

CLASS MONOCOTYLEDONAE

Plants usually herbaceous—in other words, lacking regular secondary thickening (except Palmaceae, Smilacaceae, most Agavaceae, and a few Poaceae); seedlings usually with 1 seed leaf or cotyledon; stems or branches elongating by apical growth and also by growth of basal portion of internodes; leaves when present alternate, whorled, basal, or rarely opposite, elongating by basal growth (readily seen on spring-flowering bulbs whose leaf-tips have been frozen back); leaf blades usually with parallel or concentrically curved veins, these unbranched or with inconspicuous, short, transverse connectives (leaves net-veined or with prominent midrib and spreading side-veins parallel with each other in Alismataceae, Araceae, Smilacaceae, Marantaceae, and some Orchidaceae); perianth with dissimilar inner and outer whorls (petals and sepals), or all parts about alike (tepals), the perianth parts separate or united, commonly in 3s, less often in 2s, rarely in 5s, or perianth of scales or bristles, or entirely absent.

☛ Worldwide, the Monocotyledonae is a group composed of ca. 55,800 species in 2,652 genera arranged in 84 families (Mabberley 1997); 25 of these families occur in nc TX. The monocots appear to be a well-supported monophyletic group derived from within the monosulcate Magnoliidae group of dicots (Chase et al. 1993; Duvall et al. 1993; Qiu et al. 1993). From the cladistic standpoint, the dicots are therefore paraphyletic and thus inappropriate for formal recognition (see explanation and Fig. 41 in Appendix 6). Within the monocots, *Acorus* appears to be the sister group to all other monocots, with the Alismataceae (and *Potamogeton*) being the next most basal group (Duvall et al. 1993).

REFERENCES: Cronquist 1981, 1988, 1993; Dahlgren et al. 1985; Thorne 1992; Chase et al. 1993; Clark et al. 1993; Duvall et al. 1993; Qiu et al. 1993; Reveal 1993a, 1993b; Takhtajan 1997.

ACORACEAE SWEETFLAG OR CALAMUS FAMILY

☛ *Acorus* has traditionally been placed in the Araceae (e.g., Dahlgren et al. 1985) despite many characters unusual for an aroid. Grayum (1987) gave extensive reasons why the genus should be placed in its own family. The Acoraceae, thus circumscribed, is a very small, Old World and North American family of 2 species (3 if *Gymnostachysis* included). Using cpDNA restriction site analysis, a clade containing *Acorus* and the somewhat similar *Gymnostachysis* (also traditionally placed in the Araceae) was resolved as a sister group of all other monocots (Davis 1995). An analysis by Duvall et al. (1993) also pointed to *Acorus* as the most basal living lineage of monocotyledons and a more recent molecular study by Soltis et al. (1997) again suggested that *Acorus* is anomalous among monocots. These results all support the recognition of the Acoraceae as separate from the Araceae and suggest further study is needed to determine its phylogenetic position. (subclass Arecidae)

FAMILY RECOGNITION IN THE FIELD: the only member of this family in nc TX is an aromatic herb with sword-like leaves roughly 1 m long and a cylindrical, finger-like spadix diverging laterally from an elongate, spathe-like scape.

REFERENCES: Wilson 1960a; Grayum 1987; Duvall et al. 1993; Davis 1995; Soltis et al. 1997.

ACORUS SWEETFLAG, CALAMUS

☛ A genus of 2 species with iris-like or grass-like leaves; sometimes cultivated for fragrant oils in rhizomes. (Latin name for an aromatic plant or possibly Latin: *acorus*, without pupil, the name used by Dioscorides for an iris used in treating cataracts)

REFERENCES: Buell 1935; Harper 1936.

***Acorus calamus* L.**, (ancient name for a reed). DRUG SWEETFLAG, SWEETFLAG, CALAMUS. Aromatic, rhizomatous (thick) perennial herb with erect, linear, sword-shaped, parallel-veined

leaves 0.9–1.2 m long, 5–25 mm wide; inflorescence an exposed cylindrical spadix, 4–9 cm long, diverging laterally from an elongate, leaf-like, spathe-like scape; flowers perfect, covering the spadix; perianth of 6 short segments; stamens 6; carpels 2–3; fruit a few-seeded berry. Wet ground or shallow water; Dallas Co., also Denton and Tarrant cos. (Mahler 1988). May–Jun. The geographic origin of *Acorus* has been somewhat confused. The genus is apparently introduced in TX, but was described as native in 1833 (Mahler 1988); Harper (1936) questioned whether *Acorus* is native to the U.S.; Buell (1935), however, concluded that the genus is native to the interior of North America. According to J. Kartesz (pers. comm.), TX plants are introduced from the Old World, with *A. americanus* (Raf.) Raf. extending no further s in the Great Plains than Nebraska and Iowa. Jones et al. (1997) treated TX material as *A. americanus*. This species has been used medicinally since the time of Hippocrates; it was also known from Tutankhamun's tomb; it is used religiously as “oil of holy ointment” for anointing sacred items and referred to in Exodus as SWEET CALAMUS; in Sumatra it is hung up at night to keep evil spirits from children; it is also apparently effective as an insecticide (Mabberley 1997). Duke (1985) referenced sources indicating that oil of calamus is carcinogenic, probably due to the presence of asarone (an allylbenzene) or safrole; McGuffin et al. (1997) indicated asarone is potentially hepatocarcinogenic and can cause chromosome damage in human lymphocytes. ☠ 🇺🇸

AGAVACEAE

YUCCA, CENTURY-PLANT OR AGAVE FAMILY

Herbaceous or woody, usually xerophytic perennials from a pithy corm or soft-woody root; leaves usually basal or bunched, narrow, flat to concave or thickened, ± fleshy or leathery, with widened, clasping base; flowering stems with alternate leafy bracts; flowers in racemes or panicles; tepals 6, in 1 or 2 rows; stamens 6; pistil 1; ovary superior or inferior; fruit a capsule.

☛ A medium-sized family (550 species in 18 genera—B. Hess, pers. comm.) mainly of arid or semi-arid tropics and subtropics, especially in the Americas; its taxa have sometimes been treated as Amaryllidaceae, Asteliaceae, Dracaenaceae, Liliaceae, or Nolinaceae; some authorities (e.g., Heywood 1993) have suggested they may be more closely related to taxa in the Liliaceae than to each other. Molecular studies (Bogler & Simpson 1995, 1996) indicated the family as treated here is probably not monophyletic and supported the recognition of Nolinaceae and a more narrowly circumscribed Agavaceae. Ornamentals include species of *Agave*, *Dracaena*, *Sansevieria* (MOTHER-IN-LAW'S-TONGUE), and *Yucca* Family name from *Agave*, AGAVE, MAGUEY, or CENTURY-PLANT, a genus of 100+ species native from the s United States to tropical South America. *Agave* species are the source of sisal hemp and pulque, a Mexican “beer” distilled to produce mescal and tequila. (Greek: *agave*, noble or admirable, in reference to the handsome appearance when in flower) (subclass Liliidae)

FAMILY RECOGNITION IN THE FIELD: usually *xerophytic*, typically robust perennials with often *elongate narrow* leaves usually basal or crowded near base of stem (or at stem apex in large tree-like YUCCAS) and sometimes *sharp-pointed*; inflorescence a raceme or panicle; fruit a capsule.

REFERENCES: Dahlgren et al. 1985; Bogler & Simpson 1995, 1996.

1. Flowers rosy red or salmon-colored; leaves conspicuously revolute (inrolled) upon drying (the margins nearly touching) _____ **Hesperaloe**
1. Flowers white to greenish or yellowish (can be reddish brown towards tips); leaves not revolute (can be v-shaped in *Manfreda*).
2. Ovary superior; leaves usually 30 cm long or more OR if shorter with a hard spiny tip, not succulent (but can be thick), often < 4(–8) cm wide (but 3–8 cm wide in the large tree-like YUCCAS).

3. Flowers 13–78+ mm long or broad; leaves 8–80 mm wide; capsules large (much > 1 cm long), the seeds numerous in each cell _____ **Yucca**
3. Flowers 2.5–6 mm long or broad; leaves 2–12 mm wide; capsules small (< 1 cm long), the seeds solitary in each cell _____ **Nolina**
2. Ovary inferior; leaves 10–30 cm long, without a hard spiny tip, succulent, 1–7(–10) cm wide _____ **Manfreda**

HESPERALOE

☛ A genus of 5 species native to sw North America (Starr 1997). (Greek: *hesperos*, western or evening, and the genus name *Aloe*)

REFERENCES: Trelease 1902; Starr 1995, 1997; Pellmyr & Augenstein 1997.

Hesperaloe parviflora (Torr.) J.M. Coult., (small-flowered), RED-FLOWERED-YUCCA, RED HESPERALOE. Leaves numerous, crowded at base of plant, linear, to 1.2 m long; flowering stem to 2.5 m tall, usually few-branched; pedicels to 35 mm long; flowers tubular to oblong-campanulate, 25–35 mm long; stamens shorter than the corolla; style slightly to much exerted; capsules to 3 cm or more long. Rocky slopes, open areas; Mills Co. in sw part of Lampasas Cut Plain, also across the Colorado River in San Saba Co., also spreading from cultivation in Brown Co. (Stanford 1976) and reported by Starr (1997) from Collin Co. [escaped?]; otherwise mostly much further w in sw TX. Mar–Sep. [*Yucca parviflora* Torr.] The striking flower color immediately distinguishes this species from all other nc TX Agavaceae; it is widely used as an ornamental. Pollination is reported to be by hummingbirds as well as bees (Starr 1995); experiments by Pellmyr and Augenstein (1997) showed the species to be self-incompatible and pollinated by black-chinned hummingbirds (*Archilochus alexandri*). ☒/92

MANFREDA FALSE ALOE, AMERICAN-ALOE

☛ A genus of 25 species ranging from the se United States to Honduras and El Salvador (B. Hess, pers. comm.). The species have been variously recognized in *Agave*, *Manfreda*, and *Polianthes*. (Named for Manfred, an ancient Italian writer)

REFERENCES: Shinnars 1951f, 1966a; Verhoek-Williams 1975.

Manfreda virginica (L.) Rose, (of Virginia). Glabrous perennial; leaves mostly in a basal rosette, soft, thick-herbaceous, somewhat fleshy; flowers in a spike-like raceme; perianth tubular-funnel-form; anthers linear, versatile (= attached near middle); capsules 3-celled, oblong to globose, 14–20 mm long, with numerous flattened seeds. The following key is modified from Shinnars (1951f).

1. Leaves 12–18 cm long, (2–)3–8(–10) cm wide, 3–6 times as long as wide, 4–10 per plant; scape 6–10 mm thick near base, 3–5 mm at base of inflorescence; perianth (including ovary) 2.6–3.5 cm long, the lobes 2.5–3 mm wide at base; anthers 13–17(–20) mm long; flowering mid-Jun–mid- in Jul; nc TX mainly in the Blackland Prairie _____ subsp. **lata**
1. Leaves (12–)15–30 cm long, 1–4.5 cm wide, 7–15 times as long as wide, ca. 10 per plant; scape 4–7 mm thick near base, 1.5–3.5 mm at base of inflorescence; perianth (including ovary) 2–2.3 cm long, the lobes 1.5 mm wide at base; anthers 8–10 mm long; flowering mid-Jul–mid-Aug; wooded areas _____ subsp. **virginica**

subsp. **lata** (Shinnars) O'Kennon, Diggs, and Lipscomb, comb. nov. BASIONYM: *Agave lata* Shinnars, Field & Lab. 19:171–173. 1951. TYPE: TEXAS. Grayson Co.: 4.7 miles south of Sherman, *H.V. Daly* 61, 15 Jun 1951, (HOLOTYPE: BRIT/SMU), (broad), WIDE-LEAF FALSE ALOE. Plant 0.6–1.7 m tall (to tip of inflorescence); corm pithy; leaves 4–10, noticeably fleshy, green to bluish gray-green, occasionally with reddish splotches near base, elliptic or broadly lanceolate, deeply concave, glabrous, margins scabrous; pedicels shorter than subtending bracts; flowers spicy-scented; perianth greenish or yellowish with dots or tinge of red-brown toward tips, the lobes

5–8 mm long; filaments green with reddish pigmentation; anthers exserted, cream-colored. Mainly Blackland Prairie; s Grayson (apparently now extinct locally), Hunt, and Kaufman cos., also Parker Co. (R. O'Kennon pers. obs.); otherwise apparently known only from s Oklahoma. Jun–Jul. [*Agave lata* Shinnery, *Polianthes lata* (Shinnery) Shinnery] This taxon was named as a species in the genus *Agave* by Shinnery (1951f) and subsequently transferred to *Polianthes* (Shinnery 1966a). Verhoek-Williams (1975) placed it in the genus *Manfreda* but lumped it with the more widespread *M. virginica* (L.) Rose. By the time of Verhoek-Williams' study, the Grayson Co. site was apparently no longer in existence and no other TX sites were known. Since that time, several new Blackland Prairie populations with hundreds or even thousands of individuals have been discovered. While there is undoubtedly overlap in most of the characters distinguishing this subspecies from subsp. *virginica*, we agree with Shinnery (1951f) that it is a geographically distinct entity; subspecific status appears most appropriate. Detailed taxonomic work on the large Blackland Prairie populations is needed. 📍/98

subsp. **virginica**, (of Virginia), FALSE ALOE, RATTLESNAKE-MASTER, VIRGINIA AGAVE. Leaves lanceolate to somewhat oblong-spatulate, nearly flat. Tarrant Co. (Fort Worth Nature Center; it is not completely certain that this population is native) and Lamar Co. (Carr 1994); mainly se and e TX. Used by Native Americans as an antidote for snakebite, giving rise to the common name.

Manfreda maculosa (Hook.) Rose, (spotted), cited by Hatch et al. (1990) for vegetational area 4 (Fig. 2), is an endemic to sc TX and apparently occurs only to the s of nc TX. It can be distinguished by its longer perianth (including ovary nearly 5 cm long) with longer lobes (10–19 mm long). 📍

Agave americana L., (of America), the CENTURY-PLANT, is cultivated in nc TX and long persists; it has large glaucous-gray leaves with a long (2.5–5 cm) terminal spine and a paniculate inflorescence 5–7 m tall.

NOLINA BEAR-GRASS

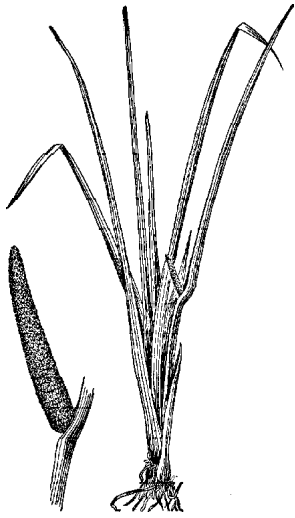
Polygamo-dioecious perennials with woody crown; leaves numerous, basal, clustered, linear, with margins smooth or serrulate; panicle pedunculate; perianth small, white, of 6 segments; stamens 6; pistil 1.

☛ A mainly sw North American genus of 30 species; some are used as ornamentals. John Kartesz (pers. comm. 1997) is currently treating *Nolina* in the Liliaceae; other authorities place it in its own family, the Nolinaceae (e.g., Dahlgren et al. 1985); B. Hess (pers. comm.) has indicated that in the forthcoming treatment for Flora of North America, it will be included in the Agavaceae. Molecular analyses (Bogler & Simpson 1995, 1996) indicate that *Nolina*, *Dasyliirion*, *Beaucarnea*, and *Calibanus* are a monophyletic group and support the recognition of the Nolinaceae. (Named for P.C. Nolin, an 18th century French agriculturalist)

REFERENCES: Trelease 1911; Bogler & Simpson 1995, 1996.

1. Leaves 4–12 mm wide, flattened in cross-section, the margins strongly serrulate; inflorescence held well above the leaves _____ **N. lindheimeriana**
1. Leaves 2–4(–7) mm wide, roundish with one flattened side in cross-section, the margins smooth to remotely toothed; inflorescence among the leaves _____ **N. texana**

Nolina lindheimeriana (Scheele) S. Watson, (for Ferdinand Jacob Lindheimer, 1809–1879, German-born TX collector), RIBBON-GRASS, DEVIL'S-SHOESTRING, LINDHEIMER'S NOLINA. Perennial 60–180 cm tall, with woody crown; leaves narrow and elongate, flat, soft, with smooth surfaces and serrulate margins with the teeth directed forward. Limestone outcrops, in sun or shade; Bell (J. Stanford, pers. comm.) and Somervell (Mahler 1988) cos., also Fort Hood (Bell or Coryell cos.—Sanchez 1997); mainly Edwards Plateau; endemic to TX. Apr–May. 📍



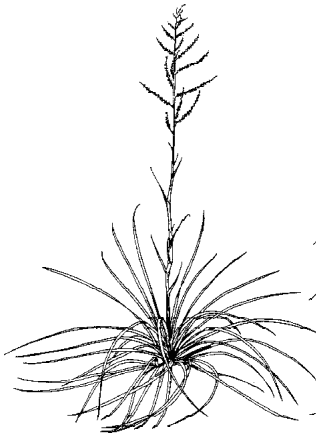
Acorus calamus [GLE]



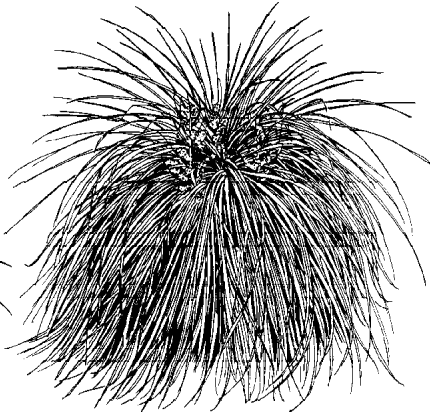
Hesperaloe parviflora [CUR]



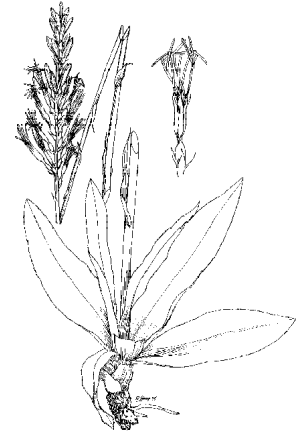
Manfreda virginica subsp. *virginica* [LAM]



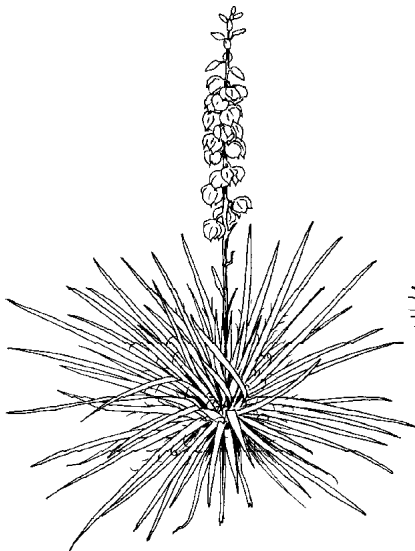
Nolina lindheimeriana [LVN]



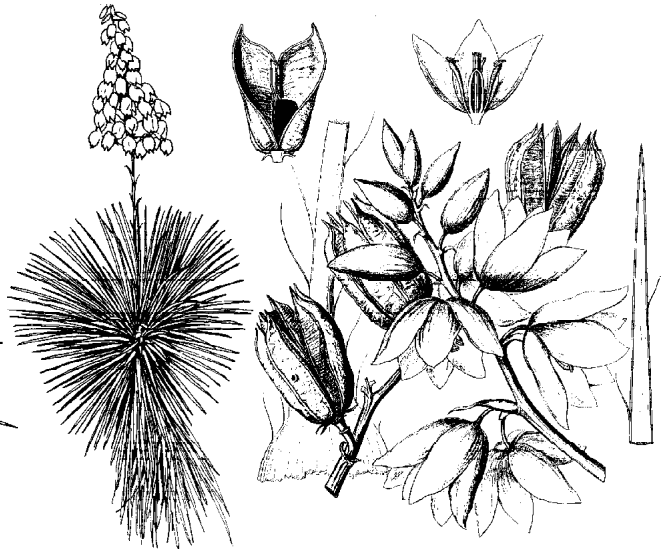
Nolina texana [LVN]



Manfreda virginica subsp. *lata* [HEA]



Yucca arkansana [LVN]



Yucca constricta [LVN, SA3]

Nolina texana S. Watson, (of Texas), SACAHUISTA, BUNCH-GRASS. Perennial 30–60 cm tall; leaves narrow, elongate, almost rounded-triangular in cross-section, the margins smooth or with distant teeth. Rocky soils; Brown (HPC) and Hamilton (Mahler 1988) cos., also Fort Hood (Bell or Coryell cos.—Sanchez 1997); w part of nc TX s and w to w TX. Apr. The flowers are poisonous and potentially fatal to livestock; liver-kidney toxicity and photosensitization are involved (Sperry et al. 1955; Kingsbury 1964). This species is normally avoided by livestock but will be eaten if no other food is available (J. Stanford, pers. comm.). ☞

YUCCA BEAR-GRASS, SPANISH-BAYONET, SOAPWEED

Plants coarse, with one to many crowns of narrow, elongate leaves, in nc TX species these usually in a basal cluster or at ends of very short trunk-like stems or in 2 species at ends of elongate trunk-like stems; flowers in terminal racemes or panicles; flowering stems with wide-based, acute or acuminate, somewhat papery bracts; flowers rather large; perianth drooping, of 6 thick, white to cream-colored or greenish segments (can be tinged with purple in 2 species); fruits dehiscent capsules or in 2 species indehiscent, erect when dry or in 2 species pendant.

☞ A genus of 35 species (B. Hess, pers. comm.) of warm areas of North America. YUCCAS were used by Native Americans as a source of food, fiber, soap, and medicine; the spiny tip was apparently used as a needle, often with the still attached fibers serving as thread (Churchill 1986c); 2,000 year old fiber and twine from YUCCA have been found in Native American ruins in AZ; according to Bell and Castetter (in Webber 1953), “. . . yucca ranked foremost among the wild plants utilized by the inhabitants of the Southwest. It holds this place because of the great variety of uses to which it could be put and to the wide accessibility of this genus within the Southwest.” During World Wars I and II, large amounts of YUCCA were harvested in TN and NM for fiber (Webber 1953). All species are dependant on yucca moths for pollination; if the moths are not present the plants reproduce vegetatively; as a result, large clonal populations are often encountered in the field (K. Clary, pers. comm.). According to Powell (1988), “The Yucca Moth (*Tegeticula* = *Pionuba*) flies at dusk to a flower where she climbs stems to collect pollen and pack the pollen in a large ball-like mass under her neck. She then visits another flower where she inserts her ovipositor directly through the ovary wall and deposits 20–30 eggs, one at a time, each directly into an ovule. She then climbs to the stigma of the same flower and spreads the pollen, thus ensuring pollination, subsequent fertilization, and developing seeds that provide nourishment for the moth larvae. Each larva ultimately destroys the seed in which it grows, but there are many undamaged seeds left in the yucca capsule.” Baker (1986) described some of the complexities of pollination in *Yucca* (A native Haitian name)

In addition to the species discussed below, several other YUCCAS are cultivated in nc TX (particularly the sw part) including 3 with trunk-like stems; these are *Y. aloifolia* L. (leaves dark green, stiff, spear-like, without marginal threads; in contrast to all other species, the leaves are arranged along the full length of the trunk instead of in well-defined leaf rosette); *Y. rostrata* Engelm. ex Trel. (leaves glaucous, flexible, the margins denticulate); and *Y. thompsoniana* Trel. (leaves glaucous, flexible, much shorter than in *Y. rostrata*, the margins denticulate) [now sometimes treated as a synonym of *Y. rostrata*]. *Yucca filamentosa* L. and *Y. flaccida* Haw., both with drooping leaves and usually without trunk-like stems or trunk-like stems very short, are also widely used in landscaping in nc TX. They are sometimes lumped as *Y. filamentosa* but can be distinguished by the leaf margins shredding into threads in *Y. filamentosa* while not shredding in *Y. flaccida*

REFERENCES: Trelease 1902; McKelvey 1938, 1947; Webber 1953.

1. Plants with leaves in a crown at ends of 1–4(–8) trunk-like stems 1.5–4.3 m tall; leaves broad, 3–8 cm wide, stiff and spear-like, thickish; fruits indehiscent, eventually drooping; sw margin of nc TX, mainly Edwards Plateau s and w to s TX and Trans-Pecos.




2. Leaves with marginal threads, the margins not denticulate, the apical portion of leaves usually rolled inward so that margins nearly touch; ovary slender for its length, not over 7 mm in diam. at flowering time _____ **Y. torreyi**
2. Leaves without marginal threads, the margins not denticulate, the apical portion of leaves not inrolled; ovary stout for its length, 7–12 mm in diam. at flowering time _____ **Y. treculeana**
1. Plants with leaves in a basal cluster (without visible stems) or at ends of very short trunk-like stems; leaves usually narrower, 0.8–4 cm wide, not as above; fruits dehiscent at maturity, not drooping; widespread in nc TX.
3. Leaf margins yellowish to dark orangish red or reddish brown, smooth or minutely toothed, not shredding into threads; pistil 3.2–4.5 mm long.
4. Leaves straight or nearly so, not with strongly inrolled margins, usually pale bluish to sage green, conspicuously glaucous, ± smooth on both surfaces; leaf margins yellowish, flat _____ **Y. pallida**
4. Leaves twisted, with margins inrolled most of their length, dark green, not glaucous, ± scabrous on both surfaces; leaf margins usually dark orangish red or reddish brown or occasionally yellowish, wavy _____ **Y. rupicola**
3. Leaf margins whitish, shredding into prominent white threads (these often disappearing late in year); pistil 2–3.2 cm long.
5. Inflorescence a much branched panicle, beginning well above tips of leaves (separated from them by nearly its own length or more of naked scape); fruits constricted near middle or not so; in nc TX mainly in West Cross Timbers.
6. Leaves very slender, 8–15 mm wide, 100–200 per strikingly globose rosette; fruits usually conspicuously constricted near middle; on limestone substrates _____ **Y. constricta**
6. Leaves usually 15–40 mm wide, ca. 50–85 per rosette (rosette not globose in appearance); fruits usually not conspicuously constricted; on sandy substrates _____ **Y. necopina**
5. Inflorescence usually unbranched and raceme-like or with 1 or 2 short, spreading branches near base (these often soon deciduous), beginning below to just above leaf tips (separated from them by less than its own length of naked scape); fruits not constricted near middle; widespread in nc TX _____ **Y. arkansana**



Yucca arkansana Trel., (of Arkansas), ARKANSAS YUCCA. Leaves 20–60 cm long, the blades 1–2.5 cm wide, the margins at first white, papery with curly fibers; perianth 32–65 mm long, greenish white, globose; capsules ca. 4–7 cm long. Rocky limestone or sandy soils; se and e TX w to eastern Rolling Plains and Edwards Plateau. Late Apr–mid-May.


Hybrids of *Y. arkansana* and *Y. pallida* have been found on limestone in Dallas (McKelvey 1947), at Glen Rose in Somervell Co. (Shinners 1958), and recently in Tarrant County at Tandy Hills Park. The Tandy Hills plants vary from having leaves with curly fibers on the margins to not so, from having leaf margins white to yellowish, and from having inflorescences branched to sparsely branched or unbranched. In general, the plants were from 1–1.5 m tall. This population of hundreds of individuals over a number of acres was quite variable with individuals ranging from much like typical *Y. arkansana* to those much like *Y. pallida* and a full spectrum of intermediates.

Yucca constricta Buckley, (constricted), BUCKLEY'S YUCCA. Usually stemless, rarely with trunk-like stems to 40 cm tall; overall aspect of basal leafy portion almost ball-like in outline; leaves 30–65 cm long, very slender, 100–200 per rosette, very straight but flexible, the margins white or green with fibers that soon erode away; perianth pale greenish white; panicle branches glabrous. Limestone outcrops or rocky prairies; Callahan, Coleman, and Erath cos., also Brown Co. (HPC); West Cross Timbers s and w to w TX; endemic to TX. Apr–Jun. 📍

📍 **Yucca necopina** Shinners, (unexpected), GLEN ROSE YUCCA. Similar to *Y. arkansana* vegetatively, but taller (1–3 m tall) and with large, much-branched inflorescences held well above the leaves; leaves 50–80 cm long, typically 1.5–4 cm wide, the margins white, with curly fibers; in-

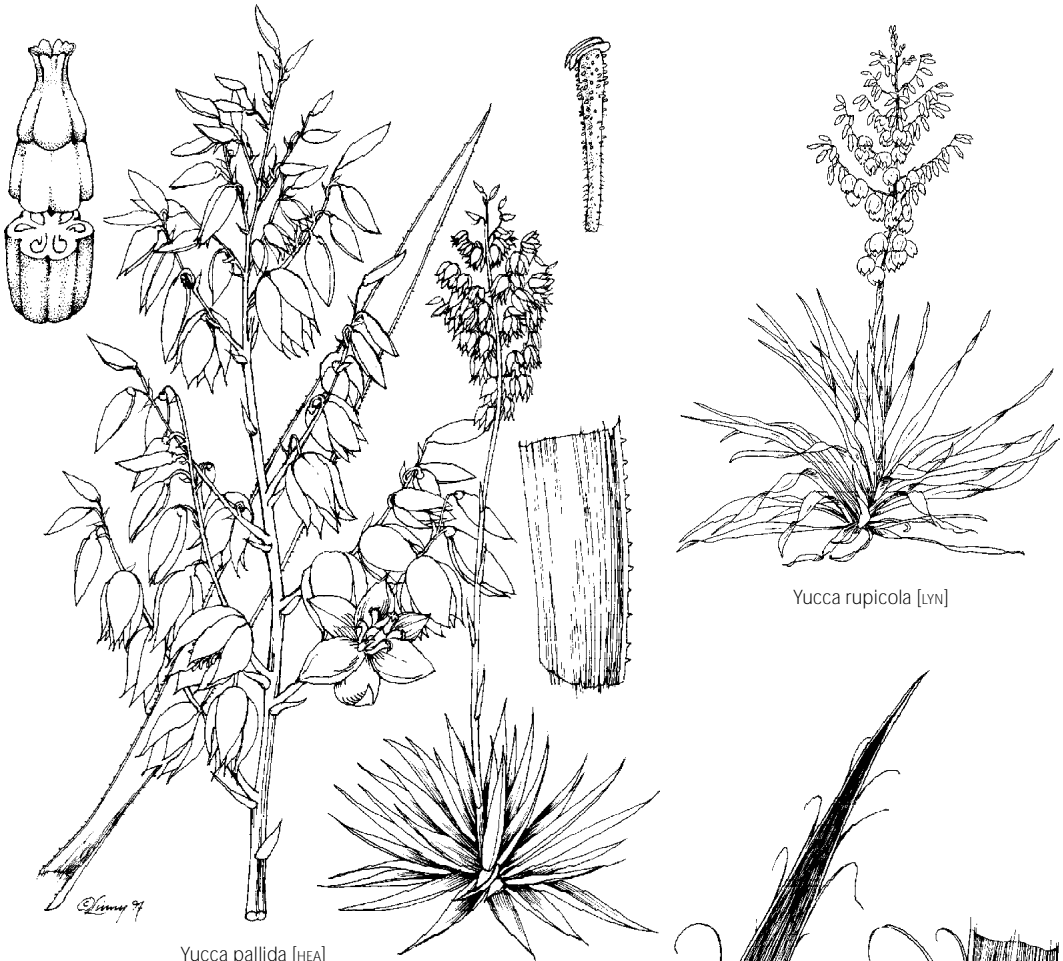
florescences completely glabrous; flowers greenish white. Previously known only from a sandy fencerow on Brazos River terrace near Glen Rose, Somervell Co. (Shinners 1958a); recently re-discovered by R. O'Kennon along Brazos River terraces in Hood and Somervell cos. and in deep sand in Parker and Tarrant cos.; these populations number in the hundreds of individuals; apparently endemic to nc TX but should be looked for in s OK. This is the common *YUCCA* of sandy soils in the West Cross Timbers in nc TX. May–Jun. Shinners thought this to be possibly a hybrid between *Y. pallida* and *Y. arkansana* but unlike an evident hybrid of these 2 species observed nearby (Shinners 1958a). Recent field observations of large numbers of relatively uniform individuals in widely separated populations—in sandy areas where neither *Y. arkansana* or *Y. pallida* typically occur—support the recognition of this entity at the specific level. Molecular evidence (K. Clary, pers. comm.) also supports specific recognition. Bill Hess (pers. comm.) is treating this species as a synonym of *Y. arkansana* in his treatment of *Yucca* for Flora North America. The closest relative of *Y. necopina* seems to be *Y. louisianensis* Trel. (to be treated as *Y. flaccida* Haw. by B. Hess (pers. comm.), which is distinguished by its usually narrower leaves and pubescent inflorescences. Vines (1960) cited *Y. louisianensis* for Dallas and Fort Worth; these records are likely to be of *Y. necopina*. The genus is in need of more detailed field study in nc Texas. (TOES 1993: V)   /107

 ***Yucca pallida*** McKelvey, (pale), PALE YUCCA, PALE-LEAF YUCCA. Plant 1.3–2.5 m tall to tip of inflorescence; leaves 18–35 cm long, 2–4 cm wide, conspicuously glaucous, margins corneous (= horn-like texture); panicle narrowly to widely branched; perianth segments with pale greenish center and white edges. Limestone outcrops or rocky prairies; Grand Prairie and Blackland Prairie (Dallas, on the Austin Chalk); endemic to nc TX or possibly slightly onto the Edwards Plateau. May–Jun. 

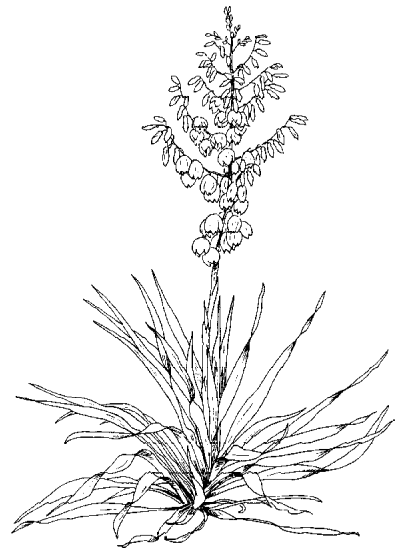
Yucca rupicola Scheele, (growing on cliffs or ledges), TEXAS YUCCA, TWIST-LEAF YUCCA. Similar to *Y. pallida*; leaves 20–60 cm long; perianth segments whitish or greenish white. Limestone ledges, plains; Bell Co. in s part of nc TX; mainly Edwards Plateau; endemic to TX. Apr–Jun. 

Yucca torreyi Shafer, (for John Torrey, 1796–1873, American botanist, physician, and collector of many w North American plants), TORREY'S YUCCA, SPANISH-DAGGER. Stems unbranched or rarely with 2–3 branches; dead leaves reflexed on trunk below leaf crown; leaves 30–110 cm long, light green, stiff, spear-like, with marginal threads; panicle with 10–50% of its total length extending beyond the leaves or rarely entirely within the leaves; perianth subglobose or campanulate, sometimes fully expanding, cream (can be tinged with purple); fruits 7–14 cm long, indehiscent, slightly pulpy. Gravelly soils, grassy and chaparral mesas and slopes; Brown and Burnet cos. (HPC) on sw margin of nc TX; mainly Edwards Plateau and Trans-Pecos. Late Mar–May. This species is sometimes treated as a synonym of the related *Y. treculeana* (e.g., Powell 1988); according to Webber (1953) and Correll & Johnston (1970), the two sometimes hybridize; they can usually be readily distinguished in the field; we are following McKelvey (1938), Kartesz (1994), Jones et al. (1997), and J. Kartesz (pers. comm., 1997) in recognizing them at the specific level. [*Y. baccata* Torr. var. *macnecarpa* Torr., *Y. crassifolia* Engelm., *Y. macnecarpa* (Torr.) Coville]

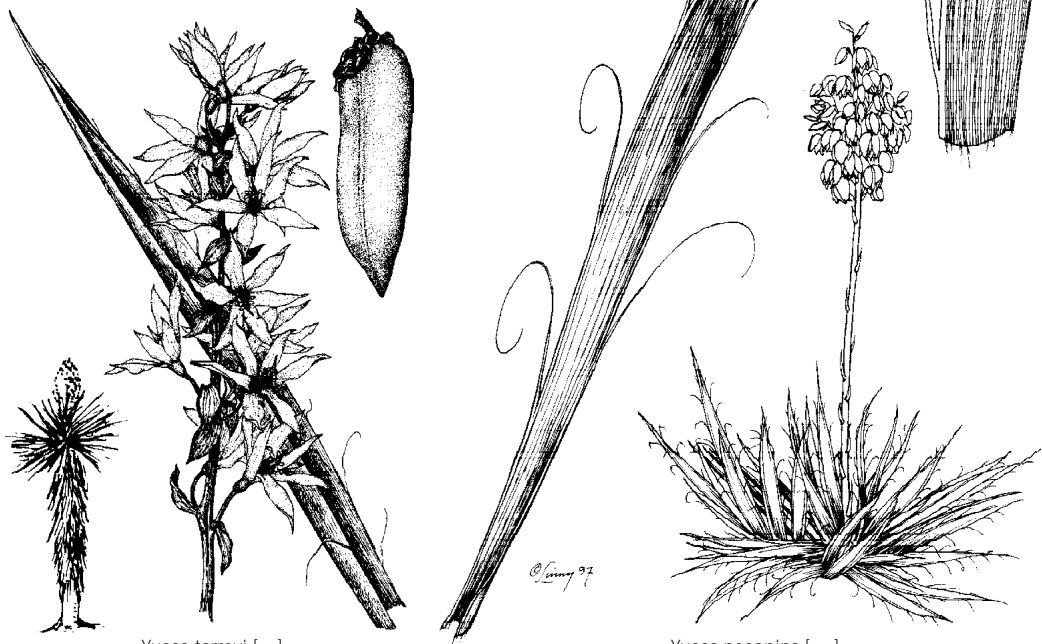
Yucca treculeana Carr., (for A.A.L. Trécul, 1818–1896, who took plants of this species to France in 1850—Vines 1960), TRECUL'S YUCCA, SPANISH-DAGGER, SPANISH-BAYONET, DON QUIXOTE'S-LANCE, PITA, PALMA PITA, PALMA DE DÁTILES, PALMA LOCA, TEXAS-BAYONET. Stems few-branched, with leaf crown at apex; dead leaves reflexed on trunk below leaf crown (trunks bare of dead leaves on old plants); leaves 50–100 cm long, without marginal threads; panicle with ca. 50–75% of its total length extending beyond the leaves; perianths broadly globose or hemispherical, greenish cream to cream (can be lightly tinged with purple); fruits 5–11.5 cm long, indehiscent, the flesh



Yucca pallida [HEA]



Yucca rupicola [LVN]



Yucca torreyi [VIN]



Yucca necopina [HEA]

sweetish and succulent. Brushland; Burnet Co. (Buckley in McKelvey 1938; also R. O'Kennon, pers. obs.), also known just s of nc TX in San Saba Co. (Buckley in McKelvey 1938) and Travis Co. (Tharp letter quoted in McKelvey 1938); Trans-Pecos and se and s TX n to Edwards Plateau near s margin of nc TX. Feb–Apr. The spines were used to jab a snake bite and induce bleeding in order to flush away the poison (Vines 1960). Pioneers cooked and prepared the flowers like cabbage and also pickled them (Schulz 1922; McKelvey 1938; Crosswhite 1980). According to Havard (1896), the fleshy, banana-like fruits are delicious, contain considerable sugar, and were converted by Chihuahua Indians into a fermented beverage. Long fibers obtained by macerating the leaves were used in the past to make ropes (Crosswhite 1980).

ALISMATACEAE

ARROWHEAD OR WATER-PLANTAIN FAMILY

Wet ground or aquatic, annual or perennial herbs, largely glabrous, with milky sap; leaves basal, sometimes dimorphic with different submerged (linear and bladeless) and emergent (generally with distinct blades) forms; leaf blades entire, linear to ovate-elliptic, or triangular and with basal lobes (= sagittate), longitudinally ribbed (midrib more prominent than others) and with cross-veins; flowers whorled, in scapose racemes or panicles, perfect or imperfect; sepals 3, green; petals 3, white or rarely pink, equal; stamens 6 to many; pistils many, on a swollen or elongating receptacle; ovary superior with basal placentation; fruits achenes in our species.

☛ A small (ca. 75 species in 11 genera) nearly cosmopolitan (Haynes & Holm-Nielsen 1994), but especially n temperate family of aquatic or wet area plants with most species found in the New World. Molecular analyses (Duvall et al. 1993) indicate that the Alismataceae is phylogenetically near the base of the monocotyledons. (subclass Alismatidae)

FAMILY RECOGNITION IN THE FIELD: wet area or aquatic herbs with milky sap and basal, often broad, usually distinctly petiolate leaves; flowers whorled, in scapose racemes or panicles, with 3 green sepals, 3 white or rarely pink petals, and numerous separate carpels (and later achenes). REFERENCES: Small 1909; Beal 1960; Rogers 1983; Dahlgren et al. 1985; Haynes & Holm-Nielsen 1994.

1. Carpels (and later achenes) in a single ring on the receptacle; stamens 6; leaf blades never sagittate (cuneate to cordate at base); extreme ne part of nc TX _____ **Alisma**
1. Carpels (and later achenes) densely crowded over surface of receptacle forming a head-like mass; stamens usually > 6 (often numerous); leaf blades variable in shape, sometimes sagittate; widespread in nc TX.
 2. Fruiting heads rough in appearance, resembling a bur (due to the conspicuous persistent styles on the achenes); achenes turgid, ribbed or ridged, not membranous-winged; flowers perfect; leaf blades never sagittate _____ **Echinodorus**
 2. Fruiting heads not bur-like (except somewhat bur-like in *S. brevirostra*); achenes flattened, membranous-winged; flowers perfect or imperfect, at least the lower imperfect; leaf blades sagittate OR not so _____ **Sagittaria**

ALISMA WATER-PLANTAIN

☛ A n temperate and Australian genus of 9 species. (Greek: *alisma*, water-plantain) REFERENCES: Fernald 1946a; Hendrick 1958; Voss 1958; Pogan 1963.

Alisma subcordatum Raf., (slightly cordate), WATER-PLANTAIN, SMALL-FLOWER WATER-PLANTAIN, MUD-PLANTAIN. Emergent perennial; stems erect; leaves basal; leaf blades ovate to elliptic, broadly cuneate to subcordate at base, to 12(–15) cm long and 8(–10) cm wide, long-petioled; inflorescences to 60(–100) cm tall, paniced, with whorled branches; flowers perfect; petals

white or pinkish, 1–3 mm long, suborbicular; receptacle flattened, including achenes the whole structure 4 mm wide or less; achenes 1–2 mm long, wingless, smooth, with a single dorsal groove. Shallow water; Lamar Co. (Carr 1994); mainly e TX. Jun–Sep. [*A. plantago-aquatica* L. var. *parviflorum* (Pursh) Torr.]

ECHINODORUS BURHEAD

Ours emergent annuals or perennials; leaves long-petioled; leaf blades with arcuate veins prominent below; inflorescences usually much exceeding the leaves, with flowers in whorls; flowers perfect; petals white; stamens ca. 12–20; fruiting heads rough in appearance, resembling a bur (due to the conspicuous persistent styles on the achenes); achenes turgid, ribbed or ridged, beaked.

☛ A genus of 26 species extending from the n U.S. to Argentina and Chile (Haynes & Holm-Nielsen 1994); some are cultivated as ornamental aquarium plants. (Greek: *echinus*, rough husk, and *doῦς*, a leather bottle, applied to the ovary, which is in most species armed with the persistent style, forming a sort of prickly head of fruits)

REFERENCES: Fassett 1955; Haynes & Holm-Nielsen 1986.

1. Inflorescences rigidly erect at maturity; veins of sepals smooth; stamens usually 12–15; flowers 6–11 mm across _____ **E. berteroi**
1. Inflorescences erect when young but later becoming prostrate and rooting at nodes; veins of sepals usually with papillose or roughened ridges; stamens usually 20–22; flowers 10–25 mm across _____ **E. cordifolius**

Echinodorus berteroi (Spreng.) Fassett, (for C.G.L. Bertero, 1789–1831, Italian physician who botanized in West Indies), BURHEAD, ERECT BURHEAD. Coarse annual or short-lived perennial with scapes to 80 cm tall; leaves variable, those of mature plants with blades broadly ovate, 3–18 cm long, subcordate to truncate or broadly cuneate at base; secretory tissue visible as pellucid (= clearish, somewhat transparent) line-like markings conspicuous in dried leaves when backlit with strong light; inflorescences with flowers in whorls of 3–9; achenes 2–3 mm long. Mud and shallow water; Dallas, Denton, Grayson, Montague, and Parker cos., also Bell, Coryell (Fort Hood—Sanchez 1997), Brown, Comanche, and Hamilton cos. (HPC); widespread in TX. May–Oct. [*E. berteroi* var. *lanceolatus* (Engelm. ex S. Watson & J.M. Coult.) Fassett, *E. rostratus* (Nutt.) Engelm. ex A. Gray]

Echinodorus cordifolius (L.) Griseb. subsp. **fluitans** (Fassett) R.R. Haynes & Holm-Niels., (sp.: with heart-shaped leaves; subsp.: floating), CREEPING BURHEAD. Annual or short-lived perennial; leaf blades broadly ovate, 2–14(–20+) cm long; pellucid markings usually absent or not conspicuous; inflorescences with flowers in whorls of 5–15, to 1.2 m long, often producing plantlets at tips; achenes ca. 2–3.5 mm long. Mud and shallow water; Tarrant Co., also Brown (Stanford 1971) and Hamilton (HPC) cos. in w part of nc TX and Lamar Co. (Carr 1994) in Red River drainage; also se and e TX and Edwards Plateau. Apr–Nov. We are following Haynes & Holm-Nielsen (1994) and Jones et al. (1997) in recognizing the TX material of this species as subsp. *fluitans*. [*E. fluitans* Fassett]

SAGITTARIA ARROWHEAD

Mostly perennial, aquatic or semi-aquatic, rhizomatous herbs, usually emergent when flowering; leaves varying with environmental conditions (particularly depth of water) and season; leaf blades unlobed or sagittate; petioles long and spongy; submerged leaves typically bladeless; inflorescences usually erect or sometimes procumbent, branched or unbranched; flowers in whorls of 3, pedicelled, bracteate, mostly imperfect or sometimes perfect; petals white; stamens numerous; achenes flattened, membranous-winged, beaked.

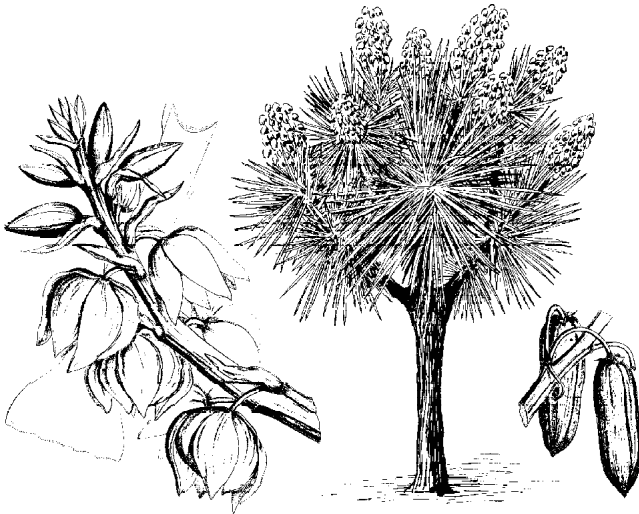
☛ A predominantly New World genus of ca. 25 species, ranging from Canada s to Argentina and Chile; 3–4 species also occur in Eurasia (Haynes & Holm-Nielsen 1994); often tuberiferous herbs of aquatic habitats; the tubers are edible in a number of species; some exhibit leaf polymorphism—the submerged leaves ribbon-shaped, the floating ones with ovate blades, the emergent ones with sagittate blades. (Latin: *sagitta*, an arrow, from the leaf shape of some species) REFERENCES: Smith 1895; Bogin 1955; Wooten 1973; Beal et al. 1982.

1. Leaf blades not sagittate, without lobes; filaments usually pubescent OR glabrous in 1 species that is rare in nc TX.
 2. Stalks of fruiting heads recurved; bracts of inflorescence smooth, thinly membranous; filaments pubescent; common and widespread in nc TX _____ **S. platyphylla**
 2. Stalks of fruiting heads ascending or spreading, not recurved; bracts of inflorescence thickened and papillose or coarsely ridged; filaments pubescent OR glabrous; rare, if present in nc TX probably limited to extreme e margin.
 3. Filaments glabrous; leaves ± phyllodial (= petiole and blade indistinct), enlarged-spongy at base, tapering to linear or narrowly lanceolate blade-like portion; achenes 1–1.5 mm long _____ **S. papillosa**
 3. Filaments pubescent; leaves with long petioles and definite blades (elliptic to lanceolate or rarely ovate); achenes 1.8–2.2 mm long _____ **S. lancifolia**
1. Leaf blades usually sagittate, with conspicuous projecting lobes basally; filaments glabrous.
 4. Sepals of pistillate flowers (when in fruit) 5–14 mm long, appressed or spreading; pedicels recurved and noticeably thickened; petioles terete; most flowers perfect; rare if present in nc TX _____ **S. montevidensis**
 4. Sepals of pistillate flowers (when in fruit) 4–7 mm long, reflexed; pedicels ascending or if recurved then not noticeably thickened; petioles angular; few or no flowers perfect; widespread in nc TX.
 5. Basal lobes of leaf commonly twice as long as blade body, typically narrow, usually < 2(–2.5) cm wide _____ **S. longiloba**
 5. Basal lobes of leaf seldom much longer than blade body, narrow to typically much wider, usually much > 2.5 cm wide.
 6. Lower floral bracts triangular-ovate, obtuse or acute, 5–12 mm long; achene beak projecting ± horizontally or slightly downcurved, the wing of the achene extending ± smoothly to upper surface of beak _____ **S. latifolia**
 6. Lower floral bracts lanceolate to narrowly triangular, acuminate, 12–30 mm long; achene beak projecting upward at an angle, the wing of the achene not extending smoothly to upper of the beak, with a definite interruption ("saddle"-like) _____ **S. brevirostra**

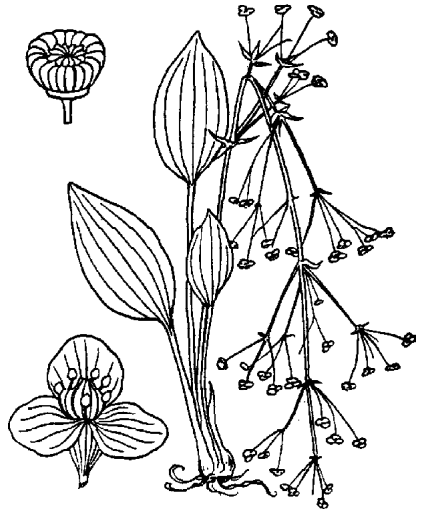
Sagittaria brevirostra Mack. & Bush, (short-beaked). Leaves to 0.6 m long; leaf blades to 30 cm long and 20 cm wide (usually smaller); sepals reflexed from fruiting aggregate; achene beak broad-based, up to 1.5 mm long. Rivers, ditches, other wet areas; Dallas, Ellis, and Grayson cos.; also se TX. Jun–Aug.

Sagittaria lancifolia L., (lance-leaved), SCYTHE-FRUIT ARROWHEAD. Leaf blades to 40 cm long and 10 cm wide; bracts of inflorescence striate to strongly papillose, to 35 mm long; sepals reflexed from fruiting aggregate; beak of achene inserted obliquely near apex of achene, to 0.8 mm long, ascending. Swamps, marshes, or other wet areas; included based on citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990); mainly se and e TX; according to R. Haynes (pers. comm.), this is a coastal species that probably does not occur in nc TX. May–Nov. [*S. falcata* Pursh, *S. lancifolia* var. *media* P. Micheli]

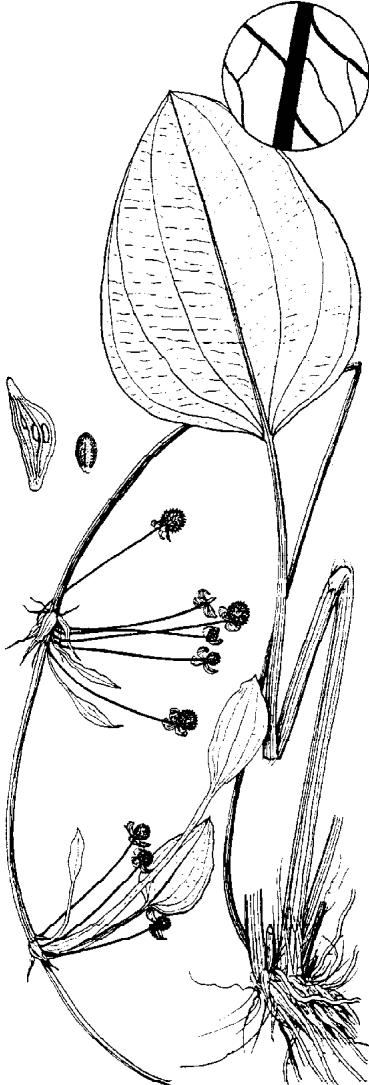
Sagittaria latifolia Willd., (broad-leaved), COMMON ARROWHEAD, DUCK-POTATO, WAPATO. Leaves to 1.5 m long; leaf blades to 50 cm long, mostly sagittate, the lobes varying from narrow to del-



Yucca treculeana [PES, SA2]



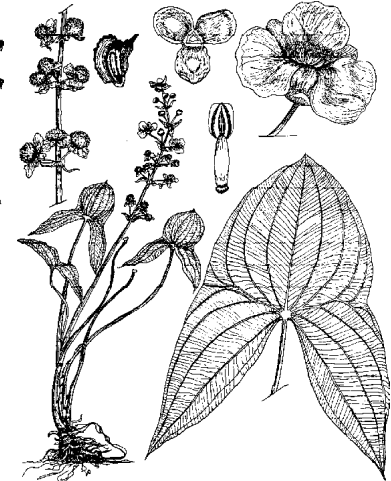
Alisma subcordatum [BB2]



Echinodorus cordifolius subsp. *fluitans* [FLN]



Echinodorus berteroi [BEA]

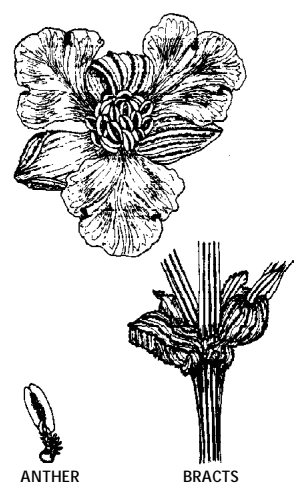


Sagittaria brevirostra [CO1]



ACHENE

Sagittaria lancifolia [ARM, CO1]



ANTHER

BRACTS

toid; bracts to 15 mm long; sepals reflexed from fruiting aggregate, to 10 mm long; petals to ca. 20 mm long; achene beak broad-based, up to 2 mm long. Lakes, ponds, or other wet areas; Denton, Grayson, and Parker cos.; widespread in TX. May-Aug. The tuberous roots were used as food by Native Americans (Erichsen-Brown 1979).

Sagittaria longiloba Engelm. ex J.G. Sm., (long-lobed), LONG-LOBE ARROWHEAD, LONG-BARB ARROWHEAD, FLECHA DE AGUA. Leaves to 0.8 m long; leaf blades to 22 cm long, 0.5–2.5 cm wide; bracts usually < 15 mm long; sepals 4–7 mm long, reflexed from fruiting aggregate; petals to ca. 14 mm long; achene beak projecting horizontally, triangular, tiny, to 0.15 mm long or obsolete. Ponds, swamps, ditches, or other wet areas; Brown (Mahler 1988) and Hamilton (Stanford 1971) cos.; mainly s and w TX. Apr–Nov. Native Americans and early settlers used the tuberous roots as food; they were called duck potatoes or swan potatoes (Kirkpatrick 1992).

Sagittaria montevidensis Cham. & Schltld. subsp. **calycina** (Engelm.) Bogin, (sp. presumably of Montevideo, Uruguay; subsp.: calyx-like), GIANT ARROWHEAD. Leaves to 1 m long; leaf blades 3–40 cm long, 2–25 cm wide; bracts ca. 10 mm long; sepals appressed around fruiting aggregate or spreading; achenes to 2.5 mm long and 1.3 mm wide, the beak horizontal or oblique, narrowly winged, ca. as long as the achene is wide. Lakes, ponds, other wet areas; included based on distribution map (without counties) in Beal et al. (1982) and on citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990), also Brown Co. (HPC); mainly e TX and Edwards Plateau. Jun–Oct. While this taxon is sometimes (e.g., Kartesz 1994) recognized as a separate species [*S. calycina* Engelm.], we are following Haynes and Holm-Nielsen (1994) and Jones et al. (1997) in treating it as a subspecies of *S. montevidensis*

Sagittaria papillosa Buchenau, (with papillae or nipple-like structures), NIPPLE-BRACT ARROWHEAD. Leaf blades to 25 cm long and 5 cm wide (usually narrower); bracts of inflorescence densely papillose, 3–10 mm long; sepals reflexed from fruiting aggregate; petals to ca. 12 mm long; beak of achene inserted laterally above middle of achene, ca. 0.2 mm long, projecting horizontally or recurving. Swamps, marshes, or other wet areas; included based on citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990); mainly se and e TX. Mar–Nov.

Sagittaria platyphylla (Engelm.) J.G. Sm., (broad-leaved), DELTA ARROWHEAD. Leaf blades 8–20 cm long, 2–8 cm wide, rarely with lateral projection(s) from the base; bracts 3–8 mm long, pistillate pedicels recurved; sepals 4–6 mm long, appressed around fruiting aggregate; beak subulate, 0.3 mm or more long, projecting upward at an angle. Swamps, marshes, ponds, or other wet areas; se and e TX w to Rolling Plains and Edwards Plateau. Apr–Oct. [*S. graminea* Michx. var. *platyphylla* Engelm.] This is the most common *Sagittaria* species in nc TX.

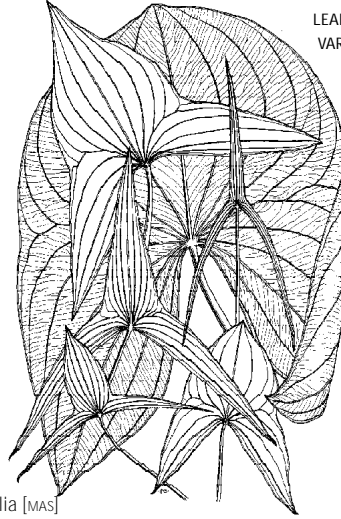
ARACEAE CALLA, ARUM, OR AROID FAMILY

Ours glabrous, herbaceous, rooted perennials with basal, simple or compound, entire leaves or 1 species a free-floating aquatic; inflorescence a fleshy spike (= spadix) with a sometimes highly modified leafy bract (= spathe) subtending or enclosing it; flowers very small, without perianth or with a few minute scales, imperfect; staminate flowers in upper part of spike, with 1–10 stamens, their filaments very short or absent; pistillate flowers in basal part of spike, each with 1 pistil; ovary superior.

☛ A large (2,550 species in 104–105 genera), mainly tropical and subtropical (a few in temperate zones) family of mainly perennial herbs or vines. ☛ Many have tissues containing raphides (bundles of microscopic, needle-like calcium oxalate crystals) that can cause injury to the mouth, throat, or hands by puncturing cell membranes; the plants are also often cyanogenic or contain alkaloids, free oxalic acid, or other toxins; some are potentially fatally poisonous (McIntire et al. 1992; Woodland 1997). *Philodendron*, one of the most popular house plants in



Sagittaria latifolia [MAS]



LEAF BLADE
VARIATION



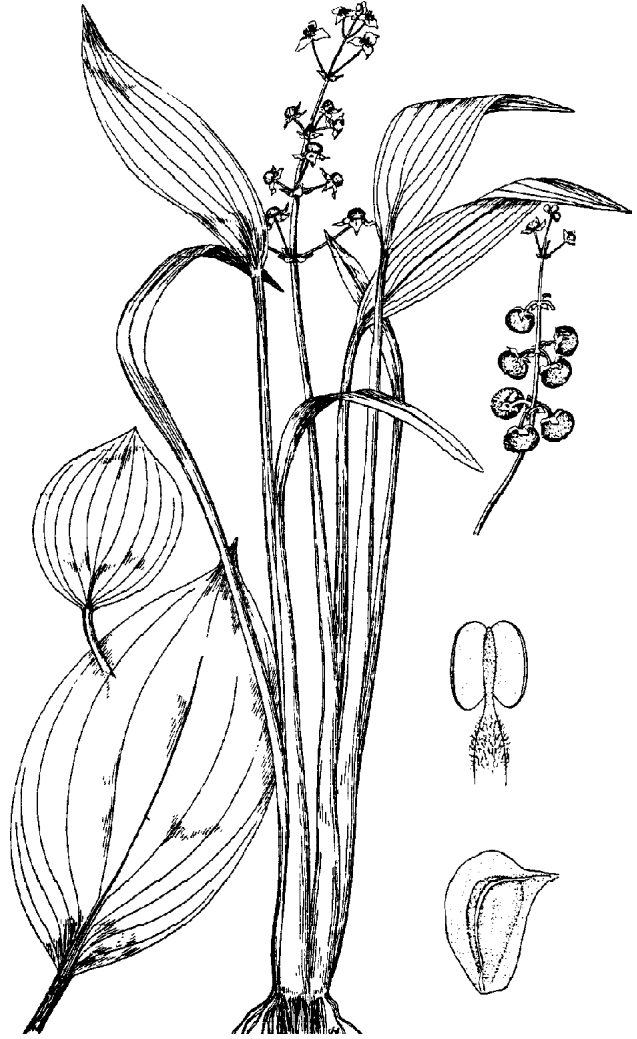
Sagittaria longiloba [CO1]



Sagittaria montevidensis subsp. *calycina* [CO1]



Sagittaria papillosa [CO1]



Sagittaria platyphylla [AMB]

the U.S., has raphides and questionable unidentified proteins and can cause painful burning to the mouth and throat and contact dermatitis; ingestion of the leaves is highly toxic to cats; the plants should not be left within reach of children or pets (Lampe & McCann 1985; Spoerke & Smolinske 1990). *Dieffenbachia* (DUMB-CANE), another common house plant, contains raphides and the alkaloid protoanemonine; ingestion causes swelling of the pharynx and larynx and can result in death through suffocation (Morton 1982); its common name is derived from its ability to paralyze the vocal cords and render people speechless. Food crops include the edible starchy corms of *Colocasia* (TARO) and *Xanthosoma* (TANIER); ornamentals include *Anthurium*, *Caladium*, *Dieffenbachia*, *Monstera*, and *Philodendron*. Some species can produce heat in the inflorescences which volatilizes odors to attract pollinators. The genus *Acorus*, traditionally placed in the Araceae, is here recognized in the Acoraceae. Family name from *Arum*, a genus of 26 species of Europe and the Mediterranean area. (Greek: *arōn*, the classical name of these plants) (subclass Arceidae)

FAMILY RECOGNITION IN THE FIELD: herbaceous perennials (also 1 floating aquatic) with numerous very small flowers in an often finger-like *spadix* subtended by a sheath-like *spathe*; leaves usually basal, with expanded blades, often with net venation.

REFERENCES: Birdsey 1951; Wilson 1960a; Jacobsen 1985; Bogner & Nicolson 1991; Grayum 1990, 1992.

1. Plants free-floating aquatics; leaves 3–15 cm long; spathes ca. 15 mm long; pistillate flower solitary at base of inflorescence _____ **Pistia**
1. Plants rooted in soil (even when in water); leaves often much longer; spathes much > 15 mm long; pistillate or perfect flowers several to many.
 2. Leaves compound with 3–15 leaflets _____ **Arisaema**
 2. Leaves simple.
 3. Leaf blades narrow (5–25 mm wide), grass-like, parallel-veined _____ **Acorus** (see Acoraceae)
 3. Leaf blades broad (much greater than 25 mm wide), not at all grass-like, net-veined.
 4. Leaves peltate (= the petiole attached on the lower leaf surface away from the margin); leaf blades cordate to sagittate or hastate at base, with a purplish spot on the upper epidermis above where the petiole attaches to the blade; spathes yellow _____ **Colocasia**
 4. Leaves not peltate; leaf blades sagittate at base, without a purplish spot; spathes creamy white _____ **Xanthosoma**

ARISAEMA JACK-IN-THE-PULPIT

☞ A genus of 150 species of e Africa, Arabia, tropical and e Asia, and North America. ☞ All parts of *Arisaema* contain microscopic crystals of calcium oxalate, which if eaten disrupt cells and cause extreme burning and swelling of the mouth and throat (Stephens 1980; Cheatham & Johnston 1995). (Greek: *aris*, a kind of arum, and *haima*, blood, from the red-spotted leaves of some species)

Arisaema dracontium (L.) Schott, (Greek name for a kind of arum, presumably from *draco*, dragon), GREEN-DRAGON, DRAGONROOT. Perennial from a corm; leaves net-veined, divided into (5–)7–15 unequal leaflets (sometimes some of the divisions are not completely separated into leaflets); summit of spathe with margins inrolled, tapering to a slender point; spadix long exserted; fruits reddish orange. Low woods, moist slopes; Dallas, Cooke, Denton, Fannin, Grayson, and Tarrant cos.; se and e TX w to East Cross Timbers and Edwards Plateau. Late Apr–May. The rust fungus *Uromyces ari-triphylli* (Schwein.) Seeler sometimes causes conspicuous lesions on GREEN-DRAGON in nc TX (J. Hennen, pers. comm.). The tissues contain injurious calcium oxalate raphides (Lampe & McCann 1985). ☞ ☒/78

Arisaema triphyllum (L.) Schott, (three-leaved), (JACK-IN-THE-PULPIT, INDIAN-TURNIP), with 3

leaflets, the summit of the spathe arching over the spadix, not inrolled, and the spadix not exerted, occurs in se and e TX to the e of nc TX. The tissues contain injurious calcium oxalate raphides (Lampe & McCann 1985). ☣

COLOCASIA TARO, ELEPHANT'S-EAR

☞ A tropical Asian genus of 8 species of tuberous herbs with peltate leaves; used as ornamentals and for food. ☣ All parts of *Colocasias* species, except the corm (when properly prepared) of TARO, contain calcium oxalate crystals which cause burning and swelling of the mouth and throat (Schmutz & Hamilton 1979). (Arabic: *kolka*, originally used for the root of a species of *Nelumbo*)

REFERENCES: Arridge & Fonteyn 1981; Wang 1983.

Colocasia esculenta (L.) Schott, (edible), TARO, WILD TARO, KALO, DASHEEN, EDDO, COCOYAM. Large perennial with large tuber-like corm and leaves all basal; easily identified by the large peltate leaves; leaf blades ± ovate, notched at base but not as deep as attachment of petiole, the upper surface often with a velvety sheen; spathe convolute, constricted between the inflated tube and expanded blade, yellow; spadix terminated by a short or long appendage. Cultivated as an ornamental and apparently spreading; Bell Co. (specimens collected in 1997 from a large population along Salado Creek including a flowering individual), also Turtle Creek and White Rock Lake (Dallas Co., R. O'Kennon, pers. obs.); also known from Travis Co. just s of nc TX; its naturalization along the San Marcos River and neighboring areas of sc TX was discussed by Arridge and Fonteyn (1981). Sep. Native of tropical Asia. Widely grown in the tropics for the edible (when appropriately cooked) tuberous corm and young leaves; in Hawaii it is eaten in the form of "poi." However, all parts of the plant except the corms (when properly prepared) contain calcium oxalate crystals and other toxins causing severe burning and swelling of the mouth and throat and even death (Schmutz & Hamilton 1979). ☣ ☞

PISTIA WATER-LETTUCE, SHELLFLOWER, WATER-BONNET

☞ A monotypic genus; the leaf hairs produce a water-repellent surface; the leaves are nearly horizontal during the day, but move to a more vertical position at night; the genus seems to evolutionarily link the Araceae to the Lemnaceae. (Greek: *pistos*, water or liquid, referring to its aquatic habitat)

Pistia stratiotes L., (soldier), WATER-LETTUCE, SHELLFLOWER, WATER-BONNET. Monoecious free-floating herb; roots long, feathery, hanging; leaves clustered, entire, gray-green, velvety-hairy, strongly ribbed lengthwise, cuneate to obovate-cuneate, to ca. 3–15 cm long, truncate to emarginate at apex; spathes axillary, inconspicuous, ca. 15 mm long; staminate flowers above, pistillate below, solitary; perianth absent. Streams, lakes, and ponds; apparently spreading from cultivation in creeks in Tarrant Co. (Fort Worth Botanic Garden); also cited for vegetational area 4 (Fig. 2) by Hatch et al. (1990); mainly s TX and Edwards Plateau. Spring. This species can become a serious pest in some regions by occupying areas of open water and in Texas is considered a "harmful or potentially harmful exotic plant"; it is illegal to release, import, sell, purchase, propagate, or possess this species in Texas (Harvey 1998). Widespread in the tropics and subtropics. Despite being called WATER-LETTUCE, this species contains oxalates and possibly other toxins; intense irritation of the mouth, throat, and upper digestive tracts has been reported from eating even small amounts (Morton 1982). ☣

XANTHOSOMA YAUTIA

☞ A tropical American genus of 57 species of herbs with milky sap and sagittate or hastate leaf blades; a number are cultivated as ornamentals and for food. ☣ Nearly all parts of a num-

ber of species are injurious due to the presence of calcium oxalate crystals and possibly a toxic alkaloid; ingestion can cause burning, swelling, and blistering of the mouth, throat, and digestive tract; fatalities have been reported; even tasting small amounts can cause serious reactions (Morton 1982; Lampe & McCann 1985). (Greek: *xanthos*, yellow, and *soma*, body, alluding to the yellow inner tissues of some species)

REFERENCE: Lemke & Schneider 1988.

Xanthosoma sagittifolium (L.) Schott, (arrow-leaved), ELEPHANT'S EAR, TANNIA, TANIA. Large perennial herb from a tuberous corm; aerial stems developing with age (in tropical areas); similar to *Colocasia* but leaves not peltate; leaf blades to 90 cm long from attachment to petiole to tip and \pm as wide, with 8-9 pairs of main lateral veins; petioles longer than blades, to ca. 2 m long; spathe convolute, constricted between the inflated tube and expanded blade. Apparently spreading from cultivation; those in water surviving the winter; Bell Co. (Fort Hood-Sanchez 1997), also cited for vegetational read 4 (Fig. 2) by Hatch et al. (1990); also Edwards Plateau. Oct. Native to West Indies. Grown there as an ornamental and in the tropics for its edible (after cooking) corms and specially prepared young leaves; however, the sap is reported to be an irritant and as with other *Xanthosoma* species, the plant should be considered toxic (Kingsbury 1964; Morton 1982). ☠ 🌿

ARECACEAE (PALMAE) PALM FAMILY

☞ A large (2,650 species in 203 genera), mainly tropical, often conspicuous family of usually unbranched, evergreen trees, shrubs, or lianas containing a number of economically important plants including *Calamus* species (RATTAN), *Cocos nucifera* L. (COCONUT PALM), *Copernicia prunifera* (Mill.) H.E. Moore (CARNAUBA WAX PALM), *Elaeis guineensis* Jacq. (OIL PALM), *Phoenix dactylifera* L. (DATE PALM), *Phytelephas macropcarpa* Ruiz & Pav. (VEGETABLE-IVORY OR TAGUA), *Roystonea regia* (Kunth) O.R. Cook (ROYAL PALM), and *Washingtonia filifera* (L. Linden) H. Wendl. (CALIFORNIA FAN PALM). The world's largest seeds (to 50 cm long) are produced by *Lodoicea maldivica* (J.F. Gmel.) Pers. (SEYCHELLES PALM, DOUBLE-COCONUT, COCO-DE-MER). Because of the variety of species useful for food, fiber, and shelter, the PALM family is considered to be the third most important family to humans, following only the GRASS and BEAN families. The family is unusual in having an unbranched trunk with a single apical bud and a terminal rosette of leaves. The woody stems are completely different in structure and manner of growth (no permanent cambium or enlargement in diam.) from those of dicots. King's-cabbage or heart-of-palm is a food obtained from the apical bud (= apical meristem). Family name from *Arecca*, a genus of 60 species native from Indomalesia to tropical Australia and the Solomon Islands. (Name derived from a vernacular name used in Malabar) (subclass Arecidae)

FAMILY RECOGNITION IN THE FIELD: the only nc TX species is a palm usually ca. 1 m tall and has distinctive, large, evergreen, fan-like leaf blades divided into numerous segments; flowers very small, numerous, in a panicle.

REFERENCES: Bailey 1961; Moore & Uhl 1982; Dahlgren et al. 1985; Tomlinson 1990; Lockett 1991; Henderson et al. 1995; Zona 1997.

SABAL

☞ A genus of 16 species of dwarf to stout, unarmed palms ranging from the se United States to South America; some are used as a source of thatch. (Possibly derived from an American vernacular name)

REFERENCES: Small 1922; Zona 1990.

Sabal minor (Jacq.) Pers., (smaller), DWARF PALMETTO, BUSH PALMETTO, DWARF PALM, BLUE PALM, PALM, BLUE STEM, SWAMP PALM. Plant about 1 m tall (rarely taller), usually acaulescent with a

pithy crown or with a short trunk; leaves long-petioled, with stiff, evergreen, glabrous, fan-like blades longitudinally pleated toward base, divided over half way (sometimes becoming split to base) into many narrowly lanceolate segments; inflorescence a long panicle, its stalk with leafy bracts consisting of closed, tubular basal sheath and grass-like short blade; flowers many, subsessile, very small, with 3-lobed calyx and 3 greenish or brownish petals as long as the calyx; stamens 6; pistil 1; ovary superior; fruits black, 6-13 mm in diam. Stream bottoms; s and se TX n along larger rivers to Dallas and Kaufman cos. in nc TX and Van Zandt and Wood cos. in e TX, also spreading from cultivation in Tarrant Co. (Fort Worth Botanic Garden, R. O'Kennon, pers. obs.). Jun.

BROMELIACEAE PINEAPPLE OR BROMELIAD FAMILY

☛ A relatively large family (2,400 species in 59 genera) of epiphytic or terrestrial xerophytic herbs; mainly limited to tropical to warm temperate areas of the New World. The most important species economically is *Ananas comosus* (L.) Merr. (PINEAPPLE); many other species are cultivated as ornamentals. A number of the epiphytic species are tank epiphytes; these have tightly clasping leaf bases and are thus able to act as well-like "tanks" to store water which is absorbed by specialized roots or hairs. These epiphytes form a "hanging ecosystem" in New World tropical forests and provide habitats for an assortment of animals including frogs. In the field, many species can be recognized by their tough, thickened, usually spiny leaves, often conspicuous inflorescences with colored bracts, and the typically epiphytic or xerophytic habit. Family name from *Bromelia*, a tropical American genus of 48 species. (Named for Olaf Bromel, 1639-1705, Swedish botanist) (subclass Zingiberidae)

FAMILY RECOGNITION IN THE FIELD: gray or gray-green, xerophytic *epiphytes*, leaves with distinctive peltate scales.

REFERENCES: Smith 1938; 1961; Smith & Wood 1975; Dahlgren et al. 1985.

TILLANDSIA BALL-MOSS

Xerophytic epiphytes largely covered with gray scales or trichomes, the plants gray when dry, gray-green when wet; leaves entire, with peltate scales that collect water and nutrients; flowers perfect; stamens 6; ovary superior; fruit a septicidal capsule; seeds with a basal plumose appendage.

☛ A tropical American genus of 380 species of epiphytes typically with leaves in a rosette; some are cultivated as ornamentals. Because of their grayish color, seedlings are sometimes confused with lichens (E. McWilliams, pers. comm.) (Named for Elias Tillands, 1640-1693, professor at Abo, who, as a student crossing directly from Stockholm, was so seasick that he returned to Stockholm by walking more than 1,000 miles around the head of the Gulf of Bothnia and hence assumed his surname (by land); the genus was erroneously supposed by Linnaeus to dislike water)

REFERENCES: Birge 1911; McWilliams 1992, 1995.

1. Plant typically a dense ball-like clump; stems short, 10 cm or less long, completely concealed by the overlapping leaf sheaths; flowers at the end of a scape (= flowering stalk) conspicuously exerted above the leaves _____ **T. recurvata**
1. Plant of slender, wiry, usually curled, elongate, hanging strands, not ball-like; stems elongate, often several meters long, visible between the leaves; flowers sessile, among the leaves _____ **T. usneoides**

Tillandsia recurvata (L.) L., (recurved), BALL-MOSS, BUNCH-MOSS, GALLITOS. Plant rarely > 15 cm tall; roots present; leaves arising close together, curving out, elongate (3-17 cm long), very narrow (to ca. 2 mm wide), covered with scales; scape slender, with 1-2(-5) flowers; flowers bluish. In nc TX, usually epiphytic on LIVE OAKS or further s and w, on rocks, tombstones, and utility

wires; Bell, Burnet, Milam, and Williamson cos. (McWilliams 1992); s and sc TX n to s part of nc TX, apparently spreading e and ne (several populations are now known from LA—E. McWilliams, pers. comm.); an introduced population on a single tree was observed in Dallas (McWilliams 1992). Flowering throughout the year. This species has expanded its geographic range in TX over the past 80 years, apparently in response to changing climate; such climate-sensitive species may be able to serve as early indicators of projected regional climatic change (McWilliams 1995).

Tillandsia usneoides (L.) L., (like *Usnea*, a lichen that hangs from trees) SPANISH-MOSS, OLD MAN'S-BEARD, LONG-MOSS, BLACK-MOSS, PASTLE, FLORIDA-MOSS. Hanging strands to 3–4(–8) m long; roots absent; leaves thread-like, 2–6 cm long; inflorescence of a single flower; flowers greenish or greenish yellow. Epiphytic or on wires or other supports; native to se, e and c TX; known just to the s of nc TX in Travis Co. (Smith 1961); included because of the possibility of occurrence on extreme s or e margins of nc TX. Feb–Jun. In moist areas in se and e Texas this species hangs in large extremely conspicuous festoons from trees. It occurs from the s U.S. to Argentina, an incredible distribution stretching across 5,000 miles of latitude. Rarely flowering; distributed by the wind and by birds using it as nest material; the dried plants are used as packing material and in upholstery (Mabberley 1987).

BURMANNIACEAE BURMANNIA FAMILY

☛ A small (160 species in 16 genera) mainly tropical family that occurs n to Japan and the e U.S. and s to New Zealand; small forest herbs including many colorless saprophytic species without chlorophyll. The family is closely related to the Orchidaceae. (subclass Liliidae)

FAMILY RECOGNITION IN THE FIELD: the only nc TX species is a very small herb with a thread-like unbranched stem, scale-like leaves, and a few small terminal flowers.

REFERENCES: Wood 1983a; Dahlgren et al. 1985.

BURMANNIA

☛ A genus of 60 species of tropical and subtropical areas of the world. (Named for Johannes Burmann, 1706–1779, a Dutch botanist)

Burmattia capitata (J.F. Gmel.) Mart., (headed), CAP BURMANNIA. Very small herb with a thread-like, usually unbranched stem 5–20 cm tall; leaves alternate, tiny and scale-like, to 5 mm long, few, widely spaced along the stem; flowers 1–several in a cluster at tip of stem, small, ca. 5 mm long, 0.5–1.5 mm wide, greenish white or cream, sometimes tinged with blue, the six perianth segments fused into a tube, tipped by minute to obsolescent lobes 0.5–1 mm long; stamens 3, almost sessile, attached to the perianth tube; ovary inferior; capsules 2–5 mm long, 3-angled, but not winged (winged in *B. biflora* L., known in TX only from deep e part). Moist woods, bogs; Milam Co. near e margin of nc TX; mainly se and e TX. Aug–Nov.

COMMELINACEAE SPIDERWORT FAMILY

Annual or perennial herbs; leaves alternate or basal, with closed, tubular basal sheaths and broad or narrow, grass-like, entire blades; flowers in small cymose clusters subtended by reduced upper leaves or leafy bracts (if the bracts enclose the flowers they are referred to as spathes); sepals 3; petals 3, thin and delicate, usually lasting half a day or less (flowers open during morning, later in cloudy weather); stamens usually (5–)6, all fertile or some staminodial or lacking; filaments often long-hairy; pistil 1; ovary superior; fruit a capsule.

☛ A medium-sized (650 species in 41 genera—R. Faden, pers. comm.) family of tropical, subtropical, and warm temperate herbs; a number are widely used ornamentals including species



Arisaema dracontium [SHI]



Colocasia esculenta [NIC]



LEAF

SPATHE

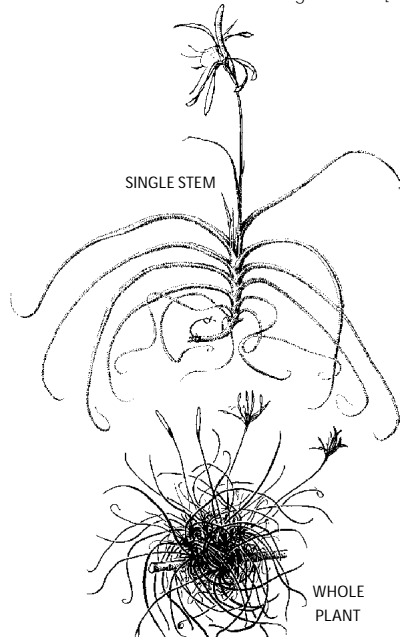
Pistia stratiotes [GWO]



Xanthosoma sagittifolium [BA1]



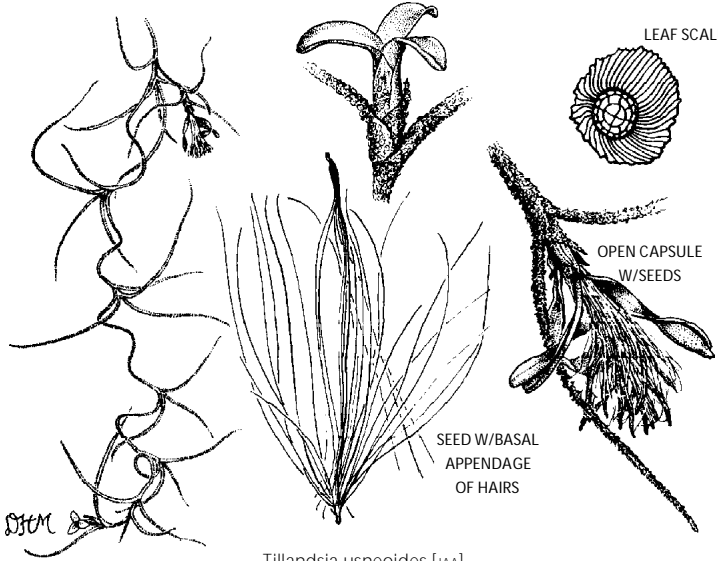
Sabal minor [BA1]



SINGLE STEM

WHOLE PLANT

Tillandsia recurvata [JAA]



LEAF SCALE

OPEN CAPSULE W/SEEDS

SEED W/BASAL APPENDAGE OF HAIRS

Tillandsia usneoides [JAA]

of *Tradescantia* (SPIDERWORT), *Rhoeo* (BOATFLOWER, OYSTERPLANT), and *Zebrina* (WANDERING-JEW); the latter 2 genera are now typically lumped into *Tradescantia* (Hunt 1986). (subclass Commelinidae)

FAMILY RECOGNITION IN THE FIELD: herbs with succulent mucilaginous stems with knotted nodes and usually alternate, ± basally sheathing leaves with strongly parallel veins; petals 3 (1 sometimes smaller), delicate, often blue.

REFERENCES: Poole & Hunt 1980; Faden 1985, 1992; Hunt 1986; Tucker 1989; Faden & Hunt 1991.

1. Inflorescences each subtended or enclosed by a single leafy bract (the bract sometimes conspicuously folded); the 3 petals not all alike, EITHER 2 larger and bluish and 1 one much smaller and white (at least paler than the others) OR one petal slightly smaller than the others; fertile stamens 3 (2–3 staminodia also present) OR 6 and unequal.
2. Bract (spathe) folded, the two sides ± parallel, 1.0–3.5 cm long, conspicuously different in shape from stem leaves; fertile stamens 3 (2–3 staminodia also present); filaments glabrous; petals (upper 2) clawed; foliage not glaucous; widespread in nc TX. _____ **Commelina**
2. Bract flat, not folded, 4–8 cm long, similar to upper stem leaves but shorter and wider; fertile stamens 6; filaments (5 of the 6) bearded; petals not clawed; foliage glaucous; in nc TX restricted to the Lampasas Cut Plain. _____ **Tinantia**
1. Inflorescences each subtended by 2(–3) leaves with reduced sheaths but conspicuous long blades; the 3 petals all ± similar; fertile stamens 6, equal. _____ **Tradescantia**

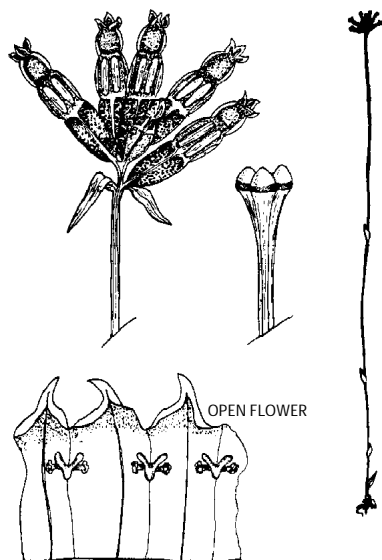
COMMELINA WIDOW'S-TEARS, DAYFLOWER

Annuals or perennials; flowers bilaterally symmetrical; inflorescences enclosed in spathes; petals greatly or slightly unequal, blue or blue and white, the upper 2 larger and clawed; stamens unequal, 3 long (1 of these curved in), 3 slightly shorter, sterile (actually staminoidea).

☛ A genus of ca. 170 species of tropical and warm areas of the world; bees pierce the juicy lobes of the upper 3 sterile anthers to obtain nectar. The common name DAYFLOWER comes from the extremely delicate flowers which open in the morning but are gone by noon on sunny days (Kirkpatrick 1992). (Named for the early Dutch botanists, Commelin, on account of the 2 showy petals and 1 less conspicuous petal. Linnaeus was referring to the three botanists of that name, two of whom, Johan, 1629–1692, and Kaspar, 1667–1731, were conspicuous botanists, while the third “. . . died before accomplishing anything in Botany”)

REFERENCES: Pennell 1916, 1937, 1938; Brashier 1966; Faden 1989, 1993.

1. Leaf-like spathe enclosing flowers open not only on the top margin, but also open down the back margin to where it attaches to its stalk; annuals with fibrous roots.
2. Two petals blue, 3rd (anterior) petal much smaller and white (or at least paler than the others); leaf blades 15–40 mm wide; leaf sheaths 10–20 mm long; bottom edge of spathes ± straight; stalk of spathes 1–7 cm long; spathes usually pale with contrasting dark green veins; capsules bilocular. _____ **C. communis**
2. All 3 petals blue, 3rd slightly smaller; leaf blades 9–15(–22) mm wide; leaf sheaths 5–10 mm long; bottom edge of spathes usually curved down at tip; stalk of spathes 1–2 cm long; spathes without contrasting veins; capsules trilocular. _____ **C. diffusa**
1. Leaf-like spathe enclosing flowers open on the top margin, but with its edges fused together along the back margin; perennials with thickened roots.
3. Two petals blue, the 3rd much smaller and white; stems usually not erect; spathes scattered along the stem (opposite leaves) and near the stem apex, usually 1 per node; leaf sheath margins inconspicuously ciliate with whitish hairs; leaves with auricles at summits of sheaths; leaf blades 14–35 mm wide. _____ **C. erecta**
3. All 3 petals blue, the lower one slightly smaller; stems usually strictly erect; spathes usually



Burmannia capitata [co1]



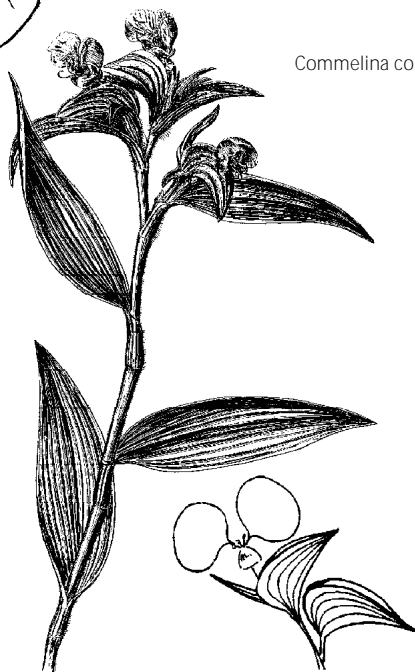
Commelina communis [dl]



Commelina diffusa [br2]



Commelina erecta var. *angustifolia* [jon]



Commelina erecta var. *erecta* [dl]



Commelina virginica [pu]

in clusters near the stem apex; leaf sheath margins conspicuously ciliate with reddish

hairs; leaves without auricles; leaf blades 20–65 mm wide _____ **C. virginica**

Commelina communis L., (common), COMMON DAYFLOWER. Stems erect, later decumbent, to 4 mm in diam., to 50 cm tall. Stream banks and low thickets, can be a garden weed; Dallas Co.; e TX, also Edwards Plateau. May–Oct. Native of e Asia. ☞

Commelina diffusa Burm. f., (diffuse, spreading), SPREADING DAYFLOWER, CREEPING DAYFLOWER. Stems erect initially, later decumbent, usually not more than 1.5 mm in diam. Low woods; Fannin (Talbot property) and Rockwall cos.; mainly se and e TX. Apr–Nov.

Commelina erecta L., (erect), ERECT DAYFLOWER, HIERBA DE POLLO. Stems erect to decumbent, 10–70(–100+) cm long. Native in various soils, often a weed. May–Jun and Sep–Oct, occasionally Jul–Aug. While often distinguishable, there is considerable variation (Brashier 1966) and overlap between the following varieties; Faden (1992) indicated the three freely intergrade and are of questionable significance.

1. Blades of middle and upper leaves broadly oblong-lanceolate, less than 5 times as long as wide, 1.4–3.2 cm wide _____ var. **erecta**
1. Blades of middle and upper leaves narrowly oblong-lanceolate or linear-lanceolate, more than 5 times as long as wide, 0.5–1.2(–2.0) cm wide.
2. Spathes (1.3–)1.5–2.0(–2.3) cm long _____ var. **angustifolia**
2. Spathes (2.2)2.5–2.8(–3.3) cm long _____ var. **deamiana**

var. **angustifolia** (Michx.) Fernald, (narrow-leaved), NARROW-LEAF DAYFLOWER. In habitats as diverse as sandy woods and rocky limestone slopes; throughout TX.

var. **deamiana** Fernald, (for Charles C. Deam, 1865–1953, American botanist). Usually in sandy soils; Hill Co.; e TX w to nc TX.

var. **erecta**. Thickets, stream banks or a weedy invader elsewhere; se and e TX w to Rolling Plains and Edwards Plateau. ☞/85

Commelina virginica L., (of Virginia), VIRGINIA DAYFLOWER. Plant spreading by elongate rhizomes; stems coarse, 3–6 mm in diam. at base, erect (rarely decumbent), to 90 cm tall; leaf blades scabrous when rubbed toward base. Low woods; Hopkins and Lamar cos.; se and e TX w to e part of nc TX. May–Oct.

Commelina caroliniana Walter, (of Carolina), apparently native to India but scattered in the se U.S., is known from Travis Co. just to the s of nc TX (Faden 1993); its presence in nc TX would not be surprising. Faden (1993) separated it from the similar *C. diffusa* as follows: ☞

1. Spathes not at all to slightly falcate; upper cyme usually vestigial (rarely well-developed and 1-flowered); capsules (5–)6–8 mm long; ventral locule seeds 2.4–4.3(–4.6) mm long, smooth to faintly alveolate _____ *C. caroliniana*
1. Spathes usually distinctly falcate; upper cyme in larger spathes usually well-developed and 1–several-flowered; capsules 4–6.3 mm long; ventral locule seeds 2–2.8(–3.2) mm long, deeply reticulate _____ *C. diffusa*

TINANTIA FALSE DAYFLOWER, WIDOW'S-TEARS

☞ A genus of ca. 13 species (R. Faden, pers. comm.) from TX to the American tropics; some cultivated as ornamentals; 2 of the species were previously treated as *Commelinantia*. (Named for Francois A. Tinant, 1908–1858, a forester in Luxembourg—R. Faden, pers. comm.)

REFERENCES: Tharp 1922, 1956; Woodson 1942; Simpson et al. 1986.

Tinantia anomala (Torr.) C.B. Clarke, (anomalous), FALSE DAYFLOWER, WIDOW'S-TEARS. Tufted glabrous annual with erect or spreading stems 20–80 cm long, becoming freely branched, the branches emerging through the back of the leaf sheaths just above the nodes; basal leaves tapered to a long petiole; upper stem leaves sessile or short petioled, the blades ± lanceolate, often somewhat cordate and clasping basally; flowers in elongate cymes; petals not clawed, the 2 upper larger ones 15–18 mm long, lavender-blue, the much smaller lower 1 white; stamens 6, all fertile, very polymorphic; upper 3 stamens, with filaments conspicuously bearded with yellow-tipped hairs, with small anthers (2 lateral upper stamens upright, middle upper stamen less upright); lower 3 stamens curved downward, with larger anthers; filaments of lateral 2 lower stamens with purple hairs; filament of middle lower stamen glabrous; capsules 6–8 mm long, Limestone gravel or rocky crevices, often in some shade; Edwards Plateau ne to McLennan and s Bosque cos. (Mahler 1988), also Fort Hood (Bell or Coryell cos.—Sanchez 1997); endemic to TX or nearly so (1 record from Mexico—Faden 1992). Apr–Jun, rarely later. [*Commelinantia anomala* (Torr.) Tharp] Simpson et al. (1986) gave detailed information on the reproductive biology of this species; it is apparently largely autogamous. 📖 📍/107

TRADESCANTIA SPIDERWORT

Perennial subsucculent herbs; leaf blades linear to oblong-elliptic; petals equal, not clawed, blue to rose, magenta, purple, or white; stamens 6, all fertile and equal; filaments long-pilose with colored hairs.

☛ An American genus of 70 species; a number are cultivated as ornamentals including species previously treated in *Rhoeo* (BOATFLOWER, OYSTERPLANT), and *Zebrina* (WANDERING-JEW). The filaments of most species have long hairs and were used by Robert Brown in 1828 to observe and describe protoplasmic streaming. Hybridization and introgression are well known in *Tradescantia* and complicate the taxonomy of the genus. The common name is possibly derived from the long slender leaves which clasp the stem and dangle like spider legs or from the mucilaginous sap stringing out to resemble a spider's web, and wort, from Anglo-Saxon: *wyr*t, a plant or herb (Tveten & Tveten 1993). (Named for John Tradescant, 1608–1662, gardener to King Charles I of England)

REFERENCES: Bush 1904; Tharp 1932; Anderson & Woodson 1935; Anderson & Sax 1936; Anderson 1954; MacRoberts 1977, 1980; Hunt 1980.

