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## Two New Species and a New Combination in Southeastern United States *Xyris* (Xyridaceae) from Florida

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**ABSTRACT.** Two new species of *Xyris* from peninsular Florida, in the southeastern United States, are described, illustrated, and discussed as to their ecological, geographical, and taxonomic relationships with other *Xyris*. *Xyris calcicola* is found primarily in central and southern Florida in calcareous habitats. *Xyris correlliorum* is endemic to southern Lake Wales Ridge lakes and is distinguished by its evident rhizomes, deeply lacerate petals, and elongated spikes. *Xyris floridana* is proposed as a change in taxonomic rank. A key is provided for all 24 *Xyris* species in Florida.

**Key words:** coastal plain, endemic, Florida lakes, Lake Wales Ridge, Xyridaceae, *Xyris*.

The genus *Xyris* L. is the only North American representative of the family Xyridaceae, and is recognized by its scapose habit, dense spike, and 3-petaled yellow or white flowers. Few species were described from the United States until Chapman (1860) published his *Flora of the Southern United States*, and it was another century until Chapman's named *Xyris* species were widely recognized as distinct, with Kral's (1960) publication of the first *Xyris* treatment for Florida. Later, Kral (1966) published a comprehensive monograph on *Xyris* for the continental United States and Canada, recognizing 22 species and infraspecific taxa. Subsequently, three additional species have been described as southeastern United States endemics (Kral, 1978; Bridges & Orzell, 1987, 1990). Despite these treatments, there have been comparatively few intensive field studies of *Xyris* in peninsular Florida. Efforts by the authors to document the distribution and habitat relationships of *Xyris* species in this region have resulted in the two novelties described herein and led us to reexamine the taxonomy of the *Xyris difformis* complex. Both of the *Xyris* species described herein have been

overlooked by past collectors, with only a few previous collections.

**1. *Xyris calcicola*** E. L. Bridges & S. L. Orzell, sp. nov. TYPE: U.S.A. Florida: Polk Co., disturbed, weedy, calcareous shell shoulder above roadside ditch on S side of Bravo Rd., E of Frostproof Rd., ca. 11 air mi. E of Avon Park, Avon Park Air Force Range, elev. 21.2 m, 20 Sep. 1994, S. L. Orzell & E. L. Bridges 23198 (holotype, USF; isotypes, BRIT, DUKE, FLAS, FSU, FTG, GA, MO, NCU, NY, TEX, US). Figure 1.

*Xyridi floridanae* similis sepalis lateralis laceratis quam bracteis spicae brevioribus, foliis ad bases subroseis vel purpureis, et seminibus farinosis, sed differt foliis ac scapis torsivis, spicis apice scapi ad angulum divergentibus, spicae bracteis inferis acute carinatis, bracteis spicae area dorsali viridi, et petalis obovatis.

Perennial herb, loosely to densely caespitose, in clumps to 15 cm diam., 3–8 dm high; the roots slender, fibrous. Leaves narrow, 15–30 cm × 1–3 mm, strongly spirally twisted, the margins and surfaces scarcely if at all tuberculate, appearing smooth at 60×, finely roughened at 180× but not distinctly tuberculate; leaf sheaths slightly expanded, a deep pink to reddish purple for the lowermost 5–10 cm. Sheath of the scape tight, reddish purple, 5–10 cm long, with a linear-subulate blade 10–25 mm long, much shorter than the principal leaves. Scapes linear, 3–8 dm × 1.0–1.5 mm at apex, spirally twisted, strongly tuberculate-scabrous, basally angled or blocky and several ridged, becoming slightly flattened and bi-costate above, the two major costae strongly tuberculate-scabrid and comprising the scape edges, with 2–4 additional prominent costae on each face of the scape. Spikes broadly ovoid, rounded to slightly acute, at maturity ca. 9–16 × 5–8 mm, several-flowered, when mature diverging from the apex of the scape at a 10° to 20° angle, the bracts tightly spirally imbricate; lower-

