additionally, vegetative *S. curtissii* is distinctive with its short leaf blades and tendency to have glabrous leaf margins. *Sporobolus floridanus* has the widest leaves within this group, with a very distinctive bluish-green color. *Sporobolus osceolensis* has shorter and narrower leaves than *S. floridanus*, which are yellowish-green to green.

Sporobolus curtissii is distinguished from *S. floridanus* by its much narrower (1.2-2 mm wide) and shorter leaves, which are lime green in striking contrast to the bluish leaf color of *S. floridanus* (McMillan et al. 2002). *Sporobolus curtissii* differs from *S. pinetorum* by its narrower glumes, short appressed pedicels, shorter leaves, and more densely pubescent leaf bases. McMillan et al. (2002) noted that the unburned foliage of *S. curtissii* is dark green, relatively short, 1–4 mm wide and strap-shaped, much like a narrow-leaved *Liriope*.

Key to the Sporobolus floridanus group in the southeastern USA (modified from the Sporobolus key in Weakley 2020)

1. Leaves terete or subterete (wiry), oval in cross-section, sometimes irregularly channeled for part of their length (never with any portion above the sheath flat), < 1 mm wide, tending to senesce and turn tan in autumn, the margins generally smooth; culms (including the inflorescence) (2-) 4-7 (-10) dm tall; culms (from base to first inflorescence branch) 1.5-5 dm tall; first glume averaging about 0.7× as long as the second glume (though variable, ranging from 0.5-0.75×) ..... **Sporobolus teretifolius**
1. Leaves flat (sometimes inrolled or folded when dry), plane or v-shaped in cross-section, with free margins their entire length, (0.5-) 1.2-10 mm wide, tending to remain green into the winter (at least until December), the margins at least partially scabrous (except in S. curtissii); culms (including the inflorescence) 3-22 dm tall; culms (from base to first inflorescence branch) (4-) 6-10 dm tall; first glume averaging 0.75-1× as long as the second glume (though variable, collectively ranging from about 0.5-1.2×)

    2. First glume averaging 0.95-1.1× as long as the second glume (though variable, ranging from 0.8-1.3×); pedicels mostly 1-3 mm long (a few sometimes as long as 10 mm long), strongly appressed to the panicle branches; culms (including the inflorescence) 3-7 dm tall; inflorescence branches stiffly ascending; leaves 0.5-1.5 mm wide (or to 2.0 mm wide when unburned), mostly 1.5-4 dm long (rarely to 5 dm long), smooth on the margins; [of e. SC southward] ..... **Sporobolus curtissii**
    2. First glume averaging 0.5-0.9× as long as the second glume (though variable, ranging from 0.5-0.95×); pedicels mostly 4-15 mm long, ascending to spreading; culms (including the inflorescence) (3-) 7-16 (-22) dm tall; inflorescence branches initially ascending, later loosely ascending to spreading; leaves 1.2-10 mm wide, mostly (3-) 4-8 dm long, upwardly scabridulous on at least the lower leaf margins; [of e. NC southward]

    3. Leaves (2.0-) 3-10 mm wide, typically pale bluish-green (sometimes with some yellowish leaves as well), typically widely spreading to recumbent with age; first glume averaging 0.75-0.9× as long as the second glume ..... **Sporobolus floridanus**
    3. Leaves 1.2-3.0 (-4.0) mm wide, yellowish-green to dark green, mostly strictly ascending; first glume averaging (0.5-) 0.6-0.8 x as long as the second glume

        4. Leaves 1.2-2.0 (-3.0) mm wide, dark green, often inrolled above when dry; culms (including the inflorescence) usually 6-12 (-18) dm tall; inflorescence usually 2-3.5 dm long; pedicels often scabridulous [of e. NC south to e. GA]..... **Sporobolus pinetorum**
        4. Leaves 2.0-3.0 (-4.0), yellowish-green, generally flat or folded; culms (including the inflorescence) usually (10-) 12-16 dm tall; inflorescence usually 3.5-6 dm long; pedicels glabrous or nearly so [of northeast to central peninsular Florida] ..... **Sporobolus osceolensis**