1. Leaf blades broader than their opened flattened sheaths, at least the upper ones _____ **T. edwardsiana**
1. Leaf blades narrower than sheaths or ca. as broad as their opened flattened sheaths.
 2. Upper internodes glabrous.
 3. Sepals glabrous or with only a small tuft of hairs at tips (this is the only nc TX species like this; all others have pubescent sepals) _____ **T. ohioensis**
 3. Sepals sparsely to densely pubescent on back (hairs either eglandular or glandular).
 4. Sepals either completely eglandular-pubescent or with eglandular and glandular pubescence intermixed; bracts pilose to glabrous _____ **T. hirsutiflora**
 4. Sepals usually with glandular pubescence only (sometimes with a tuft of eglandular hairs at tip); bracts glabrous _____ **T. occidentalis**
 2. Upper internodes variously pubescent (puberulent, pilose, or with matted hairs).
 5. Hairs on internodes minute or long and ± straight, wide-spreading.
 6. Sepals with only eglandular pubescence (use lens).
 7. Leaf sheaths glabrous or minutely pubescent; bracts conspicuously saccate, the blade reduced, densely and minutely velutinous _____ **T. gigantea**
 7. Leaf sheaths long pilose or with long matted or tangled hairs; bracts not conspicuously saccate, the blades well-developed, glabrous to ± pilose.

8. Stems 12–49 cm tall, with 2–5 nodes; leaf blades usually edged with purple; sepals relatively firm, dull-green to suffused or edged with rose _____ **T. hirsutiflora**
8. Stems 2–7 cm tall in flower, up to 30 cm in fruit, usually with 1–2 nodes; leaf blades usually edged with pink or purple; sepals somewhat petal-like, usually strikingly purple or rose-colored, occasionally pale green _____ **T. tharpii**
6. Sepals with glandular pubescence and often also eglandular pubescence (use lens).
9. Leaf sheaths long pilose, at least toward their summits _____ **T. hirsutiflora**
9. Leaf sheaths glabrous or short pubescent.
10. Petals ovate, bright blue, occasionally pink; plants 10–30(–45) cm tall; blades of leaves and bracts up to 20 cm long; bracts not conspicuously saccate _____ **T. humilis**
10. Petals obovate, magenta-pink to blue; plants 20–75 cm tall; blades of leaves and bracts 10–35 cm long; bracts conspicuously saccate _____ **T. gigantea**
5. Hairs on internodes long and matted or tangled, spider-web-like in appearance, ± appressed.
11. Stems erect or ascending, simple or infrequently branched, 30–105 cm tall; roots conspicuously felty with red-brown hairs easily visible to the naked eye _____ **T. reverchonii**
11. Stems spreading and ± diffuse, much branched, 10–35 cm long; roots not conspicuously felty to the naked eye _____ **T. subacaulis**

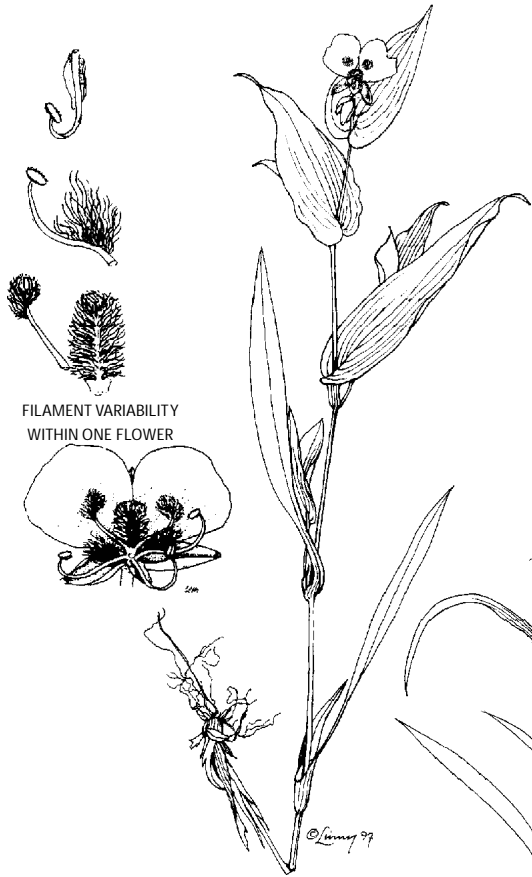
Tradescantia edwardsiana Tharp, (of Edwards Plateau), PLATEAU SPIDERWORT. Stems erect or ascending, puberulent to glabrate, 25–70 cm tall; leaf blades elliptic-lanceolate, 7–30 cm long, 15–65 mm wide, gradually constricted to the sheath, acuminate, minutely puberulent to essentially glabrate; leaf sheaths 7–20 mm wide, nearly glabrous except for the ciliate margins; pedicels minutely and densely puberulent, the hairs sometimes glandular when flowers are in bud stage; sepals glandular-puberulent, sometimes also with eglandular pubescence; petals white to pale blue or lavender, rarely bright pink, broadly ovate. Rich woods, moist alluvial terraces, and ravines; Bell, Collin, Coryell, Dallas, Fannin, and Palo Pinto cos., also Brown and Hamilton cos. (Stanford 1971); Anderson and Woodson (1935) also mapped a collection from just s of the Red River in what is apparently Cooke Co.; also Travis Co. just s of nc TX (Anderson & Woodson 1935); endemic to Edwards Plateau and nc TX. Feb–May. 📍

Tradescantia gigantea Rose, (gigantic), GIANT SPIDERWORT. Stems erect or ascending, branching infrequently, glabrous below, minutely pubescent above; leaf blades glabrous or the upper minutely pubescent; sepals with only eglandular pubescence; petals magenta-pink to blue. Limestone soils; e Edwards Plateau n to Bell Co. on s margin of nc TX, also Burnet Co. (Anderson & Woodson 1935); endemic to TX. Mar–May. 📍

Tradescantia hirsutiflora Bush, (hairy-flowered), HAIRY-FLOWER SPIDERWORT. Stems ± spreading pilose to hirsute or glabrate; sepals with only eglandular pubescence or with both glandular and eglandular; petals bright blue to purplish, rarely pink. Sandy soils; Grayson and Lamar cos. in Red River drainage, also Milam and Henderson cos. on e margin of nc TX; mainly se and e TX, also Edwards Plateau. Mar–Jun.

Tradescantia humilis Rose, (low-growing, dwarf), TEXAS SPIDERWORT. Plant 10–30(–45) cm tall, minutely pubescent or slightly pilose, or largely glabrous; petals bright blue, occasionally pink. Sandy or rocky ground; Bell, Brown, and Williamson cos., also Dallas and Lamar cos. (Anderson & Woodson 1935); mainly sc to nc TX; endemic to TX. Mar–Jun. 📍

Tradescantia occidentalis (Britton) Smyth, (western), PRAIRIE SPIDERWORT. Similar to *T. ohioensis*; 10–90 cm tall; leaf blades averaging narrower (to 20 mm wide); petals bright blue to rose or magenta. Sandy, gravelly, or less often clayey soils, prairies; widespread in w half of nc TX, also Navarro Co. on e margin of nc TX, Anderson and Woodson (1935) also reported Dallas, Kaufman, and McLennan cos. in e part of nc TX; widespread in TX, mainly Blackland Prairie s and w to w TX. Apr–Jun.



FILAMENT VARIABILITY
WITHIN ONE FLOWER

Tinantia anomala [HEA, TOR]



Tradescantia edwardsiana [RHO]



Tradescantia hirsutiflora [HEA]



Tradescantia gigantea [HEA]



Tradescantia humilis [HEA]

Tradescantia ohioensis Raf., (of Ohio), OHIO SPIDERWORT. Plant 20–75 cm tall, glabrous and glaucous; leaf blades 3–32(–45) mm wide; petals blue to rose, magenta, or rarely white. Sandy or clayey soils, prairies, meadows, thickets and roadsides; e 1/2 of TX. [*T. canaliculata* Raf.] This is the most common spiderwort in nc TX. According to Faden (1992), it is the most common and widespread species in the U.S.; it hybridizes with a number of other species. Mar–Jun. The roots are reported to contain a poisonous saponin (Ajilvsgi 1984). ☣ ☒/108

Tradescantia reverchonii Bush, (for Julien Reverchon, 1837–1905, a French-American immigrant to Dallas and important botanical collector of early TX), REVERCHON'S SPIDERWORT, GRASS-VIOLET. Stems erect or ascending, simple or infrequently branched, 30–105 cm tall, usually rather densely pilose with somewhat matted or tangled hairs; sepals with eglandular or both eglandular and glandular hairs; petals bright blue (rarely rose or white). Sandy soils, open woods; Falls and Williamson cos., also collected at Dallas by Reverchon (Mahler 1988), but not found there since, also Henderson Co. (Anderson & Woodson 1935); mainly e TX. Mar–Jul.

Tradescantia subacaulis Bush, (almost without a stem), STEMLESS SPIDERWORT. Stems spreading, 10–35 cm long, densely matted-pilose throughout; roots tuberous-thickened; sepals with glandular and eglandular hairs; petals usually bright blue, occasionally pink. Loose sandy soils, open woods, or open ground; Limestone Co., also Navarro Co. (Anderson & Woodson 1935); s TX n to se part of nc TX; endemic to TX. Late Mar–Jun. ↕

Tradescantia tharpii E.S. Anderson & Woodson, (for Benjamin Carroll Tharp, 1885–1964, botanist at Univ. of TX), THARP'S SPIDERWORT. Plant long-pilose throughout, usually densely so; stems rarely branching, often initially acaulescent; sepals with only eglandular pubescence; petals deep rose or purple, sometimes blue. Sandy clay or rarely silty clay soils, rocky prairies, open woods, or open ground; Collin, Denton, Dallas, Tarrant, and Wise cos., also Erath Co. (Anderson & Woodson 1935); Blackland Prairie w to e Rolling Plains and Edwards Plateau. Late Mar–Apr.

CYPERACEAE SEDGE FAMILY

Annual or perennial herbs; culms (= stems) triangular (most commonly), flat, round, square, or multi-angular, with smooth nodes and usually pithy or spongy internodes; leaves with tubular basal sheath (often reduced or absent from upper leaves) closed except at summit (but apt to become split by growth of culm), generally without a scaly ring (ligule) at junction of sheath and blade on upper (inner) side, and with terminal, usually elongate blade (leaves all reduced to inconspicuous sheaths in *Eleocharis* and some *Cyperus* and *Scirpus*); inflorescences various (umbellate in *Cyperus* and *Fimbristylis* and less distinctly so in some other genera); flowers (often referred to as florets) perfect or unisexual, each subtended by a single (rarely 2) scale-like bract (often referred to as floral scales or in this treatment scales of spikelets or simply scales), without perianth or perianth reduced to bristles or small perianth scales, solitary or in spikelets (these often with added empty scale-like bracts at base); stamens 1–3, with anther attached by one end; pistil 1; fruit an achene.

☛ A large, cosmopolitan (especially temperate), taxonomically difficult family of herbs with 4,500–5,000 species in 100–105 genera (Goetghebeur 1987). Because of the often similar vegetative parts and reduced reproductive structures, technical characters requiring at least a hand lens frequently have to be used to distinguish species. Cyperaceae species superficially resemble grasses or rushes; the family is of limited economic importance as wildlife food, for woodland grazing, or for erosion control; in n temperate parts of the world they sometimes replace grasses as forage; in TX in the Hill Country and w part of the state, *Carex emoryi* L. becomes important for livestock during summer months; also some are problematic weeds (S.D.



Tradescantia occidentalis [BB2]



Tradescantia reverchonii [HEA]



Tradescantia ohioensis [BB2]



Tradescantia subacaulis [HEA]



Tradescantia tharpai [AND]

Jones, pers. comm.). The monotypic North American genus *Dulichium* (*D. arundinaceum* (L.) Britton (genus: derivation not given by original author; sp.: reed-like)—THREE-WAY SEDGE) occurs in e TX just to the e of nc TX. It resembles *Cyperus* in having 2-ranked spikelets, but differs in having 6–9 perianth bristles subtending the achene (none in *Cyperus*) and the inflorescences being axillary (terminal in *Cyperus*). The Cyperaceae, with 140 species, is the fourth largest family in the nc TX flora (after Asteraceae, Poaceae, and Fabaceae). (subclass Commelinidae)

FAMILY RECOGNITION IN THE FIELD: grass-like or rush-like herbs with solid internodes, round or often 3-angled culms (“sedges have edges”), and often 3-ranked leaves without ligules; many (but not all) species grow in wet habitats; flowers small, inconspicuous, without perianth or perianth reduced to bristles or perianth small scales, enclosed by a sac-like perigynium OR subtended by 1 scale-like bract each, and arranged in very reduced spikes/spikelets. The ± similar Poaceae (GRASSES) have hollow internodes, round culms, 2-ranked leaves usually with a ligule, and flowers subtended by 2 scale-like bracts each (lemma and palea); the ± similar Juncaceae (RUSHES) have flowers with a small 6-parted perianth.

REFERENCES: Dahlgren et al. 1985; Goetghebeur 1987; Tucker 1987; Bruhl et al. 1992; Bruhl 1995; Rolfmeier 1995.

1. Pistil (and later achene) enclosed in a pouch or sac (= perigynium) from which the style is exerted during flowering; flowers imperfect _____ **Carex**
1. Pistil (and later achene) not enclosed in a perigynium (but subtended by flat or concave scales); flowers perfect.
 2. Scales of spikelets (= scale-like bracts also referred to as floral scales or simply scales) 2-ranked (= in two distinct rows), the spikelets ± flattened or square.
 3. Culms (= stems) with leaf blades or leafy bracts at least below the inflorescence; spikelets 1–many-flowered; inflorescences often conspicuously branched, of few–many spikelets; achenes without a tubercle; extremely abundant in nc TX.
 4. Plants small (culms 21(–38) cm or less tall); inflorescence a single unlobed or 3-lobed (but unbranched) terminal structure; spikelets with only 2 scales (also 2 minute, brownish, basal scales) and only 1 bisexual fertile flower; each spikelet with only 1 achene; achenes lenticular (= lens-shaped); styles 2-branched _____ **Kyllinga**
 4. Plants variable in size, but often much larger; inflorescence often obviously branched; spikelets with 4–many scales and 3–many bisexual flowers; each spikelet with > 1 achene; achenes usually trigonous (= 3-sided) OR in a few species lenticular; styles usually 3 branched OR in a few species 2-branched _____ **Cyperus**
 3. Culms without any leaf blades or leafy bracts (leaves reduced to basal sheaths); spikelets 1–3-flowered; inflorescences without any branching whatsoever, of a solitary terminal spikelet; achenes with a tubercle (= persistent style base differing in appearance from body of achene); in nc TX only 1 rare species (*E. baldwinii*) has the scales of spikelets 2-ranked _____ **Eleocharis**
 2. Scales of spikelets spirally arranged, not 2-ranked, the spikelets round.
 5. Scales of spikelets white; spikelets in a terminal, leafy-bracted head, the bracts with white base; style branches 2 _____ **Rhynchospora**
 5. Scales of spikelets variously colored (may rarely be partly white); inflorescences various, but not with white-based bracts; style branches 2 or 3.
 6. Inflorescences with a single spikelet, this terminal at end of culm, the inflorescences thus without any branching whatsoever; culms without leaf blades or leafy bracts; achenes with a tubercle (= persistent style base at apex of achene differing in appearance from body of achene) _____ **Eleocharis**
 6. Inflorescences with 1–many spikelets, these terminal or lateral, the inflorescences thus unbranched OR often conspicuously branched; culms with leaf blades (at least basal ones) or leafy bracts; achenes with or without a tubercle.

7. Achenes with whitish or light grayish, bony or crustaceous, outer layer (pericarp), usually sitting on a distinct hardened ring-like or disk-like pad _____ **Scleria**
7. Achenes with neither whitish, light grayish, bony, nor crustaceous, outer layer (pericarp), nor sitting on a distinct, hardened, ring-like or disk-like pad.
8. Achenes with prominent tubercle; spikelets 1–few-flowered, the florets with 0–1(–2) pistils (uppermost 1–2 florets without pistil); lower (1–)2–3 scales of spikelets sterile _____ **Rhynchospora**
8. Achenes without tubercle (except in *Bulbostylis*, which has thread-like leaves); spikelets 1–many-flowered, all florets with pistil; only lowest scale of spikelet sterile (except in *Cladium* which usually has more than 1 sterile lower scale).
9. Scales of spikelets with prominent bristle-tip longer than width of scale base; perianth of 3 stalked perianth scales, these sometimes alternating with 3 bristles _____ **Fuirena**
9. Scales of spikelets with short bristle-tip or bristle-tip absent; perianth of 1 thin perianth scale, or of bristles, or perianth absent.
10. "Spikelets" (actually small spikelet-like spikes or heads of spirally arranged single-flowered spikelets) 1–5(–8) mm long, sessile; inside each scale a single, thin, inconspicuous perianth-like bracteole; plants very small, to only 15 cm tall; scales with 2 or 3 prominent ribs (use strong lens) _____ **Lipocarpus**
10. Spikelets 2.5–20 mm long, sessile or on distinct pedicels; inside each scale a perianth of bristles or perianth absent; plants small to very large; scales with only 1 prominent rib (the midrib).
11. Spikelets with a single fertile (= achene-producing) floret subtended by 2–3 empty scales (these lacking achenes but can have stamens); leaf margins scaberulous (= only slightly roughened, almost smooth to the touch) to dangerously spinulose-serrulate (= saw-toothed); inflorescences with numerous spikelets, these in groups of 2–10 at the ends of short branches (= peduncles); perianth absent; rare, known in nc TX only from Dallas and Henderson cos. _____ **Cladium**
11. Spikelets not as above, with 1–many fertile florets, these subtended by only 1 empty scale; leaf margins various; inflorescences not as above; perianth absent or of bristles; common and widespread in nc TX.
12. Inflorescences usually either 1-sided or widely spreading or drooping; perianth of bristles (except in 1 small annual species); plants small to very large (to 5 m tall) (segregates of *Scirpus* in the broad sense).
13. Inflorescences with a single, erect modified leaf (involucral bract) appearing like a continuation of the culm, the inflorescences thus appearing lateral; culms with 1–3 leaves near base OR without blade-bearing leaves.
14. Spikelets 2–10 mm long; plants tufted annuals 2–22(–30) cm tall; culms wiry, < 1.5 mm thick near base; achenes minutely papillose (this can sometimes be obscured by a whitish wax-like layer); perianth bristles absent; inflorescences with 1–3 spikelets _____ **Isolepis**
14. Spikelets 5–20 mm long; plants rhizomatous perennials 30–500 cm tall OR tufted annuals or perennials 9–65 cm tall (in the rare *S. saximontanus* known in nc TX only from the Lampasas Cut Plain); culms coarse, 2–20 mm thick near base OR 0.5–1.5 mm thick (in *S. saximontanus*); achenes either smooth OR (in *S. saximontanus*) with prominent, transverse,

- wavy ridges; perianth bristles present OR absent (in *S. saximontanus*); inflorescences with 1–150 spikelets _____ **Schoenoplectus**
13. Inflorescences with 2 or more well-developed leaf-like involucral bracts, the inflorescences thus appearing terminal; culms with well-developed leaves.
15. Spikelets small, 3–10 mm long, 2–4 mm wide, very numerous; achenes < 1.5 mm long; culms mostly obscurely triangular _____ **Scirpus**
15. Spikelets larger, 10–30(–40) mm long, 6–12 mm wide, few in number; achenes 3–4 mm long; culms sharply triangular _____ **Bolboschoenus**
12. Inflorescences neither distinctly 1-sided, widely spreading, nor drooping; perianth absent; plants 1 m or less tall, often much less.
16. Leaf blades flat, some or all over 0.8 mm wide; inflorescences with 2 or more leafy bracts; achenes without tubercle.
17. Spikelets 1-flowered (with only 2 scales per spikelet), sessile in head-like clusters closely subtended by bracts much longer than the heads; style base neither dilated nor fimbriate _____ **Kyllinga**
17. Spikelets several–many-flowered (scales numerous), on distinct pedicels or if clustered then spikelets conspicuously many-scaled; style base dilated, fimbriate _____ **Fimbristylis**
16. Leaf blades thread-like, 0.1–0.6 mm wide; inflorescences with 1 prominent bract; achenes with tubercle _____ **Bulbostylis**

BOLBOSCHOENUS BULRUSH

☛ A genus of 6–13 species (Smith 1997a) known from Mesoamerica n to the United States, Eurasia, and Australia. Four species are native to North America n of Mexico, with 1 naturalized. Two species are known in TX with a third suspected (S.D. Jones, pers. comm.). Previously included in *Scirpus* (e.g., Kartesz 1994) and according to some, better treated as a section or subgenus in *Scirpus* in the broad sense; Strong (1993, 1994) argued that *Scirpus* is heterogenous but lumped *Bolboschoenus* with *Schoenoplectus*. We are following Smith (1995, 1997a) and Jones et al. (1997) in recognizing this segregate of *Scirpus* at the generic level. Smith (1995) indicated that *Bolboschoenus* and a number of other segregates of *Scirpus* will be recognized in the forthcoming Cyperaceae treatment for *Flora of North America* (Vol. 11). This approach is supported by the phylogenetic studies of Bruhl (1995) which suggested that *Scirpus* sensu lato is polyphyletic. (Greek: *bulbus*, bulb, and *schoenq* reed or rush-like)

REFERENCES: Beetle 1942, 1947; Koyama 1962; Strong 1993, 1994; Browning et al. 1995; Smith 1995, 1997a; Smith & Yatskievych 1996.

Bolboschoenus maritimus (L.) Palla, (of the sea), ALKALI BULRUSH, BAYONET-GRASS, PRAIRIE BULRUSH, KOYAMA, SALT MARSH BULRUSH. Perennial 40–150 cm tall, with rhizomes 1–4 mm thick and corms to 20 mm thick; culms sharply triangular, 5–20 mm thick at base; leaves several, well-developed; inflorescences appearing terminal, subtended by several bracts; spikelets 10–30(–40) mm long, 6–12 mm wide, usually few in number (1–)2–15(–40), either all sessile or some sessile and some peduncled; scales of spikelets with midnerve prolonged into a 1–3 mm long point; styles 2(–3) branched; achenes 3–4 mm long, biconvex or nearly so. Wet ground; Grayson Co. (Hagerman National Wildlife Refuge); nc TX w to w TX. Jul–Aug. [*B. paludosus* (A. Nelson) Soó, *B. maritimus* subsp. *paludosus* (A. Nelson) T. Koyama, *Scirpus maritimus* L., *Scirpus maritimus* L. var. *paludosus* (A. Nelson) Kük.] If infraspecific taxa are recognized, all TX mate-

rial would be subsp. *paludosus* (Smith 1997a). The corms were used as food by Native Americans in w North America (Beetle 1950).

BULBOSTYLIS

Ours tufted annuals or short-lived perennials with fibrous roots; leaves basal, filiform or setaceous; inflorescence a small, simple or compound, umbel-like cyme at end of flowering culm; spikelets several-flowered; scales of spikelets spirally imbricate, keeled; bristles absent; achenes trigonous-obovoid, ca. 1 mm long; style base persistent as a minute tubercle.

☛ A genus of 100 species of tropical and warm areas; previously included in *Fimbristylis*. (Greek: *bolbos* swelling or bulb, and *stylos* pillar, column, or style)

REFERENCES: Kral 1971; Jones & Wipff 1992.

1. Umbel-like cymes simple; scales of spikelets truncate at apex, usually notched, the tip of the keel barely reaching base of notch; achenes finely transversely ridged _____ **B. capillaris**
1. Umbel-like cymes sometimes compound (the cyme branches themselves bearing small cymes); scales of spikelets broadly obtuse at apex, the tip of the keel reaching the apex of the scale or slightly exceeding it; achenes with an easily lost, waxy, fine pebbling _____ **B. ciliatifolia**

Bulbostylis capillaris (L.) Kunth ex C.B. Clarke, (hair-like), HAIR-SEDGE. Slender annual 5–35 cm tall; spikelets narrowly ovoid; 3–5 mm long, rarely longer. In loose sand; included based on citation of vegetational areas 4 and 5 (Fig. 2) by Hatch et al. (1990); e 1/2 of TX and Trans-Pecos. Jun–Sep.

Bulbostylis ciliatifolia (Elliott) Fernald, (ciliate-leaved). Annual or short-lived perennial to 40 cm tall; spikelets narrowly ovoid to lance-ovoid or oblong, 2–6 mm long. Sandy areas. Summer–Fall. Kral (1971) separated 2 varieties as follows:

1. Low annuals; inflorescence a simple to rarely compound umbel of few, lance-ovoid spikelets; longest bract of inflorescence seldom exceeding inflorescence; edges of leaves usually hispidulous _____ var. **ciliatifolia**
1. Tall perennials; inflorescence usually of many, oblong or lance-linear spikelets and commonly compound; longest bract of inflorescence commonly longer than inflorescence; edges of leaves usually distinctly tuberculate-scabrid _____ var. **coarctata**

var. **ciliatifolia**. Parker Co.; e TX w to nc TX.

var. **coarctata** (Elliott) Kral, (crowded together). Dallas, Milam, and Parker cos.; se and e TX w to nc TX.

CAREX CARIC SEDGE

Prepared by Stanley D. Jones (BRCH)

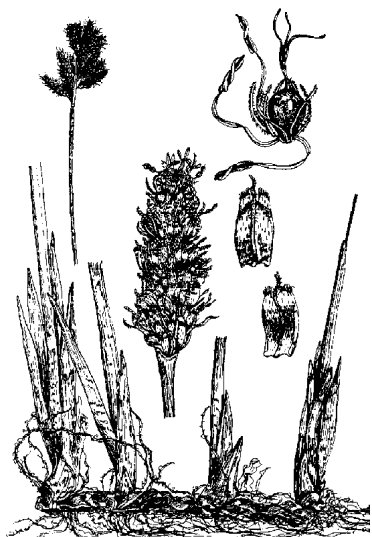
Cespitose or rhizomatous grass-like perennial herbs; plants mostly monoecious (all TX taxa), rarely dioecious; culms (= stems) triangular or terete, mostly solid; leaves 3-ranked; sheaths closed; inflorescences of spikes, either unisexual or bisexual, when bisexual they are androgynous (= having the staminate flowers distal to the pistillate), or gynecandrous (= having the pistillate flowers distal to the staminate), when unisexual the staminate spike is terminal with lateral spikes being pistillate or some androgynous; flowers enclosed by a sac-like scale (= perigynium) with an apical orifice from which the style or stigmas protrude; each perigynium subtended by a single pistillate scale; perianth absent; stamens (2–)3; carpels 2 or 3; stigmas 2 or 3; ovary and ovule 1; fruit an achene, lenticular and distigmatic or trigonous and tristigmatic.

☛ A huge genus of ca. 2,000 species, cosmopolitan in distribution, mostly in n temperate and arctic regions of moist to wet habitats. It is the largest genus in the Texas flora with ca. 95 taxa plus 3 introduced species used as cultivars that may persist; similarly it is the largest genus in the Oklahoma flora (Taylor & Taylor 1994). *Carex* is also the largest genus in the flora of nc TX, being represented by 55 species. Forage value for livestock is low but the plants can be of use for wildlife, especially rabbits, rodents, deer, and birds. The genus is also important in preventing soil erosion. (The classical Latin name, of obscure origin; derived by some from the Greek: *keirein*, to cut, on account of the sharp leaves—as indicated in the English name SHEAR-GRASS)

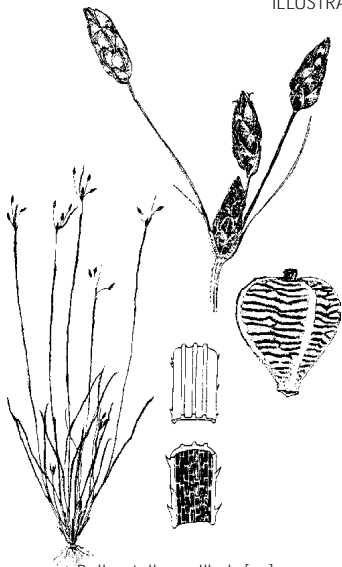
This key is based on mature perigynia and fruit; fruiting material is essential for proper identification. Incomplete veins refer to veins that do not extend the entire length of the perigynium body. County citations for *Carex* are from a number of herbaria including BRCH.

REFERENCES: Mackenzie 1931–35, 1940; Hermann 1954a, 1970; Bryson 1980; Reznicek & Ball 1980; Menapace et al. 1986; Ball 1990; Bernard 1990; Crins 1990; Manhart 1990; Reznicek 1990; Standley 1990; Jones & Hatch 1990; Naczi & Bryson 1990; Jones & Reznicek 1991; Rothrock 1991; Naczi 1992; Reznicek & Naczi 1993; Jones 1994a, 1994b.

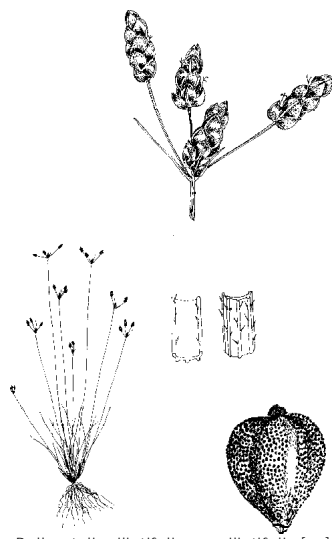
1. Achenes 2-sided, plano-convex or unequally biconvex in cross-section, flattened; stigmas 2.
 2. Inflorescence 2–5 cm wide, usually an open panicle of spicate branches; perigynia 6–7 mm long with broad subtruncate, spongy-thickened bases; perigynial wall frequently adhering to the achene; achenes ovate-lanceolate; ventral leaf sheath margins with orange-red dots _____ **C. crus-corvi**
 2. Inflorescence < 1.5 cm wide, a contracted panicle of spicate branches, spicate raceme, or composed of individual lateral or terminal spikes, but not an open panicle; perigynia without broad subtruncate, spongy-thickened bases OR if so then not 6–7 mm long; perigynial wall little to not at all adhering to the achene; achenes variously shaped but not ovate-lanceolate; ventral leaf sheath margins without orange-red dots, OR if dots present, then not in conjunction with the other characters.
3. Terminal spike solely staminate, or sometimes partly pistillate in *C. crinita*.
 4. Lateral spikes, at least the lower, sessile or nearly so, ascending _____ **C. emoryi**
 4. Lateral spikes on flexuous peduncles, drooping _____ **C. crinita** var. **brevicrinus**
3. Terminal spike either androgynous or gynecandrous.
 5. Terminal or all spikes androgynous, the staminate flowers often fugacious (= falling or disappearing early) making spikes appear solely pistillate, the spikes variously shaped, but not appearing clavate.
 6. Primary spicate branches usually less than 10, most frequently a primary branch will be comprised of a single spike, sometimes it will rebranch giving rise to secondary spikes.
 7. Leaf sheaths baggy (loose) around the culm _____ **C. gravida**
 7. Leaf sheaths tight (not loose) around the culm.
 8. Lowest inflorescence bract 5.5–25 cm long, greatly exceeding the inflorescence, two to many times as long as the inflorescence.
 9. Culms smooth below inflorescence; plants of open bottomlands or floodplain habitats _____ **C. arkansana**
 9. Culms antrorsely scaberulous below inflorescence; plants of open mesic to sub-mesic woodlands _____ **C. perdentata**
 8. Lowest inflorescence bract less than 5.5 cm long, not exceeding the inflorescence, or less than two times as long as the inflorescence.
 10. Beaks of perigynia smooth, not serrated.
 11. Perigynia ovate-deltoid, veinless ventrally, spongy at base but without a swollen spongy area at base on ventral surface _____ **C. leavenworthii**
 11. Perigynia ovate-lanceoid, with veins present on ventral surface, at least proximally over an enlarged spongy area at base.



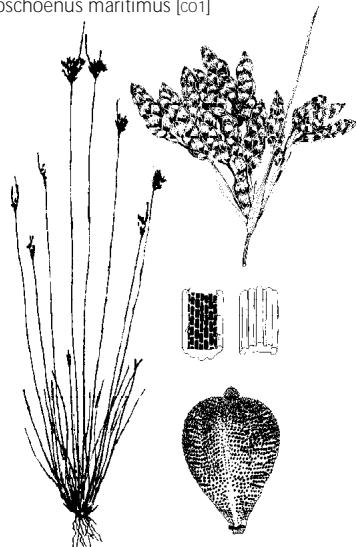
Bolboschoenus maritimus [co1]



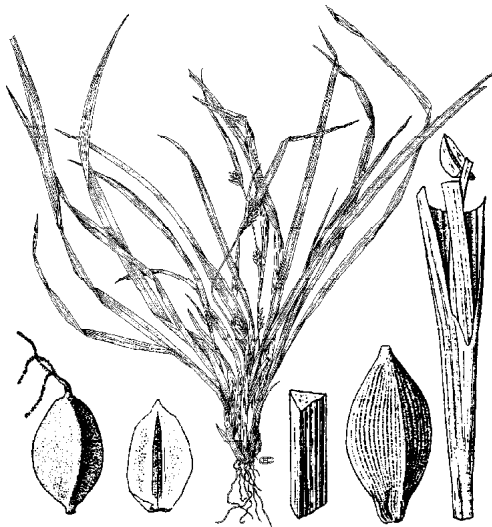
Bulbostylis capillaris [sid]



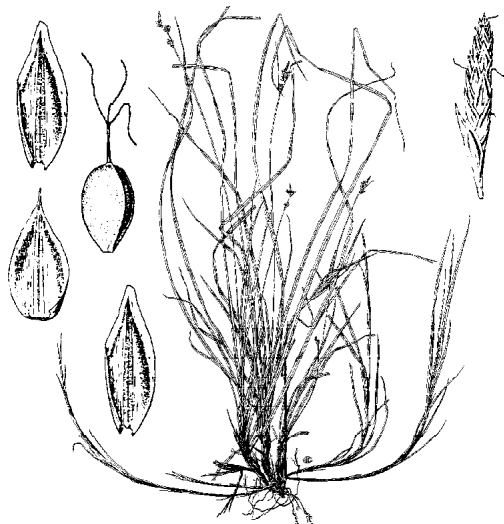
Bulbostylis ciliatifolia var. *ciliatifolia* [sid]



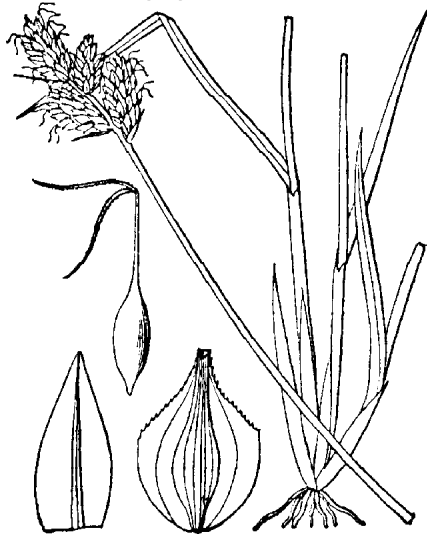
Bulbostylis ciliatifolia var. *coarctata* [sid]



Carex abscondita [mac]



Carex albicans var. *australis* [mac]



Carex albolutescens [bb2]

12. Perigynia 1.3–1.8 mm wide; widest leaf blade 1.5–3 mm wide
 _____ **C. retroflexa**
12. Perigynia 1–1.3 mm wide; widest leaf blade 1–1.5 mm wide _____ **C. texensis**
10. Beaks of perigynia serrated, not smooth.
13. Perigynia spongy at base, with or without a swollen area basely.
14. Perigynia (1.4–)1.5–2.7(–2.8) mm wide, ovate-deltoid or conspicuously ovate, without a swollen spongy area at base on ventral surface.
15. Perigynia 2.2–3.2(–3.3) mm long, veinless ventrally, with 0(–3) veins dorsally _____ **C. leavenworthii**
15. Perigynia (3.3–)3.4–5.2(–5.6) mm long, with 0–5(–8) narrow veins (ca. 0.1–0.2 mm wide) ventrally, with 0–10(–11) narrow veins dorsally _____ **C. perdentata**
14. Perigynia 0.9–1.8 mm wide, ovate-lanceoid or slightly ovate-oblong, with a swollen spongy area at base of ventral surface _____ **C. socialis**
13. Perigynia not spongy at base.
16. Adaxial and abaxial leaf surfaces smooth, not minutely papillose (not sandpaper-like), except sometimes sparingly so along major veins.
17. Perigynia (3.4–)3.5–4.7 mm long, (2–)2.1–2.7(–3.1) mm wide.
18. Apex of the ventral leaf sheath straight or slightly concave, not callused or only slightly thickened, friable, frequently with scattered reddish dots; dorsal leaf sheath white or pale green with darker green veins with darker green septate-nodules, but not green mottled with white; widest leaves (3–)4–8 mm wide; most culms forming greater than 70° angle with the ground _____ **C. gravida**
18. Apex of ventral leaf sheath concave, callused, not friable, without scattered reddish dots; all dorsal leaf sheaths green OR green with darker green septate-nodule, OR some sheaths green mottled with white; widest leaves 2.5–4.5 mm wide; most culms forming less than a 50° angle with the ground, usually much less _____ **C. austrina**
17. Perigynia 2–3.5 mm long, 1.3–2.3(–2.4) mm wide.
19. Perigynia bodies ovate-deltoid; perigynia beaks 0.3–0.7(–0.8) mm long with a single row of serrations, abruptly arising from the apex of the perigynium; widest leaf blade 1.1–3(–4) mm wide; leaves per fertile culm 2–6(–7); culm width, ca. 2 cm above rootstock, 1–2.4(–3.5) mm wide; pistillate scale (1.3–)1.5–2.2(–2.5) mm long; pistillate scale awn 0–0.8(–1) mm long; dorsal leaf sheath frequently green mottled with white dots. _____ **C. leavenworthii**
19. Perigynia bodies ovate or suborbicular; perigynia beaks 0.8–1.1 mm long with a double row of serrations, gradually tapering from the shoulder of the perigynium; widest leaf blade (1.9)2.5–4.4 mm wide; leaves per fertile culm (4–)5–8; culm width, ca. 2 cm above rootstock, 1.7–3.2(–3.3) mm wide; pistillate scale 1.1–1.7(–1.9) mm long; pistillate scale awn 0–3.2 mm long; dorsal leaf sheath mostly green, infrequently green mottled with white dots _____ **C. cephalophora**
16. Adaxial or both adaxial and abaxial leaf surfaces minutely papillose (sandpaper-like), at least near distal end (this can be detected by placing a leaf between the thumb and index finger and sliding the fingers toward the distal end of the leaf; also easily seen with a hand lens).

20. Inflorescence capitate (short triangular in outline), 12–19 mm long, 9–14 mm wide; leaves conspicuously shorter than culm, (6.5–)8.4–21(–23) mm long; ventral surface of perigynia veinless, the dorsal surface veinless or rarely with 1–4 incomplete narrow veins (ca. 0.1–0.2 mm wide) _____ **C. mesochorea**
20. Inflorescence short-oblong, oblong, or linear, not short triangular in outline, (12–)13.5–47 mm long, 6–18(–28) mm wide, the central axis visible, at least between some spikes, usually the lowest two; leaves shorter or longer than culm, 11.3–46.4(–55.5) mm long; ventral surface of perigynia 0–15 veined, the dorsal surface 0–12-veined.
21. Ventral surface of perigynia with (5–)6–15 conspicuous broad veins (ca. 0.05 mm wide), the dorsal surface with (0–)1–12 broad veins _____ **C. muehlenbergii** var. **muehlenbergii**
21. Ventral surface of perigynia with 0–6(–8) narrow veins (ca. 0.01–0.02 mm wide), the dorsal surface with 0–11(–14) narrow veins.
22. Bodies of pistillate scales 3–4.2(–4.3) mm long, (1–)1.6–2.6(–3) mm wide, the mid-stripe 3-veined, rarely 1-veined; culms usually forming an angle of 50° or less with the ground _____ **C. austrina**
22. Bodies of pistillate scales (1.5–)1.8–3.1 mm long, (1–)1.2–1.8(–2.2) mm wide, the mid-stripe 1-veined, occasionally 3-veined; culms usually forming an angle of 70° or more with the ground.
23. Beaks of perigynia 0.2–0.6(–1) mm long, abruptly arising from apex of perigynium; perigynia broadly ovate, (1.5–)2.5–3.8 mm long; dorsal leaf sheaths frequently green mottled white dots _____ **C. muehlenbergii** var. **enervis**
23. Beaks of perigynia (1–)1.4–1.7(–1.8) mm long, tapering from shoulders or occasionally abruptly arising from apex of perigynia; perigynia ovate or ovate-deltoid, 3.2–5.2(–5.6) mm long; most dorsal leaf sheaths infrequently mottled with white dots _____ **C. perdentata**
6. Primary spicate branches more than 10, often these primary branches will re-branch into secondary branches.
24. Most leaves equal to or exceeding the culms; perigynia 1–1.8 mm wide, narrowly ovate; beak of the perigynium tapering from the body, the beak 1/2 as long to as long as the body _____ **C. vulpinoidea**
24. Most leaves shorter than the culms; perigynia 1.6–3 mm wide, narrowly ovate to broadly ovate, orbicular, OR reniform; beak of the perigynium usually arising abruptly from the body but can taper from the body, the beak to ca. 1/2 the length of the body.
25. Perigynia with red glandular dots, orbicular to reniform, often broader than long; pistillate scales not conspicuous _____ **C. triangularis**
25. Perigynia without red glandular dots, narrowly ovate to ovate orbicular, rarely broader than long; pistillate scales usually conspicuous _____ **C. fissa**
5. Terminal or all spikes gynecandrous, the spikes frequently appearing clavate.
26. Perigynia bodies oblanceolate, mostly less than 1.5 mm wide; perigynium wing restricted to upper half of body _____ **C. tribuloides**

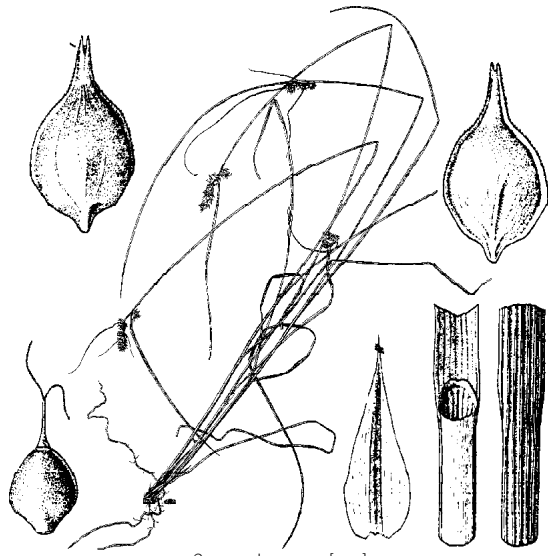
26. Perigynia bodies ovate, obovate, orbicular, or reniform, 1.5–6 mm wide; perigynium wing not restricted to upper half of body.
27. Perigynia with several obvious veins over the achene on the inner (ventral) surface.
28. Perigynia beaks 1.5–2.5 mm long; perigynia 5–20(–25) per spike; spikes 2–4 per culm _____ **C. hyalina**
28. Perigynia beaks less than 1.5(–1.8) mm long; perigynia 25–80 per spike; spikes 3–8 per culm.
29. Perigynium body widest above the middle, the body more or less obovate.
30. Styles abruptly contorted just above the achene; perigynium beak abruptly tapered to a long tip, spreading at maturity _____ **C. albolutescens**
30. Styles straight to somewhat sinuous; perigynium beak usually gradually tapering into a peak, appressed, not spreading at maturity.
31. Achenes 0.8–1.2 mm wide; perigynia 1.6–2.8 mm wide, 4–6(–7) veined over achene abaxially.
32. Pistillate scales reddish; inflorescences of robust culms arched or nodding, 2.3–8.4 cm long, the spikes strongly separated; spikes clavate, the staminate portion of well-developed spikes 2–11 mm long _____ **C. ozarkana**
32. Pistillate scales hyaline-white; inflorescences of robust culms erect, 1–4.5 cm long, the spikes slightly separated to congested; spikes rounded to acute at base, the staminate portion of spikes < 2 mm long _____ **C. longii**
31. Achenes 1.4–1.8 mm wide; larger perigynia 2.5–3.3(–3.4) mm wide, veinless or few-veined abaxially _____ **C. brevior**
29. Perigynium body widest at or below the middle, the body more or less orbicular.
33. Larger perigynia 2.5–3.8(–4.2) mm long _____ **C. festucea**
33. Larger perigynia 4.2–5.2 mm long _____ **C. aff. bicknellii**
27. Perigynia veinless or rarely with 1–3 faint veins over the achene on the inner (ventral) surface.
34. Perigynia finely granular-papillose (at 30 x magnification), the bodies reniform, wider than long, (2.6–)3.2–5 mm wide _____ **C. reniformis**
34. Perigynia smooth, the bodies more or less orbicular or rarely obovate, 1.5–6 mm wide.
35. Perigynia obovate _____ **C. brevior**
35. Perigynia more or less orbicular.
36. Larger perigynia 1.5–3.4 mm wide.
37. Achenes 1.4–1.8 mm wide, 1.7–2 mm long; larger perigynia 3.4–4.5 mm long, 2.5–3.3(–3.4) mm wide _____ **C. brevior**
37. Achenes (1–)1.1–1.35 mm wide, 1.3–1.7 mm long; larger perigynia 2.5–3.9(–4.2) mm long, 1.5–2.5 mm wide _____ **C. festucea**
36. Larger perigynia 3.7–6 mm wide _____ **C. tetrastachya**
1. Achenes 3-sided, trigonous or obscurely terete in cross-section; stigmas 3.
38. Styles continuous with the achene, of the same color and texture as the achene, persistent.
39. Larger perigynia 1 cm long or longer, including beaks.
40. Pistillate spike outline tending to be globose; perigynia loosely arranged, spreading, drying dark olive-drab green _____ **C. intumescens**
40. Pistillate spike outline oblong to cylindrical; perigynia either loosely arranged or not, drying stramineous, green, or light olive-drab green.

41. Staminate peduncles greatly exceeding the uppermost pistillate spike; perigynia loosely arranged; elongate rhizomes present _____ **C. louisianica**
41. Staminate peduncles shorter than to only slightly exceeding the uppermost pistillate spike; perigynia tightly arranged; elongate rhizomes absent _____ **C. lupulina**
39. Larger perigynia 4–9(–9.5) mm long, including beaks.
42. Larger perigynia 7–9(–9.5) mm long, including beaks; beaks 3–4 mm long _____ **C. lurida**
42. Larger perigynia 4–6.5 mm long, including beaks; beaks 2 mm long or less.
43. Perigynia mostly squarrose to the rachis (at ca. 90° angle); achenes conspicuously obovate, conspicuously minutely granular-papillose; beaks of perigynia abruptly arising from perigynium body _____ **C. frankii**
43. Perigynia ascending along the rachis; achenes broadly elliptic, not conspicuously minutely granular-papillose; beaks of perigynia gradually tapering from perigynium body _____ **C. hyalinolepis**
38. Styles not continuous with the achene, usually not of the same color and/or texture as the achene, not persistent, withering.
44. Perigynia pubescent, at least apically, often minutely so (use 25 x magnification).
45. Perigynia mostly concealed by pistillate scales; pistillate scales 2–3.2 mm long.
46. Spikes borne close together above the middle of the culm, usually exceeding the leaves _____ **C. albicans** var. **australis**
46. Spikes, at least some, borne near the base of the culm, the leaves exceeding the spikes _____ **C. microrhyncha**
45. Perigynia conspicuous, not concealed by pistillate scales; pistillate scales (3–)3.5–4 mm long _____ **C. planostachys**
44. Perigynia glabrous.
47. Spikes, at least some, borne at or near base of plant.
48. Beaks of perigynia conspicuous, 3–3.5 mm long; spikes on long capillary peduncles to 15 cm long; shoot bases reddish _____ **C. basiantha**
48. Beaks of perigynia not conspicuous, less than 0.5 mm long; spikes either not on capillary peduncles or peduncles less than 5 cm long; shoot bases either reddish or white.
49. Staminate spikes sessile; shoot bases white followed by pale brown _____ **C. abscondita**
49. Staminate spikes pedunculate; shoot bases reddish _____ **C. edwardsiana**
47. Spikes borne well above base of plant.
50. Spikes, predominantly gynecandrous.
51. Spikes arising lateral on flexuous peduncles, the spikes drooping.
52. Longest pistillate scales with awns 1.2–5 mm long; perigynia 4.5–6 mm long, ovate-lanceolate _____ **C. davisii**
52. Longest pistillate scales acuminate or short-awned, the awns 0–0.5(–2) mm long; perigynia 3.5–5 mm long, rhomboid or narrowly elliptic, broadest near the middle and tapering to both ends _____ **C. oxylepis**
51. Spikes terminal on culm, the spikes stiff, ascending.
53. Perigynia ascending along the rachis, appearing flattened on the side next to the rachis, the perigynia not appearing inflated _____ **C. complanata**
53. Perigynia spreading (to ca. 90°), or only slightly ascending along the rachis, not flattened on the side next to the rachis, the perigynia inflated.
54. Pistillate scales 3–6 mm long, including awn; achenes 2.1–2.6 mm long; plants of dry upland prairies and open grassy areas _____ **C. bushii**
54. Pistillate scales (2–)2.5–3 mm long, including awn; achenes 1.5–2 mm long; plants most frequently in low wet woods, wooded swamps, river flood plain forests, less frequent in open grassy areas _____ **C. caroliniana**

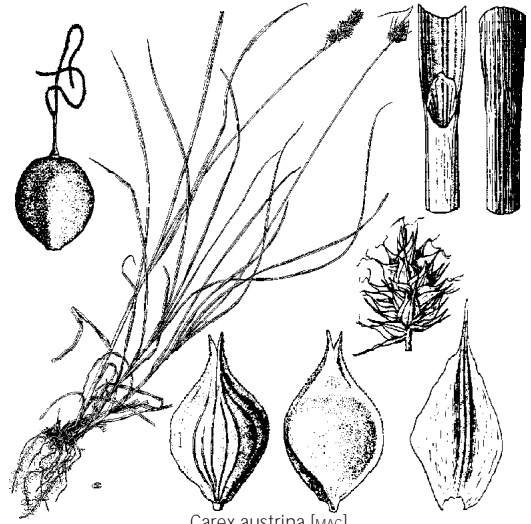
50. Spikes, at least some, usually the terminal, solely staminate.
55. Spikes arising lateral on flexuous peduncles, the spikes drooping.
56. Pistillate spikes (some are androgynous) 7–9 mm wide; rhizomatous perennials; rhizome 3–12 mm thick _____ **C. cherokeensis**
56. Pistillate spikes (solely pistillate) 2–3 mm wide; tufted perennials _____ **C. debilis**
55. Spikes terminal or lateral but not on flexuous peduncles, the spikes not drooping.
57. Most of the beaks of perigynia conspicuously bent.
58. Pistillate scales brown, reddish brown, or reddish purple on both sides of the mid-vein; plants with creeping rhizomes _____ **C. meadii**
58. Pistillate scales green or hyaline on both sides of the mid-vein; plants without creeping rhizomes.
59. Veins on faces of the perigynia raised.
60. Perigynia 1.6–2.5 mm wide _____ **C. granularis**
60. Perigynia 1–1.3 mm wide.
61. Perigynia obovoid, 2.4–2.6 mm long, with a short, abruptly bent beak _____ **C. blanda**
61. Perigynia fusiform, 3.4–5 mm long, tapering into a curved, more or less elongate beak _____ **C. striatula**
59. Veins on faces of the perigynia impressed.
62. Larger perigynia (4–)4.2–6 mm long; style base straight or slightly bent _____ **C. flaccosperma**
62. Larger perigynia 3.2–4.1 mm long; style base usually conspicuously bent or reflexed _____ **C. glaucodea**
57. Most of the beaks of perigynia straight, not bent.
63. Plants with elongate creeping rhizomes _____ **C. microdonta**
63. Plants tufted, without elongate rhizomes.
64. Perigynia distichously arranged along the rachis _____ **C. bulbostylis**
64. Perigynia spirally arranged along the rachis.
65. Shoot bases brown, often white above the brown.
66. Perigynia (4–)4.2–6 mm long; style base straight or slightly bent _____ **C. flaccosperma**
66. Perigynia 3.2–4.1 mm long; style base usually conspicuously bent or reflexed _____ **C. glaucodea**
65. Shoot bases purplish red.
67. Perigynia 2–2.6 mm wide, orbicular to suborbicular in cross-section; achene bodies (excluding stipe) 2.2–3 mm long _____ **C. grisea**
67. Perigynia 1.5–2.3 mm wide, obtusely triangular in cross-section; achene bodies (excluding stipe) 1.8–2.3 mm _____ **C. corrugata**

Carex abscondita Mack., (concealed), HIDDEN-FRUIT CARIC SEDGE. Wet to mesic, shaded deciduous hardwood forests, pine forests, or swamps; in ne part of nc TX in Red River Co., probably in other ne cos.; also Post Oak Savannah, Pineywoods, and upper portion of Gulf Prairies and Marshes. Fruiting Apr–Jun. Section *Careyanae*

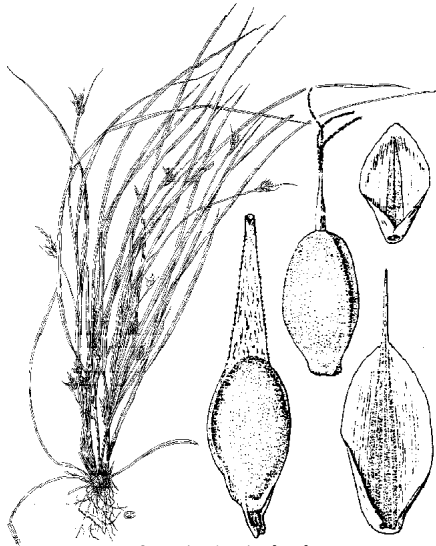
Carex albicans Willd. ex Spreng. var. **australis** (L.H. Bailey) Rettig., (sp.: whitish; var.: southern), SOUTHERN BELLOWS-BEAK CARIC SEDGE. Sandy or rocky woods, frequently on slopes in mixed pine-hardwood forests; Dallas, Delta, Hopkins, Lamar, and Red River cos.; also Post Oak Savannah and Pineywoods. Fruiting Apr–Jun. [*C. physorhyncha* Liebm. ex Steud.] Section *Acrocystis*



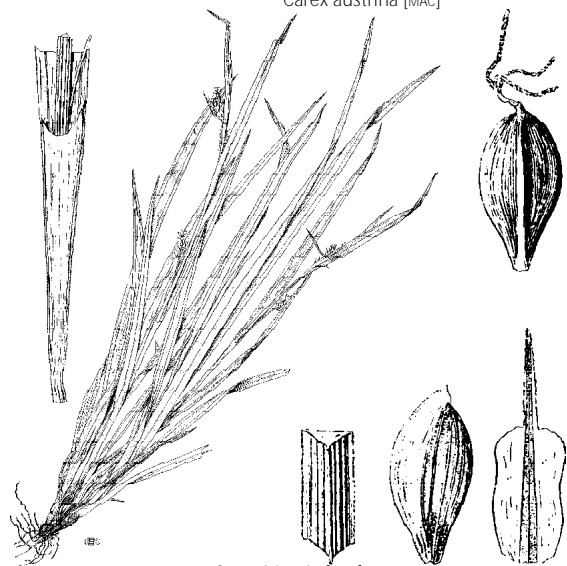
Carex arkansana [MAC]



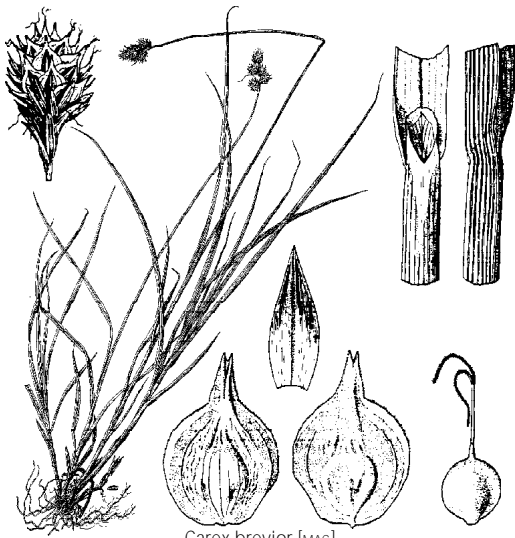
Carex austrina [MAC]



Carex basiantha [MAC]



Carex blanda [MAC]



Carex brevior [MAC]



Carex bulbostylis [MAC]

Carex albolutescens Schwein., (whitish yellow), WHITISH YELLOW CARIC SEDGE. Wet woods, thickets, and peats; Delta, Hopkins, Lamar, and Milam cos.; also Post Oak Savannah and Pineywoods. Fruiting Apr–Jun(–Aug). Section *Ovales*

Carex arkansana L.H. Bailey, (of Arkansas), ARKANSAS CARIC SEDGE. Openings in low, seasonally wet woods, open bottomlands, damp prairies associated with creeks; Dallas, Hopkins, Kaufman and Red River cos., probably in other ne cos.; also Post Oak Savannah and Pineywoods. Fruiting May–Jun. Section *Phaestoglochin*

Carex austrina (Small) Mack., (southern), SOUTHERN CARIC SEDGE. Obligate heliophyte (= a plant adapted to grow in or tolerate full sun) in open prairies in alfisols, but occasional in mollisols and vertisols, and encroaching on histosols; throughout most of nc TX; also Rolling Plains, Post Oak Savannah, Pineywoods, s to the Coastal Bend Area of the Gulf Prairies and Marshes. Fruiting Mar–early Jul. [*C. muehlenbergii* Schkuhr ex Willd. var. *australis* Olney, *C. muehlenbergii* var. *austrina* Small] Section *Phaestoglochin*

Carex basiantha Steud., (basal-flowered), BASAL-FRUIT CARIC SEDGE. Ravine slopes of mixed pine-hardwood forests and deciduous woods; usually in rocky or sandy soils; in the ne part of nc TX in Red River Co., and probably in other ne cos.; also Post Oak Savannah and Pineywoods. Fruiting late-Mar–Jul. [*C. willdenowii* of American authors, not Schkuhr ex Willd.] Section *Phyllostachyae*

Carex blanda Dewey, (mild), CHARMING CARIC SEDGE. In dry to mesic woods, bottomlands, slopes, forest edges, and meadows; Bell, Bosque, Collin, Cooke, Dallas, Grayson, Hunt, Johnson, Lamar, Parker, Red River, Tarrant, and Williamson cos. ; also Post Oak Savannah, Edwards Plateau, Pineywoods, and Gulf Prairies and Marshes. Fruiting Apr–May(–Jun). Section *Laxiflorae*

Carex brevior (Dewey) Mack. ex Lunell, (short), SHORT CARIC SEDGE. A heliophyte found in submesic open meadows, prairies, and roadsides; Navarro, Delta, Hopkins, Lamar, Milam, and Red River cos.; also Post Oak Savannah, Pineywoods, and upper portions of Gulf Prairies and Marshes. Fruiting late Apr–Jun. Section *Ovales*

Carex bulbostylis Mack., (bulb-styled), GLOBOSE CARIC SEDGE. Mesic deciduous forests, flood plains and adjacent slopes; usually in neutral soils or slightly acidic or slightly alkaline, loams, sandy loams, sandy clay loams, or clay loams; widespread in nc TX; also Post Oak Savannah, Edwards Plateau, Pineywoods, and upper portions of Gulf Prairies and Marshes. Fruiting Apr–May. [*C. amphibola* Steud. var. *globosa* (L.H. Bailey) L.H. Bailey] Section *Griseae*

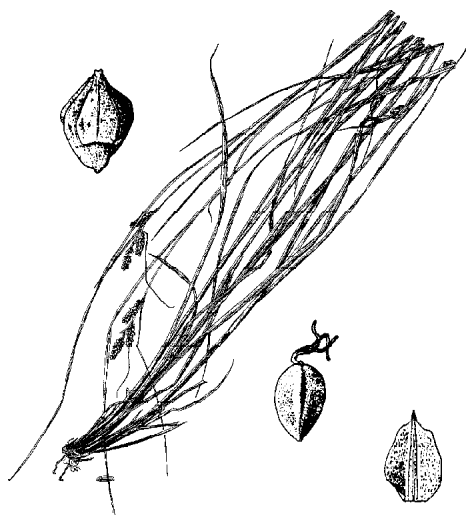
Carex bushii Mack., (for its discoverer, Benjamin Franklin Bush, 1858–1937, postmaster in MO and amateur botanist), BENJAMIN BUSH'S CARIC SEDGE. Obligate to facultative heliophyte in open mesic to submesic prairies, open roadsides, and forest edges with sandy soils; Dallas, Denton, Kaufman, Lamar, and Red River cos.; also Post Oak Savannah, Pineywoods, and upper portions of Gulf Prairies and Marshes. Fruiting Apr–May. [*C. caroliniana* Schwein. var. *cuspidata* (Dewey) Shinnery] Section *Poecystis*

Carex caroliniana Schwein., (of Carolina), CAROLINA CARIC SEDGE. Facultative sciophyte (= a plant adapted to grow in or tolerate shade) in deciduous woods, usually lower slopes and in bottoms, near wooded streams, sandy soils; in ne part of nc TX in Delta, Hopkins, and Lamar cos.; also Post Oak Savannah, Pineywoods, and upper portions of Gulf Prairies and Marshes. Fruiting Apr–May. Section *Poecystis*

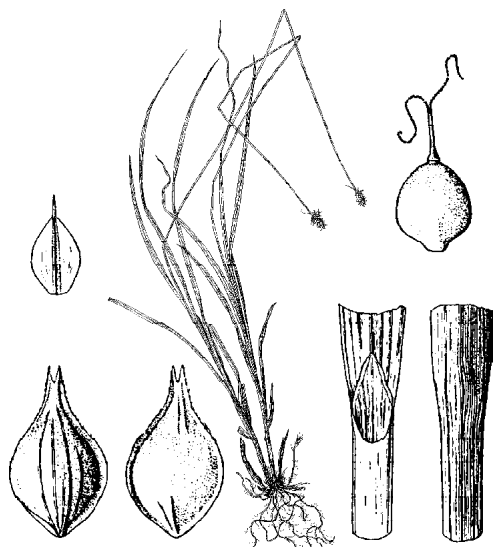
Carex cephalophora Muhl. ex Willd., (bearing heads), HEAD-BEARING CARIC SEDGE. A sciophyte, primarily in alfisols with sandy or sandy loam soils, slopes in mesic to submesic hardwood forests, or mixed hardwood pine forest, or occasionally at wetter sites in entisols along stream



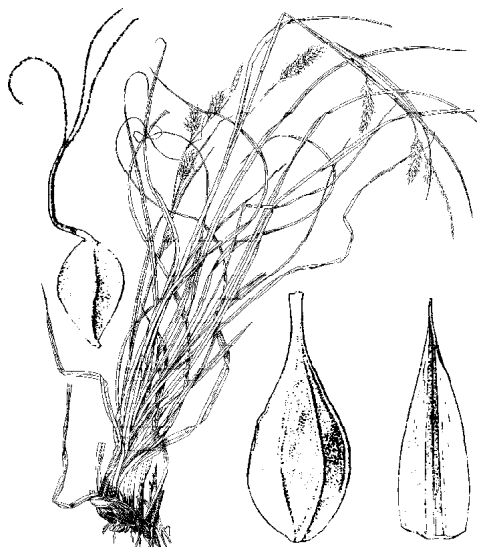
Carex bushii [MAC]



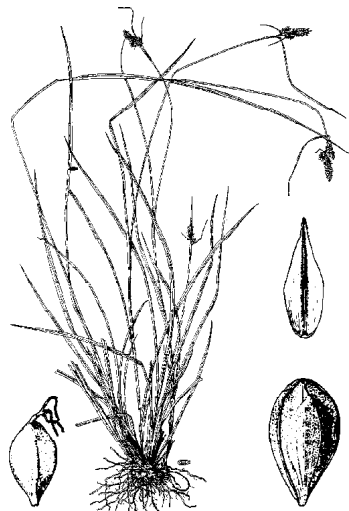
Carex caroliniana [MAC]



Carex cephalophora [MAC]



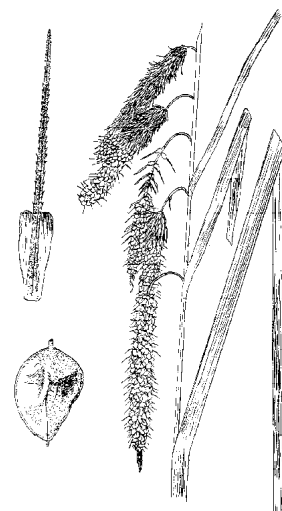
Carex cherokeensis [MAC]



Carex complanata [MAC]



Carex corrugata [HEA]



Carex crinita var. *brevicrinis* [STE]

courses, occasionally remaining as remnants in openings, pastures, or roadsides; Ellis and Red River cos.; also Post Oak Savannah, but more frequent in the Pineywoods. Fruiting (late Mar-) late Apr-late Jul(-early Oct). Section *Phaestoglochin*

Carex cherokeensis Schwein., (from its occurrence in "Cherokee country"), CHEROKEE CARIC SEDGE. Low open, damp, deciduous woods with sandy or sandy loam soils, frequently calcareous; Dallas, Hopkins, Hunt, Kaufman, Lamar, Milam, Navarro, Red River, Tarrant, and Wise cos.; also Post Oak Savannah, Pineywoods, and upper portions of Gulf Prairies and Marshes. Fruiting Apr-May(-early Jun). Section *Hymenochlaenae*

Carex complanata Torr. & Hook., (flattened), FLAT-FRUIT CARIC SEDGE. In shade or full sun, usually in open mesic deciduous forests with sandy soils, forest edges, or clear-cuts; in ne part of nc TX in Delta, Hopkins, and Lamar cos.; also Pineywoods, Post Oak Savannah, and upper portions of Gulf Prairies and Marshes. Fruiting Apr-May(-Jun). Section *Pomocystis*

Carex corrugata Fernald, (corrugated or wrinkled), WRINKLE-FRUIT CARIC SEDGE. Floodplains of mesic deciduous forests, alluvia, in acidic to alkaline clays, to silt loams; Dallas, Delta, Fannin, Hopkins, Jack, and Lamar cos.; probably in every e county of nc TX; also Post Oak Savannah, Pineywoods, and upper portions of Gulf Prairies and Marshes. Fruiting Apr-May. Section *Griseae*

Carex crinita Lam. var. **brevicrinis** Fernald, (sp.: provided with long hair; var.: short-haired), SHORT-HAIR CARIC SEDGE. Wooded swamps and bottoms; ne part of nc TX in Red River Co., likely in other ne cos.; also Pineywoods and upper portions of Post Oak Savannah. Fruiting May-Jun. Section *Phacocystis*

Carex crus-corvi Shuttlew. ex Kunze, (crow-spur), CROW-FOOT CARIC SEDGE. A heliophyte in wet prairies, depressions, roadside ditches, marshes, and open swamps; widespread in nc TX; also Post Oak Savannah, Edwards Plateau, Pineywoods, Gulf Prairies and Marshes, and s Texas Plains. Fruiting (late Feb-)Apr-Jun(-early Jul). Section *Vulpinae*

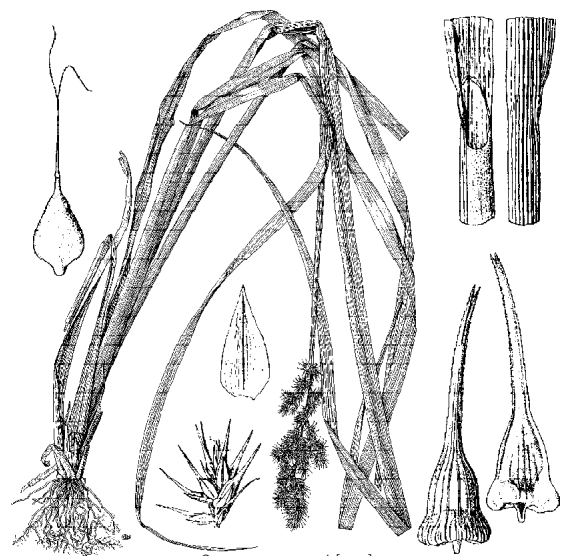
Carex davisii Schwein. & Torr., (for Emerson Davis, 1798-1866, amateur student of *Carex*), EMERSON DAVIS' CARIC SEDGE. Rich, deciduous, calcareous woods, forest edges, meadows, and shores; Dallas, Delta, Denton, Hopkins, Hunt, Johnson, Kaufman, and Tarrant cos.; also upper portion of Post Oak Savannah. Fruiting Apr-May(-mid-Jun). Section *Hymenochlaenae*

Carex debilis Michx., (frail), WEAK CARIC SEDGE. Low woods, swamps, forest edges, and especially along creek margins; ne part of nc TX in Delta, Lamar, and Red River cos.; also Post Oak Savannah, Pineywoods, and upper portion of Gulf Prairies and Marshes. Fruiting Apr-May(-Jul). Section *Hymenochlaenae*

Carex edwardsiana E.L. Bridges & Orzell, (of the Edwards Plateau), EDWARDS PLATEAU CARIC SEDGE. Mesic to submesic mixed juniper-hardwood forests and ravine slopes, alkaline clay loams and sandy clay loams; s part of nc TX in Bell Co.; also Edwards Plateau, mostly in the Balcones Canyonlands; endemic to TX. Fruiting Apr-May. [*C. oligocarpa* of Texas authors in part, not Schkuhr ex Willd.] Section *Griseae* ↵

Carex emoryi Dewey, (for Major William Helmsley Emory, 1811-1887, American soldier who worked on U.S./Mexican boundary survey), WILLIAM EMORY'S CARIC SEDGE. A heliophyte along margins of streams, rivers, lakes, ponds, marshes, and open swamps, usually on calcareous soils; Bell, Cooke, Dallas, Milam, and Williamson cos.; also Post Oak Savannah, Pineywoods, Edwards Plateau, and Rolling Plains. Fruiting Mar-May. Section *Phacocystis*

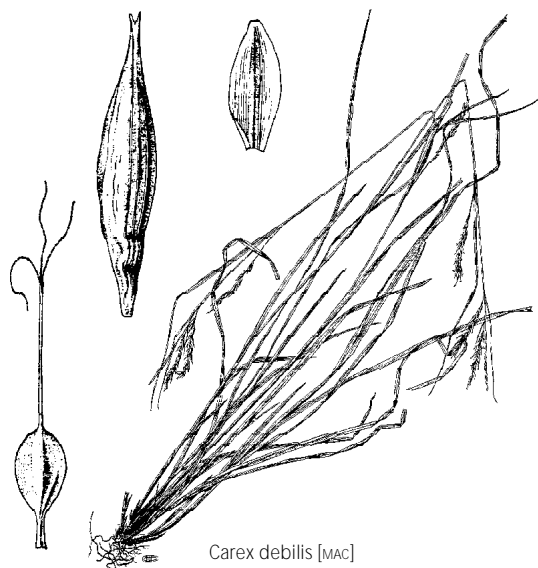
Carex festucea Schkuhr ex Willd., (fescue-like), FESCUE-LIKE CARIC SEDGE. Damp or wet low areas in woods; Dallas, Delta, Hopkins, Lamar, and Milam cos. in e part of nc TX; also Post Oak



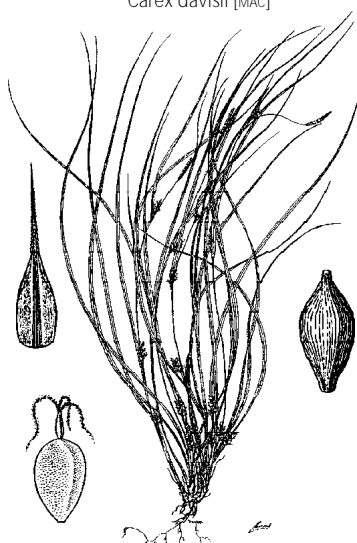
Carex crus-corvi [MAC]



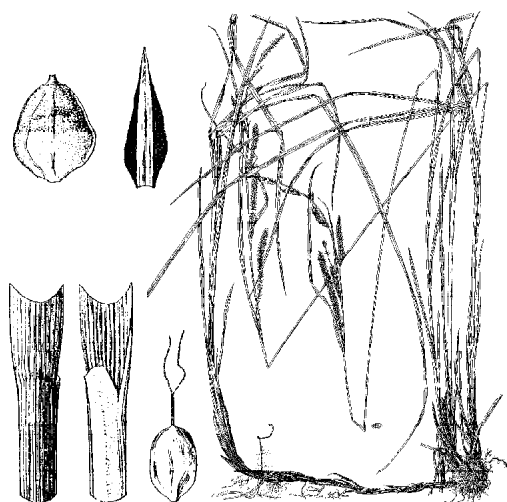
Carex davisii [MAC]



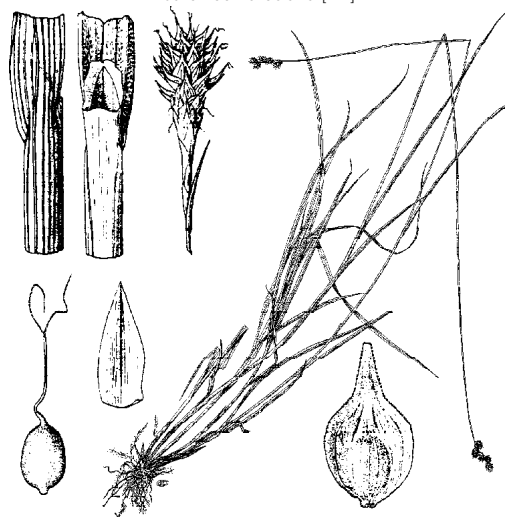
Carex debilis [MAC]



Carex edwardsiana [PHY]



Carex emoryi [MAC]



Carex festucacea [MAC]

Savannah, Pineywoods, and upper portion of Gulf Prairies and Marshes. Fruiting Apr–May(–early Jun). Section *Ovales*

Carex fissa Mack., (split), SHARP-MARGIN CARIC SEDGE. A heliophyte in open, wet, roadside ditches and in open wet areas in floodplains, usually in alluvial clay soils; Dallas, Hopkins, Hunt, Kaufman, and Milam cos.; also Post Oak Savannah and upper portion of Gulf Prairies and Marshes. Fruiting May–Jun. Section *Multiflorae*

Carex flaccosperma Dewey, (flaccid, weak, or soft-seeded or -fruited), FLACCID-FRUIT CARIC SEDGE. Usually found in floodplains in mesic deciduous forests, in acidic silt loams, sandy loams, sandy clay loams, clays, and loams; e and ne parts of nc TX in Delta, Fannin, Henderson, Hopkins, Hunt, Kaufman, and Lamar cos.; also Post Oak Savannah, Pineywoods, and upper portion of Gulf Prairies and Marshes. Fruiting Apr–May. Section *Griseae*

Carex frankii Kunth, (for its discoverer, Joseph Frank, 1782–1835, German botanist, physician, and traveler in U.S.) JOSEPH FRANK'S CARIC SEDGE. Low deciduous woods, bottomlands, and wet meadows, usually in calcareous or neutral soils; Bell, Bosque, Delta, Fannin, Grayson, Henderson, Hunt, Hopkins, Lamar, Milam, and Red River cos.; also Post Oak Savannah, Pineywoods, upper portion of Gulf Prairies and Marshes, Edwards Plateau, and Trans-Pecos. Fruiting May–Sep(–early Nov). Section *Squarrosae*

Carex glaucodea Tuck. ex Olney, (gray-green), GRAY-GREEN-FRUIT CARIC SEDGE. Along edges and in openings of mesic deciduous forests or in ephemeral wet prairies, in acidic to alkaline loams, or clays; ne part of nc TX in Hopkins and Lamar cos., probably in other ne cos.; also upper Post Oak Savannah and upper Pineywoods. Fruiting May–Jun(–early Jul). [*C. flaccosperma* Dewey var. *glaucodea* (Tuck. ex Olney) Kük.] Section *Griseae*

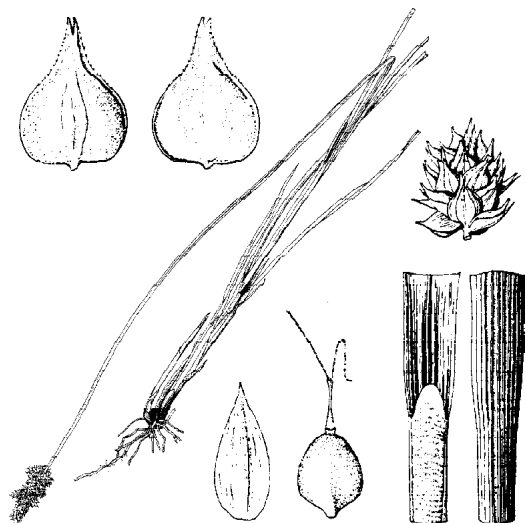
Carex granularis Muhl. ex Willd., (granular, covered with minute grains), GRANULAR CARIC SEDGE. Calcareous rich woods, shores, meadows, and bottomlands, usually in calcareous soils; ne part of nc TX in Hopkins, Hunt, Lamar, and Red River cos.; also Pineywoods and upper Post Oak Savannah. Fruiting May–Jun. [*C. granularis* var. *haleana* (Olney) Porter] Section *Granulares*

Carex grvida L.H. Bailey, (heavy with fruit), HEAVY-FRUIT CARIC SEDGE. A heliophyte in open swales, seepy areas, damp or mesic prairies with calcareous soils; Bell, Burnet, Dallas, Denton, Hamilton, Hunt, Navarro, Palo Pinto, Tarrant, and Wise cos.; also Post Oak Savannah, Rolling Plains, and High Plains. Fruiting May–Jun. [*C. grvida* var. *lunelliana* (Mack.) FJ. Herm., *C. lunelliana* Mack.] Section *Phaestoglochin*

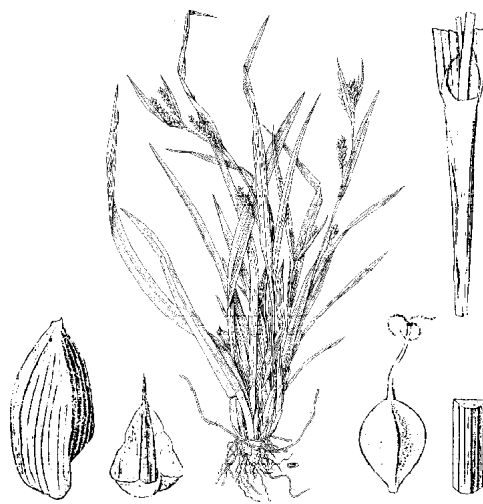
Carex grisea Wahlenb., (gray), INFLATED CARIC SEDGE. Floodplains of mesic deciduous forests, acidic to alkaline sandy loams, loams, sandy clay loams, and clay loams; Dallas, Delta, Ellis, Fannon, Grayson, Hunt, Kaufman, and Palo Pinto cos.; also Post Oak Savannah and Rolling Plains. Fruiting Apr–Jun(–early Jul). [*C. amphibola* Steud. var. *turgida* Fernald] Section *Griseae*

Carex hyalina Boott, (transparent, translucent), FEW-FLOWER CARIC SEDGE, TISSUE SEDGE. A sciophyte of bottomland hardwood forests, usually on secondary flood terraces in wet neutral clay soils but can be slightly acid or slightly alkaline; frequent along the Trinity and Sulphur rivers and their tributaries; less frequent along the Brazos River; Dallas, Delta, Denton, Ellis, Henderson, Hopkins, Hunt, Kaufman, Lamar, Navarro, and Red River cos.; also Pineywoods, upper portion of Gulf Prairies and Marshes, and Post Oak Savannah. Fruiting mid-Mar–mid-May(–mid-Jun). Section *Ovales* (TOES 1993: V) Δ

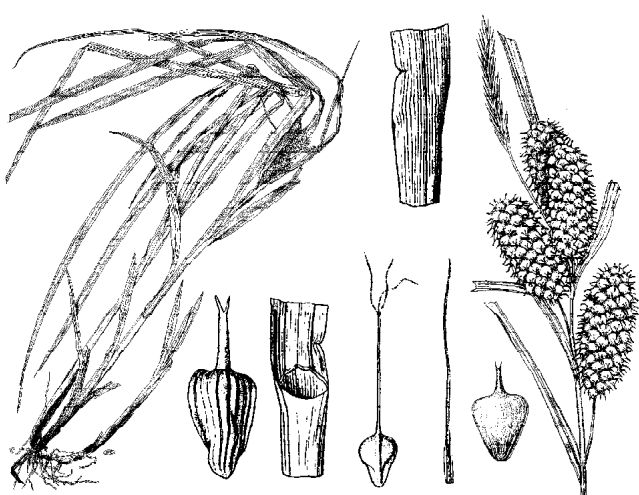
Carex hyalinolepis Steud., (with transparent or translucent scales), HYALINE-SCALE CARIC SEDGE. A heliophyte forming massive colonies; found in open roadside ditches, swales, shores, marshes,



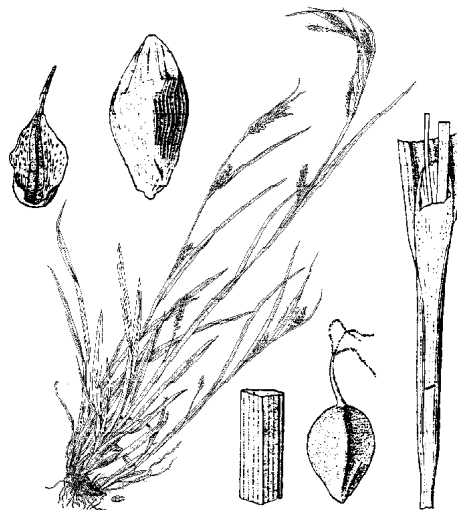
Carex fissa [MAC]



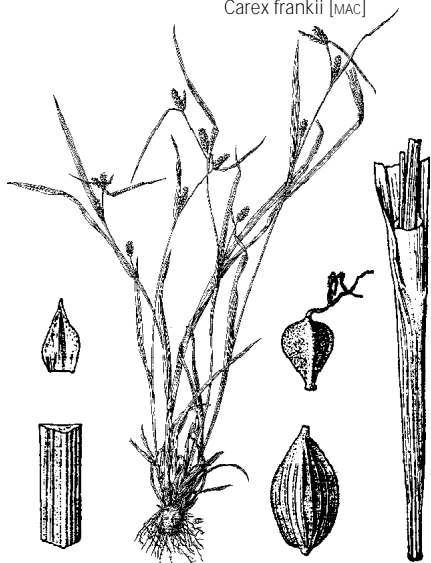
Carex flaccosperma [MAC]



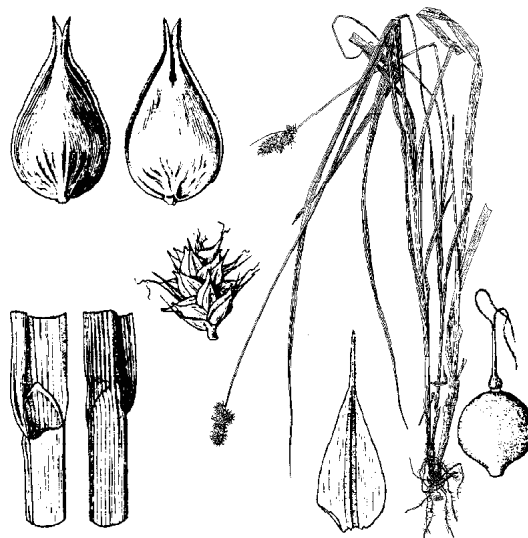
Carex frankii [MAC]



Carex glaucoidea [MAC]



Carex granularis [MAC]



Carex gravida [MAC]

and open swamps, frequently in black calcareous or neutral clay; Dallas, Delta, Ellis, Hopkins, Navarro, and Red River cos.; also Post Oak Savannah and upper portion of Gulf Prairies and Marshes. Fruiting Apr–May(–early Jul). Section *Paludosae*

Carex intumescens Rudge, (swollen, puffed up), BLADDERY CARIC SEDGE. Swampy woods, bottomland hardwood forests, acidic soils; Red River Co. in ne part of nc TX; also Post Oak Savannah, Pineywoods, and upper portion of Gulf Prairies and Marshes. Fruiting Mar–Sep. Section *Lupulinae*

Carex leavenworthii Dewey, (for its discoverer, Melines Conklin Leavenworth, 1796–1862, s U.S. botanist), MELINES LEAVENWORTH'S CARIC SEDGE. Primarily a heliophyte but grows more robust in shade, primarily in alfisols with sandy or sandy loam soils, occasionally in entisols, histosols, or mollisols, open mesic to submesic sites, occasionally in wetter sites, forest edges, forest openings, pastures, roadsides, lawn weed, appears to do better in recently disturbed sites as a successional species, but persists; widespread in nc TX; also Post Oak Savannah, Pineywoods, upper Gulf Prairies and Marshes, and upper South Texas Plains. Fruiting (mid-Feb–)mid-Mar–early Jul(–late Oct). [*C. cephalophora* Muhl. ex Willd. var. *angustifolia* Boott; *C. cephalophora* var. *leavenworthii* (Dewey) Kük.] Section *Phaestoglochin*

Carex longii Mack., (for Bayard Henry Long, 1885–1969, of Philadelphia), BAYARD LONG'S CARIC SEDGE. A facultative heliophyte in open damp or wet sites, usually in sandy, agrillaceous or peaty soils; Delta, Hopkins, Lamar, and Milam, cos. in e part of nc TX, undoubtedly in other cos. within nc TX; also Post Oak Savannah, Pineywoods, upper portion of Gulf Prairies and Marshes. Fruiting May–Jul(–Nov). Section *Ovales*

Carex louisianica L.H. Bailey, (of Louisiana), LOUISIANA CARIC SEDGE. Swampy woods, bottomland hardwood forests, acidic soils; in Red River drainage in Fannin Co.; also Post Oak Savannah, Pineywoods, and upper portion of Gulf Prairies and Marshes. Fruiting Apr–Aug. Section *Lupulinae*

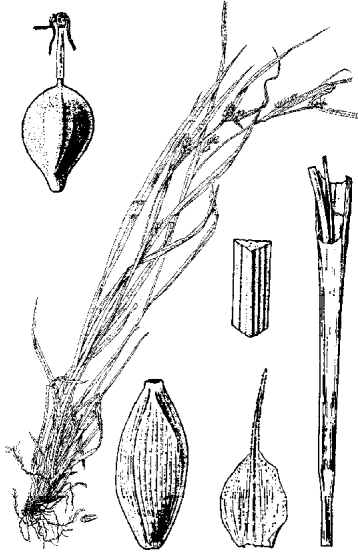
Carex lupulina Muhl. ex Willd., (resembling *Humulus lupulus*–hops), HOP CARIC SEDGE. Open swamps, wet ditches, somewhat acidic-neutral to calcareous soils; Hopkins, Lamar, Milam, and Red River cos.; also Post Oak Savannah, Pineywoods, e porton of Edwards Plateau, upper portion of Gulf Prairies and Marshes. Fruiting Apr–Oct. Section *Lupulinae*

Carex lurida Wahlenb., (sallow, pale yellow), SALLOW CARIC SEDGE. Open swales and open swamps; Denton, Lamar, Milam, and Red River cos., expected in other e cos. within nc TX; also Post Oak Savannah, Pineywoods, and upper Gulf Prairies and Marshes. Fruiting late-Apr–early Jul(–Aug). Section *Vesicariae*

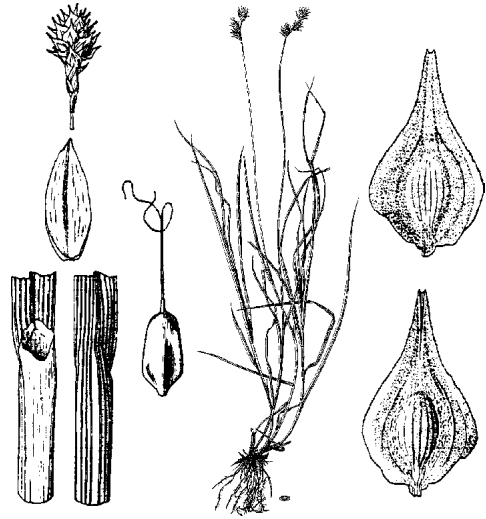
Carex meadii Dewey, (for its discoverer, Samuel Barnum Mead, 1798–1880, botanist and physician of CT and IL), SAMUEL MEAD'S CARIC SEDGE, MEAD'S CARIC SEDGE. A heliophyte in open mesic to wet calcareous clay prairies and depressions; in ne part of nc TX in Dallas, Grayson, Kaufman, and Lamar cos.; also upper Gulf Prairies and Marshes. Fruiting late-Mar–mid-May(–early Jun). Section *Paniccae*

Carex mesochorea Mack., (midland), MIDLAND CARIC SEDGE. A facultative to obligate heliophyte growing in entisols near hardwood forest edges or in openings, in pastures, or roadsides, usually on sandy or sandy loam soils, appears to need disturbance as a successional species; the only known station in TX is from Tarrant Co. Fruiting late Mar–late Jul. [*C. cephalophora* Muhl. ex Willd. var. *mesochorea* (Mack.) Gleason] Section *Phaestoglochin*

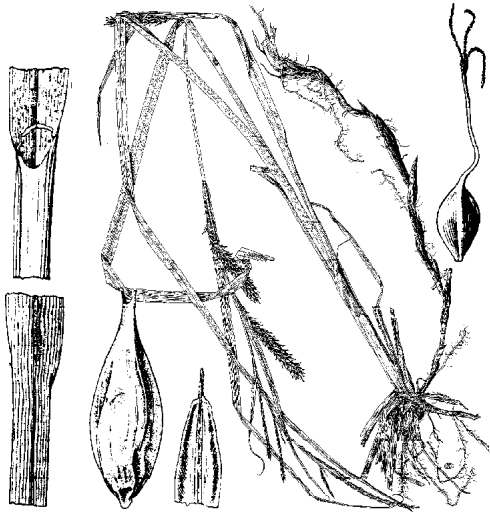
Carex microdonta Torr. & Hook., (small-toothed), SMALL-TOOTH CARIC SEDGE. A heliophyte in calcareous shores, gravels, meadows, prairies, and glades; Bell, Collin, Coryell, Dallas, Lampasas,



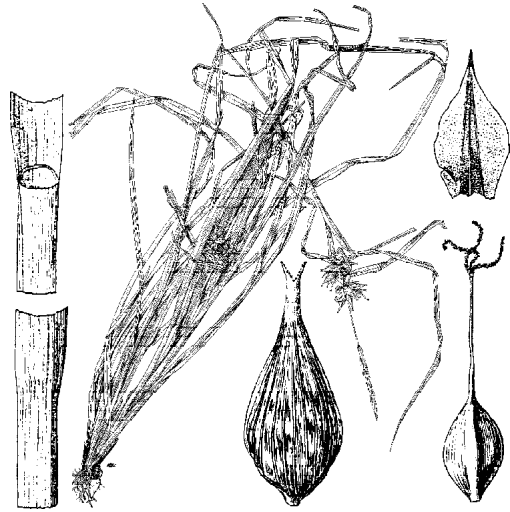
Carex grisea [MAC]



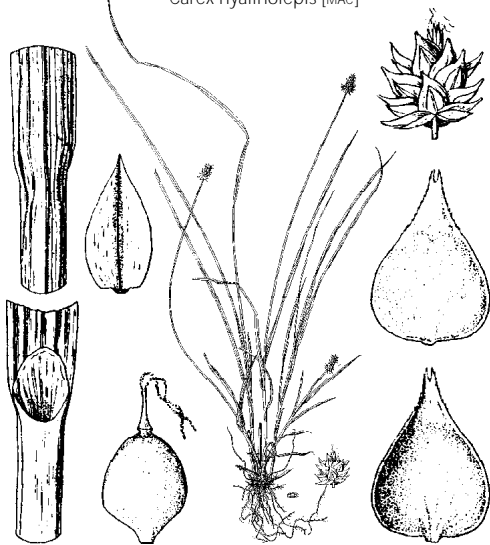
Carex hyalina [MAC]



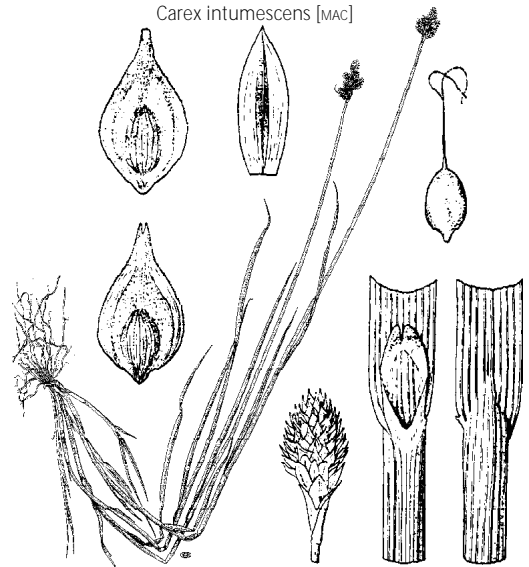
Carex hyalinolepis [MAC]



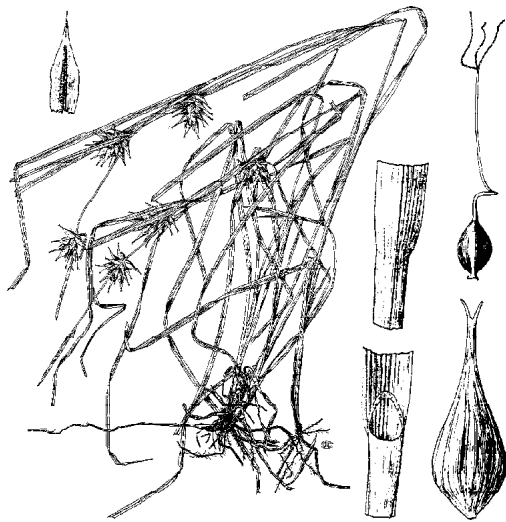
Carex intumescens [MAC]



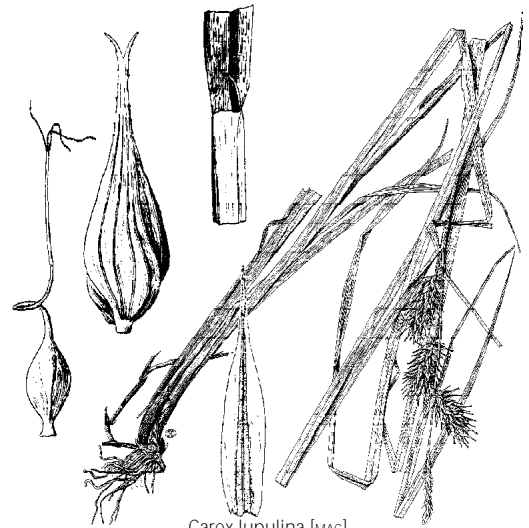
Carex leavenworthii [MAC]



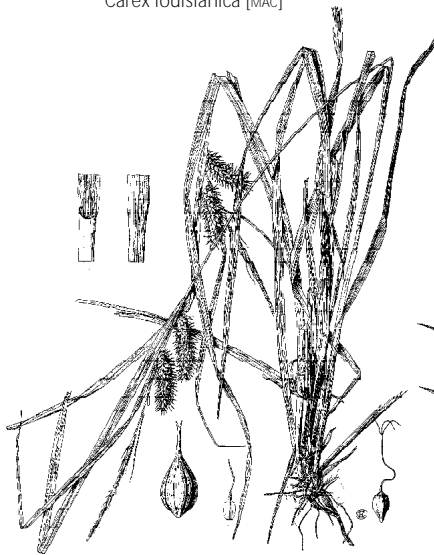
Carex longii [MAC]



Carex louisianica [MAC]



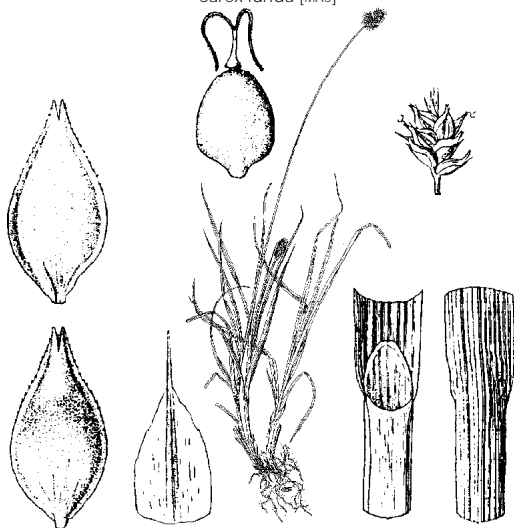
Carex lupulina [MAC]



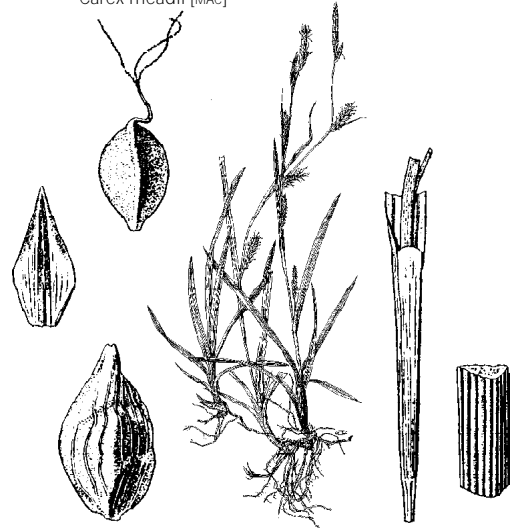
Carex lurida [MAC]



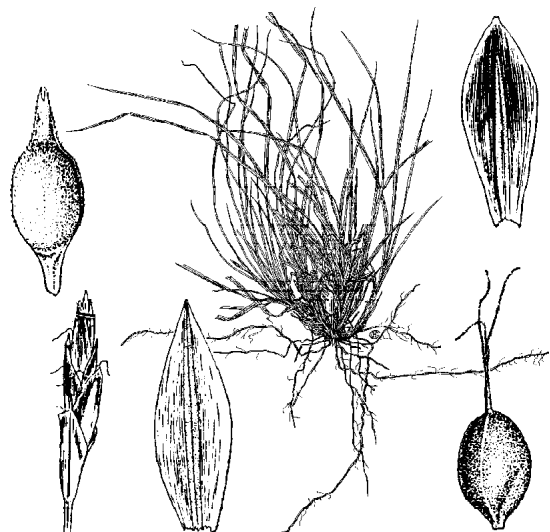
Carex meadii [MAC]



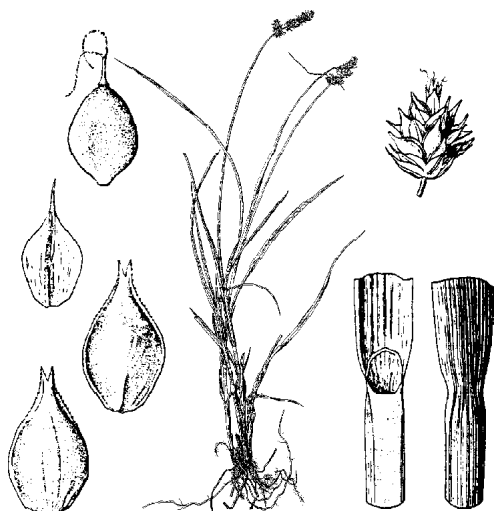
Carex mesochorea [MAC]



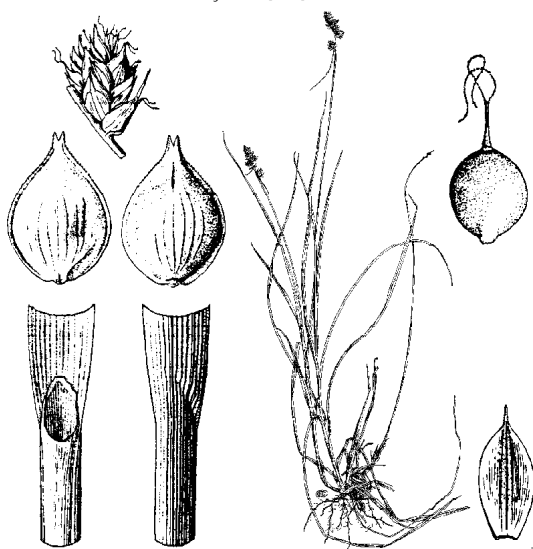
Carex microdonta [MAC]



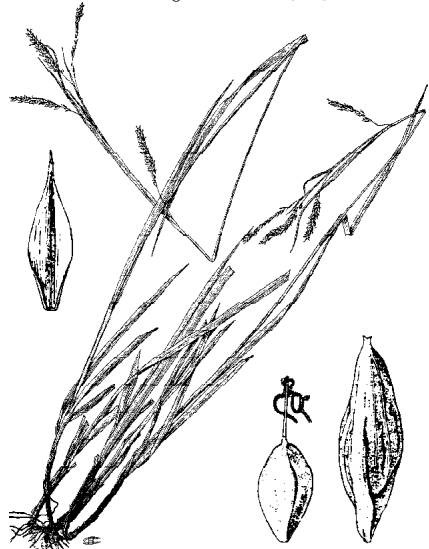
Carex microrhyncha [MAC]



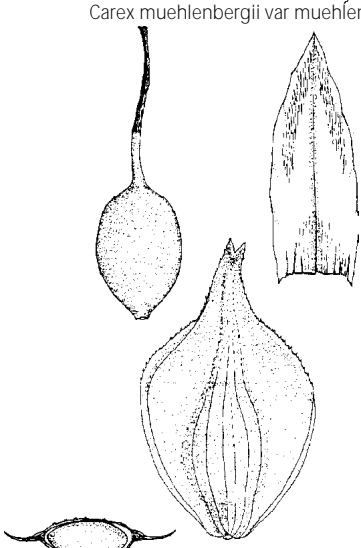
Carex muehlenbergii var. *enervis* [MAC]



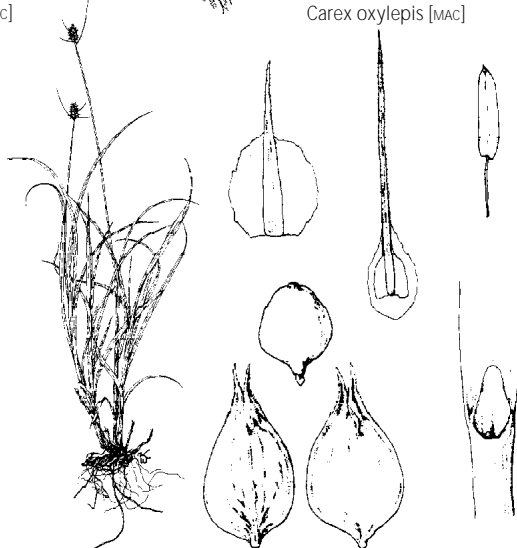
Carex muehlenbergii var. *muehlenbergii* [MAC]



Carex oxylepis [MAC]



Carex ozarkana [BTT]



Carex perdentata [SID]

Milam, Mills, and Tarrant cos.; also Post Oak Savannah, South Texas Plains, Edwards Plateau, and Trans-Pecos. Fruiting late Apr–Jun. Section *Granulares*

Carex microrhyncha Mack., (small-beaked), SMALL-BEAK CARIC SEDGE. Submesic oak-hickory forests or oak-juniper woodlands, at base of trees or in semi-open areas with sandy or gravely sandy soils; Delta, Milam, Parker, and Red River Cos.; also Pineywoods and Post Oak Savannah. Fruiting early Mar–Apr(–May). Section *Acrocystis*

Carex muehlenbergii Schkuhr ex Willd. (for Gotthilf Henry Ernest Muhlenberg, 1753–1815, German-educated Pennsylvania pioneer botanist). See key to species to separate varieties. Section *Phaetoglochin*

var. **enervis** Boott, (nerveless), GOTTHILF MUHLENBERG'S VEINLESS CARIC SEDGE. Obligate to facultative sciophyte, but in some habitats growing as a remnant in full sun, in mesic or submesic hardwood forests (frequently oak-hickory woods), alfisols, less frequent in entisols, vertisols, or histosols, regardless, most frequently found in sandy soils with a humus layer or thin soils over limestone with a humus layer; widespread in nc TX; also Pineywoods, upper Gulf Prairies and Marshes, and e Edwards Plateau. Fruiting Apr–Jul(–Oct). [*C. onusta* Mack., *C. plana* Mack.]

var. **muehlenbergii**, GOTTHILF MUHLENBERG'S CARIC SEDGE. Obligate to facultative heliophyte in entisols of open sand dunes, openings in sandy oak-hickory woods, sandy forest edges, open to semi-open sandstone outcrops, open pine barrens, or on thin soils over limestone, occasionally in alfisols or even histosols; Erath, Henderson, Lamar, Milam, Parker, and Tarrant cos.; also upper portions of Post Oak Savannah and Pineywoods. Fruiting (late Mar–)late Apr–mid-Aug(–early Sep).