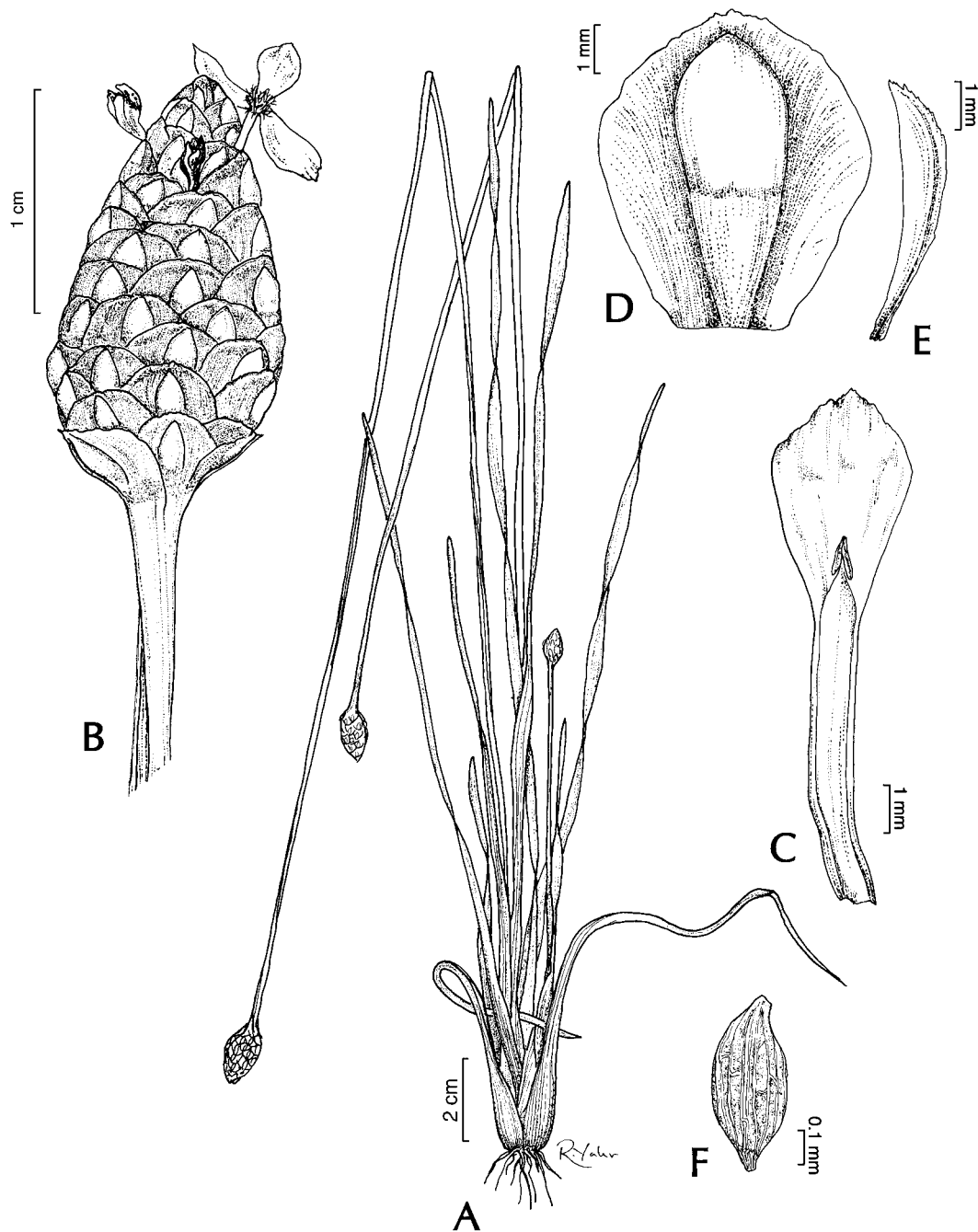


Figure 1. A–F. *Xyris calcicola* E. L. Bridges & S. L. Orzell, based upon the USF holotype collection, S. L. Orzell & Bridges 23198. —A. Habit. —B. Spike. —C. Petal blade, stamen. —D. Fertile bract. —E. Lateral sepal. —F. Seed.

most bracts of spike sharply keeled along the green dorsal area, the other bracts with rounded backs; bracts of spike orbicular, with an ovate-triangular bright green prominent dorsal area, sharply contrasting with the dark brown sides, the boundary between the two areas rather abrupt. Lateral sepals

included, 5–6 mm long, linear-curved, the keel irregularly lacerate. Petal blades obovate to somewhat obovate-obtriangular, yellow, ca. 4 mm long, 3–4 mm wide near apex, 2 mm wide at base, the base narrowed-cuneate, the apex broadly acute rounded, somewhat irregularly shallowly lacerate to

emarginate. Staminodia bi-brachiate, the branches slightly penicillate, rather small, held erect in center of flower. Capsule ellipsoid, ca.  $3\text{--}4 \times 2.5\text{--}3$  mm, the placentation parietal. Seed ellipsoid to broadly ellipsoid, 0.3–0.4 mm long, somewhat obliquely caudate-tailed at one or both ends, opaque, the surface dark brown to grayish brown, partially obscured by a yellowish farinose substance, with about 12–18 regularly spaced longitudinal lines of papillae, and several much fainter irregular cross lines.

*Etymology.* *Xyris calcicola* is named for its preference for calcareous habitats, in contrast to the acidic habitat preferences of most southeastern coastal plain species of *Xyris* in the United States. The only other U.S. *Xyris* with calcareous habitat preference is *Xyris tennesseensis* Kral, which occurs on wet calcareous substrates (Kral, 1978), in fens (calcareous seepage wetlands) developed over dolomite or limestone strata in the interior provinces of Alabama, Georgia, and Tennessee. *Xyris tennesseensis* differs from *X. calcicola* in its bulbous plant base and leaves that are wider (5–10 mm) and flat to only slightly twisted.

*Phenology.* Flowering from mid summer until late fall, from August until November. Flowers opening in late morning, generally from about 10:00 to 10:30 AM, and closing in early afternoon, from about 12:30 to 1:00 PM. The withered flower petals persist on spikes as gray-black rounded masses for short periods, probably dehiscing within one week of anthesis.

*Taxonomic relationships.* Although somewhat cryptic, its remarkably consistent morphology and lack of intermediates with the often sympatric *Xyris floridana* and *X. jupicai* indicate the distinctiveness of *X. calcicola*. Despite sharing some characters with these species, *X. calcicola* has additional distinctive characters found in neither *X. jupicai* nor *X. floridana*, indicating that it is unlikely to be a hybrid or product of introgression.

Although *Xyris calcicola* shares the flexuous, twisted scapes and leaves found in *X. platylepis*, *X. scabrifolia*, and *X. chapmanii*, it seems to be part of the complex comprising *X. jupicai*, *X. difformis*, *X. curtissii*, and *X. floridana*. *Xyris jupicai* differs from *X. calcicola* in having flat or only slightly twisted scapes and leaves, a smooth scape, spikes held erect from the apex of the scape rather than diverging at an angle of  $10^\circ$  to  $20^\circ$ , obtriangular petals, which are truncate at the apex, a translucent seed, and in lacking sharply keeled lowermost bracts on the spike.

*Xyris calcicola* shares more characters with *X. floridana* than with any other species of the group.

*Xyris floridana* differs from *X. calcicola* in lacking additional sharp scape ridges on the upper scape, lacking sharply keeled lower bracts on the spike, lacking sharply differentiated green dorsal areas on the bracts of the spike, and lacking sharply acute spikes at maturity. *Xyris calcicola* has obovate to somewhat obovate-obtriangular petals as opposed to the broadly ovate petal blades of *X. floridana*.