Distribution

All five species in this group have somewhat distinct centers of distribution within the southeastern USA, but most have some overlap in at least the periphery of their ranges (Weakley & Peterson 1998). *Sporobolus curtissii, floridanus, pinetorum,* and *teretifolius* all occur in southern Georgia and can co-occur in various combinations. Neither *S. teretifolius* nor *S. pinetorum* has any known range overlap with *S. osceolensis*. *Sporobolus teretifolius* occurs in southeastern North Carolina, south to southern Georgia, and west to extreme southeastern Alabama. *Sporobolus pinetorum* is found in eastern North Carolina, northern South Carolina, and eastern Georgia and is not currently known from Florida.

Sporobolus curtissii, S. floridanus, and *S. osceolensis* have overlapping ranges in peninsular Florida. *Sporobolus curtissii* is the most abundant and wide-ranging of these, with a range centered in southern Georgia and adjacent northeastern Florida (Alachua, Baker, Bradford, Columbia, Clay, Duval, and Nassau counties). Disjunct populations are known from Berkeley County in eastern South Carolina (McMillian et al. 2002), south-central peninsular Florida (Manatee, and Polk counties, with very old historical records from Orange and St. Lucie counties) and widely scattered westward in the Florida panhandle to Okaloosa and Walton counties. *Sporobolus floridanus* occurs in southern South Carolina, southern Georgia, eastern Alabama, and northern Florida (Weakley & Peterson 1998), but is perhaps most frequent in the Florida Panhandle and south Georgia where it can form dense monospecific stands in fire-maintained pine savannas. *Sporobolus osceolensis* has the narrowest range of these three. It is found principally in northern peninsular Florida, where it has been collected by the authors in five counties (Baker, Clay, Columbia, Duval, and Nassau) and overlaps with the southeastern extension of *S. floridanus*. More notably, there are several collections of *S. osceolensis* from further south in central peninsular Florida, in Hillsborough, Manatee, Orange, and Pasco counties, all south of the range mapped for *S. floridanus* in Weakley & Peterson (1998) and Peterson et al. (2003).

Ecological relationships

In northeast Florida, *Sporobolus curtissii, S. floridanus,* and *S. osceolensis* can co-occur, but they show preferences for slightly different microhabitats. These habitat preferences can be separated based on hydro-edaphic gradient positions at sites where all three occur. *Sporobolus curtissii* is abundant in drier pine savannas, *S. osceolensis* in wet-mesic pine savannas and depression margins, and *S. floridanus* in the wetter pine savanna habitats. While *S. floridanus* sometimes can occur in close proximity to *S. osceolensis*, *S. floridanus* is more prevalent in wetter habitats.

Sporobolus curtissii is most prevalent in mesic pine savannas on poorly drained spodosols from southern Georgia (McMillan et al. 2002) south to north-central Florida. Here it is often locally abundant (up 90% of the total groundcover) usually with *Serenoa repens, Ilex glabra, Vaccinium myrsinites, Gaylussacia dumosa,* and *Gaylussacia nana*. Outside of its distribution center we have observed *S. curtissii* as isolated patches in otherwise atypical habitats, those being seasonally wet swales in central Florida oak scrub. At its southern limit in Manatee County, Florida, *Sporobolus curtissii* can occur mixed with *S. osceolensis* in the groundcover of mesic pine savannas.