Carex oxylepis Torr. & Hook., (sharp-scaled), SHARP-SCALE CARIC SEDGE. Rich moist hardwood forests, frequently along floodplains of forest creeks; ne and se portion of nc TX in Hunt, Lamar, Milam, and Red River cos.; also Post Oak Savannah, Pineywoods, and upper portion of Gulf Prairies and Marshes. Fruiting Mar–Apr(–early Jun). Section *Hymenochlaenae*

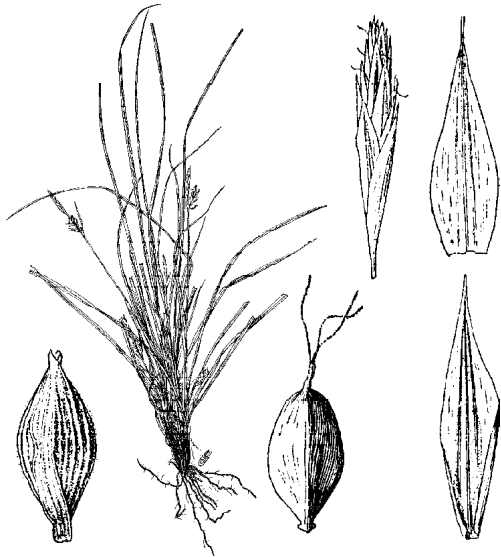
Carex ozarkana P. Rothr. & Reznicek, (of the Ozarks), OZARK CARIC SEDGE. A heliophyte in early successional wetlands on mineral soils, often in association with seepage, seepy banks of streams, permanently wet ditches, pond shores, and wet depressions in meadows and pastures; these sites are usually dominated by *Juncus* species; the soils are loamy, ranging from clay loams to silt loams, usually acidic; Hopkins and Lamar cos. in ne part of nc TX; also Upper Post Oak Savannah. Fruiting May. Section *Ovales*

Carex perdentata S.D. Jones, (having teeth), CONSPICUOUSLY-TOOTHED CARIC SEDGE. A facultative sciophyte, primarily in sandy loams, sandstone outcrops, granitic outcrops, or thin soils over limestone, open mesic to submesic hardwood forests, or open hardwood-juniper forest, or woodlands in savannas on granite outcrops; w 2/3 of nc TX; also Edwards Plateau. Fruiting mid-Mar–early Jun. Section *Phaetoglochin* This species, endemic to TX and OK, was described in 1994 (Jones 1994b).

Carex planostachys Kunze, (flat-spiked), CEDAR CARIC SEDGE. Dry oak-juniper or scrub on calcareous soils; Bell, Bosque, Coryell, Dallas, Hamilton, Hill, Hood, Johnson, McLennan, Parker, Somervell, and Tarrant cos.; also Post Oak Savannah, Edwards Plateau, Gulf Prairies and Marshes, and Trans-Pecos. Fruiting Mar–May. Section *Halleranae*

Carex reniformis (L.H. Bailey) Small, (kidney-shaped), KIDNEY-SHAPED CARIC SEDGE. A facultative sciophyte in wet woods and sloughs; Hopkins, Red River, and Tarrant Cos.; also Pineywoods, Post Oak Savannah, and upper portion of Gulf Prairies and Marshes. Fruiting May–Jun. Section *Ovales*

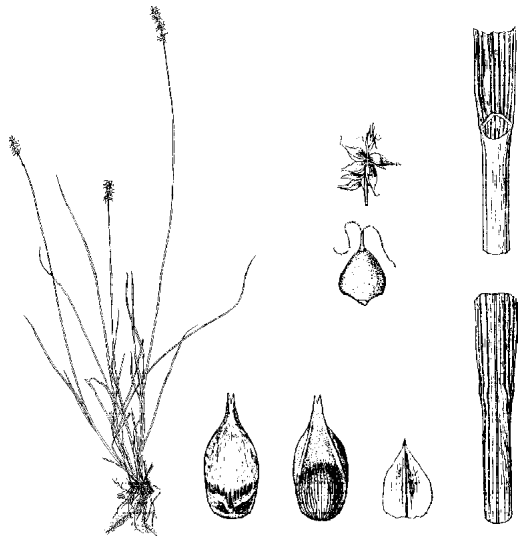
Carex retroflexa Muhl. ex Willd., (bent backward), REFLEXED-FRUIT CARIC SEDGE. Dry rocky or



Carex planostachys [MAC]



Carex reniformis [MAC]



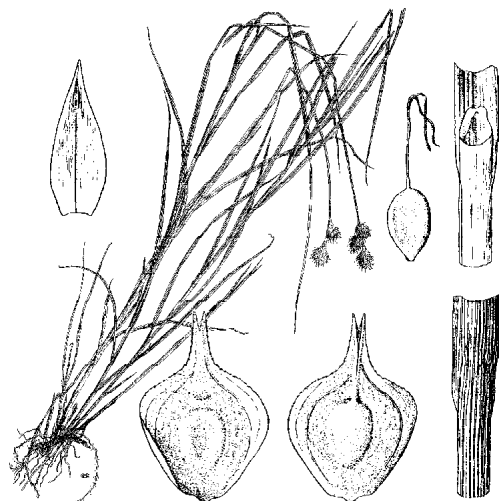
Carex retroflexa [MAC]



Carex socialis [BTT]



Carex striatula [MAC]



Carex tetrastachya [MAC]

sandy woods, thickets, and forest edges; widespread in nc TX; also Post Oak Savannah, Pineywoods, upper Gulf Prairies and Marshes, and e Edwards Plateau. Fruiting late Mar–May(–Jun). Section *Phaestoglochin*

Carex socialis Mohlenbr. & Schwegman, (sociable), COMPANION CARIC SEDGE. A facultative sciophyte in clay or sandy clay soils of secondary terraces of river floodplains; in the ne corner of nc TX in Red River Co., probably also in other ne cos., also Henderson Co. on the e margin of nc TX; also Post Oak Savannah, Pineywoods, and upper Gulf Prairies and Marshes. Fruiting late Mar–May. Section *Phaestoglochin*

Carex striatula Michx., (with fine longitudinal lines), FINE-LINE CARIC SEDGE. A facultative sciophyte, frequently on upper slopes of ravines in partial openings of deciduous forests; reported in nc TX from Dallas Co., but probably also in Lamar, Red River, and Delta cos.; also Post Oak Savannah and Pineywoods. Fruiting Mar–May. Section *Laxiflorae*

Carex tetrastachya Scheele, (four-spiked), FOUR-ANGLE CARIC SEDGE. Open, moist to wet sites, wet prairies, roadside ditches, open swamp and marsh edges, most frequent in calcareous soils; widespread in nc TX; also Post Oak Savannah, Gulf Prairies and Marshes, South Texas Plains, Edwards Plateau, and rarely in Pineywoods. Fruiting Mar–May(–early Jun). [*C. brittoniana* L.H. Bailey] Section *Ovales*

Carex texensis (Torr.) L.H. Bailey, (of Texas), TEXAS CARIC SEDGE. In submesic to mesic rocky, or sandy woods and fields; Delta, Fannin, Hopkins, and Lamar cos. in the ne part of nc TX; also Post Oak Savannah, Pineywoods, and upper Gulf Prairies and Marshes. Fruiting mid-Mar–mid-May(–early Jun). [*C. retroflexa* Muhl. ex Willd. var. *texensis* (Torr.) Fernald] Section *Phaestoglochin*

Carex triangularis Boeck., (triangular), TRIANGULAR CARIC SEDGE. A heliophyte in open wet roadside ditches and in open wet areas in floodplains, usually in alluvial clay soils; Delta, Hopkins, Lamar, and Red River cos. in the ne part of nc TX; also Post Oak Savannah, Pineywoods, and upper Gulf Prairies and Marshes. Fruiting May–Jun. Section *Multiflorae*

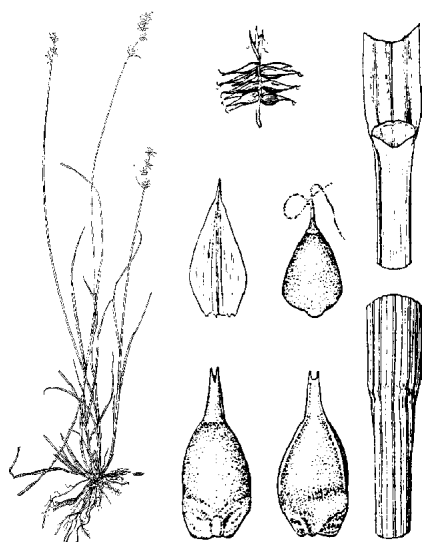
Carex tribuloides Wahlenb., (resembling *Tribulus*–caltrop), CALTROP CARIC SEDGE. Frequently in the open in bottomlands, swales, swamp margins, and marshes; ne part of nc TX in Delta, Lamar, and Red River cos.; also Post Oak Savannah, Pineywoods, and upper portion of Gulf Prairies and Marshes. Fruiting May–Aug. Section *Ovales*

Carex vulpinoidea Michx., (resembling *Carex vulpina*, with inflorescence like a fox tail), FOX-TAIL CARIC SEDGE. A heliophyte of wet roadside ditches, lakesides, pondsides, and open wet floodplains, usually in clayey soils; ne part of nc TX in Delta, Denton, Fannin, Hopkins, Lamar, and Red River cos.; also Post Oak Savannah and Pineywoods. Fruiting Jun–Aug. Section *Multiflorae*.

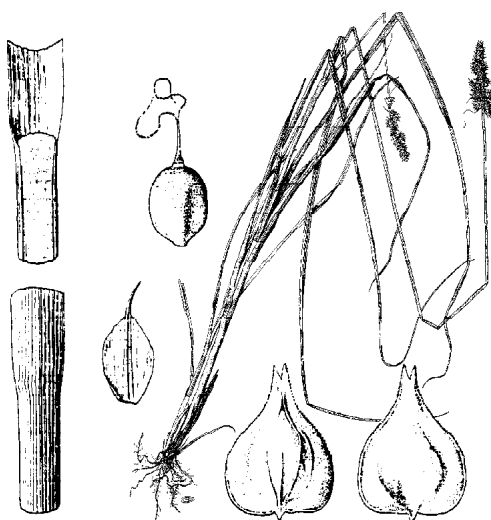
Carex affinity *bicknellii* Reznicek [*Ined.*], (the species will not be named *C. bicknellii*, a name already used in *Carex*; however, this taxon has an affinity towards that species). No illustration is available for this as yet unnamed species. A heliophyte in open wet swales and bottoms, depressions, or wet roadside ditches or ones with ephemeral water, usually in sandy soils; in nc TX in Delta, Kaufman, Lamar, Red River, and Tarrant cos.; also Fayette and Harris cos. to the e of nc TX. May–Jun. Section *Ovales*

CLADIUM SAW-GRASS, TWIG-RUSH

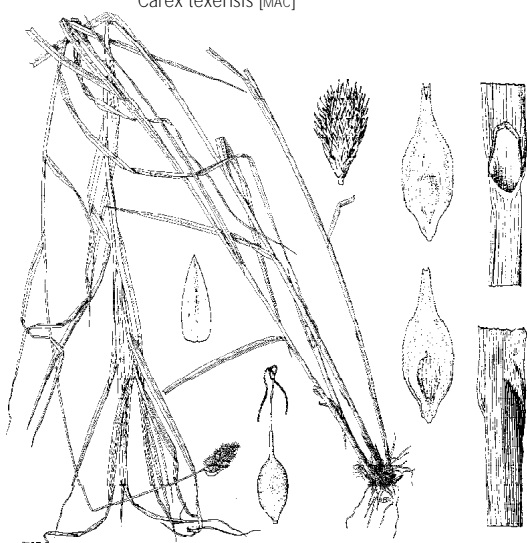
Rhizomatous perennials; culms obtusely trigonous; leaves basal and cauline, with well-developed blades; leaf sheaths loose; inflorescences cymosely branched, with numerous spikelets; spikelets with a single fertile floret subtended by 2–3 empty scales (these lacking achenes but



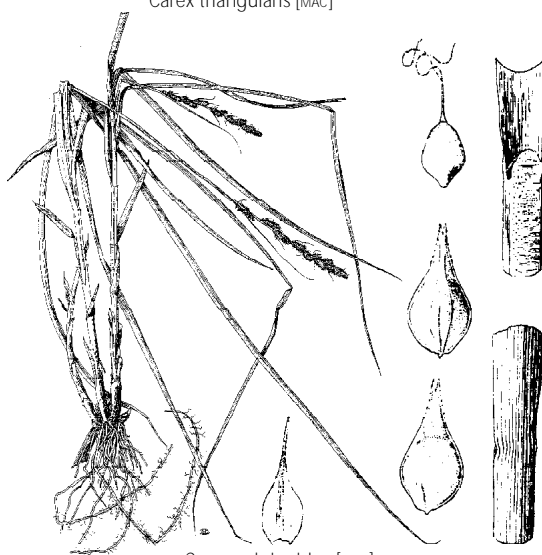
Carex texensis [MAC]



Carex triangularis [MAC]



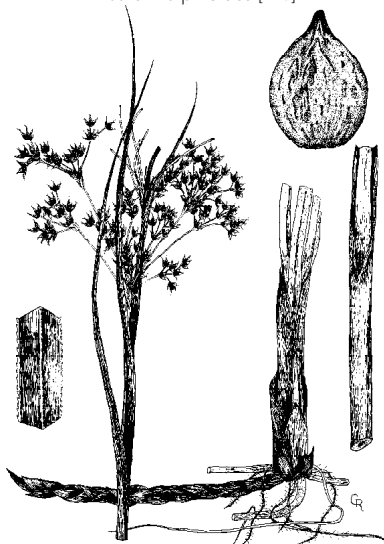
Carex tribuloides [MAC]



Carex vulpinoidea [MAC]



Cladium mariscoides [BB2]



Cladium mariscus subsp. *jamaicense* [owo]

can have stamens); scales of spikelets spirally imbricate; stamens 2; stigmas 2-3; perianth bristles absent; achenes without tubercles.

☛ A genus of 2 species, 1 in North America, the other cosmopolitan. (Greek *cladion*, a branchlet, from the repeatedly branched inflorescence of the first named species) *Cladium* species superficially resemble some *Rhynchosporataxa* but can be easily distinguished by the lack of tubercles on the achenes.

1. Leaf blades 1-3 mm wide, to ca. 0.3 m long, with margins scaberulous (= only slightly roughened, almost smooth to the touch); plants to 1 m tall _____ **C. mariscoides**

1. Leaf blades 5-15 mm wide, to 1 m long, with margins dangerously saw-toothed; plants to 3 m tall _____ **C. mariscus**

Cladium mariscoides (Muhl.) Torr., (resembling *Mariscus*, a segregate now included in *Cyperus*), TWIG RUSH. Plant 0.4-1 m tall; leaf blades involute, with scaberulous margins; inflorescences 5-30 cm long, slender, ca. 2-5 cm wide, usually of relatively few cymes, the inflorescences much smaller than in *C. mariscus*, with spikelets in groups of 3-10 at the ends of short, erect branches (peduncles); spikelets 3-6 mm long; achenes smooth, short cylindric, apiculate-pointed, truncate basally, 2.5-3.5 mm long. Wet areas; Henderson Co. (Bridges & Orzell 1989) near e margin of nc TX; mainly e TX; very rare in the state. Jul-Sep. [*Mariscus mariscoides* (Muhl.) Kuntze]

Cladium mariscus (L.) J. Pohl subsp. **jamaicense** (Crantz) Kük., (sp.: for resemblance to *Mariscus*; subsp.: of Jamaica), JAMAICAN SAW-GRASS, SAW-GRASS. Plant 1-3 m tall; leaf blades ca. 0.3-1 m long, with dangerously spinulose-serrulate (= saw-toothed) margins and midrib (on lower surface); inflorescences 20-80 cm long, 10-30 cm wide, much-branched, sometimes droopy, with spikelets in groups of 2-6 at the ends of short branches; spikelets 3-5 mm long; achenes with surfaces roughened, obovoid to subglobose, apiculate-pointed or obtuse, contracted basally, 2-3 mm long. Stream or lake margins, wet areas, often in calcareous soils; Dallas Co. (R. O'Kennon, pers. obs.); also se part of the state, Edwards Plateau, and Trans-Pecos (Hatch et al. 1990). Jul-Oct. [*Mariscus jamaicense* (Crantz) Britton]

CYPERUS FLAT SEDGE

Annuals or usually perennials; plants largely glabrous except for scabrous-margined leaves; culms (= stems) triangular; leaves basal or nearly so; inflorescences terminal, head-like or umbel-like, leafy-bracted at base; scales of spikelets 2-ranked (= in two distinct rows), the spikelets ± flattened or square; perianth bristles absent; achenes lenticular or trigonous.

☛ A genus of ca. 300 species of annual or perennial herbs of tropical and warm areas; some are problematic weeds while others are cultivated as ornamentals. The commonly cultivated Old World *Cyperus papyrus* L. (PAPYRUS, PAPER-REED) was used by the Egyptians to make paper at least 5500 years ago; the Greek word for the plant was *papyrus* from which our word paper is derived (Hepper 1992); this species was also used to make sandals, ropes, and boats (e.g., Moses in the bulrushes); the Greek word *byblos* was the name for the white pith of PAPHYRUS used in making paper (the pith was cut into strips, glued together, and then pressed and dried—Zohary 1982); the word *byblos* became modified into *biblion* and was applied to all scrolls or books and eventually to the Bible (Hepper 1992). *Cyperus* is a taxonomically difficult genus with a number of taxa apparently hybridizing and intergrading morphologically. Intermediates (genetically contaminated individuals) between *C. croceus*, *C. echinatus*, *C. retroflexus* and *C. retrosus* are frequently seen. Similar problems occur within other complexes. (*Cypeims*, the ancient Greek name)

REFERENCES: McGivney 1938, 1941a, 1941b; Corcoran 1941; Marcks 1972, 1974; Baijant 1975;

Denton 1978; Tucker 1983, 1994; Carter 1984; Carr 1988; Carter & Kral 1990; Schippers et al. 1995; Jones et al. 1996; Carter & Jones 1997.

1. Achenes lenticular (= lens-shaped); styles 2-branched.
 2. Spikelets with only 2 scales (plus 2 minute, brownish, basal scales much smaller than regular scales); achene 1 per spikelet; inflorescences 3–8(–12) mm long _____ see **Kyllinga**
 2. Spikelets with 6 or more scales; achenes several per spikelet; inflorescences variable, often much larger.
 3. Spikelets mostly 1.0–1.9 mm wide, sharp-pointed; achenes 0.4–0.5 mm wide, narrowly oblong to oblong _____ **C. polystachyos**
 3. Spikelets mostly more than 2.0 mm wide, subacute to obtuse, not sharp-pointed; achenes 0.6–0.7 mm wide, usually obovoid, often nearly as broad as long.
 4. Achenes brown to grayish at maturity, with isodiametric cells, not transversely lined, distinctly apiculate apically; rare if present in nc TX _____ **C. lanceolatus**
 4. Achenes black at maturity, with longitudinally elongate cells, usually transversely lined, slightly apiculate apically; known from several counties in nc TX _____ **C. flavescens**
1. Achenes trigonous (= 3-angled); styles 3-branched.
 5. Spikelet axis separating at maturity at the floret nodes _____ **C. odoratus**
 5. Spikelet axis remaining intact or apparently so, the florets either falling separately from the persistent axis OR the entire axis falling as a unit (OR whether unclear in immature *C. odoratus*).
 6. Culms with conspicuous septa (= internal partitions, but visible externally) at intervals of 5–50 mm; leaves usually reduced to just a sheath (bladeless or blades to 2 cm long), the culms thus appearing nearly leafless _____ **C. articulatus**
 6. Culms nonseptate; leaf blades usually present and conspicuous (reduced in *C. haspan* and *C. involucratus*), the culms thus usually appearing leafy.
 7. Scales with strongly recurved (= curved backwards) long acuminate tips; plants with a persistent spice-like odor; scales 7–9 nerved; plants annual, usually 20 cm or less tall _____ **C. squarrosus**
 7. Scales usually incurved to essentially straight or curved back but without long tips; plants usually without a spice-like odor; scales 3–5 nerved; plants perennial OR annual in case of *C. compressus*, *C. difformis*, *C. erythrorhizos*, and sometimes *C. odoratus*; plants of various heights, often much more than 20 cm tall.
 8. Culms rough to the touch, sparsely to densely covered with microscopic retrorse (= down pointing) or antrorse (= up pointing) teeth.
 9. Spikelets usually stalked, in loose heads, the heads usually clustered together; lower spikelets neither markedly reflexed nor parallel to the peduncle; culms with retrorse teeth; largest scales usually 1.1–1.5 mm long; stamen 1; achenes 0.7–0.8 mm long _____ **C. surinamensis**
 9. Spikelets sessile, in dense ovoid heads occurring singly at the ends of elongate peduncles, the peduncles 2–16 cm long; lower spikelets markedly reflexed and ± parallel to the peduncle (appearing to droop around the peduncle); culms with antrorse teeth; scales usually 4–6 mm long; stamens 3; achenes 2.5–3.0 mm long _____ **C. plukenetii**
8. Culms smooth to the touch, rarely with a few horizontal knobs.
 10. Scales usually slightly to strongly curved outward at the tips (except in *C. reflexus*); stamen 1; spikelet axis essentially wingless, persistent after scales and achenes have fallen.
 11. Leaves usually nodulose (= with knot-like septa visible under a hand lens); scales essentially linear, conspicuously falcate (= sickle-shaped); achenes linear, 1–1.3 mm long _____ **C. pseudovegetus**
 11. Leaves not nodulose; scales ovate, weakly S-shaped OR curved at base but straight at tip; achenes oblong to elliptic, 0.7–1.1(–1.2) mm long.

12. Scales weakly S-shaped, the tips curving outward; plants tufted, without rhizomes; widespread in nc TX _____ **C. acuminatus**
12. Scales curved at base but straight at tip; plants often with short, scaly, creeping rhizomes 1–3 mm thick; in nc TX known only from Denton Co. _____ **C. reflexus**
10. Scale tips not curving outward (but scales may be spreading); stamens usually 3; spikelet axis winged or wingless, persistent or whole spikelet falling as a unit.
13. Most leaves reduced to mere bladeless sheaths or occasionally the uppermost sheaths with short blades very rarely to 10 cm long.
14. Bracts usually 2, 1 of them 0.3–1(–2) times as long as the inflorescence, usually < 13 cm long; culms 0.1–0.7 m tall; native species _____ **C. haspan**
14. Bracts 10–25, often much surpassing the inflorescences, 15–40 cm long; culms 0.3–1.5 m tall; escaped cultivar _____ **C. involucratus**
13. Even the lower leaves with well-developed blades.
15. Scales minute, < 1 mm long; rare in nc TX, known only from Williamson Co. _____ **C. difformis**
15. Scales > 1 mm long; widespread in nc TX.
16. Scales 1.3–2.5(–3.2) mm long; achenes 0.7–1.5(–1.9) mm long; roots reddish OR not so; spikelets in rather loose elongate spikes, the spike axis visible.
17. Roots usually reddish; scales small, 1.3–1.5 mm long; achenes 0.7–0.8 mm long _____ **C. erythrorhizos**
17. Roots not reddish; scales 1.5–2.5(–3.2) mm long; achenes (1–)1.2–1.5(–1.9) mm long _____ **C. odoratus**
16. Scales (2.3–)2.5–5.5 mm long; achenes 1–3 mm long; roots usually not reddish; spikelets in rather loose elongate spikes as above OR in crowded or extremely densely packed short compact heads with the inflorescence axis usually not visible.
18. Achenes 1–1.3 mm long, nearly as thick as long; spikelets 10–24 mm long, 2–3.5(–4) mm wide, conspicuously flattened, digitately arranged (= all arising from about the same point on a very short axis) _____ **C. compressus**
18. Achenes 1.3–3 mm long, much longer than thick; spikelets various, flattened to angled or nearly rounded, pinnate or digitate in dense heads or open spikes.
19. Spikelet axis essentially wingless; spikelets 3–16 mm long with scales 2.5–4.2 mm long, in crowded (but not extremely dense) heads or short spikes.
20. Plants viscid (= sticky); leaves spongy at base, the dried leaves nodulose (= with knot-like septa visible with a hand lens) basally; longer peduncles branched into head-bearing secondary peduncles _____ **C. elegans**
20. Plants nonviscid; leaves neither spongy nor nonseptate basally; secondary peduncles usually absent.
21. Inflorescence usually a single nearly spherical head 1–3 cm long (sometimes with a few peduncles bearing small heads); main head with 15–55 spikelets; widely scattered in nc TX _____ **C. lupulinus**
21. Inflorescence 3–10 cm long, of 4–8 peduncles, each bearing short spikes 1–2 cm long; spikes with 5–18 spikelets each; rare if present in nc TX _____ **C. schweinitzii**

19. Spikelet axis winged; spikelets, scales, and inflorescences various, similar to above OR quite different.
22. Lower spikelets markedly reflexed and appearing \pm drooping around the peduncle; heads cylindric or obovoid; anthers 1 mm or more long; rare in nc TX _____ **C. hystericinus**
22. Lower spikelets not markedly reflexed OR if somewhat reflexed, then anthers < 1 mm long; heads various; anthers various, < 1 mm long in many species OR 1 mm or more long; widespread in nc TX.
23. Plants rhizomatous perennials; anthers 1 mm or more in length; spikelet axis persistent.
24. Bracts 3 or 4, about equaling inflorescence in length; spikelets 3–9 per spike _____ **C. rotundus**
24. Bracts 5–13, greatly exceeding inflorescence; spikelets 10–50 per spike.
25. Spikelets reddish brown; achenes 0.4–0.5 mm thick; culms (60–) 75–110 cm tall _____ **C. setigerus**
25. Spikelets brown to golden-brown; achenes 0.6–0.8 mm thick; culms 15–50(–65) cm tall _____ **C. esculentus**
23. Plants nonrhizomatous perennials; anthers less than 1 mm long; spikelet axis deciduous at base.
26. Spikelets usually 12–25 mm long, usually pinnately arranged in often rather loose elongate spikes, the spike axis visible _____ **C. strigosus**
26. Spikelets 3.5–10 mm long, usually crowded or extremely densely packed into short compact heads (inflorescence axis usually not visible), digitately arranged or if slightly pinnate, then the heads extremely dense.
27. Inflorescences extremely densely cylindric or subcylindric, usually less than 8(–10) mm broad; spikelets so dense that outline of head is smooth _____ **C. retrorsus**
27. Inflorescences neither densely cylindric nor subcylindric, mostly > 8 mm in diam., extremely densely globose or subglobose or spikelets crowded in globose or subglobose heads; outline of head appearing somewhat rough or smooth.
28. Inflorescences extremely densely globose or subglobose with 100–250 spikelets per head; spikelets so dense that outline of head is smooth _____ **C. echinatus**
28. Inflorescences spherical, with spikelets crowded (but not extremely densely), globose or subglobose with 10–70 spikelets per head; outline of head appearing somewhat rough.
29. Achenes concave in cross-section; largest scales usually 3 mm or longer;

achenes usually 1.7–2.5 mm long; plants
3–35(–60) cm tall; spikelet axis with
thickened and slightly discolored wings
clasping the achene _____ **C. retroflexus**

29. Achenes convex in cross-section; largest scales usually 3 mm or less long; achenes usually 1.7 mm or less long; plants 10–80 cm tall; spikelet axis wings neither discolored nor clasping the achene _____ **C. croceus**

Cyperus acuminatus Torr. & Hook. ex Torr., (tapering at tip), TAPER-LEAF FLAT SEDGE. Tufted perennial 10–80 cm tall; culms slender; inflorescences usually compact; sheaths not nodulose; blades 1–4 mm wide; scales weakly S-shaped, the tip with a slight to marked outward curve. Moist areas; nearly throughout TX. Mostly May–Oct.

Cyperus articulatus L., (jointed), CHINTÚL, JOINTED FLAT SEDGE. Perennial 0.5–1.4 m tall with creeping rhizomes, forming colonies; leaves few, basal, reduced to small essentially bladeless sheaths; inflorescences essentially bractless or with very small bracts; spikelets 6–33(–45) mm long. Moist grassland; se TX n to Comal and McLennan cos.; disjunct n to Grayson Co. (extensive colony on edge of small tank on bluff near Red River). May–Oct. The rhizome has been used medicinally (Burkhill 1985).

Cyperus compressus L., (flattened), POORLAND FLAT SEDGE. Tufted annual or occasionally a short-lived perennial. Weed in shrubbery, black clay; Dallas Co.; mainly se and e TX. Oct.

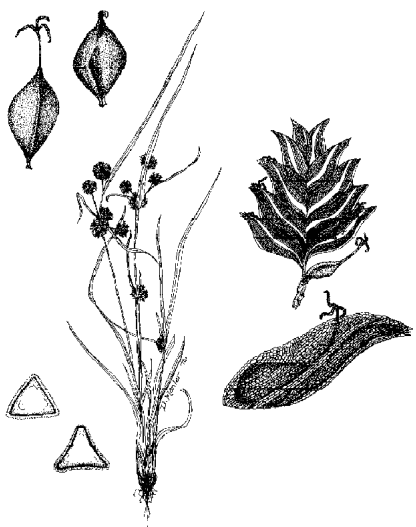
Cyperus croceus Vahl, (saffron-colored, yellow), BALDWIN FLAT SEDGE. Tufted perennial 15–70 cm tall; heads or spikes 8–20 mm broad; spikelets 3–8 mm long; scales with green keel and reddish or yellow-brown sides. Sandy open areas; Grayson, Kaufman, and Tarrant cos., also Milam Co. (S.D. Jones, pers. comm.); mainly e and se TX and Edwards Plateau. May–Oct. [*C. globulosus* of authors, not Aubl.]

Cyperus difformis L., (of unusual or differing forms). Annual 10–50 cm tall; roots red; leaves 2–4 per culm, 1–4 mm wide; heads globose or lobulate; spikelets 4–8 mm long; scales roundish, obtuse, very small, 0.5–0.8 mm long, green with brownish or purplish sides. Unshaded creek beds in perennially wet mud in shallow water over limestone or dolomite, creek banks, lake shores, other wet areas; Williamson Co. (Carr 1988); in TX otherwise known in Travis Co. (Carr 1988); first collected in TX in 1981 and first reported by Carr (1988). Native of Eurasia. Lipscomb (1980) discussed the distribution of *C. difformis* in North America. ☞

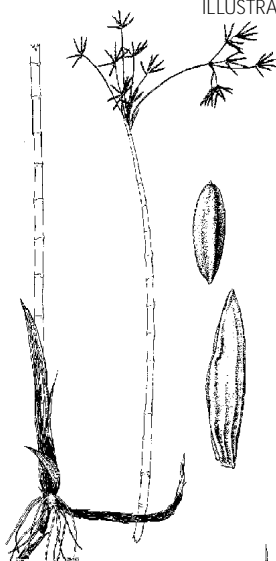
Cyperus echinatus (L.) A.W. Wood, (prickly), GLOBE FLAT SEDGE, CYLINDER FLAT SEDGE. Tufted perennial 15–70 cm tall; heads or spikes globose or subglobose, 8–21 mm long, 8.5–18 broad, less than 1/4 longer than broad. Sandy open areas; se and e TX w to West Cross Timbers, also Edwards Plateau. May–Oct. [*C. ovularis* (Michx.) Torr.]

Cyperus elegans L., (elegant), STICKY FLAT SEDGE. Tufted viscid (= sticky) perennial 25–80 cm tall; dried leaves nodulose (= with knot-like septa visible with a hand lens) basally; spikelets mostly in head-like clusters; longer peduncles branched into head-bearing secondary peduncles at ends of branches. Damp soils; known in nc TX only from Erath Co. (West Cross Timbers); mainly s TX. Jun.

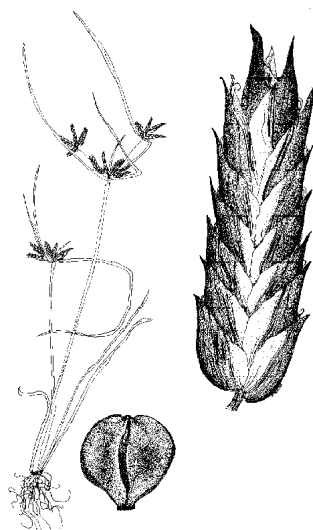
Cyperus erythrorhizos Muhl., (red-rooted), RED-ROOT FLAT SEDGE. Tufted annual 0.5–1.4 m tall; fresh roots usually reddish; inflorescences umbel-like; peduncles unequal; spikes several per peduncle; internodes of spikes 0–0.5 mm long; scales relatively small, 1.3–1.5 mm long; achenes



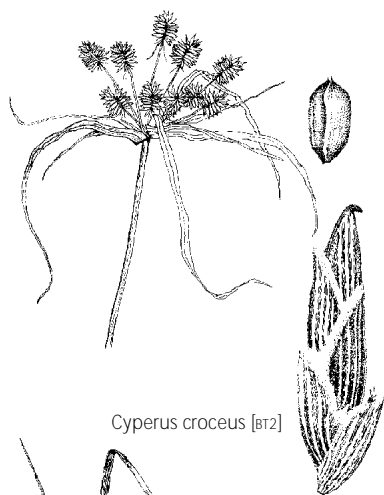
Cyperus acuminatus [B72]



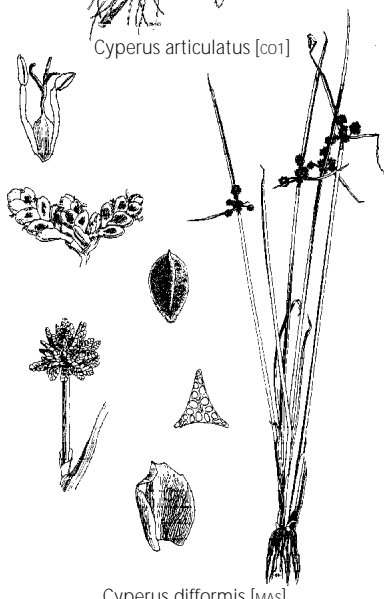
Cyperus articulatus [C01]



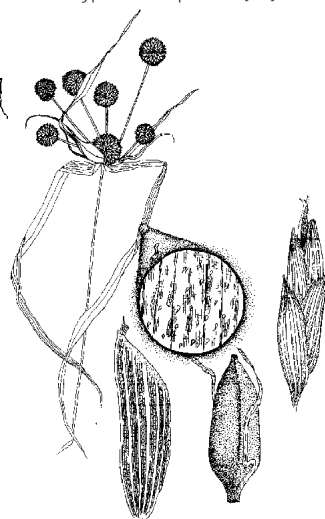
Cyperus compressus [B72]



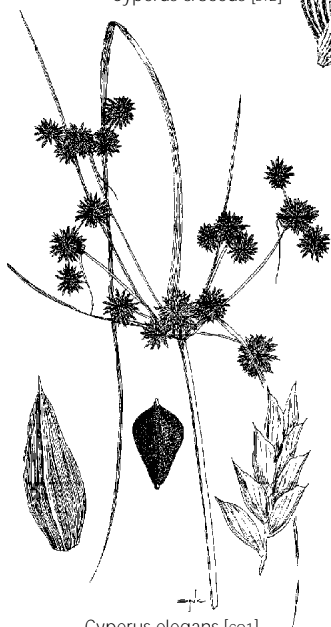
Cyperus croceus [B72]



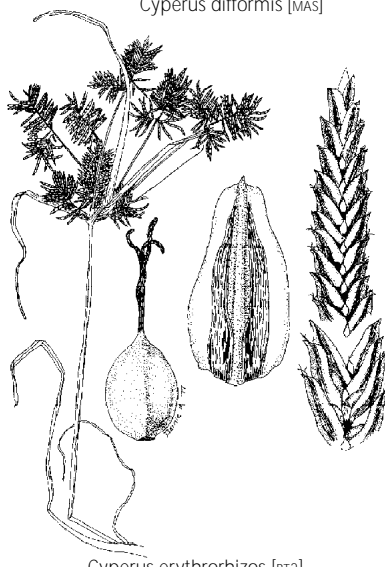
Cyperus difformis [MAS]



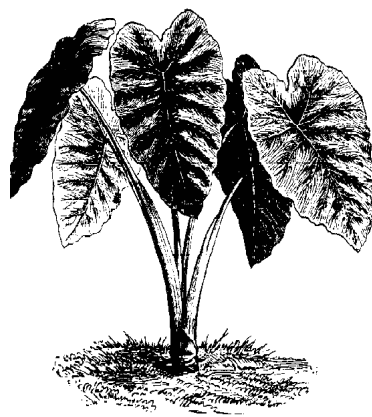
Cyperus echinatus [B72]



Cyperus elegans [C01]



Cyperus erythrorhizos [B72]



Cyperus esculentus [B72]

0.7-1 mm long. Marshy areas; se and e TX w to Grayson and Parker cos., also Edwards Plateau. Jul-Dec.

Cyperus esculentus L., (edible), YELLOW NUT-GRASS, CHUFA, NORTHERN NUT-GRASS. Perennial, colonial, 15-50 cm tall; rhizomes sometimes with tuber-like thickenings; anther connective prolonged into a red dot 0.05-0.1 mm long. Sandy disturbed soils; scattered nearly throughout TX. Summer-fall. According to Mabberley (1987), native to w Asia and Africa and widely naturalized in New World; however, Tucker (1994) considered it to be cosmopolitan. [*C. esculentus* var. *leptostachyus* Boeck., *C. esculentus* var. *macrostachyus* Boeck.] Schippers et al. (1995) discussed infraspecific variation in this widespread species; it can be a troublesome weed infesting a variety of crops (Holm et al. 1977). Varieties are sometimes recognized (e.g., Jones et al. 1997). According to Crosswhite (1980), the nut-like, edible, tuber-like thickenings were used during pioneer days.

Cyperus flavescens L., (yellowish), YELLOW FLAT SEDGE. Tufted annual 10-25 cm tall; spikelets (1.8-)2-3 mm wide; scales yellow-green to yellowish brown; achenes black, shiny, with rectangular to linear (vertical) cells, the rows of cells marked by horizontal, wavy, usually discolored sutures. Moist sand; Denton, Hamilton, and Tarrant cos.; mainly se and e TX. Jul-Nov. [*C. flavescens* var. *poaeformis* (Pursh) Fernald]

Cyperus haspan L., (the native name in Ceylon), SHEATHED FLAT SEDGE. Tufted perennial 10-70 cm tall; most leaves reduced to bladeless sheaths or rarely with short blades. Moist places; near s edge of nc TX in Burnet Co. (S.D. Jones, pers. comm.) and expected in other parts of nc TX; e and se TX and Central Mineral Region. Jun-Oct. This pantropical to warm temperate species can be a pernicious weed.

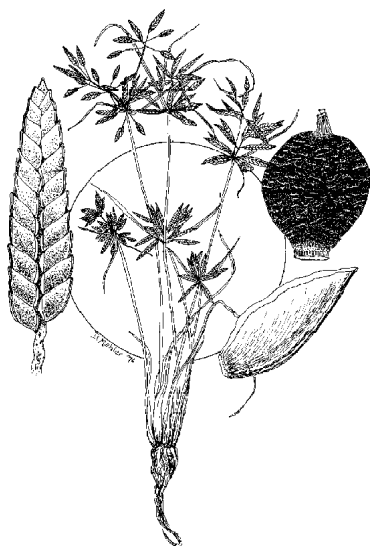
Cyperus hystricinus Fernald, (porcupine-like, bristly). Perennial to 1 m tall; rhizomes thick, to 1.5 cm long; leaf blades 4-6 mm wide; spikelets golden brown; lower spikelets markedly reflexed and appearing ± drooping around the peduncle. Xeric sandy soils; Henderson and Tarrant cos. (Tucker 1984); mainly se TX. Summer-fall. [*C. retrofractus* (L.) Torr. var. *hystricinus* (Fernald) Kük.]

Cyperus involucratus Rottb., (with an involucre), UMBRELLA-PLANT, UMBRELLA FLAT SEDGE. Perennial to 1.5 m tall; bracts very numerous (10-25) and very long (15-40 cm). Widely cultivated, persists, and spreads; Tarrant Co. Summer-fall. Native of Old World, probably Africa or Madagascar. [*C. alternifolius* of authors, not L., *C. alternifolius* L. subsp. *flabelliformis* (Rottb.) Kük., *C. flabelliformis* Rottb.] Baijnath (1975) discussed nomenclature for this species. ☞

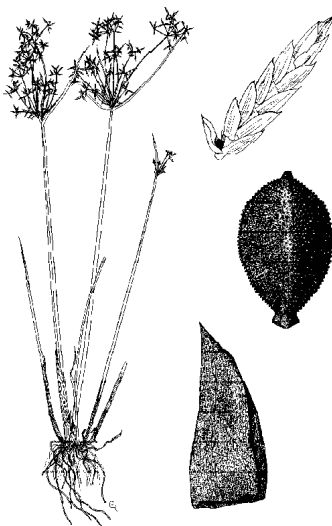
Cyperus lanceolatus Poir., (lanceolate, lance-shaped). Tufted or mat-forming perennial 5-50 cm tall; spikelets straw-colored or sometimes with an olivaceous tinge, but without darker splotch. Included based on citation of vegetational area 5 (Fig. 2) by Hatch et al. (1990) but possibly not present in nc TX (S.D. Jones, pers. comm.); also Central Mineral Region just s of nc TX (Correll & Johnston 1970). Sep. [*C. lanceolatus* var. *compositus*] Presl & C. Presl]

Cyperus lupulinus (Spreng.) Marcks, (resembling *Humulus lupulus*—hops), SLENDER FLAT SEDGE. Tufted perennial 15-50 cm tall, with hard swollen culm bases, often developing short knotty rhizomes; inflorescences typically of a single nearly spherical head or sometimes with a few peduncles bearing small heads; spikelets gray-green. Sandy open woods; Grayson, Kaufman, and Tarrant cos.; widely scattered in TX. May-Jun, occasionally to Sep. [*C. filiculis* of authors, not Vahl—Marks 1974]

Cyperus odoratus L., (fragrant), FRAGRANT FLAT SEDGE. Tufted annual or perennial 5-60 cm tall; spikelets at maturity dull reddish to brownish; spikelet axis separating at maturity at the floret nodes (because this is not always evident in young material, *C. odoratus* can also be reached in



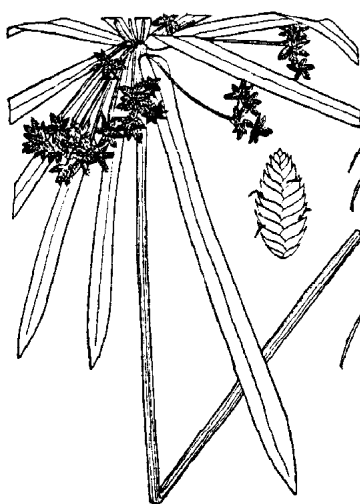
Cyperus flavescens [BR2]



Cyperus haspan [GWO]



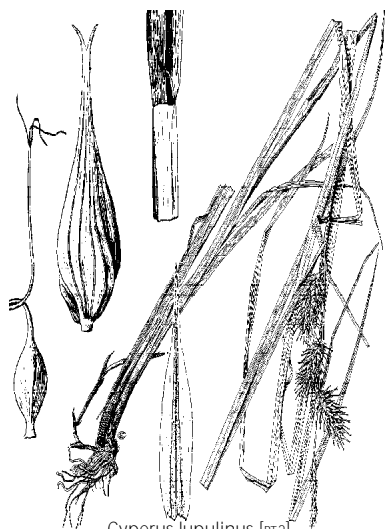
Cyperus hystericinus [BB2]



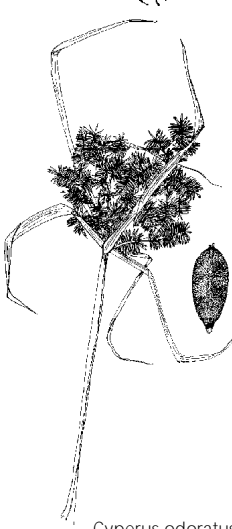
Cyperus involucratus [BA1, BR2]



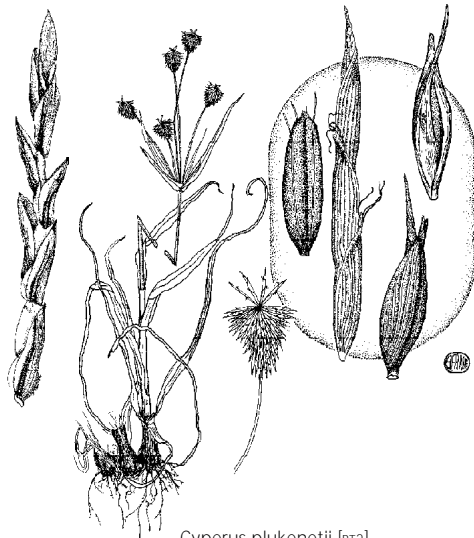
Cyperus lanceolatus [HEA]



Cyperus lupulinus [BR2]



Cyperus odoratus [BR2]



Cyperus plukenetii [BR2]

the key without recognizing this character); scales relatively small, 1.5–2.5 mm long; achenes (1–) 1.2–1.5(–1.9) mm long. Stream banks or moist areas; abundant in all parts of TX. Jun–Oct. [*C. engelmannii* Steud., *C. ferruginescens* Boeck., *C. odoratus* var. *engelmannii* (Steud.) R. Carter, S.D. Jones, & Wipff, *C. odoratus* var. *squarrosus* (Britt.) S.D. Jones, J. Wipff, and R. Carter] This is one of the most common *Cyperus* species in nc TX. It is often treated as a single variable species (Correll & Johnston 1970; Kartesz 1994; Tucker 1994); Tucker (1983, 1987) for example, indicated that there was not a single consistent character separating *C. engelmannii* from *C. odoratus* and that the two intergrade extensively. Correll and Johnston (1970) indicated concerning *C. odoratus* that “... it is impossible to distinguish segregate taxa.” Given that the varieties overlap morphologically and are mostly sympatric, treatment as a variable species without infraspecific taxa is possibly best. Jones et al. (1996), however, recognized the following three varieties indicating that “We find these three taxa closely related and mostly sympatric, but discrete. Although some intermediates exist, they are relatively few. Considering their distinct morphologies, we believe that varietal rank under *C. odoratus* is warranted. ...” The following key is from Jones et al. (1996) modified from O’Neill (1940).

1. Scales near the middle of the spikelet (2.7–)2.8–3.2 mm long; rachilla wings reaching or covering the shoulders of the achene; achenes (1.2–)1.3–1.5 mm long, (0.5–)0.6–0.7 mm wide; spikelets brownish _____ var. *odoratus*
1. Scales near the middle of the spikelet (2–)2.3–2.5(–2.6) mm long; rachilla wings rarely reaching and never covering the shoulders of the achene; achenes 0.8–1(–1.1) mm long, (0.3–)0.4–0.5 mm wide; spikelets reddish.
 2. Tip of scale reaching only to base of the scale next above and on the same side of the rachis _____ var. *engelmannii*
 2. Tip of scale conspicuously reaching over the base of the scale next above on the same side of the rachis _____ var. *squarrosus*

Cyperus plukenetii Fernald, (for Leonard Plukenet, 1642–1704, one of the original describers and illustrators of American plants). Tufted perennial 30–100 cm tall; culm bases hard, swollen, sometimes developing short knotty rhizomes; culms rough to the touch, with minute antrorse teeth; lower spikelets appearing to droop around the peduncle. Sandy woods; Henderson and Limestone cos., also Dallas Co. (S.D. Jones, pers. comm.); se and e TX w to e Blackland Prairie. Jun–Sep.

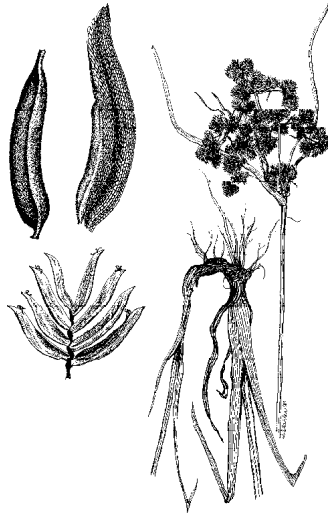
Cyperus polystachyos Rottb., (many-spiked). Tufted perennial; culms ca. 3–35 cm long; inflorescences variable, with 1–8(–12) main peduncles terminated by clusters of spikelets or clusters sometimes sessile or sometimes inflorescences secondarily branched; spikelets sessile to short-stalked, sometimes diverging ± at right angles from the axis, sometimes ± strongly ascending. Stream banks, moist sand; Hopkins and Limestone cos. on e margin of nc TX; mainly se and e TX. Spring–fall. [*C. polystachyos* Rottb. var. *texensis* (Torr.) Fernald] We are following Jones et al. (1997) in lumping var. *texensis*.

Cyperus pseudovegetus Steud., (false vigorous). Tufted perennial; inflorescences usually with 3–10 main peduncles terminated by head-like clusters of spikelets, sometimes secondarily branched; spikelets small, 2.5–4 mm long; scales essentially linear, conspicuously sickle-shaped, when spread out 0.6–0.7 mm wide; leaves usually with knot-like septa visible under a hand lens; achenes linear, 1.0–1.3 mm long, maturing brownish. Sandy soils; se and e TX w to Grayson and Parker cos. Jun–Oct. [*C. virens* Michx. var. *arenicola* (Boeck.) Shinnery]

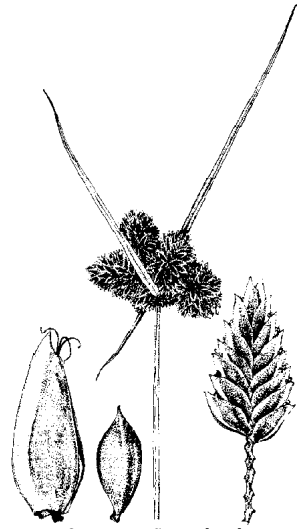
Cyperus reflexus Vahl, (bent back), BENT-AWN FLAT SEDGE. Perennial with creeping rhizomes, similar to *C. acuminatus* (which however, has S-shaped scales) and *C. pseudovegetus* (which however, has much narrower scales); scales ca. 1.1 mm wide when spread out, often reddish



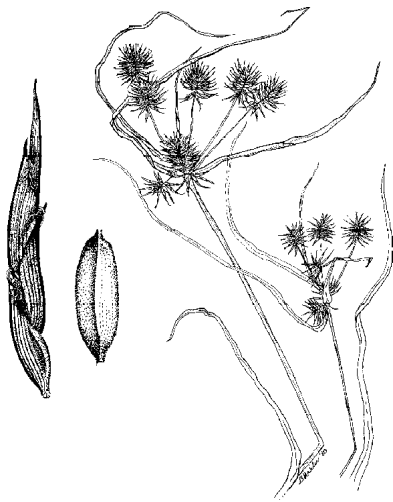
Cyperus polystachyos [cwo]



Cyperus pseudovegetus [br2]



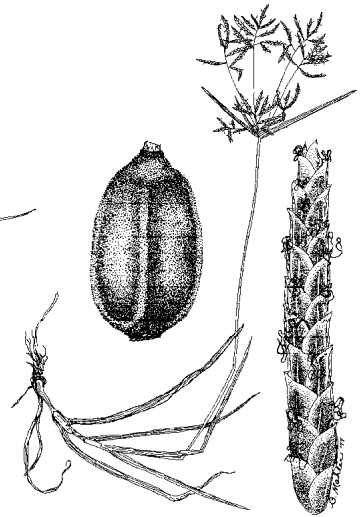
Cyperus reflexus [cum]



Cyperus retroflexus [br2]



Cyperus retrorsus [co1]



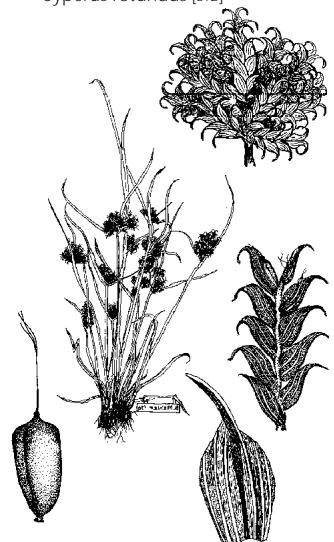
Cyperus rotundus [br2]



Cyperus schweinitzii [bb2]



Cyperus setigerus [gle]



Cyperus squarrosus [br2]

with greenish keels, straight at base but curved at tip; achenes pale brown, 0.9–1.2 mm long. Moist sand; Denton Co., also Bell and Henderson cos. (S.D. Jones, pers. comm.); mostly se and e TX, also Edwards Plateau. Spring–summer. [*C. reflexus* var. *fraternus* (Kunth) Kuntze]

Cyperus retroflexus Buckley, (reflexed), ONE-FLOWER FLAT SEDGE. Tufted perennial usually 3–35(–60) cm tall; scales at maturity often deep red-brown with prominent green keel. Sandy open woods or prairies; throughout TX. May–Oct. [*C. retroflexus* var. *pumilus* (Britt.) R. Carter & S.D. Jones, *C. uniflorus* Torr. & Hook., not Thunb., *C. uniflorus* var. *pumilus* Britt., *C. uniflorus* var. *retroflexus* (Buckley) Kük.] Intraspecific taxa are often not recognized in this species (e.g., O'Neill 1942; Kartesz 1994; Tucker 1994) and given the extensive overlap in morphological characters between the varieties and the lack of geographical isolation, treatment as a variable species without infraspecific taxa is possibly best. However, the following varieties were recognized by Carter and Jones (1997). They indicated that despite “overlap in virtually every characteristic we examined,” when combinations of characteristics were used, most specimens could be identified to variety. According to S.D. Jones (pers. comm.), both varieties occur throughout nc TX, but var. *retroflexus* is by far the most common. The following key is from Carter and Jones (1997).

1. Fertile floral scales 1.9–3.0(–3.3) mm long; rachilla wing usually membranaceous throughout; rachilla usually lacking lateral nerves; longest spikelets 2.2–5.8(–8) mm long; terminal sterile floral scale of spikelet often much reduced, less than 2/3 the length of fertile floral scales; longest peduncle less than 2.7(–3.9) cm long; plants diminutive, 3–35(–45) cm tall _____ var. *pumilus*
1. Fertile floral scales (2.8–)3.0–3.9 mm long; rachilla wing usually chartaceous beyond clasped achene angle, border membranaceous; rachilla usually with two lateral nerves, one along each side of median; longest spikelets 4.9–9(–11.3) mm long; terminal sterile floral scale usually not greatly reduced, 2/3 or more the length of fertile floral scales; longest peduncle (0.5–)2.4–6.8 cm long; except for depauperate specimens, plants usually greater than 25(–57) cm tall _____ var. *retroflexus*

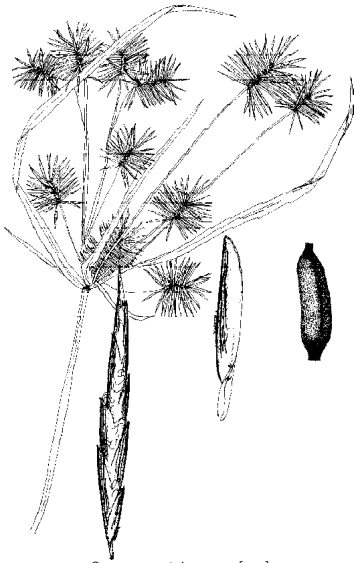
Cyperus retrorsus Chapm., (twisted or turned backward). Tufted perennial; spikes extremely densely cylindric or subcylindric, 6–8(–10) mm broad by 7–18 mm long, more than 1/4 longer than broad. Ditches, roadsides, open woods, usually in sandy soils; se and e TX w to West Cross Timbers. Jun–Oct. Because of indistinct boundaries even between species within this complex, we are not recognizing infraspecific taxa within *C. retrorsus*. [*C. ovularis* (Michx.) Torr. var. *cylindricus* (Elliott) Torr., *C. globulosus* Aubl. var. *robustus* (Boeck.) Shinnery]

Cyperus rotundus L., (round), NUT-GRASS, NUT SEDGE, COCO-GRASS, PURPLE NUT-GRASS. Deeply rhizomatous perennial 7–50 cm tall, forming colonies; rhizomes at intervals with tube-like thickenings; each cluster of inflorescence with 2–12 spikelets; spikelets 4–40 mm long, dark red-brown to purplish. Disturbed waste or lawn areas; widespread in TX. May–Oct. Native of the Old World. Often a pernicious weed and sometimes referred to as “the world’s worst weed” (Mabberley 1987). ☞

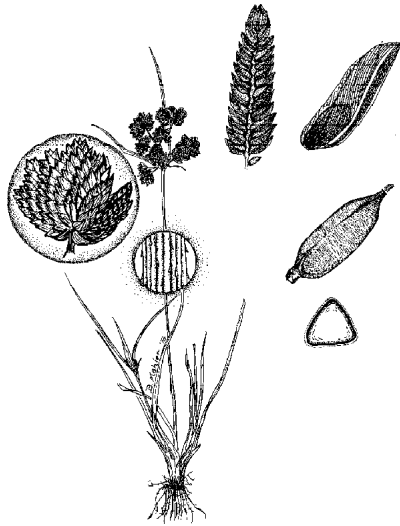
Cyperus schweinitzii Torr., (for its discoverer, Lewis David von Schweinitz, 1780–1834, German-born Pennsylvania clergyman and student of fungi), SCHWEINITZ’ FLAT SEDGE. Tufted perennial 15–45(–80) cm tall; achenes dark-brown. Deep sands; included based on citation of vegetational area 5 (Fig. 2) by Hatch et al. (1990); also Plains Country and Trans-Pecos (Correll & Johnston 1970). Spring and summer. According to S.D. Jones (pers. comm.), this species does not occur in nc TX.

Cyperus setigerus Torr. & Hook., (bearing bristles). Perennial 40–110 cm tall with shallow creeping rhizomes, forming small colonies; spikelets reddish brown. Stream or pond banks, low areas; widespread in TX. May–Sep.

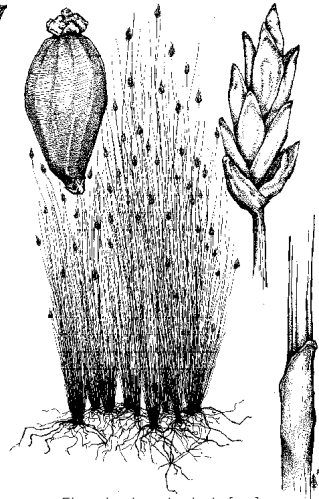
Cyperus squarrosus L., (with recurved tips), BEARDED FLAT SEDGE. Tufted annuals 1–20 cm tall, with persistent odor, like coffee-and-chicory or curry powder; inflorescences of 1–3 heads, es-



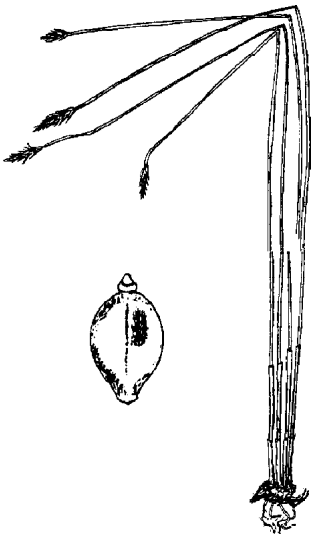
Cyperus strigosus [BT2]



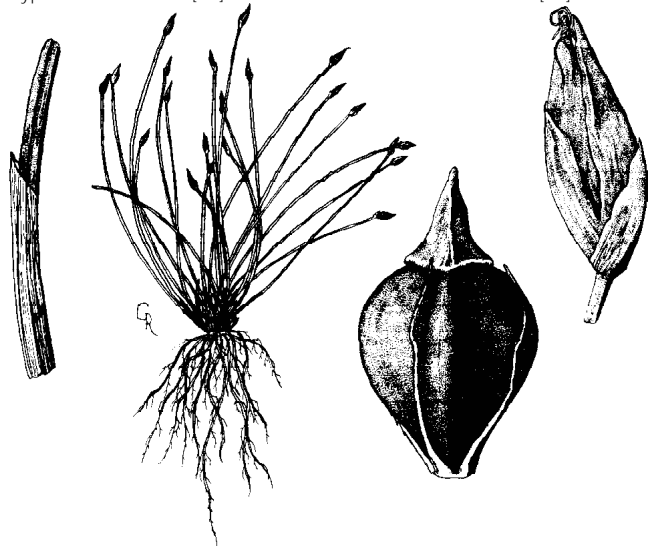
Cyperus surinamensis [BT2]



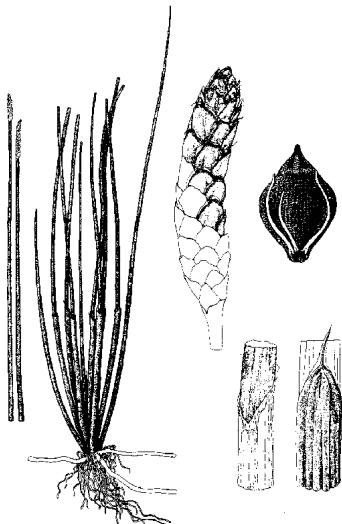
Eleocharis acicularis [BT2]



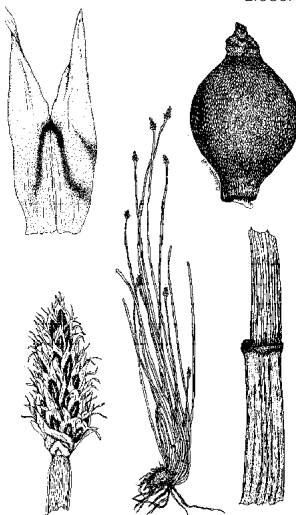
Eleocharis acutisquamata [RH0]



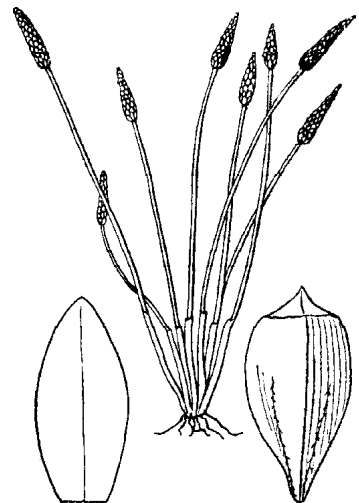
Eleocharis baldwinii [GWO]



Eleocharis cellulosa [GWO]



Eleocharis compressa [BT2]



Eleocharis engelmannii [ABR]

sentially sessile; scale tips prominently recurved. Disturbed soils, sand; Bell, Bosque, Dallas, Grayson, Hood, Parker, and Tarrant cos.; nearly throughout TX. Jun–Jul. [*C. aristatus* Rottb.]

***Cyperus strigosus* L.**, (strigose, with straight appressed hairs bent at base), FALSE NUT-GRASS. Tufted perennial 10–110 cm tall, without rhizomes; spikelets usually pinnately arranged in often rather loose elongate spikes, the spike axis visible; scales 3.75–4.5 mm long. Low sandy soils; e 1/2 of TX. Jun–Oct.

***Cyperus surinamensis* Rottb.**, (of Surinam), TROPICAL FLAT SEDGE. Tufted perennial, short-lived, flowering first year, 10–40(–80) cm tall; culms rough to the touch, with minute retrorse teeth. Low moist areas; Grayson and Tarrant cos., also Dallas Co. (Lipscomb 1978a), also Williamson Co. (S.D. Jones, pers. comm.); s and se TX n to nc and e TX. Jul–Nov.

Cyperus bipartitus Torr., (two-parted), is cited by Hatch et al. (1990) for vegetational area 4 (Fig. 2) but apparently occurs only to the s and e of nc TX. This species can be distinguished from the similar *C. flavescens* as follows: scales yellow with large blotches of chestnut or purplish brown, rarely entirely purplish. [*C. rivularis* Kunth, *C. niger* Ruiz & Pavon var. *rivularis* (Kunth) V.E. Grant]

Cyperus digitatus Roxb., (finger- or hand-like) FINGER FLAT SEDGE, is cited by Hatch et al. (1990) for vegetational area 4 (Fig. 2) but apparently occurs only to the s and e of nc TX. It differs from *C. erythrorhizos* as follows: internodes of spikes 0.6–2 mm long; scales 1.5–2 mm long.

Cyperus ochraceus Vahl, (ochre-colored), is cited by Hatch et al. (1990) for vegetational area 4 (Fig. 2) but apparently occurs only to the s and e of nc TX. This species can be distinguished from *C. pseudovegetus* and *C. reflexus* as follows: scales broader when spread out, 1.5–1.9 mm wide; achenes maturing nearly black, 1.3–1.5 mm long.

ELEOCHARIS SPIKE-RUSH

Culms (= stems) green and glabrous, flat, round, or angled, with leaf sheaths present on basal part; leaf blades absent; inflorescence a single terminal spikelet at the end of a usually elongate culm (hence name SPIKE-RUSH); scales of spikelets spirally arranged (\pm 2-ranked in 1 species—*E. baldwinii*); perianth of bristles or absent; achenes with a tubercule (= hardened persistent style).

☛ A cosmopolitan genus of ca. 120 species; *E. dulcis* (Burm. f.) Hensch. (WATER-CHESTNUT), native to the Old World tropics, is often used in Chinese cuisine. (Greek: *elos*, marsh, and *charis*, grace; many species being marsh plants)

REFERENCES: Fernald & Brackett 1929; Svenson 1929, 1939, 1953, 1957; Drapalik & Mohlenbrock 1960; Harms 1968, 1972; González-Elizondo & Peterson 1997.

1. Scales of spikelets with long-pointed scarious tip (often split in two).
 2. Culms usually several-angled or -ribbed, not strongly flattened, 0.3–0.8 mm wide; widespread in nc TX _____ ***E. acutisquamata***
 2. Culms strongly flattened, to 1.5 mm wide; apparently erroneously reported for nc TX, questionably present in deep e TX _____ ***E. compressa***
1. Scales of spikelets with rounded or broadly short-pointed tip (sometimes split).
 3. Spikelets tiny, 1–2 mm thick in flower excluding styles or stamens, 2–7 mm long, with 2–15 scales; culms thread-like.
 4. Scales \pm 2-ranked, the spikelets flattish; tubercle ca. 1/3 or more the length of the achene body; rare, known locally only from e margin of nc TX _____ ***E. baldwinii***
 4. Scales spirally arranged, the spikelets not flattish; tubercle smaller (1/4 or less the length of the achene body) or not distinct; widespread in nc TX.

5. Achene body with 6–9 ribs or ridges running lengthwise with fine perpendicular lines between ribs _____ **E. acicularis**
5. Achene body smooth, without ribs, ridges, or lines.
6. Tubercle not differentiated from achene body, blending into achene body so that the junction is not visible (appearing as though tubercle not present); achene body gray to black at maturity, 0.8–1.5 mm long; widespread in nc TX _____ **E. parvula**
6. Tubercle constricted basally, well-differentiated from achene body, the junction with achene body clearly visible; achene body pearly white to pale greenish gray, 0.5–0.6 mm long; rare, known in nc TX only from Lamar Co. in Red River drainage _____ **E. microcarpa**
3. Spikelets 1.8–5 mm thick in flower, 3–25 mm or more long, with (3–)15–90 or more scales; culms coarsely thread-like, wiry, or thick.
7. Culms 2–5 mm wide; spikelets of roughly the same diam. at the supporting culm.
8. Culms conspicuously quadrangular (= square in cross-section) _____ **E. quadrangulata**
8. Culms not quadrangular.
9. Culms strongly flattened to ± rounded, 0.9–3 mm wide; spikelets 8–25 mm long; scales usually acute; styles 2-branched; body of achenes 1.2–1.8 mm long, the tubercle basally constricted, distinct from the achene body, the junction between the 2 clear _____ **E. palustris**
9. Culms ± rounded, 2–5 mm wide; spikelets 19–36(–50) mm long; scales obtuse; styles 3-branched; body of achenes ca. 2 mm long, the tubercle ± appearing as a continuation of the achene body, not at all constricted basally _____ **E. cellulosa**
7. Culms 2 mm or less wide; spikelets distinctly thicker than the supporting culm.
10. Plants annuals with only fleshy-fibrous roots, pulled up easily.
11. Scales definitely acute (= pointed); spikelets lanceolate, acuminate _____ **E. lanceolata**
11. Scales obtuse; spikelets lanceolate to broadly ovoid to ovoid-cylindric, acute to obtuse.
12. Tubercle (= hardened persistent style) much narrower than summit of achene body, 0.1–0.2 mm wide, somewhat constricted basally and thus slightly separated from achene body, light-colored; styles 2-branched _____ **E. geniculata**
12. Tubercle nearly as broad as summit of achene body, 0.5–1 mm wide, in outline merging with achene body, dark-colored; styles 2- or 3-branched.
13. Spikelets globose-ovoid or oblong-ovoid and obtuse, mostly 3–12 mm long; bristles mostly surpassing the tubercule; tubercule 1/3–nearly 1/2 as high as achene body _____ **E. obtusa**
13. Spikelets mostly cylindrical and acute, usually 6.0–18.0 mm long; bristles shorter than to barely reaching tip of tubercule; tubercle short, not more than 1/4 as high as achene body _____ **E. engelmannii**
10. Plants perennials with rhizomes, often very difficult to pull up (and underground parts often lost).
14. Plants often very small, 2–7(–12) cm tall; tubercle not differentiated from achene body, blending into achene body so that the junction is not visible (appearing as though tubercle not present); scales (and thus flowers) 3–8(–20) per spikelet _____ **E. parvula**
14. Plants usually much larger; tubercle well-differentiated from achene body, the junction with achene body clearly visible; scales (and thus flowers) 15–90(–110) per spikelet.
15. Spikelets longer, at least (8–)10 mm long in flower, to 25 mm long in age; scales ± acute, 40–100 per spikelet; plants to 120 cm tall; achenes biconvex; style branches 2 _____ **E. palustris**
15. Spikelets shorter, 3–9 mm long in flower, to 14 mm long in age; scales obtuse, 15–70(–110) per spikelet; plants 50 cm or less tall; achenes trigonous (in species widespread in nc TX) OR biconvex (in species rare in nc TX); style branches 2 or 3.

16. Achenes biconvex, reddish just before maturity, maturing to black or dark purplish black; style branches 2; scales (and thus flowers) 15–25 per spikelet; plant rare, in nc TX known only from Lampasas Co. _____ **E. flavescens**
16. Achenes trigonous, ripening through yellow to brown or dark brown; style branches 3; scales (and thus flowers) 24–70(–110) per spikelet; plant wide-spread in nc TX _____ **E. montevidensis**

Eleocharis acicularis (L.) Roem. & Schult., (needle-shaped), REVERCHON'S SPIKE-RUSH, NEEDLE SPIKE-RUSH. Small perennial 2–23 cm tall, often forming mats; spikelets with 5–15 scales (and thus flowers), 2–5 mm long; achene body trigonous, 0.5–0.7 mm long, pearly white; tubercle small. Damp soils; Dallas Co.; scattered in TX. May–Jun, sporadically to Oct. [*E. reverchonii* Svenson]

Eleocharis acutisquamata Buckley, (with sharp-pointed, small, scale-like bracts or leaves), SHARP-SCALE SPIKE-RUSH. Rhizomatous perennial, forming mats; rhizomes 2–4(–6) mm thick; culms slender, 8–28 cm tall; spikelets 3–11 mm long, narrowly oblong or cylindrical to narrowly elliptic, with 24–44 scales; achene body trigonous, 0.9–1.2 mm long, yellow to golden-brown; tubercle small. Pond margins or low areas of prairies, calcareous soils; mainly nc TX and Edwards Plateau. Late Mar–May.

Eleocharis baldwinii (Torr.) Chapm., (for its discoverer, William Baldwin, 1779–1819, Pennsylvania botanist and physician). Delicate tufted annual or perennial [?], stoloniferous, mat-forming; culms thread-like, 3–20 cm tall; spikelets flattish, 2–7 mm long, with few (2–4(–10)) scales, sometimes proliferating; cleistogamous spikelets often present at base of plant; scales of spikelet ± 2-ranked, folded from the midrib and thus boat-like; achenes trigonous, with body ca. 0.5–0–0.8 mm long, whitish buffy to olive, grayish olive, or brownish olive; tubercle conic-subulate, 0.2–0.3 mm long. Wet areas; Henderson Co., also Milam Co. (S.D. Jones, pers. comm.). Summer–fall. [*E. capillacea* of authors, not Kunth]

Eleocharis cellulosa Torr., (from the cellular surface of the achene), GULFCOAST SPIKE-RUSH. Tufted perennial; culms erect to 80 cm tall; spikelets cylindrical, to 1.9–3.6(–5) cm long and 3.5–5 mm thick, with many scales; achene body biconvex, ca. 2 mm long, light brown; tubercle not at all basally constricted, appearing as a continuation of the achene body. Mud; Grayson Co., also Burnet Co. (S.D. Jones, pers. comm.); also se TX and Edwards Plateau. Spring–fall.

Eleocharis compressa Sull., (flattened), COMPRESSED SPIKE-RUSH. Similar to *E. acutisquamata*; rhizomatous perennial 9–20 cm tall, forming mats; spikelets 5–12 mm long, with 20–40 scales, ovoid to narrowly ovoid; achene body trigonous, ca. 1 mm long, yellow to golden-brown; tubercle small. Loamy usually moist soils; reported from Dallas by Svenson (Mahler 1988); e TX[?]. According to S.D. Jones (pers. comm.), *E. compressa* is a species to the e and n that apparently does not reach TX; he indicated that TX material identified as *E. compressa* is actually *E. acutisquamata*. Brown and Marcus (1998) also did not find any TX material of *E. compressa* and indicated that all specimens examined were referable to *E. acutisquamata*.

Eleocharis engelmannii Steud., (for George Engelmann, 1809–1884, German-born botanist and physician of St. Louis), ENGELMAN'S SPIKE-RUSH. Included based on citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990); not reported for other parts of TX. [*E. obtusa* var. *detonsa* (A. Gray) Drapalik & Molenbrock; *E. ovata* (Roth) Roem. & Schult. var. *engelmannii* (Steud.) Britton] This species has sometimes been lumped with *E. obtusa* (e.g., Mahler 1988).

Eleocharis flavescens (Poir.) Urb., (yellowish), PALE SPIKE-RUSH. Perennial by elongate rhizomes 0.5–1 mm thick, delicately mat forming; culms 4–35 mm tall; spikelets 3–6 mm long; achene body biconvex, 0.6–1 mm long, reddish just before maturity, maturing to black or dark purplish

black; tubercle small. Wet areas; Lampasas Co. in Lampasas Cut Plain (S.D. Jones, pers. comm.); mainly se and e TX and Edwards Plateau. Spring-fall. [*E. flaccida* (Rchb.) Urb.] Similar to and can be confused with the annual *E. geniculata* (which has the summit of the leaf sheaths firm and opaque versus thin-membranous and hyaline in *E. flavescens*).

Eleocharis geniculata (L.) Roem. & Schult., (jointed, bent like the knee), Tufted annual 4–40 cm tall; spikelets 3–6 mm long, ovoid to broadly ovoid, usually of 28–50 scales; achene body biconvex, 0.7–1 mm long, black or purplish black; tubercle small. Moist calcareous soils; in much of TX. Summer and fall. [*E. caribaea* of authors, not (Rottb.) S.F. Blake]

Eleocharis lanceolata Fernald, (lanceolate, lance-shaped), LANCE-SPIKE SPIKE-RUSH. Tufted annual 10–20 cm tall; spikelets with 30–80 scales; achene body biconvex, 0.9–1.1 mm long, brownish; tubercle not basally constricted, merging in outline with achene body. Sandy soils; Grayson (Correll & Johnston 1970) and Lamar (Carr 1994) cos.; also Bowie (Correll & Johnston 1970) and Red River cos.; apparently very rare in TX. Summer. [*E. obtusa* (Willd.) Schult. var. *lanceolata* (Fernald) Gilly]

Eleocharis microcarpa Torr., (small-fruited), SMALL-SEED SPIKE-RUSH. Tufted annual; culms thread-like, 10–30 cm tall; spikelets 1.5–5 mm long, sometimes proliferous; achene body 0.5–0.6 mm long, pearly white to pale greenish gray; tubercle small. Wet areas; Lamar Co. (Carr 1994) in Red River drainage; se and e TX, also Edwards Plateau and Rolling Plains. Spring-fall.

Eleocharis montevidensis Kunth, (presumably of Montevideo, Uruguay), Rhizomatous perennial 10–50 cm tall; spikelets 3–14 mm long, variable in shape, with 24–70(–110) scales; scales often dark brownish purple, obtuse; achene body trigonous, 0.8–1.2 mm long, yellow to golden-brown; tubercle ± conic. Low ground, sandy or clay soils; nearly throughout TX. Late Mar–early Jun. [*E. arenicola* Torr.]

Eleocharis obtusa (Willd.) Schult., (obtuse, blunt), BLUNT SPIKE-RUSH. Tufted annual 3–50 cm tall; spikelets ca. 3–12 mm long, usually broadly ovoid to nearly cylindrical, usually with 50–100 scales; achene body biconvex, 0.8–1.5 mm long, pale to dark brown; tubercle nearly as wide as summit of achene. Moist sandy soils, pond margins; e TX w to Grayson and Tarrant cos.; also Edwards Plateau. Late Apr–Oct.

Eleocharis palustris (L.) Roem. & Schult., (of marsh), LARGE-SPIKE SPIKE-RUSH, CREEPING SPIKE-RUSH. Rhizomatous perennial 15–60 cm tall; culms round to strongly compressed; spikelets 8–25 mm long, with 40–100 scales; achene body biconvex, usually more turgid on 1 side, 1.2–1.8 mm long, yellow to golden-brown; tubercle 0.3–0.7 mm long, basally constricted. Wet soils or shallow water, sometimes extremely abundant; nearly throughout TX. May–Jun, sporadically to Oct. [*E. macrostachya* Britton; *E. xyridiformis* Fernald & Brackett] The complex that has been treated as *E. palustris* or *E. macrostachya* is quite confusing and is in need of taxonomic work. We are following Kartesz (1994), Jones et al. (1997), and S.G. Smith (pers. comm.) in using the name *E. palustris*. While one taxon, *E. xyridiformis*, is here lumped, another, *E. erythropoda* Steud. [= *E. calva* Torr.], is possibly a good species. According to Taylor and Taylor (1994), *E. erythropoda* is widely distributed in OK and while we have seen no specimens, it is therefore likely present in nc TX. According to S.D. Jones (pers. comm.), *E. erythropoda* is present in the Rolling Plains and along the TX-LA border. Galen Smith (pers. comm.) indicated that *E. erythropoda* and *E. palustris* intergrade; the two can be distinguished as follows:

1. Culms round in cross-section or nearly so; sterile scale at base of spikelet only 1, this completely encircling the base of the spikelet; spikelets < 15 mm long; anthers 1.2–1.5 mm long _____ *E. erythropoda*
1. Culms strongly flattened to round in cross-section; sterile scales at base of spikelets 1–3, the lowest often not encircling the base of the spikelet; spikelets (8–)10–25 mm long; anthers 1.6–2.1 mm long _____ *E. palustris*

Eleocharis parvula (Roem. & Schult.) Link ex Bluff, Nees & Schauer, (very small), DWARF SPIKE-RUSH. Plant of ten very small, 2-7(-12) cm tall; rhizomes or stolons short, plants forming mats in mud; spikelets of ten very small, 2-5(-9) mm long; achene body trigonous, 0.8-1.5 mm long including confluent tubercle, gray to black; tubercle scarcely recognizable as separate except under high magnification. In mud; nearly throughout TX. Spring, fall. [*E. parvula* var. *anachaeta* (Torr.) Svenson]

Eleocharis quadrangulata (Michx.) Roem. & Schult., (four-angled), SQUARE-STEM SPIKE-RUSH. Coarse perennial; culms erect, to 80(-150) cm tall, distinctly 4-sided; spikelets cylindric, 20-42 mm long, with 40-90 scales; achene body biconvex, ca. 2 mm long, yellowish brown, reticulate; tubercle longer than broad, constricted basally. Mud, lake margins; Grayson, Lamar, and Tarrant cos., also Denton Co. (G. Dick, pers. comm.) and Fort Hood (Bell or Coryell cos.—Sanchez 1997); mainly e TX. Late spring-fall. [*E. quadrangulata* var. *crassior* Fernald]

FIMBRISTYLIS

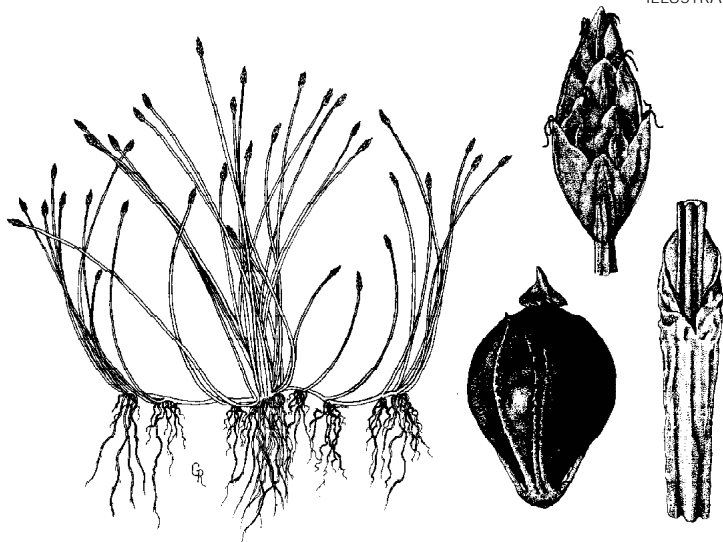
Annuals or perennials; leaves filiform to linear; inflorescences of peduncled or sessile spikelets, often subtended by a leafy involucre; scales of spikelets spirally imbricate; flowers perfect; perianth none; stamens 1-3.

☛ A genus of ca. 150-250 species depending on circumscription; some species are used as copper indicators or for their fiber; *Bulbostylis* sometimes included. (Latin: *fimbria*, a fringe, and Greek: *stylos* pillar, column, or style, from the style being fringed with hairs in some species) REFERENCES: Kral 1971; Kolstad 1986a.

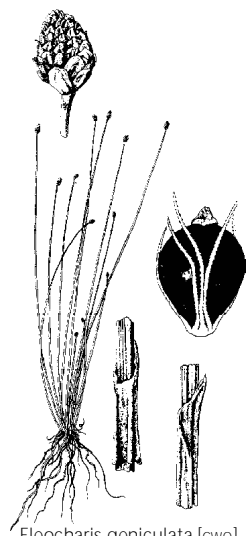
1. Styles 3-branched; achenes trigonous or not; spikelets usually 2-7 mm long.
 2. Spikelets lanceolate to linear-oblong, usually 3-7 mm long, apically acute; scales of spikelets acute to acuminate; ligules of short hairs present; achenes trigonous, the surfaces not reticulate or only faintly so, smooth or warty especially at base _____ **F. autumnalis**
 2. Spikelets usually ovoid to nearly round, 2-4 mm long, apically rounded; scales of spikelets obtuse; ligules absent; achenes not trigonous or only obscurely so, obovoid, the surfaces reticulate and usually warty _____ **F. miliacea**
1. Styles 2-branched; achenes lenticular to biconvex or obovoid; spikelets 3-10 mm long.
 3. Spikelets (at least 1 or more) peduncled; achenes 1 mm or more long; plants annual or perennial, to 1 m tall; leaves narrowly linear.
 4. Plants caespitose (= tufted or clumped) annuals; spikelet apex acute; achenes longitudinally and horizontally (less distinct) ribbed, often warty; ligules of short hairs present _____ **F. annua**
 4. Plants perennials with culms solitary or a few together; spikelet apex obtuse to acute; achenes minutely reticulate, usually without either conspicuous ribs or warts; ligules inconspicuous to absent OR of short hairs _____ **F. puberula**
 3. Spikelets sessile, all close together in a capitate cluster; achenes ca. 0.5-0.7 mm long; plants low growing annuals to 15 cm tall; leaves filiform _____ **F. vahlii**

Fimbristylis annua (All.) Roem. & Schult., (annual). Caespitose annual; culms decumbent, ascending, or erect, to 50 cm tall; leaves narrowly linear, 1-2(-4) mm wide; spikelets lance-ovoid to ovoid to oblong, 3-8 mm long, apically acute; achenes 1-1.3 mm long. Weedy areas; Dallas Co.; mainly e TX and Edwards Plateau. Oct. [*F. baldwiniana* (Schult.) Torr., *Scirpus annuus* All.]

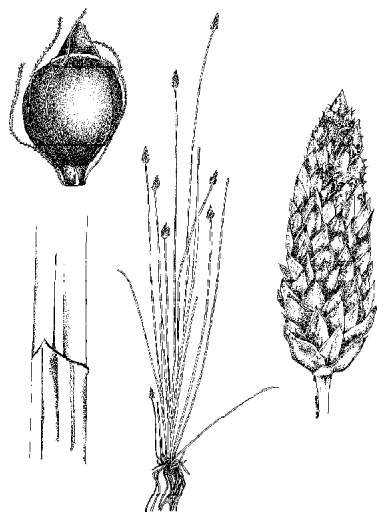
Fimbristylis autumnalis (L.) Roem. & Schult., (autumnal, of the fall), SLENDER FIMBRISTYLIS. Caespitose annual, 5-20 cm tall; leaves linear, to 4 mm wide; achenes ca. 1 mm long. Moist or wet, often sandy areas; e TX w to West Cross Timbers; also Edwards Plateau. (Jun-)Jul-Nov. [*Scirpus autumnalis* L.]