*Distribution and ecology.* *Xyris calcicola* occurs almost exclusively in calcareous habitats, primarily in southern and south-central Florida, and very rarely in northern Florida. It is occasional in wet marly soils overlying limestone and in herbaceous-dominated ecotones between wetland South Florida slash pine (*Pinus elliottii* Engelmann var. *densa* Little & Dorman) savannas and depression marshes in southern Florida. It also occurs in muhly grass [*Muhlenbergia capillaris* (Lamarck) Trinius var. *filipes* (M. Curtis) Chapman ex Beal] dominated marl prairies and calcareous South Florida slash pine savanna-flatwoods, particularly in the Big Cypress Region in Collier County. In southeastern Florida, it occurs on calcareous-influenced soils, primarily in the hydric pine savanna-flatwoods region of Martin and Palm Beach Counties. It is sporadic in south-central Florida in both disturbed and natural habitats. *Xyris calcicola* has been collected from the upper edges of calcareous roadside ditches, where crushed shell or marl has been used for road surface or subsurface fill. It also occurs in calcareous fringing wet prairies bordering depression wetlands found within the pine savanna-flatwoods/dry prairie landscape of south-central Florida (in Okeechobee and Polk Counties). Some calciphiles associated in native habitats include *Eriocaulon ravenelii* Chapman, *Heliotropium polyphyllum* Lehmann, *Iva microcephala* Nuttall, *Ludwigia microcarpa* Michaux, *Paspalum monostachyum* Vasey ex Chapman, *Rhynchospora colorata* (L.) H. Pfeiffer, *R. divergens* Chapman ex M. Curtis, *Schoenus nigricans* L., *Schizachyrium rhizomatum* (Swallen) Gould, and *Scleria verticillata* Muhlenberg ex Willdenow. All habitats for *X. calcicola* are generally in saturated soils that are inundated to a depth of 2 to 15 cm during the wet season. Botanists should search for *X. calcicola* in wet calcareous areas elsewhere in the outer coastal plain and in the Caribbean.

*Paratypes.* U.S.A. **Florida:** Baker Co., edge of cutover slash pine-cypress swamp, W of Sanderson, 22 Aug. 1991, Orzell & Bridges 17972 (FLAS, FTG, MO, NY, USF); Collier Co., ecotone betw. pine rockland savanna & marl prairie, ca. 4.3 air mi. NE of Copeland, 29 Oct. 1993, Orzell & Bridges 22538 (FTG), 11 Nov. 1994, Orzell & Bridges 23442 (FLAS, FTG, MO, US, USF); Lee Co., clearcut wetland slash pine savanna, ca. 7.9 air mi. NE of Bonita Springs, 28 Nov. 1995, Bridges & Mears 24147 (FTG, USF);

Monroe Co., wet slash pine-cabbage palm marly savanna, ca. 4 mi. W of Pinecrest, 11 Nov. 1994, *Orzell & Bridges 23443* (FTG, USF); Polk Co., calcareous roadside ditch, Avon Park Air Force Range, 11 Sep. 1993, *Orzell & Bridges 22350* (APAFR, FLAS, USF), 31 Oct. 1994, *Orzell & Bridges 23370* (APAFR, BRIT, FLAS, FTG, MO, USF); Okeechobee Co., calcareous wet prairie, ca. 10.4 mi. WNW of Fort Drum, 29 Oct. 1997, *Orzell & Bridges 25256* (FLAS, MO, USF); Osceola Co., wet roadside with shell, ca. 2 mi. E of Holopaw, 24 Aug. 1996, *Orzell & Bridges 25158* (FTG, USF); Palm Beach Co., marly hydric slash pine savanna, J. W. Corbett Wildlife Management Area, 18 Oct. 1995, *Orzell & Bridges 23842* (BRIT, FLAS, FTG, MO, NY, USF). Additional habitat and location data are available for Orzell & Bridges collections from the authors.

**2. *Xyris floridana*** (Kral) E. Bridges & Orzell, comb. nov. Basionym: *Xyris difformis* Chapman var. *floridana* Kral, *Sida* 2: 256. 1966. TYPE: U.S.A. Georgia: Chatham Co., 7 mi. N of Richmond Hill on wet sandy peat of bulldozed pine flatwoods, 21 Aug. 1963, *R. Kral 18941* (holotype, SMU [BRIT]).

While investigating the distinctiveness of *X. calicicola*, we also reexamined the taxonomy of *Xyris difformis* and its varieties. The *Xyris difformis* complex has been recognized as consisting of three varieties (Kral, 1966, 2000)—*Xyris difformis* var. *curtissii*, *X. difformis* var. *floridana*, and *X. difformis* var. *difformis*. *Xyris curtissii* was described as a species by Malme (1913), and Kral (1960) treated it as a variety of *X. serotina*. In 1966, Kral described *X. difformis* var. *floridana*, differentiating it from *X. serotina*. Kral in 1960 (p. 318) and later (Kral, 1966: 253–254), after much careful study and debate, recognized *Xyris difformis* var. *difformis* as distinct from *X. jupicai*. Kral (1960: 318) commented that future study of *X. difformis*, *X. serotina*, and *X. curtissii* might reduce them to subspecies status. In contrast, our study has led us to recognize these three taxa, as well as *X. floridana*, at the species level.