Sporobolus floridanus is prevalent from southern Georgia (McMillan et al. 2002; Bridges & Orzell 2010) to the Gulf Coastal Lowlands of the Florida Panhandle, and is especially prevalent in the Apalachicola Embayment region. In the Apalachicola National Forest, it is not uncommon to see it forming monospecific stands in the transition between uplands and seepage slopes or wetland savannas (Bridges 2005). Throughout its range, especially near its range limits (South Carolina and northeast Florida) it seems to prefer herbaceous ecotones bordering shallow depressions or cypress strands embedded in poorly drained pine savannas. Outside of northeast Florida, collections of *S. floridanus* from near-coastal grasslands indicate that it may have a wider ecological tolerance in the Florida Panhandle.

In northeast Florida, *S. osceolensis* occurs within seasonally wet habitats (ecotonal seeps and occasionally in the outer margins of depression wetlands) within the pine savanna landscape. Although now rare, historically these seeps were widespread and occurred along the interface of the upland pine savannas with adjacent forested wetlands, based on our examination of historical aerial photography of the Osceola National Forest. These are herbaceous dominated zones which are seasonally saturated by seepage, occurring on gradual almost imperceptible slopes below *Serenoa repens* in the upland pine savannas to just above the adjacent forested wetlands. Plants associated with *S. osceolensis* in these seeps include *Dichanthelium ensifolium, Andropogon cretaceus, Hymenachne hemitoma, Amphicarpum muehlenbergianum, Sarracenia minor, Rhynchospora fascicularis, Andropogon brachystachyus,* and *Lyonia lucida*. Historically, lightning fires from the pine savannas burned into the seeps and depression wetlands during dry periods thereby reducing competing shrub cover and maintaining them as herbaceous communities. While *Sporobolus floridanus* can occur intermixed with *S. osceolensis* in depressions, *S. floridanus* usually prefers the wetter habitats.

In central peninsular Florida the habitat of *S. osceolensis* is upland mesic to even slightly dry-mesic pine savannas. Community dominants at an Orange County site include *Pinus palustris / Serenoa repens - Dichanthelium tenue - Rhynchospora plumosa - Lyonia fruticosa - Scleria muehlenbergii - Aristida beyrichiana - Lyonia lucida - Ilex glabra - Rhynchospora fascicularis - Xyris caroliniana - Aristida rhizomophora,* in addition to *S. osceolensis*. In Manatee County it occurs in a similar community type, with *Sporobolus curtissii, Aristida beyrichiana, A. spiciformis, Serenoa repens, Lachnocaulon anceps, Lyonia fruticosa, Vaccinium myrsinites, Schizachyrium stoloniferum, Andropogon capillipes,* and *Polygala rugelii.* We have only been able to locate one site for *Sporobolus osceolensis* on Avon Park Air Force Range in southern Polk County, where it occurs in slightly elevated *Serenoa repens* "islands" within a wetland pine savanna. The general area of this site is known for having species at or near their southern range limit, and in wetter habitats within a few hundred meters of this site are the southernmost known records of *Agalinis filicaulis* and *Platanthera integra*. Associated species at this Polk County site include *Serenoa repens, Ctenium aromaticum, Xyris ambigua, Carphephorus corymbosus, Lyonia fruticosa, Scleria distans, Aristida beyrichiana, Morella pumila, Sophronanthe pilosa, Liatris resinosa, Helianthus angustifolius, Eryngium synchaetum, Pityopsis tracyi, Ilex glabra,* and *Sorghastrum secundum.* Given the variation in habitats at sites we have surveyed for *Sporobolus osceolensis* in central peninsular Florida, information from more sites is needed in order to more completely document its habitat requirements and explain its sporadic occurrences in south-central Florida.