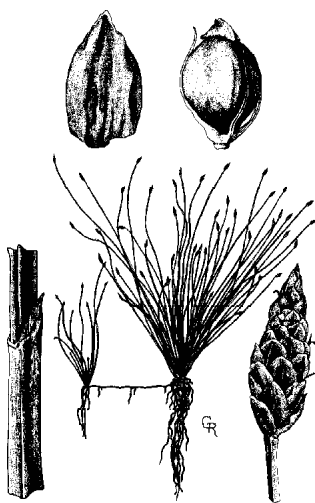
Eleocharis flavescens [gwo]



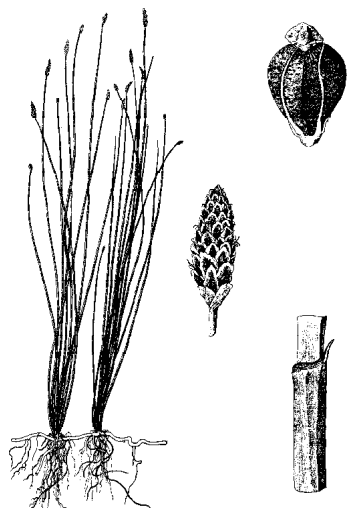
Eleocharis geniculata [gwo]



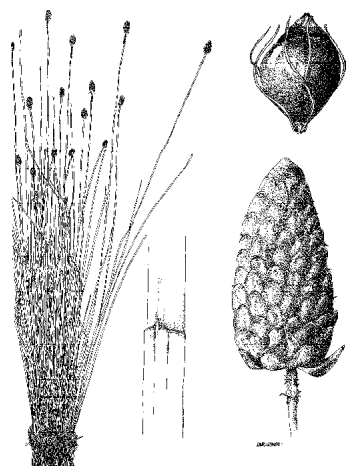
Eleocharis lanceolata [B12]



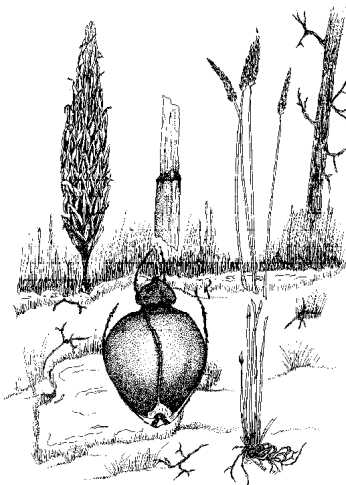
Eleocharis microcarpa [gwo]



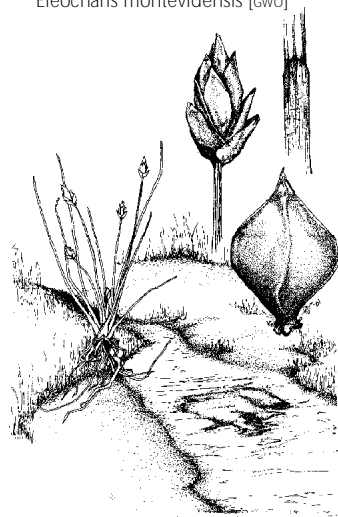
Eleocharis montevidensis [gwo]



Eleocharis obtusa [B12]



Eleocharis palustris [B12]



Eleocharis parvula [B12]

Fimbristylis miliacea (L.) Vahl, (resembling *Milium*—millet), GLOBE FIMBRISTYLIS. Cespitose annual to 50(–100) cm tall; achenes ca. 1 mm long. Sandy areas; Delta, Lamar, Hopkins, and Red River cos. (S.D. Jones, pers. comm.); mainly e TX. Aug.–Oct. Native of Asia. [*Scirpus miliaceus* L.] Kral (1971) indicated, “The history of introduction of this weed into the U.S.A. probably parallels that of rice, in that it is a common species of the rice growing countries of the Orient.” 🌾

Fimbristylis puberula (Michx.) Vahl, (somewhat pubescent). Glabrous perennial 15–60(–100) cm tall; culms solitary or in small tufts; leaves basal; inflorescences umbel-like; spikelets ± ovoid; achenes to 1.8 mm long. Sandy prairies, open woods, often in wet areas. The following key to varieties is modified from Kral (1971) and Kolstad (1986a).

1. Base of culms rarely bulbous, producing fascicles of slender orangish rhizomes; old leaf bases not persisting as shreddy remnants; outer surface of fertile scales seldom with any puberulence; longest bract of inflorescence usually longer than the inflorescence; ligules inconspicuous or often of short ascending hairs _____ var. **interior**
1. Base of culms bulbous, often jointed together into a stout, knotty rhizome; old leaf bases often persisting as shreddy remnants; outer surface of fertile scales usually with some puberulence; longest bract of inflorescence usually much shorter than inflorescence; ligules inconspicuous to absent _____ var. **puberula**

var. **interior** (Britton) Kral. According to S.D. Jones (pers. comm.), there is a specimen (Hamilton Co.) at TAES; Kral (1971) mapped the species to the s and w of nc TX; mainly Edwards Plateau and Trans-Pecos. Early summer–summer. [*F. interior* Britton]

var. **puberula**. Se and e TX w to Grand Prairie, also Edwards Plateau. This is the common variety in nc TX. Apr–Jul (usually finished flowering by early summer). [*F. drummondii* (Torr. & Hook. ex Torr.) Boeck., *Scirpus puberulus* Michx.]

Fimbristylis vahlii (Lam.) Link, (for Martin Hendriksen Vahl, 1749–1804, Danish botanist and student of Linnaeus), VAHL'S FIMBRISTYLIS. Leaves filiform, < 1 mm wide; spikelets lance-ovoid to linear-ellipsoid or oblong-cylindric, apically obtuse or acute. Usually along lake margins, streams, or in disturbed bottomlands; e TX w to Bell, McLennan, and Wise cos., also Edwards Plateau. Jul–Oct. [*Scirpus vahlii* (Lam.) Link]

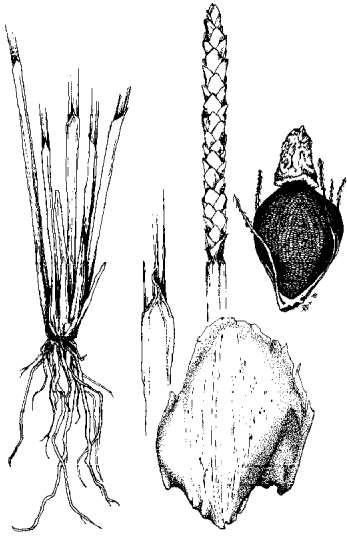
FUIRENA UMBRELLA-GRASS

Perennials or annuals to 1 m tall; culms (= stems) obtusely triangular to nearly round; inflorescences condensed, often head-like, of 1–10 ovoid spikelets; scales of spikelets numerous, spirally imbricate, usually with a very conspicuous, often recurved, bristle-like awn; perianth of 3 stalked, scale-like or paddle-like structures often thickened, expanded, or swollen at maturity, often also 3 perianth bristles alternating with the stalked structures; achenes strongly 3-angled.

☛ A genus of 30 species of warm areas. In the past, some authors lumped *Fuirena* into *Scirpus*. (Named for Georg Fuiren, 1581–1628, a Danish botanist)

REFERENCES: Coville 1890; Bush 1905; Svenson 1957; Kral 1978.

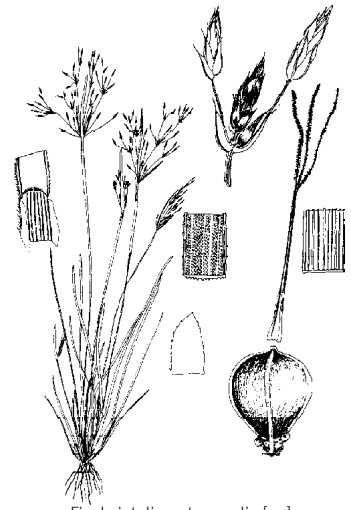
1. Upper leaf sheaths with obvious pubescence; scale-like perianth parts (look under scales of spikelets) without a subapical bristle, the apex either conic and swollen or acuminate; rhizomes producing corm-like shoot buds; only near e margin of nc TX.
2. Scale-like perianth parts with apex thinnish or thickened, acuminate, incurved; bristles of perianth retrorsely barbellate; anthers 1.3 mm or less long; swollen cormous buds of rhizome not separated by narrower internodes _____ **F. squarrosa**
2. Scale-like perianth parts swollen at maturity, narrowing to the conic and erect, sometimes



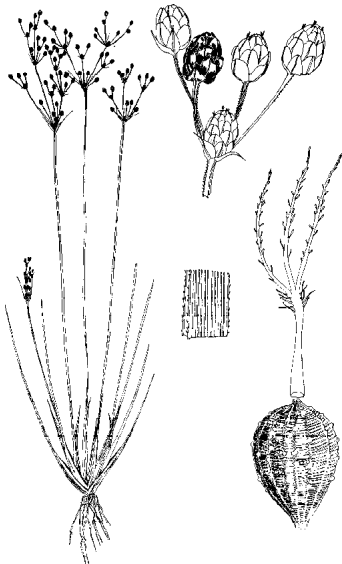
Eleocharis quadrangulata [B72]



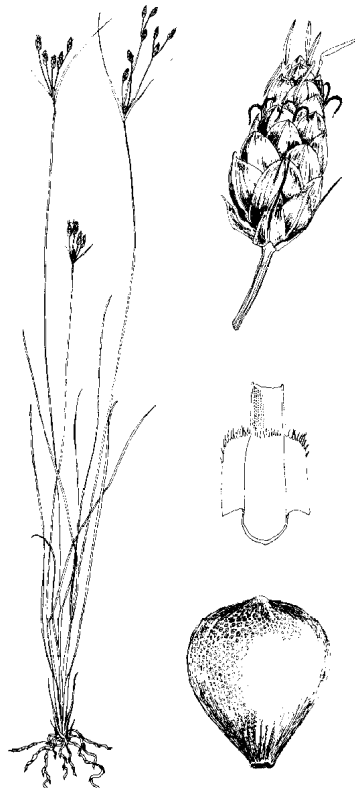
Fimbristylis annua [S10]



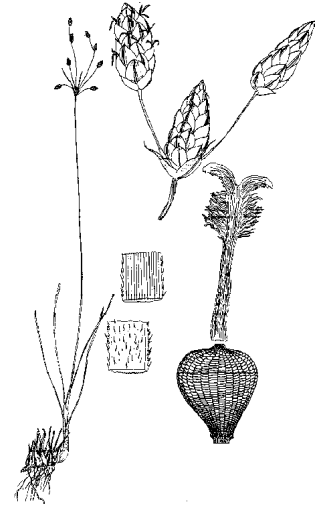
Fimbristylis autumnalis [S10]



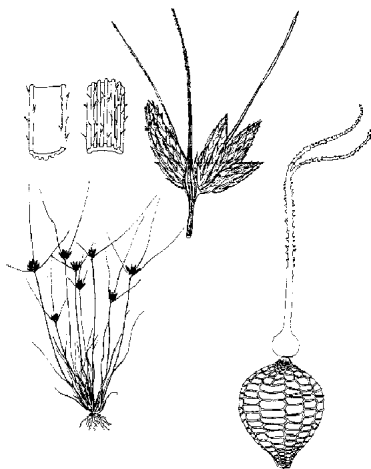
Fimbristylis miliacea [S10]



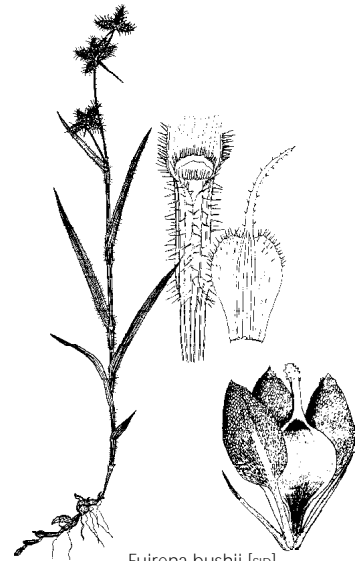
Fimbristylis puberula var. *interior* [S10]



Fimbristylis puberula var. *puberula* [S10]



Fimbristylis vahlii [S10]



Fuirena bushii [S10]

apiculate apex; bristles of perianth smooth; anthers ca. 2 mm long; swollen cormous buds of rhizome often separated by narrow internodes longer than corm width _____

F. bushii

1. Upper leaf sheaths glabrous; scale-like perianth parts usually with a subapical bristle, the apex flattish or notched or turgid and conic; rhizomes simple, lacking corm-like shoot buds; widespread in nc TX _____

F. simplex

Fuirena bushii Kral, (for its discoverer, Benjamin Franklin Bush, 1858–1937, postmaster in MO and amateur botanist). Plant to 1 m tall; leaf sheaths strongly hirsute; leaf blades with pubescence; bristles of perianth reaching base of blades of stalked, scale-like perianth parts. Wet, acidic, usually sandy areas; Lamar Co. (BRCH) in Red River drainage; mainly se TX. Jun–Oct. [*F. ciliata* Bush]

Fuirena simplex Vahl, (unbranched), UMBRELLA SEDGE, WESTERN UMBRELLA-GRASS. Plant 0.1–1 m tall; leaf sheaths glabrous or only the lowest hirsute; leaf blades minutely scabrous or glabrous; bristles of perianth reaching at least base of blade of stalked, scale-like perianth part, retrorsely (downwardly) barbed. Aquatic or wet places. Jun–Oct. This is a widespread variable species and is by far the most common species in nc TX. Kral (1978) distinguished two varieties as follows:

1. Plants nonrhizomatous, mostly annual; anthers 0.5–0.6 mm long _____ var. **aristulata**
1. Plants rhizomatous, perennial; anthers 0.9–1.2 mm long _____ var. **simplex**

var. **aristulata** (Torr.) Kral, (bearded or awned). Widespread in TX. [*F. squarrosa* Michx. var. *aristulata* Torr.]

var. **simplex**. Widespread in TX.

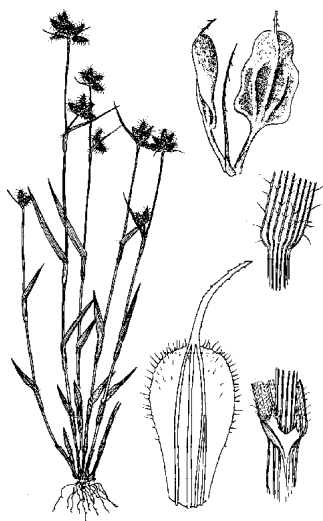
Fuirena squarrosa Michx., (with recurved tips). Plant to 1 m tall, usually less; leaf sheaths strongly hispid-hirsute; leaf blades with pubescence; bristles of perianth of ten reaching middle of blade of stalked scale-like perianth parts. Wet areas, often on sandy substrates; Limestone Co., also Milam Co. (BRCH); mainly se and e TX, also Edwards Plateau and Panhandle. Jun–Oct. [*F. hispida* Elliott]

Fuirena breviseta (Coville) Coville, (short-bristled), is cited by Hatch et al. (1990) for vegetational area 4 (Fig. 2). Kral's (1978) range map, however, showed all localities of *F. breviseta* to be well e and s of nc TX. It can be distinguished by its short perianth bristles, these not reaching the base of the blades of the stalked, scale-like perianth parts; the bristles are also without barbs or weakly, usually upwardly barbed (vs. markedly downwardly barbed in the 3 other nc TX species).

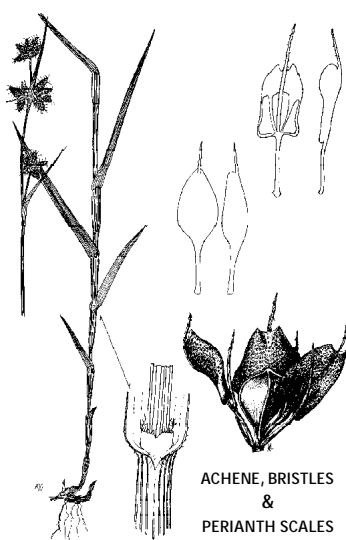
ISOLEPIS BULRUSH

Small tufted annuals 2–25(–30) cm tall, glabrous or nearly so; leaves setaceous, near base of culms; inflorescences of 1–3 sessile spikelets, appearing lateral, with a single, erect, modified leaf (= involucre bract) appearing like a continuation of the culm; flowers (7–)10–30 per spikelet; scales of spikelets keeled, awnless or very short-awned; perianth absent; stigmas 3; achenes trigonous, minutely papillose (this can sometimes be obscured by a whitish, wax-like, surface layer).

☛ A cosmopolitan genus of ca. 70 species (Smith 1997b), mostly of temperate and subtropical climates; when tropical, restricted to mountains at higher elevations. Three species are reported for TX (S.D. Jones, pers. comm.). Previously included in *Scirpus* (e.g., Kartesz 1994) and according to some, better treated as a section or subgenus in *Scirpus* in the broad sense. We are following Smith (1995, 1997b) and Jones et al. (1997) in recognizing this segregate of *Scirpus* at the generic level. Smith (1995) indicated that *Isolepis* and a number of other segregates of *Scirpus* will be recognized in the forthcoming Cyperaceae treatment for *Flora of North America* (Vol. 11).



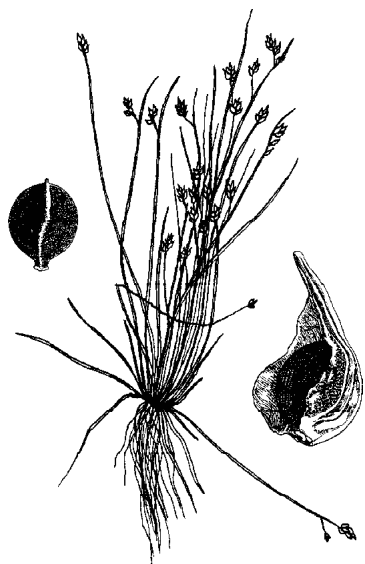
Fuirena simplex var. *aristulata* [SID]



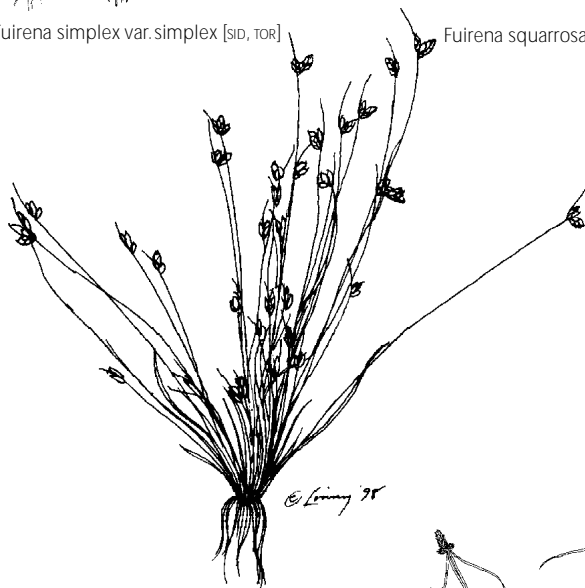
ACHENE, BRISTLES
&
PERIANTH SCALES
Fuirena simplex var. *simplex* [SID, TOR]



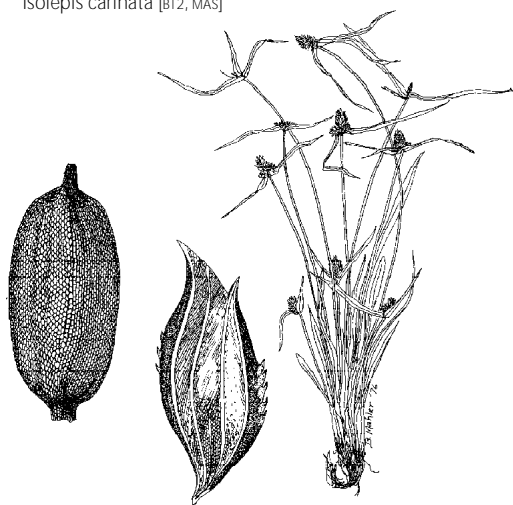
Fuirena squarrosa [SID]



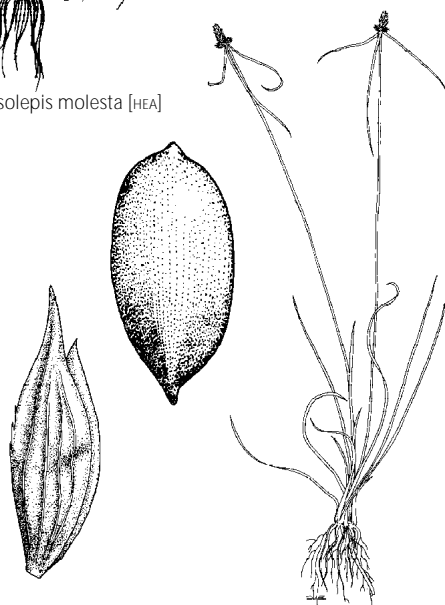
Isolepis carinata [BT2, MAS]



Isolepis molesta [HEA]



Kyllinga brevifolia [BT2]



Kyllinga pumila [GWO]

This approach is supported by the phylogenetic studies of Bruhl (1995) which suggested that *Scirpus* sensu lato is polyphyletic. The key to species is modified from Smith (1997b). (Greek: *isos*, equal, and *lepis*, scale)

REFERENCES: Beetle 1947; Johnston 1964; Smith 1995, 1997b; Smith & Yatskievych 1996.

1. Scales from middle of spikelet 1.8–2.0 mm long, short-awned (awns so short that the scales appear merely acuminate); achenes 1–1.5 mm long _____ **I. carinata**
 1. Scales from middle of spikelet 1–1.2 mm long, mucronate; achenes 0.7–0.9 mm long _____ **I. molesta**

Isolepis carinata Hook. & Arn. ex Torr., (with a keel), ANNUAL BULRUSH. Tufted annual 4–25(–30) cm tall; involucre bract 5–30 mm long; spikelets usually solitary, sometimes 2(–3), 2–10 mm long, 1.5–2 mm wide. Moist sandy soils; Fannin (Talbot property), Hood, Lamar, Navarro, and Tarrant cos.; mainly se and e TX; also Edwards Plateau. Spring. [*I. koilolepis* Steud., *Scirpus koilolepis* (Steud.) Gleason]

Isolepis molesta (M.C. Johnston) S.G. Smith, (troublesome). Tufted annual 2–20 cm tall; involucre bract 3–10(–25) mm long; spikelets 1–3, 2–8 mm long, 1–1.5 mm wide. Moist sandy soils; based on range map in Smith (1997b), this species apparently occurs in the s part of nc TX; se and e TX w to e part of c TX; it should be looked for in mixed populations with *I. carinata*. Spring. [*Scirpus molestus* M.C. Johnston] Johnston (1964) indicated that while this species seems like a dwarf form of *I. carinata*, clear-cut differences exist and no intermediate specimens are known.

KYLLINGA

Small rhizomatous or tufted annuals or perennials to 21(–38) cm tall; inflorescence a single roundish to 3-lobed congested head or head-like mass, 3–8(–12) mm long; spikelets flat, 1.8–4 mm long, with only a single, fertile, bisexual flower, deciduous as a unit, of only 4 scales, 2 of these normal in size, the basal 2 minute, brownish; achene 1 per spikelet.

☛ A genus of ca. 40–45 species, mostly tropical with the greatest diversity in tropical Africa and Madagascar; 8 occur in the New World (Tucker 1984). *Kyllinga* is sometimes included in the genus *Cyperus*. (Named for P. Kylling, died 1696, Danish Botanist)

REFERENCES: Johnston 1966; Delahoussaye & Thieret 1967; Tucker 1984.

1. Rhizomatous perennials, the culms arising at intervals of 3–10 mm; stamen solitary; roundish inflorescences usually without any visible lobing _____ **K. brevifolia**
 1. Densely tufted annuals with 4–20 culms per square cm; stamens paired; roundish inflorescences often slightly 3-lobed _____ **K. pumila**

Kyllinga brevifolia Rottb., (short-leaved), SHORT-LEAF FLAT SEDGE. Perennial with reddish rhizomes to 20 cm long and 1–2 mm thick; culms to ca. 20(–38) cm tall; leaf blades usually 1–3(–10) cm long, 1–4 mm wide; spikes 3–12 mm long; spikelets flat, 2.5–4 mm long. Moist loam; Dallas and Tarrant cos.; mainly se and e TX, also Edwards Plateau. Apr–Nov. [*C. brevifolius* (Rottb.) Endl. ex Hassk.]

Kyllinga pumila Michx., (dwarf, very small), SLENDER-LEAF FLAT SEDGE. Tufted fragrant annual to 21 cm tall; leaf blades 2–11 cm long, 1–1.8(–3) mm wide. Moist sites; Denton Co., also Grayson Co. (Johnston 1966); mainly se and e TX. Sep–Nov. [*C. tenuifolius* (Steud.) Dandy]

LIPOCARPHA

Tufted, delicate, glabrous annuals 1–15 cm tall; leaves basal, 2, one without blade; inflorescence of 1–3 ovoid, sessile, spikelet-like spikes 2–5(–8) mm long, the spikes of numerous single-flowered spikelets whose scales (here called floral scales in contrast to the included hyaline scales)

are spirally and imbricately arranged to make the whole spike appear like a single spikelet; in ours inside each floral scale there is 1 inconspicuous hyaline scale or bracteole often split and torn by or adhering to the achene; floral scales with 0–3 prominent veins; inflorescence subtended by 1–3 bracts, 1 of these much larger and appearing like a continuation of the culm, the inflorescence thus appearing lateral; achenes narrowly oblong-obovate to obovate or ovate, 0.5–0.8 mm long, granular, very minutely apiculate.

☛ A small, mainly tropical genus of 8 species with inflorescences and flowers much reduced; possibly derived from *Cyperus*. The species treated here as *Lipocarpha* have historically been segregated into the genus *Hemicarpha*. According to Friedland's (1941) range map, at least two and possibly three difficult to distinguish taxa are to be expected in nc TX. He recognized these as varieties of *Hemicarpha micrantha* and said that in order to key them, "... the spikelet must be boiled and then dissected under a binocular microscope capable of at least a magnification of forty diameters." Tucker (1987) and Kartesz (1994) recognized these taxa as species (*Lipocarpha aristulata* (Coville) G.C. Tucker, *L. drummondii* (Nees) G.C. Tucker, and *Lipocarpha micrantha* (Vahl) G.C. Tucker). While Friedland's range map clearly showed *L. aristulata* and *L. drummondii* in nc TX, the only specimens we have seen from nc TX are annotated *L. micrantha* by Tucker. Using the key from Friedland (1941), we have been completely unable to consistently distinguish the taxa; the following key was developed by S.D. Jones using TX material. (Greek: *lipos*, fat, and *carphos*, chaff, from the thickness of the inner scales of some species) REFERENCES: Friedland 1941; Svenson 1957; Tucker 1987.

1. Mid-upper floral scales of the spikelet mostly tapering into a conspicuous awn 1/4 to longer than the scale body; achenes obovate, maturing dark reddish brown to blackish; inner hyaline scale as long as or longer than the achene and cupped around it, veinless _____ **L. aristulata**
1. Mid-upper floral scales of the spikelet acute-triangular apically, awnless, or, at most with a short mucro; achenes obovate or narrowly obovate, maturing brown to reddish brown, (but not as dark reddish brown to blackish as in *L. aristulata*); inner hyaline scale as long as the achene or longer and cupped around it OR shorter than the achene OR absent, if present, then 3–5-veined.
 2. Apices of floral scales incurved over top of the achenes; achenes not normally readily visible at maturity; achenes narrowly obovate; inner hyaline scale as long as or longer than the achene and cupped around it; when an achene is shed, the scales usually are shed with it; inner hyaline scale not bifurcated _____ **L. drummondii**
 2. Apices of floral scales spreading, barely exceeding the achenes; achenes normally readily visible at maturity; achenes obovate; inner hyaline scale much shorter than achene or absent; when an achene is shed it usually leaves the inner scale behind attached to the rachis; inner hyaline scale usually bifurcated _____ **L. micrantha**

Lipocarpha aristulata (Coville) G.C. Tucker, (bearded or awned). Range map given by Friedland (1941) showed this taxon within nc TX; Hatch et al. (1990) cited vegetational area 4 (Fig. 2); we have seen no nc TX specimens but S.D. Jones (pers. comm.) indicated there is a Cooke Co. specimen at TEX; he also indicated there is a TEX specimen from Wichita Co. just to the w of nc TX; also Edwards Plateau and Trans-Pecos. Friedland (1941) mapped a number of locations from the e 1/2 of TX and one from the Trans-Pecos. Jun–Nov. [*Hemicarpha aristulata* (Coville) Smyth]

Lipocarpha drummondii (Nees) G.C. Tucker, (for its discoverer, Thomas Drummond, 1780–1835, Scottish botanist and collector in North America), COMMON HEMICARPHA. Range map given by Friedland (1941) showed this taxon within nc TX; we have seen no nc TX specimens but S.D. Jones (pers. comm.) indicated there are Johnson Co. and Tarrant Co. specimens at TEX; Friedland (1941) mapped several localities in nc and e TX; also se and e TX and Edwards Plateau. May–Nov. [*Hemicarpha drummondii* Nees, *H. micrantha* (Vahl) Pax var. *drummondii* (Nees) Friedl.]

Lipocarpa micrantha (Vahl) G.C. Tucker, (small-flowered). Moist sandy soils, seasonally wet areas; Bosque, Henderson, Hood, and Parker cos.; e 1/2 of TX; also Trans-Pecos. Mar-Oct. [*Hemicarpha micrantha* (Vahl) Pax, *Hemicarpha micrantha* var. *minor* (Schrad.) Friedl., *Scirpus micranthus* Vahl] Inconspicuous and rarely collected.

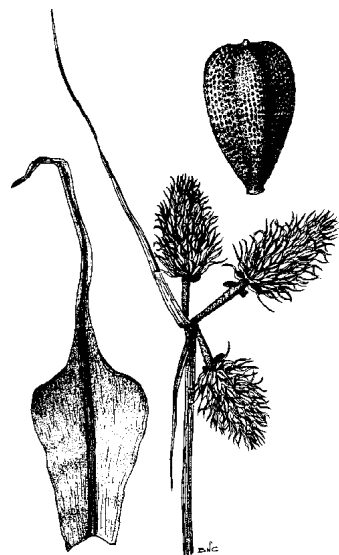
RHYNCHOSPORA BEAK-RUSH, HORNED-RUSH

Tufted or clump-forming perennials (rarely annuals), glabrous or with scabrous-margined leaves; culms (= stems) triangular; spikelets narrowly ovoid to fusiform or roundish, brownish, 1-few-flowered, in loose or compact clusters, in spike-like or open panicles; lower (1-)2-3 scales of spikelets sterile; perianth of bristles or absent; achenes with a conspicuous tubercle or "beak" (= hardened and persistent style base) from the apex (hence the name BEAK-RUSH).

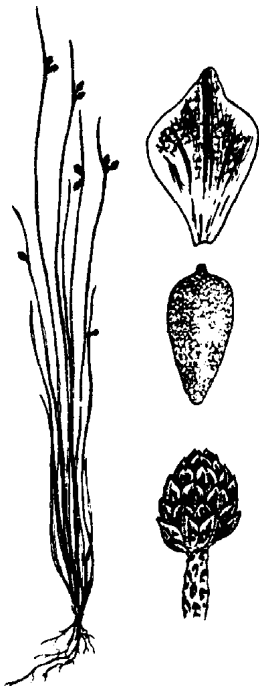
☛ A genus of ca. 250 species nearly cosmopolitan in distribution, especially in tropical and warm areas of South America. (Greek: *rhynchos*, a snout, and *spora*, a seed, from the beaked achene)

REFERENCES: Gale 1944; Nixon & Ward 1982; Thomas 1984, 1992.

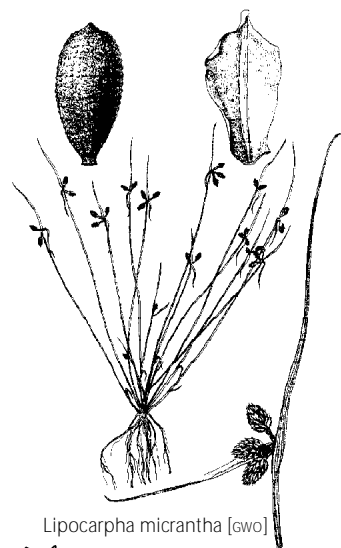
1. Scales of spikelets white; bracts below inflorescence with white base (much more conspicuous in *R. colorata*).
 2. Bracts exceeding spikelets 1-2(-3) in number, very narrow, most filiform; white spot on bract only at the very base, not longer than spikelets; rhizomes absent; leaf blades 3-15 mm long, ca. 1(-2) mm broad basally, narrower (arcuate-filiform) distally _____ **R. nivea**
 2. Bracts exceeding spikelets 3-6(-7) in number, (1.5-)2.5-5 mm broad at base; white spot on bract conspicuous, usually much longer than spikelets; rhizomes extensively creeping, orangish or whitish; leaf blades 6-25 mm long, 1.2-4 mm broad basally and at least 1 mm broad even ± distally _____ **R. colorata**
1. Scales of spikelets variously colored (not white); bracts below inflorescence not with white base.
 3. Mature spikelets conspicuously long, 15-23 mm long; achene body 3.5-5 mm long; tubercle 13-18 mm long.
 4. Bristles subtending achene shorter than achene body (usually ca. 1/3-2/3 as long) _____ **R. corniculata**
 4. Bristles (at least most) much longer than the achene body (ca. 1.5-2.5 times as long) _____ **R. macrostachya**
 3. Mature spikelets much shorter (2.5-9 mm long); achene body (to ca. 2 mm); tubercle much shorter, 2 mm or less long.
 5. Achene body 0.7-1 mm long, with conspicuous, irregular bone-colored, transverse ridges; tubercle ± as wide as body of achene; perianth absent; all scales of spikelets fertile (developing an achene); plants annual; rare, known locally only from Milam Co. near e margin of nc TX _____ **R. nitens**
 5. Achene body 1.5-2 mm long, surface various, but without conspicuous, bone-colored, transverse ridges; tubercle definitely narrower than body of achene; perianth of 5-6 bristles present; lowest 1(-2) scales of spikelets empty (without an achene); plants perennial; widespread in nc TX.
 6. Spikelets 4.5-6 mm long; bristles conspicuously retrorsely (backward or downward) barbed, much longer than the achene body; achene body usually smooth _____ **R. glomerata**
 6. Spikelets 2.5-4 mm long; bristles antrorsely (forward or upward) barbed or plumose or absent or smooth, shorter than the achene body; achene body usually either honey-combed or finely cross-wrinkled.
 7. Scales of spikelets awned; achene body honeycombed; summit of achene with a smooth collar-like ring fitted against the tubercle _____ **R. harveyi**
 7. Scales of spikelets obtuse or with a very short point; achene body usually finely transversely-wrinkled; summit of achene narrowed up to style (= tubercle) base, without a collar-like ring _____ **R. globularis**



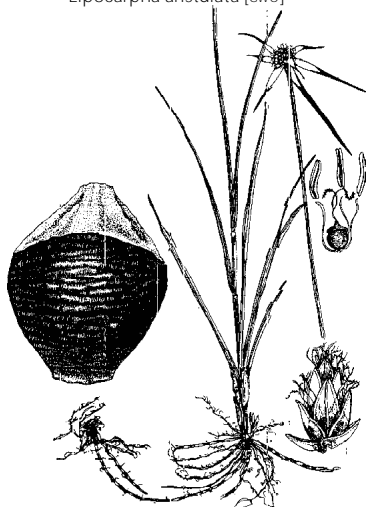
Lipocarpa aristulata [gwo]



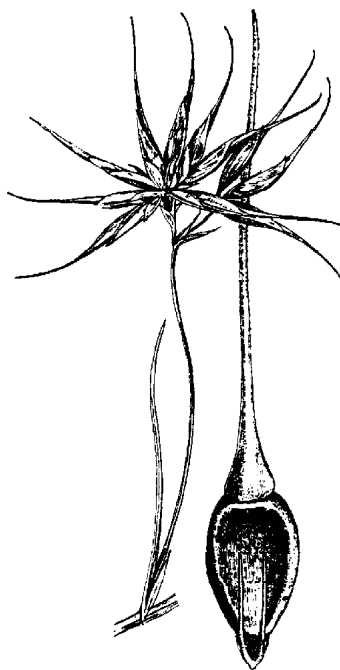
Lipocarpa drummondii [moh]



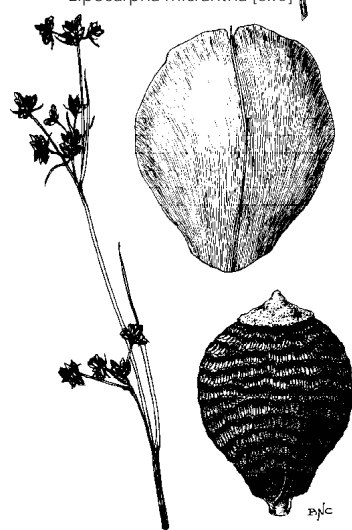
Lipocarpa micrantha [gwo]



Rhynchospora colorata [gwo]



Rhynchospora corniculata var. *interior* [ste]



Rhynchospora globularis var. *globularis* [gwo]



Rhynchospora glomerata [gwo]



Rhynchospora harveyi [bt3, ste]

Rhynchospora colorata (L.) H. Pfeiff., (colored), WHITE-TOP UMBRELLA-GRASS, STAR-RUSH WHITE-TOP SEDGE, UMBRELLA-GRASS. Perennial to ca. 56 cm tall; leaves cauline although sometimes crowded near base; bracts unequal in length, the longer ones mostly 5–15 cm long; white spot on bracts conspicuous, (2.5–)5–20(–25) mm long. Wet places; included on basis of citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990); se TX and s part of e TX w across much of the state. (Spring–)Summer. Previously separated into the genus *Dichromena* [as *D. colorata* (L.) Hitchc.].

Rhynchospora corniculata (Lam.) A. Gray var. **interior** Fernald, (sp.: horned; var.: inland), HORNED BEAK-RUSH, HORNED-RUSH. Rhizomatous or tufted perennial 0.5–1.5 m tall; culms sharply triangular; inflorescence large, with spreading branches; spikelets strikingly elongate (15–23 mm long), usually in clusters of 3–7(–14); achene body flattish, 3.5–5 mm long, 2–3.5 mm wide, with extremely conspicuous, long-subulate tubercle; bristles 3–6, but normally 5, unequal, ca. 2–5 mm long. Mud, edge of ponds, or on decaying logs in water; Grayson, Fannin, Henderson, and Kaufman cos., also Tarrant Co. (R. O'Kennon, pers. obs.); mainly se and e TX, also Edwards Plateau and Trans-Pecos. Spring–Summer (fruit present into fall). Some authorities (eg., Jones et al. 1997) lump this variety.

Rhynchospora globularis (Chapm.) Small var. *globularis*, (globular, of a little ball or sphere), GLOBE BEAK-RUSH. Perennial 15–100 cm tall; leaf blades ca. 1.5 mm wide; spikelets 2.5–4 mm long, 1–3-fruited; bristles to 2/3 as long as achene body; achene body 1.6–2.0 mm long. Damp sandy soils, disturbed sites; Dallas Co.; mainly e TX. May–Sep.

Rhynchospora globularis var. *recognita* Gale is abundant in e TX just to the e of nc TX. Robert Kral, who is treating the genus for the *Flora of North America* has indicated that he will be recognizing this taxon at the specific level (R. Kral, pers. comm.). Kral indicated that *R. globularis* var. *recognita* is expected in the ne part of nc TX. It is similar to *R. globularis*; the following key separating the two is from Gale (1944) with modifications from R. Kral (pers. comm.).

1. Habit frequently depressed (culms often short, but ranging from 14–68 cm tall); leaves usually 1.5–2 mm wide; branchlets of the cymes terminating in small knobby glomerules; bracts inconspicuous; spikelets 2.5–3 mm long, roundish, dark; achenes 1–1.2 mm wide, 1.3–2.3 mm long (including tubercule), finely cancellate, transversely ridged to rugulose. _____ *R. globularis* var. *globularis*
1. Habit robust (culms up to ca. 100 cm tall); leaves usually 2–4 mm wide; branchlets of the cymes usually terminating in dense glomerules; setaceous bracts conspicuous (giving the inflorescence a bristly appearance); spikelets 3–4 mm long, elongate, reddish; achenes 1.2–1.5 mm wide, 1.3–1.6 mm long, coarsely cancellate to striate, transversely ridged. _____ *R. globularis* var. *recognita*

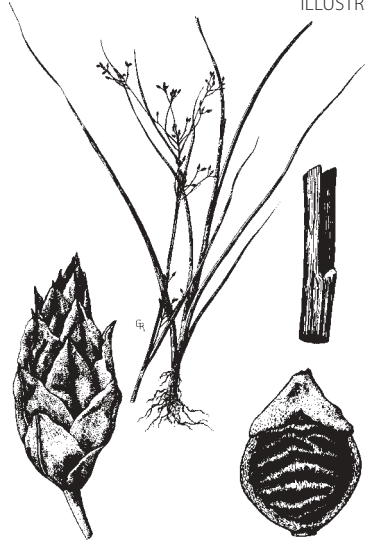
Rhynchospora glomerata (L.) Vahl, (in compact clusters), CLUSTER BEAK-RUSH. Tufted perennial to 1.1 m tall; spikelets usually 2(–3)-fruited; bristles slightly surpassing the tubercle in length; achene body 1.5–2 mm long. Moist sand; Lamar Co. in Red River drainage (Carr 1994); mainly se and e TX. Summer.

Rhynchospora harveyi W. Boott, (for its discoverer, Francis Leroy Harvey, 1850–1900, of NY), HARVEY'S BEAK-RUSH, PLANK BEAK-RUSH. Perennial 20–60 cm tall; leaf blades 1–4 mm wide; inflorescence narrow, of few small clusters; spikelets 2.5–3 mm long, mostly 1-fruited; bristles < 1/2 length of achene body; achene body 1.5–1.8 mm long. Damp sandy soils; disturbed sites; se and e TX w to Grayson and Parker cos., also Edwards Plateau. May–Jul.

Rhynchospora macrostachya Torr. ex A. Gray, (large-spiked), TALL BEAK-RUSH, HORNED BEAK-RUSH. Perennial similar to *R. corniculata* except for the longer bristles subtending the achenes and the plant usually not as tall or coarse; also inflorescence branches usually more stiffly erect rather than spreading and spikelets usually in clusters of 10 or more; bristles usually 6, mostly



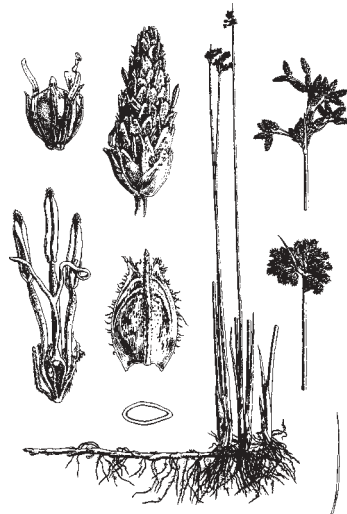
Rhynchospora macrostachya [co1]



Rhynchospora nitens [gwo]



Rhynchospora nivea [co1]



Schoenoplectus acutus [co1]



Schoenoplectus californicus [MAS]



Schoenoplectus pungens [MAS]



Schoenoplectus saximontanus [HEA]



Schoenoplectus tabernaemontani [co1]

10–12 mm long, antrorsely barbed. Lamar Co. in Red River drainage; mainly se and e TX. Summer. [*R. corniculata* var. *macrostachya* (Torr.) Britton]

Rhynchospora nitens (Vahl) A. Gray, (shining), SHORT-BEAK BALD-RUSH. Glabrous annual 15–80 cm tall; spikelets 4–9 mm long, with numerous scales; perianth absent; achene body ca. as broad as long; tubercle much wider than long. Wet areas; Milam Co. (BRCH); mainly se and e TX. Jul–Aug. Previously segregated into the genus *Psilocarya* [as *P. nitens* (Vahl) A.W. Wood]. [*Psilocarya portoricensis* Britton]

Rhynchospora nivea Boeck., (snowy, white), SNOWY WHITE-TOP SEDGE. Tufted, glabrous perennial 10–30(–40) cm tall; spikelets few-flowered, white; longer bracts 1.7–3.7 cm long; white spot only at the very base of bract. Creek beds on limestone, wet areas; Bell, Brown, Burnet, and Parker cos., also collected along Turtle Creek, Dallas (Austin Chalk), in 1881 or 1882 by Reverchon, noted as “very rare”; not found there since (Thomas 1984; Mahler 1988); also e TX and Edwards Plateau. Previously separated into the genus *Dichromena* [as *D. nivea* (Boeck.) Boeck. ex Britton, *D. reverchonii* S.H. Wright].

SCHOENOPLECTUS BULRUSH, TULE

Rhizomatous perennials (*S. saximontanus*, which is rare in nc TX, can be annual) of wet areas or in water; plants 0.3–5 m tall (0.09–0.65 m tall in *S. saximontanus*), glabrous or nearly so; culms (= stems) without blade-bearing leaves or with 1–3 blade-bearing leaves near base, sharply triangular or bluntly trigonous to nearly round; inflorescences of one or few sessile spikelets or many in an open panicle, appearing lateral, usually with a single, erect, modified leaf (= involucre bract) appearing like a continuation of the culm; scales of spikelets awnless or nearly so; perianth of bristles present or absent (in *S. saximontanus*); achenes plano-convex to strongly trigonous.

☛ A cosmopolitan genus of ca. 50 species (Smith 1996); 15 are native to North America plus 2 have been introduced. Approximately 10 species occur in TX (S.D. Jones, pers. comm.). Previously included in *Scirpus* (e.g., Kartesz 1994) and according to some, better treated as a section or subgenus in *Scirpus* in the broad sense. We are following Smith (1995, 1996) and Jones et al. (1997) in recognizing this segregate of *Scirpus* at the generic level. Smith (1995) indicated that *Schoenoplectus* and a number of other segregates of *Scirpus* will be recognized in the forthcoming Cyperaceae treatment for *Flora of North America* (Vol. 11). This approach is supported by the phylogenetic studies of Bruhl (1995) which suggested that *Scirpus* sensu lato is polyphyletic. Some species can be ecological dominants in wetlands and provide valuable food and habitat for wildlife (Smith 1996). *Schoenoplectus* species were also extensively used by Native Americans in making baskets, mats, and roof thatching; *S. californicus* (known in South America as TOTORA) is still used for making the famous boats (balsas) seen on Lake Titicaca (Beetle 1950; Heiser 1978). (Greek: *schoeno*, a reed or rush-like, and *plectus*, twine, braid, or plait; alluding to the mat-forming rhizomes of some species)

REFERENCES: Beetle 1941, 1943, 1947; Koyama 1962, 1963; Schuyler 1974; Raynal 1976; Heiser 1978; Strong 1993, 1994; Smith 1995, 1996; Smith & Yatskievych 1996.

1. Plants 0.09–0.65 m tall; culms 0.5–1.5 mm thick near base; perianth bristles absent; achenes with ca. 10–20 prominent (use lens), transverse, wavy, mostly sharp ridges; known in nc TX only from Coryell Co. _____ **S. saximontanus**
1. Plants 0.3–5 m tall; culms 2–23 mm thick near base; perianth bristles present; achenes smooth; widespread in nc TX.
 2. Inflorescences unbranched, usually with 1–5 sessile spikelets; plants 0.3–1.2 m tall; culms sharply triangular, 2–6 mm thick near base _____ **S. pungens**

2. Inflorescences branched, with many, mostly pedicelled spikelets; plants 1–5 m tall; culms usually nearly round to bluntly trigonous, 8–23 mm thick near base.
3. Achene bristles 2–4 (2–3 different appearing stamens also present), with closely spaced lateral projections; leaf sheaths retrorsely fimbriate-filiferous (= fringed) _____ **S. californicus**
3. Achene bristles usually 4–6 (2–3 different appearing stamens also present), with well-spaced barbs; leaf sheaths smooth or merely lacerate (= cut as if torn).
4. Spikelets in glomerules of 3–8, sessile or on short stiff pedicels; scales of spikelets often ca. 5 mm long, with conspicuous elongate reddish glutinous spots (under a hand lens) _____ **S. acutus**
4. Spikelets usually in glomerules of 2 (sometimes 3 or single) on long lax pedicels; scales of spikelets often 3–4 mm long, nearly smooth (occasionally with a few reddish spots near midrib) _____ **S. tabernaemontani**

Schoenoplectus acutus (Muhl. ex Bigelow) Å. Löve & D. Löve, (acute, sharp-pointed), HARD-STEM BULRUSH, ALKALI TULE. Rhizomatous perennial 1–3 m tall forming extensive colonies; spikelets 8–15 mm long; achenes plano-convex or unequally biconvex. Calcareous mud, usually in water; Grayson and Rockwall cos.; w TX, rare e and nc TX. May. [*Scirpus acutus* Muhl. ex Bigelow] According to Beetle (1950), this species, which was used for mats and roofing, “... was very important in the Indian cultures of western North America.”

Schoenoplectus californicus (C.A. Mey.) Soják, (of California), CALIFORNIA BULRUSH, GIANT BULRUSH, TULE, CALIFORNIA TULE. Perennial 1–3+ m tall, from tight subrhizomatous knots; culms bluntly trigonous; spikelets 6–11 mm long; achenes plano-convex or biconvex. Mud or shallow water; nearly throughout TX. Spring and summer. [*Scirpus californicus* (C.A. Mey.) Steud.]

Schoenoplectus pungens (Vahl) Palla, (piercing, sharp-pointed), AMERICAN BULRUSH, SWORD-GRASS, THREE-SQUARE BULRUSH. Rhizomatous perennial 0.3–1.2 m tall; spikelets 5–20 mm long; achenes lenticular to trigonous. Wet soils; Ellis, Montague, and Wise cos.; widespread in TX. Apr–Jul. [*Scirpus pungens* var. *longispicatus* (Britton) S.G. Sm., *Scirpus americanus* Pers. var. *longispicatus* Britton] Varieties *longispicatus* and *pungens* intergrade extensively (Smith 1996); we are therefore following Kolstad (1986b) and Kartesz (1994) in not recognizing infraspecific taxa in this species; Smith (1996) recognized var. *longispicatus* and var. *pungens* in TX and separated the two as follows:

1. Styles trifid; achenes thickly lenticular to bluntly trigonous; floral scales [scales of spikelets] brown to stramineous _____ var. *longispicatus*
1. Styles bifid; achenes lenticular; floral scales brown _____ var. *pungens*

Schoenoplectus saximontanus (Fernald) J. Raynal, (rocky mountain), ROCKY MOUNTAIN BULRUSH. Small annual or perennial 9–65 cm tall; rhizomes inconspicuous, ca. 1 mm thick; culms cylindrical, ridged when dry; 0–2 smaller bracts sometimes present in addition to the erect bract which appears like a continuation of the culm; inflorescences with 1–10(–20) spikelets, usually sessile or nearly so, sometimes with 1–2 short branches; spikelets 6–20 mm long; scales with a slightly recurved awn ca. 0.2–0.5 mm long; achenes usually strongly trigonous. Damp soils or emergent from water; Coryell Co. (Fort Hood—Sanchez 1997); in a band from the Panhandle to s TX (Smith 1996). Spring–fall. [*Scirpus bergsonii* Schuyler, *Scirpus saximontanus* Fernald, *Scirpus supinus* L. var. *saximontanus* (Fernald) T. Koyama]

Schoenoplectus tabernaemontani (C.C. Gmel.) Palla, (for Jacob Theodore von Bergzabern, died 1590, Heidelberg botany professor who Latinized his name as Tabernaemontanus), GREAT BULRUSH, SOFT-STEM BULRUSH, GIANT TULE. Rhizomatous perennial 1–5 m tall; spikelets 6–10 mm long; achenes plano-convex. The usually terete fresh culms (just below inflorescences) of this species help distinguish it from the similar *S. californicus* with bluntly trigonous culms. Wet

ground, shallow water around lakes; included on basis of citation of vegetational areas 4 and 5 (Fig. 2) by Hatch et al. (1990); widely scattered in TX. May–Jul, occasionally to Oct. [*Scirpus tabernaemontani* C.C. Gmel., *Scirpus validus* Vahl]

SCIRPUS BULRUSH

Perennials of wet areas, with or without rhizomes; plants glabrous or nearly so; culms (= stems) obtusely triangular, with well-developed leaves; inflorescences of many spikelets in open panicles, appearing terminal, with 2 or more well-developed leaf-like involucre bracts; scales of spikelets awnless or essentially so; perianth of bristles.

☛ In the strict sense, a cosmopolitan genus of ca. 30 species; 6 are reported for TX (S.D. Jones, pers. comm.). *Bolboshoenus*, *Isolepis*, and *Schoenoplectus* have traditionally been treated as part of *Scirpus* sensu lato (e.g., Kartesz 1994); according to some authorities these segregates are better treated as sections or subgenera; according to Mabberley (1987), *Scirpus* is a heterogeneous and indivisible genus. If treated in the broad traditional sense, the genus contains ca. 200–300 species (Tucker 1987; Mabberley 1997). We are following Smith (1995, 1996, 1997a, 1997b) and Jones et al. (1997) in recognizing the segregates of *Scirpus* at the generic level. Smith (1995) indicated that the segregates will be recognized in the forthcoming Cyperaceae treatment for *Flora of North America* (Vol. 11). This approach is supported by the phylogenetic studies of Bruhl (1995) which suggested that *Scirpus* sensu lato is polyphyletic. (The Latin name of the bulrush)

REFERENCES: Beetle 1947; Schuyler 1966, 1967; Strong 1993, 1994; Smith 1995; Smith & Yatskievych 1996.

1. Perianth bristles very long, obviously and greatly exceeding the scales of spikelets in length; mature inflorescences appearing almost woolly to the naked eye _____ **S. cyperinus**
1. Perianth bristles shorter than to slightly exceeding the scales of spikelets in length; mature inflorescences not appearing woolly.
 2. Scales of spikelets with prominent green-keeled midribs; spikelets 6–10 mm long; spikelets usually sessile, clustered in glomerules _____ **S. pendulus**
 2. Scales of spikelets without prominent green-keeled midrib; spikelets 2–5 mm long; at least some spikelets often on separate peduncles.
 3. Bristles 0–3, shorter than achenes; bracts usually shorter than inflorescences; each spikelet with 70–150(–200) florets _____ **S. georgianus**
 3. Bristles usually 5 or 6, shorter than or little longer than the achenes; bracts usually as long as or exceeding the inflorescences; each spikelet with 20–40 florets _____ **S. atrovirens**

Scirpus atrovirens Willd., (dark green, from the fuscous spikelets), PALE BULRUSH. Rhizomatous perennial to 1.5 m tall, resembling *S. georgianus*; sheaths and blades cross-septate; spikelets 2–4 mm long. Moist areas; Grayson Co.; mainly e TX and Panhandle. Summer.

Scirpus cyperinus (L.) Kunth, (resembling *Cyperus*), WOOLLY-GRASS BULRUSH. Perennial 0.8–2 m tall, perennating by basal offshoots; spikelets 3–6 mm long. Wet or boggy places; Lamar Co., also Delta and Red River cos. (S.D. Jones, pers. comm.); mainly e TX. Summer. [*C. cyperinus* var. *rubricosus* (Fernald) Gilly]

Scirpus georgianus R.M. Harper, (of Georgia). Tufted perennial, not distinctly rhizomatous, 0.5–1.5 m tall; sheaths and blades usually not cross-septate; spikelets to 4 mm long. Moist or wet soils; included based citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990); mainly e TX. Spring.

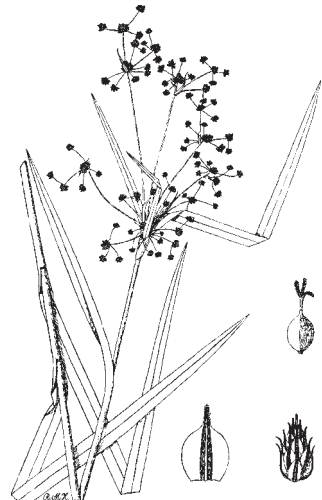
Scirpus pendulus Muhl., (pendulous, hanging). Cespitose perennial to 1.5 m tall; spikelets 5–10 mm long. Ditches, streambeds, pond margins; e TX w to Cooke and Palo Pinto cos. (West Cross Timbers). Apr–Jun. [*S. lineatus* of TX authors, not Michx.]



Scirpus atrovirens [coi]



Scirpus cyperinus [owo]



Scirpus georgianus [tor]



Scirpus pendulus [coi]



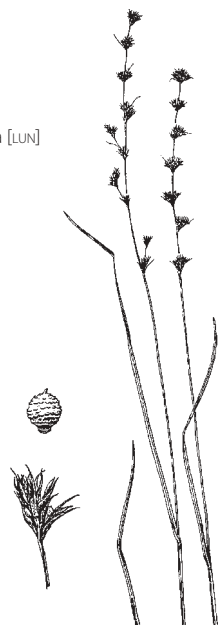
Scleria ciliata [LUN]



Scleria oligantha [LUN]



Scleria triglomerata [LUN]



Scleria verticillata [LUN]

SCLERIA NUT-RUSH

☛ Monoecious annuals or perennials usually less than 1 m tall; culms (= stems) sharply triangular, leafy; inflorescences of axillary and terminal, small, compact clusters of few spikelets, leafy-bracted at base; staminate and pistillate spikelets often mixed within a cluster; achenes globose or ovoid to obovoid, usually whitish, bony, or crustaceous, usually on a hardened pad (= hypogynium).

A genus of 200 species of tropical and warm areas. (Greek: *scleria*, hardness, from the hardened fruit)

REFERENCES: Core 1936, 1966; Fairey 1967; Kessler 1987.

1. Plants annual, without rhizomes; achenes wrinkled or roughened, ca. 1 mm long, without pad at base; plants rare or possibly not currently present in nc TX _____ **S. verticillata**
1. Plants perennial with short rhizomes; achenes smooth or warty, 2–4 mm long, with ring-like pad at base; plants widespread in nc TX.
 2. Achene body rough (reticulate, papillose or warty); leafy bracts of inflorescence pubescent and long ciliate _____ **S. ciliata**
 2. Achene body smooth; leafy bracts of inflorescence glabrous OR pubescent and long ciliate.
 3. Pad completely covered with rough white crust, without distinct tubercles; bracts glabrous _____ **S. triglomerata**
 3. Pad not covered with rough white crust, but with 8 or 9 papillose tubercles (use lens); bracts pubescent _____ **S. oligantha**

Scleria ciliata Michx., (ciliate, fringed), FRINGED NUT-RUSH, CILIATE NUT-RUSH. Plant 20–90 cm tall; lower leaf sheaths densely pilose with slightly reflexed hairs. Low sandy woods or open areas; se and e TX w to Dallas and Montague cos. Late Apr–Jul. [*S. ciliata* Michx. var. *elliottii* (Chapm.) Fernald]

Scleria oligantha Michx., (few-flowered), LITTLE-HEAD NUT-RUSH, FEW-FLOWER NUT-RUSH. Perennial 30–60 cm tall; leaf sheaths pubescent or glabrous. Sandy woods, drainage areas; se and e TX w to Dallas and Limestone cos. Late Apr–May.

Scleria triglomerata Michx., (three-clustered), WHIP-GRASS, WHIP NUT-RUSH, TALL NUT-RUSH. Plant 40–100 cm tall, glabrous or nearly so except for scabrous culm angles and leaf margins. Sandy open woods, low areas; se and e TX w to East Cross Timbers. Jun.

Scleria verticillata Muhl. ex Willd., (whorled), LOW NUT-RUSH, WHORLED NUT-RUSH. Plant tufted, slender, 10–60 cm tall; leaf sheaths pilose; leaf blades glabrous. Collected in Dallas Co. by Reverchon (Core 1966), not found in nc TX since; also reported from Post Oak Savannah and Edwards Plateau. Jul–Sep.

DIOSCOREACEAE YAM FAMILY

☛ A medium-sized family (880 species in 8 genera) of mostly herbaceous twining vines from tubers found throughout tropical and warm areas with a few in the n temperate zone; most species are in the genus *Dioscorea*. ☛ Raphides are usually present as are steroidal saponins and often lactone alkaloids. (subclass Liliidae)

FAMILY RECOGNITION IN THE FIELD: herbaceous twining vines with alternate, petiolate, cordate ovate leaves with 7–11 main veins; flowers very small, with 6 stamens and an inferior ovary; fruit a 3-winged capsule.

REFERENCES: Dahlgren et al. 1985; Al-Shehbaz & Schubert 1989.

DIOSCOREA YAM

Dioecious perennials from rhizomes (in nc TX species) or tubers (in some other species); stems to 3 m or more long, leaning on other plants or twining-climbing; leaves alternate, opposite,

whorled, or a mixture of these, long-petiolate; leaf blades cordate-ovate, cordate at base, acute to acuminate at apex, with 7-11 main, convergent, parallel veins and numerous cross veins; flowers very small, whitish to greenish yellow, in axillary panicles or spikes; perianth radially symmetrical; petals and sepals 3 each, 0.2-2 mm long; stamens 6; ovary inferior; stigmas 3, bilobed; capsule 3-winged, 1.2-3 cm long, loculicidal, splitting through wings; seeds flat, with a broad wing equal to or wider than body.

☞ A genus of ca. 850 species of tropical and warm areas. *Dioscorea* species (YAMS) are cultivated in some areas as a subsistence crop; ☞ proper preparation to remove toxic saponins is necessary. The storage tubers of Mexican species of *Dioscorea* have served as a source of steroidal precursor molecules (e.g., diosgenin) for cortisone and the active ingredients in early birth control pills (Lewis & Elvin-Lewis 1977). *Dioscorea bulbifera* L. (AIR-POTATO), native of tropical Asia and possibly Africa, ☞ contains diosgenin, alkaloids, oxalates, and other toxins (Morton 1982); it has both inedible and edible forms (Bailey & Bailey 1976). This species, which is sometimes cultivated in nc TX, can be distinguished from native taxa by the presence of conspicuous, axillary, aerial bulbils. (Named for Dioscorides, Greek naturalist of the first century A.D., who wrote *Materia Medica*, a description of ca. 600 plants used medicinally)

1. Petioles usually pubescent at junction with leaf blade, usually 7 cm or more long on well-developed leaves; leaves in whorls of 4-7 at 1 or more lower nodes _____ **D. quaternata**
1. Petioles glabrous at junction with leaf blade, usually 6 cm or less long on well-developed leaves; leaves of lower nodes at most opposite or with 3 in close proximity _____ **D. villosa**

Dioscorea quaternata J.F. Gmel., (in fours). Rhizomes relatively stout, 10-15 mm thick, often contorted irregularly or with many short branches; leaves of lower nodes whorled, opposite to alternate above; leaf blades 7-15 cm long; capsules usually 2.5-3 cm long; seeds ca. 18 mm wide. Moist rich woods; included based on citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990); ne TX. Apr-Jun. [*D. villosa* var. *glabrifolia* (Bartlett) Fernald]

Dioscorea villosa L., (soft-hairy), WILD YAM, ATLANTIC YAM, COLICROOT. Rhizomes relatively slender, 5-10 mm thick, ± straight, not much branched; leaves except for the lowest all alternate; leaf blades 5-11 cm long; capsules 1.2-2.5 cm long; seeds 7-12 mm wide. Low woods; Lamar Co.; mainly deep e TX. Apr-Jun.

ERIOCAULACEAE PIPEWORT FAMILY

☞ The Eriocaulaceae is a medium-large (1,100 species in 9 genera) family of usually perennial, small, scapose herbs distributed mainly in the tropics and warm areas, especially in the Americas; a few are in temperate regions. (subclass Commelinidae)

FAMILY RECOGNITION IN THE FIELD: wet area herbs with a basal rosette of linear, grass-like leaves; flowers small and inconspicuous, in a small (5-20 mm in diam.) head at the end of an elongate naked peduncle; the head often has a whitish appearance.

REFERENCES: Moldenke 1961a; Kral 1966b, 1989; Dahlgren et al. 1985.

ERIOCAULON PIPEWORT

Clump-forming, usually monoecious perennial or biennial herbs reproducing vegetatively by lateral offshoots or rhizomes; leaves ± all in basal rosette, linear and grass-like in appearance, sheath-like at base; inflorescence a compact hemispherical to globose head terminating an elongate, naked, angled peduncle, the peduncle with a basal sheath; heads with involucre and receptacular bracts; bracts and perianth parts often with conspicuous whitish hairs; flowers small (ca. 3 mm or less long) and crowded together; sepals 2; petals 2; male flowers with 3-6 stamens; carpels 2; ovary superior; fruit a 1-seeded loculicidal capsule.

☛ A genus of ca. 400 species of tropical and warm areas including Japan and North America. In TX the genus occurs mainly in the se and e parts of the state extending w to near the extreme e margin of nc TX. (Greek: *erion*, wool, and *caulos*, a stalk, from the wool at the base of the scape in the first named species)

1. Mature heads 10–20 mm wide, hard and little compressed upon pressing and drying; involucre bracts acute to acuminate at apex; mature scape with 8–12 ridges; leaves 10–40 cm long, exceeding the sheaths of the scape in length _____ **E. decangulare**
1. Mature heads ca. 5 mm wide, soft and compressed upon pressing and drying; involucre bracts rounded at apex; mature scape with 4–7 ridges; leaves 1–6.5 cm long, the sheaths of the scape exceeding all or most of the leaves in length _____ **E. texense**

Eriocaulon decangulare L., (ten-angled), TEN-ANGLE PIPEWORT, PIPEWORT. Mature scapes 30–110 cm long; mature heads subglobose, dull white; lowermost flowers and bractlets reflexed and obscuring the subtending involucre bracts; outer involucre bracts narrowly ovate to lanceolate, 2–4 mm long, straw-colored, with clavate white hairs apically; surface of receptacle villous; receptacular bracts acute to acuminate, sometimes visibly exserted; sepals 2–3 mm long, yellowish white, with clavate white hairs on keel and apex. Meadows, swamps, pond margins, bogs; e Milam Co., also Henderson Co. (Moldenke 1948); mainly se and e TX. Apr–Nov.

Eriocaulon texense Körn., (of Texas), TEXAS PIPEWORT, PIPEWORT. Mature scapes 5–30 cm long, mature head hemispherical, gray except for the white trichomes of the bractlets and perianth parts and the straw-colored outer involucre bracts; outer involucre bracts suborbicular to broadly ovate, ca. 1.5 mm long, at maturity usually hidden by the florets; surface of receptacle with numerous hairs; receptacular bracts acute; sepals ca. 1.5 mm long, dark gray apically, with clavate white hairs on keel and sometimes margins apically. Wet acidic areas, bogs; c Henderson Co., also Milam Co. (Moldenke 1948); mainly se and e TX w to near e margin of nc TX. Moldenke (1961a) indicated Cory recorded the species from the Blackland Prairie. Apr–Jun.

Eriocaulon aquaticum (Hill) Druce, (aquatic), SEVEN-ANGLE PIPEWORT, WHITE-BUTTONS, DUCK-GRASS, [*E. septangulare* With.], was reported for TX in vegetational areas 1 and 4 (Fig. 2) by Hatch et al. (1990). However, Godfrey and Wooten (1979) indicated it occurs in Canada and the n U.S. only to North Carolina; R. Kral (pers. comm.) confirmed that this species does not occur in TX. According to Kral, “Early reports of *E. aquaticum* (*E. septangulare*) were based on lack of understanding of the similar-looking *E. texense*.” This species can be distinguished by the heads which are small (4–5 mm wide) and ± dark in appearance due to usually gray to almost black bracts and perianth parts (only tips of perianth parts and receptacular bracts have whitish hairs); also the receptacles are glabrous.

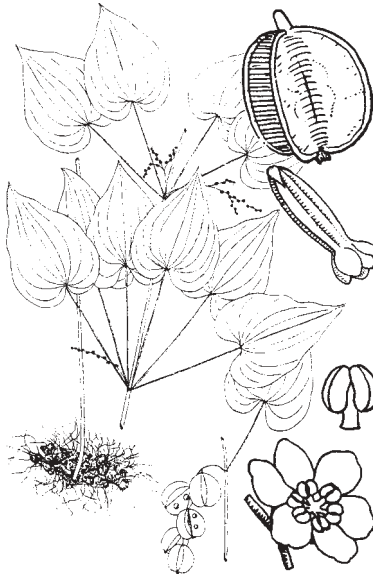
Eriocaulon kornickianum Van Heurck & Müll.Arg., (for Friedrich August Körnicke, 1828–1908, German botanist), SMALL-HEAD PIPEWORT, is known from e TX and could possibly be expected near the e margin of nc TX (R. Kral, pers. comm.). This diminutive species has short scapes (5–8 cm long), mature heads 3–4 mm broad, outer involucre bracts not hidden by bractlets and perianth parts, sepals ca. 1 mm long, and receptacles glabrous.

HYDROCHARITACEAE

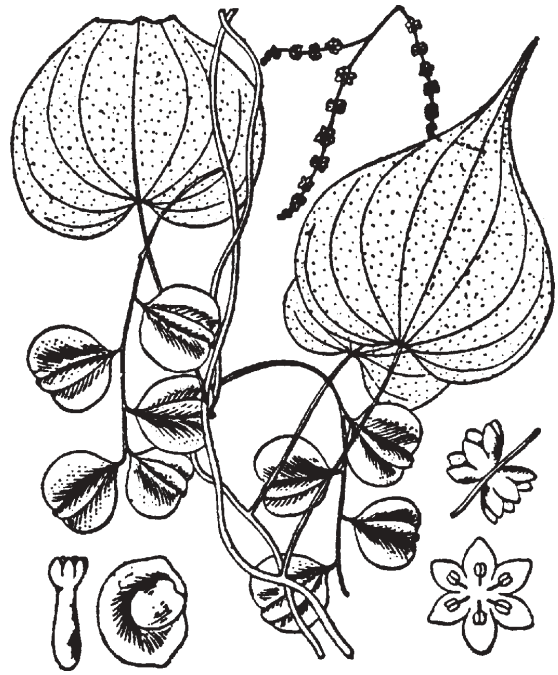
FROG’S-BIT, TAPE-GRASS OR WATERWEED FAMILY

Ours submerged, monoecious or dioecious herbs; leaves basal or subopposite, opposite, or in whorls along the stem; inflorescences with a spathe; perianth 3-merous or minute or absent; flowers at the water surface or borne underwater; fruits indehiscent, ripening underwater.

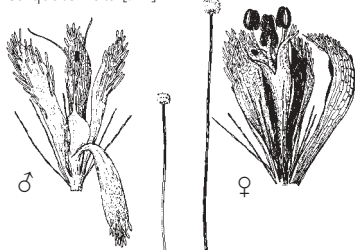
☛ A small (112 species in 16 genera), cosmopolitan, but mainly tropical family of aquatics; it



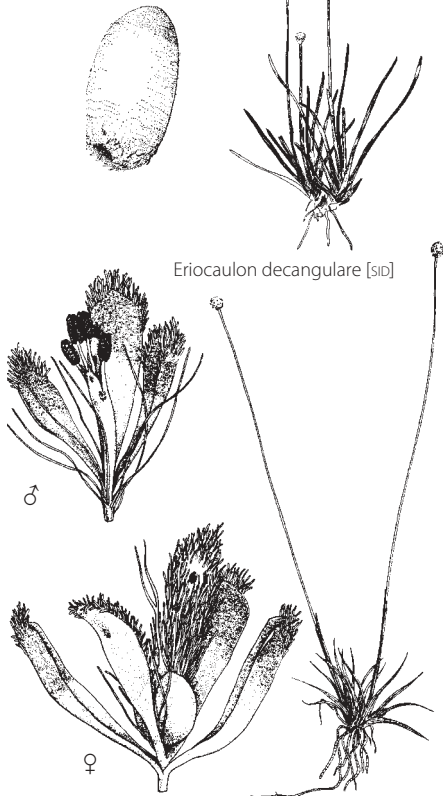
Dioscorea quaternata [SM1]



Dioscorea villosa [BB2]



Eriocaulon decangulare [SD]



Eriocaulon texense [GWO, SD]



Egeria densa [MAS]

includes *Elodea* (WATERWEED, DITCH-MOSS) and *Hydrilla*. The family is notable for its wide variety of pollination mechanisms including male flowers that detach and float or sail to the female flower, and also anthers that explode and scatter pollen over the water surface; it is one of relatively few families that exhibit hydrophily—water-mediated pollination; both hypohydrophily (pollination under water) and epihydrophily (pollination at the water surface) are known in the family (Philbrick 1991, 1993). A number of species are used as aquarium plants; some have become noxious aquatic weeds. We are following Thorne (1993b) and R. Haynes (pers. comm.) in including *Najas*, a genus previously recognized in its own family, in the Hydrocharitaceae. Family name from *Hydrocharis*, FROGBIT, an Old World genus of 3–6 species of floating aquatics. (Greek: *hydor*, water, and *charis*, graceful, in reference to the habit) (sub-class Alismatidae)

FAMILY RECOGNITION IN THE FIELD: submerged *aquatic* herbs with leaves EITHER simple, linear to linear-lanceolate or narrowly oblong, subopposite to opposite or whorled OR long and ribbon-like and clustered at base of plant.

REFERENCES: Dahlgren et al. 1985; Thorne 1993b.

1. Leaves subopposite, opposite, or whorled, distributed along the elongate stem, 4.5 cm or less long, 3(–5) mm or less wide.
2. Leaves subopposite or opposite (some can occasionally appear whorled where branches arise—if so they are dilated at base); flowers sessile or subsessile, borne underwater; perianth absent or minute, clearish or greenish, virtually indistinguishable without a lens; including extremely abundant native species _____ **Najas**
2. Leaves in distinct whorls of 3–8, not dilated at base; flowers (male and/or female) borne to the water surface on a thread-like stalk 3–6 cm long; perianth 3–10 mm long, white or translucent, visible with the naked eye; introduced species found in a few lakes in nc TX (currently spreading)
3. Leaves usually 2–3(–4) cm long, serrulate (teeth scarcely visible to the naked eye) marginally but lacking teeth on the midvein beneath (fresh leaves thus not rough to the touch); male flowers borne to the water surface on a thread-like stalk, with conspicuous white perianth parts 8–10 mm long _____ **Egeria**
3. Leaves usually 1.5(–2) cm or less long, serrate (teeth visible to the naked eye) marginally and with teeth on the midvein beneath (fresh leaves thus rough to the touch); male flowers detaching and floating to the surface, without a conspicuous white perianth _____ **Hydrilla**
1. Leaves clustered at base of plant on a very short stem, long and ribbon-like, 8–60(–nearly 100) cm long, to 8(–20) mm wide _____ **Vallisneria**

EGERIA

☞ A genus of 2 species of subtropical South America; it has sometimes been lumped with *Elodea* (an American genus of 12 species); *Elodea canadensis* Michx., known from OK but apparently not TX, can be distinguished from the somewhat similar *Egeria densa* and *Hydrilla verticillata* using the following characters: leaves opposite or in whorls of three, mostly 8–15 mm long, leaf margins lacking teeth perceptible to the naked eye, and leaf midveins lacking teeth. *Egeria* has nectariferous flowers and a relatively large perianth (Catling & Wojtas 1986); it is presumably animal-pollinated in contrast to the many hydrophilous taxa observed in this family. (Named after a Roman goddess of water or mythical water nymph)

REFERENCES: St. John 1965; Cook & Urmi-König 1984; Catling & Wojtas 1986.

Egeria densa Planch., (dense), WATERWEED. Perennial, submerged aquatic, rooting at bottom or if broken, drifting; lowermost leaves opposite or in whorls of 3; rest of leaves in whorls of 4–6(–8); leaves crowded, usually linear-lanceolate, serrulate, transparent, to ca. 2.5(–4) cm long and 3(–5) mm wide; flowers 3-merous; male spathes 2–4-flowered, in upper axils; male flowers reaching

the surface on a long thread-like hypanthium 3–6 cm long; petals white, ca. 8–10 mm long, much longer than the sepals; anthers 9; female flowers not observed. Lakes, ponds; Dallas, Grayson (Lake Ray Roberts), and Lamar (Pat Mayse Lake) cos., also Brown (City Reservoir) and Comanche cos. (HPC); mainly e TX and Edwards Plateau; probably spread from lake to lake by boats or boat trailers; commonly called ELODEA even though this is the scientific name of a related genus; widely used in biological laboratories. [*Anacharis densa* (Planch.) Vict., *Elodea densa* (Planch.) Casp.] Native of South America. 🌿

HYDRILLA

☞ A monotypic Old World genus introduced into the U.S. and Central America. The male flowers are released underwater, rise to the surface, and float to the female flowers (an example of epihydrophily—see discussion in *Vallisneria* generic synopsis). Cook and Lüönd (1982) indicated that during flower opening the stamens spring upward, the anthers burst, and pollen is scattered in the air, some of this landing on the female flowers and some on the surface of the water; apparently the pollen grains landing on the water are lost in terms of reproduction and only those actually landing on the female flower are involved in pollination. Even though the effective pollen grains never contact the water, the male flowers float and the system can thus be described as epihydrophily. (Diminutive of Greek: *hydra*, water, sea serpent)

REFERENCES: Godfrey & Wooten 1979; Cook & Lüönd 1982; Steward et al. 1984; Langeland 1996.

Hydrilla verticillata (L.f.) Royle, (whorled). Perennial, submersed, dioecious or monoecious aquatic with horizontal stems in the substrate sometimes forming tubers; erect stems branching, capable of ascending as much as 8.5 m (Godfrey & Wooten 1979), growing horizontally near the water surface; leaves in whorls of (2–)3–8, sessile, mostly 1.5–(2) cm or less long, 1.5–2 mm wide, narrowly oblong, serrate marginally (the teeth visible to the naked eye), with a single vein which on the abaxial surface bears conical protrusions tipped with teeth (fresh leaves thus noticeably rough to the touch); staminate flowers detach and float to surface; pistillate flowers reach the surface at the end of an elongate, thread-like floral tube 4–5 cm long; perianth segments 6, colorless, very inconspicuous, 3–5 mm long; fruits 5–6 mm long, ± fusiform. Lakes and other aquatic habitats; rapidly spreading at present in nc TX; probably spread vegetatively from lake to lake by boats or boat trailers and also intentionally by fishermen (L. Hartman, pers. comm.) to “improve” the habitat (this is both illegal and ill-advised since it ultimately degrades the fishery); Cooke, Dallas, Denton, Hopkins, Hunt, and Tarrant cos. (M. Smart, pers. comm.); also se and e TX and Edwards Plateau. Native of the Old World, probably the warmer areas of Asia (Cook & Lüönd 1982). Female plants were first reported in the U.S. in 1960 from South Florida (misidentified as *Elodea canadensis*) (Blackburn et al. in Steward et al. 1984); monoecious plants were first observed in the U.S. in Washington, D.C. in 1982; the female (dioecious) individuals are triploid, while monoecious plants are diploid (Steward et al. 1984). Since its introduction in Florida, this problematic species has spread across the southern U.S. to Texas, California, Washington state, and up the east coast to Delaware and Maryland. The earliest TX collection we are aware of is from 1974 (*Amerson 2097*, BRIT/SMU); the species was first collected in Louisiana in 1973 (Solymosy 1974). *Hydrilla* is a serious invasive pest which can completely dominate aquatic habitats eliminating native species, clogging waterways, and severely curtailing recreational use (Steward et al. 1984; Flack & Furlow 1996; Langeland 1996). In Texas, *Hydrilla* is considered a “harmful or potentially harmful exotic plant” and it is illegal to release, import, sell, purchase, propagate, or possess this species in the state (Harvey 1998). *Hydrilla* can easily be confused with *Egeria densa*. 🌿

NAJAS NAIAD, WATER-NYMPH, BUSHY-PONDWEED

Submerged, monoecious or dioecious, aquatic herbs; leaves subopposite, opposite, or crowded

and appearing whorled but inserted at barely different levels, sheathing basally, 3 mm wide or less; flowers axillary, few; staminate flowers with 1 stamen; pistillate flowers sessile, 1-carpellate; stigmas 2–4; fruit a 1-seeded nutlet enclosed in a loose coat.

☛ A cosmopolitan genus of ca. 32 species. The stems have reduced xylem lacking vessels; some are serious weeds in rice fields, but make good green fertilizer; *Najas* species are an important source of food for waterfowl and fish; however, they are capable of vigorous growth and may become so dense as to impede water flow and the movement of boats (Tyril et al. 1994). *Najas* is one of relatively few genera that exhibit hypohydrophily (pollination under water) in contrast to some cases of hydrophily in which pollination occurs at the water surface (epihydrophily; e.g., *Hydrilla*, *Vallisneria*) (Cox 1988; Philbrick 1991, 1993). While traditionally recognized in its own family, the Najadaceae (e.g., Kartesz 1994; Jones et al. 1997), Thorne (1993b) treated *Najas* in the Hydrocharitaceae, and there is molecular and morphological evidence that it should be lumped with the Hydrocharitaceae (R. Haynes, pers. comm.). Shaffer-Fehre (1991b), for example, put *Najas* in the Hydrocharitaceae based on seed coat anatomy. (Greek: *Naias*, a water-nymph)

REFERENCES: Morong 1893; Taylor 1909b; Clausen 1936; Haynes & Wentz 1974; Haynes 1977, 1979; Stuckey 1985; Lowden 1986; Shaffer-Fehre 1991a, 1991b; Haynes & Hellquist 1996).

1. Leaves usually minutely denticulate (appearing entire to the naked eye) or nearly entire;

internodes and back of leaves unarmed

N. guadalupensis

1. Leaves coarsely and obviously (to the naked eye) toothed; internodes and often back of

leaves armed with small spines

N. marina

Najas guadalupensis (Spreng.) Magnus, (for the Caribbean Island of Guadalupe, from where the type was collected), COMMON WATER-NYMPH, SOUTHERN NAIAD. Monoecious; leaves to 25 mm long and 2 mm wide (usually ca. 10 mm long and 1 mm wide); seeds fusiform, 2–3 mm long, 0.4–0.8 mm wide, areolate, the areolae in rows and easily seen under low magnification. Often very abundant; possibly in nearly every tank, pond, and lake in nc TX, also streams and ditches; throughout TX. Jun–Sep.

Najas marina L., (of the sea), HOLLY-LEAF WATER-NYMPH, SPINY NAIAD. Dioecious; leaves to 45 mm long and 3 mm wide; seeds ovoid, 4–5 mm long, 1.2–2.3 mm wide, smooth or minutely areolate, the areolae irregularly arranged. Lakes and ponds; Somervell Co.; also in TX in Cameron, Tom Green, Travis, and Zapata cos. (Stuckey 1985). May–Jul.

VALLISNERIA TAPE-GRASS, EEL-GRASS

☛ A genus of 2–10 species of tropical and warm temperate areas of the world. Pollination occurs when male flowers break off, float to surface, open, and float to the female flowers which are borne at the surface on long peduncles; the female flowers create a slight depression in the surface of the water and the male flowers fall into this depression (Cox 1988); this type of hydrophily (= water-mediated pollination) occurring at the water surface is known as epihydrophily (in contrast to hypohydrophily or underwater pollination as seen in *Najas*) (Philbrick 1993). Some workers (e.g., Cox 1988) further divide epihydrophily into a category in which pollen is transported just above the surface of the water (e.g., *Hydrilla*, *Vallisneria*) and a category in which pollen is transported directly on the surface of the water (e.g., *Elodea*) (Named for Antonio Vallisneri, 1661–1730, an Italian botanist)

REFERENCE: Rydberg 1909.

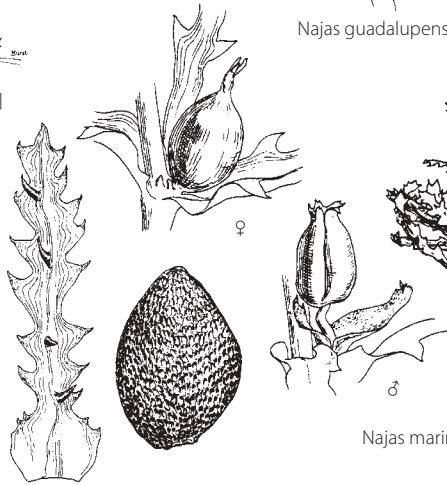
Vallisneria americana Michx., (of America), AMERICAN WILD-CELERY, EEL-GRASS, WATER-CELERY. Submerged stoloniferous aquatic; leaves clustered at base of plant on a very short stem, long and ribbon-like, 8–60(–nearly 100) cm long, to 8(–20) mm wide; male flowers numerous, tiny, breaking from a spathe and free-floating at maturity, with 3 very thin, transparent sepals and 1



Hydrilla verticillata [gwo]



Najas guadalupensis [STE]



Najas marina [MAS]



Vallisneria americana [LAM]

transparent petal; female flowers solitary in pedunculate spathes at the water surface at flowering time, with 3 thickish persistent sepals 3–4 mm long and 3 rudimentary, soon disintegrating petals to ca. 2 mm long; peduncles to 1 m long, coiling after pollination and pulling the flowers below the surface; fruits cylindrical, 8–18 cm long; to ca. 5 mm in diam. Lakes, flowing streams; introduced into Lake Ray Roberts (Grayson Co.) (M. Hackett, pers. comm.) but no nc TX specimens seen; rare in se and e TX w to Edward Plateau. Apr–Jul. [*V. spiralis* of authors, not L.] Where abundant in the n U.S., it is a valuable wildlife food.

IRIDACEAE IRIS FAMILY

Plants annual or perennial herbs from fibrous roots or a bulb, corm, or rhizome; leaves basal or alternate; leaf blades equitant (2-ranked, folded around a stem in the manner of the legs of a rider around a horse; the stem and leaves together having a flattened appearance), or pleated, or concave above, or with prominent midrib; inflorescences various; flowers arising from a spathe of bracts; tepals 6, in 1 or 2 rows, similar or of 2 different sizes or shapes; stamens 3; pistil 1; stigmas petaloid in *Iris* and some other genera; ovary inferior; fruit a capsule.

☛ A medium-large family (1,700 species in 82 genera) of nearly worldwide distribution in tropical and temperate regions, but especially s Africa, e Mediterranean, and Central and South America; it includes many important ornamentals in addition to *Iris*, including *Crocus*, *Gladiolus*, and *Tigridia* (TIGER-FLOWER). The world's most expensive spice, saffron, important as a food coloring, is obtained from the stigmas of *Crocus sativus* L. (subclass Liliidae)

FAMILY RECOGNITION IN THE FIELD: herbs with *equitant* leaves and flowers subtended by bracts, with a 6-parted petaloid perianth, 3 *stamens*, and a 3-celled inferior ovary; the somewhat similar Liliaceae have 6 stamens and a superior or inferior ovary.

REFERENCES: Dahlgren et al. 1985; Goldblatt 1990; Goldblatt & Takei 1997.

1. Leaves flat; rootstock a rhizome or obsolete and roots fibrous (except *Iris xiphium* with a bulb).
 2. Tepals similar in size and positioning (but some can be narrower); style branches filiform, entire; flowers small (ca. 12 mm or less long); plants grass-like vegetatively. _____ **Sisyrinchium**
 2. Tepals not similar in size or positioning, the inner whorl erect, the outer whorl reflexed; style branches petaloid, cleft at apex; flowers large (much more than 12 mm long); plants not grass-like, the leaves large. _____ **Iris**
1. Leaves plicate (= folded like a fan), occasionally so narrow that pleats not developed; rootstock a bulb.
 3. Tepals (3 inner vs. 3 outer) conspicuously unequal in size, variously patterned, either with very small inner tepals dark (blackish violet) towards base or inner tepals spotted reddish brown over yellow towards base; anthers 6–10 mm long.
 4. Tepals blue or purple-blue, yellow color never present; outer larger tepals lanceolate to broadly so, with a violet halo (= ring) outlining whitish, purple-dotted base; inner tepals much smaller, ca. 8 mm long, blackish violet towards base, acuminate apically; cauline leaves if present reduced to bract-like structures. _____ **Herbertia**
 4. Tepals velvety purple to rose-purple, spotted reddish brown over yellow towards base; outer large tepals ovate; inner tepals ca. 15 mm long, obtuse apically; cauline leaves leaf-like towards base of stem, becoming bract-like above. _____ **Alophia**
 3. Tepals nearly equal in size and appearance, uniformly blue except lighter to white at very base giving the perianth the appearance of a white "eye"; anthers 11–15 mm long. _____ **Nemastylis**

ALOPHIA

☛ A genus of 5 species of perennial herbs native from the s United States to South America; some are used as cultivated ornamentals. (Greek: *a*, without, and *lophos*, crest)

Alophia drummondii (Graham) R.C. Foster, (for its discoverer, Thomas Drummond, 1780–1835, Scottish botanist and collector in North America), PURPLE PLEAT-LEAF. Perennial from a shallow bulb; basal leaves sheathing, narrowly linear to linear-lanceolate, to ca. 30 cm long and 2 cm wide; cauline leaves leaf-like near base of stem, bract-like above; flowering stem to 75 cm tall; flowers few, emerging from the spathes; tepals velvety-purple to rose-purple (rarely white), spotted reddish brown over yellow toward base, to ca. 25 mm long, fugacious; 3 outer tepals somewhat larger than the 3 longitudinally cupped and apically crimped inner; anthers 6–8 mm long; capsules ca. 1.5–5 cm long. Sandy soils, grassy areas, and open woods; Dallas Co. (Reverchon collection), also Milam Co. near e edge of nc TX, also Lamar Co. in Red River drainage (Carr 1994); mainly se and e TX. Mostly May–Jul. [*Nemastylis purpurea* Herb., *Eustylis purpurea* (Herb.) Engelm. and *A. drummondii* in the sense of Correll & Johnston (1970)]. ☒/77

HERBERTIA

☛A mainly South American genus of 4 species of perennial herbs with 1 species in TX and LA; some cultivated as ornamentals. (Named for William Herbert, 1778–1847, Dean of Manchester and an authority on bulbiferous plants)

REFERENCE: Goldblatt 1977 [1978].

Herbertia lahue (Molina) Goldblatt subsp. ***caerulea*** (Herb.) Goldblatt, (sp.: derivation unknown; subsp.: dark blue). Scapose herb from a bulb; leaves with sheathing bases, narrowly linear, to ca. 20 cm long, usually 6 mm or less wide, cauline leaves if present reduced and bract-like; scape to ca. 30 cm tall; spathes with 1–2 flowers; perianth ca. 5 cm across; 3 outer tepals usually pale or dark lavender with patterned base, to 25 mm long; 3 inner tepals much smaller, with upper part violet and lower blackish violet, sometimes with white spots; anthers 7–10 mm long; capsules to 25 mm long. Grasslands and prairies; Denton Co.; also Dallas Co. (probably introduced with sod-R. O’Kennon, pers. obs.); mainly se and e TX; endemic to TX and LA. Mar–May. [*Alophia drummondii* of Correll & Johnston (1970) and Mahler (1988), not (Graham) R.C. Foster, *H. caerulea* (Herb.) Herb., *Trifurcia lahue* (Molina) Goldblatt subsp. *caerulea* (Herb.) Goldblatt] The name *Alophia drummondii* was misapplied by Correll & Johnston (1970) and Mahler (1988) to this species which is correctly placed in *Herbertia* (Goldblatt 1977 [1978]). ☒/92

IRIS FLAG, FLEUR-DE-LIS

Ours perennials from rhizomes (bulb in *I. xiphium*); leaves flat (nearly cylindrical in *I. xiphium*), equitant; flowers usually large and showy, usually mostly bluish, purplish, white, or variously colored in cultivated forms; perianth segments (tepals) of 2 types, the outer (= falls) deflexed or spreading, the inner (= standards) usually erect; style divided into 3 petaloid branches, each overlying a stamen and the claw of a fall; hypanthial tube present.

☛A mostly n temperate genus of ca. 210 species; *Iris* species are very important ornamentally; e.g., they are the “fleur-de-lis” of French royalty (Tveten & Tveten 1993). Several species are also grown for orris, a powder with the odor of violets; it is obtained from the rhizomes and used in perfumes. ☛Leaves and especially the rhizomes of some species (e.g., *I. germanica*, *I. pseudacorus*) contain an irritating resinous substance (irisin) which can cause severe digestive upset if eaten and dermatitis if handled (Schmutz & Hamilton 1979; Lampe & McCann 1985). There are no *Iris* species native to nc TX; all of the following are Old World taxa that are introduced, persist, and escape. In addition, LOUISIANA IRIS, hybrids of *I. fulva* Ker. Gwal., *I. giganteaerulea* Small, and to a lesser degree *I. brevicaulis* Raf. (all native to LA or adjacent areas), are also cultivated in nc TX, especially in wet areas such as pond margins (e.g., Edith Wolford of Fannin Co.). These are rhizomatous, have flat leaves and beardless falls, and are very variable in color. (Named after Iris, Greek goddess of the rainbow, from flower colors)

REFERENCES: Dykes 1913; Anderson 1936; Foster 1937.

1. Leaves nearly cylindrical, channeled on upper surface; plants with a bulb _____ **I. xiphium**
1. Leaves flat, the two surfaces identical; plants with a thick rhizome.
2. Petals yellow; standards 4–8 mm wide; falls glabrous _____ **I. pseudacorus**
2. Petals bluish, purplish, or white (or variously colored in cultivated forms); standards 30–60 mm wide; falls with a beard of multicellular hairs.
3. Spathes entirely scarious (= dry, papery, and translucent or transparent) at flowering time, 20–35 mm long; hypanthial tube 8–11 mm long _____ **I. pallida**
3. Spathes herbaceous (= greenish) in the lower half at flowering time, the upper half scarious, 35–55 mm long; hypanthial tube 17–25 mm long _____ **I. germanica**

Iris germanica L., (German), GARDEN IRIS. Perianth bluish violet to white or variously colored in a diversity of cultivated forms; falls 40–60 mm wide; standards 45–60 mm wide. This is the commonly cultivated *Iris* widely planted in TX. It persists indefinitely and escapes widely. Grayson Co., also Dallas (Ed McWilliams, pers. comm.) and Tarrant (R. O'Kennon, pers. obs.) cos. Spring. Probably of hybrid origin from several European species. Toxic (Lampe & McCann 1985). ☠ 🌿

Iris pallida Lam., (pale), BLUE FLAG, ORRIS. Perianth lilac to violet; falls 30–50 mm wide; standards 30–45 mm wide. Cultivated and escapes; Dallas Co., also Tarrant Co. (R. O'Kennon, pers. obs.) Apr–May. Native to the Old World. 🌿

Iris pseudacorus L., (false sweet-flag), YELLOW FLAG. Perianth yellow; falls 20–30 mm wide; standards 4–8 mm wide; hypanthial tube 10–15 mm long. Commonly cultivated and escapes, in ponds and lake margins; Parker and Tarrant (Fort Worth Botanic Garden) cos. (R. O'Kennon, pers. obs.) Apr–May. Native to Europe and n Africa. Toxic (Lampe & McCann 1985). ☠ 🌿

Iris xiphium L., (sword-leaved), DUTCH IRIS, SPANISH IRIS. Flowers usually solitary; perianth blue (to other colors in cultivated forms); falls 18–25 mm wide; standards 15–20 mm wide. Cultivated and escapes; Dallas Co. Apr–May. Native to Europe and n Africa. 🌿

NEMASTYLIS CELESTIAL, PLEAT-LEAF, SHELL-FLOWER

☞ A genus of 5 species ranging from the s U.S. to Central America. (Greek: *nema*, a thread, and *stylos*, pillar, column, or style, for the slender style branches)

REFERENCES: Foster 1945; Goldblatt 1975.