*Xyris difformis* is remarkably consistent in morphological characters on the southeastern U.S. coastal plain. It is distinguished from both *X. curtissii* and *X. floridana* in being much taller, typically solitary, broad-leaved, and having a broad scape, smooth leaves and scape (except for the scape ridges and leaf edges), and a distally widened scape with two prominent ribs. Its many-flowered ovoid spike with a rounded apex and larger lateral sepals to 7 mm long also help to separate it from both other entities. Its translucent seed separates it from *X. floridana*, and the numerous fine longitudinal lines on the seed separate it from *X. curtissii*. Throughout most of their ranges, *X. curtissii* and *X. floridana* are easily recognizable as distinct from *X. difformis*, with few or no intermediates even where

more than one of these is sympatric. Typical *X. curtissii* is a low, caespitose plant with translucent seeds, where it is sympatric with *X. floridana* and *X. jupicai*. However, in northern Florida and elsewhere on the outer coastal plain there are some populations of *X. curtissii* that are slightly taller and with more erect leaves that resemble *X. floridana* vegetatively, but lack the farinose seeds of *X. floridana*. There is potential for hybridization and introgression between these species at some locations, but we have seen no specimens that simultaneously overlap in more than one or two characters. Notwithstanding the occasional intermediate herbarium specimen, in our experience and that of others with extensive field experience with *Xyris* (LeBlond & Sorrie, 2001: 300), they are justifiably recognized at the species level.

All three species are somewhat ecologically differentiated at least in Florida. Range and habitat descriptions are based on manuscripts in preparation for the *Flora of Florida* (Bridges, unpublished manuscript). *Xyris difformis* occurs in bay forests, along seepage streams, and in forested stream floodplains in the Florida panhandle east to Jefferson County, and also in Nassau County in northeast Florida. In Florida, it is typically associated with shaded muck or mucky peat substrates, usually where there is seepage or periodic flooding. Range-wide, the habitats are more diverse, including wet sands or sandy peats of flatwoods, pond margins, ditches, lakeshores, and alluvial habitats such as stream margins and floodplain forests. Although primarily a coastal plain species, *X. difformis* is wide-ranging from east-central Texas to its northern limits in New England and southeastern Canada. *Xyris curtissii* occurs in seepage areas and wetland pine savannas, in Florida primarily in the panhandle region east to Jefferson County, and also in Duval and Clay Counties in northeastern Florida. It occurs from southeastern Virginia to northern Florida and west to east-central Texas, and also Belize (Kral, 2000). In Florida, *X. floridana* occurs on moist sands and peaty sands in acidic, wet to wet-mesic pine savanna-flatwoods, wet prairies, and ecotones between pine flatwoods and wetlands. *Xyris floridana* is primarily an outer coastal plain species, with the largest number of collections from peninsular Florida, and is less common in the Florida panhandle. It ranges from southeastern North Carolina across rarely to southeastern Louisiana. It also occurs in Belize, Honduras, and Nicaragua (Kral, 2000).

Our observations are based upon hundreds of collections by the authors from several southeastern coastal plain states, examination in the field of nu-

merous large *Xyris* populations, and critical study of many herbarium specimens while preparing the *Xyris* treatment for the *Flora of Florida*. The overlapping ranges of the three taxa in Florida allowed us to study many sympatric populations in the field.

**3. *Xyris correlliorum*** E. L. Bridges & S. L. Orzell, sp. nov. TYPE: U.S.A. Florida: Highlands Co., emergent vegetation rooted in organic floating vegetation mats, along S shoreline of Lake Placid, elev. 28.7 m, 5 Sep. 1995, S. L. Orzell & E. L. Bridges 23809 (holotype, USF; isotypes, BRIT, FLAS, FSU, FTG, GA, MO, NCU, NY, TEX, US). Figure 2.

*Xyridi longisepalae* similis sepalis lateralibus ciliatis versus basim laceratis versus apicem, sed differt rhizomatibus tenuibus elongatis squamosis, spicis 2–3.2 cm longis ca. 4 plo longioribus quam latioribus, sepalis latioribus inclusis vel a bracteis spicae parum exsertis, petalis profunde laceratis, et seminibus farinosis obscure alveolatis.

Perennial herb, the culms arising singly, or in rather dense clumps from thin, elongate, light tan scaly rhizomes, the clumps ranging from fairly small to forming an extensive dense turf of basal rosettes. Leaves of emergent plants erect to slightly spreading, linear-curved, 10–15(–20) cm long, 1–3(–5) mm wide, lustrous, smooth, the margins somewhat pale and sometimes slightly tuberculate, the sheaths slightly expanded, stramineous or tan to pale pink. Sheaths of scape rather loose above, a lustrous tan to golden brown at the base (more evident on dried specimens), becoming duller colored above, 10–15 cm long, with an elongate acute blade from 3 to 6 cm long, the tip of the blade acute and becoming maroon to reddish brown, the total length of the sheath and blade nearly equaling or longer than the principal leaves. Scapes 30–50 cm tall, 1–2 mm wide, inconspicuously ridged, subterete below, becoming slightly 2-angled and bi-convex above, the angles and surfaces smooth. Spikes narrowly lanceolate to narrowly oblong, blunt, when well-developed from 2 to 2.7(–3.2) cm long (but flowering and fruiting when only 1 cm long on some plants), (3–)5–7 mm wide, many-flowered, the bracts tightly spirally imbricate; bracts obovate to orbicular, 5–6 mm long, 4–5 mm wide, with a small ovate rather obscure gray-green dorsal area, and dark chestnut brown sides. Lateral sepals included (to very slightly exserted), linear to very slightly curved, 5–6 mm long, blunt, the keel entire to slightly ciliate below, entire to slightly ciliate or lacerate above, the keel sometimes extending as a sharp point slightly beyond the blunt hyaline sepal tip. Petal blades obovate, cupped or twisted when fresh, yellow, 5–7 × 3–4 mm, with an irreg-

ularly deeply lacerate apex, the lacerations forming 5 to 8 narrow lobes at the apex of each petal, the lobes 1–1.5 mm long. Staminodia very conspicuous, bi-brachiate, to 4 mm long, the branches densely long penicillate. Capsule elliptic, ca. 3–4 mm long. Seed narrowly elliptic, 0.5–0.6 mm long, narrowed at the ends, dull brown, opaque, covered with a yellowish farinose substance, with ca. 12 prominent longitudinal ridges and very faint cross lines.