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Appendix I: Representative specimens of *Sporobolus floridanus* from northeast Florida, most from sites where sympatric with *Sporobolus osceolensis*

Florida: Baker Co.: Burned open ecotone above depression swamp N of FS Rd 205, ca. 0.4 mi E of jct FS Rd 286, ca. 10 air mi NNE of Olustee, Osceola NF, Sanderson North 7.5' Quad., NEQ, SWQ, Sec. 13, T2S, R19E, 30°19'02" N, 82°21'55" W. 10 Sep 1999, *Orzell & Bridges 25529* (FLAS, FSU, FTU, NCU, USF), burned shallow upland depression pond ca. 0.2 mi W of Osceola NF boundary, NE of FS Rd 207B, ca. 4.3 air mi ENE of Olustee, Osceola NF, Sanderson South 7.5' Quad., SEQ, NEQ, Sec. 18, T3S, R20E, 30°14'00" N, 82°20'45" W, 13 Sep 1999, *Orzell & Bridges 25601* (FLAS, NCU, NY, USF). Columbia Co.: Herbaceous ecotone between pine flatwoods and cypress on W side of Caney Flat Branch, E of FS Rd 236-1, ca. 0.7 air mi SSE of jct FS Rd 233-2 at Greenfield; Osceola NF, Compartment 65, Stand 4, Deep Creek 7.5' Quad., SWQ, SWQ, SWQ, Sec. 18, T2S, R18E, 30°18'28" N, 82°33'30" W, Soils - Surrency (Arenic Umbric Paleaquults), 13 Sep 1999, *Orzell & Bridges 25598* (FLAS, USF); herbaceous ecotone between pine flatwoods and cypress S of FS Rd 233-B, 0.55 air mi NE of jct FS Rd 234-1, ca. 3 air mi NNW of jct FL 250 and I-10, ca. 12 air mi N of Lake City, Osceola NF, Compartment 67, Stand 10, Deep Creek 7.5' Quad., NWQ, NEQ, Sec. 28, T2S, R18E, 30°17'29" N, 82°30'56" W, Soils - Mascotte (Ultic Haplaquods), 15 May 1999, *Orzell & Bridges 25480* (FLAS, USF), burned margin of depression pond in wet-mesic slash pine flatwoods ca. 0.4 air mi NNE of jct FL 250 and FS Rd 233-1, ca. 2 air mi NW of I-10

crossing of Columbia Co line, ca. 12 air mi NE of Lake City, Osceola NF, Compartment 58, Stand 5, Big Gum Swamp 7.5' Quad., SEQ, NEQ, Sec. 26, T2S, R18E, 30°17'18" N, 82°28'31" W, Soils - Olustee (Ultic Haplaquods), 10 Sep 1999, *Orzell & Bridges 25538* (FLAS, FTU, NCU, USF). Duval Co.: Depressional wetlands S of Cypress Pond Rd, ca. 0.5 mi E of Power Line Rd, ca. 3 air mi NE of jct. US 301 and FL 119 on S side of Bryceville (Nassau Co.), Cary State Forest, Bryceville 7.5' Quad., SEQ, NWQ, Sec. 22, T1S, R24E, 30°23'58" N, 81°53'30" W, Soils - Boulogne (Typic Haplaquods). 12 Sep 1999, *Orzell & Bridges 25570* (FLAS, USF); burned powerline right-of-way through flatwoods W of Powerline Rd, ca. 0.4 mi S of Big Oaks Rd, N of jct. of Cypress Pond Rd, ca. 3 air mi NE of jct US 301 and FL 119 on S side of Bryceville (in Nassau Co.), Cary State Forest, Bryceville 7.5' Quad., WH, NWQ, Sec. 22, T1S, R24E, 30°24'04" N, 81°53'55" W, 12 Sep 1999, *Orzell & Bridges 25582* (FLAS, USF). Nassau Co.: Clearcut burned mesic flatwoods and ecotone to depression swamp N of intersection of Fox Squirrel Rd and Chicken Farm Rd, ca. 3 air mi NW of jct. US 301 and FL 119 on S side of Bryceville, Cary State Forest, Bryceville 7.5' Quad., SWQ, NWQ & NWQ, SWQ, Sec. 21, T1S, R24E, 30°23'52" N, 81°54'55" W, Soils - Boulogne (Typic Haplaquods). 12 Sep 1999, *Orzell & Bridges 25555* (FLAS, NCU, NY, USF).