Nemastylis geminiflora Nutt., (twin-flowered), PRAIRIE CELESTIAL, PRAIRIE PLEAT-LEAF, CELESTIAL-LILY, PRAIRIE-IRIS. Perennial from a bulb 2–3 cm in diam.; basal leaves (2–)3, 20–40 cm long, 3–6 mm wide; cauline leaves 2 or 3, to 35 cm long, 5–11 mm wide, at least one exceeding the inflorescence; flowering stems 12–30(–46) cm tall; spathes 1–2-flowered; tepals subequal, to 3 cm long, blue, lighter at base giving the appearance of an “eye,” all flat or saucer-shaped; filaments free or connate at very base; anthers 11–15 mm long; capsules 15–25 mm long. Prairies or open oak woods; se and e TX w to Rolling Plains and Edwards Plateau. Mar–May. According to Wills and Irwin (1961), the flowers are only open for a few hours; they indicated flower opening occurs in late morning with the perianth parts curling up usually before 3 p.m. ☒/100

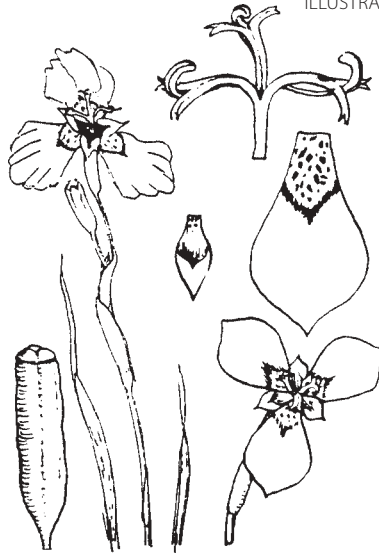
Nemastylis nuttallii Pickering ex R.C. Foster, (for Sir Thomas Nuttall, 1786–1859, English-American botanist), is cited by Hatch et al. (1990) for vegetational areas 3 and 4 (Fig. 2); we have seen no TX material and Goldblatt (1975) gave a range map showing only AR, OK, and MO. It can be distinguished by the following characters: filaments united; anthers ca. 4 mm long; cauline leaves < 4 mm wide or bract-like.

SISYRINCHIUM BLUE-EYED-GRASS, GRASS-VIOLET

Annuals or perennials from fleshy-fibrous roots; leaves few, equitant; flowers solitary or in



Alopia drummondii [DOR]



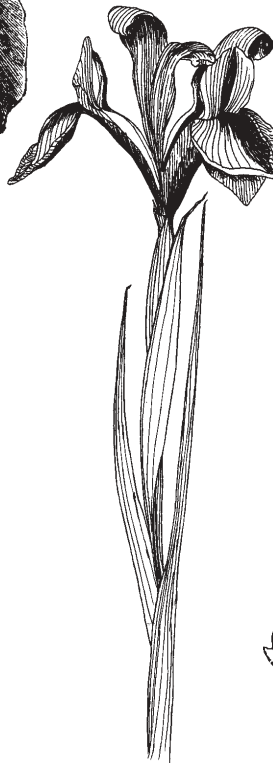
Herbertia lahue subsp. *caerulea* [DOR, SM1]



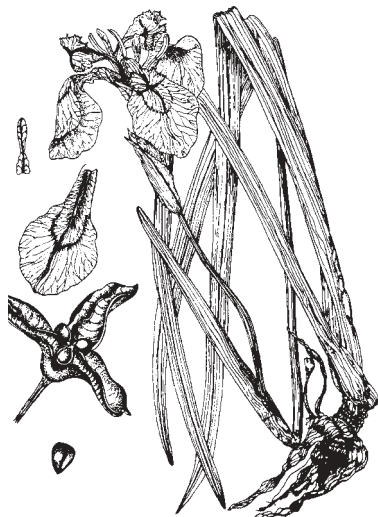
Iris pallida [NIC]



Iris germanica [NIC]



Iris xiphium [BT3]



Iris pseudacorus [CO1]



Nemastylis geminiflora [SM1, STE]

small, umbel-like clusters, from a pair of leaf-like bracts (referred to as the spathe), closed at night or in cloudy weather; perianth radially symmetrical, the tepals similar or alternating narrow and wide, bluish to purplish, rose or white, often with a yellow “eye”; stamens united into a narrow column.

☛ A mainly American genus (especially Central and South America) of 80 species with 1 in Ireland (possibly naturalized); some are cultivated as ornamentals. It is a taxonomically difficult group that needs detailed study; hybridization sometimes occurs, further complicating the picture. Mosquin (1970) proposed lumping a number of the species, including *S. albidum*, *S. angustifolium*, *S. campestre*, and *S. langloisii*, into a single, widespread, variable taxon. While the flowers are relatively small, the plants are often abundant, making showy displays along roadsides and open areas. The most widely used common name, BLUE-EYED-GRASS, is doubly incorrect, the plants neither having a blue center or “eye” nor being related to grasses. (Name used by Theophrastus for some plant, later transferred to this genus; possibly derived from Greek: *sys*: with, and *rhynchus*, snout or beak; significance not known)

REFERENCES: Bicknell 1901; Shinnery 1962b; Mosquin 1970; Goldblatt et al. 1989; Hornberger 1991.

1. Tepals 3–7 mm long, lavender-pink to purple-rose, occasionally white; plants annual _____ **S. minus**
1. Tepals 6.5–12 mm long, white to pale or deep blue or blue-purple; plants perennial.
 2. Bracts immediately subtending flowers (spathe or spathe plus additional leafy bract located so close as to be touching spathe) clearly different in length; flowers white to light blue; stems usually without leaves or leafy bracts except those immediately subtending the flowers; margins of outer spathe bract not fused at base or only slightly so (for 1 mm or less).
 3. Spathes (each composed of 2 bracts) usually paired at stem apex; the pair of spathes immediately subtended by an elongate bract much longer than the spathes _____ **S. albidum**
 3. Spathe (composed of 2 bracts) single at stem apex; spathe not subtended by an elongate bract _____ **S. campestre**
 2. Bracts immediately subtending flowers equal in length or nearly so; flowers intense blue to blue-violet to purple-blue, rarely white; stems with leaves or leafy bracts in addition to those immediately subtending the flowers; margins of outer spathe bract fused at base (for 1.1 mm or more).
 4. Stems winged with each wing equaling stem width and at least 1 mm wide _____ **S. angustifolium**
 4. Stems not broadly winged.
 5. Ovaries usually glabrous; plants drying medium- to olive-green; stems usually numerous _____ **S. prinosum**
 5. Ovaries minutely pubescent (under a hand lens); plants sometimes drying light-green to glaucous, particularly in *S. chilense*; stems few to numerous.
 6. Leaves 2–4 mm wide; narrower tepals 1.3–3.3 times longer than broad; capsules 4–7 mm long; stems solitary to few _____ **S. chilense**
 6. Leaves 1–2 mm wide; narrower tepals (2.5–)3–5 times longer than broad; capsule 3.5–4.5 mm long; stems usually numerous _____ **S. langloisii**

Sisyrinchium albidum Raf., (white), WHITE BLUE-EYED-GRASS. Plant 20–40 cm tall; stems narrow, broadly winged, simple; leafy bract so close to the spathes as to appear to be the much elongated outer bract of the spathe; paired spathes sessile; flowers white to light blue. In open woods; Milam and Wise cos.; e and nc TX. Mar–Apr.

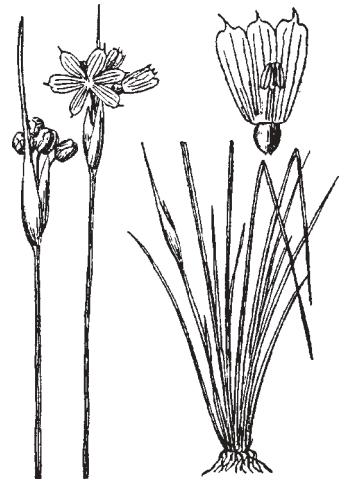
Sisyrinchium angustifolium Mill., (narrow-leaved), BERMUDA BLUE-EYED-GRASS. Plant 15–30 cm tall; peduncles 1–5 mm longer than the subtending leafy bract; flowers blue to blue-violet, rarely white; capsules 4–5.5 mm long. Sandy woods; Dallas and Lamar cos.; mainly se and e TX, also Edwards Plateau. Mar–May. [*S. bermudiana* of authors, not L.]



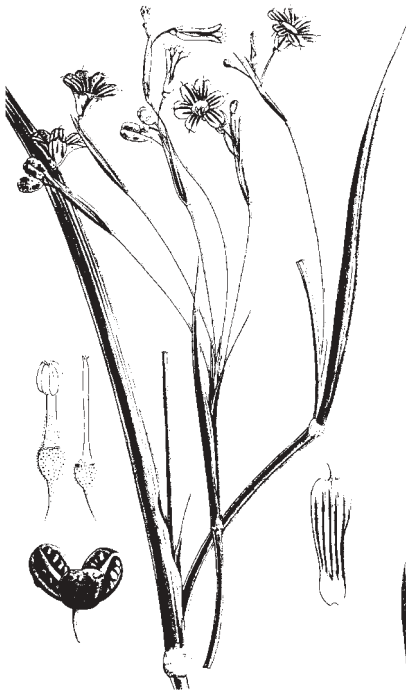
Sisyrrinchium albidum [BB2]



Sisyrrinchium angustifolium [TOR]



Sisyrrinchium campestre [BB2]



Sisyrrinchium chilense [CUR]



Sisyrrinchium langloisii [HEA]



Sisyrrinchium minus [ADD]



Sisyrrinchium pruinatum [SHI]

Sisyrinchium campestre E.P. Bicknell, (of the plains or fields), PRAIRIE BLUE-EYED-GRASS. Plant 15–28 cm tall; stems narrow, broadly winged, simple, without leafy bracts or one rarely present; outer bract of spathe ca. 1.5–2(–5) times as long as the inner; flowers white to light blue; capsules 3–4 mm long. Prairies; Delta, Grayson, and Fannin cos.; se and e TX w to n part of nc TX, also Edwards Plateau. Apr–May.

Sisyrinchium chilense Hook., (of Chile), SWORD-LEAF BLUE-EYED-GRASS. Plant 15–50 cm tall; stems solitary or few, slightly to strongly glaucous or gray-green; flowers blue-purple. Prairies; w edge of Blackland Prairie (Bell and Grayson cos.) s and w to w TX. Apr–May. [*S. ensigerum* E.P. Bicknell]

Sisyrinchium langloisii Greene, (for Rev. A.B. Langlois, 1832–1900, French-born clergyman and botanist in LA), PALE BLUE-EYED-GRASS. Plant 12–35 cm tall; stems usually numerous; perianth light violet-blue to purple-blue with yellow “eye,” pale outside. Sandy woods; Fannin, Hopkins, Kaufman, McLennan, and Tarrant cos.; se and e TX w to nc TX, also Edwards Plateau. (Mar–) Apr–May.

Sisyrinchium minus Engelm. & A. Gray, (smaller), LEAST BLUE-EYED-GRASS. Plant prostrate to erect, 4–22 cm tall; stems with 1 or 2 leafy nodes and a leafy bract; flowers lavender-pink to purple-rose, occasionally white, rarely yellow; capsules 4–5 mm long. Sandy soils; Bell and Navarro cos., also Dallas (Shinners 1948b) and Tarrant (R. O’Kennon, pers. obs.) cos.; mainly se and c TX. (Mar–)Apr.

Sisyrinchium pruinatum E.P. Bicknell, (with a white glistening coating or bloom), DOTTED BLUE-EYED-GRASS. Plant 9–30 cm tall; stems numerous; leaves 1–3 mm wide; flowers light violet-blue to purple-blue, rarely white or very rarely mottled, with yellow “eye,” pale outside; capsules 4–6 mm long. Prairies, disturbed sites, often a lawn weed; se and e TX w to West Cross Timbers, also Edwards Plateau. (Mar–)Apr(–May). Hornberger (1991), Kartesz (1994), and Jones et al. (1997) lumped this taxon into *S. langloisii*; pending a treatment of the group as a whole, we are maintaining it as a separate species. ☒/106

JUNCACEAE RUSH FAMILY

Grass-like or sedge-like annuals or perennials; stems pithy or hollow, round or somewhat flattened on one side, with smooth nodes; leaves basal and/or cauline, with open or closed, tubular, basal sheath smoothly continuous with the blade or with margins or inner lining prolonged at summit into auricles or a scale (resembling the ligule of grasses); leaf blades flat or terete; inflorescences of spike-like racemes, panicles, or heads; perianth of 2 whorls of 3, narrow, scaly, green to red-brown or yellowish perianth parts; stamens 3 or 6; pistil 1; ovary superior; fruit a dry dehiscent capsule.

☛ A small (430 species in 7 genera) family of herbs of temperate and cold areas and tropical mountains primarily in wet or damp habitats. The family is thought by some authorities (e.g., Dahlgren et al. 1985) to be related to the Cyperaceae. (subclass Commelinidae)

FAMILY RECOGNITION IN THE FIELD: grass-like or sedge-like herbs with basal, tufted, linear leaves; flowers inconspicuous with 6 scaly perianth segments, clustered but not in spikelets; fruit a capsule; the somewhat similar Poaceae and Cyperaceae have 1-seeded fruits, either lack a perianth or have the perianth very reduced, and have flowers in spikelets.

REFERENCE: Dahlgren et al. 1985.

1. Plants glabrous; seeds numerous per capsule; capsules usually 3-celled (sometimes imperfectly so); leaf blades terete (= rounded in cross-section) or flat; leaf sheaths open; widespread in nc TX

1. Plants with pubescence; seeds 3 per capsule; capsules 1-celled; leaf blades flat; leaf sheaths closed; mainly e TX, rare in nc TX _____ **Luzula**

JUNCUS RUSH

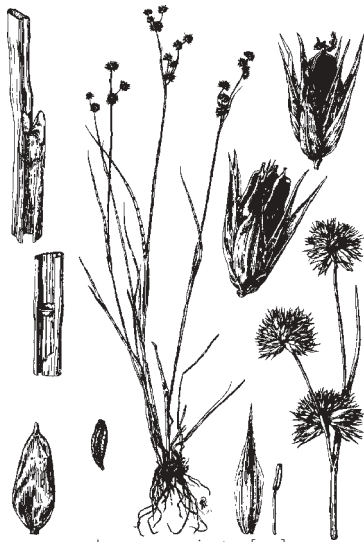
Glabrous perennial or annual (only 2 nc TX species) herbs with fibrous roots, some species rhizomatous; leaf blades flattened or terete, sometimes septate; inflorescences variable, sometimes with numerous rebranched branches; flowers solitary on pedicels or often in head-like clusters; seeds numerous and small.

☛ A genus of ca. 300 species, cosmopolitan in distribution but rare in the tropics. (Latin: *iuncus*, name for rush; derived from *iungere*, to join or bind, from use of stems for tying)

REFERENCES: Engelmann 1868; Wiegand 1900.

1. Inflorescence appearing lateral, the "stem" apparently continuing beyond it [actually the "stem" beyond the inflorescence is a stem-like involucral bract]; leafy bracts absent or much shorter than inflorescence.
2. Capsules obovoid, clearly longer than broad, obtuse, truncate, or even depressed apically; flowers numerous, 30–100 per panicle; upper leaf sheaths without blades; widespread in nc TX _____ **J. effusus**
2. Capsules spherical (rarely slightly ovoid), ca. as broad as long, apically turgid; flowers few, 2–25 per panicle; upper leaf sheaths with blades; in nc TX known only from Henderson and Lamar cos. _____ **J. coriaceus**
1. Inflorescence terminal, or both terminal and appearing lateral, with either short or long leafy bracts.
3. Small tufted annuals 5–30 cm tall; leaves ca. 0.5 mm or less broad, inrolled or flat, not nodulose (= without knot-like septa).
4. Flowering stems usually branched; inflorescence not head-like; leaves inrolled, filiform; bracteoles usually 2–3 beneath each flower; stamens often 6, rarely 3 _____ **J. bufonius**
4. Flowering stems unbranched; inflorescence of 1–2 head-like clusters which appear sessile; leaves flat; bracteoles solitary beneath each flower; stamens 3 _____ **J. capitatus**
3. Perennials 8–125 cm tall; leaves various.
5. Flowers solitary at ends of pedicels or in few-flowered clusters, not forming a dense head-like cluster or glomerule (sometimes clustered in *J. dudleyi*); leaf blades usually thin and flat, or slender and terete, neither equitant (= 2-ranked) nor nodulose (= with knot-like septa); each flower closely subtended by a pair of opposite (or nearly so) bracteoles clearly smaller than the perianth.
6. Flowers solitary at ends of pedicels (but may be crowded).
7. Capsules oblong, nearly equaling or exceeding the perianth; sepals 4.5–5 mm long; leaf blades flat or inrolled; capsules distinctly 3-locular _____ **J. brachyphyllus**
7. Capsules oblong-ovoid to globose-ovoid, shorter than or equaling the perianth; sepals 3–5 mm long; leaf blades flat, inrolled, or terete; capsules apparently 1-locular or incompletely 3-locular.
8. Leaf auricles (at summit of leaf sheath) 1–2.3(–5) mm long, prolonged, distinctly longer than broad, scarious (= thin and dry) or scarious margined; plants 8–45 cm tall _____ **J. tenuis**
8. Leaf auricles 0.3–1 mm long, rounded, not longer than broad; firm-membranous or subcoriaceous; plants 20–125 cm tall.
9. Leaf blades strongly inrolled, thread-like, grooved on one side or terete; bracteoles underneath flowers acute or acuminate; flowers few and widely scattered _____ **J. dichotomus**
9. Leaf blades flat or inrolled; bracteoles underneath flowers obtuse or acute; flowers often rather crowded.

10. Perianth 4–5 mm long; flowers partly solitary, partly in tight clusters of 2–5
 _____ **J. dudleyi**
10. Perianth 3.3–4.2 mm long; flowers solitary though crowded _____ **J. interior**
6. Flowers (at least terminal ones) sessile in 2s or 3s, or in small clusters.
11. Perianth 2.5–3.5 mm long; capsule about equaling the perianth; inflorescences often rather open _____ **J. marginatus**
11. Perianth 4–5 mm long; capsule distinctly shorter than perianth; inflorescences of dense, almost head-like clusters _____ **J. dudleyi**
5. Flowers often forming dense heads or head-like clusters or glomerules; leaf blades rather thick and fleshy or spongy, equitant, usually nodulose (except neither equitant nor nodulose in *J. marginatus* and *J. filipendulus* with flat leaves); each flower subtended by a single bracteole.
12. Leaf blades thin and flat, neither equitant nor nodulose.
13. Perianth 2.5–3.5 mm long; capsule about equal to perianth in length; stems 1.5–3 mm broad in broadest dimension; panicle much branched, with 10–80 head-like clusters _____ **J. marginatus**
13. Perianth 4–5 mm long; capsule shorter than perianth; stems 0.5–1 mm broad in broadest dimension; panicle few branched, of 2–5(–10) head-like clusters _____ **J. filipendulus**
12. Leaf blades rather thick and fleshy or spongy, equitant, usually nodulose.
14. Flowers in globose heads 6–18 mm high, 15–60 per head; plants with or without rhizomes.
15. Heads 8–15 mm broad in flower, 10–18 mm in fruit; perianth 3.5–5.5 mm long.
16. Heads closely crowded, few or none widely spaced; branches of inflorescence if present to only 4 cm long; basal leafy bract slightly or greatly exceeding the inflorescence _____ **J. torreyi**
16. Heads mostly well-separated, long-peduncled or separated on the branches by naked internodes longer than diameter of heads; branches of inflorescence 1.5–30 cm long; basal leafy bract shorter to slightly longer than inflorescence.
17. Larger leaf blades 2.5–7.0 mm wide; branches of inflorescence 2–30 cm long.
18. Leaf blades 3–4(–6) mm thick in the larger dimension, with several tough complete septa, tough and resistant to crushing; stems 3–5 mm thick basally; leaves and stems grayish or olivaceous; heads (10–)12–15 mm broad; valves of capsules spreading and free after dehiscence
 _____ **J. validus**
18. Leaf blades 4–7 mm thick in the larger dimension, with many weak incomplete septa, mostly crushed flat in herbarium specimens; stems 6–10 mm thick basally; leaves and stems greenish; heads 10–12 mm broad; valves of capsules remaining united at their tips after dehiscence
 _____ **J. polycephalus**
17. Larger leaf blades 0.7–2.0 mm wide; branches of inflorescence 1.5–10(–12) cm long _____ **J. texanus**
15. Heads 6–8 mm broad in flower, 7–10 mm in fruit; perianth 2.7–3.5 mm long.
19. Capsule 1/4–2/3 as long as the perianth, ovoid to obovate, abruptly apiculate
 _____ **J. brachycarpus**
19. Capsule equaling or exceeding the perianth, slender, tapering uniformly to an elongate apex _____ **J. scirpoides**
14. Flowers in small heads, usually 2–10(–20) (rarely solitary) per head, the heads narrow to hemispherical or nearly globose, 3–6 mm high, 1–8 mm broad; plants without rhizomes.



Juncus acuminatus [MAS]



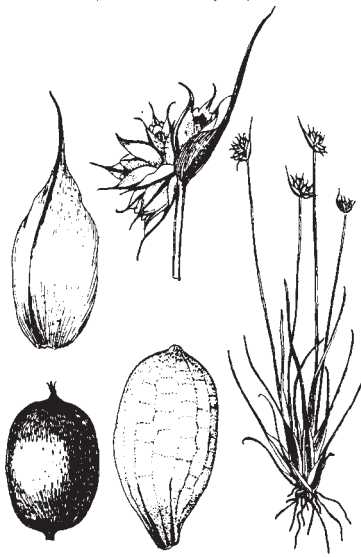
Juncus brachycarpus [STE]



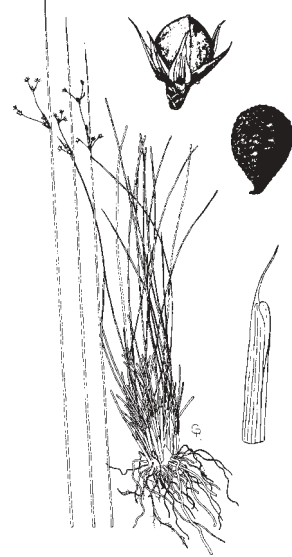
Juncus brachyphyllus [ABR]



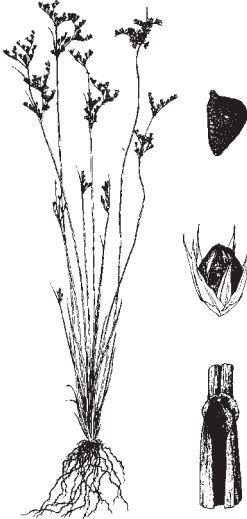
Juncus bufonius [BT3]



Juncus capitatus [SID]



Juncus coriaceus [GWO]



Juncus dichotomus [GWO]



Juncus diffusissimus [BT3, EN1]



Juncus dudleyi [EN1]

20. Heads (or single flowers) 16–200 or more per inflorescence, narrow to hemispherical, 1–6 mm broad (excluding exerted capsules of old flowers), mostly with 1–6 flowers; inflorescences 6–20 cm long, 4–25 cm broad or more.

21. Capsules distinctly elongate, becoming 3.8–6 mm long, about twice as long as the perianth; larger leaf blades 0.7–2.5 mm wide, not strongly nodulose

_____ **J. diffusissimus**

21. Capsules becoming 2.0–3.2 mm long, equaling or slightly exceeding the perianth; larger leaf blades 2.5–5 mm wide, strongly nodulose _____

J. nodatus

20. Heads 6–55 per inflorescence, becoming hemispherical or almost globose, 6–9 mm broad, mostly with 5–10(–20) flowers; inflorescences 2.5–15 cm long, 1.5–10 cm broad _____

J. acuminatus

Juncus acuminatus Michx., (long-pointed, tapering to tip), KNOT-LEAF RUSH. Resembling *J. nodatus*, but inflorescences more open. Wet places; Bell and Fannin cos., also Dallas Co. (Mahler 1988) and Parker and Tarrant cos. (R. O'Kennon, pers. obs.); se and e TX w to nc TX, also Edwards Plateau and Trans-Pecos. Apr–Jul.

Juncus brachycarpus Engelm., (short-fruited), WHITE-ROOT RUSH. Plant 15–80 cm tall, rhizomatous or occasionally not so. Damp sandy ground; se and e TX w to West Cross Timbers, also Edwards Plateau. May–Jun, sporadically to Jul.

Juncus brachyphyllus Wiegand, (short-leaved), SMALL-HEAD RUSH. Plant 40–80 cm tall; auricles of leaf sheaths either shorter or longer than wide, chartaceous or subcoriaceous; floral bractlets oblong, obtuse or acute. Low, sandy or rocky, open ground; Bosque, Grayson, Navarro, and Wise cos.; in TX apparently only in nc part of the state. Apr–Jun.

Juncus bufonius L., (pertaining to a toad), TOAD RUSH. Plant 4–18(–30) cm tall; stems often reddish tinged; inflorescence 1/4–3/4 the total height of the plant. Damp sandy soils; Bell, Burnet, Henderson, and Lamar cos.; widespread in TX. Late Apr–Jun.

Juncus capitatus Weigel, (headed), CAPPED RUSH. Plant usually less than 10 cm tall; leaves all basal. Sandy soils; Grayson Co. (Mahler 1988), also Lamar Co. (Carr 1994); mainly e TX, also Edwards Plateau. May–Jun. First reported for TX by Gould in 1962 [1963] from Walker Co; Keeney and Lipscomb (1985) gave additional locations.

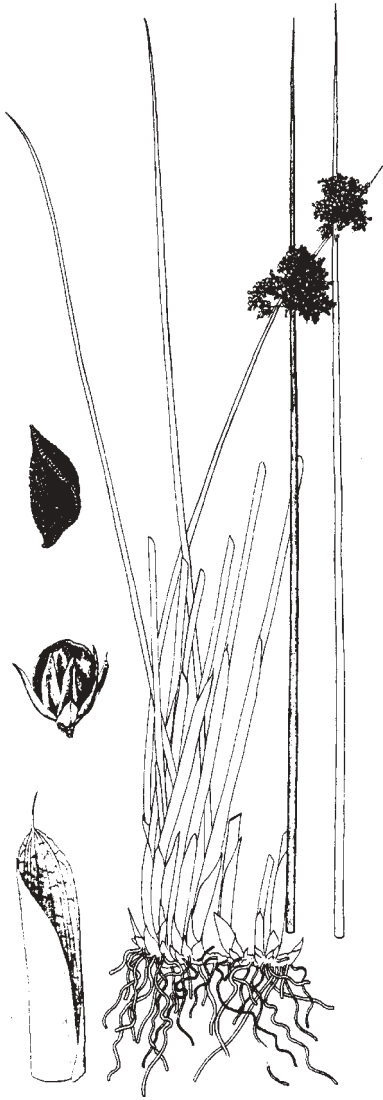
Juncus coriaceus Mack., (leathery), LEATHERY RUSH. Plant 30–100 cm tall. Moist sand; Henderson Co., also Lamar Co. (Carr 1994); e TX w to e margin of nc TX. Summer.

Juncus dichotomus Elliott, (2-parted or forked), FORKED RUSH. Plant 35–80 cm tall. Sandy woods or open ground, on slopes or in low places; Hopkins, Lamar, and Navarro cos.; mainly e TX w to e edge of nc TX; scattered elsewhere in the state. May.

Juncus diffusissimus Buckley, (most diffuse), SLIM-POD RUSH. Stems few to many in dense, rounded clumps 15–65 cm tall; inflorescence very open. Damp sandy ground; se and e TX w to East Cross Timbers and Edwards Plateau. May–Jun, less freely to Oct.

Juncus dudleyi Wiegand, (for its discoverer, William Russell Dudley, 1849–1911), DUDLEY'S RUSH. Plant 25–125 cm tall. Low ground; Denton and Tarrant cos. (Mahler 1988); scattered in TX. Jun.

Juncus effusus L. var. **solutus** Fernald & Wiegand, (sp.: loosely spreading; var.: loosened), COMMON RUSH, SOFT RUSH. Perennial forming dense, rounded clumps 70–130 cm tall; stems with rhizomatous base; leaves basal or nearly so, with very small blades or none; inflorescence appearing lateral, a rather compact panicle, almost head-like while young. Wet open ground; Denton, Grayson, Hopkins, and Lamar cos., also Bell (Fort Hood–Sanchez 1997) and Tarrant (R. O'Kennon, pers. obs.) cos.; se and e TX w to East Cross Timbers. Late Apr–Jun.



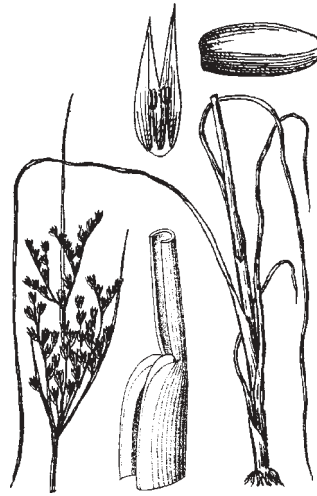
Juncus effusus var. *solutus* [gwo]



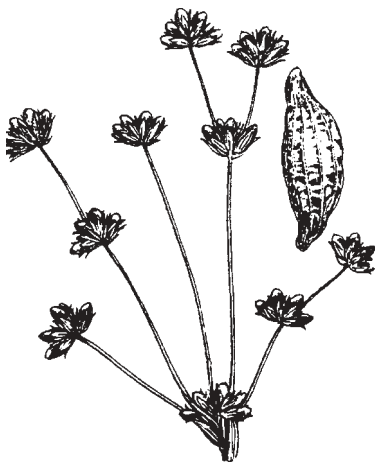
Juncus filipendulus [co1]



Juncus marginatus [BB2]



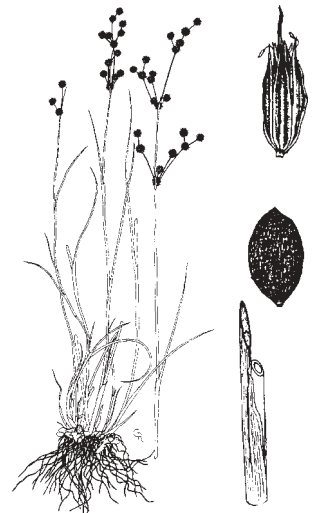
Juncus interior [BB2, EN1]



Juncus nodatus [STe]



Juncus polycephalus [gwo]



Juncus scirpoides [gwo]

Juncus filipendulus Buckley, (hanging thread), RING-SEED RUSH. Perennial, tufted or from slightly swollen bases; stems 15–30 cm long. Moist soils or along streams; Bell and Denton cos.; also Edwards Plateau and Rolling Plains. Spring–summer.

Juncus interior Wiegand, (inland), INLAND RUSH. Plant 20–80 cm tall. Chiefly low ground, in open woods or prairies; nearly throughout TX. Late Apr–Jul.

Juncus marginatus Rostk., (margined), GRASS-LEAF RUSH, TWO-FLOWER RUSH, NEEDLE-POINT RUSH. Plant 15–90 cm tall, with swollen stem base, usually short-rhizomatous; inflorescence compact, of many small clusters of 2–12 flowers each; to avoid keying errors, this species which has flowers subtended by only 1 bracteole can be reached either way in the key beginning at dichotomy 5. Sandy old fields, roadsides, moist areas; se and e TX w to West Cross Timbers and Edwards Plateau, also Trans-Pecos. May–Jul, occasionally to Aug. [*J. setosus* (Coville) Small] While var. *setosus* is sometimes recognized (e.g., Jones et al. 1997), we are following Correll and Johnston (1970), Churchill (1986a) and J. Kartesz (pers. comm. 1997) in not recognizing in-fraspecific taxa in this species.

Juncus nodatus Coville, (with nodes, knots, or swellings), JOINTED RUSH. Stems 40–110 cm tall, forming loose clumps from rhizomatous base; inflorescence rather dense; similar to *J. marginatus* but with nodose leaves and more elongate inflorescences. Damp sandy ground or shallow water; Grayson and Kaufman cos.; se and e TX w to Wichita Co. in Red River drainage (Mahler 1988); scattered elsewhere in TX. Jun–Jul, rarely to Nov.

Juncus polycephalus Michx., (many-headed), FLAT-LEAF RUSH. Tufted perennial from subrhizomatous base; similar to *J. validus*, but with smaller heads. Included based on citation of vegetational area 5 (Fig. 2) by Hatch et al. (1990); mainly se TX, scattered elsewhere. Summer.

Juncus scirpoides Lam., (*Scirpus*-like), NEEDLE-POD RUSH. Very similar to *J. brachycarpus* except for capsules. Damp, sandy ground; in nc TX collected once at w edge of East Cross Timbers in Johnson Co. (Mahler 1988), also Milam Co. near e margin of nc TX; mainly se and e TX, also Edwards Plateau. Late May–Aug.

Juncus tenuis Willd., (slender), SLENDER RUSH, POVERTY RUSH, PATH RUSH. Tufted perennial 8–30(–45) cm tall; panicle 3–6(–9) cm long, about 1/4–1/5 the total height of plant (in contrast to *J. bufonis*). Moist sand in woods; Grayson Co.; mainly se and e TX, also Edwards Plateau. Spring, rarely summer.

Juncus texanus (Engelm.) Coville, (of Texas), TEXAS RUSH. Plant slender, 20–80 cm tall, freely rhizomatous and tuber-bearing; capsules with slender, prolonged, exerted tip. Low ground; Bell, Bosque, Collin, Coryell, Ellis, and Grayson cos.; Blackland Prairie and Grand Prairie; nc TX, s TX, Edwards Plateau, and Trans-Pecos; endemic to TX. Jun–Jul. ↴

Juncus torreyi Coville, (for John Torrey, 1796–1873, coauthor with Asa Gray of “The Flora of North America”), TORREY’S RUSH. Plant rhizomatous, 30–110 cm tall; rhizomes often tuber-bearing; heads 8–10(–11) mm thick. Damp or wet ground; mainly Blackland Prairie s and w to w TX; rare farther e in Red River drainage (Mahler 1988). Jun–Jul, sporadically to Oct.

Juncus validus Coville, (vigorous). Resembling *J. torreyi* but heads well-separated; rhizomes often very short or absent. Damp or wet ground. Jun–Oct.

1. Inflorescences mostly 2–5 cm long, of 6–15 heads; capsules tardily dehiscent _____ var. **fascinatus**

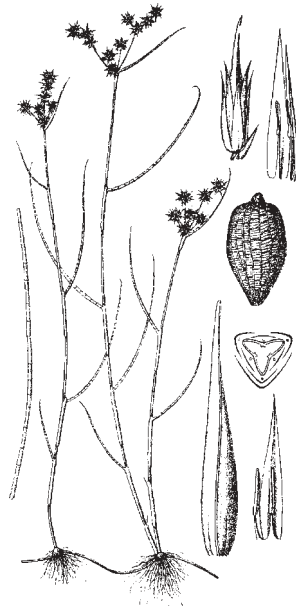
1. Inflorescences 5–25 cm long, of (12–)15–76 heads; capsules promptly completely dehiscent

_____ var. **validus**

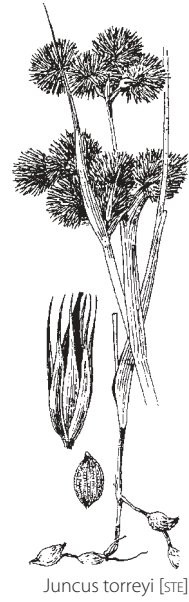
var. **fascinatus** M.C. Johnst., (fascinating). Included based on citation of vegetational areas 4 and 5 (Fig. 2) by Hatch et al. (1990); in much of e 1/2 of TX; endemic to TX. ↴



Juncus tenuis [gwo]



Juncus texanus [EN1]



Juncus torreyi [STE]



Juncus validus var. *fasciatus* [HEA]



Juncus validus var. *validus* [gwo, SHB]



Luzula bulbosa [SH3, STE]



Luzula echinata [GLE]

var. **validus**. ROUND-HEAD RUSH. Se and e TX w to Grayson and Tarrant cos.; also Edwards Plateau and Panhandle.

LUZULA WOODRUSH

Tufted perennials; leaves flat, grass-like, with pubescence; inflorescences terminal, of 5–10(–13) usually simple branches, with 1–3 leaf-like bracts; flowers (in our species) in few-flowered glomerules; stigmas much longer than styles; seeds 3, with whitish elaiosomes or caruncles (= appendages used in dispersal by ants or other insects) ca. 1/3–2/3 length of seed.

☛ A genus of 115 species, cosmopolitan in distribution but especially in temperate Eurasia. Handel (1978) presented experimental evidence that the seeds of some species are dispersed by ants. (From *Gramen Luzulae*, or *Luxulae*, diminutive of Latin *lux*, light; a name given to one of the species from its shining with dew)

1. Small bulb-like whitish structures (= swollen, reduced leaves) usually present on the rhizomes; glomerules (= flower clusters) cylindric; capsule usually exceeding perianth; elaiosome 0.9–1.3 mm long, 1/2–2/3 length of seed _____ **L. bulbosa**
1. Small bulb-like structures not present on the rhizomes (but base of plant can be swollen); glomerules subglobose or ovoid; perianth usually conspicuously exceeding capsule; elaiosome 0.5–0.6 mm long, ca. 1/3 length of seed _____ **L. echinata**

Luzula bulbosa (A.W. Wood) Smyth, (bulbous), BULB WOODRUSH. Tufted perennial to 45 cm tall; rhizomes slender with whitish, swollen, bulb-like structures (= reduced leaves) ca. 2–4 mm thick; leaves few, 2–7 mm wide, long-hairy marginally; inflorescence branches usually erect or ascending. Sandy soils in forests; Fannin Co. in Red River drainage (Talbot property); Hatch et al. (1990) also cited vegetational area 5 (Fig. 2); mainly e TX. Spring. [*L. campestris* (L.) DC. var. *bulbosa* A.W. Wood]

Luzula echinata (Small) FJ. Herm. var. **mesochorea** FJ. Herm., (sp.: prickley; var.: midland). Similar to *L. bulbosa* but more densely tufted; rhizomes knotty and base of plant sometimes swollen, but rhizomes without bulb-like structures; some of the inflorescence branches usually divergent at right angles. Sandy soils; Lamar Co. (Carr 1994); mainly e TX. Spring. [*L. campestris* (L.) DC. var. *echinata* (Small) Fernald & Wiegand]

LEMNACEAE DUCKWEED FAMILY

Very small or minute annual aquatics, floating free on or in the water, consisting of a flat or solid body (called thallus, frond, or joint) a few mm or less across, not differentiated into stems and leaves, solitary or in small clusters; new plants (= daughter fronds) chiefly produced asexually by budding, often remaining attached to the parent frond by a short stipe; flowering infrequent or at least infrequently observed; inflorescence with 1 or 2 staminate flowers of a single stamen and 1 pistillate flower with a single pistil, produced in 2 lateral pouchs at frond base (in *Lemna* and *Spirodela*) or in a cavity on frond surface (in *Wolffia* and *Wolffiella*); flowers minute, imperfect, without perianth (a very minute bract may be present); fruit an urticel.

☛ A small (25 species in 4 genera) family of aquatics thought to be derived from the Araceae; molecular studies link *Lemna* with *Pistia* (a free-floating member of the Araceae) (Duvall et al. 1993). Because of their huge numbers and rapid reproduction, duckweeds can have pronounced influences on aquatic habitats (Hicks 1937); they are important as food for waterfowl and fish, but can also become pests. Lemnaceae have also been used in wastewater treatment systems as biological filters and the plants are sometimes harvested to make a high-protein feed for livestock (Tyrrel et al. 1994). Due to their prolific asexual reproduction, Lemnaceae are being studied

by NASA as a possible food source for prolonged space voyages. The family is not well-collected or well-studied in nc TX. All nc TX species are found on lakes, ponds, swamps, marshes, or other standing water or stranded on mud; they are prominent chiefly in late summer and fall. This easily recognized family contains the smallest known flowering plants, members of the genus *Wolffia*. While easy to identify to genus, specific determination is often difficult. (sub-class Arecidae)

FAMILY RECOGNITION IN THE FIELD: free-floating, very small or minute aquatics (larger plants only a few mm in size).

REFERENCES: Thompson 1897; Hicks 1937; Wilson 1960a; Harrison & Beal 1964; McClure & Alston 1966; Clark & Thieret 1968; den Hartog & van der Plas 1970; Landolt 1980, 1986; Dahlgren et al. 1985.

1. Fronds with 1 or more roots, 2 mm long or longer, oblong to elliptic, ovate, obovate, or orbicular, not long-tapered to apex.
2. Each frond with 1 root; fronds 2–5 mm long _____ **Lemna**
2. Each frond with several roots; fronds 2.5–10 mm long (*Lemna* size or much larger) _____ **Spirodela**
1. Fronds rootless, EITHER < 1.4 mm long (pinhead size) OR fronds larger and narrowly lanceolate and distinctly long-tapered from a relatively broad base to a narrow apex.
3. Fronds < 1.4 mm long, pinhead size, ± distinctly 3-dimensional, never flat except on the upper surface, solitary or usually at most only two fronds attached together, usually floating on the water surface _____ **Wolffia**
3. Fronds 4–8.4 mm long, flat, membranous, (rarely solitary–) usually 2–many attached together, usually floating below the water surface _____ **Wolffiella**

LEMNA DUCKWEED

Fronds solitary or in clusters of a few, pale green, yellow-green, or green, sometimes with reddish purple pigmentation; base of the single root surrounded by a tubular sheath, not covered by a membranous scale; 2 vegetative reproductive pouches per frond, these lateral near frond base.

☛ A cosmopolitan genus of 7 species (Landolt (1980) indicated 9–13 species). (Classical Greek name for a water plant)

REFERENCES: Landolt 1975; Reveal 1990a.

1. Fronds with 3–5(–7) nerves, without OR with anthocyanin (= red or purple pigmentation) present; upper (= dorsal) surface of fronds with or without prominent protuberances (= papillae); including species widespread in nc TX.
2. Fronds without any reddish purple pigmentation on either lower or upper surfaces; lower frond surface flat to slightly convex; root sheath with definite wings or appendages; root tips usually sharp-pointed; including species widespread in nc TX.
3. Upper frond surface with only 1 papilla above the node (= point where root attaches on lower frond surface) and this one typically smaller than the one near the frond tip; widespread in nc TX _____ **L. aequinoctialis**
3. Upper frond surface very often with 2–3 prominent papillae above the node larger than the one near the frond tip; rare in nc TX, reported only from Dallas Co. _____ **L. perpusilla**
2. Fronds typically with reddish purple pigmentation, at least on lower surface; lower frond surface slightly to strongly convex or gibbous; root sheath without wings or appendages; root tips mostly rounded; apparently rare in nc TX _____ **L. obscura**
1. Fronds with 1 nerve, without red or purple pigmentation; upper surface of fronds flat, smooth or with obscure median papillae, with no prominent papillae; rare in nc TX.
4. Fronds very asymmetrical at the base $1\frac{1}{3}$ –3 times as long as wide; nerve reaching at least

$\frac{3}{4}$ of the distance from the node to the apex, usually distinct; plants sometimes submerged

_____ **L. valdiviana**

4. Fronds nearly symmetrical at the base, $1-1\frac{2}{3}$ times as long as wide; nerve reaching at most $\frac{2}{3}$ of the distance from the node to the apex, sometimes indistinct; plants always floating on surface _____ **L. minuta**

Lemna aequinoctialis Welw., (of equinoctial zone, from equatorial regions). Fronds ovate to lanceolate, 1–6.5 mm long, 0.8–4.5 mm wide, nearly symmetrical, light to medium green; lower surface flat to slightly convex; wing of root sheath $1-2\frac{1}{2}$ times as long as wide. Bell, Brown, Dallas, Denton, Grayson, and Tarrant cos.; throughout TX. [*L. trinervis* (Austin) Small] This is the common DUCKWEED in nc TX.

Lemna minuta Kunth, (minute, very small), LEAST DUCKWEED. Fronds ovate to lanceolate, 0.8–4 mm long, 0.5–2.5 mm wide, never pointed, light green; lower surface flat to slightly convex; root sheath not winged. Dallas Co. (Landolt 1986); rare in TX; se and e TX, also Edwards Plateau and Trans-Pecos. [*L. minima* Phil. ex Hegelm., *L. minuscula* Herter, *L. valdiviana* Phil. var. *minima* Hegelm.] According to Landolt (1986), this species is sometimes difficult to distinguish from *L. valdiviana*.

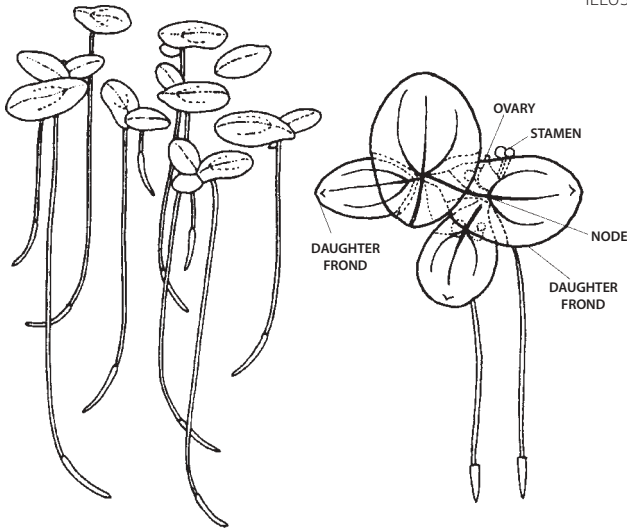
Lemna obscura (Austin) Daubs, (hidden). Fronds broadly ovate to suborbicular, $1\frac{1}{5}-1\frac{2}{3}$ times as long as wide, 1–3.5 mm long, 0.8–3 mm wide, green to yellowish green, typically with reddish purple pigmentation, especially on lower surface; upper frond surface with a distinct papilla near tip and several smaller indistinct papillae along midline; lower frond surface slightly to strongly convex or gibbous. The *Lemna gibba-minor-obscura-turionifera* complex is quite confusing. Landolt (1975) indicated that *L. gibba* occurs only to the w of nc TX. Based on incomplete comparative material, but using Landolt's (1980) worldwide key to *Lemna* species and his map (1975), Lamar Co. and Tarrant Co. pigmented populations with the lower frond surfaces convex are apparently *L. obscura*. The name *L. minor* has been misapplied to this taxon in TX in the past (e.g., Jones et al. 1997). Ox-bow lake in Lamar Co. in Red River drainage and Tarrant Co. (Fort Worth Nature Center); Landolt (1975) indicated this species occurs along the Gulf coast and northwards to n TX. [*L. minor* L. var. *obscura* Austin, *L. minor* of TX authors, not L.]

Landolt's (1975) range map indicated that *L. turionifera* could also possibly occur in nc TX; however, he (Landolt 1986) indicated the species is rare in TX and cited no nc TX localities. This species would be identified as *L. obscura* by the key above. The following dichotomy to separate the two is modified from Landolt (1980):

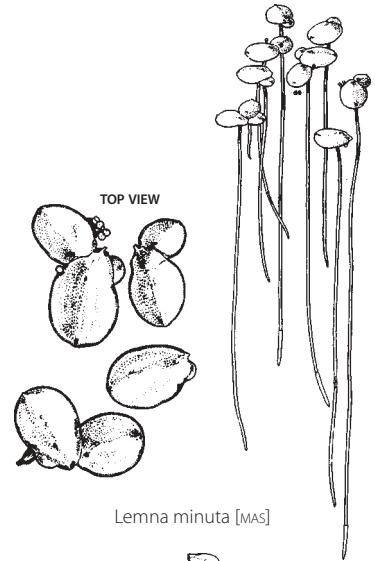
1. Fronds slightly to strongly convex or gibbous beneath; upper frond surface with papilla at apex bigger than others; not forming turions _____ *L. obscura*
1. Fronds nearly flat beneath; upper frond surface with several papillae of \pm equal size along the midline; forming small obovate to circular, rootless, dark green to brown turions under unfavorable conditions which sink to the bottom of the water _____ *L. turionifera*

Lemna perpusilla Torr., (very weak and slender). Fronds ovate to lanceolate, 1–4 mm long, 0.8–3 mm wide, $1-1\frac{2}{3}$ times as long as wide, light green; apical and central papillae prominent; wing of root sheath 2–3 times as long as wide. Dallas Co. (Landolt 1986); rare in TX; Landolt (1986) gave only the Dallas locality; Hatch et al. (1990) indicated se and s TX.

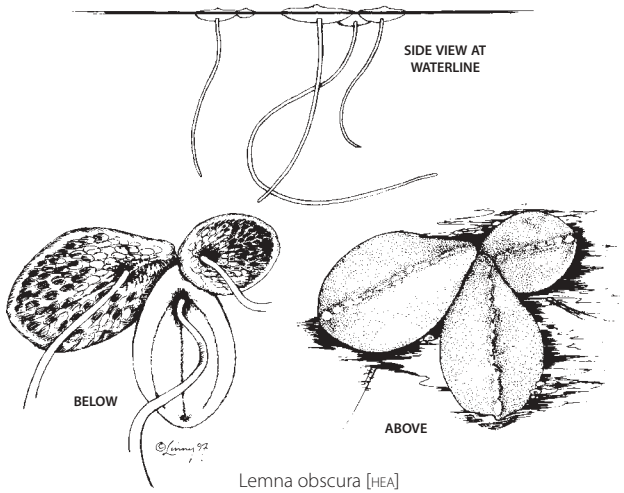
Lemna valdiviana Phil., (of Valdivia, Chile), VALDIVIANA DUCKWEED, PALE DUCKWEED. Fronds ovate to lanceolate, somewhat falcate to symmetrical except for the oblique base, 1–5 mm long, 0.6–3 mm wide, occasionally somewhat pointed, light green, flat to slightly biconvex; root sheath not winged. Included based on citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990); according to Landolt (1986), rather frequent in TX except in the nw and s parts of the state; however, we have not observed specimens from nc TX.



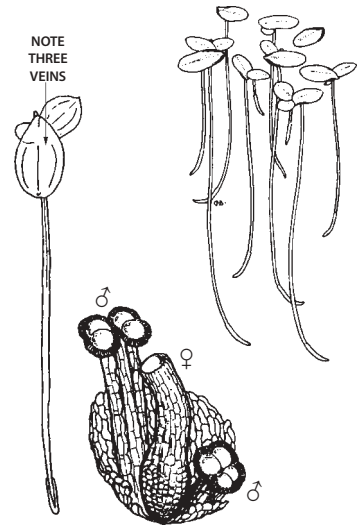
Lemna aquinoctialis [MAS, VGI]



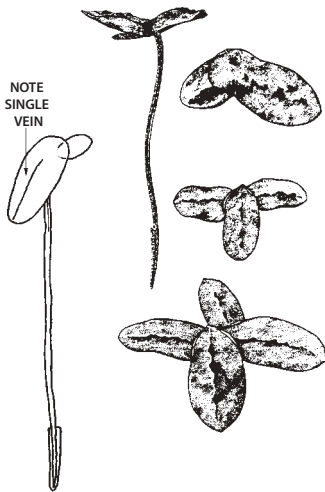
Lemna minuta [MAS]



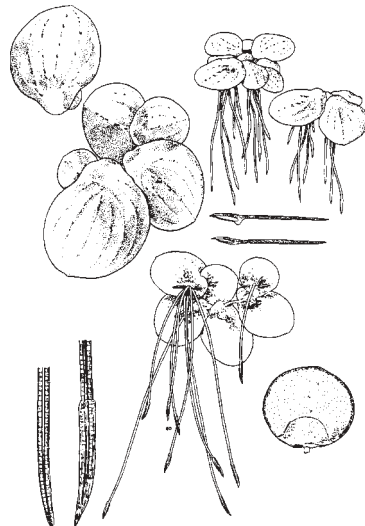
Lemna obscura [HEA]



Lemna perpusilla [JEM, MAS]



Lemna valdiviana [GWO, JEM]



Spirodela polyrhiza [MAS]



Spirodela punctata [MAS]

SPIRODELA DUCKMEAT

Fronds solitary or in clusters of a few, dark lustrous green on upper surface, usually reddish purple on lower; 1 or more of the roots penetrating a membranous scale (= prophyllum); vegetative reproductive pouches 2 per frond, these lateral near frond base.

☛ A cosmopolitan genus of 4 species. *Spirodela* is the least reduced genus in the family; sometimes grown, using dairy waste water, as a substitute for alfalfa in animal food. (Greek: *speira*, a cord or thread, and *delos*, evident or visible, from the roots)

1. Roots 4–20 per frond; fronds 3–10 mm long, orbicular-ovate to nearly ovate, almost as wide as long, the upper surface often with a conspicuous red dot near center, conspicuously several nerved; widespread in nc TX _____ **S. polyrhiza**
1. Roots 2–5 per frond; fronds 2.5–5 mm long, oblong-ovate to somewhat elliptic-reniform, distinctly longer than wide, the upper surface usually without a conspicuous red dot, not conspicuously nerved; rare in nc TX _____ **S. punctata**

Spirodela polyrhiza (L.) Schleid., (many-rooted), COMMON DUCKMEAT, GREATER DUCKWEED. Fronds usually ca. 3–6 mm wide; only 1(–3) of the roots penetrating the prophyllum. Dallas, Denton, Grayson, Henderson, and Tarrant cos.; nearly throughout TX. This species is the largest of the surface-floating duckweeds.

Spirodela punctata (G. Mey.) C.H. Thomps., (punctate, dotted). Closely resembling some *Lemna* species in size and shape; fronds usually ca. 1–3 mm wide; all of the roots penetrating the prophyllum. Denton Co. (mixed collection with *Lemna aequinoctialis*); rare in se and e TX. [*S. oligorhiza* (Kurtz) Hegelm.] Native to South America, se Asia, Australia, and probably also s Africa. Introduced as an aquarium plant (Godfrey & Wooten 1979). ☞

WOLFFIA WATER-MEAL

Fronds extremely tiny, about the size of a pinhead, solitary or paired, with a single terminal vegetative reproductive pouch; rarely flowering; when in large numbers the plants appear ± like green scum on the water surface.

☛ A tropical to temperate genus of ca. 7 species. *Wolffia* species are the smallest known flowering plants. Concentrations of 1–2 million plants per square yard of water surface can occur (Hicks 1937). (Named for Johann Friedrich Wolff, 1788–1806, German botanist and physician who wrote on *Lemna* in 1801)

1. Fronds usually ellipsoid or broadly ovoid, the upper surface flattened and often (but not always) with a raised, conical papilla in the center; frond epidermis often (but not always) with brownish pigmented cells (seen in dried material); cells of fronds progressively smaller and less inflated from lower to upper surface and fronds thus appearing darker near upper surface when viewed laterally in transmitted light _____ **W. brasiliensis**
1. Fronds usually ± globular, rarely ellipsoid, the upper surface strongly convex, not flattened and without a central papilla; frond epidermis without brownish pigmented cells; cells of fronds uniformly inflated and fronds thus ± uniformly green when viewed laterally in transmitted light _____ **W. columbiana**

Wolffia brasiliensis Wedd., (of Brazil). DOTTED WOLFFIA, POINTED WOLFFIA. Fronds 0.5–1.5 mm long. Fannin, Co.; mainly se and e TX and Edwards Plateau. Even though w of the known range of this species, many individuals from an isolated swamp/beaverpond complex near Telephone in Fannin Co. (L. Talbot property), have definite epidermal pigmentation and papilla. [*W. papulifera* C.H. Thomps., *W. punctata* Griseb.]

Wolffia columbiana H. Karst., (of Colombia), COLOMBIA WOLFFIA, COMMON WOLFFIA. Fronds 0.1–1.4 mm long; upper surface smooth or slightly roughened by a few minute papillae much smaller than the usually central papilla often seen in *W. braziliensis*. Dallas and Lamar cos.; se and e TX w to nc TX and Edwards Plateau.

WOLFFIELLA MUD-MIDGET, BOG-MAT

☞ A genus of ca. 7 species, mostly of tropical and warm areas of the Americas and Africa. (Name a diminutive of *Wolffia*)

Wolffiella gladiata (Hegelm.) Hegelm., (sword-like). Fronds narrowly lanceolate, often falcate, 4–8.4 mm long, 0.5–1.4 mm wide at base, flat, membranous, distinctly long-tapered from a relatively broad base to a narrow apex, usually 5–15 times as long as width at middle of frond, (rarely solitary-) usually 2–many attached, sometimes forming star-like groups, usually floating below the water surface; vegetative reproductive pouch solitary per frond; seldom flowering. Falls Co. on e margin of nc TX (Landolt 1986); mainly se and e TX. [*W. floridana* (Donn. Sm.) C.H. Thomps.]

Wolffiella lingulata (Hegelm.) Hegelm., (strap-shaped), occurs in se TX. This species can be distinguished by its fronds wide tongue-shaped or ovate, up to 1.5–4 times as long as wide, rounded at the tips, solitary to 2(–4) attached.

LILIACEAE LILY FAMILY (including AMARYLLIDACEAE)

Perennial herbs with bulb or rhizome, or with fleshy-fibrous or tuberous roots; leaves basal, alternate, or whorled, sometimes sheathing or with narrow and petiole-like base, or with distinct, tubular basal sheath and grass-like blade; flowers radially symmetrical or nearly so, solitary or in racemes, panicles, corymbs, umbels, or head-like inflorescences, bractless, individually bracted, or inflorescence with an involucre of sheathing bracts; perianth segments (= tepals) 6, in one or two rows, separate or united; stamens 6; pistil 1; ovary superior or inferior; fruit a dry capsule or fleshy berry.

☞ We are following Cronquist (1981, 1988, 1993) and Kartesz (1994) in treating the Liliaceae broadly to include the Alliaceae, Amaryllidaceae, Asparagaceae, Convallariaceae, Hemerocallidaceae, Hyacinthaceae, and Hypoxidaceae, but not the Agavaceae or Smilacaceae. The key to genera separates the species sometimes placed in the Amaryllidaceae from those in a more restricted Liliaceae. Some authors recognize an Amaryllidaceae limited to those taxa with inferior ovaries. The Liliaceae is quite diverse and has been divided into as many as 27 smaller families; however, Cronquist (1993) indicated that while there is significant variation within the group, he has not been able to find a reasonable way of dividing that variation at the family level. As treated here, the Liliaceae is a large (4,950 species in 288 genera), cosmopolitan family important for its numerous ornamentals including *Amaryllis*, *Hosta*, *Lilium* (LILY) and *Tulipa* (TULIP); the medically important *Aloe* is sometimes placed in the Liliaceae, while some authorities segregate it into its own family, the Aloaceae. *Colchicum autumnale* L. (AUTUMN CROCUS), native from Europe to n Africa, is also medicinally important as the source of the alkaloid colchicine, used in treating gout. ☞ Some Liliaceae are edible (e.g., *Allium*, *Asparagus*), but many are very toxic due to the presence of alkaloids. *Liriope muscari* (Decne.) L.H. Bailey, (musk), (LILYTURF), with a dense raceme of small violet flowers usually exceeding the foliage, and *Ophiopogon japonicus* (Thunb.) Ker Gawl., (of Japan), (MONDO-GRASS OR MONKEY-GRASS), with racemes of off-white flowers not exceeding the foliage, are both widely cultivated, persist,

1192 LILIACEAE

and spread vegetatively in flower beds in nc TX. Family name from *Lilium*, LILY, a genus of 100 species native from the n temperate zone to the Philippines. (Latin form of Greek: *leirion*, name for Madonna lily—*Lilium candidum* L.) (subclass Liliidae)

FAMILY RECOGNITION IN THE FIELD: bulbous or rhizomatous, perennial herbs; flowers of ten showy, with 6-parted petaloid perianth, 6 stamens (3 in the somewhat similar Iridaceae), and 3-celled, superior or inferior ovary; fruit a capsule or berry.

REFERENCE: Dahlgren et al. 1985.

1. Perianth pilose, yellow; leaves narrowly linear, pilose (sometimes segregated as the Hypoxidaceae) _____ **Hypoxis**
1. Perianth and leaves not as above.
 2. Ovary inferior or superior; inflorescence with a basal involucre of sheathing bract or bracts; flowers solitary, umbellate or in head-like inflorescences (sometimes segregated as the Amaryllidaceae).
 3. Perianth bright red, to 40 mm long; leaves not present at flowering time; rarely escaped, introduced, ornamental species _____ **Lycoris**
 3. Perianth either not red OR if red then 10 mm long or less; leaves usually (but not always) present at flowering time; widespread native and introduced species.
 4. Ovary superior; perianth (including tube if present) up to 28 mm long (usually much less), white to yellow or variously colored, without a crown; perianth segments without green tips.
 5. Filaments separate; perianth white to yellowish, pink or red, 10 mm or less long.
 6. Umbels with 5–30 or more flowers, or with bulblets; anthers oblong, ca 1 mm long; plants with onion odor; flower stalks (= pedicels) within umbels of ± same length _____ **Allium**
 6. Umbels with 4–12 flowers, without bulblets; anthers linear, ca. 2 mm long; plants without onion odor; flower stalks within umbels of different lengths _____ **Nothoscordum**
 5. Filaments united; perianth lavender-blue or white with pale blue tinge, 16–28 mm long.
 7. Flowers single, rarely 2, with 2 partly or wholly united bracts; perianth white with pale blue tinge, the lobes with a darker central line and brownish tinge on back _____ **Ipheion**
 7. Flowers 1–6, with 2 large and 2 small bracts; perianth, including lobes, lavender-blue _____ **Androstephium**
 4. Ovary inferior; perianth at least 25 mm long OR with a crown OR perianth segments with green tips; perianth white, yellow, or orange-yellow.
 8. Perianth without a crown (= circle of tissue inside the corolla).
 9. Flowers nodding, usually 2–10; perianth segments tipped with green; introduced species _____ **Leucojum**
 9. Flowers not nodding, usually solitary; perianth segments not tipped with green; native species.
 10. Perianth white, with tube much more than 30 mm long _____ **Cooperia**
 10. Perianth orange-yellow, with tube 25–30 mm long _____ **Habranthus**
 8. Perianth with a crown.
 11. Perianth tube 6–8 cm long; crown united with the filaments; perianth white _____ **Hymenocallis**
 11. Perianth tube < 3 cm long; crown not united with the filaments; all or part of perianth usually yellow _____ **Narcissus**
 2. Ovary superior; inflorescence bractless or flowers individually bracted; flowers solitary, racemose, paniculate, or corymbose (sometimes recognized as the Liliaceae in a stricter sense).
 12. Flowers urceolate (perianth segments united almost their whole length and slightly con-

- stricted at mouth), 3–6 mm long, dark blue with whitish teeth or rarely all white; flowering stalk to ca. 20 cm tall _____ **Muscari**
12. Flowers not urceolate, 6–120 mm long (except 3–4 mm long in the greenish white flowered *Schoenocaulon*), white to lavender-blue to variously colored; flowering stalk usually much more than 20 cm tall (except in *Ornithogalum*).
13. Perianth segments united 1/2–2/3 their lengths; rare escape or persistent cultivated species _____ **Hyacinthus**
13. Perianth segments separate or united up to 1/4 their length; common native and naturalized species.
14. Inflorescences scapose (= flowers on leafless stalks from the base of the plant); plants without a leafy stem or leafy portion of stem very short, the leaves nearly all basal; fruit a capsule.
15. Flowers solitary, leaves 2 _____ **Erythronium**
15. Flowers in racemes, corymbs, or panicles; leaves more than 2.
16. Perianth segments very large, > 80 mm long, orangish _____ **Hemerocallis**
16. Perianth segments smaller, < 30 mm long, greenish white, white, lavender-blue, or yellow or orange-yellow.
17. Flowers greenish white; perianth segments ca. 3–4 mm long; plants both with leaves mostly 4 mm or less wide AND with flowers sessile or nearly so _____ **Schoenocaulon**
17. Flowers white, lavender-blue, yellow, or yellow-orange; perianth segments 6–20 mm long; plants either with leaves wider than 4 mm wide OR flowers distinctly stalked OR both.
18. Perianth segments ca. 7 mm long, yellow or orange-yellow; flowers sessile or nearly so; plants without a bulb _____ **Aletris**
18. Perianth segments 6–20 mm long, white or lavender-blue; flowers distinctly pedicellate; plants bulbous.
19. Perianth segments white, bright green on back, usually with white margins; flower stalk usually 25 cm or less tall; lower pedicels often very long, to 8.5 cm long _____ **Ornithogalum**
19. Perianth segments lavender-blue or white, not green on back; flowering stalk often much more than 25 cm tall; lower pedicels usually < 3 cm long.
20. Perianth segments lavender-blue or rarely white; anthers roughly orbicular, ca. 1 mm long _____ **Camassia**
20. Perianth segments white; anthers elongate, oblong, ca. 2 mm long _____ **Zigadenus**
14. Inflorescences axillary (= from axils of the leaves); plants with an erect-arching leafy stem or stem with numerous finely dissected branches; fruit a berry.
21. Leaves reduced to scales; main stem with numerous finely dissected branches; ripe berry red; perianth 4–6 mm long _____ **Asparagus**
21. Leaves well-developed, lanceolate-elliptic to broadly elliptic, to 15 cm long and 7 cm wide; main stem unbranched; ripe berry blue-black; perianth 13–20 mm long _____ **Polygonatum**

ALETRIS STAR-GRASS, COLIC-ROOT

☞ An Asian and North American genus of 10 species including some cultivated as ornamentals. (Greek: *aleitris*, a female slave who ground corn, referring to the apparent mealiness of the perianth)

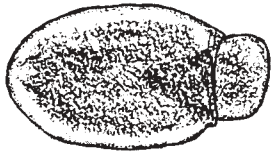
Aletris aurea Walter, (golden), YELLOW STAR-GRASS. Perennial, rhizomatous, scapose herb; leaves flat, lanceolate, to 12 cm long; flowers in a spike-like raceme terminating a ± naked (a few small remote bracts can be present) scape to 80 cm or more tall; pedicels 3 mm or less long; perianth tubular, yellow or orange-yellow. Savannahs, boggy areas; included based on citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990); mainly se and e TX. May-Jul. ☒/77

ALLIUM ONION, GARLIC, LEEK

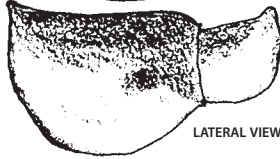
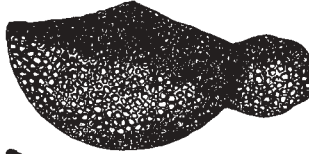
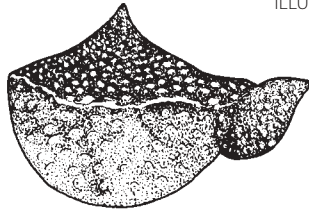
Bulbous perennials typically with odor of onion or garlic, our species glabrous; leaves with closed, tubular, basal sheath and slender blade; inflorescence subtended by a spathe that divides into 1–3 bracts; flowers white to pink, reddish pink, or purplish, or replaced by bulbils; perianth of 6 similar, ± free segments (= tepals); fruit a capsule.

☛ A n hemisphere genus of ca. 690 species ranging from Eurasia to Africa, Sri Lanka, and Mexico. It includes many species cultivated as ornamentals and for food including ONION, GARLIC, SHALLOT, LEEK, and CHIVES; placed by some authorities in the Amaryllidaceae or the Alliaceae (e.g., Dahlgren et al. 1985). *Allium* species contain sulfur-containing compounds similar to those found in the unrelated mustard family (Blackwell 1990); cows grazing on wild onions are known to give onion-flavored milk and butter (Cheatham & Johnston 1995); while generally edible, gastroenteritis in children or other problems can result from excessive consumption of some species (Lampe & McCann 1985; Cheatham & Johnston 1995). According to Block (1985), when an ONION or GARLIC bulb is cut, low-molecular-weight organic molecules that incorporate sulfur atoms are released. These compounds have a number of biological effects: they are tear-inducing (= lacrimatory; the tear-inducing substance can undergo hydrolysis to form sulfuric acid); certain of the compounds are antibacterial or antifungal; others inhibit blood from clotting. (The ancient Latin name of the garlic, from Celtic: *all*, hot or pungent) REFERENCES: Fraser 1939; Ownbey 1950b; Ownbey & Aase 1955; Davies 1992; Howard 1994; Mathew 1996; Mes et al. 1997 [1998].

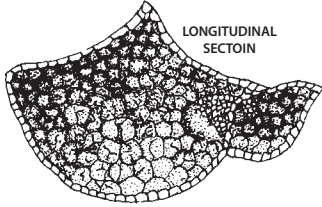
1. Leaf blades cylindrical, hollow; flowering stalk up to more than 1 m tall _____ **A. cepa**
1. Leaf blades flat, folded, or concave; flowering stalk usually 0.5(–0.9) m or less tall (except taller in *A. sativum*).
 2. Umbels with bulbils, often with few or no flowers; the few flowers, if present, rarely producing capsules or seeds.
 3. Flowering stems naked above the subbasal leaves, usually 0.5(–0.9) m or less tall; bulb coats (base of leaves) with fibers that persist as a conspicuous net-like structure enclosing the bulbils; leaf blades 1–5 mm wide; widespread native species _____ **A. canadense** var. **canadense**
 3. Flowering stems with leaves nearly to middle, often 0.5–1.8 m or more tall; bulb coats lacking fibers that persist as a conspicuous net-like structure enclosing the bulbils; leaf blades 5–24(–40) mm wide; persisting or escaped introduced species.
 4. Underground bulb usually with ca. 2–few main cloves and producing numerous bulblets from the base, the bulblets small (ca. 1 cm long), yellowish or brownish, helmet-shaped or subhemispherical, and typically stalked; stamens equaling or usually slightly exerted beyond the perianth segments; umbels usually large, (3–)5–10 cm in diam. _____ **A. ampelopresum**
 4. Underground bulb without small bulblets, but usually with 5–18+ similar-sized large bulblets (= cloves); stamens included or just equaling perianth segments; umbels usually 5 cm or less in diam. _____ **A. sativum**
 2. Umbels without bulbils; flowers producing capsules and seeds.
 5. Plants 25–180 cm tall, but typically > 50 cm tall; leaves 5–20(–40) mm wide; persisting or escaped introduced species _____ **A. ampelopresum**
 5. Plants 7–90 cm tall, but typically < 50 cm; leaves 1–5(–7) mm wide; widespread native species.



DORSAL VIEW

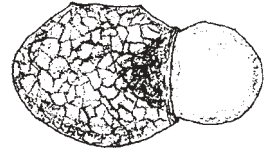
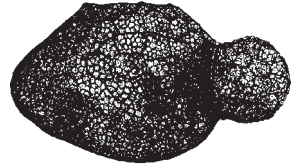
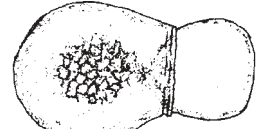


LATERAL VIEWS

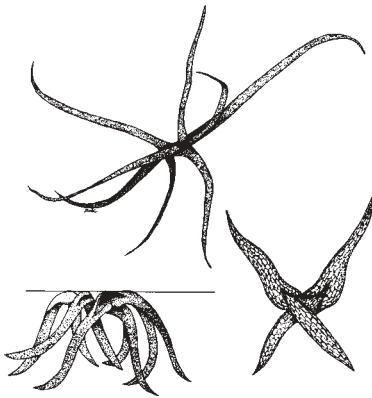


LONGITUDINAL SECTION

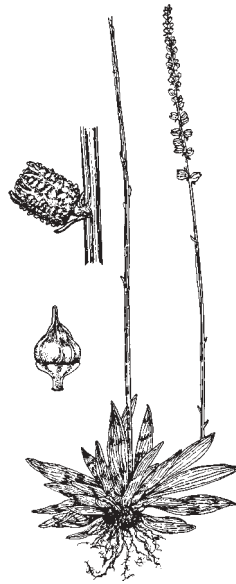
Wolffia brasiliensis [GWO, MIB]



Wolffia columbiana [GWO, MIB]



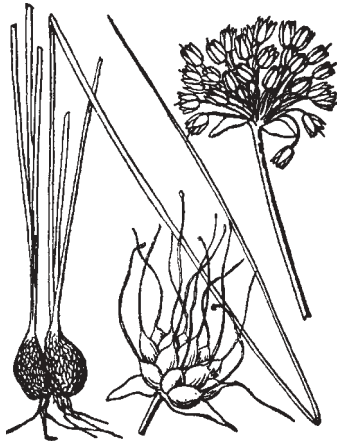
Wolffella gladiata [GWO]



Aletris aurea [COI]



Allium ampeloprasum [ALÉ]



Allium canadense var. *canadense* [BBZ]



Allium canadense var. *mobile* [BBZ]

6. Bulb coats lacking fibers that persist as a conspicuous net-like structure enclosing the bulbs; perianth segments deep pink; flowering late summer and fall _____ **A. stellatum**
6. Bulb coats with fibers that persist as a conspicuous net-like structure enclosing the bulbs; perianth segments pink, lavender, purplish red, or white; flowering in spring.
7. Perianth segments not remaining spreading after flowering, either shriveling or if persistent, then urceolate; involucre bracts with 3–7 nerves (spathe usually divided into 2–3 separate or partly united involucre bracts).
8. Perianth campanulate or urceolate-campanulate, ultimately withering somewhat and exposing the capsule, the segments 4–7 mm long; net-like structure enclosing bulbs fine or only moderately coarse-meshed.
9. Perianth usually pinkish or lilac.
10. Pedicels filiform (= thread-like); plants slender; leaf blades narrower than flowering stem, 0.3–2 mm wide; flowers ± scentless; se and e TX w to East Cross-Timbers _____ **A. canadense** var. **mobile**
10. Pedicels stouter; plants more robust; leaf blades narrower to broader than flowering stem, 0.5–7 mm wide; flowers with sweet hyacinth scent; Blackland Prairie w to Rolling Plains _____ **A. canadense** var. **hyacinthoides**
9. Perianth usually white (rarely pink) _____ **A. canadense** var. **fraseri**
8. Perianth urceolate, permanently enclosing the capsule, the segments 5–11 mm long; net-like structure enclosing bulbs usually very coarse.
11. Bulbs at flowering time with a cluster of short-stalked basal bulblets; perianth segments 5–7 mm long, white with pinkish midribs, fading pink; pedicels ca. 2 times the length of perianth in full flower _____ **A. runyonii**
11. Bulbs at flowering time without basal bulblets; perianth segments deep rose color, fading purple, 7–11 mm long; pedicels ca. equal in length to perianth in full flower _____ **A. perdulce**
7. Perianth segments remaining spreading after flowering, becoming dry, papery and rigid; involucre bracts usually 1-nerved (spathe usually divided into 2–3 separate or partly united involucre bracts) _____ **A. drummondii**

Allium ampeloprasum L., (onion of the vineyard), WILD LEEK. Flowering stem 45–200 cm tall, sheathed below, with leaves withering by flowering time; rounded parent bulb with many yellowish bulblets; leaves flat, 30–60 cm long, 15–24(–40) mm wide; umbels 5–10 cm wide; flowers very many, often more than 100 to up to 500 per umbel, white to pink or reddish pink, sometimes with bulbils. Weedy areas; Grayson Co. (extensive roadside colony), also, the map in Cheatham and Johnston (1995) showed 2 nc TX localities; scattered in e 1/2 of TX. Summer. Native of Europe, n Africa, and Asia. *Allium porrum* L., LEEK, probably derived from *A. ampeloprasum*, is also cultivated and probably persists locally. It differs in having the bulb but poorly developed and bulblets few. It is cultivated for the edible fleshy leaf sheaths. Stanford (1971) reported *A. porrum* from Hamilton Co. ☞

Allium canadense L., (of Canada), WILD ONION. Flowering stalk 10–50 cm tall; leaves 1–5(–7) mm wide; flowers usually few or none, intermixed with bulblets and green sprouts, or many and without bulblets or sprouts; perianth white to pink or lavender. The key to varieties of *A. canadense* is included in the key to *Allium* species. In large amounts, this plant has caused death in cattle (Kingsbury 1964); gastroenteritis has been reported in children (Lampe & McCann 1985). ☞

var. **canadense**. CANADA GARLIC, WILD GARLIC, WILD ONION. Flowering stalk 15–50 cm tall; leaf blades 1–5 mm wide; perianth segments when present 4–7 mm long, white to pink. Sandy open woods, fields, roadsides, other open areas; Falls, Henderson, Hopkins, Hunt, and Lamar cos; se and e TX w to East Cross Timbers. Mar–May. [*Allium acetabulum* (Raf.) Shinnery]

var. **fraseri** Ownbey, (for John Fraser, 1750–1811, Scottish collector in North America). Flowering stalk 20–50 cm tall; leaf blades 1–7 mm wide; perianth segments 4–7 mm long, white (rarely pink). Rocky soils, woods or open areas; Post Oak Savannah w to Rolling Plains and Edwards Plateau. Apr–May. [*A. fraseri* (Ownbey) Shinnery]

var. **hyacinthoides** (Bush) Ownbey & Aase, (hyacinth-like). Flowering stalk 15–30(–40) cm tall; leaf blades 0.5–7 mm wide; umbels many-flowered; flowers fragrant; perianth segments 5–7 mm long, pink, thin. Calcareous prairies or infrequently in sandy soils, in sun or shade; Blackland Prairie w to edge of Rolling Plains and Edwards Plateau, mostly to the w of var. *mobile*. Late Mar–Apr. [*A. hyacinthoides* Bush]

var. **mobile** (Regel) Ownbey, (of Mobile, Alabama). Flowering stalk 10–30(–50) cm tall; bulb at base of plant sometimes with 1 or 2 bulblets (not in other vars.); leaf blades 0.3–2 mm wide; flowers many, scentless; perianth segments 4–7 mm long, pink (rarely white). Sandy or rocky soils, rarely on limestone or clay, woods and prairies; se and e TX w to East Cross Timbers, also Edwards Plateau. Apr–mid-May. [*A. mobile* Regel]

var. *ecristatum* (M.E. Jones) Ownbey, (not crested), is cited by Hatch et al. (1990) for vegetational area 4 (Fig. 2) but apparently occurs only to the s of nc TX (Ownbey & Aase 1955). It can be distinguished from the similar var. *hyacinthoides* by its few (5–25)-flowered umbels and thicker perianth segments.

Allium cepa L., (Latin for onion), ONION. Flowering stalk to > 1 m tall; leaves cylindrical with groove on inner surface; pedicels many times longer than flowers; perianth whitish green. Cultivated, persisting, and escaped?; included based on citation of vegetational areas 4 and 5 (Fig. 2) by Hatch et al. (1990), also s TX. May–Jun. Native of w Asia. 🌿

Allium drummondii Regel, (for its discoverer, Thomas Drummond, 1780–1835, Scottish botanist and collector in North America), DRUMMOND'S ONION, PRAIRIE ONION. Flowering stalk 7–30 cm tall; leaves 1–3(–5) mm wide; umbels with 10–25 flowers; perianth segments 6–9 mm long, white to pink, lavender, or purple-red (rarely greenish yellow); pedicels ca. 6–18 mm long. Sandy or gravelly, often limestone soils; nearly throughout TX. Mar–May.

Allium perdulce S.V. Fraser, (very sweet). Flowering stalk 7–25 cm tall; leaves 1–2 mm wide; flowers sweet-scented; umbel 5–25-flowered; perianth rose-purple. Sandy or gravelly prairies; Archer, Bosque, and Callahan cos., also Clay and Palo Pinto cos. (Ownbey & Aase 1955), w part of nc TX w to Plains Country and s to Edwards Plateau. Mar–early Apr.

Allium runyonii Ownbey, (for H. Everett Runyon, 1881–1968, TX botanist and photographer), RUNYON'S ONION. Flowering stalk 10–35 cm tall; leaves 1–4 mm wide; perianth segments 5–7 mm long, white with pinkish midribs, fading pink. Sandy soils; included based on citation of vegetational areas 4 and 5 (Fig. 2) by Hatch et al. (1990); Ownbey and Aase (1955) gave the distribution as Rio Grande Plains in s TX; endemic to TX. Mar. The cluster of stalked bulblets typically present at the base of the bulb is distinctive among the nc TX species of *Allium*. 🌿

Allium sativum L., (cultivated or sown), GARLIC. Plant stout; bulb coats membranous, silky white or pink; bulb of 5–15(+) similar-sized bulblets (= cloves); leaves 6–12, flat, 5–15 mm wide, sheathing the stem; flowers usually aborting before anthesis; perianth segments usually whitish green or pinkish. Cultivated in nc TX and probably persisting and escaping?; included because of likelihood of encounter in abandoned garden spots; May–Jul. Cultigen derived from an Old World species; cultivated since ancient times, probably 3,000 B.C. or earlier; bulbs were found in the tomb of Tutankhamen; used medicinally, in cooking, and worn around the neck to supposedly ward off evil spirits, trolls, and vampires (Rose & Strandtmann 1986; Mabberley 1987; Mathew 1996). 🌿

Allium stellatum Nutt. ex Ker Gawl., (star-like), PRAIRIE ONION, WILD ONION, PINK WILD ONION. Flowering stalk 20–70 cm tall; leaves 1–5 mm wide; perianth segments 5–8 mm long, deep pink. Prairies, usually in calcareous soils; Cooke and Tarrant cos., also Lamar Co. (Carr 1994); in TX only in nc part of the state. Jul–Oct.

Allium texanum T.M. Howard, (of Texas). This species was named by Howard (1990) with the type from Bosque Co. and another nc TX collection from Comanche Co. He indicated that “it is distinguished from the closely related *A. fraseri* [*A. canadense* var. *fraseri*] in flowering later, having broadly spiraled, glaucous foliage, taller, more robust habits, larger umbels with flowers having green ovaries, and having membranous coated bulbs or with non-persisting, poorly developed reticulated bulb coats. *Allium texanum* differs from *A. canadense* in its mostly membranous-coated bulbs, floriferous, rather than bulbil-bearing, umbels, and in the individual floral form.” We have seen no specimens but based on the description assume it is part of the *A. canadense* complex, possibly a variety of that species. Because of our unfamiliarity with this taxon and our hesitancy to add to nomenclatural complexity by treating it as a var. of *A. canadense*, we are simply including it as a note.

ANDROSTEPHIUM FUNNEL-LILY

☛ An American genus of 2 species; cultivated as ornamentals. (Greek: *andros*, male, and *stephanos*, a crown, in reference to the fused filaments)

Androstephium coeruleum (Scheele) Greene, (dark blue), BLUE FUNNEL-LILY. Glabrous perennial from a fibrous-coated corm, gray-green, 6–25 cm tall; leaves basal, slender, longer than the scape (= flowering stem), exerted from a broad, loose, thinly papery, sheathing bract; scape to 25 cm tall, usually < 15 cm; flowers 1–6 in an umbel-like cluster subtended by membranous bracts, with strong spicy-sweet scent; perianth lavender-blue, 16–24 mm long; filaments ± united to form a tube; capsules ca. 15 mm long. Prairies; Blackland Prairie (on the Austin Chalk) w to Edwards Plateau and Rolling Plains. Late Mar–mid-Apr.

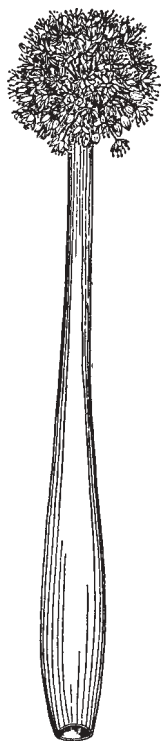
ASPARAGUS

☛ An Old World genus of 130–140 species. (The ancient Greek name)

Asparagus officinalis L., (used in medicine), GARDEN ASPARAGUS. Rhizomatous, dioecious, glabrous perennial usually 1–3 m tall; stems with many very finely dissected branches; leaves reduced to scales; photosynthesis carried out by the stem tissue; flowers axillary, 1–2(–3) per axil, on jointed pedicels, greenish yellow, ca. 4–6 mm long; fruit a red berry ca. 1 cm in diam. Widely cultivated and escapes to sandy areas; Cooke, Grayson, and McLennan cos.; mainly e 1/2 of TX. May–Jul. Native of the coasts of Europe, n Africa, and Asia. Grown since time of the ancient Greeks for the edible young spring shoots (Mabberley 1997). Mature asparagus has caused poisoning in cattle (Kingsbury 1964); the young plants can cause dermatitis and the fruits are suspected of poisoning humans (Schmutz & Hamilton 1979); there are steroid saponins which are molluscicidal (Mabberley 1997). ☛ ☞

CAMASSIA WILD-HYACINTH

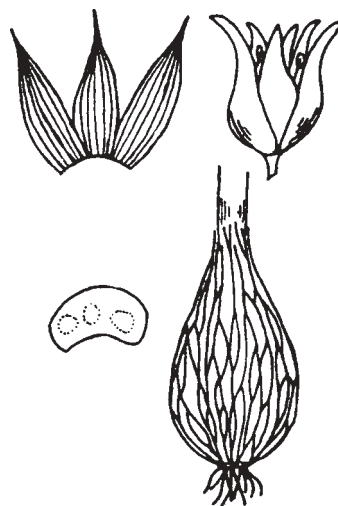
☛ A genus of 6 species, 5 in North America (1 e U.S., 4 disjunct to w North America—Wood 1970), 1 South American. Some species (e.g., *C. quamash* (Pursh) Greene—CAMASH or QUAMASH of Native Americans) were extensively used as food by Native Americans in the nw U.S. (Kindscher 1987); some also are cultivated as ornamentals. *Camassia* is sometimes segregated with similar genera (e.g., *Hyacinthus*, *Muscari*, *Ornithogalum*) into the Hyacinthaceae (Dahlgren et al. 1985). (From the Native American name, *quamash* or *camass*)
REFERENCES: Gould 1942; Ranker & Schnabel 1986.



Allium cepa [GLÉ]



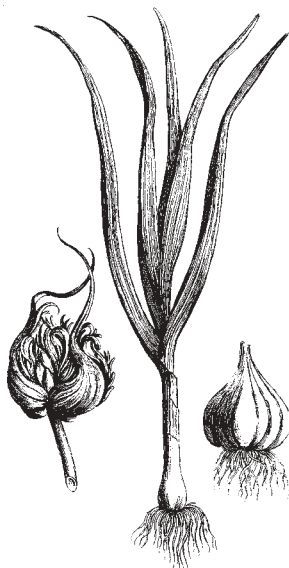
Allium drummondii [BBZ]



Allium perdulce [TKA]



Allium runyonii [HEA]



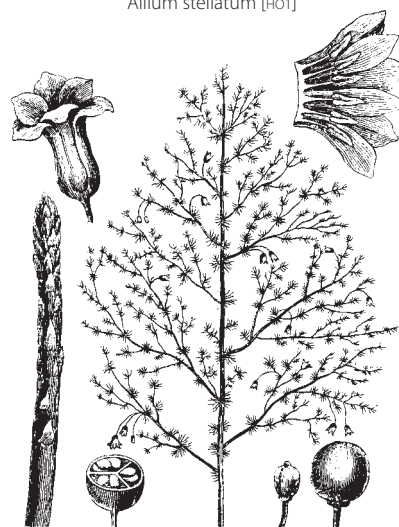
Allium sativum [ANO]



Allium stellatum [HOI]



Androstephium coeruleum [RVD]



Asparagus officinalis [LAM]

Camassia scilloides (Raf.) Cory, (resembling the genus *Scilla*), WILD-HYACINTH, EASTERN CAMASS, ATLANTIC CAMASSIA, CAMASS, CAMASS-LILY, MEADOW-HYACINTH, MEADOW QUILL, SIKO. Bulbous perennial 15–85 cm tall; leaves crowded at base of stem, their bases clasping and surrounded by a sheathing, somewhat papery bract; inflorescence an elongating erect raceme; flowers sweet-scented; perianth segments 10–14 mm long, lavender-blue, rarely white; fruit a capsule. Open woods and prairies; se and e TX w to West Cross Timbers and Edwards Plateau. Apr–May. The bulb is edible and was an important food source for Native Americans and early settlers; however, it resembles that of the potentially fatal *Zigadenus nuttallii* (DEATH CAMAS) (Ajilvsgi 1984; Kindscher 1987). ☒/81

COOPERIA RAIN-LILY

Plants glabrous, often flowering without leaves, 8–35 cm tall; flowers erect, solitary, subtended by a conspicuous bract; flowering stems appearing quickly after rains; perianth white, sometimes pink-tinted outside, salverform, with an elongate tube and an open limb of similar sepal and petal lobes; flower sessile or short-pedicelled; ovary borne inside the involucre; capsule trilocular.

☛ A small American genus of ca. 6–7 species (Correll & Johnston 1970) sometimes lumped into *Zephyranthes* (e.g., Mabberley 1997) and previously placed in the Amaryllidaceae. We are following Kartesz (1994), Jones et al. (1997), and J. Kartesz (pers. comm. 1997) in maintaining *Cooperia* as a distinct genus. (Named for Daniel Cooper, ?1817–1842, an English botanist)

1. Flower sessile, ovary borne at base of subtending bract; perianth tube (from base to where perianth begins to widen) greatly elongate (3.4–18 cm long); style > 40 mm long _____ **C. drummondii**
1. Flower short-pedicelled, the ovary borne 1/3–1/2 way above base of subtending bract; perianth tube shorter (2.2–4 cm long); style < 35 mm long _____ **C. pedunculata**

Cooperia drummondii Herb., (for its discoverer, Thomas Drummond, 1780–1835, Scottish botanist and collector in North America), CEBOLLETA, RAIN-LILY. Spring leaves 1–3(–5) mm wide; perianth with nearly flat limb about 1/4 as long as the long, slender, pedicel-like basal tube, the lobes 12–20 mm long, obtuse. Prairies, roadsides, often on thin soils over limestone; se and e TX w to West Cross Timbers and Edwards Plateau. Jun–Oct, typically after a rain. [*Zephyranthes brazosensis* (Herb.) Traub, *Zephyranthes herbertiana* D. Dietr.] The flowers open in the late afternoon or evening (Kirkpatrick 1992).

Cooperia pedunculata Herb., (peduncled, stalked, or footed), GIANT RAIN-LILY, PRAIRIE RAIN-LILY, WHITE RAIN-LILY, WIDE-LEAF RAIN-LILY. Spring leaves 4–10 mm wide; perianth with broadly funnelform limb about 1/2 or more as long as the narrowly cylindrical basal tube, the lobes 25–30 mm long, with an abrupt small point. Rocky or sandy soils, prairies, roadsides, open woods; Coryell Co., also McLennan Co. (Mahler 1988); s part of nc TX sw to Edwards Plateau, also se and e TX. Apr–Jul, typically a few days after heavy rains. [*Zephyranthes drummondii* D. Don.] According to Wills and Irvin (1961), the flowers “... open slowly around dusk or earlier on cloudy days, the lobes gradually spreading during the night, and appearing fully expanded the next morning. Ordinarily each flower lasts only one day, turning pale pink before withering, but in dull weather withering may not occur until the second day.” ☒/85

ERYTHRONIUM DOG-TOOTH-VIOLET, FAWN-LILY

Perennial from deep bulb; runners or stolons present or absent; leaves of flowering plants 2, of sterile plants 1; inflorescence usually a 1-flowered scape; perianth segments 6, in ours white to tinged with varying shades of blue and red, 2–4 cm long; 3 inner perianth segments with a yellow spot at base, stamens 6; pistil superior; 3-carpellate; capsule obovate.

☞ A genus of ca. 20 species of temperate North America and Eurasia; some have edible corms; a number are cultivated as ornamentals. The following key is from Robertson (1966); all nc TX specimens we have observed had mottled leaves; some of these had the mature fruits resting on the ground and some were from prairies; Robertson (1966) indicated that specimens from near Fort Worth were definitely *E. mesochoreum*. Taylor and Taylor (1994) recognized the two taxa as varieties of *E. albidum*. Further work on this complex is needed before specimens can be classified with confidence; we are not fully convinced there are actually two different species in nc TX. (Greek name for the purplish-flowered European species, from *erythros*, red)
REFERENCES: Harper 1945; Ireland 1957; Robertson 1966.

1. Perianth segments reflexed in full bloom; leaves mottled; mature fruits erect to nodding at maturity, held off ground; moist woods _____ **E. albidum**
1. Perianth segments spreading to at most half-reflexed in full bloom; leaves usually not mottled; mature fruits resting on ground; prairies, pastures, dry open woods _____ **E. mesochoreum**

Erythronium albidum Nutt., (white), WHITE DOG-TOOTH-VIOLET, WHITE FAWN-LILY, TROUT-LILY. Leaves abruptly attenuated, mottled, flat to half-folded; perianth reflexed; sterile forms with long runners with a new bulb forming at runner tip; chromosome number $2n = 44$. Usually moist woods; Collin, Cooke, Dallas, Grayson, and Tarrant cos., also Comanche (HPC), Hunt, Kaufman, Red River, and Rockwall (Mahler 1988) cos.; e TX w to nc TX. Feb–Mar. The common name TROUT LILY refers to the leaf mottling which resembles the speckling on a trout (Ajilvsgi 1984).

Erythronium mesochoreum Knerr, (midland). Leaves gradually attenuated, not mottled, conduplicate or occasionally only half-folded; perianth spreading; sterile forms usually without runners, a new bulb forming at base of old one; chromosome number $2n = 22$. Prairies and dry woods; Bell, Bosque, Coryell, Dallas, Grayson, Rockwall, and Tarrant cos. (Mahler 1988); nc TX and Edwards Plateau. (Jan–)Feb–Mar. [*E. albidum* var. *coloratum* Sterns, *E. albidum* var. *mesochoreum* (Knerr) Rickett] Churchill and Bloom in Churchill (1986b) indicated that ants eat the white oil body attached to the seeds and apparently act as dispersal agents. ☞/89

HABRANTHUS COPPER-LILY

☞ A temperate South American genus of 10 species including some cultivated as ornamentals; previously placed in the Amaryllidaceae. (Greek: *habros*, graceful, and *anthos*, a flower)
REFERENCE: Holms & Wells 1980.