*Etymology and history.* *Xyris correlliorum* is named in honor of its first collectors, Donovan S. Correll (1908–1983) and Helen B. Correll (1907–2001). Upon completion of the *Flora of the Bahama Archipelago*, they began work on the *Flora of Florida* with Richard Wunderlin at USF in Tampa. Exploratory collecting by the Corrells for this project eventually led to the collection of *X. correlliorum*. Unsure of its identification, their specimen remained an enigma to the Corrells.

The senior author first noticed *Correll 52376* at FTG and USF while compiling distribution records of *Xyris* for the *Atlas of the Flora of Florida* (Wunderlin et al., 1996) in 1991. Neither of the two sheets could be definitively identified, since both lacked rhizomes, petal blades, and mature seeds. Over the next three years, repeated visits to the Correll collection site on Lake Placid failed to uncover any *Xyris* resembling the Correll specimen. However, in September 1995 the authors along with Rebecca Yahr gained access to newly purchased conservation lands on the south side of Lake Placid. Here we unexpectedly encountered an extensive population of the mystery *Xyris*, growing on floating vegetation mats near and along the lakeshore. Following this initial finding the second author conducted boat and bank surveys of other Lake Wales Ridge lakes, but these yielded only a few additional locations.

*Phenology.* Flowering in August and September, possibly extending until frost conditions. Petals open in late morning, mostly opening between 10:00 and 10:30 AM, and closing by 1:30 to 2:00 PM.

*Taxonomic relationships.* The deeply lacerate petal blades and evident rhizomes of *X. correlliorum* are unique among North American *Xyris*. Its narrowly elongate, blunt-tipped spikes, with an average length:width ratio of about 4:1, and some spikes exceeding 3 cm in length, are unlike any *Xyris* in the United States. The keel of the lateral sepal is somewhat intermediate between ciliate and lacerate, a characteristic similar to *X. longisepala*, which has much longer and narrower lateral sepals that are always exserted beyond the subtending bracts. The farinose seed of *X. correlliorum* is shared with *X. stricta*, *X. louisianica*, and *X. laxi-*



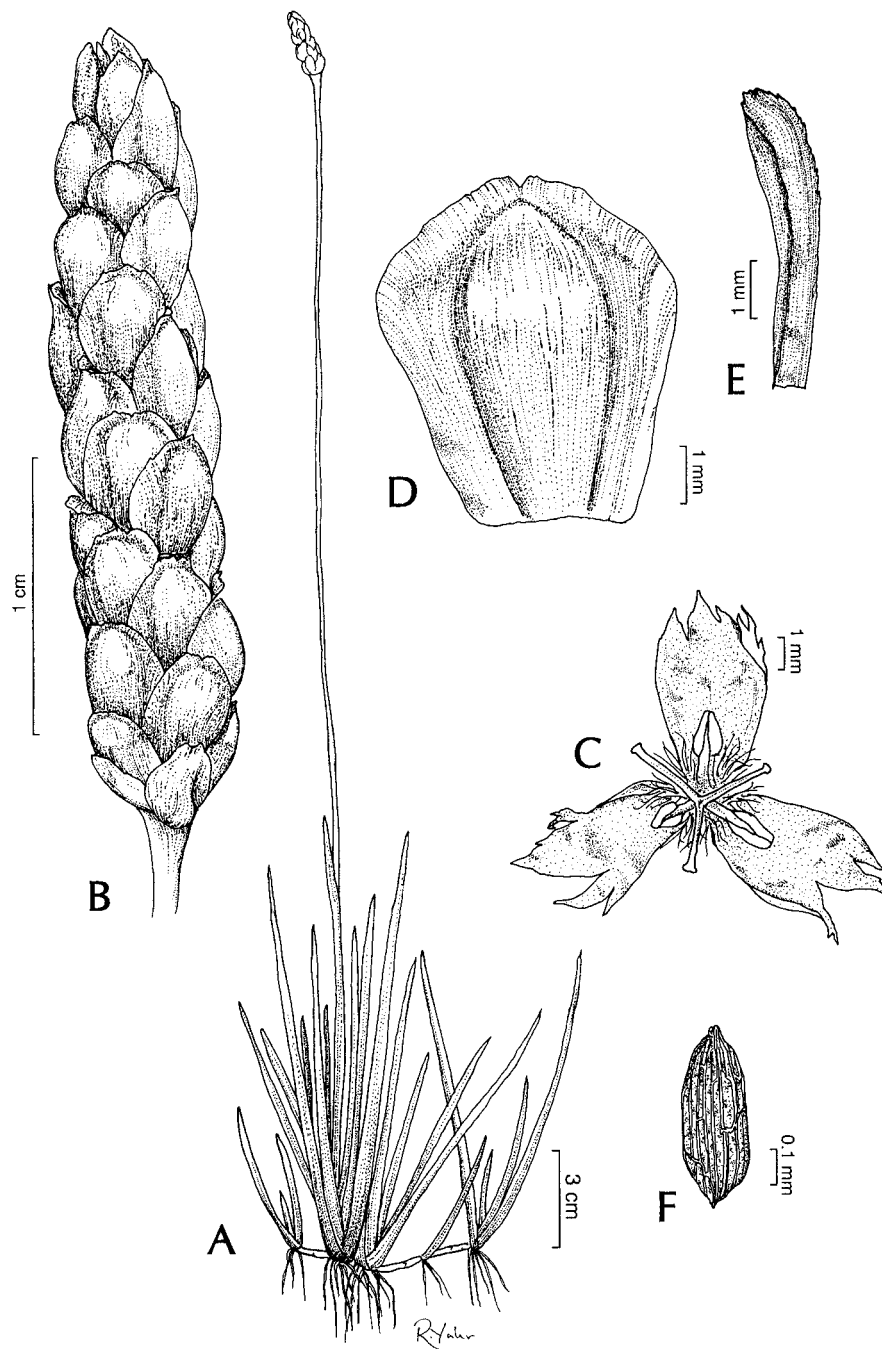


Figure 2. A–F. *Xyris correlliorum* E. L. Bridges & S. L. Orzell, based upon the USF holotype collection, S. L. Orzell & Bridges 23309. —A. Habit, plants with rhizomes. —B. Spike. —C. Flower, petal blades, stamens, stylar apex. —D. Fertile bract. —E. Lateral sepal. —F. Seed.

*folia* var. *iridifolia* (all of which are out of range and differ in other characters). *Xyris floridana*, *X. serotina*, and *X. calcicola* also have farinose seeds but differ from *X. correlliorum* in leaf and spike

characters. The petal blades of *X. correlliorum* are deeply lacerate at the apex, to the point where they could almost be considered as lobed, with the lobes 1.0–1.5 mm long. All other species of *Xyris* in the

United States have petal blades that are entire, emarginate, slightly erose, or shallowly serrate, but never deeply lacerate as in *Xyris correlliorum*.

*Distribution and ecology.* *Xyris correlliorum* has been collected from three south-central Florida lakes: Lake Placid, Lake Annie, and Grassy Lake. All of these lakes lie near the southern terminus of the Lake Wales Ridge (LWR), a prominent sand ridge only a few kilometers wide but more than 150 km long, extending southward from southeastern Lake County to southern Highlands County. All of the lakes having *X. correlliorum* occur within the Intra Ridge Valley (White, 1970) of the LWR, a feature characterized by residual sandhills, relict beach ridges, and paleo-sand dunes (Brooks, 1981). They are part of a linearly aligned series of lakes extending some 320 km to the north along the Florida peninsular axis (Layne, 1979). Lakes Placid and Annie are relatively deep (17 and 20 m, respectively) solution depressions, which ultimately flow into the drainage basin for Lake Okeechobee. Lakes Placid and Annie are oligotrophic, clear, soft-water, nutrient-poor lakes with low alkalinity, low specific conductance (McDiffett, 1980) with sandy bottoms. Both lakes are considered to be astatic lakes because extreme variability in lake water levels is typical (Brenner et al., 1990).

Within these lakes, *Xyris correlliorum* occurs on floating mats or submerged along the lakeshore. These mats have emergent vegetation rooted in highly organic, buoyant, sphagnum mats that rise and fall with changes in water levels. Floating mats of short dense turfs of *X. correlliorum* mixed with *Drosera intermedia* Hayne, *Mayaca fluviatilis* Aublet, *Myriophyllum laxum* Shuttleworth ex Chapman, *Fuirena scirpoidea* Michaux, and *Sphagnum* sp. are typically found on the downwind side of the lake. These mats occur in the littoral zone downslope of forested seeps or deep xeric sands with scrub vegetation. Groundwater from forested seep or scrub soils percolates downslope onto the sandy lakeshore, and this telluric seepage may be an important habitat requirement for *X. correlliorum* and some of its associates. *Drosera intermedia*, *Eriocaulon lineare* Small, *Mayaca fluviatilis*, *Myriophyllum laxum*, and *Websteria confervoides* (Poiret) S. S. Hooper are all closely associated with *X. correlliorum*, and are very rare habitat specialists where they occur in south-central Florida. Each reaches its southern limit in Highlands County LWR lakes with seepage influence. In contrast, *X. correlliorum* is absent from peaty lakeshores, with dense, rank stands of non-native *Ludwigia peruviana* (L.) H. Hara, *Eragrostis atrovirens* (Desfontaines) Trinius ex Steudel, and *Panicum repens* L., with native *Ty-*

*pha domingensis* Persoon and *Pontederia cordata* L. *Xyris correlliorum* is also absent from littoral zones where mucky detrital deposits cover the sandy bottom. Vegetative *X. correlliorum* can grow submerged in clear water up to 70 cm in depth, where it can form dense rhizomatous stands on lakeshore bottom sands. When submersed, it rarely flowers, although flowering individuals have been observed with their spikes and scapes rising above the water surface.

*Xyris correlliorum* is apparently a very narrow endemic of relatively deep clear-water (17–20 m at their deepest points), sinkhole-solution lakes found on the southern portion of the LWR, in Highlands County. Vascular plant endemism on the LWR and central Florida endemic xeric vegetation types is well documented (Abrahamson et al., 1984; Christman & Judd, 1990; Dobson et al., 1997; Menges, 1999; Estill & Cruzan, 2001). *Xyris correlliorum* is the first endemic plant described from lacustrine habitats on the LWR, and the only one of the four vascular plants endemic to Highlands County (Bridges & Orzell, 2002) that does not occur in xeric habitats. This is noteworthy since some of the LWR lakes (Lakes Annie and Tulane) that presently exceed 18 m in depth have yielded continuous pollen cores that extend from the present to at least 13,000 years B.P. (Watts, 1975; Watts & Hansen, 1994; McDiffett, 1980). It is probable that southern LWR lakes, particularly the “fossil lakes” of Watts and Hansen (1994) contained surface water prior to 8,500 years B.P. (Watts & Stuiver, 1980; Watts & Hansen, 1988) at a time when an overwhelming majority of Florida’s present-day lakes are presumed to have been dry (Watts & Hansen, 1988). Perhaps the long-term stability of these lakes accounts for the presence of *X. correlliorum* in these lakes, while it is absent from similar sinkhole-solution lakes found elsewhere in central Florida.