Habranthus tubispathus (L'Hér.) Traub, (tube-spathed), ATAMOSCO-LILY, STAGGER-GRASS. Leaves basal; scape to ca. 30 cm tall, with 1 flower; perianth long-funnelform with gradually tapering base, 25–30 mm long, orange-yellow, sometimes with reddish tinge on outer surface; flower on pedicel about twice as long as the subtending involucre bract; ovary borne above the bract; capsule subglobose, ca. 15 mm wide. Moist open areas; Milam Co., also yard weed in Tarrant Co., also McLennan and Williamson cos. (Holmes & Wells 1980); s part of nc TX to se and s TX and Edwards Plateau. Jul–Oct, after rains. [*H. texanus* (Herb.) Herb. ex Steud., *Zephyranthes texana* Hook.] Holmes and Wells (1980) proposed that this species is native to South America and was introduced in the U.S. in the late 1600s or early 1700s possibly by Spanish missionaries. ☞

HEMEROCALLIS DAY-LILY

☞ An ornamentally important genus of ca. 15 species occurring from c Europe to China and Japan; many cultivars are of hybrid origin. Some authorities (e.g., Dahlgren et al. 1985) segregate the genus as the Hemerocallidaceae. (Greek: *hemera*, a day, and *callus*, beauty, referring to the flowers lasting one day)
REFERENCES: Bailey 1930a; Erhardt 1992.

Hemerocallis fulva L., (tawny, dull yellow-brown), TAWNY DAY-LILY, ORANGE DAY-LILY. Perennial from fleshy roots with tuberous swellings; leaves basal, to 1 m long; scape 0.7–1.5 m tall; flowers several, not fragrant; perianth large and showy, usually tawny orange, 8.5–12 cm long, broadly campanulate to funnellform with cylindrical tube; perianth lobes spreading to slightly recurved; margins of inner perianth lobes undulate; fruit a capsule; seeds usually not maturing. Widely cultivated, long persists, and sometimes escapes; Lamar Co., also Grayson Co. (G. Diggs, pers. obs.). Native of e Asia. The dried flowers are used to flavor food in China and Japan (Mabberley 1987). ☞

Hemerocallis lilioasphodelus L., (lily and *Asphodelus*, another genus of Liliaceae), is another cultivated species; this Eurasian native can be distinguished by its bright yellow fragrant flowers and the margins of the perianth lobes plane (not undulate). ☞

HYACINTHUS HYACINTH

☞ A genus of 3 species native from w and c Asia to the Mediterranean; sometimes segregated with similar genera (e.g., *Camassia*, *Muscari*, *Ornithogalum*) into the Hyacinthaceae (Dahlgren et al. 1985). (The Greek name)

Hyacinthus orientalis L., (oriental), HYACINTH, GARDEN HYACINTH. Bulbous perennial 10–30 cm tall; leaves crowded at base, ± clasping and sheathing; flowers sweet-scented, short-pedicelled, in an erect, spike-like raceme; perianth narrowly campanulate with recurved lobes, violet-blue to white, rosy, or rarely yellowish. In 1893 Reverchon wrote that a wild strain of this had self-sown and escaped from his garden in Dallas, maintaining itself for several years (Mahler 1988). Modern cultivated varieties sometimes persist about old farms and gardens (Hunt Co.), but are not known to produce seed. Late Feb–Mar. Native of the e Mediterranean region. All parts of the plant, but especially the bulb, can cause poisoning in humans and livestock; toxicity is apparently due to alkaloids such as lycorine (Stephens 1980; Spoerke & Smolinske 1990). ☞ ☞

HYMENOCALLIS WHITE SPIDER-LILY, SPIDER-LILY

Glabrous perennials from a large bulb; leaves basal, strap-like; inflorescence an umbel, usually with 6–9 flowers, terminating a naked scape, subtended by 2 or more usually scarious bracts; flowers white, extremely showy, sweet scented; perianth with a long slender tube and linear to narrowly lanceolate, spreading segments; large, conspicuous, cup-like crown (= corona) present and connecting the bases of the filaments; fruit a few-seeded capsule.

☞ A genus of 30–40 species of warm areas of the Americas; a number are cultivated as ornamentals; previously placed in the Amaryllidaceae. ☞ The bulbs of some species are poisonous due to the presence of alkaloids such as lycorine and tazettine (Lampe & McCann 1985; Spoerke & Smolinske 1990). (Greek: *hymen*, a membrane, and *callos*, beauty, presumably referring to the crown)

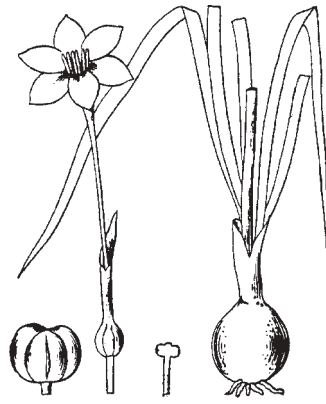
REFERENCES: Shinnars 1951d; Sealy 1954.

1. Free portion of filaments 23–35 mm long; crown 33–40 mm long; larger perianth segments usually > 5 mm wide; leaves 18–42 mm wide _____ **H. caroliniana**
1. Free portion of filaments (above attachment to crown) 20 mm or less long; crown 25–35 mm long; larger perianth segments usually 5 mm or less wide; leaves usually < 20(–40) mm wide _____ **H. liriosme**

Hymenocallis caroliniana (L.) Herb., (of Carolina). Plant 35–53 cm tall; perianth segments white, greenish white below, to 10 cm long; crown 3.3–4 cm long. Wet sandy areas; included based on citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990); mainly se and e TX. Mar–May(–Jul).



Camassia scilloides [BB2]



Cooperia drummondii [BB2]



Cooperia pedunculata [CUR]



Erythronium albidum [RVD]



Erythronium mesochoreum [STE]



Habranthus tubispatus [CUR]



Hemerocallis fulva [BT2, GAR]



Hyacinthus orientalis [NIC]

Hymenocallis liriosme (Raf.) Shinners, (lily-smell or fragrant lily), WESTERN SPIDER-LILY, FRAGRANT SPIDER-LILY. Plant 35–100 cm tall; perianth extremely showy, to ca. 20 cm in diam., snowy white, tinged with yellow in the center; yellowish or greenish on tube; tube 6–8 cm long. Stream bottoms and ditches, sometimes in shallow water; Kaufman and Red River cos. (Correll & Johnston 1970); se and e TX w to Blackland Prairie. Late Mar–May, occasionally to Jul. [*H. eulae* Shinners] 🌱/93

HYPOXIS YELLOW STAR-GRASS, GOLDSTAR

☞ A genus of 150 species of tropical and warm areas of the world, especially the s hemisphere. It is sometimes segregated as the Hypoxidaceae (e.g., Dahlgren et al. 1985; Jones et al. 1997) or placed in the Amaryllidaceae. (Old name taken over by Linnaeus; either from Greek: *hypoxys*, somewhat acidic, or Greek: *hypo*, beneath, and *oxys*, sharp, alluding to the base of the capsule) REFERENCES: Brackett 1923; Herndon 1992.

Hypoxis hirsuta (L.) Coville, (hairy), YELLOW STAR-GRASS, COMMON GOLDSTAR. Perennial from a small corm; leaves basal, slender, grass-like, with closed, tubular basal sheath; several additional papery sheaths present outside the leaves, the old ones disintegrating and disappearing; flowering stems 6–20 cm tall, from half as long as the leaves to almost as long; flowers usually 2–4, in an umbel-like inflorescence with a pair of opposite, thread-like bracts at its base; perianth yellow, greenish and pubescent outside, nearly rotate when fully open; perianth segments 6, 6–12 mm long, up to 18 mm with age, lanceolate to elliptic; stamens 6; pistil 1; ovary inferior; capsule 2–6 mm long. Open woods, prairies, and roadsides; se and e TX w to Dallas, Grayson, and Wise cos., also Montague Co. (R. O'Kennon, pers. obs.), also Edwards Plateau. Late Mar–early May. [*H. rigida* Chapm., *H. leptocarpa* Engelm.]

IPHEION SPRING-STAR

☞ A South American genus of 10 species of onion-scented herbs (Mabberley 1987) sometimes treated in the genus *Tristagma* (e.g., Mabberley 1997); previously placed by some authorities in the Amaryllidaceae or Alliaceae. (Greek: origin obscure)

Ipheion uniflorum (Lindl.) Raf., (one-flowered), SPRING-STAR. Glabrous perennial, 7–20 cm tall, with onion odor; leaves basal, with long, closed, tubular sheath of thin, scarios texture, and slender green blade; scape with 2 partly or wholly united bracts above the middle, terminated by 1(–2) flowers; perianth 20–28 mm long, white with pale blue tinge, the lobes with darker central line and brownish tinge on back; filaments ± united to form a tube. Cultivated and escaping; Blackland Prairie (Kaufman Co.) and Edwards Plateau. Feb–Mar. Native of Argentina and Uruguay. [*Brodiaea uniflora* (Graham) Engl.] 🌱

LEUCOJUM SNOWFLAKE

☞ A genus of 10 species ranging from Europe to Morocco and Iran; related to *Galanthus*; previously placed in the Amaryllidaceae. (Greek: *leucos*, white, and *ion*, a violet, in reference to the delicate fragrance)

REFERENCE: Webb 1980.

Leucojum aestivum L., (summer), GIANT SNOWFLAKE, SUMMER SNOWFLAKE. Bulbous perennial; leaves broadly linear, to 10 cm long and 5–20 mm wide, surrounded at base by tubular sheaths; scapes 20–40(–80) cm tall; umbel with 2–10 nodding flowers, subtended by a membranous bract 3–5 cm long; pedicels 1–4(–7) cm long; perianth campanulate, without elongate perianth tube; corona absent; perianth segments free nearly to base, all about equal, white with green tips, 1.5–3 cm long; anthers opening by longitudinal slits; seeds 5–7 mm long, black. Cultivated



Hymenocallis caroliniana [COI]



Hymenocallis lirioides [HEA]



Hypoxis hirsuta [BB2]



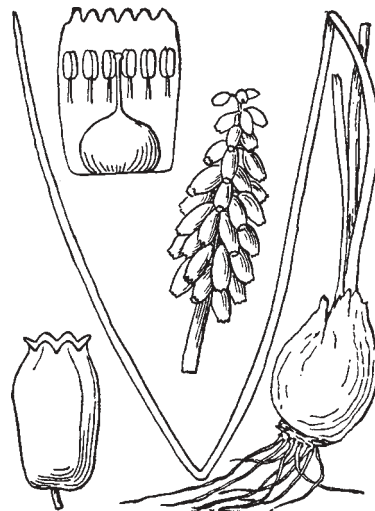
Ipheion uniflorum [CHT]



Leucojum aestivum [LAM]



Lycoris radiata [SIN]



Muscari neglectum [BB2]

and escapes; Dallas Co. Mar. Native of Europe. Two other similar European species are cultivated and persist in nc TX: ☞

Galanthus nivalis L., (genus: Greek: *gala*, milk, and *anthos*, flower; sp.: of snow), SNOWDROP, has the inner tepals much shorter than outer, only the inner green-tipped, and anthers opening at tip. ☞

Leucojum vernum L., (spring), SPRING SNOWFLAKE, has flowers solitary. ☞

LYCORIS

☞ A genus of 11 species native from China and Japan to Burma; cultivated as ornamentals; previously placed in the Amaryllidaceae. ☞ The bulbs of *Lycoris* species are poisonous due to the presence of the alkaloid, lycorine (Lampe & McCann 1985). (Named after Lycoris, a beautiful Roman actress and mistress of Marc Antony)

REFERENCE: Ping-Sheng et al. 1994.

Lycoris radiata (L'Hér.) Herb., (with rays), SPIDER-LILY, RED SPIDER-LILY. Bulbous perennial; leaves to ca. 8 mm wide, glaucous, not appearing with the flowers; inflorescence a few-flowered umbel at end of a solid scape; flowers bright red, lacking fragrance; perianth ca. 4 cm long, the lobes reflexed with wavy margins; stamens much-exserted, 2 times as long as perianth; ovary inferior; fruit a few-seeded capsule. Cultivated and long persists or possibly escapes; roadside ditch in Grayson Co. (G. Diggs, pers. obs.). Fall. Native of China and Japan. Poisonous (Lampe & McCann 1985). ☞ ☞

MUSCARI GRAPE-HYACINTH

☞ A genus of 30 species ranging from Europe and the Mediterranean to w Asia; some contain alkaloids including colchicine; a number are cultivated as ornamentals and the flowers of some are used in scent making. *Muscari* is sometimes segregated with similar genera (e.g., *Camassia*, *Hyacinthus*, *Ornithogalum*) into the Hyacinthaceae (Dahlgren et al. 1985). (Named in reference to the musky flower odor of some species)

Muscari neglectum Guss. ex Ten., (overlooked), STARCH GRAPE-HYACINTH. Low-growing bulbous perennial; leaves basal, several or many, dark green, about 3–4 mm wide, arched or loosely coiled and spreading, longer than flowering stem; inflorescences scapose, racemose, to ca. 20 cm tall; perianth urceolate, dark blue with whitish teeth (rarely all white), about 3 mm broad, 3.5–6 mm long, with musky odor; pedicels 2–4 mm long; fruit a capsule. Cultivated widely, escaping and naturalizing, yards, fields, and roadsides; Bosque, Dallas, Grayson, McLennan, and Rockwall cos., also Tarrant Co. (R. O'Kennon, pers. obs.); nc, c and e TX. Mar–early Apr. Native of the Mediterranean region. [*M. racemosus* (L.) Lam. & DC.] ☞

NARCISSUS

Bulbous, glabrous, scapose perennials with linear, flat or terete leaves exserted from closed tubular sheaths; inflorescence terminal, subtended by a membranous sheathing bract splitting along 1 side; flowers sweet-scented; perianth united into a tube, with perianth parts spreading to reflexed from the base of the central tubular or cup-shaped crown (= corona), yellow or white; stamens included or barely exserted from the tube; fruit a many-seeded capsule.

☞ A genus of 27 species; a number of species (and their hybrids) of this Old World (European and Mediterranean) genus are cultivated for their early spring flowers; previously placed in the Amaryllidaceae. Several of the most frequently cultivated species and their hybrids, that long persist around old homesites or escape, are treated here. ☞ The bulbs have been known to

cause poisoning in humans and also in livestock when used as emergency food; even small amounts cause vomiting; bulbs and leaves can cause dermatitis in susceptible individuals; toxins include alkaloids (e.g., narcissine, lycorine) and a glycoside; raphides (= bundles of microscopic, needle-like calcium oxalate crystals) are also present in the bulbs and can cause mechanical injury to the mouth, throat, or hands by puncturing cell membranes (Kingsbury 1964; Schmutz & Hamilton 1979; Spoerke & Smolinske 1990; Turner & Szczawinski 1991). (Greek plant name derived from *narke*, numbness or torpor, from its narcotic properties; in Greek mythology the youth Narcissus fell in love with his own reflection in a pool and was turned into this plant by the gods.)

1. Crown nearly as long as or slightly longer than lobes of perianth; perianth tube (below attachment of perianth lobes) broadly conical, about as long as lobes _____ **N. pseudonarcissus**
1. Crown ca. 2/3 as long as lobes of perianth or less (often much less); perianth tube nearly cylindrical, slightly to much shorter than lobes.
 2. Crown ca. 1/2–2/3 as long as perianth lobes; perianth usually yellow; flower 1 per flowering stalk _____ **N. ×incomparabilis**
 2. Crown 1/3 as long as perianth lobes or less; perianth yellow or white (but crown can be colored); flowers usually 2–10(–15) per flowering stalk or if 1, then perianth white.
 3. Leaves thick, terete (= cylindrical) or nearly so (and grooved on upper surface), green _____ **N. jonquilla**
 3. Leaves flat or nearly so, mostly ± glaucous.
 4. Perianth white; crown red-rimmed; flowers usually 1 per flowering stalk _____ **N. poeticus**
 4. Perianth yellow or white; crown yellow or orange; flowers 2–8(–15) per flowering stalk _____ **N. tazetta**

Narcissus ×incomparabilis Mill. [*N. poeticus* × *N. pseudonarcissus*], (incomparable). Hybrid similar to *N. pseudonarcissus*; leaves 8–12 mm wide; perianth lobes 25–35 mm long; perianth tube 20–25 mm long; corona 13–22 mm long; there are numerous forms including many of the modern “fancy” types (Shinners 1958a). Cultivated; no escaped specimens from nc TX seen; included because it is expected to be found persisting. Mar. ☞

Narcissus jonquilla L., (from Spanish: *junquillo*, rush, for the slender leaves), JONQUIL. Leaves 2–4 mm wide; inflorescences 2–5-flowered; pedicels unequal; flowers fragrant; perianth yellow with deeper yellow crown; perianth lobes 10–15 mm long; perianth tube slender, (17–)20–30 mm long; crown 3–5 mm long. Cultivated and long persists; Grayson and Hunt cos. Feb–Mar. Native of s Spain and Algeria. ☞

Narcissus poeticus L., (pertaining to the poets), PHEASANT’S-EYE, POET’S NARCISSUS. Leaves 5–13 mm wide; flowers very fragrant; perianth lobes 15–30 mm long; perianth tube 20–30 mm long, slender, ± equal in diam. to apex; corona 1–2.5 mm long. Cultivated; no escaped specimens from nc TX seen; included because it is expected to be found persisting. Mar–May. Native from France to Greece. Flowers used in making perfume. ☞

Narcissus pseudonarcissus L., (false *Narcissus*), DAFFODIL, TRUMPET NARCISSUS. Leaves 5–15 mm wide; perianth yellow (rarely white) with crown usually deeper yellow (rarely white); perianth lobes 18–40(–55) mm long; perianth tube broad, gradually flared, about 12–18 mm long; crown 15–50 mm long. Cultivated and long persists; Grayson and Hunt cos. Feb–Mar. Native of Europe. ☞

Narcissus tazetta L., (small cup, from Italian word), POLYANTHUS NARCISSUS. Leaves 5–25 mm wide; flowers fragrant, perianth lobes 8–22 mm long; perianth tube slender, 12–18 mm long tube; crown 3–6 mm long. Cultivated and long persists; according to Shinners (1958a), this species and its hybrids are the most frequent escapes from cultivation in nc TX; included on that basis. Late Feb–Mar. Native of Mediterranean area. PAPER-WHITE NARCISSUS is a large-flowered, all white form of *N. tazetta*. ☞

Narcissus × odorus L. [*N. jonquilla* × *N. pseudonarcissus*], CAMPERNELLE JONQUIL, is occasionally cultivated; this hybrid, with usually 2–4 yellow flowers per flowering stalk, resembles *N. jonquilla* in having thick, grooved leaves, but has slightly larger flowers and the crown ca. 1/2 as long as the perianth lobes. ☞☞

NOTHOSCORDUM FALSE GARLIC

☞ An American genus of 20 species similar to *Allium* but odorless; previously considered by some authorities to be in the Alliaceae (e.g., Dahlgren et al. 1985) or the Amaryllidaceae. (Greek: *nothos*, false, and *scordon*, garlic)

Nothoscordum bivalve (L.) Britton, (two-valved), CROW-POISON, YELLOW FALSE GARLIC. Bulbous glabrous perennial, 7–40 cm tall; leaves basal, with closed, tubular, basal sheath and slender blade; inflorescences scapose, umbellate, of (3–)6–12 flowers, subtended by 2 scarious bracts; flowers scentless; perianth funnelform, 8–10 mm long, whitish with yellowish base inside and lavender to purple-red midribs on backs of perianth segments. Open woods, prairies, disturbed sites; throughout most of TX; one of our most abundant and widespread native plants. Mostly Mar–early May and late Sep–Oct. Resembling an *Allium* and placed by some in that genus [as *A. bivalve* (L.) Kuntze]; easily distinguished by its longer anthers (2 mm long) and lack of odor.

ORNITHOGALUM

☞ An Eurasian and African genus of ca. 200 species; sometimes segregated with similar genera (e.g., *Camassia*, *Muscari*, *Ornithogalum*) into the Hyacinthaceae (Dahlgren et al. 1985). Some species have alkaloids including colchicine; a number are cultivated as ornamentals; some have edible bulbs; ☞ others are toxic. (Greek: *ornis*, a bird, and *gala*, milk; this was an expression used by the ancient Greeks to describe something amazing—Love 1994).

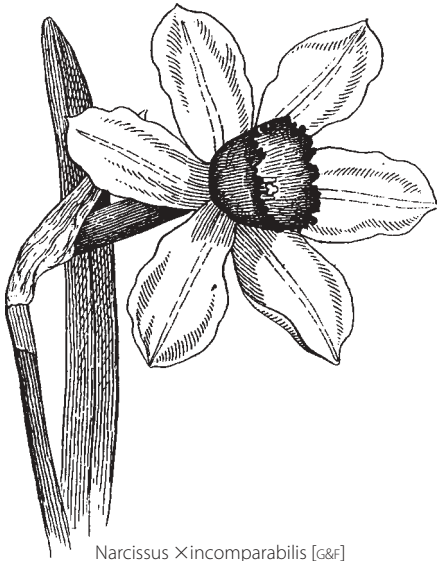
Ornithogalum umbellatum L., (with umbels), STAR-OF-BETHLEHEM. Bulbous perennial 10–35 cm tall; leaves basal, longer than flowering stem; inflorescence a simple corymb; flowers subtended by conspicuous, clasping, papery, acuminate bracts; perianth broadly funnelform or nearly rotate; perianth segments white inside, green with white margins outside; fruit a capsule. Low of ten shady ground, cultivated, escaped, and naturalized; Dallas and Grayson cos., also Collin Co. (R. O'Kennon, pers. obs.); Blackland Prairie and Edwards Plateau. Apr. Native of Europe. All parts of the plant, particularly the bulbs, are considered poisonous to humans and animals due to the presence of a digitalis-like alkaloid or cardiac glycosides; death in livestock has been reported (Muenscher 1951; Kingsbury 1964; Fuller & McClintock 1986; Blackwell 1990; Spoerke & Smolinske 1990). ☞☞

POLYGONATUM SOLOMON'S-SEAL

☞ A n temperate (especially sw China) genus of 55 species of herbs with robust horizontal rhizomes; species variously used as ornamentals, for food, or medicinally. *Polygonatum* is sometimes segregated with similar genera into the Convallariaceae (Dahlgren et al. 1985). The common name refers to the scar formed on the rhizome when the stem breaks off at the end of the growing season; it supposedly resembles the official seal of King Solomon (Ajilvsgi 1984). (Greek, *polys*, many, and *gonu*, knee, in reference to the many joints of the rhizome)

REFERENCES: Gates 1917; Ownbey 1944.

Polygonatum biflorum (Walter) Elliott, (two-flowered), GREAT SOLOMON'S-SEAL. Glabrous perennial from knotty rhizomes; stem erect-arching, to ca. 1 m tall; leaves borne along the stem, elliptic-lanceolate to broadly elliptic, to ca. 15 cm long and 7 cm wide; inflorescences axillary, 1–9-flowered; peduncles to ca. 5 cm long; pedicels 0–2 cm long; flowers perfect, pendulous; perianth 13–20 mm long, greenish white; fruit a blue-black berry. Rich, moist, wooded slopes; Dallas



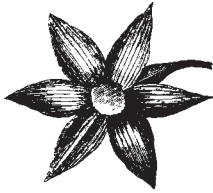
Narcissus × *incomparabilis* [G&F]



Narcissus jonquilla [NIC]



Narcissus poeticus [NIC]



Narcissus pseudonarcissus [LAM]



Narcissus tazetta [LAM]



Nothoscordum bivalve [BB2]





Ornithogalum umbellatum [NIC]



Polygonatum biflorum [BA]

(Spring Creek Preserve in Garland) and Grayson cos., also Lamar Co. (TOES 1993); mainly e TX. Mar–May. (TOES 1993: V) 



SCHOENOCAULON SABADILLA


 A genus of 10 species native from the s U.S. to Peru;  some have alkaloids including veratrin; *S. officinale* A.Gray (SABADILLA, CEVADILLA) has seeds that are insecticidal and used in veterinary medicine. (Greek: *schoeno*, reed or rush-like, and *caulos*, a stalk)

Schoenocaulon texanum Scheele, (of Texas), TEXAS SABADILLA. Herbaceous perennials from bulbs; scapes naked, to 55 cm tall; leaves all basal, grass-like, to 60 cm long, mostly 4 mm or less wide; spikes 10–15 mm in diam.; flowers sessile or nearly so, each subtended by a small bract; perianth segments 6, essentially separate, fleshy-thickened or leathery, linear-oblong, with thickish entire margins, 3–4 mm long, ca. 1 mm or less wide, greenish white; stamens 6; filaments 3.5–5 mm long; capsules 10–15 mm long. Limestone soils, rocky grasslands and openings in juniper-oak woodlands; Bell Co., also Burnet and Williamson cos. (Balcones Canyonlands Nat. Wildlife Refuge, C. Sexton, pers. comm.); s margin of nc TX s through Edwards Plateau to Trans-Pecos. Mar–Jul.


Schoenocaulon drummondii A. Gray, (for Thomas Drummond, 1780–1835, Scottish botanist and collector in North America), DRUMMOND'S SABADILLA, GREEN-LILY, the only other member of the genus occurring in TX, is known mainly from the s 1/2 of the state. It can be distinguished by its submembranous, elliptic to ovate-elliptic perianth segments with thin erose margins, a larger spike (15–20 mm in diam.), and its phenology (usually flowering in autumn).

ZIGADENUS DEATH-CAMASS, POISON-SEGO

 A genus of 18 species native to North America, the Urals, and e Asia;  many are poisonous due to the presence of alkaloids; a few are cultivated as ornamentals. Previously sometimes spelled *Zygadenus*. (Greek: *zygos*, a yoke, and *aden*, a gland, referring to the glands sometimes being in pairs)

Zigadenus nuttallii (A. Gray) S. Watson, (for Sir Thomas Nuttall, 1786–1859, English-American botanist), NUTTALL'S DEATH-CAMASS, POISON-CAMASS, DEATH-CAMASS. Perennial from bulb, 30–100 cm tall; leaves crowded near base with short, tubular basal sheath (closed but very thin down side opposite blade, easily splitting); inflorescence a raceme or a panicle with a few short branches near base, these flower-bearing nearly to base; pedicels becoming 10–25 mm long; perianth segments 6–9 mm long, white, ovate, abruptly narrow and claw-like at base; fruit a 3-lobed capsule ca. 8–12 mm long. Prairies, open woods; e TX w to West Cross Timbers, also Edwards Plateau. Late Mar–early May. All parts of the plant may be fatally poisonous to cattle, sheep, and horses due to complex steroidal alkaloids (Sperry et al. 1955; Ajilvsgi 1984; Blackwell 1990); *Zigadenus* species have caused poisoning in children from eating the bulbs or chewing the flowers and deaths have been reported from eating the bulbs; toxins present include zygadenine, zygacine, and related alkaloids (Marsh et al. 1915; Schmutz & Hamilton 1979; Stephens 1980; Ajilvsgi 1984; Fuller & McClintock 1986). 

MARANTACEAE ARROWROOT FAMILY

 A medium-sized (535 species in 29 genera) primarily tropical family of rhizomatous perennial herbs. The stamens are distinctive; all are sterile and modified into staminodes with the exception of one petal-like functional stamen. There are a number of ornamentals including *Calathea* and *Maranta*. Family name from *Maranta*, ARROWROOT or PRAYER-PLANT, a tropical American genus of ca. 20 species. *Maranta arundinacea* L., WEST INDIAN ARROWROOT, has a



Schoenocaulon texanum [HEA]



Zigadenus nuttallii [BB2]



Thalia dealbata [CO1, NIC]

starchy edible rhizome, the starch being easily digested and used for infants and invalids. (Named for Bartolommeo Maranti, 16th century Venetian botanist) (subclass Zingiberidae)

FAMILY RECOGNITION IN THE FIELD: the only nc TX species is a large rhizomatous herb with broad, *banana-like* leaves with a joint where the long petiole and blade join; inflorescences usually *white-powdery*; flowers purple; androecium of a single fertile stamen and often staminoidea.

REFERENCES: Rogers 1984; Dahlgren et al. 1985.

THALIA

☛ A mostly tropical American (1 in Africa) genus of 7 species. (Named for Johann Thal, a German physician and naturalist who died in 1583)

Thalia dealbata Fraser ex Roscoe, (white-washed), POWDERY THALIA, POWDERED THALIA. Perennial herb 1–2 m tall from strong rhizomes, glabrous and with whitened surfaces; leaves alternate, long-petioled, mostly in basal half of plant, large, banana-like; leaf blades 30–50 cm long, to 20 cm wide, ovate-lanceolate, with prominent midrib and numerous side veins parallel or concentric with each other; petioles to 80 cm long, the base winged and clasping; inflorescence with whitish appearance, the axes zigzag in appearance, a rather small, loose panicle with a prominent basal bract paired with a small one, the bracts typically with conspicuously whitened surfaces; flowers small, usually paired and enclosed by two bracts, sessile; sepals 3, short; petals 3, unequal, purple, 5–10 mm long; staminodes present, petal-like, purple, united, one with cupped, projecting apex exceeding the petals; pistil 1; ovary inferior; fruit a bluish purple, subglobose urticule 10–15 mm in diam. Shallow water, ditches, pond margins, or other wet areas; Dallas Co., also escaping cultivation in Tarrant Co. (Fort Worth Botanic Garden); mainly se and e TX. May.

ORCHIDACEAE ORCHID FAMILY

Ours perennial terrestrial herbs with fleshy-fibrous roots, some species rhizomatous or with swollen, bulbous base, autotrophic and with green leaves or saprophytic and lacking chlorophyll; leaves when present basal or alternate, with sheath or clasping petiolar base; leaf blades with parallel or parallel convergent veins, or ribbed and net-veined, or rather fleshy and not evidently veined; flowers solitary or in spikes or racemes, bilaterally symmetrical; sepals 3, green or colored and petal-like; petals 3, one (the lip or labellum, normally the lowest due to twisting of the flower) slightly or very different from the others in shape or size and often elaborated into lobes, spurs, sacs, fringes, or grooves; nectaries usually present; stamens and pistil united into a central knob-like or column-like structure (the column) with 1 (or 2 in some species in other regions) inconspicuous sessile anther; pollen usually in waxy masses (= pollinia); ovary inferior, in most species twisted and the flower thus resupinate (= inverted 180°, making the lip the lowermost of the petals); placentation parietal; fruit (in ours) a dry dehiscent capsule; seeds very numerous, minute, without endosperm.

☛ This is a huge cosmopolitan group with more species than any other monocot family; estimates range from ca. 17,500–30,000 species (Luer 1975) or even more in 796 genera; Dressler (1981) estimated 19,192 species and Atwood (1986), in an analysis of the size of the family, determined there were 19,128 species and suggested that eventually the total may reach 20,000–23,000 or even an improbable maximum of 25,000. The Orchidaceae is possibly larger even than the Asteraceae and thus possibly the largest family of flowering plants. Orchids are particularly abundant in the tropics where many species are epiphytic; Atwood (1986) indicated epiphytes account for 73% of the family; many have special swollen water and nutrient storage structures called pseudobulbs—a particularly important adaptation for the epiphytic habit.

The family is extremely important horticulturally for its beautiful and intricate flowers; orchid cultivation is very old, dating back nearly 1,000 years in China; well known cultivated genera include *Cattleya* (CORSAGE ORCHID), *Dendrobium*, and *Epidendrum*. In addition to hybridization, tissue culture and other sophisticated techniques are now used in orchid propagation and cultivation. Pollination mechanisms are often incredibly specialized (e.g., pseudocopulation in which the flower mimics a female insect and thus attracts males who carry out pollination); some species even imprison and intoxicate their pollinators. Special relationships with mycorrhizal fungi are often necessary for seed germination. The fruit of *Vanilla planifolia* Jackson, a tropical American spice used by the Aztecs, is the source of the flavoring vanilla. Many orchids have a low tolerance for environmental disturbance and many species are now greatly reduced in number or extinct due to habitat destruction and modification. Family name from *Orchis*, a genus of 33 species native from the temperate zone to sw China and India. (Greek: *orchis*, testicle, in reference to the shape of the tuberous roots of some species) (subclass Liliidae)

FAMILY RECOGNITION IN THE FIELD: perennial herbs with alternate or basal leaves; reproductive parts united into a central *column*; flowers bilaterally symmetrical, with 3 sepals and 3 petals, 1 of the petals (the *lip*) usually being different from the other 2; fruit a capsule with very numerous nearly microscopic seeds.

REFERENCES: Correll 1937, 1947, 1950, 1961a; Schultes & Pease 1963; Magrath 1973; Luer 1975; Dressler 1981; Rasmussen 1985; Atwood 1986; Burns-Balogh & Funk 1986.

1. Stems with 1 or more leaf blades; plants green and photosynthetic.
 2. Flowers greenish or uniformly orange, neither white nor with any pinkish, reddish, or purplish pigmentation, with a slender spur ca. as long as or longer than the ovary (spur 9–33 mm long).
 3. Flowers greenish; spur 9–14 mm long; lip divided into 3 linear divisions, not fringed _____ **Habenaria**
 3. Flowers orange; spur 20–33 mm long; lip conspicuously fringed _____ **Platanthera**
 2. Flowers either white to white with green or yellow markings OR if not white then variously colored with at least some pinkish to reddish or purplish pigmentation (not orange), without a spur.
 4. Stems with 6–12 leaves below inflorescence, the leaves passing into leafy bracts under the flowers; leaves large, 6–20 cm long, 2–7 cm wide, not at all grass-like; flowers greenish to brownish, yellowish, or pinkish, with purplish or reddish markings _____ **Epipactis**
 4. Stems with 1–6 leaves below inflorescence, the floral bracts if present abruptly differentiated; leaves large OR small and often grass-like; flowers white to white with green or yellow markings OR pink to rose-purple.
 5. Stems with a single leaf inserted ca. halfway up the stem (floral bract also present); lip heavily bearded; flowers 1 (–2), not in a conspicuous spiral; lip the lowermost of the petals _____ **Pogonia**
 5. Stems with 1–6 leaves, if 1 then the leaf ± basal; lip bearded or glabrous; flowers 2–numerous; lip either the uppermost of the petals and the flowers not in a conspicuous spiral OR lip the lowermost of the petals and flowers usually in a conspicuous spiral.
 6. Flowers not in a conspicuous easily visible spiral; perianth 7–40 mm broad, pink to rose-pink or rose-purple or rarely white; lip bearded, representing the uppermost of the petals _____ **Calopogon**
 6. Flowers usually arranged in a conspicuous easily visible spiral; perianth 1.5–4 mm broad, white or white with green or yellow markings; lip not bearded, representing the lowermost of the petals _____ **Spiranthes**
 1. Stems without leaf blades, with sheaths or clasping bracts only; plants green and photosynthetic OR not green (yellowish to reddish, brownish, or purplish) and saprophytic.
 7. Plants green, photosynthetic; flowers sessile; perianth white or white with green or yellow marking; floral bracts slightly longer than the ovary _____ **Spiranthes**

7. Plants not green, saprophytic, the stems usually yellowish to reddish, brownish, or purplish; flowers short-pedicelled; perianth mottled purple, brown, yellow, and white; floral bracts not longer than the ovary.
8. Stem bracts elliptic-ovate, shorter to slightly longer than broad; floral bracts easily observed, ± conspicuous; perianth either < 10 mm long OR much longer (15–20 mm long); lip with 5–7 longitudinal ridges or crests; rhizomes with annular markings, not coral-like _____ **Hexalectris**
8. Stem with long, tubular sheaths much longer than broad; floral bracts minute, inconspicuous; perianth < 10 mm long; lip without ridges or crests; rhizomes coral-like, lacking annular markings _____ **Corallorrhiza**

CALOPOGON GRASS-PINK

Erect, scapose herbs from corms; leaf 1 (rarely more), grass-like, sheathing the stem near base; racemes with 2–20 flowers; flower buds waxy; flowers showy, pink to rose-pink or rose-purple, rarely white, not resupinate (the lip therefore the uppermost of the petals); lip bearded with numerous clavellate hairs; pollinia 4; capsules erect.

☞ A North American genus of 5 species (1 described in 1995); sometimes cultivated as ornamentals. (Greek: *calos*, beautiful, and *pogon*, beard, from the colorful tuft of bristles on the lip which is characteristic of the genus)

REFERENCES: Magrath 1989; Goldman 1995.

1. Corm forked; leaf nearly as long as or longer than inflorescence; buds grooved longitudinally; flowers fragrant _____ **C. oklahomensis**
1. Corm spherical, not forked; leaf usually shorter than inflorescence; buds usually smooth; flowers not fragrant.
2. Flowers usually more than 8 (varying from 4–20), opening in slow succession up the raceme, the blooming period extending over a prolonged period; leaf usually > 5 mm wide (varying from 4–37 mm); column usually 10–20 mm long _____ **C. tuberosus**
2. Flowers usually 2–5, all opening nearly simultaneously; leaf usually ca. 2 mm wide (varying from 1–4 mm); column 7–8 mm long _____ **C. barbatus**

Calopogon barbatus (Walter) Ames, (barbed), BEARDED GRASS-PINK. Plant 15–30(–45) cm tall; leaf 5–18 cm long; pedicels 6–10 mm long; flowers very closely spaced; lateral sepals grooved longitudinally, recurved; sepals and petals 12–17 mm long; lip 10–13 mm long, 7–10 mm wide; disk of lip pink, the same color as most of flower; stigma flat against column surface. Bogs, marshes, other wet areas; Henderson Co. (Correll & Johnston 1970) near e margin of nc TX; mainly e TX. Apr–May. Goldman (1995) indicated that such TX specimens previously identified as *C. barbatus* are actually small individuals of *C. oklahomensis*; it is therefore probable that *C. barbatus* is not a component of the nc TX flora or even the TX flora.

Calopogon oklahomensis D.H. Goldman, (of Oklahoma). Plant to 35 cm tall; leaf to 35 cm long, 5–15 mm wide; flowers 2–7(–11), opening in rapid succession, with citronella odor; lateral sepals grooved longitudinally, recurved; petals 11–20 mm long; lip 9–15 mm long; disk of lip pinkish, the same color as most of flower, with a basal area of yellow hairs above which is an area of pinkish hairs; stigma flat against column surface. Mesic to damp, acidic, sandy or loamy soils in oak woods, savannas, or bog margins; Lamar Co. (Goldman 1995—specimen at TEX); mainly e TX; one of the most recently described species in nc TX (Goldman 1995). Mar–May. (TOES 1993: IV) **△**

Calopogon tuberosus (L.) Britton, Sterns, & Poggenb., (tuberous), GRASS-PINK. Plant 20–80(–135) cm tall; leaf to 50+ cm long, 5–50 mm wide; lateral sepals smooth, straight; sepals and petals 12–27 mm long; lip 10–20 mm long, 5.5–13 mm wide; disk of lip white with basal area of white to yellow hairs above which is a region of white, yellow, or orange hairs; stigma usually perpen-

dicular to column surface. Bogs, marshes, other wet areas; Lamar Co. (Correll 1961a) in Red River drainage; mainly se and e TX. May–Jun. [*C. pulchellus* R. Br. ex W.T. Aiton]

CORALLORRHIZA CORALROOT

☞ A n temperate genus of 15 species of saprophytes lacking chlorophyll; some are cultivated as ornamentals. (Greek: *corallion*, coral, and *rhiza*, root, referring to the coral-like rhizome)

REFERENCES: Engel 1997; Freudenstein 1997.

Corallorrhiza wisteriana Conrad, (for its discoverer, Charles Jones Wister, 1782–1865), SPRING CORALROOT, WISTER'S CORALROOT. Plant 10–40 cm tall, from irregular rhizomes; stems yellowish to reddish brown or purple, not bulbous-based; flowers in a small, spike-like raceme; perianth brownish, greenish yellow, or reddish brown with purple dots; lip white with purple to pink markings, 5–6 mm long, with notched apex and entire or denticulate margin; pollinia 4. In leaf mold on limestone hills or on sandy soils; Dallas and Grayson (Hagerman Nat. Wildlife Refuge) cos., also Coryell (Fort Hood—Sanchez 1997) and Fannin (Freudenstein 1997) cos.; mainly se and e TX; also Edwards Plateau. Apr.

Corallorrhiza odontorrhiza (Willd.) Nutt., (tooth-rooted), AUTUMN CORALROOT, LATE CORALROOT, has been collected in n Red River Co. (*Magrath 12302*, OCLA) just to the e of nc TX; it differs in having the stems bulbous-based, the lip only 4 mm long with rounded apex and eroded margin, and flowering in the fall.

EPIPACTIS HELLEBORINE

☞ A genus of 22 species ranging from the n temperate zone to the tropics. (Greek: *epipactis*, an ancient name applied by Theophrastus, ca. 350 B.C., to a plant used to curdle milk, possibly hellebore—Luer 1975)

Epipactis gigantea Douglas ex Hook., (gigantic), GIANT HELLEBORINE, STREAM-ORCHIS, STREAM EPIPACTIS, CHATTERBOX. Plant 20–80 cm tall, rhizomatous; leaves clasping stem, broadly elliptic to linear-lanceolate, 6–22 cm long, 2–7 cm wide; inflorescences 2–8-flowered, prominently bracteate; flowers greenish to brownish, yellowish, or pinkish, with purplish or reddish markings; sepals 15–25 mm long; capsules pendent, 2–2.5 cm long. Stream banks in woods; Dallas and Wise cos. (Correll 1961a); also Edwards Plateau and Trans-Pecos. Jun.

HABENARIA FINGER ORCHID

☞ A pantropical and subtropical genus of ca. 600 species depending on circumscription; a number of segregates are sometimes split out (e.g., many species previously placed in *Habenaria* are now treated in *Platanthera*). (Latin: *habena*, reins, thong, or strap, in allusion to the shape of the long, strap-like divisions of the lip of some species)

REFERENCE: Ames 1910.

Habenaria repens Nutt., (creeping), WATER SPIDER ORCHID, CREEPING ORCHID, NUTTALL'S HABENARIA. Plant glabrous, 10–90 cm tall; stems leafy; leaves 3-ribbed, 5–24 cm long, 3.5–20 mm wide; racemes usually densely many-flowered; flowers greenish, small; sepals 3–7 mm long; lip divided into three narrow parts to near lobes, the middle lobe 4–7 mm long, linear, not fringed, the spur 9–14 mm long. Pond margins, ditches, other wet areas, often in water; Milam Co. (Correll 1961a) near extreme e margin of nc TX; Hatch et al. (1990) also cited vegetational area 4 (Fig. 2); mainly se and e TX. May–Nov.

HEXALECTRIS CRESTED-CORALROOT

Plants saprophytic, leafless; rhizomes irregular; stems reddish or purplish; flowers in a spike-

like raceme; corolla lip with 5–7 longitudinal crests down the middle of the disc; pollinia 8.

☛ A genus of 7 species of the s U.S. and Mexico. The plants live in symbiosis with a mycorrhizal fungus (Luer 1975). Luer (1975) has excellent color photographs of all three nc TX species. (Greek: *hex*, six, and *alectryon*, cock, referring to the 5–7 crests resembling a cock's comb on the lip) REFERENCES: Luer 1975; Catling & Engel 1993; Engel 1997.

1. Lip with 5–7 longitudinal, purple, non-wavy crests, shallowly 3-lobed, the fissures < 2 mm deep; petals (non-lip) either 11 mm or less long OR larger and yellowish or purplish brown, with brown or purple veins; racemes with up to 25 flowers.
 2. Sepals, petals, and lip 12–20 mm long; petals (non-lip) yellowish or purplish brown, with brown or purple veins; middle lobe of lip usually yellow to white with purple striations _____ **H. spicata**
 2. Sepals, petals, and lip 11 mm or less long; petals (non-lip) pinkish brown; middle lobe of lip bright purple _____ **H. nitida**
1. Lip with 5 conspicuous, longitudinal, yellow, wavy crests, deeply 3-lobed, the fissures > 3 mm deep; petals (non-lip) 15–20 mm long, maroon or deep purple; racemes with 10 flowers or less _____ **H. warnockii**

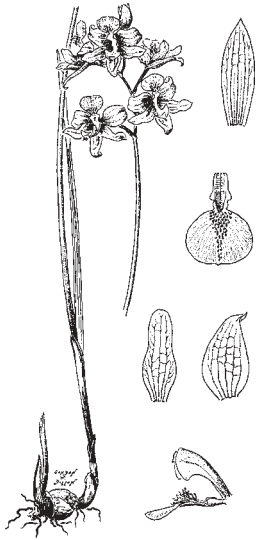
Hexalectris nitida L.O. Williams, (shining), SHINING HEXALECTRIS. Plant 15–30 cm tall; racemes with up to 20 flowers; flower parts with shiny or polished appearance; middle lobe of lip bright purple, the lateral lobes white. Under juniper trees; Dallas Co.; also known s and w of nc TX from Brewster, Bandera, Kendall, and Taylor cos. (Mahler 1988). Jul. ☒/92

Hexalectris spicata (Walter) Barnhart, (with spikes), CRESTED-CORALROOT, BRUNETTA, BUFF-CREST, COCK'S-COMB, LEAFLESS ORCHID. Plant 15–80 cm tall; racemes with 5–25 flowers; middle lobe of lip usually yellow to white with purple striations; occasionally plants lack purple pigment—the sepals and petals (non-lip) are then mahogany brown with darker brown striations, and the lip is all white except for faint yellowish markings (Luer 1975). While we are following Catling and Engel (1993) in recognizing two varieties, these taxa might better be recognized as forms. The key to varieties is modified from Catling and Engel (1993).

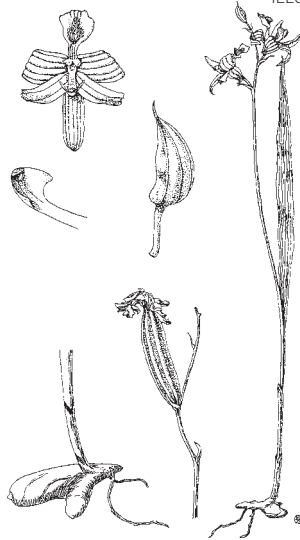
1. Flowers usually not opening (typically auto-pollinating, but sometimes opening); the 5 central veins of the lip with their highest keels raised 0.4–0.7 mm above the lip surface; column without a rostellar flap separating the pollen masses from the stigmatic surface; flowering in nc TX in Jun–Jul _____ var. **arizonica**
1. Flowers opening, the sepals and petals often with recurving tips; the 5 central veins of the lip with their highest keels raised (0.4–)0.7–1 mm above the lip surface; column with a rostellar flap separating the pollen masses from the stigmatic surface; flowering in TX in May–early Jun _____ var. **spicata**

var. **arizonica** (S. Watson) Catling & V.S. Engel, (of Arizona). In rotting wood or leaf litter in oak, pine, or juniper woods over limestone; Palo Pinto Co., also Dallas and Tarrant cos. (Engel 1997); in TX also known from Anderson Co. in e TX, Travis Co. just s of nc TX, and Brewster and Culberson cos. in far w TX. Jun–Jul. Catling and Engel (1993) indicated that most plants seen in the Dallas area and all in Travis Co. have closed flowers that do not open and are apparently auto-pollinating; they suggested this taxon is an auto-pollinating race derived from var. *spicata*; alternatively, they suggested that var. *arizonica* might have a hybrid origin, possibly resulting from a cross between *H. nitida* and *H. spicata* var. *spicata*. [*Corallorhiza arizonica* S. Watson]

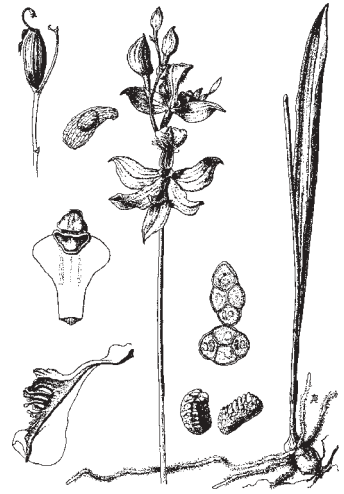
var. **spicata**. Oak, hickory, or conifer woods, calcareous sandy or organic soils; Dallas Co., also Bell, Brown, and Coryell cos. (HPC); according to Catling and Engel (1993), this species occurs at the same site (Dallas Nature Center) as *H. spicata* var. *arizonica* and *H. nitida*; TX distribution unclear. May–early Jun. According to J. Stanford (pers. comm.), these delicate-appearing plants have massive underground rhizomes (ca. 10 cm in diam.).



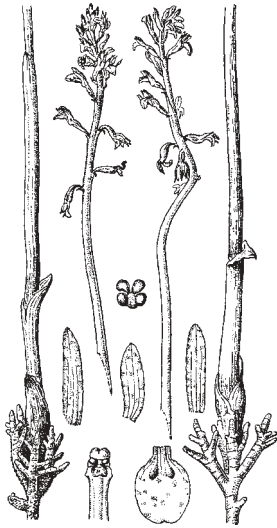
Calopogon barbatus [GWO]



Calopogon oklahomensis [LUN]



Calopogon tuberosus [LUN]



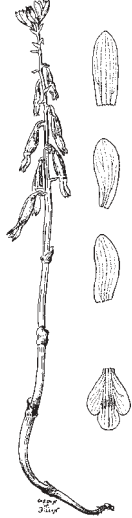
Corallorrhiza wisteriana [LUN]



Epipactis gigantea [LUN]



Habenaria repens [LUN]



Hexalectris nitida [COZ]



Hexalectris spicata var. *arizonica* [LUN]



Hexalectris spicata var. *spicata* [LUN]

Hexalectris warnockii Ames & Correll, (for Barton Holland Warnock, 1911–1998, Trans-Pecos Texas botanist), TEXAS PURPLE-SPIKE. Plant to ca. 30 cm tall; inflorescences with up to 10 flowers; sepals, petals, and lip ca. 15–20 mm long; middle lobe of lip edged in purple or white, with 5 conspicuous yellow crests, 3 of which reach the apex; lateral lobes of lip pale pink with purple veins. Under juniper trees; Dallas Co. (Mahler 1988; Engel 1997); also Edwards Plateau and Trans-Pecos. Jul. ☒/92

PLATANATHERA

FINGER ORCHID, BUTTERFLY ORCHID, FRINGED ORCHID

☛ A northern hemisphere genus of 40 species. In the past this genus has often been lumped with *Habenaria*. Many other *Platanthera* species occur in e TX. (Greek: *platys*, broad or wide, and *anthera*, anther, in reference to the unusually wide anther)

REFERENCE: Ames 1910.

Platanthera ciliaris (L.) Lindl., (ciliate, fringed), YELLOW FRINGED ORCHID, YELLOW FINGER ORCHID. Plant 24–100 cm tall; leaves oblong lanceolate to lanceolate, 7–30 cm long, 0.6–6 cm wide; racemes densely or laxly flowered; flowers very showy, bright to deep orange; spur slender, longer than the ovary; lip 8–12 mm long, 2–3 mm wide, ciliate-fringed, the fringes usually 10 mm or more long. Low woods, near edge of water, moist areas; Henderson and Milam cos. (Correll 1961a) near extreme e margin of nc TX; mainly e TX. Jun–Oct. [*Habenaria ciliaris* (L.) R. Br. ex W.T. Aiton] ☒/103

POGONIA SNAKE-MOUTH

☛ A genus of 2 species of North America and temperate Asia. (Greek: *pogonias*, bearded, referring to the bearded lip)

REFERENCE: Teuscher 1978

Pogonia ophioglossoides (L.) Ker Gawl., (resembling *Ophioglossum*–adder’s-tongue fern, in reference to the single leaf), ROSE POGONIA. Plant 20–40 cm tall, from fibrous roots; stems rigidly erect; leaf usually 1, ovate to ovate-lanceolate, 2–12 cm long, 1–3 cm wide; flowers 1(–2) at tip of stem, rose-pink to white, occasionally fragrant, 15–25 mm long, resupinate (the lip therefore the lowermost of the petals); lip heavily yellow-white bearded; capsule 2–3 cm long. Marshy areas, seepage slopes, other wet areas; included based on citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990); se and e TX w to at least c Henderson Co. near e margin of nc TX. Apr–Jul.

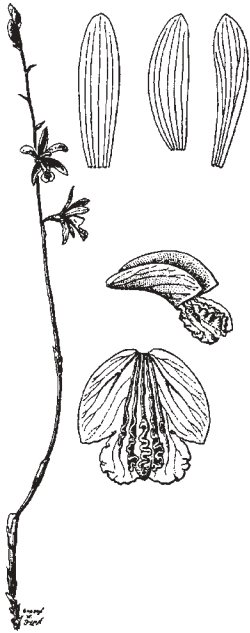
SPIRANTHES LADIES’-TRESSES

Roots fleshy, tuberous-thickened; stems with few leaves or none; flowers in a slender twisted or spiraled spike; perianth narrow, almost tubular, white or partly green or yellowish.

☛ A mainly n temperate (few tropical) genus of 30 species; some are cultivated as ornamentals. *Spiranthes* are by far the most common orchids in nc TX. (Greek: *speira*, a coil or spiral, and *anthos*, flower, from the spiraled inflorescence)

REFERENCES: Garay 1980; Catling 1981, 1982, 1983a, 1983b; Sheviak 1982.

1. Axis of spike pubescent (use lens); leaves cauline and/or basal.
2. Flowers in 1 secund (= 1-sided) or loose spiral; pubescence blunt to capitate (= end enlarged) or pointed.
3. Lip usually widest near base, often fleshy-thickened; widespread in nc TX.
 4. Lip white with a yellow-green center; pubescence blunt to capitate _____ **S. cernua**
 4. Lip white; pubescence pointed _____ **S. vernalis**



Hexalectris warnockii [LUN]



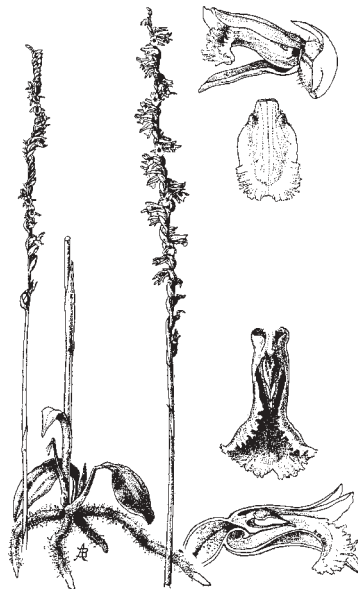
Platanthera ciliaris [LUN]



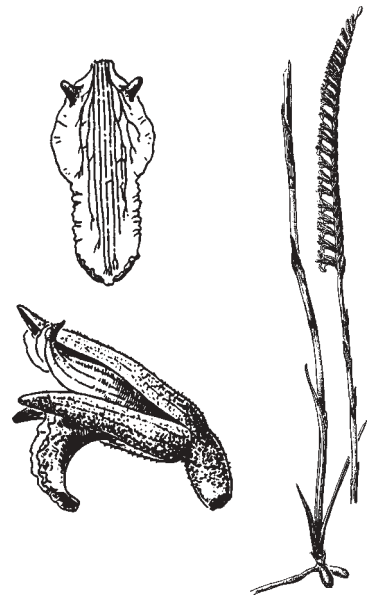
Pogonia ophioglossoides [LUN]



Spiranthes cernua [LUN]




Spiranthes lacera var. *gracilis* [LUN]



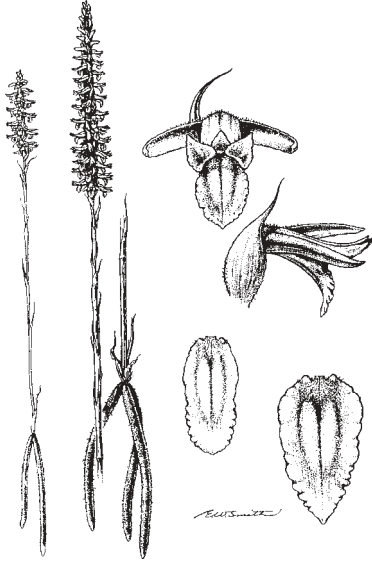
Spiranthes longilabris [CO1]

3. Lip usually widest near apex or lateral margins parallel, thin, membranous; rare near e margin of nc TX _____ **S. praecox**
2. Flowers in 2–4 dense spirals; pubescence blunt to capitate.
5. Perianth 5.5 mm or less long; plants delicate, slender; spike 15 mm or less in diam.; rare in nc TX _____ **S. ovalis**
5. Perianth > 6 mm long; plants usually large, stout (for a *Spiranthes*); spike usually much > 15 mm in diam.; widespread in nc TX.
6. Lip not constricted near the middle, with small basal tuberosities (\pm short conical knobs); leaves usually absent at flowering time; flowers slender, not inflated; lateral sepals spreading; typically in calcareous soils _____ **S. magnicamporum**
6. Lip slightly to distinctly constricted near the middle, with prominent basal tuberosities (usually somewhat inward-curving); leaves present at flowering time; flowers appearing inflated; lateral sepals appressed; typically in sandy soils _____ **S. cernua**
1. Axis of spike glabrous; leaves all basal.
7. Perianth 5.5–11 mm long; lip 2–6 mm wide; leaves (if present) mostly 5 mm or less wide, erect or ascending, without a petiole, the lower portion sheathing the stem, linear to narrowly lanceolate or oblong-elliptic; flowering Mar–Jun or Oct–Dec.; rare in nc TX.
8. Inflorescences 1-sided (rarely slightly spiraled); lip tapering from broad base to narrow obtuse apex, not marked or veined with green; flowering Oct–Dec _____ **S. longilabris**
8. Inflorescences strongly spiraled; lip usually widest near apex, marked or veined with green; flowering Mar–Jun _____ **S. praecox**
7. Perianth 2–5.5(–7) mm long; lip 1.5–2.5 mm wide; leaves (if present) 6–25 mm wide, spreading, the \pm short broad blades with a distinct petiole, ovate to ovate-lanceolate; flowering Jun–Nov; widespread in nc TX.
9. Perianth 4–5.5(–6) mm long; lip with green or yellowish green center; roots several, in a fascicle _____ **S. lacera**
9. Perianth up to 3(–4) mm long; lip white; root 1(–2) _____ **S. tuberosa**

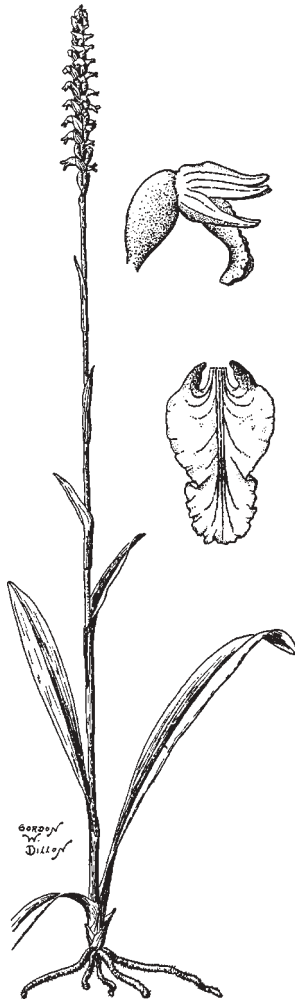
Spiranthes cernua (L.) Rich., (drooping, nodding), NODDING LADIES'-TRESSES, COMMON LADIES'-TRESSES, LADIES'-TRESSES. Plant glabrous below, pubescent above, to 60 cm tall; leaves mostly basal, linear to lanceolate, to 25 cm long and 2.5 cm wide; spike 1.5–2 cm thick; flowers sometimes fragrant; perianth 10–15 mm long; sepals and petals white or nearly so; lip thick, white with yellow-green center, apically recurved and undulate or crenulate; column 3–7 mm long. Prairies, open woodlands, sandy soils; se and e TX w to Rolling Plains and Edwards Plateau. *2n* = 60 (Sheviak 1982). Jul–Nov.

Spiranthes lacera (Raf.) Raf. var. **gracilis** (Bigelow) Luer, (sp: torn; var: graceful), SLENDER LADIES'-TRESSES, GREEN-LIP LADIES'-TRESSES. Plant essentially glabrous, 20–60 cm tall; leaves all basal, not always persisting until flowering, short petioled; leaf blades ovate, 1.5–6.5 cm long, 10–25 mm wide; flowers in 1 spiral row; lip white marked with broad green or yellowish green stripe in center, 4–5(–6) mm long, 2–2.5 mm wide, the apex finely lacerate. Sandy woods, prairies; Bell, Denton, and Grayson cos., also Dallas and Kaufman cos. (Correll 1961a); se and e TX w to East Cross Timbers. Jun–Nov. [*S. gracilis* (Bigelow) L.C. Beck] /107

Spiranthes longilabris Lindl., (long-lipped), GIANT SPIRAL ORCHID. Plant \pm glabrous throughout, 12–60 cm tall; leaves when present basal, 3–10 cm long, mostly < 5 mm wide; inflorescences with flowers projecting horizontally; flowers white or white tinged with cream, conspicuously open; perianth 6–10 mm long; lip 3–5.5 mm wide near base (which is widest portion), recurved apically, crenate. Low woods, wet open areas; included based on citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990), no other vegetational areas cited for TX; rare if present in nc TX. Oct–Dec.



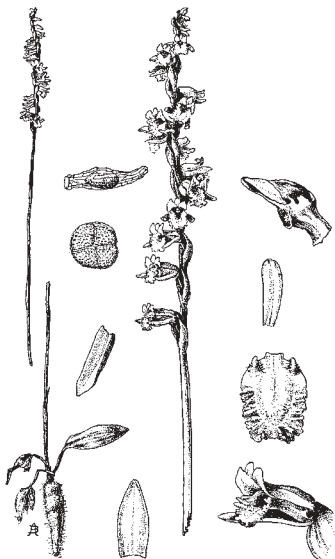
Spiranthes magnicamporum [BML]



Spiranthes ovalis [LUN]



Spiranthes praecox [LUN]



Spiranthes tuberosa [LUN]



Spiranthes vernalis [LUN]

Spiranthes magnicamporum Sheviak, (great field), GREAT PLAINS LADIES'-TRESSES. Plant pubescent, to 60 cm tall; leaves linear-lanceolate, to 14 cm long and ca. 1 cm wide; spike pubescent; flowers fragrant often with strong odor similar to vanilla; perianth 7-11 mm long; lip white with center yellowish and fleshy, slightly crisped apically; column 3 mm long. Upland, calcareous soils, prairies; Grayson, Montague, Parker, and Tarrant cos., also Cooke Co. (H. Garnett, pers. comm.); the only TX citations given by Hatch et al. (1990) were for vegetational areas 4 and 5 (Fig 2). Sep-Nov. $2n = 30$ (Sheviak 1982). Flowers appear slender with spreading sepals as compared to *S. cernua* with inflated tubular flowers and appressed sepals. According to L. Magrath (pers. comm.), *S. magnicamporum* and *S. cernua* may not be specifically distinct; rather they may occupy different ends of a continuum. Sheviak (1982) indicated that while introgression occurs between the two, they differ in chromosome number, are partially genetically isolated, and have different ecological requirements; he recognizes them at the specific level.

Spiranthes ovalis Lindl., (oval), OCTOBER LADIES'-TRESSES, OVAL LADIES'-TRESSES. Plant glabrous below, pubescent above, ± delicate, to only 35(-45) cm tall; leaves 2-4, basal or low on stem, 5-27 cm long, 6-15 mm wide; spike with 2 or 3 tight spirals; flowers small; perianth 3-5.5 mm long, white; lip 4-5.3 mm long, 2.4-4 mm wide, recurved apically, wavy-crenate. Wooded areas; collected by Reverchon in Dallas Co. (Correll 1961a); apparently not collected in TX since that time. Aug-Oct. This is the only small-flowered species of *Spiranthes* in nc TX with the flowers in 2 or more spirals.

Spiranthes praecox (Walter) S. Watson, (precocious), GRASS-LEAF LADIES'-TRESSES. Plant often glabrous throughout (sometimes axis of inflorescence pubescent), 20-75 cm tall; leaves when present up to 7, mostly basal, narrowly linear to filiform, 10-25 cm long, 1-5 mm wide; perianth 5.5-11 mm long, white, usually marked with green; lip thin, 5.5-11 mm long, 2-6 mm wide near apex (which is widest portion), apically mostly wavy and slightly crenate. Low woods, wet open areas; included based on citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990); mainly se and e TX. Mar-Jun.

Spiranthes tuberosa Raf., (tuberous), LITTLE LADIES'-TRESSES, GRAY'S LADIES'-TRESSES. Plant 20-40(-60) cm tall; leaves all basal, ovate, 2.5-6.5 cm long, 6-15 mm wide; flowers small, in 1 spiral row; lip white, 2.3-4 mm long, 1.5-2 mm wide, the apex barely erose. Dry sandy woods; Lamar Co. in Red River drainage; mainly se and e TX. Jun-Oct. [*S. grayi* Ames.]

Spiranthes vernalis Engelm. & A. Gray, (of spring), SPRING LADIES'-TRESSES, TWISTED LADIES'-TRESSES, UPLAND LADIES'-TRESSES. Plant 10-90(-117) cm tall; spike about 1.6 cm thick, the rachis and ovaries with reddish or whitish pointed hairs; perianth 5-10 mm long, usually white; lip 4.5-8 mm long, fleshy, with stout basal tuberosities, recurved, apically crenulate. Sandy woods and prairies, moist areas; se and e TX w to Cooke and Dallas cos.; also Rolling Plains. Late Apr-Jun. [Incl. *S. reverchonii* (Small) Cory]

POACEAE (GRAMINEAE) GRASS FAMILY

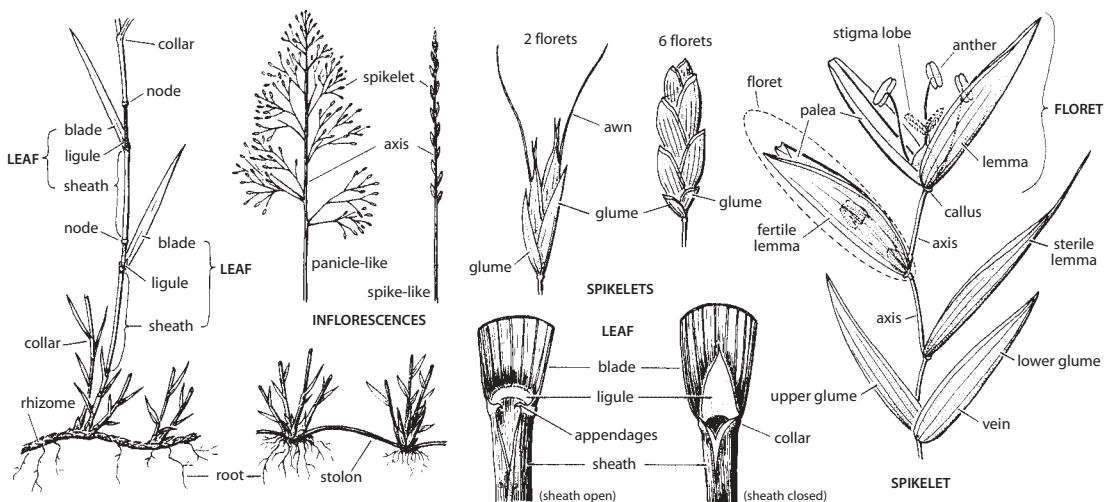
Ours herbaceous annuals or perennials or woody in bamboos; roots fibrous; culms (= stems) usually rounded, with prominent, swollen or constricted, solid nodes, the internodes hollow or solid, and with intercalary meristem at base allowing continued elongation; tillers (= basal branches), stolons (= above ground horizontal stems or "runners"), or rhizomes (= underground horizontal stems) often present; leaves alternate, with tubular basal sheath enclosing the culm and usually split to base down one side opposite the blade, and a short or elongate, usually linear, flattened or sometimes involute (= inrolled) blade, with a row of hairs or scaly membrane (= ligule) at junction of blade and sheath on inner (upper) side, often with intercalary meristem near the ligule; inflorescences made up of very reduced branches (called spikelets), these spike-

lets, which are the basic units of the grass inflorescence, are arranged in various ways (e.g., spikes, racemes, panicles); spikelets composed of 1–numerous flowers, associated scale-like bracts (each flower and its subtending (1–)2 scale-like bracts are collectively called a floret), and a short axis; florets borne 2-ranked, one above another, alternating along the concealed axis (= rachilla), the spikelets usually with an additional pair of empty scale-like bracts (= glumes) at base (in some only 1 glume, or none, or reduced to awns instead); flowers perfect or imperfect, without true perianth, this apparently represented only by 2(–3) minute lodicules which function by swelling and opening the floret; florets usually with 2 alternate, overlapping scale-like bracts (lemma—the outer or lower; palea—the inner or upper, which is usually smaller and more delicate, sometimes absent or not visible); stamens (1–)3(–6), the anthers often dangling outside the floret at anthesis to allow the wind-borne pollen to be carried away, but sometimes retained within the floret; pistil 1, the typically 2(–3) stigmas usually feathery with increased surface area to catch wind-blown pollen; flowers typically open only for a short time (usually during morning) or not at all, wind- or self-pollinated; fruit a caryopsis (= achene-like, 1-seeded fruit with ovary wall adnate to the seed coat), rarely an achene.

Ordinarily dissection is necessary to see the parts of the grass spikelet; because of the small size of the structures involved (e.g., lemmas, paleas), a dissecting scope or at minimum a hand lens is often necessary for definitive identification. In the keys, measurements of glumes, lemmas, or spikelets do not include awns (= beards or bristle-like appendages) if these are present. A number of species of ornamental grasses are cultivated and long persist in nc TX including *Cortaderia selloana* (Schult. & Schult. f.) Asch. & Graebn., *Miscanthus sinensis* Andersson, *Pennisetum* species, and a variety of bamboos.

☛ This huge (ca. 9,500 species in 668 genera) cosmopolitan family, on a worldwide basis, is ecologically the world's most dominant vascular plant family, occurring over vast areas of prairie, plain, steepe, and pampas; it is estimated that 20% of the world's vegetational cover is made up of grasses. The family is also economically the most important, containing all the cereal crops including *Oryza sativa* (RICE), *Triticum aestivum* (WHEAT), and *Zea mays* (CORN), as well as *Saccharum officinarum* (SUGAR CANE). More than 70% of farmland worldwide is devoted to cereals, which provide humans with more than 50% of all calories (Heiser 1990a). Just three plants, RICE, WHEAT, AND CORN provide ca. 45% of total human caloric intake (Chrispeels & Sadava 1977). Most grasses are extremely well-adapted to fire, grazing, trampling, and lawn mowers.

GENERAL CHARACTERISTICS OF THE POACEAE (GRAMINEAE) FAMILY [JEP]



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This is due in part to the presence of intercalary meristems (located in the culms just above the nodes and in the leaves near the ligules, thus allowing growth from the base even if terminal parts are damaged) and the tendency to branch (“tiller”) or produce stolons or rhizomes near or below ground level. Species worldwide range from tiny annuals (2–3 cm tall) to huge bamboos 40 m (ca. 130 feet) tall. Grasses are wind-pollinated and shed large amounts of pollen; this is a major source of allergic reactions (e.g., hay fever) in humans. The Poaceae is a particularly important part of the nc TX flora; the 249 species present represent about 11% of the total species known for the region and make the Poaceae the second largest family in nc TX (following only the Asteraceae). (subclass Commelinidae)

FAMILY RECOGNITION IN THE FIELD: mostly herbs with 2-ranked leaves having sheathing bases, free blades, and ligules; culms round, with hollow or solid internodes; flowers small, inconspicuous, reduced to stamens and pistils, subtended by 2 scale-like bracts each, and arranged in very reduced spikes called *spikelets*; the ± similar Cyperaceae (SEDGES) have 3-ranked leaves usually without ligules, often 3-sided culms with solid internodes, and flowers subtended by 1 scale-like bract each; the ± similar Juncaceae (RUSHES) have flowers with a small 6-parted perianth.

REFERENCES: Nash 1909, 1912; Nash & Hitchcock 1915; Hitchcock 1931–1939, 1935, 1951; Silveus 1933; Tharp 1952; Shinnars 1954; Gould 1957b, 1968a, 1968b, 1973, 1975b, 1978; Box & Gould 1959; deWitt 1981; Stebbins 1981, 1982, 1985; Estes et al. 1982; Gould & Shaw 1983; Campbell 1985; Coughenour 1985; Dahlgren et al. 1985; Redmann 1985; Clayton & Renvoize 1986; Soderstrom et al. 1987; Hignight et al. 1988; Tucker 1988, 1990, 1996; Crins 1991; Allen 1992; Powell 1994; Clark et al. 1995; Kellogg et al. 1996; Peterson et al. 1997.

1. Culms woody, persisting for more than 1 season (bamboos).
 2. Culms terete (= rounded); upper nodes often puberulent; base of midvein on lower leaf surface without a mustache of hairs; branches 3–6 per node; plants native in ne part of nc TX _____ **Arundinaria**
 2. Culms flattened above node on 1 side; upper nodes glabrous; base of midvein on lower leaf surface often with a mustache of hairs along one side; branches usually 2(–3) per node; plants introduced in ncTX _____ **Phyllostachys**
1. Culms not woody, lasting 1 season only.
 3. Plants typically 2–6 m tall, usually reed-like; inflorescence a large panicle up to ca. 60 cm long and 20 cm wide.
 4. Leaves distributed along much of the length of the culm; inflorescences not silvery-white in appearance; leaf blades 0.8–6 cm wide; stout creeping rhizomes present or absent; plants in extensive dense colonies or not so.
 5. Spikelets in pairs of 1 pedicelled and 1 sessile (or nearly so); plants not in dense extensive colonies (but culms can be clumped).
 6. Spikelets with a tuft of long hairs at base ca. as long as spikelets; awn of lemmas 5–25 mm long.
 7. Awn of lemmas 12–25 mm long; 1 spikelet of each pair sessile, 1 pedicelled; inflorescence branches disarticulating (breaking into sections) at maturity, the pedicels falling with the sessile spikelets _____ **Saccharum**
 7. Awn of lemmas 5–10 mm long; both spikelets of pairs pedicelled, pedicels 1–5 mm long, unequal, one much shorter; inflorescence branches not disarticulating, the spikelets falling from pedicels at maturity _____ **Miscanthus**
 6. Spikelets without a tuft of long hairs at base; awn of lemmas usually much shorter (usually 1.5 mm or less long) or absent _____ **Sorghum**
5. Spikelets not in pairs; plants often in extensive dense colonies.
 8. Spikelets 3–5 mm long, glabrous; florets 2 per spikelet (upper perfect, lower staminate); leaf blades 0.3–1.5 cm wide _____ **Panicum** (*P. virgatum*)
 8. Spikelets 10–15 mm long, either with rachilla or lemmas hairy; florets 2–8 per spikelet; leaf blades mostly 1.5–7 cm wide.

9. Lemmas glabrous; rachilla hairy; glumes 8 mm or less long, shorter than the lowest lemma _____ **Phragmites**
9. Lemmas hairy; rachilla glabrous; glumes 10–15 mm long, nearly as long as entire spikelet _____ **Arundo**
4. Leaves mostly at the base of the plant; inflorescences silvery-white in appearance; leaf blades 1.5 cm or less wide; creeping rhizomes absent; culms clumped but plants not forming extensive colonies _____ **Cortaderia**
3. Plants usually < 2(–3+) m tall, not reed-like; inflorescences various, usually much smaller.
10. Spikelets fused with or closely fitted into the axis of the inflorescence, forming a solid cylindrical or flattened spike.
11. Inflorescences as long as or longer than the leafy portion of the culm, with (3–)4–12 branches _____ **Schedonnardus**
11. Inflorescences shorter than the leafy portion of the culm, unbranched or with up to 3 branches.
12. Spikelets (at least upper) awned _____ **Aegilops**
12. Spikelets awnless.
13. Spike-like inflorescences flattened, the axis exposed between the spikelets; plants creeping, with flowering branches only 10–30 cm tall _____ **Stenotaphrum**
13. Spike-like inflorescences (or if branched, the spike-like branches) not flattened or flattened only on one side, the axis not evident; plants not creeping, 30–300 cm or more tall.
14. Inflorescences 2–3 mm thick, unbranched; leaf blades 1.5–4 mm wide _____ **Coelorachis**
14. Inflorescences (if unbranched, or if branched, the inflorescence branches) 5–8 mm thick, unbranched or with 2–3 branches; leaf blades usually 10–25 mm wide _____ **Tripsacum**
10. Spikelets neither fused with nor closely fitted into the axis of the inflorescence (but may be sessile and appressed).
15. Spikelets unisexual, the staminate and pistillate conspicuously different with naked eye observation.
16. Spikelets with 3–6(–10) florets, conspicuously (pistillate) or inconspicuously (staminate) long hairy; plants 0.2–0.6 m tall _____ **Poa** (*P. arachnifera*)
16. Spikelets with 1–2 florets, glabrous or nearly so; plants either 0.3 m or less tall OR 0.5–3+ m tall.
17. Plants low, 30 cm or less tall, mat-forming, usually dioecious (=staminate and pistillate spikelets on different plants) _____ **Buchloe**
17. Plants much larger, not mat-forming, monoecious (= staminate and pistillate spikelets on the same plant).
18. Staminate and pistillate spikelets in separate inflorescences; pistillate spikelets in large “cobs”; whole pistillate inflorescence covered by large, leaf-like, modified leaves or bracts (= shucks) _____ **Zea**
18. Staminate and pistillate spikelets in the same inflorescence; whole inflorescence not covered by leaf-like shucks.
19. Inflorescence unbranched and spike-like OR with 2–3 spike-like _____ **Tripsacum**
19. Inflorescence a much-branched panicle; pistillate spikelets not becoming hard; plants usually growing in shallow water _____ **Zizaniopsis**
15. Spikelets perfect, or if unisexual, not conspicuously different to the naked eye.
20. Spikelets with 2–many perfect florets.
21. Spikelets pedicelled (pedicels may be short) _____ **KEY A**

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21. Spikelets sessile, or nearly sessile and so densely crowded as to conceal the short pedicels _____ **KEY B**
20. Spikelets with 1 perfect floret (staminate or reduced rudimentary florets sometimes present) _____ **Key C**

KEY A

1. Lemmas 1-awned from the back (not from their apex).
2. Spikelets (excluding awns) 2.5 mm long or less; inflorescence an open panicle with numerous spikelets and main branches bare of spikelets below the middle _____ **Aira**
2. Spikelets (excluding awns) 4 mm long or more (often much more); inflorescence not as above.
3. Glumes 1.5–5 mm long, not longer than the lemmas (excluding awns) _____ **Trisetum**
3. Glumes ca. 20–30 mm long, longer than the lemmas (excluding awns) _____ **Avena**
1. Lemmas awnless or awned from their apex (awn can arise between apical teeth).
4. Glumes conspicuously longer than individual lemmas (excluding awns) and usually exceeding all of the lemmas.
5. Spikelets 15 mm or less long (excluding awns).
6. Lemmas awnless (but with minute mucro < 1 mm long); inflorescences many-flowered, 10–36 cm long _____ **Tridens**
6. Lemmas awned, the twisted and geniculate awns usually 5–7 mm long; inflorescences few-flowered, to ca. 5 cm long _____ **Danthonia**
5. Spikelets 20–30 mm long (excluding awns) _____ **Avena**
4. Glumes not conspicuously longer than individual lemmas.
7. Spikelets in several very dense 1-sided clusters at the end of branches; the branches bare of spikelets in their lower portions; rare introduced species _____ **Dactylis**
7. Spikelets not borne as above; common native and introduced species.
8. Ligule a membrane (may have ciliate margin, or become split or torn).
9. Lemmas 3-nerved, the nerves often prominent.
10. Nerves of lemmas pubescent or puberulent OR base of lemmas with long hairs; lemmas with midnerve usually exerted as a short awn or mucro.
11. Plants annual; spikelets usually with 2–4 florets; inflorescence a panicle 3–11 cm long with a few rebranched primary branches, the lower branches spreading, bare of spikelets on the lower 1/3–1/2; paleas with long cilia on upper margins _____ **Triplasis**
11. Plants perennial; spikelets with 4–12 florets; inflorescences various, but often quite different from above; paleas not ciliate on upper margins.
12. Inflorescences 5–35 cm or more long; culms with several nodes above base; leaf margins green _____ **Tridens**
12. Inflorescences 2–4 cm long; culms with one node above base; leaf margins white _____ **Erioneuron**
10. Nerves of lemmas not hairy; base of lemmas without long hairs; lemmas awnless.
13. Lemmas < 6 mm long; second glume with 1 nerve; caryopsis (= fruit) not beaked; widespread and abundant in ncTX _____ **Eragrostis**
13. Lemmas (3.8–)4.6–10.8 mm long; second glume with 3–5 nerves; caryopsis beaked; rare if present in ncTX _____ **Diarrhena**
9. Lemmas 5–many-nerved, the nerves prominent or sometimes so obscure as to be almost unnoticeable.
14. Lemmas awned.
15. Spikelets (12–)15–35 mm long, if spikelets at the lower end of this size range then lemmas 2-toothed or minutely notched at apex.
16. Lemmas not 2-toothed or notched at apex, rather tapering to a 10–20 mm

- awn from an entire apex; inflorescence a spike or spicate raceme of 1–5 large stiffly erect spikelets; spikelets 2–3.5 cm long, usually with 9–18 florets; rare in nc TX _____ **Brachypodium**
16. Lemmas often 2-toothed or minutely notched at apex, with 1–18 mm long awn arising from between teeth or notch; inflorescences not as above; spikelets various; very common in nc TX _____ **Bromus**
15. Spikelets < 15(–18) mm long (often much less), if spikelets at the upper end of this size range then lemmas not 2-toothed or notched at apex.
17. Lemmas awned from (or just below) a conspicuously 2-toothed apex, the awn geniculate _____ **Trisetum**
17. Lemmas awned from an entire or minutely and indistinctly notched apex, the awn straight.
18. Leaf blades 0.1–2.5 mm wide; plants annual; stamens 1, infrequently 3; plants 5–70 cm tall _____ **Vulpia**
18. Leaf blades 2.5–12 mm wide; plants perennial; stamens 3; plants 50–120(–200) cm tall _____ **Festuca**
14. Lemmas awnless.
19. Spikelets 6–20 mm wide, (10–)20–50 mm long, conspicuously flattened, with 1–4 sterile (empty) lemmas below fertile _____ **Chasmanthium**
19. Spikelets much smaller, not conspicuously flattened; spikelets without sterile lemmas below fertile.
20. Lemmas as wide as long, spreading at right angles, inflated with the margins outspread _____ **Briza**
20. Lemmas longer than wide, not spreading at right angles, not inflated, the margins clasping the paleas.
21. Lemmas rounded on back, without prominent keel or raised midnerve except near apex.
22. Upper florets sterile, much reduced to a small “rudiment” usually broadest near apex; glumes thin, papery at least on margins and apices; leaf sheaths with margins united except at summit _____ **Melica**
22. Upper florets ± like the lower; glumes not thin and papery; leaf sheaths open down one side (edges may overlap) except in *Glyceria* which has sheath margins united.
23. Leaf blades mostly 10–20 mm wide, with prominent midrib; caryopsis (= fruit) beaked, turgid, conspicuously exerted from the lemma and palea at maturity _____ **Diarrhena**
23. Leaf blades usually 1–12 mm wide, the midrib not prominent; caryopsis neither beaked, turgid, nor conspicuously exerted.
24. Lemmas with nerves (usually 7) strongly and uniformly developed and equally spaced; leaf sheaths with margins united except at summit _____ **Glyceria**
24. Lemmas with several indistinct nerves or none on each side; leaf sheaths open down one side (edges may overlap).
25. Plants perennial, usually much > 30 cm tall; either spikelets 10–15(–18) mm long OR if smaller then lower panicle branches bare of spikelets in their lower 1/3–1/2 _____ **Festuca**
25. Plants annual, to only 15(–30) cm tall; spikelets 5–7 mm long; panicle branches with spikelets nearly to base _____ **Desmazeria**

21. Lemmas keeled or with prominent midnerve from tip to base.
26. Plants strongly rhizomatous, of alkaline or alkaline-saline habitats; leaves 2-ranked with sheaths conspicuously overlapping; spikelets unisexual, the similar staminate and pistillate inflorescences on separate plants; spikelets usually 5–20-flowered, 6–18(–28) mm; rare in nc TX, known only from Brown and Comanche cos. _____ **Distichlis**
26. Plants not rhizomatous or not conspicuously so, of various habitats; leaves not as above; spikelets various; widespread in nc TX.
27. Spikelets (12–)15–35 mm long _____ **Bromus**
27. Spikelets 1.5–11(–12) mm long.
28. Panicles 1–3(–4.5) cm long, overtopped by the leaves; lemmas obtuse, with 5(–7) prominent, raised, almost parallel nerves; culms to only 10(–18) cm long _____ **Sclerochloa**
28. Panicles 3–25 cm long, exserted above the foliage; lemmas acute to obtuse, without 5 prominent, raised, almost parallel nerves; culms of variable length, often much more than 18 cm long.
29. Lemmas often puberulent, the base of lemma often with long, kinky hairs; upper glume only slightly wider than lower glume (much less than 2 times as wide) _____ **Poa**
29. Lemmas glabrous or merely scabrous, the base of lemma lacking hairs; upper glume much wider than lower (2 times as wide or wider).
30. Upper glume widest near middle, slightly pointed at apex; main axis of inflorescence puberulent; disarticulation above glumes _____ **Koeleria**
30. Upper glume widest near apex, with cupped, blunt apex; main axis of inflorescence glabrous or minutely scabrous; disarticulation below glumes _____ **Sphenopholis**
8. Ligule of hairs entirely, or with membranous base less than half the total length.
31. Spikelets 6–20 mm wide, (10–)20–50 mm long, conspicuously flattened _____ **Chasmanthium**
31. Spikelets much smaller, not at all flattened or only slightly so.
32. Inflorescence an elongate, narrow, stiffly erect, spike-like panicle with a few widely spaced, usually short side branches; lower 1–2 florets sterile; only in extreme ne part of nc TX (Lamar Co.) _____ **Chasmanthium**
32. Inflorescences various, but usually quite different from above; lower florets fertile; widespread in nc TX.
33. Lemmas with entire pointed apex; nerves of lemmas not hairy; base of lemmas without long hairs _____ **Eragrostis**
33. Lemmas with notched or rounded-truncate apex (can be short awned from the notch); nerves of lemmas pubescent or puberulent OR base of lemmas with long hairs.
34. Plants annual; spikelets usually with 2–4 florets; inflorescence a panicle 3–11 cm long with a few rebranched primary branches, the lower branches spreading, bare of spikelets on the lower 1/3–1/2; paleas with long cilia on upper margins _____ **Triplasis**
34. Plants perennial; spikelets with 4–12 florets; inflorescences various, but often quite different from above; paleas not ciliate on upper margins.