*Paratypes.* U.S.A. **Florida:** Highlands Co., in sedge-grass marsh along Lake Placid, Henry & Helen Price Memorial of Archbold Biological Station, 2 Sep. 1981, *Correll & Correll 52376* (FTG, USF); abundant, submerged, on E side of Lake Annie, 20 Aug. 1984, *Bourdieu & Desley s.n.* (ARCH); submerged and floating mats on SE shore of Lake Annie, 29 Mar. 1996, *Yahr, Orzell & Casado 233* (ARCH), 4 Sep. 1996, *Orzell, Bridges & Dean 25164* (ARCH, FLAS, USF), 5 Mar. 1996, *Orzell & Bridges 24250* (FLAS, FTG, USF); same as type locality, 4 Sep. 1996, *Orzell & Bridges 25163* (ARCH, BRIT, FLAS, FSU, FTG, MO, NY, TEX, USF); floating in clear, shallow water of sandy bottom lakeshore, E side of Grassy Lake, 16 Sep. 1996, *Orzell, Bridges & Yahr 25171* (FLAS, FTG, USF). Additional habitat and location data are available for Orzell & Bridges’ collections from the authors.

The dichotomous key below covers all *Xyris* in Florida, including the new taxa.

KEY TO THE SPECIES OF *Xyris* IN FLORIDA

- 1a. Keel of the lateral sepals shortly ciliate-scabrid, or if entire then the bract tips purple-tinged.
  - 2a. Plants relatively small, usually less than 30 cm tall, principal leaves usually less than 10 cm long, mature spikes less than 1 cm long at maturity.
    - 3a. Leaves filiform, with expanded brownish lustrous bases, usually exceeding sheath of scape . . . . . *X. isoetifolia* Kral
    - 3b. Leaves linear, bases not expanded, shorter than, equaling, or slightly exceeding sheath of scape.
      - 4a. Keel of lateral sepals linear to slightly curvate, remotely ciliate or entire; spikes broadly ovoid to subglobose, the bracts with maroon to purple-tinged, loose, often erose borders . . . . . *X. brevifolia* Michaux
      - 4b. Keel of lateral sepals strongly curvate, densely ciliate; spikes lance-ovoid to ovoid, the bracts entire, not purple-tinged, lacking erose borders.
        - 5a. Plants perennial; leaves ascending, equitant, green with distinct dark brown patch near base; fruiting spikes ovoid, blunt, somewhat two-edged from the strongly keeled outer bracts . . . . . *X. drummondii* Malme
        - 5b. Plants annual; leaves flabellately arranged, spreading to recurved, usually maroon; fruiting spikes often elongated and acute, not two-edged . . . . . *X. flabelliformis* Chapman
  - 2b. Plants relatively large, usually 30 cm or more tall, principal leaves more than 10 cm long, mature spikes more than 1 cm long at maturity.
    - 6a. Seed lustrous, translucent, broadly ovoid; spike pale brown or tan, the scales loosely imbricate; plant bases pink, purple, or stramineous, with dark longitudinal striations on inner leaf bases; leaves shorter, broader, more flabellately spreading, abruptly tapered to tip; petal blades obovate, 0.6–0.7 mm long or more, opening in early morning, usually closed by mid day . . . . . *X. ambigua* Beyrich ex Kunth
    - 6b. Seed farinose, narrowly ellipsoid to ovoid; spike dark brown, the scales tightly imbricate; plant bases maroon, purple, dark brown, or red-brown; leaves narrowly linear, gradually tapering from the equitant base to tip; petal blades triangular-cuneate, 0.3–0.5 cm long, open at mid day.
      - 7a. Seed dark when mature; plant bases dark maroon to dark brown, densely caespitose on wet, mucky substrata; apex of scape conspicuously flattened, almost as broad as the spike; spike oblong-cylindrical, obtuse . . . . . *X. stricta* Chapman
      - 7b. Seed light-colored; plant bases maroon to maroon-brown, solitary or in small clumps on drier, clayey substrata; apex of scape somewhat flattened, but not nearly as broad as spike; spike narrowly ovoid to ellipsoid, slightly pointed . . . . . *X. louisianica* E. L. Bridges & Orzell
- 1b. Keel of the lateral sepals irregularly lacerate or fimbriate, or if entire then the bract tips not purple-tinged.
  - 8a. Leaves narrowly linear to filiform, scarcely or not at all twisted, with expanded lustrous tan to brown harder bases, the plant base not bulbous or deeply seated in the substrate; plants usually densely caespitose; spikes ovoid and less than 1 cm long.
    - 9a. Leaves linear, flattened in cross section, and with a pale, hardened margin; scape usually narrower than the leaf blades; staminodia bearded . . . . . *X. elliotii* Chapman
    - 9b. Leaves filiform, terete to elliptic in cross section, without a paler margin; scape as broad as or broader than the leaf blades; staminodia beardless (unique in genus) . . . . . *X. baldwiniana* Schultes
  - 8b. Leaves broader, twisted or straight, without expanded hardened brown bases, or if with brown bases, then the plant base bulbous or deeply seated in the substrate; plants caespitose or solitary; spikes narrowly to broadly ovoid, oblong, or ellipsoid, 0.4–3.5 cm long.
    - 10a. Keel of the lateral sepals long-fimbriate toward the tip, the fimbriate tip conspicuously exerted from the subtending bract (sometimes eroded and less conspicuous on older spikes).
      - 11a. Bases of leaves swollen, bulbous, dark lustrous brown; leaves strongly twisted; spikes narrowly ellipsoid or lance-ovoid; scape ridges smooth, not scabrous; petal blades white or yellow . . . . . *X. caroliniana* Walter
      - 11b. Bases of leaves soft, pale green, stramineous, or pink; leaves not twisted; spikes ellipsoid or oblong; scape ridges strongly scabrous; petal blades yellow . . . . . *X. fimbriata* Elliott
    - 10b. Keel of the lateral sepals lacerate, or if very shortly fimbriate then not exerted from the subtending bract.
      - 12a. Lateral sepals longer than and exerted from the subtending bracts, or if not exerted then plants rhizomatous.
        - 13a. Keel of the lateral sepal entire toward its base and lacerate toward the tip; ripe seeds ovoid or oblong, more than 0.5 mm long, with irregular, stout cross lines; plants generally larger, with the largest leaves more than 30 cm long and 5 mm broad . . . . . *X. smalliana* Nash
        - 13b. Keel of the lateral sepal tending to be ciliate toward its base and lacerate toward the tip; ripe seeds ellipsoidal, less than 0.6 mm long, with regular, thin cross lines, or cross lines obscure; plants generally smaller, with the largest leaves less than 25 cm long and 3 mm broad.
          - 14a. Plants annual, caespitose, without elongate scaly rhizomes; spikes 1–1.6 cm long; lateral sepals conspicuously exerted; petal blades slightly erose or shallowly serrate at tip; seeds with regular rectangular alveolae . . . . . *X. longisepala* Kral