35. Inflorescences 5–35 cm or more long; culms with several nodes above base; leaf margins green _____ **Tridens**
35. Inflorescences 2–4 cm long; culms with one node above base; leaf margins white _____ **Erioneuron**

KEY B

1. Spikelets borne on opposite sides of the zigzag, usually flattened, main axis of the inflorescence; inflorescence unbranched, consisting of a solitary, 2-sided spike or spike-like raceme.
 2. Glumes 3.6 mm or more wide _____ **Triticum**
 2. Glumes 1.0–3.5 mm wide.
 3. Lemmas minutely spiny-ciliate on keel and margins (the hairs visible with the naked eye and obvious with a lens) _____ **Secale**
 3. Lemmas not minutely spiny-ciliate on keel and margins.
 4. Spikelets solitary at each node of the inflorescence.
 5. Spikelets with 1 glume, oriented with edge (back of lemmas) facing inflorescence axis _____ **Lolium**
 5. Spikelets with 2 glumes, oriented with side facing inflorescence axis _____ **Pascopyrum**
 4. Spikelets 2–3 at each node of the inflorescence.
 6. Lemmas awnless (glumes can have awns up to 5 mm long); plants 30 cm or less tall with leaf blades 3 mm or less wide; inflorescences to 3.5 cm long _____ **Hilaria**
 6. Lemmas conspicuously awned or sometimes awnless; plants usually much > 30 cm tall; leaf blades usually much > 3 mm wide; inflorescences usually > 3.5 cm long.
 7. Spikelets 1-flowered, in groups of 3 per node (lateral ones may be reduced to group of awns) _____ **Hordeum**
 7. Spikelets 2–12-flowered, 2–3 per node.
 8. Lemmas awnless or with awns to only 3 mm long; spikelets 5–12-flowered, solitary or sometimes 2 per middle and lower nodes _____ **Pascopyrum**
 8. Lemmas with prominent awns 5–50 mm long; spikelets 2–6-flowered, usually 2–3 per node _____ **Elymus**
 1. Spikelets not on opposite sides of a main axis, rather borne all on 1 side or on all sides of the main axis or its branches; inflorescence usually branched, consisting of 2–many spikes, racemes, or panicles (condensed to open) OR if unbranched then not distinctly 2-sided.
 9. Spikelets in several very dense, 1-sided clusters at the end of branches bare of spikelets in their lower portions; rare introduced species _____ **Dactylois**
 9. Spikelets not borne as above; common native and introduced species.
 10. Plants 5–15(–30) cm tall; inflorescences usually 1–9 cm long and 19 mm or less wide.
 11. Spikelets with 3–4 florets, falling as a unit (disarticulation below glumes); inflorescences usually 1–3(–4.5) cm long, overtopped by the upper leaves; lemmas obtuse, prominently 5-nerved, the lowest lemma ca. 5 mm long _____ **Sclerochloa**
 11. Spikelets with (4–)5–9(–10) florets, not falling as a unit (disarticulation above glumes); inflorescences usually 3–9 cm long, exerted beyond upper leaves; lemmas broadly acute, obscurely nerved, the lowest lemma ca. 2.5 mm long _____ **Desmazeria**
 10. Plants usually much larger; inflorescences usually much larger.
 12. Spikelets not borne on 1 side of the inflorescence axis or its branches, instead spikelets borne crowded on all sides of the axis or on short, crowded branchlets, the whole inflorescence narrow, usually a dense spike or spike-like or head-like.
 13. Inflorescences not dense, the main axis clearly visible at a glance (spikelets crowded on well-separated short side branches); lowermost lemma sterile, not very different from glumes in size or appearance _____ **Chasmanthium**
 13. Inflorescences dense, the main axis often obscured by the numerous spikelets;

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- lowermost lemma perfect, sometimes quite different from glumes in size or appearance.
14. Lemma nerves pubescent, at least in lower portion, or base of lemma long-hairy; spikelets with 4–11 florets; lemmas rounded at apex or usually notched and thus 2-toothed, sometimes with mid-vein exerted as a mucro _____ **Tridens**
14. Lemma nerves and base of lemma glabrous or nearly so; spikelets with 2–4 florets; lemmas pointed or rounded, not notched.
15. Upper glume widest near middle, slightly pointed at apex; main inflorescence axis puberulent; disarticulation above glumes _____ **Koeleria**
15. Upper glume widest near apex, with cupped, blunt apex; main inflorescence axis glabrous or minutely scabrous; disarticulation below glumes _____ **Sphenopholis**
12. Spikelets borne on 1 side of the inflorescence axis or its branches, often in 2 distinct rows, the inflorescence with 2–many, distinct, short or long, digitately arranged or scattered, spicate branches.
16. Branches of inflorescence distributed (scattered) along main axis, usually only 1 arising per node, not crowded together.
17. Spikelets not crowded on branches, usually not overlapping adjacent spikelet _____ **Eragrostis**
17. Spikelets often rather crowded, usually overlapping adjacent spikelet _____ **Leptochloa**
16. Branches of inflorescence digitate (all arising together at very tip of flowering culm) or nearly so or verticillate (in whorls).
18. Lemmas and glumes awnless _____ **Eleusine**
18. Lemmas and/or glumes with awns.
19. Axis of each spicate inflorescence branch projecting as a stiff point beyond terminal spikelet; second glume mucronate or with a short awn; spikelets with 3–5 perfect florets _____ **Dactyloctenium**
19. Axis of each spicate inflorescence branch not projecting as a stiff point beyond terminal spikelet; second glume neither mucronate nor with a short awn; spikelets with 1–2 perfect florets _____ **Chloris**

KEY C

1. Spikelets in pairs (1 sessile or nearly so and 1 pedicelled, both pedicelled at branch tips), the pedicelled spikelet similar to sessile spikelet or usually reduced or absent (often represented by an empty pedicel); pedicels flattened, with long-ciliate margins.
2. Individual inflorescences usually less than 6 cm long.
3. Inflorescence of a single spike-like raceme per peduncle (each terminal branchlet with a single raceme above the uppermost leaf) _____ **Schizachyrium**
3. Inflorescence a panicle or of 2 or more racemes or spikes per peduncle (each terminal branchlet with 2–many inflorescence branches, racemes, or spikes above the uppermost leaf).
4. Pedicelled spikelets smaller (shorter or narrower, usually rudimentary, vestigial, or absent) than the sessile spikelets, tapered to a narrow apex; extremely widespread and abundant native and introduced species.
5. Pedicels and internodes of inflorescence branches neither strongly flattened nor grooved on both sides (can be slightly flattened or grooved on one side), the central portion thus neither thin nor membranous _____ **Andropogon**
5. Pedicels and usually upper internodes of inflorescence branches strongly flattened and grooved on both sides, the central portion thus thin to membranaceous, often easily ruptured with a probe _____ **Bothriochloa**

4. Pedicelled spikelets ca. the same size as the sessile spikelets, rounded apically; introduced species known in nc TX only from Coryell Co. in Lampasas Cut Plain _____ **Dichanthium**
2. Individual inflorescences usually over 7 cm long.
6. Pedicelled spikelet absent, represented only by the hairy pedicel; awn of lemmas usually 12–35 mm long _____ **Sorghastrum**
6. Pedicelled spikelet present; awn of lemmas shorter or absent (*Miscanthus* and *Sorghum*) or 12–25 mm long (*Saccharum*).
7. Spikelets with a tuft of long hairs at base ca. as long as spikelets; awn of lemmas 5–25 mm long.
8. Awn of lemmas 12–25 mm long; 1 spikelet of pairs sessile, 1 pedicelled; spikelets ca. 6–8 mm long; inflorescence branches disarticulating (breaking into sections) at maturity, the pedicels falling with the sessile spikelets _____ **Saccharum**
8. Awn of lemmas 5–10 mm long; both spikelets of pairs pedicelled, pedicels 1–5 mm long, unequal, one much shorter; spikelets 4–5.5 mm long; inflorescence branches not disarticulating, the spikelets falling from pedicels at maturity _____ **Miscanthus**
7. Spikelets without a tuft of long hairs at base; awn of lemmas usually much shorter (usually 1.5 mm or less long) or absent _____ **Sorghum**
1. Spikelets in pairs or not, but usually not in sessile-pedicelled pairs; pedicels glabrous or evenly pubescent on all sides, or pedicels absent.
9. Spikelets surrounded by an involucre of prickly or smooth scales, spines, or bristles.
10. Involucre of scales or spines that are flattened at least at base, these sharply prickly or not so.
11. Involucres smooth, not prickly, not painful to the touch _____ **Buchloe**
11. Involucres sharply prickly, very painful to the touch (SANDBURS) _____ **Cenchrus**
10. Involucre of bristles (not flattened), these not sharply prickly.
12. Bristles remaining when the spikelets fall, usually < 20 mm long _____ **Setaria**
12. Bristles falling with the spikelets, the longer bristles > 20 mm long, often 40–50 mm or more _____ **Pennisetum**
9. Spikelets without a well-developed involucre (may have ring or collar at base).
13. Reduced floret or florets present below the perfect floret (the reduced ones staminate or sterile, sometimes represented only by a sterile lemma); spikelets awnless.
14. Lemmas strongly compressed, sharply keeled; inflorescences spike-like; reduced florets 2 per spikelet, rudimentary or scale-like, their lemmas not similar to the second glume; disarticulation above glumes _____ **Phalaris**
14. Lemmas usually not as above; inflorescences various, spike-like to very different; reduced floret 1 per spikelet, the lemma similar to the second glume; disarticulation below glumes _____ **Key D**
13. Reduced floret below the perfect floret absent (reduced florets found above the perfect or absent or seemingly so); spikelets awnless or awned.
15. Spikelets usually borne along 1 side of the often flattened inflorescence branches, usually in 2 rows, and/or inflorescences of spike-like branches bearing sessile spikelets to very base; spikelets sessile or nearly so.
16. Branches of inflorescence digitate (all arising together at very tip of flowering culm) or nearly so or verticillate (in whorls).
17. Spikelets awnless; inflorescence branches usually 2–5(–7); rudimentary floret absent or present only as a minute scale _____ **Cynodon**
17. Spikelets usually awned (can be awnless in *Eustachys*); inflorescence branches 3–20 or more, variously arranged; rudimentary floret or florets present above perfect floret.
18. Lemma of perfect floret awned, the awns usually conspicuous; widespread and common in nc TX _____ **Chloris**

18. Lemma of perfect floret awnless, sometimes mucronate or minutely aristate; rare in ncTX, mainly to the e _____ **Eustachys**
16. Branches of inflorescence distributed along flowering culm, usually only one arising per node.
19. Plants dwarf, mat-formers to only ca. 30 cm tall; inflorescence branches 1–4, usually 6–14 mm long; plants dioecious, male and female flowers on different plants; spikelets awnless or nearly so _____ **Buchloe**
19. Plants often larger; inflorescence branches 1–80, 8–150 mm long; plants not dioecious, each spikelet with 1 perfect floret; spikelets awned or awnless.
20. Lemmas awnless; leaf blades 3 mm or less wide; spikelets neither densely arranged and comb-like on the side branches nor loosely arranged on the main axis.
21. Inflorescence branches spreading, 2–10(–20) cm long; glumes stiff _____ **Schedonnardus**
21. Inflorescence branches appressed, usually 2–3 cm long; glumes soft _____ **Willkommia**
20. Lemmas usually awned; leaf blades less than to much more than 3 mm wide; if less than 5 mm wide then the spikelets either densely arranged and comb-like on the side branches or loosely arranged on the main axis.
22. Inflorescences mostly wider than long with widely spreading panicle branches mostly 10–20 cm long; leaf blades lanceolate, rather broad in appearance for a grass, abruptly narrowed at base _____ **Gymnopogon**
22. Inflorescences mostly longer than wide with spreading to appressed branches to 15 cm long but usually much shorter; leaf blades linear, narrow in appearance, not abruptly narrowed at base.
23. Spikelets without rudimentary florets; inflorescence branches usually appressed, usually 4–15 cm long _____ **Spartina**
23. Spikelets with 1–several rudimentary or staminate florets above the perfect floret; inflorescence branches spreading, 5 cm or less long _____ **Bouteloua**
15. Spikelets not borne along 1 side of the inflorescence branches; inflorescences without spike-like branches having spikelets to very base; spikelets sessile or pedicelled.
24. Spikelets in clusters of 3 per node (laterals often reduced, staminate or sterile); spikelets sessile.
25. Lemmas awned; inflorescence axis usually disarticulating at maturity, the sections falling with the spikelets; spikes usually 4–10 cm long _____ **Hordeum**
25. Lemmas awnless; inflorescence axis not disarticulating, a cluster of 3 spikelets falling as a unit from the inflorescence axis; spikes 2–3.5 cm long _____ **Hilaria**
24. Spikelets not 3 per node; spikelets sessile or on pedicels.
26. Glumes absent, the caryopsis (= fruit) thus subtended by only 2 scale-like bracts (lemma and palea); inflorescence a panicle with spreading branches.
27. Lemmas hispid or hispidulous, the hairs sometimes conspicuous, awnless, 5-nerved, the lateral nerves marginal; spikelets 2.5–5.5 mm long; aerial culms 3 mm or less thick, 0.7–1.5 m tall _____ **Leersia**
27. Lemmas glabrous, awned, 7-nerved, the lateral nerves not marginal; spikelets 6–8 mm long; aerial culms stout, 5–15 mm thick, 1.5–2.5(–3) m tall _____ **Zizaniopsis**
26. Glumes present, the caryopsis thus subtended by more than 2 scale-like bracts (lemma, palea, glume(s)); inflorescences various.
28. Lemmas hard, closed except in anthesis, permanently enclosing caryopsis,

- narrowly fusiform-cylindrical (shaped like a fat needle broadest near middle), with a sharp-pointed callus at base, with 1 or 3 stiff or wiry awns.
29. Lemmas with 1 awn; ring of hairs present at base of awn _____ **Nassella**
29. Lemmas with 3 awns; ring of hairs at base of awn absent _____ **Aristida**
28. Lemmas neither hard nor permanently enclosing caryopsis, open down one side, variously shaped, but not as above, usually without a sharp-pointed callus, with a single awn or awnless.
30. Glumes and lemmas both awnless.
31. Glumes both as long as or longer than lemma.
32. Panicles dense, spike-like, 30 mm or less wide.
33. Fertile lemmas 0.9–1.5 mm long (the single lemma always fertile), glabrous; inflorescences 10–30 mm wide _____ **Agrostis**
33. Fertile lemmas 3–6.8 mm long, pubescent (2 reduced sterile lemmas also present); inflorescences 8–18(–20) mm wide _____ **Phalaris**
32. Panicles open, not spike-like, 20–250 mm wide _____ **Agrostis**
31. Glumes, at least the first, shorter than lemma.
34. Lemmas 1-nerved; fruit dropping from lemma and palea at maturity; seed loose, not fused to ovary wall; ligule a minute ring of hairs with membranous base _____ **Sporobolus**
34. Lemmas 3-nerved, the lateral nerves sometimes faint; fruit enclosed in lemma and palea at maturity; seed fused to ovary wall; ligule a short membrane, usually without hairs _____ **Muhlenbergia**
30. Glumes OR lemmas awned.
35. Inflorescence very dense, spike-like.
36. Glumes awned; lemma awnless or with an awn to ca. 1 mm long arising from the apex of the lemma.
37. Awns of glumes 0.8–1.5 mm long, abrupt from unnotched apex; inflorescences 5–9 mm wide; lemma awnless _____ **Phleum**
37. Awns of glumes 5–9 mm long, from apical notch; inflorescences 10–30 mm wide; lemma with a delicate awn ca. 1 mm long _____ **Polypogon**
36. Glumes awnless; lemma with awn 3–5 mm long arising at or near the base of the lemma _____ **Alopecurus**
35. Inflorescence usually an open or sometimes contracted panicle, not spike-like.
38. Lemmas usually awned from an entire or very minutely cleft apex or awnless; glumes, at least the first, usually shorter than lemma, awnless or awned _____ **Muhlenbergia**
38. Lemmas awned from back, just below tip to near middle; glumes equaling or exceeding lemma, awnless.
39. Panicles contracted, dense, narrow, ca. 10 mm wide; spikelets 3–4 mm long (excluding awns) _____ **Limnodea**
39. Panicles open, very diffuse, > 15 mm wide; spikelets 1.2–2.2 mm long.
40. Awn arising near middle of back of lemma, ca. 2 mm long; florets 2 per spikelet (though only 1 with awned lemma and thus appearing as if only 1 floret) _____ **Aira**
40. Awn arising just below tip of lemma, 4–8 mm long; floret 1 per spikelet _____ **Agrostis**

KEY D

1. Spikelets with 2 well-developed, outer, scale-like bracts (excluding the tough or hard and grain-like fertile lemma), the 3rd if present, much reduced, less than 1/4 as long or 1/2 as wide as the others.
 2. Spikelets long-pedicelled, widely separated in open panicle _____ **Digitaria** (*Leptoloma*)
 2. Spikelets sessile or short-pedicelled, the inflorescence or its branches with closely spaced spikelets, the spikelets often overlapping one another or nearly so.
 3. Pedicels with a prominent collar-like or cup-like structure (modified glume) just under the spikelet (obvious with a lens) _____ **Eriochloa**
 3. Pedicels without collar-like or cup-like structure.
 4. Spikelets with well-developed pedicels, or both sessile and pedicelled together, in panicles or narrow racemes.
 5. Lemmas with silky hairs longer than the spikelet _____ **Digitaria**
 5. Lemmas short-pubescent or glabrous _____ **Sorghum**
 4. Spikelets sessile or subsessile, on a flattened inflorescence branch, the inflorescence consisting of 1 or more spikes or spike-like racemes.
 6. Spikelets lanceolate to oblong or suborbicular, obtuse or acute, 0.8–2.5 times as long as wide; inflorescence branches either only 2 apically or scattered along main inflorescence axis, not digitately arranged; fertile lemma with relatively thick margins, these inrolled over edges of the palea.
 7. Inflorescence with 2–many branches; rounded back of fertile lemma facing the axis of the inflorescence branch; spikelets closely packed and often paired, in 2 or 4 rows, 1.6–4.8 mm long; widespread in nc TX _____ **Paspalum**
 7. Inflorescence with 2–4 branches; rounded back of fertile lemma facing away from the axis of the inflorescence branch; spikelets more widely spaced (only slightly overlapping), not in pairs, in 2 rows, 1.8–2.2(–2.6) mm long; in nc TX only known from extreme e margin _____ **Axonopus**
 6. Spikelets narrowly lanceolate, gradually acute, 3–4 times as long as wide; inflorescence branches digitately arranged or scattered along main inflorescence axis, never only 2 apically; fertile lemma with thin and flat margins, these not inrolled over the palea _____ **Digitaria**
1. Spikelets with 3 or 4 well-developed, outer, scale-like bracts (3rd or 4th may be much shorter than rest, but nearly as wide).
 8. Inflorescences with an easily discernible central axis bearing relatively few (1–ca.30) discrete unbranched spike-like racemes, these racemes usually discernible at a glance.
 9. Inflorescences usually with only 2 paired spike-like racemes at end of culm; plants of wet habitats _____ **Paspalum** (*P. distichum*)
 9. Inflorescences not as above; plants of various habitats.
 10. Second glume and lower lemma usually with brownish glandular blotches; spike-like racemes usually 2–5; in nc TX known only from Tarrant Co. _____ **Paspalum** (*P. langei*)
 10. Second glume and lower lemma without brownish glandular blotches; spike-like racemes 1–ca.30; widespread in nc TX.
 11. First glume > 1/2 as long as the spikelet (excluding awns).
 12. First glume awnless _____ **Urochloa**
 12. First glume with an awn 5–10 mm long _____ **Oplismenus**
 11. First glume 1/2 or less as long as the spikelet.
 13. Glumes and lemmas awnless; first glume rounded apically; inflorescence branches winged or not winged.
 14. Inflorescence branches winged; inflorescences with 2–6 branches _____ **Urochloa**

14. Inflorescence branches not winged; inflorescences with 7–17 branches _____ **Paspalidium**
13. Glumes or lemmas awned or awnless; first glume acute apically; inflorescence branches not winged _____ **Echinochloa**
8. Inflorescences without a conspicuous central axis, the branches usually rebranched, discrete spike-like racemes not easily discernable.
15. Spikelets asymmetric at base, the second glume with a pouch- or sac-like swelling at base; first glume greatly reduced, 1/4 or less as long as second glume; in nc TX known only from Lamar Co. in Red River drainage _____ **Sacciolepis**
15. Spikelets various, but not as above; widespread and extremely common in nc TX _____ **Panicum**

AEGILOPS

☞ A genus of 21 species native from the Mediterranean to c Asia and Pakistan. Related to *Triticum* and one species is thought to have possibly contributed a genome to polyploid WHEAT. (Classical Latin name for wheat or a kind of wild oat) (subfamily Pooideae, tribe Triticeae)

REFERENCES: Gupta & Baum 1986, 1989.

Aegilops cylindrica Host, (cylindrical), JOINTED GOAT GRASS. Annual 35–75 cm tall; leaf sheaths glabrous except on margins; leaf blades with flaring base projecting to form small, sometimes indistinct auricles; ligule a membrane < 1 mm long; inflorescence a slender, cylindrical, pencil-like spike, the spikelets closely fitted into niches in the unbranched, flattened, bilateral axis of the inflorescence; disarticulation usually first in lowest node of inflorescence axis, the spike falling whole; spikelets sessile, 2–5-flowered, the upper florets reduced; glumes rounded, asymmetrical; lemmas and glumes of upper spikelets long-awned, the awns ca. 3–8 cm long. Road-sides and disturbed sites, limestone areas; Dallas, Denton, Grayson, and McLennan cos.; widespread in TX. Apr–Jun. Native of se Europe and adjacent Asia. [*Triticum cylindricum* (Host) Ces., Pass. & Gibson] 🇺🇸

AGROSTIS BENT GRASS

Glabrous annuals or perennials; ligule a membrane; inflorescence an open panicle; spikelets 1-flowered; florets separating above glumes; glumes equaling or exceeding the lemma; paleas short or absent; lemmas awned or awnless.

☞ A cosmopolitan, but especially n temperate genus of 220 species; a number are important for use in lawns and pastures. (Old Greek name for grass from *agros*, a field) (subfamily Pooideae, tribe Aveneae)

REFERENCE: Hitchcock 1905.

1. Lemmas awned (awns 4–8 mm long); plants annual _____ **A. eliottiana**
1. Lemmas awnless; plants perennial.
2. Spikelets 1.5–2.1 mm long; lemmas 1–1.3(–1.5) mm long; native and widespread in nc TX _____ **A. hyemalis**
2. Spikelets (at least some) (2–)2.2–3(–3.2) mm long; lemmas 1.3–2 mm long; introduced into nc TX or native only to the extreme ne portion.
3. Panicles with main branches rebranched only towards the tips, the spikelets clustered near the tips; primary panicle branches (at least some) usually 5–15 cm or more long; mainly w TX, rarely introduced elsewhere; spring flowering except in w TX (form of *A. hyemalis* previously recognized as *A. scabra*) _____ **A. hyemalis**
3. Panicles with main branches rebranched near or below the middle, the spikelets not clustered near the tips; primary panicle branches usually 5 cm or less long, infrequently more; e TX w to Lamar Co.; usually flowering in fall _____ **A. perennans**

Agrostis eliottiana Schult., (for Stephen Elliott, 1771–1830, Carolinian botanist), ELLIOTT'S BENT GRASS, ANNUAL TICKLE GRASS. Annual 10–40 cm tall; leaf blades 1.6 mm or less wide; panicles delicate, becoming very open; spikelets 1.2–2.2 mm long; lemmas 1.1–2 mm long, with awn 4–8 mm long from just below apex, rarely awnless. Sandy soils, disturbed sites; Burnet, Dallas (Reverchon, Apr 1876), Denton, Grayson, Hunt, Navarro, and Tarrant cos.; se and e TX w to East Cross Timbers, also Edwards Plateau. Apr–May.

Agrostis hyemalis (Walter) Britton, Sterns, & Poggenb., (of winter), TICKLE GRASS, SPRING BENT GRASS, WINTER BENT GRASS, FLY-AWAY GRASS. Tufted perennial 15–75(–80) cm tall; leaf blades 0.5–3(–4) mm wide; panicles narrow at start of flowering, later becoming very open; primary panicle branches in whorls, at least some 5–15 cm or more long. Open areas, usually sandy soils; Dallas, Denton, Grayson, Hunt, and Lamar cos.; throughout much of TX. Late Apr–early Jun. [*A. scabra* Willd.] Gould (1975b) and Kartesz (1994) recognized *A. scabra* as a distinct species; however, we are following Jones et al. (1997) and S. Hatch (pers. comm.) in lumping this taxon with *A. hyemalis*.

Agrostis perennans (Walter) Tuck., (perennial), AUTUMN BENT GRASS. Clumped perennial 30–80(–100) cm tall; leaf blades 1–6 mm wide. Moist sand along wooded streams, open oak woods; Lamar Co. (Carr 1994); e TX w to ne corner of nc TX. Aug–Oct, occasionally in spring.

AIRA HAIR GRASS

☞ A genus of 10 species of Europe and the Mediterranean region to Iran; also widely distributed as weeds. (An ancient Greek name for some grass, perhaps darnel—*Lolium temulentum* L.) (subfamily Pooideae, tribe Poeae)

REFERENCE: Brown & Peterson 1984.

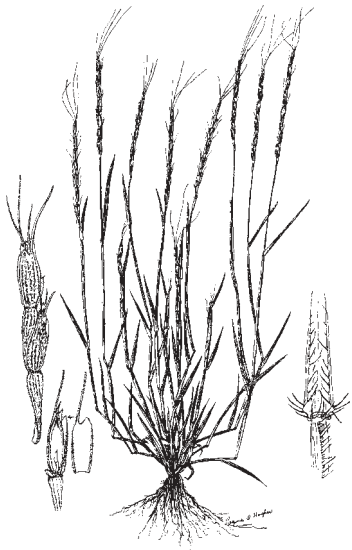
Aira caryophyllea L. var. **capillaris** Mutel, (sp.: clove-like scent; var.: resembling hair, very slender), ANNUAL HAIR GRASS. Delicate tufted annual to ca. 35 cm tall; leaf blades usually 0.5 mm or less wide; ligules 1.5–4 mm long, white, membranous; panicles delicate, very open and diffuse, 4–12 cm long; spikelets 2-flowered, ca. 2 mm long excluding awn; glumes longer than the lemmas; lower lemma awnless; lemma of upper floret awned from near middle of back, the awn ca. 2 mm long. Sandy open areas; Grayson, Lamar, and Tarrant cos.; mainly e TX. Apr–Jun. Native of Europe. [*A. capillaris* Host, *A. elegans* Willd. ex Roem. & Schult., *A. elegantissima* Schur] Gould (1975b) and Kartesz (1994) treated this taxon as *A. elegans*; however, we are following Jones et al. (1997) and S. Hatch (pers. comm.) in recognizing it as *A. caryophyllea* var. *capillaris*. 🗨️

Aira caryophyllea L. var. *caryophyllea*, was reported by Carr (1994) as occurring in Lamar Co. This European native is extremely similar to var. *capillaris* except the lower floret as well as the upper has an awn. 🗨️

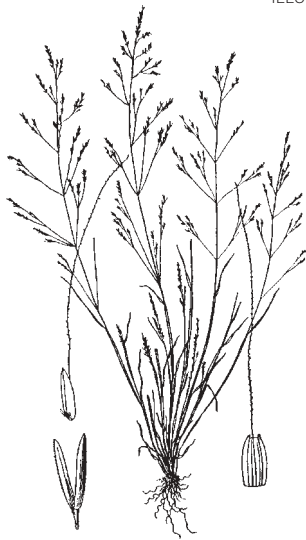
ALOPECURUS FOXTAIL

☞ A genus of 36 species of the n temperate zone and South America. (Greek: *alopez*, fox, and *oura*, tail) (subfamily Pooideae, tribe Poeae)

Alopecurus carolinianus Walter, (of Carolina), CAROLINA FOXTAIL. Glabrous, green or usually blue-green annual 7–35 cm tall; ligule a membrane 3.5–7 mm long; inflorescence a dense, cylindrical, spike-like panicle 2–6 cm long and 4–6 mm in diam.; spikelets strongly compressed, 1-flowered; glumes silky-pubescent; lemmas with 3–5 mm awn from back near base, the awn geniculate medianly. Sandy soils; Bell, Grayson, and Wise cos., also Lamar Co. (Carr 1994); se and e TX w to nc TX, also Edwards Plateau. Mar–Jun.



Aegilops cylindrica [REE]



Agrostis eliottiana [USB]



Agrostis hyemalis [H11]



Agrostis perennans [USB]



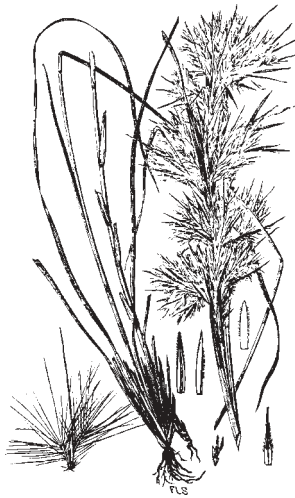
Aira caryophylla var. *capillaris* [SIL]



Alopecurus carolinianus [H11]



Andropogon gerardii [GO1]



Andropogon glomeratus [USB]



Andropogon gyrans [USB]

ANDROPOGON BLUESTEM, BEARD GRASS

Perennials; culms stiffly erect; ligules membranous; inflorescences paniculate, of 2–several spike branches; spikelets in pairs: one sessile, perfect, the other pedicellate, staminate, neuter, rudimentary, or absent (represented by pedicel only); disarticulation so that sessile spikelet falls with associated pedicel and section of the inflorescence branch; first glume large, firm, tightly clasping or enclosing second glume; perfect spikelet with 2 florets, the lower neuter, often vestigial; lemma of perfect (upper) floret awned or awnless.

☛ A genus of ca. 100 species of tropical and warm areas of the world. It has sometimes been circumscribed more broadly to include such genera as *Bothriochloa*, *Dichanthium*, and *Schizachyrium*. (Greek: *aner* (*andr*), man, and *pogon*, beard, referring to the hairy staminate spikelets) (subfamily Panicoideae, tribe Andropogoneae)


REFERENCES: Gould 1957a, 1967; Campbell 1983, 1986; Barnes 1986; Wipff 1996.

1. Sessile spikelets 7–11 mm long; terminal inflorescence conspicuously exerted beyond bracts, not woolly in appearance; pedicelled spikelets large, well-developed, similar to sessile except awnless _____ **A. gerardii**
1. Sessile spikelets 7 mm or less long; inflorescences either not conspicuously exerted beyond bracts OR if exerted then appearing woolly; pedicelled spikelets rudimentary, vestigial, or absent (= pedicel only).
 2. Each inflorescence with 2 relatively stiff and usually straight branches, the spikelets and hairs usually so dense that the branch axes are not easily visible; inflorescences often conspicuously exerted beyond bracts; sessile spikelets 5–7 mm long _____ **A. ternarius**
 2. Each inflorescence with 2–5 slender, delicate and flexuous branches, the spikelets and hairs often not as dense, the branch axes thus often visible, sometimes easily so; sessile spikelets 5 mm long or less; inflorescences not conspicuously exerted OR exerted in *A. gyrans*.
 3. Upper sheathing bracts of inflorescence inflated-spathe-like; inflorescences usually exerted beyond the bracts; sessile spikelets 4–5 mm long; culms with tufts of long hairs just below sheathing bracts of inflorescence; rare in nc TX, known only from Tarrant Co. _____ **A. gyrans**
 3. Upper sheathing bracts of inflorescence not inflated; inflorescences not conspicuously exerted; sessile spikelets 4 mm or less long; culms glabrous OR with tufts of long hairs just below sheathing bracts of inflorescence; extremely widespread and abundant in nc TX.
 4. Inflorescences crowded apically, broad, broom-like; culms with tuft of long hairs below sheathing bracts of inflorescence _____ **A. glomeratus**
 4. Inflorescences numerous but not clustered apically; culms glabrous below sheathing bracts of inflorescence _____ **A. virginicus**

Andropogon gerardii Vitman, (for Loius Gérard, 1733–1819, French botanist). Plant to 2 m tall, essentially glabrous, often glaucous; inflorescences of 2–7 branches, digitate; racemes 4–11 cm long; sessile spikelets usually scabrous, often glaucous; upper lemma of sessile spikelet awned or awnless (sometimes in subsp. *hallii*); pedicellate spikelets about as large as sessile one, awnless. Aug–Nov. The following key to subspecies is modified from Sutherland (1986) and Wipff (1996).

1. Upper lemma of sessile spikelet awned with an awn (7.5–)10.0–25.0 mm long; rhizomes short or absent, the internodes usually 2 mm or less in length; anthers usually < 3.8 mm long; ligules 0.4–2.5 mm long _____ subsp. **gerardii**
1. Upper lemma of sessile spikelet awnless or with an awn to 8(–11) mm long; rhizomes well-developed, creeping, the internodes often exceeding 20 mm in length; anthers usually > 3.8 mm long; ligules (0.9)3–4.5 mm long _____ subsp. **hallii**

subsp. **gerardii**, BIG BLUESTEM, TURKEYFOOT. In relatively undisturbed areas; throughout TX. One

of “big four” tall grasses of the original native prairie along with *Panicum virgatum*, *Schizachyrium scoparium*, and *Sorghastrum nutans*. /78

subsp. **hallii** (Hack.) Wipff, (presumably named for E.A. Hall who collected the type in Nebraska in 1862), SAND BLUESTEM. Sandy soils; a Montague Co. collection is apparently this subspecies, which is generally found to the w of nc TX; Rolling Plains, High Plains, and Trans-Pecos. [*A. gerardii* var. *paucipilus* (Nash) Fernald, *A. hallii* Hack., *A. paucipilus* Nash] The 2 subspecies sometimes hybridize (Barnes 1986) with the hybrids named *A. gerardii* subsp. \times *chrysocomus* (Nash) Wipff (Wipff 1996).

Andropogon glomeratus (Walter) Britton, Sterns, & Poggenb., (clustered), BUSHY BLUESTEM, BUSHY BEARD GRASS. Plant 0.75–1.5 m tall; inflorescences much-branched, crowded, broom-like; inflorescence branches 1.5–3 cm long; sheaths of terminal branchlets of inflorescences narrow, reddish brown; sessile spikelets 3–4.5 mm long; glumes glabrous; pedicellate spikelets rudimentary or absent. Roadsides, low moist areas; throughout TX. Sep–Nov.

Andropogon gyrans Ashe, (going around in circles, concentrically twisted and plaited backward and forward; the significance of the name unclear, not given in the type description), ELLIOTT'S BLUESTEM, ELLIOTT'S BLUE GRASS. Plant 0.3–0.80 m tall; inflorescences not broom-like; inflorescence branches 3–4(–5) cm long; upper sheathing bracts of inflorescence inflated-spathe-like, to 6–10 mm broad, 7–15+ cm long; awns of sessile spikelets 10–15 mm long; pedicellate spikelets rudimentary or nearly so. Usually in partial shade; Tarrant Co. (Campbell 1983); mainly se and e TX. [*A. elliottii* of authors, not Chapman] This species has long incorrectly gone under the name *A. elliottii* (Campbell 1983).

Andropogon ternarius Michx., (in threes), SPLIT-BEARD BLUESTEM, SPLIT-BEARD BEARD GRASS, FEATHER BLUESTEM, SILVERY BEARD GRASS. Plant 0.7–1.2 m tall; culms glabrous or with a tuft of long hairs below bract bearing node; inflorescences on lateral shoots at all upper nodes; inflorescence branches 3–6 cm long; sessile spikelets glabrous, awned; pedicellate spikelets slender, awnless, rudimentary, 2 mm or less long, not wider than pedicel. Sandy soils, woodland or woodland pastures; se and e TX w to West Cross Timbers. Sep–Nov.

Andropogon virginicus L., (of Virginia), BROOMSEDGE BLUESTEM, BROOMSEDGE, VIRGINIA BLUESTEM, YELLOWSEDGE BLUESTEM. Plant 0.50–1 m tall; culm nodes glabrous; inflorescences branched, not densely clustered; inflorescence branches 2–3 cm long; sheathing bracts of inflorescence usually straw-colored; sessile spikelets with awned lemma; pedicellate spikelets rudimentary or absent. Sandy soils; moist areas or slopes; Grayson, Hopkins, Kaufman, Lamar, and Limestone cos.; widespread in e 1/2 of TX. Sep–Nov. This species was inadvertently introduced to the Hawaiian Islands in 1932 and is there considered one of the most threatening alien species; it is a serious invader of native communities and alters the fire and hydrology regimes (Cronk & Fuller 1995).

ARISTIDA THREEAWN

Annuals or perennials; panicles open or contracted; spikelets 1-flowered, usually relatively large (long); glumes 1(–3)-nerved; lemmas hardened, terete, linear, with a sharp-pointed callus at base, with 3 awns; awn column present or absent; caryopsis permanently enclosed within the lemma.

☛ A genus of ca. 230 species of warm areas of the world. The sharp calluses can be problematic for livestock and irritating when in shoes and socks. (Latin: *arista*, a beard or awn) (subfamily Aristidoideae, tribe Aristideae)

REFERENCES: Hitchcock 1924; Holmgren & Holmgren 1977; Allred 1984a, 1984b, 1985a, 1985b, 1986; Sutherland 1986.

1. Lateral awns of lemma much reduced, 1–2 mm long, erect; central awn of lemma 3–8 mm long, deflexed, with a spiral coil at base like a corkscrew _____ **A. dichotoma**
1. Lateral awns of lemma usually well-developed, (2–)4 mm or more long (often much longer), erect to spreading, horizontal, or even deflexed; central awn of lemma (5–)10–36 mm long, deflexed to erect, without a spiral coil at base OR in 1 rare species (*A. basiramea*) with a spiral coil at base.
 2. Awns of lemma, at least central one, spirally coiled at base like a corkscrew OR with a distinct semicircular bend at base.
 3. Lemmas 7–10 mm long (to base of awn); awn column with a well-defined joint at base, separating at the joint at maturity (check mature spikelets); central awn of lemma with a semicircular bend at base _____ **A. desmantha**
 3. Lemmas 4–7 mm long; awn column not jointed basally and not separating at maturity; central awn of lemma spirally coiled at base like a corkscrew _____ **A. basiramea**
2. Awns of lemma nearly straight or curved, but neither spirally coiled basally nor with a distinct semicircular bend.
 4. Lemmas 16–28 mm long to base of awn _____ **A. oligantha**
 4. Lemmas 15 mm or less long to base of awn.
 5. Leaf sheaths (at least lower ones) lanate pubescent, the hairs cobwebby, kinked, and intertwined _____ **A. lanosa**
 5. Leaf sheaths not lanate pubescent, varying from glabrous to pilose, the hairs if present \pm straight, not cobwebby, and usually appressed.
 6. Panicles open, at least lower branches spreading.
 7. Awns of lemma 4–10 cm long; second glume usually 14–25 mm long; lemmas 12–16 mm long (to base of awns) _____ **A. purpurea** var. **longiseta**
 7. Awns of lemma 3–4.5 cm long; second glume usually 15 mm or less long; lemmas usually 10–12 mm long _____ **A. purpurea** var. **purpurea**
 6. Panicles contracted, the branches usually all stiffly appressed along the main axis.
 8. Lemmas narrowing into a slender twisted awn column (sometimes called a beak) 1–4 mm long _____ **A. purpurea** var. **nealleyi**
 8. Lemmas thick to base of awns; awn column absent.
 9. Awns 4–10 cm long _____ **A. purpurea** var. **longiseta**
 9. Awns 3.5 cm or less long.
 10. Plants annual; glumes about equal; central awns 5–30 mm or more long; lemmas (3–)4–9 mm long; lateral awns sometimes reduced and 1/2 or less the length of the central awn OR well-developed _____ **A. longespica**
 10. Plants perennial; glumes about equal OR first glume half to three-fourths as long as second; central awns 15–30 mm long; lemmas 4–15 mm long; lateral awns well-developed, at least 1/2 the length of the central awn.
 11. First (= lower) glume \pm as long as to slightly longer than the mostly 5–10 mm long second glume; lemma 4–8 mm long _____ **A. purpurascens**
 11. First glume 1/2–3/4 as long as the 11–15 mm long second glume; lemma ca. 11–15 mm long _____ **A. purpurea** var. **wrightii**

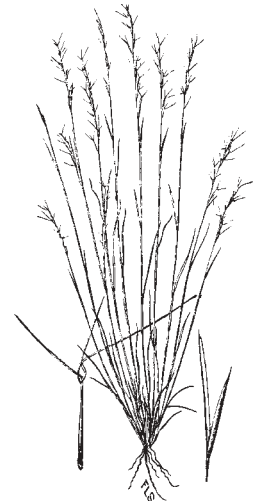
Aristida basiramea Engelm. ex Vasey, (branching from base), FORK-TIP THREEAWN. Annual; panicles contracted; glumes about equal, up to 10 mm long including awn; lemmas 4–7 mm long, central awn 9–15 mm long, conspicuously spirally coiled. Sandy soils; Dallas Co.; known only from Bastrop, Dallas, and Red River cos. in TX (Gould 1975b). Aug–Oct. According to Allred (1986) this species is similar to *A. dichotoma* and could be treated as a variety of that species. The 2 are distinguished by *A. basiramea* having spreading lateral awns usually 4–10 mm long (vs. erect, 1–2 mm long in *A. dichotoma*)



Andropogon ternarius [H11]



Andropogon virginicus [REE]



Aristida basiramea [US8]



Aristida desmantha [US8]



Aristida dichotoma [US8]



Aristida lanosa [US8]



Aristida longespica var. *geniculata* [GO1]



Aristida longespica var. *longespica* [H11]



Aristida oligantha [US8]

Aristida desmantha Trin. & Rupr., (with clustered flowers), CURLY THREEAWN, WESTERN TRIPLEAWN, WESTERN THREEAWN. Annual; leaf sheaths glabrous to lanate pubescent; panicles loosely contracted, 8–20 cm long; spikelets light yellowish or golden-brown; glumes 1-nerved, awn-tipped, about equal; lemmas 7–10 mm long, the awns about equal, spreading; awn column jointed basally, well-defined. Sandy soils; Dallas (*Reverchon*, 1876; *Stillwell*, 1935), Limestone, Palo Pinto, and Parker cos.; se and e TX w to nc TX. Sep–Nov.

Aristida dichotoma Michx., (2-parted or forked), CHURCH-MOUSE THREEAWN, POVERTY GRASS. Annual; panicles contracted or racemes spike-like; glumes about equal; lemmas 4–6 mm long; central awn 3–8 mm long, spirally coiled basally; lateral awns 1–2 mm long, erect. Sandy soils; Dallas, Grayson, and Lamar cos.; e TX w to Blackland Prairie. Aug–Nov.

Aristida lanosa Muhl. ex Elliott, (woolly), WOOLLY-SHEATH THREEAWN, WOOLLY TRIPLEAWN GRASS, WOOLLY THREEAWN. Perennial; panicles with appressed or somewhat spreading branches; glumes subequal, 9–15 mm long including the awn when present; lemmas 8–9 mm long, without a well-defined awn column; lemma awns only curved below. Similar in appearance to *A. desmantha* which also has leaf sheaths with lanate pubescence. However, *A. desmantha* has lemma awns with a semicircular bend and a distinct awn column well-defined from the lemma. Woods openings, often in sandy soils; Lamar and Montague cos.; mainly e and se TX. Late Aug–Nov.

Aristida longespica Poir., (long-spiked), SLIM-SPIKE THREEAWN. Annual; leaves not in a conspicuous basal tuft; panicles contracted, narrow and spike-like; glumes about equal, (3–)4–9 mm long; central awn erect to reflexed. Two varieties, not always easily distinguished, occur in nc TX; Allred (1986) noted that intermediates between the 2 are not uncommon; however, he further indicated that since the extremes are so strikingly different, distinction at the varietal level seems appropriate. Sandy open areas. Late Aug–Dec.

1. Lemmas usually (3.5–)7–10 mm long; central awn usually (8–)12–36 mm long; lateral awns usually 2/3–3/4 as long as central, usually 6–18 mm long _____ var. **geniculata**

1. Lemmas usually 2.5–7 mm long; central awn usually 5–10(–15) mm long; lateral awns much shorter, usually 1/3–slightly more than 1/2 as long as central, usually 2–5(–8) mm long _____ var. **longespica**

var. **geniculata** (Raf.) Fernald, (jointed), KEARNEY'S THREEAWN, PLAINS THREEAWN. Montague, Parker, and Tarrant cos.; widespread in e 1/2 of TX. Aug–Dec. [*A. intermedia* Scribn. & C.R. Ball]

var. **longespica**. SLIM-SPIKE THREEAWN, SLENDER THREEAWN. Bell, Bosque, Dallas, Grayson, and Parker cos.; se and e TX w to West Cross Timbers.

Aristida oligantha Michx., (few-flowered), OLDFIELD THREEAWN, PRAIRIE THREEAWN, FEW-FLOWER ARISTIDA. Annual; panicles open, much branched; glumes subequal, 18–25 mm long, the second awned, the awn up to 1 cm long; lemmas 16–28 mm long, the awns about equal, 3–7 cm long. Calcareous soils; throughout TX. Jun–Nov. This species apparently has allelopathic effects on other plants; it is also often seen growing on seed harvester ant mounds (J. Stanford, pers. comm.).

Aristida purpurascens Poir., (purplish), ARROW-FEATHER THREEAWN, BROOMSEDGE, ARROW GRASS. Tufted perennial; basal leaves persistent after drying, curly; panicles narrow, contracted; lemmas 4–8 mm long, purple or mottled with purple at maturity; central awns 15–30 mm long. Similar to *A. longespica* except *A. purpurascens* is perennial. Woods openings, borders, and prairies, usually on sandy soils; Dallas, Fannin, Grayson, and Hunt cos.; se and e TX w to Blackland Prairie, also Edwards Plateau. Aug–Nov.

Aristida purpurea Nutt., (purple). Perennial; panicles open or contracted. A highly variable species with 4 varieties in nc TX that have in the past been treated as separate species. Because of

extensive intergradation, we are following most recent authors (e.g., Holmgren & Holmgren 1977, Allred 1984b, Sutherland 1986, Kartesz 1994) in treating them as varieties of *A. purpurea*. Most plants may be separated by the characters given in the key to species and varieties.

var. **longiseta** (Steud.) Vasey, (long-bristled), RED THREEAWN, DOGTOWN GRASS, LONG-AWNED ARISTIDA, LONG-AWNED THREEAWN. Panicles contracted or open; glumes unequal, the first 0.5–0.6 as long as second, the second 14–25 mm long; lemmas 12–16 mm long, the awns about equal, 4–10 cm long. Disturbed sites; mainly Blackland Prairie s and w to w TX. Mar–Dec. [*A. longiseta* Steud., *A. reverchonii* Vasey]

var. **nealleyi** (Vasey) Allred, (for Greenleaf Alley Nealley, 1864–1896, botanist), BLUE THREEAWN. Panicles contracted; glumes unequal, the first glume about half as long as second; lemmas slightly longer than second glume; apex of lemma twisted into awn column 1–4 mm long; awns slightly unequal, 15–20(–30) mm long. Rocky, usually limestone soils; Coleman and Somervell cos., also Hood Co. (Mahler 1988); w part of nc TX s and w to w TX. May–Oct. [*A. glauca* (Nees) Walp.]

var. **purpurea**, (purple), PURPLE THREEAWN, PURPLE NEEDLE GRASS. Panicles open, curving, the branches flexuous; glumes unequal, the second 11–15 mm long, up to twice the length of the first; lemmas 10–12 mm long, the awns about equal, 3.5–4.5 cm long. Sandy or rocky soils; Post Oak Savannah s and w to w TX. Apr–Oct.

var. **wrightii** (Nash) Allred, (for Charles Wright, 1811–1885, TX collector), WRIGHT'S THREEAWN, WRIGHT'S TRIPLEAWN GRASS. Panicles contracted; glumes unequal, the second 11–15 mm long, the first 0.5–0.75 as long as second; lemmas equaling or exceeding second glume, the awns about equal, 15–30 mm long, the central occasionally longer than laterals. Calcareous soils; Blackland Prairie s and w to w TX. May–Oct. [*A. wrightii* Nash]

ARUNDINARIA

☛ A genus of ca. 50 species of bamboos native to China, Japan, and the Americas. (Latin: *arundo*, a reed) (subfamily Bambusoideae, tribe Bambuseae)

REFERENCE: Platt & Brantley 1997.

Arundinaria gigantea (Walter) Muhl., (gigantic), GIANT CANE, SOUTHERN CANE, SWITCH CANE. Much branched woody perennial 2–5(–8) m tall from rhizome; leaves variable, the lower often reduced; upper leaf blades usually 15–25 cm long, 2–4(–5.5) cm wide; ligule a firm membrane 1.5 mm or less long; inflorescences racemose or narrowly paniculate; spikelets 1–few, large, 4–7(–8) cm long, ca. 8 mm broad, with 6–12(–13) flowers; lemmas (10–)15–25 mm long. Moist woods or low areas; can form dense stands known as canebrakes; much reduced with the introduction of domestic livestock; Lamar Co. in Red River drainage, also Henderson Co. on e margin of nc TX; mainly se and e TX, also Edwards Plateau and Trans-Pecos. Mostly Apr–May. This is the only native bamboo species in TX.

ARUNDO

☛ A genus of 3 species native to the Mediterranean and Taiwan. (Latin: *arundo*, a reed) (subfamily Panicoideae, tribe Arundineae)

Arundo donax L., (classical name), GIANT REED. Perennial, rhizomatous; extremely large, the culms 2–6 m tall, usually unbranched; leaf blades usually 4–7 cm wide on main culms; panicles 30–60 cm long; branchlets and rachilla joints essentially glabrous; spikelets usually with 2–4 florets; glumes glabrous; lemmas densely hairy. Wet areas of ponds and roadsides; usually tight, clay soils; cultivated along highways; apparently not setting fertile seed, spreads vegeta-

tively; nearly throughout TX. Mostly Sep–Nov. Native to Mediterranean region. This is the “reed” of the Bible and has been used for 5,000 years for pipe instruments (Mabberley 1987). ☞

AVENA OATS

Erect annuals 30–120 cm tall; ligule a whitish membrane 2–4 mm long; inflorescence an open panicle of ca. 8–30 large pendulous spikelets; spikelets 2–4-flowered; glumes ca. 17–30 mm long, longer than the lemmas, acute to acuminate; lemmas awned from near middle of the back or awnless.

☞ A mainly temperate Old World genus of ca. 25 species ranging from Europe to the Mediterranean region and Ethiopia. (Classical Latin name for oats) (subfamily Pooideae, tribe Aveneae) REFERENCES: Baum 1968, 1977, 1991; Zohary & Hopf 1994.

1. Awn of lemmas geniculate, mostly 2.5–4 cm long; lemmas with stiff, usually reddish brown hairs on dorsal surface; spikelets usually 3–4-flowered _____ **A. fatua**
1. Awn of lemmas not geniculate, irregularly developed, to < 3 cm long or absent; lemmas glabrous; spikelets usually 2-flowered _____ **A. sativa**

Avena fatua L., (simple), WILD OATS. Roadsides and other disturbed areas; Tarrant Co.; scattered in TX. Mostly Apr–May. Native to the Mediterranean area. The pointed callus of the fruit is reported to cause mechanical injuries (Burlage 1968). ☞

Avena sativa L., (cultivated), COMMON OATS, CULTIVATED OATS. Commonly cultivated for grain, often planted to prevent washing on newly graded roadsides, also naturalized and common as a weed on roadsides and other disturbed areas; throughout TX. Mostly Mar–Jun. Native of the Mediterranean area where it has long been a cultivated cereal crop. [*A. fatua* L. var. *sativa* (L.) Hausskn.] While OATS is thought to be a later domesticate than WHEAT, it is one of the most nutritious of the cereals, having a high protein content; this hexaploid species probably evolved from weeds invading the fields of early WHEAT and BARLEY farmers (Heiser 1990a; Zohary & Hopf 1994). It is possibly best treated as a variety (e.g., Jones et al. 1997) or subspecies of *A. fatua*, which is apparently involved in its ancestry (Zohary & Hopf 1994). High nitrate concentrations and fungal contaminants can result in the loss of cattle and horses upon ingesting OAT hay (Lewis & Elvin-Lewis 1977). ☞ ☞

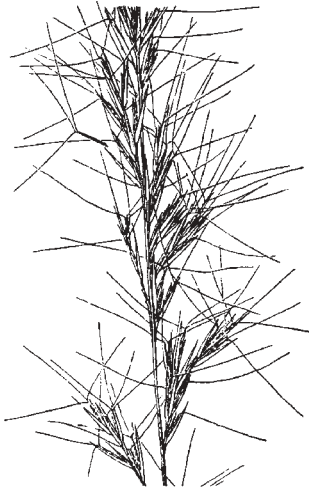
AXONOPUS CARPET GRASS

☞ A genus of 35 species of tropical and warm areas of the Americas and Africa. (Greek: *axon*, axis, and *pous*, foot) (subfamily Panicoideae, tribe Paniceae) REFERENCES: Chase 1938; Black 1963; Crins 1991.

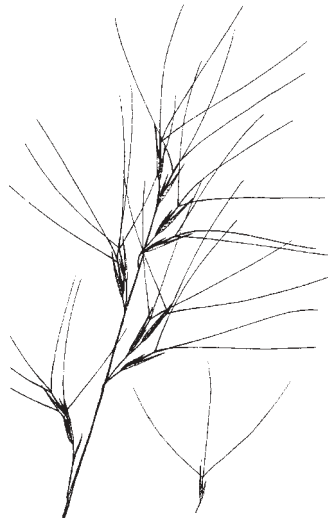
Axonopus fissifolius (Raddi) Kuhlman, (split-leaved), COMMON CARPET GRASS. Perennial, caespitose, stoloniferous, forming carpets but the flower-bearing culms erect; culms 20–75 cm long; leaves essentially glabrous; leaf blades 6–17(–28) cm long, 1.5–7(–9) cm wide, flat, blunt; ligule a membrane ca. 0.3 mm long; inflorescences of 2–4 slender branches, the upper 2 usually paired and spreading at culm tip, the branches ca. 2.5–8(–10) cm long, ca. 1 mm wide, slightly winged; spikelets awnless, 2-flowered, the lower floret staminate or neuter, the upper floret perfect, 1.8–2.2(–2.6) mm long; first glume absent; perfect lemma hardened, glabrous, with inrolled margins, with rounded back facing away from axis. Moist sandy woods, margins of wet areas, roadsides; Henderson, Limestone, and Milam cos., near extreme e margin of nc TX; mostly se and e TX. (Feb) May–Nov(–Dec). [*A. affinis* Chase]

BOTHRIOCHLOA BLUESTEM, BEARD GRASS

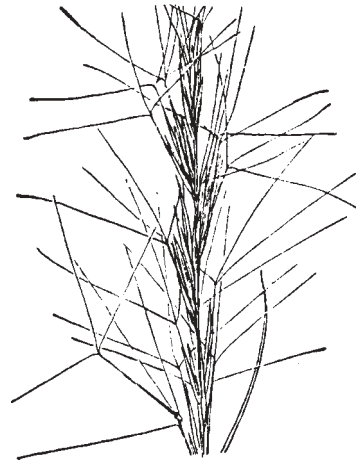
Annuals or perennials; ligules membranous; inflorescences paniculate with racemose



Aristida purpurascens [H11]



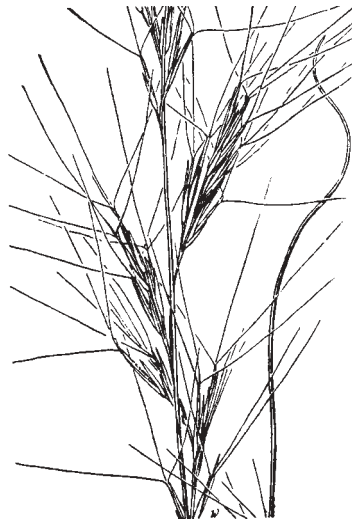
Aristida purpurea var. *longiseta* [G01]



Aristida purpurea var. *nealleyi* [G01]



Aristida purpurea var. *purpurea* [G01]



Aristida purpurea var. *wrightii* [H11]



Arundinaria gigantea [SC8]



Arundo donax [LVN]



Avena fatua [H11]

branches; spikelets in pairs, one sessile, one pedicelled; pedicels and upper internodes of inflorescence branches with a central groove or broad membranous area; disarticulation at base of sessile spikelet so that associated pedicel and section of inflorescence branch fall with the sessile spikelet; sessile spikelets perfect, 2-flowered, the lower floret sterile, the upper floret fertile; first glume dorsally flattened, not enclosing the second glume; second glume with a rounded median keel; lemma of upper floret usually awned; pedicellate spikelets well-developed, but often much smaller and narrower than sessile spikelets, neuter or staminate, awnless.

☛ A genus of ca. 35 species of warm areas of the world; a number are cultivated for fodder; formerly treated in a more inclusive *Andropogon*. (Greek: *bothrion*, a shallow pit, and *chloa*, grass, from pitted glumes of some species) (subfamily Panicoideae, tribe Andropogoneae)

REFERENCES: Gould 1953, 1957a, 1959b, 1967; Shinnars 1956e; Celarier & Harlan 1958; Allred 1981; Allred & Gould 1983.

1. Inflorescences purplish, open, with 2–8 branches; inflorescence axis shorter than branches, the inflorescence appearing nearly digitate; pedicelled spikelets about as large and broad as sessile spikelets _____ **B. ischaemum**
1. Inflorescences whitish silvery, contracted, with panicle branches often numerous; inflorescence axis usually longer than branches, the inflorescence not appearing digitate; pedicelled spikelets conspicuously smaller and narrower than sessile spikelets.
 2. Sessile spikelets 4.5–7.3 mm long; awn of lemma 20–30 mm or more long; first glume of sessile spikelet with or without a glandular pit; culm nodes with a conspicuous ring of short, spreading, white hairs _____ **B. barbinodis**
 2. Sessile spikelets < 4.5 mm long; awn of lemma 18 mm or less long; first glume of sessile spikelet without a glandular pit; culm nodes without a conspicuous ring of short, spreading, white hairs _____ **B. laguroides**

Bothriochloa barbinodis (Lag.) Herter, (bearded at nodes). Panicles included to long exserted; lemma awn of sessile spikelet geniculate. Sandy or rocky limestone soils. Mostly May–Oct.

1. First glume of most sessile spikelets without a glandular pit or depression _____ var. **barbinoidis**
1. First glume of most sessile spikelets with a glandular pit or depression (like a conspicuous “pin-hole” in the surface of the glume) _____ var. **perforata**

var. **barbinodis**, CANE BLUESTEM, CANE BEARD GRASS, BRISTLE-JOINT BLUESTEM. Bosque, Brown, Hamilton, Palo Pinto, and Young cos.; Grand Prairie s and w to w TX.

var. **perforata** (Trin. ex E. Fourn.) Gould, (perforated), PINHOLE BLUESTEM, PINHOLE BEARD GRASS, PERFORATED BLUESTEM. Bosque, Palo Pinto, and Tarrant cos.; w part of nc TX s and w to w TX.

Bothriochloa ischaemum (L.) Keng var. **songarica** (Rupr. ex Fisch. & C.A. Mey.) Celarier & Harlan, (sp.: from Greek: *ischaemos*, blood-restraining, from supposed styptic properties; var.: of Dzungaria, central Asia), KING RANCH BLUESTEM, KR BLUESTEM. Plant becoming rhizomatous or stoloniferous with mowing or grazing; lemma awn of sessile spikelet geniculate, 1–1.5 mm long. Calcareous soils, roadsides, fields; throughout TX. Mostly May–Nov. Native of c and e Asia. A pernicious weed crowding out native species. ☛

Bothriochloa laguroides (DC.) Herter. subsp. **torreyana** (Steud.) Allred & Gould., (sp.: like *Lagurus*—hare’s-tail grass; subsp.: for John Torrey, 1796–1873, botanist and physician, co-author with Asa Gray, described many w American plants), SILVER BLUESTEM, SILVER BEARD-GRASS. Plant 50–130 cm tall; panicles usually exserted. Dry, often sandy soils, increases under disturbance, extremely common along roadsides; throughout TX, more commonly Blackland Prairie and w. Mostly May–Nov. [*Bothriochloa longipaniculata* (Gould) Allred & Gould, *B. saccharoides* (Sw.) Rydb. var. *longipaniculata* (Gould) Gould, *B. saccharoides* (Sw.) Rydb. var. *torreyana*

(Steud.) Gould] While this taxon has been variously treated in the past (e.g., Gould 1975b; Kartesz 1994), we are following Jones et al. (1997) and S. Hatch (pers. comm.) in recognizing it as *B. laguroides* subsp. *torreyana*.

BOUTELOUA GRAMA GRASS

Perennials or annual (*B. barbata*); culms erect, tufted; rhizomes present or absent; leaves mostly basal; leaf blades usually flat, involute apically; inflorescences of 1-many short, spike-like branches; spikelets sessile, with 1 perfect floret and 1 or more staminate or neuter florets above; glumes 1-nerved; lemmas 3-nerved.

☛ An American genus of 24 species ranging from Canada to Argentina, especially in Mexico. It includes a number of valuable native forage grasses; some are also used as ornamentals. All species are C₄ plants with typical Kranz leaf anatomy (Gould 1979); these adaptations allow more effective capture of carbon dioxide and thus less water loss through transpiration (since stomata do not have to be as open for gas exchange), an advantage in arid environments. (Named for Claudio Boutelou, 1774–1842, a Spanish writer on floriculture and agriculture) (subfamily Chloridoideae, tribe Cynodonteae)

REFERENCES: Griffiths 1912; Featherly 1931; Gould & Kapadia 1962, 1964; Kapadia & Gould 1964a, 1964b; Roy & Gould 1971; Gould 1979; Wipff & Jones 1996.

1. Spikelets usually 3–7 per inflorescence branch, not pectinately arranged on inflorescence branches; inflorescence branches ca. 1.5 cm or less long, falling entire (section *Bouteloua*).
 2. Inflorescence branches 25 to numerous per inflorescence _____ **B. curtipendula**
 2. Inflorescence branches 10 or less per inflorescence _____ **B. rigidisetia**
1. Spikelets usually 8–90 per inflorescence branch, with a striking pectinate (= comb-like) arrangement on inflorescence branches; inflorescence branches 1–5 cm long, not falling entire, the florets separating from persistent glumes (section *Chondrosioides*).
 3. Plants tufted annuals; inflorescence branches 1–3 cm long (usually averaging ca. 2 cm), usually < 3 mm wide including awns _____ **B. barbata**
 3. Plants perennials; inflorescence branches 1.5–5 cm long (typically > 3 cm except in *B. trifida*), usually 3 mm or more wide including awns.
 4. Inflorescence branches ending with a naked extension of branch axis or axis-like rudimentary spikelet extended well beyond the terminal normal spikelet, the inflorescence branches thus with conspicuous, elongated, sharp points (these definitely different from awns).
 5. Tuft of hairs absent at base of the lowermost rudimentary floret of each spikelet; culms 15–40 cm tall, decumbent at base, usually branched, with 4–6 nodes; anthers 2–2.5 mm long; inflorescences 10–30 cm long (above uppermost leaf); inflorescence branches ending with a naked extension of branch axis extended well beyond the terminal normal spikelet _____ **B. hirsuta**
 5. Tuft of hairs present at base of the lowermost rudimentary floret of each spikelet; culms 35–75 cm tall, strictly erect, unbranched, usually with three nodes; anthers ca. 3 mm long; inflorescences 25–40 cm long (above uppermost leaf); inflorescence branches ending with axis-like rudimentary spikelet extending beyond normal spikelets _____ **B. pectinata**
 4. Inflorescence branches ending in a spikelet (this spikelet can be reduced and pointed), without conspicuous, long, sharp points (awns often the terminal most part of the inflorescence branches).
 6. Inflorescence branches usually 1–3 per main inflorescence axis, spreading, 1.5–6 cm long (at least some usually > 3 cm long) _____ **B. gracilis**
 6. Inflorescence branches 3–8 per main inflorescence axis, usually appressed to axis, < 2(–2.5) cm long _____ **B. trifida**

Bouteloua barbata Lag., (barbed), SIXWEEKS GRAMA. Culms to 30 cm; inflorescence branches usually 4–6 per main axis; axis of inflorescence branches not extended beyond spikelets. Dry grasslands, roadsides, and wastelands, typically sandy soils; city weed in Tarrant Co.; mainly Rolling Plains s and w to w TX. Apr–Nov.

Bouteloua curtipendula (Michx.) Torr., (short-hanging), SIDE-OATS GRAMA. **State grass of Texas.** Rhizomatous; inflorescence branches usually 25–80, about 1.5 cm long, along 1 elongate main axis terminating a leafy culm; fertile lemma awnless. Jun–Nov. This species is extremely variable morphologically, ecologically, and in terms of chromosome number; it often reproduces apomictically (Gould 1959a). It was adopted as the state grass by the 62nd Texas Legislature in 1971 (Jones et al. 1997).

1. Plants without creeping rhizomes (base can sometimes be knotty); culms in large or small clumps, stiffly erect _____ var. **caespitosa**
 1. Plants with creeping rhizomes; culms not in large clumps, decumbent or stiffly erect ____ var. **curtipendula**

var. **caespitosa** Gould & Kapadia, (tufted). Mostly on loose, limey soils; Erath, Palo Pinto, and Tarrant cos.; w part of nc TX s and w to w TX.

var. **curtipendula**. On better soils and little disturbed areas including native prairies; throughout TX. This is the predominant variety throughout nc TX.

Bouteloua gracilis (Willd. ex Kunth) Lag. ex Griffiths, (graceful), BLUE GRAMA. Inflorescence branches 1–3(–4) per main axis, up to 5 cm long, curved; axis of inflorescence branches not extending beyond spikelets; apical rudimentary spikelets absent. Grasslands; Archer and Jack cos.; West Cross Timbers s and w to w TX. Jul–Oct.

Bouteloua hirsuta Lag., (hairy), HAIRY GRAMA. Inflorescence branches 1–4 per main axis, usually 2.3–4 cm long (including branch axis tip), straight to curved; axis of inflorescence branches continuous and extending beyond spikelets, usually scabrous; chromosome number quite variable, $2n = 20–60$ (Roy 1968). Grasslands and a variety of other habitats; throughout TX. Jun–Nov.

Bouteloua pectinata Feath., (comb-like), TALL GRAMA. Inflorescence branches usually 3–5 per main axis, 2.5–4.5 cm long, straight to slightly curved; axis of inflorescence branches not extended but with axis-like rudimentary spikelet extending beyond spikelets; axis-like rudimentary spikelet usually hairy at base, its apex usually visibly bifid under magnification; $2n = 20$. Limestone outcrops, hilltops, well-drained calcareous soils; Bell, Brown, Burnet, Coryell, Grayson, Hood, Johnson, Parker, Somervell, and Williamson cos., also Bosque, Erath, Hamilton, Lampasas, Wise (Roy 1968), and Tarrant (Featherly 1931) cos.; nc TX and Edwards Plateau; endemic to TX and OK. Mostly Jul–Aug, with a much shorter flowering period than *B. hirsuta*. [*B. hirsuta* var. *pectinata* (Feath.) Cory, *B. hirsuta* subsp. *pectinata* (Feath.) Wipff & S.D. Jones] While Wipff and Jones (1996) and Jones et al. (1997) recognized this taxon at the subspecific level, we are following Roy and Gould (1971), whose biosystematic investigation supported its recognition as a separate species. Even though hybridization can occur where the two grow together, they differ in numerous morphological characters and are usually easily distinguished in the field. According to Gould (1979), “... the morphological uniformity of this species contrasts strikingly with the variability observed in populations of plants of *B. hirsuta*.” ☒/81

Bouteloua rigidisetia (Steud.) Hitchc., (stiff-awned), TEXAS GRAMA, MESQUITE GRASS. Inflorescence branches 6–8(–10), about 1 cm long, along 1 main axis terminating a leafy culm; fertile lemma 3-awned; single rudimentary floret usually reduced to an awn column, 3-awned. Grasslands; nearly throughout TX. Mar–Oct.

Bouteloua trifida Thurb., (three-parted), RED GRAMA, THREEAWN GRAMA. Inflorescence branches 3–7 per main axis, up to 2(–2.5) cm long, slender and appressed to main axis; axis of inflores-



Avena sativa [NVE]



Axonopus fissifolius [GO1]



Bothriochloa barbinodis var. *barbinodis* [HI1]



Bothriochloa barbinodis var. *perforata* [HI1]



Bothriochloa ischaemum var. *songarica* [GO1]



Bothriochloa laguroides subsp. *torreyana* [GO1, HEA]



Bouteloua barbata [GO3]



Bouteloua curtipendula var. *curtipendula* [USB]



Bouteloua gracilis [GO3]

cence branches not extending beyond spikelets; apical rudimentary spikelet absent. Grasslands; Bell Co., also Brown, Comanche, and Hamilton cos. (HPC); throughout much of TX except Blackland Prairie and far e TX. Apr–Nov.

BRACHYPODIUM FALSE BROOM

☞ A genus of 17 species of temperate Eurasia, tropical America, and tropical mountains. (Greek: *brachy*, short, and *podos*, foot, from the short thick spikelets in some species) (subfamily Pooideae, tribe Brachypodieae)

Brachypodium distachyon (L.) P. Beauv., (two-spiked), PURPLE FALSE BROOM. Annual usually 20–50 cm tall; ligules 1–2 mm long, erose apically; inflorescence a spike or spicate raceme with 1–5 large spikelets; spikelets 2–3.5 cm long, usually with 9–18 imbricated florets; lower glume 3- to 7-nerved; upper glume 7- to 9-nerved; lemmas 7-nerved, with 1–2 cm long awn from entire apex; paleas pectinate-ciliate on nerves. Roadsides and disturbed sites; included based on citation of vegetational area 5 by Gould (1975b) and Hignight et al. (1988); also Edwards Plateau. Spring. Native of Europe. 🌿

BRIZA QUAKING GRASS, SHAKING GRASS

Annuals (our species) with open panicles of awnless spikelets on long pedicels; spikelets usually with 3–14(–20) florets, the florets crowded and widely spreading; lemmas usually broader than long, rounded apically.

☞ A genus of 20 species of temperate Eurasia and South America including cultivated ornamentals. (Named from Greek word for a kind of grain) (subfamily Pooideae, tribe Aveneae)

1. Spikelets large, mostly 12–25 mm long; inflorescences usually with only 1–6(–12 or more) spikelets _____ **B. maxima**

1. Spikelets small, 2–6 mm long; inflorescences with many spikelets _____ **B. minor**

Briza maxima L., (largest), BIG QUAKING GRASS. Plant to ca. 60 cm tall, glabrous or leaf blades minutely scabrous; ligule of uppermost leaf usually 10 mm or more long; spikelets 12–25 mm long, 8–12 mm wide, with 7–14(–20) florets, not markedly tapered, longer than wide, on long, slender, drooping pedicels. Introduced as a garden ornamental; included based on citation for vegetational area 5 by Hignight et al. (1988); mainly se and e TX. Apr–May. Native of Europe. 🌿

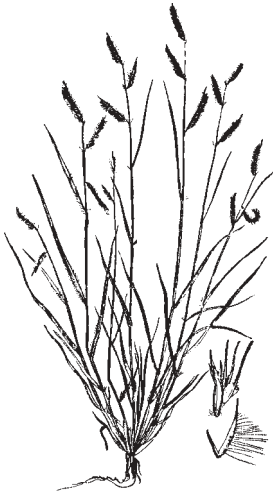
Briza minor L., (smaller), LITTLE QUAKING GRASS. Plant to ca. 50 cm tall, glabrous or nearly so; ligules 5–10 mm long; spikelets ca. 2–6 mm wide, with 3–8 florets, markedly tapered toward apex, often almost triangular in shape, about as wide as long, pendulous on long usually kinked pedicels. Open areas in woods, fields, disturbed places, sandy areas; Grayson and Tarrant cos., also Lamar Co. (Carr 1994); mainly se and e TX. Mostly Apr–May. Native to Europe. Reported to contain cyanide (Burlage 1968). 🌿

BROMUS BROME GRASS, CHESS

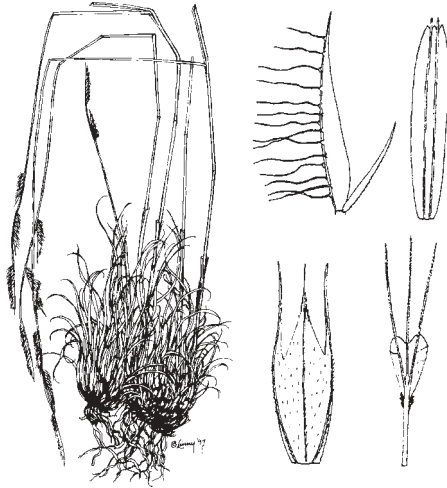
Plants annual or perennial; leaf sheaths closed except at summit; ligule a membrane, often prominent; inflorescence a usually ± 1-sided (barely so in *B. hordeaceus*) panicle or infrequently a raceme; spikelets pedicelled, with 4–numerous florets; lemmas 2-toothed at apex (inconspicuously in *B. catharticus*), usually awned, with awn arising between the teeth, or awnless.

☞ A genus of ca. 100 species of temperate regions and tropical mountains; some are used as ornamentals and for forage. (An ancient Greek name for oats; from *broma*, food) (subfamily Pooideae, tribe Bromeae)

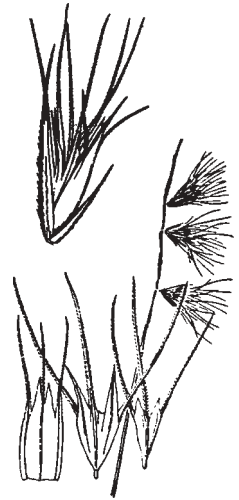
REFERENCES: Wagon 1952; Soderstrom & Beaman 1968.



Bouteloua hirsuta [US8]



Bouteloua pectinata [BOT, HEA]



Bouteloua rigidisetata [HI1]



Bouteloua trifida [US8]



Brachypodium distachyon [GLE]



Briza maxima [LAM]



Briza minor [BB2]



Bromus catharticus [US8]



Bromus hordeaceus [US8]

1. Glumes and lemmas sharply keeled, the spikelets strongly flattened; lower lemmas 2.5–3.2 mm wide from keel to margin, awnless or with a short awn 1–3 mm long, with apical teeth 0.1–0.3 mm long _____ **B. catharticus**
1. Glumes and lemmas not sharply keeled, the spikelets not strongly flattened; lower lemmas 1.0–2.7 mm wide from keel to margin, with an awn 4–18 mm long, with apical teeth 0.2–5 mm long (sometimes appressed, inconspicuous).
2. Apical teeth of lemmas 2–5 mm long, thin, whitish or transparent, lance-linear, acuminate; awn of lemmas 12–18 mm long _____ **B. tectorum**
2. Apical teeth of lemmas 0.2–2.5 mm long, papery, opaque, triangular or ovate, acute or obtuse; awn of lemmas 4–13 mm long.
3. Lower glume usually 1-nerved; upper glume narrowly oblong-lanceolate, 0.8–1.3 mm wide from keel to margin, 6–12 mm long; plants perennial, typically found in woods _____ **B. pubescens**
3. Lower glume 3- or 5-nerved; upper glume broadly lanceolate or oblong-elliptic, 1.2–2 mm wide from keel to margin, 4–8 mm long; plants annual, typically found in disturbed areas.
4. Glumes pubescent _____ **B. hordeaceus**
4. Glumes glabrous or slightly pubescent on nerves or near apex.
5. Palea from 0.8 mm shorter than lemma to equaling or barely exceeding it; mature lemmas mostly 6–7.5 mm long, with margins inrolled; awns usually 4–9 mm long; basal leaf sheath glabrous or inconspicuously hirsute _____ **B. secalinus**
5. Palea 1–2 mm shorter than lemma; mature lemmas mostly 7–9 mm long, with margins not inrolled; awns usually 8–13 mm long; basal sheaths often conspicuously (with a lens) shaggy-pilose _____ **B. japonicus**

Bromus catharticus Vahl, (cathartic, purgative), RESCUE GRASS, RESCUE BROME, SCHRADER'S GRASS. Winter annual, in green growth from late fall to summer, 10–70 cm tall when in flower; leaf sheaths spreading-pilose; spikelets glabrous. Roadsides, disturbed sites, lawns; throughout TX. Mar–May. Native of s South America. [*B. willdenowii* Kunth, *B. uniolooides* Kunth, *Festuca uniolooides* Willd.] 🌿

Bromus hordeaceus L., (like barley—*Hordeum*), SOFT CHESS. Annual 10–60 cm tall; lower leaf sheaths densely pilose, the upper glabrous; lemmas densely pubescent. Found as a weed at Denton Agricultural Experiment Station in May, 1947; Denton, Limestone, and McLennan cos.; also e TX. Native of Europe. [*B. mollis* of authors, not L., *B. molliformis* J. Lloyd] 🌿

Bromus japonicus Thunb. ex Murray, (Japanese), JAPANESE BROME, JAPANESE CHESS, SPREADING BROME. Annual 20–80 cm tall; leaf sheaths densely soft-pubescent or occasionally the uppermost glabrous; leaf blades densely pilose; panicles rather dense, with drooping branches; lemmas glabrous; awns either straight or bent out in age. Roadsides, yards, and disturbed sites; nearly throughout TX. May–Jun. Native of Europe and Asia. 🌿

Bromus pubescens Muhl. ex Willd., (downy). Perennial 70–120 cm tall, forming small clumps; leaf sheaths spreading-pilose; spikelets drooping; lemmas usually densely pubescent. Woods and thickets; Bosque, Dallas, Denton, Fannin, Grayson, McLennan, and Tarrant cos., also Johnson Co. (R. O'Kennon, pers. obs.); e TX w to nc TX and Edwards Plateau. May. We are following Gould (1975b) in lumping [*B. nottowanus* Fernald]; the name has been applied to individuals with 5-nerved first glumes.

Bromus secalinus L., (like rye—*Secale*), RYE BROME. Annual, 20–100 cm tall; leaf sheaths glabrous or (especially lower ones) densely pubescent; leaf blades usually ± pilose; panicles narrow, slightly drooping; lemmas glabrous or inconspicuously pubescent. Roadsides, fields, and disturbed sites; widespread in TX. Apr–Jun. Native of Europe. Similar to and possibly hybridizes with *B. japonicus*. Texas plants of *B. secalinus* have been treated as *B. racemosus* by a number of

authors. However, we are following Gould (1975b), Hatch et al. (1990), and Jones et al. (1997) in placing them in *B. secalinus*. [*B. racemosus* of authors, not L.] ☞

Bromus tectorum L., (of houses), CHEAT GRASS BROME. Annual 10–80 cm tall; lower leaf sheaths densely pubescent, the upper glabrous; panicle branches drooping. Roadsides, railroads, and disturbed sites. Apr–May. Native of Europe; in TX since 1945 (Mahler 1988). The awns can cause mechanical injury to grazing livestock (Burlage 1968). ☞

1. Lemmas glabrous or scabrous _____ var. **glabratus**
 1. Lemmas soft pubescent _____ var. **tectorum**

var. **glabratus** Spenn., (rather smooth, without hairs), CHEAT GRASS. Included based on citation of vegetational area 4 (Fig. 2) by Gould (1975b) and Hatch et al. (1990); in TX cited only for vegetational area 4. Spring. ☞

var. **tectorum**. CHEAT GRASS, DOWNY BROME, DOWNY CHESS, BRONCO GRASS. Collin, Denton, Grayson, Hill, McLennan, and Wise cos., nc TX s and w to w TX. Apr–May(–Jun). ☞

BUCHLOE BUFFALO GRASS

☞ A monotypic North American genus. (Greek: *bous*, cow or ox, and *chloë*, grass) (subfamily Chloridoideae, tribe Cynodonteae)

Buchloe dactyloides (Nutt.) Engelm., (finger-like), BUFFALO GRASS. Perennial; plants dioecious or occasionally monoecious, stoloniferous forming sod; leaves usually with short, curly blades; ligule a ciliate membrane ca. 0.5 mm long, not auricled; staminate inflorescences elevated above the leaves, with 1–4 spike-like branches 6–14 mm long; staminate spikelets usually 6–12 per branch, sessile, pectinately arranged, 2-flowered; glumes unequal, 1(–2)-nerved; lemmas 3-nerved; pistillate inflorescences bur-like, usually hidden in leafy portion of plant, closely subtended by inflated leaf sheaths, with usually 3–5(–7) one-flowered spikelets, falling entire; inflorescence axis indurate; second glumes indurate, yellowish with apex toothed, green; lemmas 3-nerved, 3-lobed. Grasslands; throughout TX. Apr–Sep. This species is dominant over large areas of the short grass prairie of the Great Plains; it was used by settlers in making sod houses; it is currently increasing in use as a low maintenance, drought resistant yard grass.

CENCHRUS SANDBUR, GRASSBUR

Annuals or perennials, largely glabrous; leaf sheaths compressed and keeled; ligule of hairs; inflorescence spike-like, with zigzag, triangular-flattened axis; spikelets of 2 florets, the lower floret sterile with glume-like lemma, the upper floret fertile with hardened grain-like lemma, enclosed in bur-like involucre with bristles and spines that penetrate the flesh and are quite painful.

☞ A genus of 30 species of warm and dry regions of America, Africa, and India. The “burs” are particularly problematic in areas where sheep are raised. (Modification of the old Greek name, *cenchros*, of *Setaria italica*) (subfamily Panicoideae, tribe Paniceae)

REFERENCES: DeLisle 1963; Crins 1991.

1. Bur with 1 whorl of united flattened spines confined to lower part of bur, subtended by 1–several whorls of shorter, finer bristles _____ **C. echinatus**
 1. Bur with more than one whorl of flattened spines, the spines present irregularly throughout the body of the bur, usually not subtended by whorls of bristles.
 2. Bur usually with 8–40 spines, the base of larger spines often to 1.5 mm wide, the base of bur usually without numerous, thin, down-pointing spines _____ **C. spinifex**

2. Bur usually with 45–75 spines, the base of larger spines 1 mm wide or less, the base of bur with numerous, thin, down-pointing spines _____ **C. longispinus**

Cenchrus echinatus L., (finger-like), SOUTHERN SANDBUR, HEDGE-HOG GRASS, CADILLO. Annual with geniculate or trailing culms to 85 cm long; bur short pubescent; spines and bristles retrorsely barbed. Disturbed areas; included based on citations for vegetational area 4 (Fig. 2) by Gould (1975b) and Hatch et al. (1990); mainly se and e TX. Spring–fall.

Cenchrus longispinus (Hack.) Fernald, (long-spined), LONG-SPINE SANDBUR. Annual; culms partly decumbent, 15–65 cm long; bur long-pubescent; spines retrorsely barbed. Sandy or gravelly sites, disturbed areas; Grayson, Montague, and Parker cos., also Tarrant Co. (R. O'Kennon, pers. obs.); Oak-pine s and w to w TX. Jun–Oct.

Cenchrus spinifex Cav. (spiny), COMMON SANDBUR, GRASSBUR. Perennial but flowering the first year; culms partly decumbent, up to 100 cm long; bur glabrous to short-pubescent; spines retrorsely barbed. Sandy or gravelly sites, disturbed areas; throughout TX. May–Oct. [*C. carolinianus* of authors, not Walter, *C. incertus* M.A. Curtis] We are following Jones et al. (1997) and J. Kartesz (pers. comm. 1997) for nomenclature of this species.

CHASMANTHIUM WOOD-OATS

Perennials, ours rhizomatous; leaf blades broad, flat; ligule in ours a minute ciliate membrane; inflorescence an open or contracted panicle (rarely a raceme); spikelets (2–)3–many-flowered, laterally flattened, sometimes conspicuously so; glumes shorter than lemmas; lower 1–2 florets often not seed-bearing; rachilla disarticulating above the glumes and between the florets.

☛ A genus of 6 species of e North America; in the past it was recognized as part of the genus *Uniola*, which includes *U. paniculata* L., a coastal dune species, known as SEA OATS. However, it is now recognized that *Chasmanthium* and *Uniola*, while superficially similar, belong in different subfamilies. (Greek: *chasme*, gaping, and *anthus*, flower, presumably from the form of the spikelets) (subfamily Panicoideae, tribe Centothecae)

REFERENCES: Yates 1966a, 1966b; Clark 1990; Wipff & Jones 1994 [1995].

1. Inflorescence branches drooping, the spikelets long-pedicelled; spikelets (10–)20–50 mm long, 6–17(–26)-flowered _____ **C. latifolium**
1. Inflorescence branches erect or ascending, the spikelets subsessile or short-pedicelled; spikelets 5–18 mm long, 3–7-flowered _____ **C. laxum**

Chasmanthium latifolium (Michx.) H.O. Yates, (broad-leaved), WILD OATS, BROAD-LEAF WOOD-OATS, CREEK-OATS. Glabrous perennial, 0.4–1.5 m tall, with short rhizomes; culms leafy to 4/5 of their height; leaf blades 8–20(–30) mm wide; spikelets conspicuously flat, very wide (6–20 mm). Along streams and in moist woods; one of our most common woodland grasses; e 1/2 of TX. Jun–Sep. [*Uniola latifolia* Michx.] The large spikelet size makes this an excellent example to use in demonstrating spikelet structure to students; the dried inflorescences are also sometimes used ornamentally in dried flower arrangements.

Chasmanthium laxum (L.) H.O. Yates, (loose), Clumped perennial, glabrous or pubescent; culms usually 0.7–1.5 m tall, leafy < 1/2 their height; leaf blades usually 4–12(–15) mm wide; spikelets flat, 3–5 mm wide.

1. Leaf sheaths essentially glabrous or nearly so; collar of leaf sheaths glabrous; panicle branches ± appressed _____ var. **laxum**
1. Leaf sheaths (at least lower) usually long-pubescent or hirsute (rarely glabrous); collar of leaf sheaths pubescent; panicle branches ± divergent _____ var. **sessiliflorum**



Bromus japonicus [REE]



Bromus pubescens [IOW]



Bromus secalinus [REE]



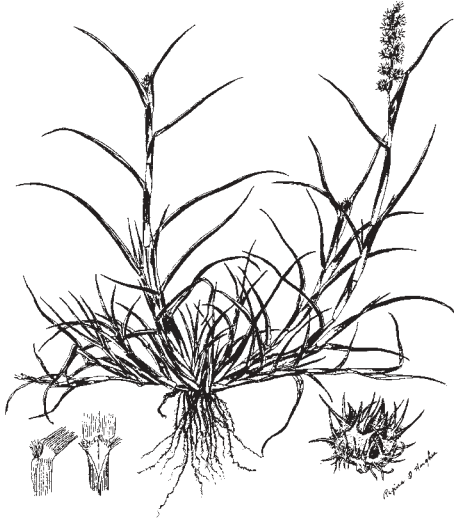
Bromus tectorum var. *tectorum* [REE]



Buchloe dactyloides [H1]



Cenchrus echinatus [REE]



Cenchrus longispinus [REE]



Cenchrus spinifex [REE]

var. **laxum**. Moist, usually sandy areas; Lamar Co. in Red River drainage; mainly se and e TX. Jun–Nov. [*Uniola laxa* (L.) Britton, Sterns, & Poggenb.]

var. **sessiliflorum** (Poir.) Wipff & S.D. Jones, (sessile-flowered), NARROW-LEAF WOOD-OATS. Moist forests and prairie openings, sandy soils; Fannin and Lamar cos. in Red River drainage; mainly se and e TX. Jun–Nov. We are following Wipff and Jones (1994 [1995]) for the nomenclature of this taxon. [*C. laxum* subsp. *sessiliflorum* (Poir.) L.G. Clark, *C. sessiliflorum* (Poir.) H.O. Yates, *Uniola sessiliflora* Poir.]

CHLORIS WINDMILL GRASS

Annuals or perennials; leaf sheaths strongly compressed and sharply keeled; ligule a ciliate membrane; branches of inflorescence digitately or subdigitately arranged at tip of culm or in several whorls; spikelets with 1 perfect floret at base and 1 or more reduced ones above; margins of perfect lemmas often variously pubescent.

☛ A genus of 40 species of tropical and warm areas of the world; it includes some pasture grasses. (Named for Chloris, Greek mother of Nestor, goddess of flowers) (subfamily Chloridoideae, tribe Cynodonteae)

REFERENCES: Nash 1898; Anderson 1974.

1. Branches of inflorescence in more than 1 whorl on main axis _____ **C. verticillata**
1. Branches of inflorescence in 1 whorl only.
 2. Awn of lower lemmas 1.5 mm or less long; lower lemmas 1.5–2 mm long _____ **C. cucullata**
 2. Awn of lower lemmas 2 mm or more long; lower lemmas 2.2–4.2 mm long.
 3. Inflorescences appearing bristly-woolly at arms length; awns 5–15 mm long; upper margins of lower lemmas with a prominent tuft of hairs to ca. 2–3 mm long; plants annual _____ **C. virgata**
 3. Inflorescences not appearing bristly-woolly at arms length; awns 1.5–6 mm long; upper margins of lower lemmas with or without a tuft of hairs; plants perennial.
 4. Sterile or staminate florets (1–)2–4, similar to perfect floret but smaller, often tapering to apex, much longer than wide; upper margins of lower lemmas with a prominent tuft of hairs _____ **C. gayana**
 4. Sterile or staminate floret 1, usually distinctly different from perfect floret, often with a squared-off apex, often nearly as wide as long, sometimes triangular; upper margins of lower lemmas without a prominent tuft of hairs _____ **C. subdolichostachya**

Chloris cucullata Bisch., (hooded), HOODED WINDMILL GRASS, CROWFOOT GRASS, HOODED FINGER GRASS. Perennial; panicle branches 10–20, 2–5 cm long; lower lemma broadly elliptic; sterile floret 1, conspicuously inflated. Sandy soils; mainly East and West cross timbers in nc TX; in much of TX except far e part. Apr–Oct.

Chloris gayana Kunth, (for Jacques Etienne Gay, 1786–1864, French botanist), RHODES GRASS. Perennial; panicle branches 9–30, 8–15 cm long; lemma of lower (perfect) floret 2.5–3.2 mm long, somewhat gibbous (= swollen on 1 side), the awn 1.5–6.5 mm long; sterile florets somewhat gibbous. Cultivated forage grass, escapes along roadsides; included based on citation for vegetational area 5 by Hignight et al. (1988); mainly s TX. May–Dec. Probably native to e Africa. ☛

Chloris subdolichostachya Müll.Hal., (somewhat small-spiked), SHORT-SPIKE WINDMILL GRASS. Perennial, stoloniferous; panicle branches 5–numerous, 3–17 cm long; lemma of lower (perfect) floret 2.2–2.9 mm long, not gibbous, the awn 2–5 mm long; sterile florets variable. Disturbed sandy sites; in much of e 1/2 of TX. May–Oct. [*Chloris latisquamea* Nash] Jones et al. (1997) treated this taxon as *C. ×subdolichostachya* [*C. cucullata* × *C. verticillata*].

Chloris verticillata Nutt., (whorled), TUMBLE WINDMILL GRASS, WINDMILL FINGER GRASS. Peren-



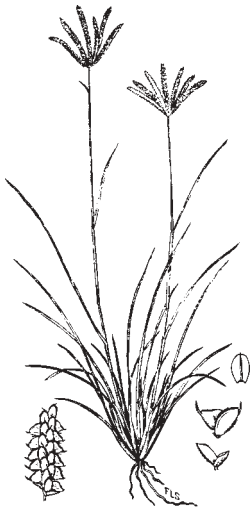
Chasmanthium latifolium [usb]



Chasmanthium laxum var. *laxum* [usb]



Chasmanthium laxum var. *sessiliflorum* [usb]



Chloris cucullata [usb]



Chloris gayana [go1]



Chloris subdolichostachya [go1]



Chloris verticillata [usb]



Chloris virgata [h11]



Coelorachis cylindrica [h11]

nial; panicle branches 5–15 cm long, 10–16 per verticil, in 2–5 verticils; lemma of lower (perfect) floret 2–3.5 mm long, not gibbous; sterile floret 1, slightly inflated. Disturbed clay or sandy sites; mainly Blackland Prairie w to w TX. A minor member of original prairie, increasing under disturbance. May–Oct.

Chloris virgata Sw., (twiggy, wand-like), FEATHER FINGER GRASS, SHOWY CHLORIS. Annual; panicle branches 5–10 cm long, 4–20; lemma of lower (perfect) floret 2.5–4.2 mm long, gibbous, producing beaked apical appearance; sterile floret 1, similar to fertile except smaller. Disturbed prairies and roadsides; throughout TX. May–Nov.

Enteropogon chlorideus (J. Presl) Clayton, (genus: ? Greek, *entero*, intestine, and *pogon*, beard; sp.: presumably for resemblance to *Chloris*), (BURY-SEED CHLORIS), previously treated in *Chloris* [as *C. chloridea* (J. Presl) Hitchc.], is cited by Hatch et al. (1990) for vegetational area 4 (Fig. 2), apparently based on a Brazos Co. record (Gould 1975b) to the se of nc TX. This species can be distinguished by the lemma of lower (perfect) floret 4.5–7.5 mm long (versus < 4.5 mm long in all nc TX *Chloris* species) and the plants with underground cleistogamous spikelets at the tips of rhizomes (not present in any nc TX *Chloris* species).

COELORACHIS JOINT-TAIL

☛ A mainly tropical genus of 21 species; related to *Rottboellia*. (Greek: *coelo*, hollow, and *rachis*, spine or backbone, possibly from the niches in the rachis (= inflorescence axis) into which the spikelets fit) (subfamily Panicoideae, tribe Andropogoneae)

REFERENCES: Clayton 1970; Veldkamp et al. 1986.

Coelorachis cylindrica (Michx.) Nash, (cylindrical), CAROLINA JOINT-TAIL. Glabrous perennial with hard-based, solitary or loosely clumped, erect to over-arched culms 25–100 cm long; old plants with short, knotty rhizomes; ligule a short membrane 0.5–1 mm long; inflorescence a very slender (ca. 3 mm thick), elongate cylindrical spike-like raceme (pencil-like but much smaller in diam.) breaking apart at the nodes of the inflorescence axis, the base of each internode with a niche on one side into which the spikelets fit closely; spikelets awnless, in pairs of 1 sessile, fertile (with a pitted glume) and 1 pedicelled, sterile. Prairies and open woods, sandy or clayey soils; widespread in e 1/2 of TX. May–Jun. An important component of certain native sandy prairies, including “mima mound” prairies. [*Manisuris cylindrica* (Michx.) Kuntze, *Mnesithea cylindrica* (Michx.) de Koning & Sosef] Jones et al. (1997) treated this species as *Mnesithea cylindrica*; however, J. Wipff (pers. comm.) has since indicated that the species is better treated in the genus *Coelorachis*.

CORTADERIA PAMPAS GRASS

☛ A genus of 24 species of coarse, clump-forming grasses native to South America, New Zealand, and New Guinea. (From the Argentinian name; a term for cutting) (subfamily Chloridoideae, tribe Danthonieae)

Cortaderia selloana (Schult. & Schult.f.) Asch. & Graebn., (for Friedrich Sellow, 1789–1831, German botanist who collected in South America), PAMPAS GRASS. Dioecious perennial to ca. 3 m tall, forming large clumps to 1 m or more in diam.; leaves mostly basal, the blades usually 0.6–1 m or more long, with scabrous margins; ligule a dense tuft of hairs 3–5 mm long; inflorescence a showy, densely flowered, silvery, feathery panicle 25–100 cm long; spikelets 2–3-flowered, disarticulation above glumes and between florets; pistillate lemmas with long silky hairs; staminate lemmas glabrous. No escaped nc TX specimens have been seen, but this species is widely cultivated throughout TX as a lawn ornamental and long persists. Sep–Nov. Native from Brazil to Argentina and Chile. ☛

CYNODON BERMUDA GRASS

☛ A tropical and warm area genus of 8 species; it includes pasture and lawn grasses. (Greek: *cyon*, dog, and *odous*, tooth, from the close rows of tooth-like spikelets or the hard scales on rhizomes) (subfamily Chloridoideae, tribe Cynodonteae)

REFERENCE: deWet & Harlan 1970.

Cynodon dactylon (L.) Pers., (fingered), BERMUDA GRASS, BAHAMA GRASS. Rhizomatous and stoloniferous perennial 10–40 cm tall; leaf sheaths compressed, keeled, with tufts of hairs at summit; lower leaf sheaths also pilose on back; ligule a short ciliate membrane 0.2–0.5 mm long; branches of inflorescence usually digitately arranged at tip of culm; spikelets with 1 perfect awnless floret, closely overlapping, in 2 rows on a flattened or triangular branch. Cultivated in nc TX since about 1882 for pasture and lawns (Mahler 1988), also a common weed throughout TX. May–Oct. Native probably of Africa, but India has been suggested also (not from Bermuda, despite the common name). Reported to be an important cause of hay fever and potentially poisonous to livestock due to the production of hydrocyanic acid under certain environmental conditions (Lewis & Elvin-Lewis 1977; Fuller & McClintock 1986). ☛ ☞

DACTYLIS

☛ A genus of 1–5 Eurasian species (often considered monotypic). (Greek *dactylus*, finger; a name used by Pliny for a grass with digitate spikes or from the crowded spikelets at inflorescence tips) (subfamily Pooideae, tribe Poeae)

Dactylis glomerata L., (clustered), ORCHARD GRASS, COCK'S-FOOT. Erect, densely clumped perennial to 1 m tall; leaf blades 2–10 mm wide; ligules membranous, 2–5 mm long; panicles long exserted, with or without elongated lower branches, of rather dense terminal aggregations of nearly sessile groups of spikelets; spikelets usually with 2–5 flowers, ca. 5–9 mm long. Roadsides, field margins, yard weed; Grayson (first observed 1998) and Tarrant (first observed 1996) cos.; introduced as a forage grass, now a weed in scattered localities in TX. Spring–Summer. Native to Eurasia. This species is now widely naturalized in North America and s Africa; it is an important cause of hay-fever and is complex genetically, there being diploid and tetraploid forms (Mabberley 1997). ☛ ☞

DACTYLOCTENIUM CROWFOOT

☛ A genus of 10 species of warm areas of the world. (Greek *dactylos*, finger, and *ctenion*, a little comb, referring to the finger-like arrangement of the comb-like inflorescence branches) (subfamily Chloridoideae, tribe Eragrostideae)

REFERENCE: Peterson et al. 1997.

Dactyloctenium aegyptium (L.) P. Beauv., (of Egypt), CROWFOOT, DURBAN CROWFOOT GRASS, EGYPTIAN CROWFOOT GRASS. Annual with culms mostly 10–60 cm tall, often rooting at lower nodes; ligule a membrane usually 0.1–1 mm long, fringed with short hairs; leaf blades 2–9 mm wide; inflorescences with 2–7(–more) digitately arranged branches usually 1.5–6 cm long; branch tip projecting 1–7 mm beyond terminal spikelets as a sharp point; spikelets sessile, very crowded, in 2 rows along one side of the narrow flattened branch, strongly laterally compressed, usually 3–4 mm long, with 3–5 flowers; second glumes and lemmas usually with short awns. Usually sandy soils, moist areas, disturbed sites; Bell Co.; se and e TX w to s part of nc TX, also Edwards Plateau. (Jul–)Sep–Dec. Native of the Old World tropics. ☛ ☞

DANTHONIA POVERTY-OATS

☛ A genus of 100 species native to North America, South America, Europe, Australia, and New

Zealand. (Named for Etienne Danthoine, an early 19th century French botanist of Marseilles) (subfamily Chloridoideae, tribe Danthonieae)

REFERENCE: Darbyshire & Cayouette 1989.

Danthonia spicata (L.) P. Beauv. ex Roem. & Schult., (with spikes), POVERTY-OATS, POVERTY DANTHONIA, POVERTY OAT GRASS. Tufted perennial 25–50 cm tall, with crowded, mostly basal leaves; leaf sheaths pilose near summit; leaf blades persistent, curling in age; ligule a short membrane with long-ciliate margin longer than base; inflorescences narrow, short, spike-like; spikelets erect, 10–13(–15) mm long, with 3–7(–9) florets, on pedicels ca. 1–8 mm long; glumes much longer than lemmas; lemmas awned from between apical acute or acuminate teeth, the awns ca. 5–7 mm long, spirally twisted near base, geniculate. Sandy open woods; Dallas, Grayson, Hunt, and Lamar cos.; mainly e TX. May–Jul.

DESMAZERIA

☛ A genus of 3 species native from Europe to n Africa and Iran; treated here as including *Catapodium*. (Named for J.B. Desmazieres, French botanist) (subfamily Pooideae, tribe Poeae)

Desmazeria rigida (L.) Tutin, (rigid), Glabrous tufted annual 10–30 cm tall; ligule a membrane 1.5–4 mm long; panicles usually 3–10 cm long, narrow, dense, erect; spikelets (4–)5–9(–10)-flowered; glumes and lemmas awnless. Railroads, stock pens, roadsides, and disturbed areas; Hill Co., also Ellis and Wise cos. (Mahler 1988); scattered in e 1/2 of TX. Apr–May. Native of Europe. Sometimes recognized in the genus *Catapodium* [as *C. rigidum* (L.) C.E. Hubb. ex Dony]. [*Scleropoa rigida* (L.) Griseb.] ☛

DIARRHENA BEAKGRAIN

Rhizomatous perennials; culms arching; leaves basal and low cauline; leaf blades flat; ligule a membrane; inflorescence a narrow panicle, long exserted and arching; spikelets with 3–5 florets, the terminal floret reduced and sterile; florets often ± spreading at maturity; glumes 2, awnless; lemmas ± rounded on back, awnless, with a sharp cusp 1–2 mm long at apex; caryopsis (= fruit or grain) with a beak.

☛ A genus of 4 species of e Asia and North America. Subfamilial classification of this genus is problematic with some authorities putting it in the Pooideae and others in the Bambusoideae (Brandenburg et al. 1991a). The following key is from Brandenburg et al. (1991a). (Greek: *dis*, twice, and *arrhen*, male, from the two stamens) (subfamily Pooideae, tribe Diarrheneae)

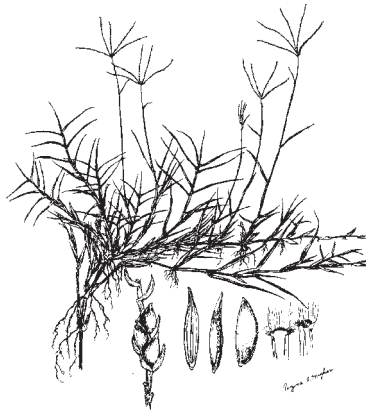
REFERENCE: Brandenburg et al. 1991a.