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- 14b. Plants perennial, forming dense mats from elongate scaly rhizomes; spikes (when mature) 2–3.2 cm long; lateral sepals only slightly if at all exerted; petal blades deeply lacerate at tip, the lobes 1.0–1.5 mm long; seeds with obscure alveolae . . . . . *X. correlliorum* E. L. Bridges & Orzell
- 12b. Lateral sepals shorter than, therefore hidden by, the subtending bracts except when spikes open and seeds are shed, plants never rhizomatous.
- 15a. Scapes flexuous, usually spirally twisted; upper portion of leaf blade conspicuously twisted; plant bases pink, purple, or dark brown.
- 16a. Plants forming rather dense clumps, scapes usually less than 50 cm tall; spikes diverging at a 10° to 20° angle from the apex of the scape; seed surface farinose . . . . . *X. calcicola* E. L. Bridges & Orzell
- 16b. Plants solitary or in small clumps, scapes usually more than 50 cm tall; spikes held vertically at the apex of the scape; seed surface not farinose.
- 17a. Base of plant deeply set in the substrate, without distinct outer scale leaves; leaf bases not noticeably expanded, thus the plant base not bulbous; leaves smooth, 2–4 mm wide; petal blades ca. 3 mm long . . . . . *X. chapmanii* E. L. Bridges & Orzell
- 17b. Base of plant shallowly set on the substrate, often with short, black outer scale leaves, leaf bases noticeably expanded to form short bulbous bases; leaves scabrous, 2–10 mm wide, or when smooth, then 5–10 mm wide; petal blades ca. 5 mm long.
- 18a. Leaf and scape surfaces smooth or scabrous only along the margins and ridges; petal blades obovate, white or yellow; seeds ovoid, 0.5–0.6 mm long . . . . . *X. platylepis* Chapman
- 18b. Leaf and scape surfaces prominently papillose or tuberculate-scabrid; petal blades suborbicular, yellow; seeds narrowly ovoid or narrowly ellipsoidal, ca. 1 mm long . . . . . *X. scabrifolia* R. M. Harper
- 15b. Scapes usually not flexuous, the scapes and leaf blades not conspicuously twisted; plant base color various.
- 19a. Summit of the scape distinctly flattened, usually more than 2 mm wide, broad relative to the spike; scape ridges few, the two most prominent comprising the flattened edges.
- 20a. The two principal scape ridges flattened and wing-like, their combined width (on fresh specimens) broader than the scape proper; fruiting spikes usually less than 1.5 cm long; seeds translucent, ovoid or ellipsoidal, less than 0.6 mm long . . . . . *X. difformis* Chapman
- 20b. The two principal scape ridges not flattened and wing-like, much narrower than the scape proper; fruiting spikes usually more than 1.5 cm long; seeds farinose, dark when ripe, fusiform or narrowly oblong, longer than 0.6 mm . . . . . *X. laxifolia* Martius var. *iridifolia* (Chapman) Kral
- 19b. Summit of the scape nearly terete or somewhat flattened, usually less than 2 mm wide, much narrower than the spike; scape ridges several, at least on the mid to lower portion of the scape.
- 21a. Seeds farinose or very dark; surfaces of leaves tuberculate-scabrid; leaves generally dull colored.
- 22a. Mature spikes ovoid, sharply acute; plants solitary or in small clumps; base of leaves a dark maroon to purple color, rarely pink . . . . . *X. floridana* (Kral) E. L. Bridges & Orzell
- 22b. Mature spikes ovoid to ellipsoid, acute to blunt; plants typically in large dense tufts; older leaves with dark-brown to gray bases, inner leaves with stramineous bases . . . . . *X. serotina* Chapman
- 21b. Seeds translucent, not farinose; surfaces of leaves smooth, or if sparsely tuberculate-scabrid, then broadly linear-curved; leaves generally a bright yellow-green above the base.
- 23a. Plants annual, solitary or in small tufts; leaves linear, ascending, widely variable in size but usually more than 10 cm long; mature spikes obtuse, many-flowered; leaf bases usually stramineous (very rarely pink); petals often drying black and persisting on spike . . . . . *X. jupicai* Richard
- 23b. Plants perennial, usually in tufts, rarely solitary; leaves broadly linear-curved, spreading, typically less than 10 cm long; mature spikes acute, with 10 or fewer flowers; leaf bases pink or purple, the bases spreading to expose the distinctly dark brown to purple-maroon base of scape; petals fugacious, not persisting on spikes . . . . . *X. curtissii* Malme

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