1. Callus pubescent on all mature lemmas except first; lemmas widest below the middle and gradually tapering into a cusp at apex, those of first floret 7.1–10.8 mm long; mature fruits 1.3–1.8 mm broad, gradually tapering into a broad, blunt beak _____ **D. americana**
1. Callus glabrous on all mature lemmas; lemmas widest near or above the middle and ± abruptly contracted into cusp at apex, those of the first floret 4.6–7.5 mm long; mature fruits 1.8–2.5 mm broad, abruptly contracted into a bottlenose-shaped beak _____ **D. obovata**

Diarrhena americana P. Beauv., (of America), AMERICAN BEAKGRAIN. Culms ca. 0.6–1.3 m long; leaf blades 7–20 mm wide; ligule a membranous collar 0.5–1.8 mm long; inflorescences 9–30 cm long, with 4–23 spikelets; spikelets 10–20 mm long; lemmas (3.8–)5.3–10.8 mm long, glabrous to scaberulous; anthers (1.7–)2–2.9(–3.5) mm long. This species has long been reported from nc TX based on a Reverchon collection from Dallas (Mahler 1988). However, Dallas material is of the recently named, related species, *D. obovata* (Brandenburg et al. (1991a). *Diarrhena americana*, native to the e U.S., is known from e OK but is apparently unknown from TX (Brandenburg et al. (1991a). Hatch et al. (1990) reported *D. americana* from vegetational area 1



Cortaderia selloana [EN2]



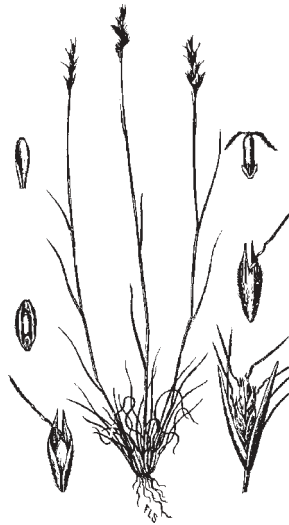
Cynodon dactylon [REE]



Dactylis glomerata [H11]



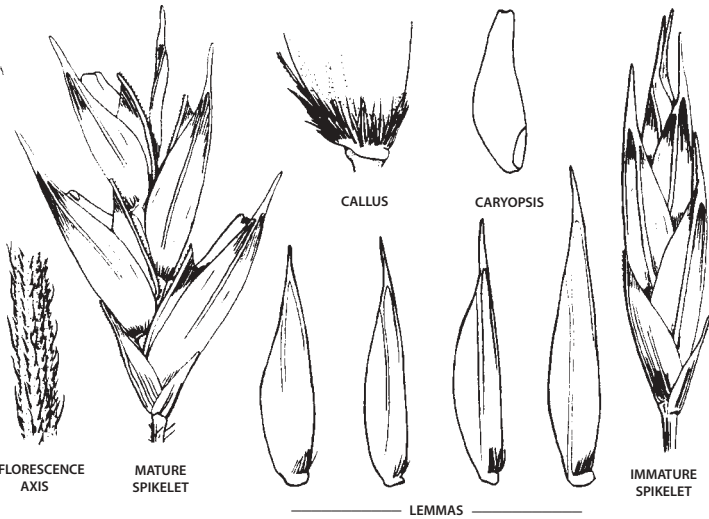
Dactyloctenium aegyptium [US8]



Danthonia spicata [US8]



Desmazeria rigida [BR2]



Diarrhena americana [TOR, US8]

(deep e TX), but it is not known which species this citation represents. *Diarrhena americana* is included here to help clarify recent changes in the taxonomy of the genus. Summer–fall.

Diarrhena obovata (Gleason) Brandenburg, (obovate, inversely ovate). Culms ca. 0.5–1.3 m long; leaf blades 6–18 mm wide; ligules 0.2–1 mm long; inflorescences 5–30 cm long, with 4–33 spikelets; spikelets 7–17 mm long; lemmas 4.6–7.5 mm long, glabrous; anthers 1.4–2 mm long. Woodlands; collected by Reverchon in Jun, 1874, in “rich woods, Buzzards Spring” (now in e Dallas and a residential section), not found in nc TX since (cited in Mahler 1988 as *D. americana*); Brandenburg et al. (1991a) indicated that the only TX collection is from Dallas Co. Summer–fall. [*D. americana* var. *obovata* Gleason]

DICHANTHIUM BLUESTEM

☛ An Old World tropical genus of 10 species; formerly treated in a more inclusive *Andropogon*. (presumably from Greek: *dicho*, in two, and *anthus*, flower, in reference to the paired spikelets) (subfamily Panicoideae, tribe Andropogoneae)

REFERENCE: Gould 1967.

Dichanthium annulatum (Forssk.) Stapf, (ringed, ring-like), KLEBERG BLUESTEM. Perennial superficially resembling *Bothriochloa ischaemum* var. *songarica* (KING RANCH BLUESTEM) but with much longer and more conspicuous lemma awns; culms both erect and stoloniferous; nodes bearded with a conspicuous ring of long white hairs; ligule a short membrane; inflorescences with (2–)3–5(–8) spicate branches, the lowest pair of spikelets on the branches usually without awns and not producing seeds; main inflorescence axis and branches just below spikelets glabrous; pedicels and inflorescence branches without a groove or membranous area; spikelets in pairs, one sessile, awned, the other pedicelled, awnless; pedicelled spikelets ca. the same size as the sessile spikelets, rounded apically; awn of lemma of sessile spikelets ca. 2–2.5 cm long; disarticulation at base of sessile spikelet so that the associated pedicel and section of the inflorescence branch fall with the sessile spikelet. Introduced as a forage grass, disturbed areas; Coryell Co. (Fort Hood—Sanchez 1997); mainly introduced in se and s TX. Flowering throughout the growing season. [*Andropogon annulatus* Forsk.] Native of Africa to India and China. ☛

DIGITARIA CRAB GRASS, FINGER GRASS

Annuals or perennials; ligules membranous; inflorescences often digitate or nearly so (sometimes with branches below the terminal cluster), with few to numerous unbranched spike-like branches or an open, much-branched panicle (*D. cognata*); inflorescence branches winged or unwinged; spikelets 2-flowered, the lower floret staminate or neuter, the upper floret perfect, disarticulating below glumes; first glume minute or absent; second glume well-developed but usually shorter than lemmas; lemma of lower spikelet resembling a glume; lemma margins flat, not inrolled.


☛ A genus of ca. 220 species of tropical and warm areas of the world; many are weedy and some are cultivated for food in Africa. As treated here, *Digitaria* includes *Leptoloma*. (Latin: *digitus*, finger, from the finger-like arrangement of the inflorescence branches) (subfamily Panicoideae, tribe Paniceae)

REFERENCES: Henrard 1950; Ebinger 1962; Gould 1963; Webster 1987; Crins 1991; Wipff & Hatch 1994.

1. Spikelets long-pedicelled (pedicels 2–several times as long as spikelet); inflorescence a much branched and rebranched, open panicle with spikelets far apart _____ ***D. cognata***
1. Spikelets subsessile or on short, appressed pedicels; inflorescence of a few main unbranched branches digitately arranged or nearly so (or an unbranched panicle in *D. filiformis*), with spikelets close together.

2. Inflorescence branches winged (wings often as wide as central part of branch); spikelets glabrous to short-pubescent.
3. Spikelets 1.9–2.2 mm long; fertile lemma dark brown at maturity; mainly e TX, rare in nc TX _____ **D. ischaemum**
3. Spikelets 2.2–3.6 mm long; fertile lemma light brown or grayish; abundant in nc TX.
4. Spikelets 2.2–3.3 mm long; second glume 1–1.8 mm long; leaf blades usually densely pubescent; lower lemmas minutely scabrous on lateral nerves (under a dissecting scope) _____ **D. sanguinalis**
4. Spikelets 2.8–3.6 mm long; second glume 1.5–2.7 mm long; leaf blades glabrous or sparsely pubescent; lower lemmas smooth on lateral nerves _____ **D. ciliaris**
2. Inflorescence branches not winged; spikelets silky-pubescent with long white-silky or purplish hairs OR not so.
5. Spikelets silky-pubescent (inflorescences appearing conspicuously white-silky or purplish); spikelets 3–4 mm long; plants caespitose perennials; w part of nc TX _____ **D. californica**
5. Spikelets not silky-pubescent (inflorescences not appearing white-silky or purplish); spikelets 1.5–2.6 mm long; plants tufted annuals; widespread in nc TX.
6. Spikelets 1.5–1.9(–2) mm long; inflorescence branches usually 8–13 cm long _____ **D. filiformis**
6. Spikelets 2–2.6 mm long; inflorescence branches usually 13–25 cm long _____ **D. villosa**

Digitaria californica (Benth.) Henrard, (of California), CALIFORNIA COTTONTOP, ARIZONA COTTONTOP. Perennial with erect culms ca. 50–100 cm tall; leaf blades glabrous; inflorescences digitate or nearly so, the branches usually appressed, densely flowered; second glume and margins of lower floret densely long hairy, the hairs 2–4 mm long. Disturbed grasslands; Erath, Lampasas, and Palo Pinto cos.; w part of nc TX s and w to w TX. May–Sep. [*Trichachne californica* (Benth.) Chase]

Digitaria ciliaris (Retz.) Koeler, (ciliate, fringed), SOUTHERN CRAB GRASS. Annual; similar to *D. sanguinalis*, differing in characteristics as enumerated in key. Common weed; throughout TX. Jun–Nov. According to Gould (1975b), presumably introduced from the Old World. [*D. adscendens* (Kunth) Henrard, *D. sanguinalis* var. *ciliaris* (Retz.) Parl.] 

Digitaria cognata (Schult.) Pilg., (related to), Clump-forming perennial 20–70 cm tall; culms usually decumbent near base; lower leaf sheaths densely pubescent, upper glabrous; ligule a membrane; panicles open, breaking off and acting as tumbleweeds; spikelets long-pedicelled, narrowly lanceolate, acute; lower glume minute or absent; upper glume and sterile lemma similar. In sandy soils, occasional in rocky or gravelly soils, open woods, fields, and disturbed sites. May–Oct, but chiefly Aug–Oct. Sometimes recognized in the genus *Leptoloma* [as *L. cognatum* (Schult.) Chase]. According to Wipff and Hatch (1994), the only character separating *Leptoloma* and *Digitaria* is inflorescence type and that is unreliable. When examined worldwide, there is no justification for separating the 2 genera. The key and nomenclature for this species follows Wipff and Hatch (1994).

1. Lowermost (sterile) lemma 7-veined (rarely 6-); spikelets glabrous to pubescent; rhizomes absent _____ subsp. **cognata**
1. Lowermost (sterile) lemma 5-veined; spikelets densely pubescent; rhizomes present or absent _____ subsp. **pubiflora**

subsp. **cognata**. FALL WITCH GRASS. Limestone, Montague, Palo Pinto, Parker, and Tarrant cos.; widespread in e 1/2 of TX.

subsp. **pubiflora** (Vasey) Wipff, (with hairy flowers), WESTERN WITCH GRASS. Throughout TX.

Digitaria filiformis (L.) Koeler, (thread-like), SLENDER CRAB GRASS, SLENDER FINGER GRASS. Annual with erect culms 50–80 cm tall; inflorescences paniculate, the primary branches un-

branched; second glume usually 3/4 as long as fertile lemma. Sandy fields or woods; Grayson, Parker, and Tarrant cos.; mainly se and e TX. Sep–Oct.

Digitaria ischaemum (Schreb.) Muhl. (Greek: *ischaemos*, blood-restraining, from supposed styp-tic properties), SMOOTH CRAB GRASS. Tufted annual to ca. 50 cm tall; leaf sheaths glabrous; inflorescences digitate or nearly so, the branches ca. 3–9(–11) cm long; spikelets 1.9–2.2 mm long. Open woods; included on basis of citation for vegetational area 5 (Fig. 2) by Hatch et al. (1990); mainly far e TX. Aug–Nov. Native of Europe. 🌿

Digitaria sanguinalis (L.) Scop., (of blood-red color), HAIRY CRAB GRASS, LARGE CRAB GRASS. Annual; culms weak, rooting at nodes; leaves with papilla-based hairs; inflorescences digitate or nearly so, usually with 4–9 branches 6–14 cm long; lemma of lower floret 5-veined, the lateral nerves minutely scabrous above. Weed, much less common in nc TX than *D. ciliaris*; Hood and Wise cos.; also Travis and Wichita cos. just s and w of nc TX; mainly w TX. Jul–Nov. Native of Europe. 🌿

Digitaria villosa (Walter) Pers., (softly hairy), SHAGGY CRAB GRASS. Similar to *D. filiformis* and sometimes treated as a variety of that species; annual with erect culms to 125 cm or more tall, much branched at base; second glume usually > 3/4 as long as fertile lemma, the second glume and fertile lemma usually more pubescent than in *D. filiformis*. Disturbed sandy soils; Dallas Co., also Milam and Limestone cos. at the e edge of nc TX, also Lamar Co. (Carr 1994); mainly se and e TX. Aug–Nov. [*D. filiformis* (L.) Koeler var. *villosa* (Walter) Fernald] Jones et al. (1997) treated this species as a variety of *D. filiformis*.

DISTICHLIS SALT GRASS, ALKALI GRASS

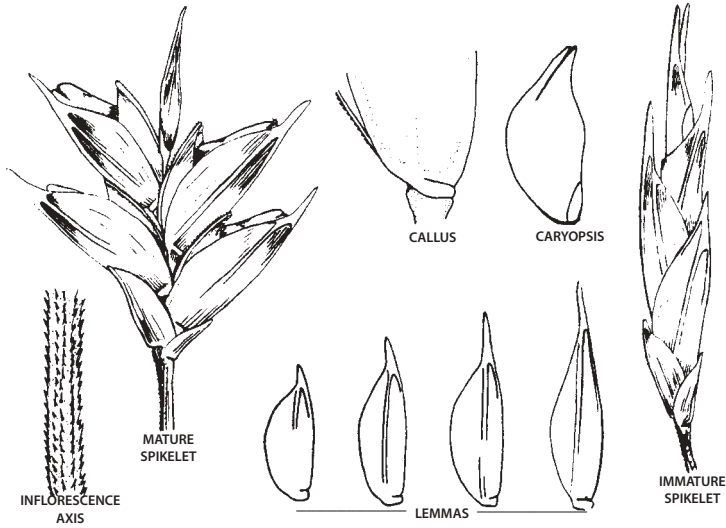
☛ A genus of 5 species, 4 in the New World, 1 in Australia. (Greek: *distichos*, two-ranked) (subfamily Chloridoideae, tribe Eragrostideae)

REFERENCE: Peterson et al. 1997.

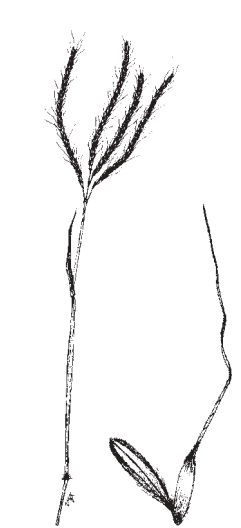
Distichlis spicata (L.) Greene, (with spikes), SALT GRASS, SPICATE SALT GRASS, INLAND SALT GRASS, DESERT SALT GRASS, COASTAL SALT GRASS, SPIKE GRASS, ALKALI GRASS. Low glabrous perennial 10–35(–70) cm tall from extensive scaly rhizomes; usually dioecious; flowering culms erect, the internodes short with leaf sheaths conspicuously overlapping at least on lower portion of culm; leaves noticeably 2-ranked; leaf blades 2–20 cm long, 1–3 mm wide, often ± involute; ligule a minute membrane < 0.5 mm long; inflorescences contracted spike-like panicles or spike-like racemes 3–8 cm long; spikelets pedicellate, ± similar on male and female plants, usually 5–20-flowered, 6–18(–28) mm long, awnless; disarticulation above glumes and between florets; glumes slightly unequal; lemmas similar to glumes but longer and broader, 3–6 mm long, keeled; pistillate lemmas coriaceous, enclosing the caryopsis; paleas as long as lemmas or nearly so. In w 1/2 of TX in alkaline or alkaline-saline areas, along the coast in saline marshes and flats; Brown Co., also Comanche Co. (Stanford 1971); mainly se TX, also Edwards Plateau and Rolling Plains w to w TX. [*Distichlis spicata* var. *stricta* (Torr.) Scribn.] Nc TX plants fall into var. *stricta*, which is here lumped; according to Gould (1975b), this variety “appears to represent little more than a variable series of inland populations of *Distichlis spicata* growing under a wide range of soil and climatic conditions.”

ECHINOCHLOA BARNYARD GRASS

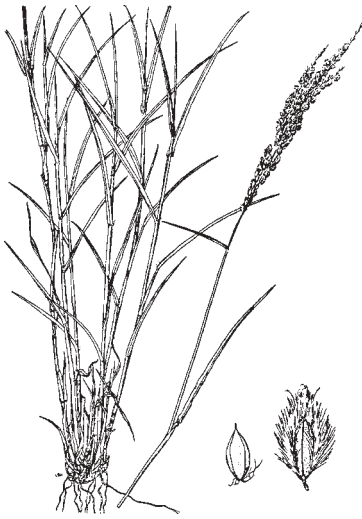
Annuals (our species); ligules absent; panicles dense; spikelets of 2 florets (1 perfect), subsessile, crowded along one side of branches, glabrous, pubescent, or hispid; first glume present, much shorter than second; second glume and lemma of lower (sterile) floret similar; lemma of perfect floret hardened, grain-like, smooth and shiny with inrolled margins.



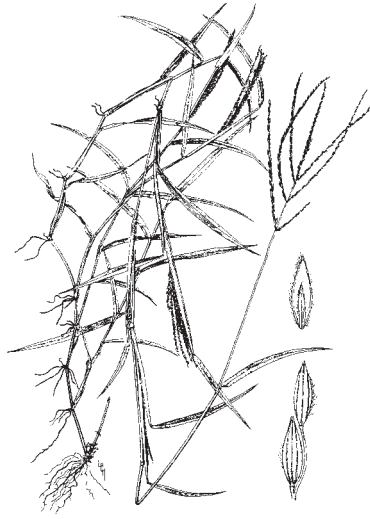
Diarrhena obovata [TOR]



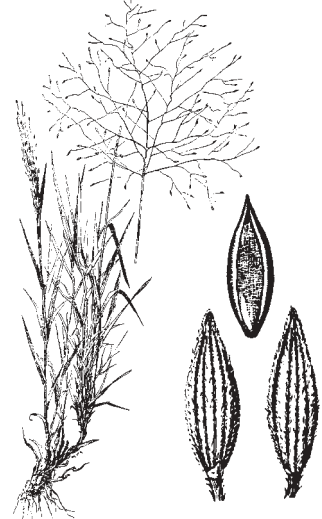
Dichanthium annulatum [GO1]



Digitaria californica [GO3]



Digitaria ciliaris [GO4]



Digitaria cognata subsp. *cognata* [H11]



Digitaria filiformis [H11]



Digitaria ischaemum [REE]



Digitaria sanguinalis [REE]

☞ A genus of ca. 35 species of warm areas of the world. *Echinochloa* species are often extremely variable, making absolute distinctions between taxa difficult. (Greek: *echinus*, sea-urchin, and *chloa*, grass, referring to the bristling awns) (subfamily Panicoideae, tribe Paniceae)

REFERENCES: Hitchcock 1920b; Gould et al. 1972; Crins 1991.

1. Leaf sheaths hirsute or hispid; lemma of lower floret usually with awn 1.5–6 cm long (occasionally short-awned or awnless) _____ **E. walteri**
1. Leaf sheaths glabrous; lemma of lower floret awnless or variously awned.
 2. Palea of lower floret absent or vestigial; spikelets awnless or infrequently with awns to 0.9 cm long _____ **E. crus-pavonis**
 2. Palea of lower floret well-developed; spikelets awnless or awned, the awns if present variable in length, to 6 cm long.
 3. Inflorescence branches 3–7, usually 2(–3) cm or less long; spikelets 2.5–3 mm long, awnless, arranged in 4 regular rows, with hairs without papillate bases; leaf blades 3–6(–9) mm wide _____ **E. colona**
 3. Inflorescence and spikelets without the above combination; leaf blades ca. 3–30 mm wide.
 4. Lemmas with awns usually 1.5–6 cm long; inflorescences usually very large, (10–)20–40 cm or more long and up to 10 cm thick; rare glabrous-sheathed form of this species _____ **E. walteri**
 4. Lemmas awnless or variously awned; inflorescences variable, often smaller; weedy species widespread in nc TX.
 5. Fertile lemma obtuse to broadly acute, with a sharply differentiated, withering, membranous tip; spikelets without papilla-based hairs _____ **E. crus-galli**
 5. Fertile lemma acute to acuminate, tapering to a firm, stiff tip; spikelets usually with some stout, papilla-based hairs _____ **E. muricata**

Echinochloa colona (L.) Link, (farmer), JUNGLE-RICE, SHAMA-MILLET. Spikelets 2.5–3 mm long. Low ground, disturbed areas; throughout TX. Jul–Nov. Native of Old World tropics. ☞

Echinochloa crus-galli (L.) P. Beauv., (cockspur), BARNYARD GRASS. Spikelets 2.8–4 mm long; lower lemma awnless or with an awn to over 5 cm long. Low ground, disturbed areas; throughout TX. Jun–Oct. Apparently introduced from the tropics. ☞

Echinochloa crus-pavonis (Kunth) Schult. var. **macera** (Wiegand) Gould, (sp.: peacock spur; var: soften). Spikelets 2.8–3.1 mm long. Disturbed areas; nearly throughout TX. Jul–Nov.

Echinochloa muricata (P. Beauv.) Fernald, (with numerous minute short points, roughened). Spikelets green or purple, usually conspicuously echinate with stout, papilla-based hairs. Low moist areas. Jul–Nov.

1. Spikelets 3.5 mm or less long (excluding awn); awn of lemma of lower floret absent to 6 mm long _____ var. **microstachya**
1. Spikelets 3.5 mm or more long (excluding awn); awn of lemma of lower floret usually 6–25 mm long (rarely absent) _____ var. **muricata**

var. **microstachya** Wiegand, (small-spiked). Throughout TX.

var. **muricata**. Widespread in TX.

Echinochloa walteri (Pursh) A. Heller, (for an early Carolinian botanist, Thomas Walter, ?1740–1789). Plant 1–2 m tall; leaf sheaths usually hirsute or hispid with papilla-based hairs, especially toward apex, rarely glabrous; spikelets 3–5 mm long (excluding awn), without or with papilla-based hairs; awn of lemma of lower floret usually 1.5–6 cm long but occasionally short-awned or awnless. Low moist areas; Bell, Grayson, and Kaufman cos.; se and e TX w to Blackland Prairie, also Edwards Plateau. Jul–Nov.



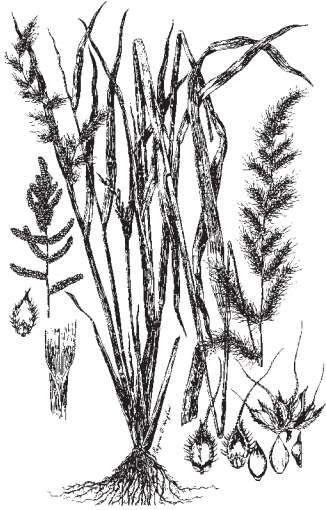
Digitaria villosa [GOZ]



Distichlis spicata [GOI]



Echinochloa colona [MAS]



Echinochloa crus-galli [REE]



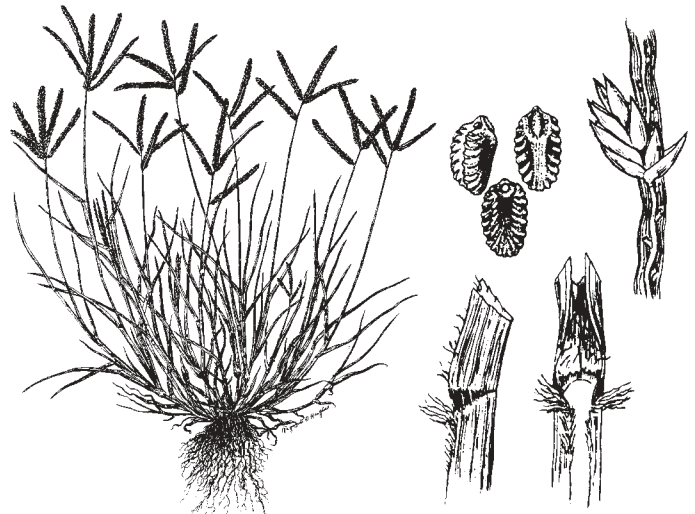
Echinochloa crus-pavonis var. *macra* [H11]



Echinochloa muricata var. *muricata* [RYD]



Echinochloa walteri [GOI]



Eleusine indica [REE]

ELEUSINE GOOSE GRASS

☛ A genus of ca. 9 species of Africa and South America including *E. coracana* (L.) Gaertn. (FIN-GER-MILLET), an important grain crop in Africa and India cultivated since the 3rd Millennium BC. (Named from Eleusis, Greek town where Ceres, the goddess of harvests, was worshiped) (subfamily Chloridoideae, tribe Eragrostideae)

REFERENCE: Peterson et al. 1997.

Eleusine indica (L.) Gaertn., (of India), GOOSE GRASS, YARD GRASS, ZACATE GUAIMA. Annual with decumbent to erect culms 15–65 cm long; leaf sheaths compressed, keeled, pilose on margins; ligule a short membrane; branches of inflorescence crowded at tip of culm, usually digitate or with 1–2 branches attached lower; spikelets awnless, crowded, overlapping, in two rows on flattened winged branches. Common weed of gardens, lawns, and disturbed sites; throughout TX. Late Jun–Oct. Native of Old World tropics. ☞

ELYMUS WILD RYE

Ours perennials with solitary or few culms in small clumps; leaf blades auricled at base; ligule a membrane; inflorescence a dense unbranched 2-sided spike with 2–3 sessile spikelets per node, the inflorescence axis in our species remaining intact, disarticulation occurring above glumes and between florets; spikelets with 2–6 florets; glumes and lemmas awned.

☛ A temperate, especially Asian, genus of ca. 150 species. (Ancient Greek name for millet; from *elyo*, rolled up, from the caryopsis (= fruit) being tightly embraced by the lemma and palea) (subfamily Pooideae, tribe Triticeae)

REFERENCES: Pohl 1959; Bowden 1964b; Church 1967; Runemark & Heneen 1968; Davies 1980; Dewey 1982; Estes & Tyril 1982.

1. Glumes strongly 1–4-ribbed to base or nearly so, 0.2–1.5 mm wide near middle, not or only slightly bowed out at base, flat, neither yellowish, hardened nor rounded basally, with awn equaling or exceeding the body; lemma awns usually curving outward at maturity, 15–50 mm long

E. canadensis

1. Glumes strongly 3–8-ribbed above base, 1.0–2.5 mm wide near middle, often strongly bowed out at base, often yellowish, hardened or rounded basally, with awn shorter than or equaling the body; lemma awns straight or slightly curved, 5–25 mm long

E. virginicus

Elymus canadensis L., (of Canada), CANADA WILD RYE, NODDING WILD RYE. Plant 40–160 cm tall; leaf blades mostly 4–12 mm wide; leaf sheaths glabrous; ligule a membrane 0.5–1 mm long; spikes thick, usually oblique or nodding, (4–)8–21 cm long and 6–18 mm thick (excluding awns). Thickets and open woods, in limestone or sandy clay; in nc TX mainly East and West cross timbers, throughout most of TX. (Mar–)late May–Jun. [*E. canadensis* L. var. *brachystachys* (Scribn. & C.R. Ball) Farw., *E. canadensis* L. var. *villosus* (Muhl.) Shinners]

Elymus virginicus L., (of Virginia), VIRGINIA WILD RYE. Plant 30–140 cm tall; leaf blades 5–15 mm wide; leaf sheaths glabrous or scabrous-pubescent, only the uppermost to all of the leaf sheaths inflated; ligule a minute membrane; spikes rather dense and stiff, usually erect, partly included to well-exserted, usually 3–15 cm long. Thickets or open ground; in much of e 1/2 of TX. (Apr–)May–Aug. [*E. virginicus* L. var. *glabriflorus* (Vasey) Bush] Hybrids with *E. canadensis* are known (Pohl 1959).

ERAGROSTIS LOVE GRASS

Annuals or perennials; ligule a ring of hairs (except in *E. secundiflora*); spikelets in very open or contracted panicles, 2-many-flowered, sometimes with a reddish purple color, often somewhat

laterally compressed; lemmas obtuse or acute, awnless, rounded or keeled on back, 3-nerved, the lateral nerves sometimes obscure, glabrous.

☛ A genus of ca. 300 species of temperate and tropical areas of the world; some are cultivated as ornamentals, for fodder, and for edible seeds; some have inflorescences which detach and disperse the seeds by acting as tumbleweeds. (Greek: *eros*, love or god of love, and *agrostis*, a grass) (subfamily Chloridoideae, tribe Eragrostideae)

REFERENCES: Koch 1974, 1978; Witherspoon 1977; Perry & McNeill 1986; Van den Borre & Watson 1994; Peterson et al. 1997.

1. Culms creeping, rooting at nodes; plants mat-forming annuals; flowering culms up to 25 cm tall (usually less).
 2. Plants dioecious; anthers 1.2–2 mm long; lemmas (1.8–)2.6–3.5 mm long; styles long exserted from lemma and palea, often persistent and conspicuous (with a lens) as thread-like structures _____ **E. reptans**
 2. Plants monoecious; anthers 0.5 mm or less long; lemmas 1.5–2(–2.3) mm long; styles not exserted _____ **E. hypnoides**
1. Culms erect; plants clump-forming annuals or perennials; flowering culms usually much more than 25 cm tall.
 3. Panicle branches bearing spikelets to base or nearly so.
 4. Spikelets sessile, widely spaced on long branches _____ **E. sessilispica**
 4. Spikelets sessile or short-pedicelled, closely crowded on short branches.
 5. Spikelets 3–10 mm wide, usually < 2 times as long as wide, strongly compressed; introduced species rare in nc TX _____ **E. superba**
 5. Spikelets up to 5 mm wide (often much narrower), > 2 times as long as wide (often many times), usually slightly to strongly compressed; including abundant and widespread native and introduced species.
 6. Plants perennial; spikelets 3–5 mm wide, strongly flattened; lemmas very acute, 2–5 mm long _____ **E. secundiflora**
 6. Plants annual; spikelets 1–4 mm wide, flattened but not strongly so OR not flattened; lemmas subacute or obtuse, 1.6–2.8 mm long.
 7. Spikelets linear, almost as thick as wide, 1–1.5 mm wide; lemmas not glandular-dotted _____ **E. barrelieri**
 7. Spikelets ovate to lanceolate, much wider than thick, 2–4 mm wide; lemmas usually glandular-dotted on the keels _____ **E. cilianensis**
 3. Panicle branches naked for a distance from base.
 8. Spikelets widely spreading from branches; pedicels longer than spikelets.
 9. Spikelets 2–4(–6)-flowered, 2–4 mm long _____ **E. hirsuta**
 9. Spikelets (4–)5–18-flowered, 4–10 mm long.
 10. Spikelets very narrow, usually 1(–1.3) mm or less wide; lemmas 1.2–1.6 mm long _____ **E. pilosa**
 10. Spikelets 1.5–3 mm wide; lemmas 1.8–3.4 mm long.
 11. Lemmas keeled, the lateral nerves conspicuous; spikelets 4–10(–20) mm long.
 12. Lemmas ca 1.4–2.2 mm long; spikelets oblong to linear; plants with knotty rhizomes _____ **E. spectabilis**
 12. Lemmas 2.4–3.8 mm long; spikelets lanceolate to ovate; plants without rhizomes _____ **E. trichodes**
 11. Lemmas rounded on back, the lateral nerves inconspicuous; spikelets 3–5(–6) mm long _____ **E. intermedia**
 8. Spikelets slightly spreading or appressed along the branches, sessile or on pedicels mostly shorter than spikelets (some pedicels may be longer).

13. Culm bases neither hardened nor enlarged; plants annual.
14. Closed spikelets (before lemmas spread open) over 1 mm wide; lemmas 2–2.4 mm long; leaf blades 3–7 mm wide; lower inflorescence branches 1–3, if somewhat verticillate then not hair-like _____ **E. pectinacea**
14. Closed spikelets 1 mm wide or less; lemmas 1.2–1.6 mm long; leaf blades 0.4–2.2 (–3) mm wide; lower inflorescence branches hair-like, usually verticillate (in whorls of 3 or more branches) _____ **E. pilosa**
13. Culm bases hardened or enlarged; plants perennial.
15. Longer glume 1–1.9 mm long; spikelets 4–5 mm long _____ **E. curtipedicellata**
15. Longer glume 2.2–5 mm long; spikelets 6–20(–25) mm long.
16. Spikelets 3–5 mm wide; culms 70 cm or less tall; spikelets 10–40-flowered, often brown-red, densely arranged, in conspicuously overlapping groups _____ **E. secundiflora**
16. Spikelets 1.4–1.6 mm wide; culms to 150 cm tall; spikelets 7–11-flowered, gray-green, less dense, not much overlapping _____ **E. curvula**

Eragrostis barrelieri Daveau, (for French botanist, Jacques Barrelier, d. 1673), MEDITERRANEAN LOVE GRASS. Low-spreading to erect annual 7–50 cm tall; leaf sheaths glabrous except at top; panicles dense; spikelets gray- or yellow-green to bronze or dark purple-red-brown; lemmas 1.8–2.2 mm long. Roadsides and disturbed sites; nearly throughout TX. Apr–Nov. Native of s Europe. ☞

Eragrostis cilianensis (All.) Vignolo ex Janch., (fringed with hairs), STINK GRASS. Annual often with a strong odor; lemmas 2.2–2.8 mm long, with minute, raised, glandular dots on keel. Disturbed sites; throughout TX. Mostly Aug–Oct. Native of Europe. ☞

Eragrostis curtipedicellata Buckley, (short-stalked), GUMMY LOVE GRASS, SHORT-STALKED LOVE GRASS. Tufted, hard-based perennial 15–75 cm tall; leaf sheaths glabrous except for margins and summit; panicles open, with viscid axis, breaking off in age. Sandy oak woods, fields, roadsides, and open areas; nearly throughout TX. May–Nov.

Eragrostis curvula (Schrud.) Nees, (curved), WEEPING LOVE GRASS. Clump-forming perennial 60–150 cm tall; upper leaf sheaths usually glabrous, the lower pubescent with closely ascending hairs; panicles narrow, ± drooping. Planted on sandy soils for erosion control and range improvement; fields, roadsides; now widespread in TX. May–Jul. Native of Africa. Cattle wait until more palatable species are gone before eating the rather coarse foliage; subsequently they will eat this species nearly to the ground; the hard stubble that remains will hurt their feet making them “tender-footed” and hesitant to walk and properly feed; they have to be removed from such a pasture (J. Stanford, pers. comm.). ☞

Eragrostis hirsuta (Michx.) Nees, (hairy), BIG-TOP LOVE GRASS, STOUT LOVE GRASS. Tufted perennial; spikelets small (to 4 mm long), few-flowered (2–4(–6)). Sandy woods and river bottoms; e TX w to West Cross Timbers. Sep–Nov.

Eragrostis hypnoides (Lam.) Britton, Sterns, & Poggenb., (like *Hypnum*—a genus of mosses, moss-like), TEAL LOVE GRASS, SMOOTH CREEPING LOVE GRASS. Annual; culms creeping, rooting at nodes, mat-forming; in aspect similar to *E. reptans*; flowering culms 10–25 cm tall. Mud and sand bars of streams, lakes; Lamar Co. (Carr 1994); mainly se and e TX; also Edwards Plateau. Spring to fall, but mostly fall.

Eragrostis intermedia Hitchc., (intermediate), PLAINS LOVE GRASS. Tufted erect perennial 50–100 cm tall; leaf sheaths glabrous except at top; panicles open; spikelets 5–11-flowered. Sandy woods or less often open ground; mainly e 1/2 of TX, also Trans-Pecos. May–Oct. Many of the specimens we put in *E. intermedia* have been previously placed in *E. lugens* (Correll & Johnston



Elymus canadensis [H11]



Elymus virginicus [US8]



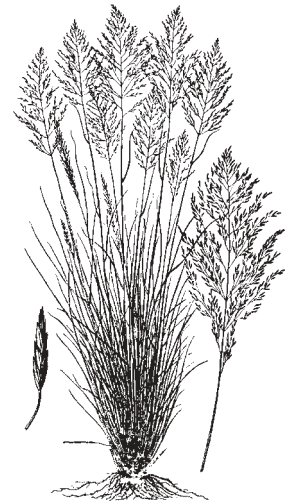
Eragrostis barrelieri [GO2]



Eragrostis cilianensis [H11]



Eragrostis curtipedicellata [US8]



Eragrostis curvula [US0]



Eragrostis hirsuta [H11]



Eragrostis hypnoides [GO2]

1970). We are following Gould (1975b) and Hatch et al. (1990) in recognizing *E. lugens* as restricted to vegetational areas 1, 2, 6, and 7 (Fig. 2) in TX.

Eragrostis pectinacea (Michx.) Nees ex Steud., (comb-like). Low-spreading to erect annual 10–60 cm tall; leaf sheaths glabrous except at top; lemmas grayish green. Sandy or clayey roadsides, disturbed areas. Spring–Nov.

1. Pedicels not appressed, 3–10 mm long, averaging > 4 mm _____ var. **miserrima**

1. Pedicels appressed, flexuous, 1–5 mm long, usually averaging < 4 mm _____ var. **pectinacea**

var. **miserrima** (E. Fourn.) Reeder, (possibly from Latin: *miser*, miserable, sickly, or wretched). The characters used to distinguish the varieties given here follow Correll and Johnston (1970), who recognized the taxa at the specific level; however, the distinctions seem weak. Specimens from Grayson, Jack, and Limestone cos. may be examples of var. *miserrima*; scattered in TX. [*E. arida* Hitchc., *E. tephrosanthos* Schult.]

var. **pectinacea**. SPREADING LOVE GRASS. Bell, Dallas, Denton, Erath, Hamilton, Mills, and Montague cos.; widespread in TX. This is by far the more common of the 2 varieties in nc TX. [*E. diffusa* Buckley]

Eragrostis pilosa (L.) P. Beauv., (pilose, with long soft hairs), INDIA LOVE GRASS. Tufted annual 15–45 cm tall; closed spikelets (before lemmas spread open) very narrow, 1 mm wide or less, when open to 1(–1.3) mm wide; lemmas grayish green with reddish or purplish tips. Sandy or sandy clay roadsides, disturbed sites; e TX w to West Cross Timbers, also s TX and Panhandle. Jun–Aug. Native of Europe and Asia. 🌿

Eragrostis reptans (Michx.) Nees, (creeping), CREEPING LOVE GRASS. Dioecious annual; culms creeping, rooting at nodes, mat-forming; flowering culms 5–10(–20) cm tall; spikelets usually 0.8–2(–2.5) mm long, with 16–40(–60) florets, crowded, sessile or short-pedicelled, ovate to lanceolate or linear, sometimes curved. Dry lake beds, stream bottoms, weedy areas; Bell, Cooke, Dallas, Denton, Grayson, and Kaufman cos.; e 1/2 of TX. Apr–Nov. Sometimes segregated into the genus *Neeragrostis* [as *N. reptans* (Michx.) Nicora].

Eragrostis secundiflora J. Presl. subsp. **oxylepis** (Torr.) S.D. Koch, (sp.: with flowers on one side of the stalk; subsp.: sharp-scaled), RED LOVE GRASS. Tufted perennial 15–90 cm tall; leaf sheaths glabrous except at top; ligules very short, with membranous base half the total length, obscured by long hairs at base of leaf blade; panicles usually small and compact, occasionally with 1 or 2 long branches; spikelets glaucous or blue-gray to green, or brown-red. Sandy woods or open ground, rarely in limestone gravel; Grayson Co. w through West Cross Timbers; nearly throughout TX, but more common in the e 1/2. May–Nov. Koch (1978) indicated that subsp. *secundiflora* occurs from South America n to Mexico. We are following Koch (1978) for synonymy of this taxon. [*E. beyrichii* J.G. Sm., *E. oxylepis* (Torr.) Torr., *E. oxylepis* (Torr.) Torr. var. *beyrichii* (J.G. Sm.) Shinnors]

Eragrostis sessilispica Buckley, (with sessile spikelets), TUMBLE LOVE GRASS. Tufted perennial 30–90 cm tall; leaf sheaths glabrous except at top; panicles becoming loosely coiled and half prostrate, ultimately breaking off and acting as tumbleweeds. Sandy prairies and oak openings; East Cross Timbers w to Panhandle, also s TX. Apr–Sep.

Eragrostis spectabilis (Pursh) Steud., (spectacular), PURPLE LOVE GRASS. Perennial with a knotty, rhizomatous base; leaf sheaths usually pilose on collar and upper margins; panicles open, the branches capillary, wiry. Sandy or disturbed sites; widespread in TX, but mainly e 1/2. Aug–Oct.

Eragrostis superba Peyr., (superb), WILMANN'S LOVE GRASS. Perennial; spikelets 3–10 mm wide, conspicuously compressed, showy; lemmas keeled. Drought resistant species planted as a range



Eragrostis intermedia [H11]



Eragrostis pectinacea var. *miserrima* [H11]

Eragrostis pectinacea var. *pectinacea* [US8]

Eragrostis pilosa [US8]



Eragrostis reptans [H11]

grass, persists, and escapes; Parker Co. (R. O'Kennon, pers. obs.), cited for vegetational area 5 by Hignight et al. (1988) and vegetational areas 4, 5, 6, and 7 (Fig. 2) by Hatch et al. (1990). Introduced from Africa. 🌿

Eragrostis trichodes (Nutt.) A.W. Wood, (hair-like), SAND LOVE GRASS. Tufted perennial; leaf sheaths pilose at throat, sometimes villous on back or papillose-villous on margins; lemmas with reddish-tinged splotches. Sandy prairies; widespread in TX. Jul-Dec., sporadically in the spring. [*E. pilifera* Scheele, *E. trichodes* var. *pilifera* (Scheele) Fernald] We have not been able to find consistent differences and are thus following Correll and Johnston (1970), Gould (1975b), and S. Hatch (pers. comm.) in lumping var. *pilifera*.

ERIOCHLOA CUP GRASS

Annuals or perennials; ligule of hairs to 1-2 mm long; panicles slender, of erect, spike-like racemes; spikelets with a cup-like collar or ring just under the base (representing the much-reduced lower glume), 2-flowered, the lower staminate or neuter, the upper perfect; upper glume and sterile lemma similar.

☞ A genus of ca. 30 species of tropical and warm areas of the world. (Greek: *erion*, wool, and *chloë*, grass) (subfamily Panicoideae, tribe Paniceae)

REFERENCES: Shaw & Webster 1987; Crins 1991.

1. Pedicels densely short-pubescent; racemes overlapping each other; lemma of perfect floret with an awn 0.5-0.8 mm long; plants annual _____ **E. contracta**
1. Pedicels with silky hairs more than half as long as the spikelets; racemes not or only scarcely overlapping each other; lemma of perfect floret awnless or with a minute awn tip less than 0.5 mm long; plants perennial _____ **E. sericea**

Eriochloa contracta Hitchc., (contracted), PRAIRIE CUP GRASS. Plant 15-75 cm tall, often with many culms, forming bushy clumps, rather densely soft-pubescent. Dry roadsides, disturbed areas; nearly throughout TX. May-Oct.

Eriochloa sericea (Scheele) Munro ex Vasey, (silky), TEXAS CUP GRASS, SILKY CUP GRASS. Plant tufted, 30-100 cm tall, rather densely soft-pubescent. Prairies or open thickets, calcareous clays; nc TX w to Rolling Plains and s to Edwards Plateau. May-Oct. Secondary member of original prairie; it does not withstand grazing.

ERIONEURON WOOLLY GRASS, FLUFF GRASS

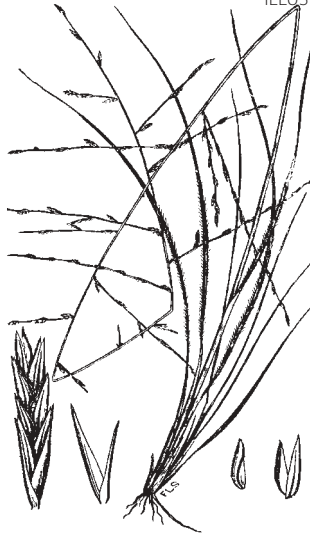
☞ A New World genus of 3 species (Valdés-Reyna & Hatch 1997); similar to and previously lumped with *Tridens*. (Greek: *erion*, wool, and *neuron*, nerve, from hairs on nerves of lemmas and paleas) (subfamily Chloridoideae, tribe Eragrostideae)

REFERENCES: Valdés-Reyna 1985; Valdés-Reyna & Hatch 1997; Peterson et al. 1997.

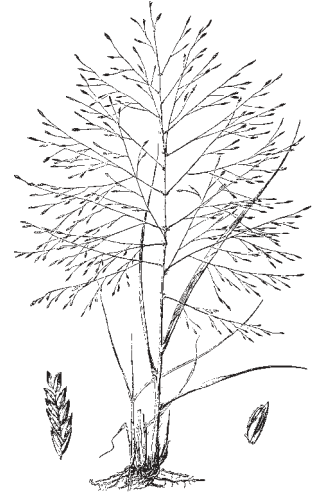
Erioneuron pilosum (Buckley) Nash, (pilose, with long soft hairs), HAIRY TRIDENS, HAIRY ERIONEURON. Tufted perennial; culms 10-30 cm tall, usually with one node above the basal cluster of leaves; ligule of hairs ca. 0.5 mm long; leaf blades 1-2 mm broad, 2-8(-11) cm long, with a thick white margin (visible with a lens); panicles or racemes contracted, 2-4 cm long, 1.5-2 cm broad, of ca. 4-12 large spikelets; spikelets usually 10-16 mm long, with 7-18 closely imbricated florets; glumes 1-nerved, glabrous; lemmas rounded on back, 3-nerved, the nerves and margins conspicuously long-hairy, with awn 1-2 mm long from entire or notched apex. Disturbed sites, prairies; Bell, Dallas, and Grayson cos.; also Parker (R. O'Kennon, pers. obs.) and Tarrant (Mahler 1988) cos.; nc TX s and w to w TX. Apr-Oct. [*Tridens pilosus* (Buckley) Hitchc.]



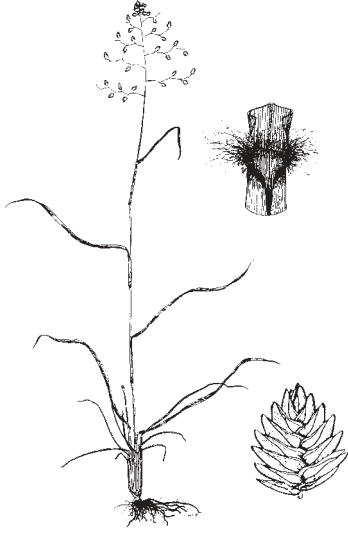
Eragrostis secundiflora subsp. *oxylepis* [US8]



Eragrostis sessilispica [US8]



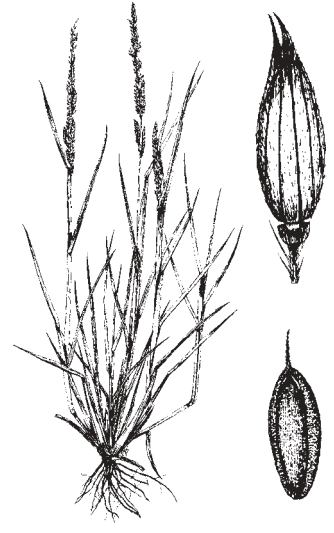
Eragrostis spectabilis [H11]



Eragrostis superba [H16]



Eragrostis trichodes [US8]



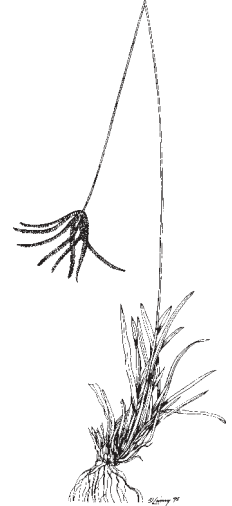
Eriochloa contracta [G01]



Eriochloa sericea [US8]



Erioneuron pilosum [BB2]



Eustachys retusa [HEA]

EUSTACHYS

☛ A genus of 10 species native to tropical America and Africa. *Eustachys* has sometimes been treated as a section of *Chloris*. (Greek: *eu*, good, and *stachys*, spike, possibly in reference to the spike-like inflorescence branches) (subfamily Chloridoideae, tribe Cynodonteae)

REFERENCE: McKenzie et al. 1987.

Eustachys retusa (Lag.) Kunth, (retuse, notched slightly at apex). Tufted perennial with erect culms 25–90 cm tall; ligule a membrane ca. 0.5 mm long; leaf blades 4–7(–10) mm wide; inflorescences of 3–14 digitately arranged, spike-like branches 4–9 cm long; spikelets crowded, in 2 rows along 1 side of the branches, with 1 perfect lower floret and usually 1 sterile (sometimes staminate) floret above; fertile lemma with margins strongly ciliate; sterile lemma cylindrical to narrowly obtriangular and truncate. Disturbed roadsides; Falls and Limestone cos.; Hatch et al. (1990) only cited vegetational areas 3 and 4 (Fig. 2). May–Sep. Native to South America. [*Chloris argentina* (Hack.) Lillo & Parodi] ☛ ☞

FESTUCA FESCUE

Tufted perennials; leaf blades 2.5–12 mm wide; leaf sheaths open; ligule a membrane; panicles open or contracted; spikelets with 2–8 florets; lemmas not toothed at apex, awned or awnless, the backs rounded, not plainly nerved except at apex.

☛ A genus of 450 species of temperate areas and tropical mountains; some are important as pasture and lawn grasses. *Vulpia* (SIXWEEKS GRASS, ANNUAL FESCUE), treated here as a separate genus, has in the past sometimes been included in *Festuca*. Darbyshire (1993) recently suggested that *Festuca* subgenus *Schedonorus*, including *F. arundinacea*, be shifted to the related genus *Lolium*. (Ancient Latin name of some grass) (subfamily Pooideae, tribe Poeae)

REFERENCES: Piper 1906; Aiken & Lefkovitch 1993; Darbyshire & Warwick 1992; Darbyshire 1993.

1. Lower lemmas 5–9 mm long; spikelets 8–20 mm long; panicles contacted, at least above

_____ **F. arundinacea**

1. Lower lemmas 3–4.7 mm long; spikelets 4–8 mm long; panicles open

_____ **F. subverticillata**

Festuca arundinacea Schreb., (reed-like), TALL FESCUE, ALTA FESCUE. Nearly glabrous perennial 60–120(–200) cm tall, forming clumps; panicles rather narrow and dense; spikelets 5–8-flowered; lemmas usually awnless (or with short awn). In calcareous clay, roadsides, disturbed areas; also cultivated; Grayson, Kaufman, and Rockwall cos., also Lamar Co. (Carr 1994), also observed (R. O'Kennon) in Hunt, Johnson, Parker, and Tarrant cos.; spreading rapidly and probably in numerous nc TX cos.; widespread in TX. Mostly Apr–Jun. Native of Europe. [*F. elatior* L. var. *arundinacea* (Schreb.) Wimm., *Lolium arundinaceum* (Schreb.) Darbysh.] This species can be a problematic invasive weed in native prairie remnants. There are reports of livestock being poisoned (fescue foot or gangrenous fescue poisoning) from eating this species; the symptoms are similar to those produced by ingestion of ergot alkaloids and fungi infecting the plant may be at fault (Kingsbury 1964; Hardin & Brownie 1993). Darbyshire (1993) presented evidence that *Festuca* is polyphyletic and that this species is best treated in the genus *Lolium*; however, we are treating it conservatively and for now continuing to recognize it in *Festuca*. Jones et al. (1997) placed it in *Lolium*. ☛ ☞

Festuca subverticillata (Pers.) E.B. Alexeev, (slightly whorled), NODDING FESCUE. Glabrous perennial 50–120 cm tall, forming clumps; panicles open, with drooping branches; spikelets 2–5(–6)-flowered; lemmas glabrous, awnless, falling early. Low woods and thickets; Grayson Co.; also Dallas Co. (Mahler, 1988); mainly e TX. Apr–Jun. [*F. obtusa* Biehler]

GLYCERIA MANNA GRASS

Perennials, often with rhizomes or rooting at lower nodes; ligule a membrane; inflorescence an open or contracted panicle (rarely a raceme); spikelets in ours with 3-14(-20) florets, awnless, disarticulating above glumes and between florets; lemmas usually with 7 strong, parallel nerves, rounded on back.

☛ A temperate, but especially North American genus of 40 species; some are good pasture grasses; Native Americans formerly used the fruits of some. (Greek: *glyceros*, sweet, referring to the taste of the seeds of one species) (subfamily Pooideae, tribe Meliceae)

1. Inflorescence branches usually short and stiffly erect or ascending; spikelets 8-30 mm long, with 7-14(-20) florets; first glume 2-3 mm long _____ **G. arkansana**

1. Inflorescence branches (at least lower) long and flexuous; spikelets 5 mm or less long, usually with 3-7 florets; first glume < 1 mm long _____ **G. striata**

Glyceria arkansana Fernald, (of Arkansas), ARKANSAS MANNA GRASS. Plant glabrous; culms ca. 1-1.8 m tall, often rooting near base; ligules ca. 3-6 mm long; inflorescences usually 18-40(-50) cm long, the panicle branches short and rigid; lemmas 2.5-3.5 mm long, hirsute or hirtellous. Wet areas; Fannin Co. in Red River drainage (Talbot property), also Lamar Co. (Carr 1994); mainly e TX. Mar-May. According to Gould (1975b), *G. arkansana* "is close to and weakly differentiated from *G. septentrionalis* Hitchc. (EASTERN MANNA GRASS) and probably should be treated as a variety of that species." Jones et al (1997) treated it as a variety of *G. septentrionalis*, while J. Kartesz (pers. comm. 1997) recognizes it at the species level. *Glyceria septentrionalis* Hitchc., also known from e TX, differs in having longer (3.5-5 mm), scabrous lemmas. [*G. septentrionalis* Hitchc. var. *arkansana* (Fernald) Steyerf. & Kucera]

Glyceria striata (Lam.) Hitchc., (striated, striped), FOWL MANNA GRASS, NERVED MANNA GRASS. Plant glabrous, often with short rhizomes; culms 0.4-0.9 m tall; ligules 1.5-4 mm long; inflorescence a panicle 10-22 cm long with numerous slender, flexuous branches bare of spikelets on the lower 1/3-1/2; spikelets ca. 3-4(-5) mm long; lemmas usually 1.5-2 mm long. Along streams, moist forest margins; Lamar Co. (Carr 1994) in Red River drainage, also Bell Co. (Fort Hood-Sanchez 1997); rare in Trans-Pecos, Edwards Plateau, and e TX. Apr-Aug. Reported as potentially cyanogenic (Burlage 1968). ☛

GYMNOPOGON

☛ A genus of ca. 15 species of warm areas of the Americas and from India to Thailand. (Greek: *gymnus*, naked, and *pogon*, beard, referring to the reduction of the abortive flower to a bare awn) (subfamily Chloridoideae, tribe Cynodonteae)

REFERENCE: Smith 1971.

Gymnopogon ambiguus (Michx.) Britton, Sterns, & Poggenb., (ambiguous), BEARDED SKELETON GRASS. Perennial from short rhizome; culms 25-60 cm long with numerous short overlapping leaves with spreading to deflexed blades to 13 mm wide; ligules minute, membranous or a rim of callus tissue; panicles usually broader than long, 10-25 cm long, with 12-35 widely spreading, spike-like branches; branches usually 10-20 cm long with spikelets to base or bare on basal 2-5 cm; spikelets usually not overlapping, appressed, in 2 rows on 1 side of the slender, slightly flattened branch, with 1 perfect lower floret and 1 rudimentary upper floret; glumes 3-7 mm long; lemmas shorter than the glumes, with a 4-8(-11) mm awn from the minutely notched apex. Usually in sandy soils, typically in shade; Grayson, Hunt, and Montague cos.; also Lamar Co. (Carr 1994); mainly e TX. Late Aug-Nov.

HILARIA

☛ A genus of 10 species ranging from the s U.S. to Guatemala. (Named for A. Saint-Hilaire, 1779–1853, French botanist) (subfamily Chloridoideae, tribe Cynodonteae)

REFERENCES: Cory 1948b; Brown & Coe 1951.

Hilaria belangeri (Steud.) Nash, (named for Charles Paulus Bélanger, 1805–1881), COMMON CURLY-MESQUITE. Low tufted perennial, 10–30 cm tall, sending out slender stolons that produce new tufts; nodes densely bearded with spreading hairs; ligule a membrane 0.5–1 mm long; leaf blades 1–2(–3) mm wide, short and often forming a curly tuft, but sometimes longer and erect; inflorescence a slender spike 2–3.5 cm long, exerted on peduncles, with 4–8 clusters of 3 spikelets each; spikelet clusters usually 4.5–6 mm long; central spikelet fertile, 1-flowered, lateral spikelets staminate, 2-flowered; glumes united below, usually asymmetrical; glumes of central spikelet with awns usually 2.5–5 mm long. Open brushy and rocky areas, usually on calcareous soils; Bell, Brown, and Stephens cos.; nc TX s and w to w TX. (Mar–)Aug–Oct(–Nov).

HORDEUM BARLEY

Annuals (in nc TX); leaves with or without auricles; ligule a membrane; inflorescence a dense, 2-sided spike or spike-like raceme, breaking apart in age except in *H. vulgare*; spikelets 3 per node, each 1-flowered (or lateral spikelets may be reduced to a group of awns), the central spikelet sessile, usually perfect, the 2 lateral spikelets usually short-pedicelled, staminate or sterile (perfect in *H. vulgare*); lemmas usually awned apically.

☛ A n temperate genus of ca. 20 species including *H. vulgare* (cultivated BARLEY). BARLEY is a very old cereal crop originally grown by people of the ancient Near East and is considered along with WHEAT to be one of the oldest cultivated plants; it is currently used primarily in the malting process of beer- and whiskey-making and as animal feed (Heiser 1990a). The awns of some species are minutely barbed and cause physical damage and infection in livestock (Stephens 1980). (Ancient Latin name for BARLEY) (subfamily Pooideae, tribe Triticeae)

REFERENCES: Covas 1949; Bowden 1959b; Dewey 1982; Estes & Tyrl 1982; Baum & Bailey 1986, 1989, 1990; von Bothmer et al. 1991; Zohary & Hopf 1994.

1. Lemmas of lateral spikelets absent or much smaller than lemma of central spikelet; lemma awns 2–10(–15) mm long; leaf sheaths without auricles at summit _____ **H. pusillum**
1. Lemmas of lateral spikelets as large as lemma of central spikelet; lemma awns 10 mm or more long (usually much longer); leaf sheaths with auricles at summit.
 2. Leaf blades 1–6 mm wide; lemmas 1.3–1.9 mm wide across back; lateral spikelets short-pedicelled; glumes of central spikelet ciliate marginally _____ **H. murinum**
 2. Leaf blades mostly 7–18 mm wide; lemmas 2–3 mm wide across back; lateral spikelets sessile; glumes of central spikelet glabrous or scabrous _____ **H. vulgare**

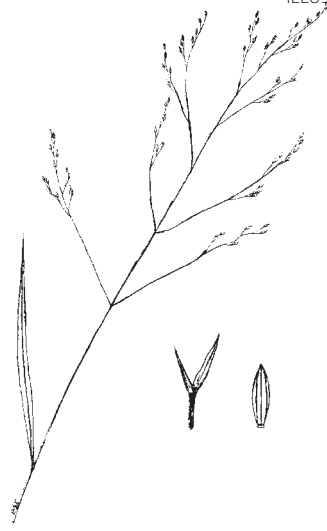
Hordeum murinum L. subsp. **leporinum** (Link) Arcang, (sp.: mouse-gray; subsp.: hare-like), HARE BARLEY. Annual 30–75 cm tall; culms erect or decumbent basally; leaf sheaths glabrous; glumes ciliate marginally; lemma awns 10–35 mm long. Disturbed sites; Dallas, Coleman, and Williamson cos.; throughout TX except extreme e and s. Apr. Native of Europe. [*H. leporinum* Link] The awns can cause mechanical injury to grazing livestock (Burlage 1968). ☛

Hordeum pusillum Nutt., (very small), LITTLE BARLEY, MOUSE BARLEY. Annual 12–60 cm tall; culms erect or with bent or decumbent base; leaf sheaths glabrous; spikes flattened; glumes scabrous, not ciliate; lemma awns 2–10(–15) mm long. Disturbed sites; throughout TX. Apr–May.

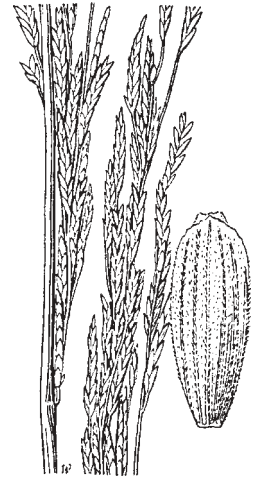
Hordeum vulgare L., (common), BARLEY. Glabrous annual; vegetatively resembling WHEAT and RYE; axis of spike remaining intact (vs. abscising at each node in our other species); lemma awns



Festuca arundinacea [us8]



Festuca subverticillata [go2]



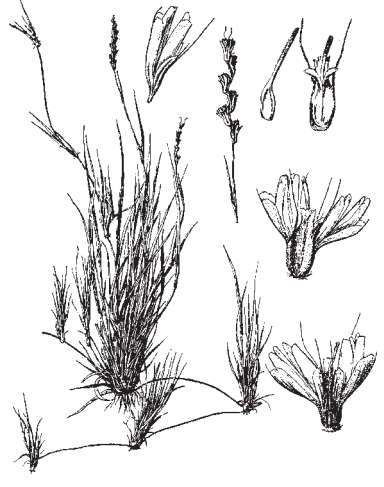
Glyceria arkansana [H11]



Glyceria striata [H11]



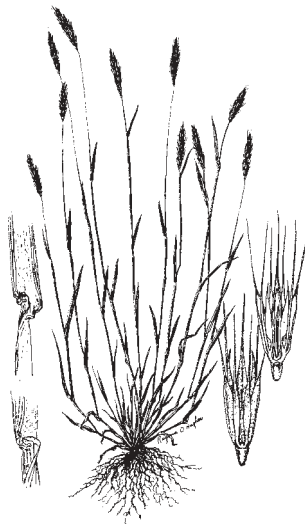
Gymnopogon ambiguus [us8]



Hilaria belangeri [H11]



Hordeum murinum subsp. *leporinum* [MAR]



Hordeum pusillum [REE]



Hordeum vulgare [H11]

long, up to 150 mm. Cultivated throughout much of TX and occasionally occurring as a transitory waif along roadsides, railroads, and field margins; Denton Co., also Tarrant Co. (R. O'Kennon, pers. obs.). Apr–May. Like its wild ancestor, *H. vulgare* subsp. *spontaneum* (C. Koch) Thell., BARLEY native to Eurasia (Zohary & Hopf 1994). BARLEY is considered one of the two oldest cultivated plants (WHEAT—*Triticum aestivum*, is the other); as such it was probably important in the development of early civilization in the Near East (Heiser 1990a); BARLEY is able to stand drier, less fertile, and more saline conditions than WHEAT. It is the main cereal used in Old World beer production (Zohary & Hopf 1994). ☞

KOELERIA

☞ A temperate genus of ca. 35 species. (Named for Georg Ludwig Koeler, 1765–1807, professor at Mainz and student of grasses) (subfamily Pooideae, tribe Aveneae)

REFERENCE: Arnow 1994.

Koeleria macrantha (Ledeb.) Schult., (large-flowered), JUNE GRASS, PRAIRIE JUNE GRASS. Perennial 35–75 cm tall, forming small clumps; leaves mostly crowded toward base, the lowest with finely pubescent sheaths, the upper glabrous; ligule a short membrane 0.5–1(–2) mm long; inflorescence a narrow panicle, dense, spike-like, with puberulent axis; spikelets shiny, mostly 2–4-flowered, 4–5 mm long, disarticulating above glumes; lemmas usually acute or minutely apiculate. Grasslands; Delta, Denton, Grayson, and Kaufman cos., also Dallas Co. (Mahler 1988); mainly w 1/2 of TX. May–Jun. [*K. cristata* of authors in part, not Pers., *K. pyramidata* of authors in part, not (Lam.) P. Beauv.]

LEERSIA CUT GRASS

Rhizomatous perennials (our taxa); ligule a membrane; spikelets 1-flowered, sessile or subsessile, secund along the distal portions of the branchlets of the inflorescence, compressed laterally, disarticulating from pedicel; glumes absent (the spikelets thus consisting solely of naked florets); lemmas oblong to elliptic, with nerves and keel hispid-ciliate.

☞ A genus of 17 species native to tropical and warm temperate areas; typically marsh grasses sometimes used as fodder; related to *Oryza sativa* L. (RICE), an annual with spikelets 7–10 mm long (vs < 6 mm long in *Leersia*). In se and e TX, RICE is cultivated and is occasionally a weed in moist soils; this native of se Asia is one of the world's most important food crops. While less widely distributed than WHEAT, RICE feeds more people, being the basic food for more than half the world's human population (Heiser 1990a). (Named for Johann Leers, 1727–1774, a German botanist) (subfamily Oryzoideae, tribe Oryzeae)

REFERENCE: Pyrah 1969.

1. Spikelets 3–4 mm wide, nearly as wide as long; leaf blades 5–15(–20) mm wide; in nc TX known only from Lamar Co. in Red River drainage _____ **L. lenticularis**
1. Spikelets 2 mm or less wide, 2–3 times as long as wide; leaf blades 3–10 mm wide; widespread in nc TX.
 2. Lower panicle branches fascicled; spikelets 4–5.5 mm long, 1.5–2 mm wide _____ **L. oryzoides**
 2. Lower panicle branches solitary; spikelets 2.2–3(–3.5) mm long, 1 mm wide _____ **L. virginica**

Leersia lenticularis Michx., (lens-shaped), CATCHFLY GRASS. Culms 0.9–1.5 m long, erect or sprawling and ascending; panicles open, with spikelets clustered towards ends of flexuous, often drooping branches, the branches naked nearly 1/2 their length; spikelets broadly oblong, slightly asymmetrical, mostly 4–5 mm long; keel and nerves of lemmas with conspicuous, stiff hairs giving the appearance of widely spaced comb teeth (use lens). Wet or moist areas along streams and lakes; Lamar Co. at edge of oxbow lake in Red River drainage; mainly se and e TX. Mostly Jul–Nov.

Leersia oryzoides (L.) Sw., (like rice—*Oryza*), RICE CUT GRASS. Plant 1–1.5 m tall; rhizomes slender, creeping; leaf blades 7–10 mm wide; panicle branches usually numerous, naked of spikelets for < 1/2 their length. Marshes, wet places; Bell, Dallas, Grayson, and Limestone cos., also Lamar Co. (Carr 1994); throughout most of TX. Sep–Nov.

Leersia virginica Willd., (of Virginia), WHITE GRASS, VIRGINIA CUT GRASS. Plant 0.5–1.2 m tall; rhizomes scaly, clustered, stouter than culm base; leaf blades 3–8 mm wide; panicle branches few, widely spaced, long and slender, up to 8–12 cm long, naked for > 1/2 their length. Ditches, moist areas; Collin, Dallas, Grayson, and Rockwall cos., also Bell (Fort Hood—Sanchez 1997), Fannin (Mahler 1988), and Lamar (Carr 1994) cos.; se and e TX w to nc TX. May–Nov.

LEPTOCHLOA SPRANGLETOP

Annuals or perennials; inflorescence a panicle of spicate branches; spikelets with 2–12 flowers, the lower 1–2 perfect, the rest staminate or neutral, sessile or nearly so, overlapping in 2 rows on 1 side of a nearly terete branch, disarticulating above the glumes and between florets; lemmas in ours awnless or with a short awn to 1.5 mm long.

☛ A genus of 27 species native to tropical and warm areas of the Americas and Australia; some are used as fodder. (Greek: *leptos*, slender, and *chloa*, grass, from the slender inflorescence branches) (subfamily Chloridoideae, tribe Eragrostideae)

REFERENCES: Snow & Davidse 1993; Snow 1996; Peterson et al. 1997.

1. Lemmas 1–1.5 mm long; leaf sheaths usually papillose-pilose; spikelets 1.4–3 mm long, with 2–4 florets _____ **L. mucronata**
1. Lemmas at least 1.8 mm long; leaf sheaths glabrous to pilose, not papillose; spikelets usually 5–10 mm long, with 3–12 florets.
 2. Tip of lemma appearing chopped off, usually notched, awnless; plants perennial _____ **L. dubia**
 2. Tip of lemma not appearing chopped off, blunt to acute or acuminate (but can be slightly notched), awnless or with an awn 0.5–1.5 mm long; plants annual.
 3. Second glume 3–4.2 mm long; inflorescence branches 4–12(–19) cm long; lemmas lance-elliptic, acute to acuminate, 2.5–4 mm long, usually with awn 0.5–1.5 mm long _____ **L. fascicularis**
 3. Second glume < 3 mm long; inflorescence branches 3–6 cm long; lemmas obovate, blunt, 1.8–3 mm long, awnless or abruptly mucronate _____ **L. uninerva**

Leptochloa dubia (Kunth) Nees, (doubtful), GREEN SPRANGLETOP, TEXAS CROWFOOT. Tufted perennial 25–115 cm tall, erect, unbranched above base (but inflorescences with 2–15 unbranched flexuous, loosely erect or spreading main branches); ligule a dense row of cilia 0.3–1.2 mm long; spikelets usually with 3–8 florets; glumes and lemmas awnless. Rocky slopes, loams; Bell, Johnson, Palo Pinto, Shackelford, and Tarrant cos.; widespread in TX. Spring–fall.

Leptochloa fascicularis (Lam.) A. Gray, (fascicled, clustered), BEARDED SPRANGLETOP, SALT MEADOW GRASS, SALT SPRANGLETOP. Tufted annual usually 50–100 cm tall, moderately branched; ligule a well-developed membrane 2.5–6 mm long; inflorescences with ca. 8–35 stiffly erect or erect-spreading branches; spikelets with 6–12 florets; lemmas with central nerve usually projecting as an awn 0.5–1.5 mm long. Mud, sometimes alkaline or subsaline; Dallas and Grayson cos.; throughout TX. Summer–fall.

Leptochloa mucronata (Michx.) Kunth, (mucronate, with a short and small abrupt tip), RED SPRANGLETOP, SLENDER GRASS. Tufted annual 10–80 cm tall; inflorescence branches few to numerous (to ca. 70), scattered, slender, flexuous; spikelets widely spaced and only slightly overlapping, with 2–4 florets; glumes and lemmas usually awnless. Moist soils and mud; nearly throughout TX. Late spring–fall. [*L. filiformis* (Lam.) P. Beauv.]

Leptochloa uninerva (J. Presl) Hitchc. & Chase, (one-nerved), MEXICAN SPRANGLETOP. Similar to *L. fascicularis*; spikelets more darkly colored at maturity. Mud, sometimes alkaline or subsaline; included based on citation for vegetational area 5 by Hignight et al. (1988); mainly s TX n to Edwards Plateau. Spring–summer(–fall).

LIMNODEA OZARK GRASS

☛ A monotypic genus of the s United States. (Name altered from *Limnas*, an Old World genus of grasses) (subfamily Pooideae, tribe Aveneae)

Limnodea arkansana (Nutt.) L.H. Dewey, (of Arkansas), OZARK GRASS. Annual 15–60(–100) cm tall; leaf blades glabrous or more often hispidulous or hispid on upper and lower surfaces; ligule a lacerate-ciliate membrane 1–2 mm long; inflorescence a narrow but not cylindrical panicle, erect or nodding at tip; spikelets 1-flowered, 3–4 mm long excluding awns; lemmas usually slightly 2-toothed at apex, awned from back at or near base of the 2 teeth, the awn (4–) 8–12 mm long, geniculate. Prairies and disturbed areas, calcareous soils, often in sand; throughout most of TX except extreme w and nw. Mar–Jun.

LOLIUM RYE GRASS

Annuals or perennials; leaves auricled; ligule a membrane; inflorescence an unbranched spike with sessile spikelets in 2 ranks on opposite sides of the inflorescence axis; inflorescence axis remaining intact, disarticulation occurring above glume and between florets; spikelets 1 per node, placed with edge (keels of lemmas) against axis of inflorescence, without a glume on that side, 5–15(–20)-flowered.

☛ An Eurasian genus of 8 species including valuable fodder and lawn grasses. Darbyshire (1993) suggested that *Festuca* subgenus *Schedonorus*, including *F. arundinacea*, be shifted to *Lolium*. (Ancient Latin name for rye grass) (subfamily Pooideae, tribe Poeae)

REFERENCE: Darbyshire 1993.

1. Glumes markedly shorter than spikelet, 5–10 mm long _____ **L. perenne**
 1. Glumes as long as the entire spikelet (excluding awns), 10–20 mm long _____ **L. temulentum**

Lolium perenne L., (perennial), Annual or short-lived perennial. Cultivated for winter-green lawns and erosion control; escaped to roadsides, disturbed areas; throughout TX. Mar–Jun. Native of Europe. While we are following Kartesz (1994) in recognizing the following 2 subspecies, there appears to be significant intergradation and variation. According to Gould (1975b), “... recognition of two varieties [subspecies] is not satisfactory.” Awned and unawned individuals can be found together. ☛

1. Leaf auricles long, slender, pointed; lemmas usually all awned, rarely all awnless, occasionally only a few in upper spikelets awned _____ subsp. **multiflorum**
 1. Leaf auricles mostly short, rounded; lemmas awnless _____ subsp. **perenne**

subsp. **multiflorum** (Lam.) Husn., (many-flowered), ITALIAN RYE GRASS. More common in cultivation than subspecies *perenne*. Coryell, Ellis, Grayson, Hill, McLennan, and Navarro cos. [*L. multiflorum* Lam., *L. perenne* var. *italicum* sensu Mahler, possibly (A. Braun) D.R. Parnell, *L. perenne* var. *multiflorum* (Lam.) D.R. Parnell] Jones et al. (1997) treated this taxon as *L. perenne* var. *aristatum* Willd. ☛

subsp. **perenne**. PERENNIAL RYE GRASS. Perennial but grown as winter annual. Hill and Grayson cos. ☛

Lolium temulentum L., (drunken), DARNEL, DARNEL RYE GRASS, BEARDLESS DARNEL RYE GRASS, POISON DARNEL. Annual. Roadsides, sandy weedy areas; Grayson, Lamar, and McLennan cos., also



Koeleria macrantha [H11]



Leersia lenticularis [US8]



Leersia oryzoides [MAS]



Leersia virginica [H11]



Leptochloa dubia [US8]



Leptochloa fascicularis [US8]



Leptochloa mucronata [H11]



Leptochloa uninerva [US8]



Limnodea arkansana [US8]

Fort Hood (Bell or Coryell cos.—Sanchez 1997); throughout much of TX. May–Jun. Native of Eurasia. [*L. temulentum* var. *leptochaeton* A. Braun] Poisonous due to alkaloids produced by fungi infecting grains; livestock can be affected with symptoms including “rye-grass staggers” in sheep; infected grains were formerly used to make an intoxicating beverage (Muenscher 1951; Mabberley 1987; Hardin & Brownie 1993). ☞ ☞

MELICA MELIC, MELIC GRASS

Tall perennials; leaf sheaths closed; ligule a membrane; inflorescence a panicle; spikelets usually with (1–)2–3 perfect florets, also usually 2–3 neuter reduced florets (“rudiments”) above; glumes broad; lemmas (in our species) awnless; disarticulation below spikelets (in our species).

☞ A genus of 80 species of temperate regions excluding Australia. (Greek: *meli*, honey, or classical name for some plant, possibly with sweet sap, taken up by Linnaeus for this genus) (subfamily Pooideae, tribe Meliceae)

REFERENCE: Boyle 1945.

1. Panicles usually simple (rarely compound); glumes ca. equal in length or second slightly longer; spikelets ± flat-topped and triangular in shape; ligules 1 mm or less long; rudiments broadly obovate to obconic, truncate (appearing abruptly cut off) _____ **M. mutica**
1. Panicles usually compound (branches themselves branched); glumes not equal in length; spikelets neither flat-topped nor triangular in shape; ligules 3–6 mm long; rudiments narrowly obovate or oblong, not truncate _____ **M. nitens**

Melica mutica Walter, (pointless), TWO-FLOWER MELIC, NARROW MELIC. Culms usually 40–80(–100) cm tall from creeping rhizomes; inflorescences 4–16 cm long; spikelets 7–11 mm long; fertile florets usually 2; rudiments broadly obovate to obconic (= like an inverted cone), spreading at an angle from the rachilla. Forest openings on sandy soils; Lamar Co. (Carr 1994) in Red River drainage; mainly se and e TX. Apr–Jun.

Melica nitens (Scribn.) Nutt. ex Piper, (shining), THREE-FLOWER MELIC, TALL MELIC. Rhizomatous, 50–120 cm tall; inflorescences usually 10–26 mm long; spikelets 8–15 mm long, much longer than broad; fertile florets usually 2–3; rudiments not spreading at an angle from the rachilla. Woodland, rocky grasslands; Grayson Co.; also Coleman Co. (Mahler 1988); mainly w 1/2 of TX. Apr–Jun.

MISCANTHUS

☞ A genus of ca. 20 species of the Old World tropics, s Africa, and e Asia; some are cultivated as ornamentals. (Greek: *mischos*, pedicel, and *anthos*, flower, from stalked spikelets) (subfamily Panicoideae, tribe Andropogoneae)

Miscanthus sinensis Andersson, (Chinese), SILVER GRASS, EULALIA. Perennial ca. 1–3(–more) m tall, forming dense, bushy clumps; leaves basal and distributed up the culm, the blades to ca. 1 m long and 2 cm wide, green or variegated (with green and white or yellow bands or stripes) in some cultivated forms, the margins sharply scaberulous; ligule a ciliate membrane 1.5–3 mm long; inflorescence a dense panicle 10–35 cm long, 5–20 cm wide, the branches ascending; inflorescence branches not disarticulating, the spikelets falling from pedicels at maturity; spikelets in pairs, both spikelets of each pair alike, except 1 short-pedicelled, 1 long-pedicelled; pedicels 1–5 mm long; spikelets 4–5.5 mm long, with a tuft of long hairs at base of glumes slightly longer than spikelet; lemmas shorter than glumes, with a twisted, geniculate awn 5–10 mm long. No escaped nc TX specimens have been seen, but this species is cultivated, persists, and possibly escapes. Fall. Native of e Asia. ☞



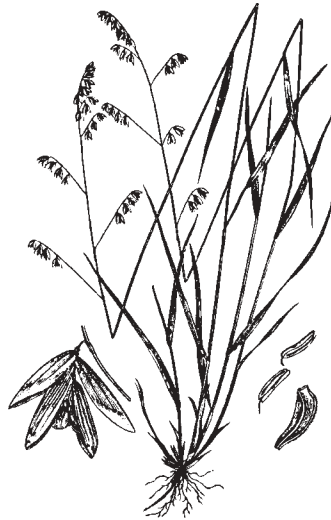
Lolium perenne subsp. *multiflorum* [usd]



Lolium perenne subsp. *perenne* [us8]



Lolium temulentum [us8]



Melica mutica [us8]



Miscanthus sinensis [H11]



Melica nitens [H11]

MUHLENBERGIA MUHLY

Ours perennials; ligule a membrane; inflorescences open to contracted; spikelets usually 1-flowered, the floret separating above the glumes; glumes 1-nerved or nerveless, rarely 3–5-nerved; lemmas 3(–5)-nerved, usually awned; paleas 2-nerved.

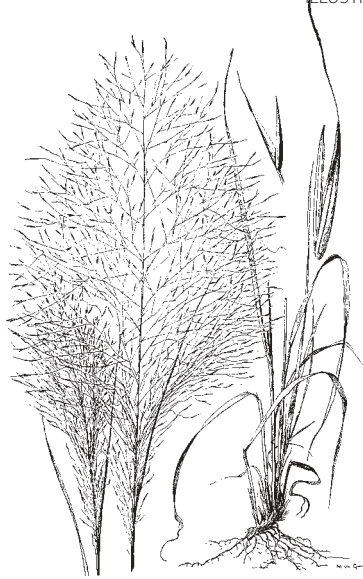
☛ A genus of ca. 160 species primarily of tropical and warm areas of the Americas, with a few in s Asia. (Named for Gotthilf Henry Ernest Muhlenberg, 1753–1815, distinguished American botanist of Pennsylvania) (subfamily Chloridoideae, tribe Eragrostideae)

REFERENCES: Scribner 1907; Soderstrom 1967; Pohl 1969; Morden & Hatch 1987, 1989, 1996; Crosswhite & Crosswhite 1997; Peterson et al. 1997.

1. Panicles open, usually 2–17 cm or more wide; branches bare of spikelets for a distance from base.
 2. Leaf sheaths compressed-keeled; spikelets on pedicels usually 2–5(–8) mm long; lemma awns 0.5–2 mm long; panicles with branches narrowly spreading, 2–5(–7) cm wide _____ **M. × involuta**
 2. Leaf sheaths rounded, not keeled; spikelets on pedicels 3–25 mm long, at least some usually 10 mm or more long; lemma awns 0.5–13 mm long; panicles with branches usually widely spreading, 4–17(–20) cm wide.
 3. Awns of lemma usually 5–15 mm long (rarely as little as 2 mm); second (longer) glume < 1/2 as long as lemmas _____ **M. capillaris**
 3. Awns of lemma usually 0.5–4 mm long (rarely to 7 mm); second glume 1/2 as long as lemmas or longer _____ **M. reverchonii**
1. Panicles contracted, usually < 2(–3) cm wide; branches with spikelets nearly to base.
 4. Glumes minute, 0.3 mm or less long, the first often absent; culms decumbent, often rooting at lower nodes _____ **M. schreberi**
 4. Glumes usually much longer; culms usually erect.
 5. Plants without scaly creeping rhizome; leaf sheaths sharply keeled; inflorescences (10–)20–54 cm long, usually 10–15(–30) mm wide; plants with unbranched erect culms, usually 80–100(–150) cm tall _____ **M. lindheimeri**
 5. Plants with scaly creeping rhizome; leaf sheaths not sharply keeled; inflorescences variable in size, to 21 cm long and 10 mm wide, usually smaller; plants either with culms much branched above or not erect, to ca. 90 cm tall, usually much smaller.
 6. Mat-like plants of wet areas; leaf blades mostly 1–2(–3.5) cm long, 0.5–1(–2) mm wide; both glumes and lemmas 2 mm or less long _____ **M. utilis**
 6. Plants not mat-like, of various habitats; leaf blades mostly 4 cm or more long, 1–3 (or more) mm wide; either glumes or lemmas or both > 2 mm long.
 7. Panicles terminal only; glumes narrowly lanceolate; lemmas pilose below, with conspicuous awns 3–10(–18) mm long _____ **M. sylvatica**
 7. Panicles terminal and axillary; glumes lanceolate to ovate; lemmas pilose to glabrous, awnless or with awns to 3 mm long (rarely to 7 mm in *M. bushii*).
 8. Culms glabrous.
 9. Glumes overlapping nearly to middle, ovate, abruptly tapering to an awn tip; panicles long-exserted, the peduncles up to 11 cm long _____ **M. sobolifera**
 9. Glumes not overlapping or overlapping only at base, lanceolate, gradually tapering to an awn tip; panicles not long-exserted, the peduncles only 1–2 cm long.
 10. Glumes 2 mm or less long; ligules 0.6 mm or less long _____ **M. bushii**
 10. Glumes 2–4 mm long; ligules 0.8–1.4 mm long _____ **M. frondosa**



Muhlenbergia bushii [H11]



Muhlenbergia capillaris [H11]



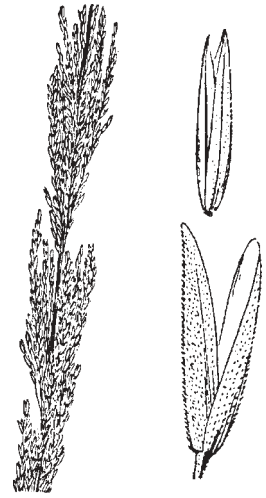
Muhlenbergia frondosa [H11]



Muhlenbergia glabrifloris [SIL]



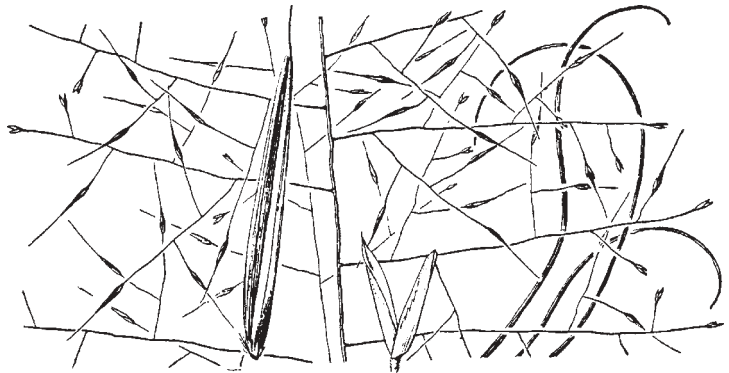
Muhlenbergia X involuta [H11]



Muhlenbergia lindheimeri [H11]



Muhlenbergia mexicana [US8]



Muhlenbergia reverchonii [H11]

Muhlenbergia bushii R.W. Pohl, (for Benjamin Franklin Bush, 1858–1937, amateur botanist of Missouri), NODDING MUHLY. Rhizomatous perennial; culms 30–90 cm tall, erect, becoming much-branched above; panicles numerous, slender; lemma awnless or with awn rarely to 7 mm, pilose basally. Rich or low woods; Clay, Denton, Grayson, Hunt, McLennan, and Montague cos., also Tarrant Co. (Silveus 1933); otherwise in TX only known from Van Zandt Co. in e TX. Jul–Oct. [*M. brachyphylla* Bush]

Muhlenbergia capillaris (Lam.) Trin., (hair-like), HAIRY-AWN MUHLY, LONG-AWNED HAIR GRASS, SLENDER MUHLY, GULF MUHLY. Densely tufted perennial; culms erect, 60–100 cm tall; panicles open, diffuse, to 35(–40) cm long, 8–17(–20) cm wide, the branches and pedicels capillary and widely spreading at maturity; lemmas 3.5–4.5(–5) mm long, minutely scabrous, with a few hairs basally, with variable awn (2–)5–15 mm long. Sandy forest openings; Grayson, Henderson, Lamar, and Tarrant cos.; mainly se and e TX. Sep–Oct.

Muhlenbergia frondosa (Poir.) Fernald, (leafy), WIRE-STEM MUHLY. Rhizomatous perennial; culms often becoming decumbent or sprawling, to 100 cm long; panicles numerous, slender; lemmas awnless or with awn to 2 mm long, pubescent basally. Clay soils; in TX known only from Dallas and Grayson cos. (Correll & Johnston 1970). Oct.

Muhlenbergia glabrifloris Scribn., (smooth-flowered), INLAND MUHLY. Rhizomatous perennial similar to *M. frondosa*; panicles numerous, slender; lemmas awnless, glabrous. Rich woods, in TX known only from the Blackland Prairie; type of this species was collected by Reverchon at Dallas (Mahler 1988). Sep.

Muhlenbergia × **involuta** Swallen [*M. lindheimeri* × *M. reverchonii*], (rolled inward), CANYON MUHLY. Densely tufted perennial; culms stiffly erect, 60–140 cm tall; panicle branches slender, erect-spreading; spikelets 3–4 mm long; lemmas 3–4 mm long, minutely bifid apically, with awn 0.5–2 mm long from between the minute apical teeth. Prairie draws and openings; Burnet Co.; type collected 20 mi ne of San Antonio; also Bandera, Blanco, Comal, Kendall and Travis cos. to the s of nc TX (Mahler 1988); Edwards Plateau n to very s edge of nc TX; endemic to TX. Fall. 📍

Muhlenbergia lindheimeri Hitchc., (for Ferdinand Jacob Lindheimer, 1801–1879, German born TX botanist), LINDHEIMER'S MUHLY. Large tufted perennial with stiffly erect culms usually 80–100(–150) cm tall; panicles (10–)20–54 cm long, tightly or loosely contracted, densely flowered; panicle branches with flowers nearly to base; lemmas ca. 2–4 mm long, glabrous, scabrous, or puberulent, awnless or infrequently with awn to 3(–4) mm long. Mesic limestone areas and creek banks; Bell Co.; mainly Edwards Plateau n to s part of nc TX. Sep–Dec.

Muhlenbergia mexicana (L.) Trin., (Name given under mistaken idea that the species is Mexican). Rhizomatous perennial; culms 30–90 cm tall, much-branched above; ligules to 1 mm long; panicles slender, the branches densely flowered; spikelets 2–4 mm long; glumes ca. equaling floret, with awn to 1.5 mm long; lemmas 1.3–3.4 mm long, awnless or with awn to 0.5 mm long, pilose basally. Thickets and field borders; a Reverchon collection (4110) reported from Granbury, Hood Co. is the only known TX collection (Gould 1975b). Summer–fall.

Muhlenbergia reverchonii Vasey & Scribn., (for Julien Reverchon, 1837–1905, a French-American immigrant to Dallas and important botanical collector of early TX), SEEP MUHLY, REVERCHON'S MUHLY. Densely tufted perennial; culms stiffly erect, 40–80 cm tall; ligules 2–4 mm long; panicles open; glumes to 3 mm long; lemmas glabrous or scabrous, 3.5–5 mm long, with awn 0.5–4(–7) mm long. Calcareous soils, typically in moist or wet areas; mainly Blackland Prairie w to West Cross Timbers and s to Edwards Plateau. Aug–Nov. The inflorescences can have a striking reddish appearance (J. Stanford, pers. comm.).



Muhlenbergia schreberi [R&E]



Muhlenbergia sobolifera [H11]



Muhlenbergia sylvatica [US8]



Muhlenbergia utilis [H11]



Nassella leucotricha [G01]



Oplismenus hirtellus [US8]



Panicum aciculare var. *aciculare* [H11]

Muhlenbergia schreberi J.F. Gmel., (for Johann Daniel Christian von Schreber, 1739–1810, German botanist), NIMBLE-WILL, SATIN GRASS, SCHREBER'S MUHLY. Perennial; culms decumbent below, rooting at lower nodes, usually 10–40(–60) cm tall, much-branched; ligules to 0.5 mm long; panicles contracted; lemmas 2–2.5 mm long, with awn 1.5–5 mm long, pilose basally. Woods and thickets; Bell, Collin, Dallas, Denton, and Fannin cos.; se and e TX w to East Cross Timbers, also Edwards Plateau. Jun–Oct.

Muhlenbergia sobolifera (Muhl. ex Willd.) Trin., (bearing sprouts), ROCK MUHLY, ROCK-DROPSEED. Rhizomatous perennial; culms 40–85(–100) cm tall, much-branched above; ligules to 1 mm long; glumes about equal, overlapping basally; lemmas 2–3 mm long, awnless or with awn to 3 mm long, pubescent basally. Rocky slopes, open woods; Grayson Co., also Brown, Hamilton (HPC), and Dallas (Mahler 1988) cos.; also infrequent in e TX and Edwards Plateau. Sep–Oct. Including [*M. sobolifera* var. *setigera* Scribn.], the type of which was collected by Reverchon (70) at Dallas (Mahler 1988).

Muhlenbergia sylvatica Torr. ex A. Gray, (forest-loving), FOREST MUHLY. Rhizomatous perennial; culms decumbent or sprawling below, usually 40–100 cm long, freely branching at middle nodes; internodes puberulent; ligules to 2.5 mm long; panicles terminal, slender, contracted; lemmas 2.2–3.2 mm long, pilose basally, with awns 3–10(–18) mm long. Woods and shaded stream banks; included based on citations of vegetational areas 4 and 5 (Fig. 2) by Gould (1975b) and Hatch et al. (1990); mainly Edwards Plateau. Aug–Sep.

Muhlenbergia utilis (Torr.) Hitchc., (useful), APAREJO GRASS, APAREJO MUHLY. Low rhizomatous perennial; culms 20–40 cm long; panicles narrow, interrupted, loosely flowered, 1–4 cm long; lemmas 1.6–2 mm long, minutely scabrous, scarcely mucronate. Along streams, marshy meadows, usually very wet areas of calcareous soils; Tarrant Co.; mainly Edwards Plateau. Late summer–fall.

NASELLA

☛ A genus of 79 species of warm and tropical areas of the Americas, especially the Andes; related to and previously treated in *Stipa*. (Latin: *nassa*, a basket with a narrow neck) (subfamily Pooideae, tribe Stipeae)

REFERENCES: Hitchcock 1925; Brown 1952; Barkworth 1990, 1993.


Nassella leucotricha (Trin. & Rupr.) Barkworth, (white-haired), WINTER GRASS, TEXAS WINTER GRASS, SPEAR GRASS, TEXAS NEEDLE GRASS. Perennial, tufted, 25–100 cm tall, green from late fall to summer; ligules variable, from absent to a 1 mm membrane; axillary, cleistogamous florets produced basally in addition to terminal panicles; spikelets 1-flowered; glumes acuminate, 14–18 mm long; lemma 9–12 mm long, with very long (4.5–10 cm), geniculate awn; lemma apex with smooth white neck and ring of hairs around awn base; caryopsis permanently enclosed within the lemma. Prairies, disturbed sites; throughout TX. Apr–May. A minor component of original prairie, increasing under disturbance. The lemma base and rachilla form a callus that is so sharp-pointed that it will easily stick into clothing or skin; wounds can result including those to the mouth of animals (Lipscomb & Diggs 1998). [*Stipa leucotricha* Trin. & Rupr.]

OPLISMENUS

☛ A genus of 7 species of the tropics and warm areas including *O. hirtellus* cultivar *variegatus*, a cultivated greenhouse hanging-basket plant. (Greek: *hoplismos*, a weapon, referring to the awns) (subfamily Panicoideae, tribe Paniceae)

REFERENCES: Hitchcock 1920a; Davey & Clayton 1978; Scholz 1981; Crins 1991.

Oplismenus hirtellus (L.) P. Beauv., (rather hairy), BASKET GRASS. Perennial with culms creeping and rooting at the nodes; ligule a ciliate membrane; leaf blades 1.5–7 cm long, 5–15 mm wide,

widely spreading to reflexed; inflorescences of 3–7 widely spaced, very short, spike-like branches ca. 1–6 mm long; spikelets sessile or nearly so, in 2 rows on 1 side of the inflorescence branches, 2-flowered, the lower floret sterile, the upper floret perfect; glumes awned; awn of first glume 5–10 mm long, much longer than awn of second glume; fertile lemma indurate, the margins virtually enclosing the palea. Tarrant Co., also Limestone Co. near the e edge of nc TX; mainly se and e TX. Summer–Oct. Native to New World tropics and subtropics. The nc TX specimens of this species were treated as *O. hirtellus* subsp. *setarius* by Correll and Johnston (1970) and Gould (1975b), while recognized as a separate species, *O. setarius*, by Kartesz (1994). We are following Davey and Clayton (1978) whose worldwide study of the group indicated that the two taxa should be lumped; Crins (1991) and Jones et al. (1997) also treated the two as conspecific. [*O. hirtellus* subsp. *setarius* (Lam.) Mez ex Ekman, *O. setarius* (Lam.) Roem. & Schult.] 

PANICUM PANIC GRASS

Annuals or perennials with or without rhizomes; basal rosette leaves not developed (basal leaves few, usually withering by flowering time) or in subgenus *Dichantherium* basal tuft or rosette of leaves shorter and wider than those of the culms present, produced from fall to spring, persistent; ligule usually a membrane, often ciliate or with a fringe of hairs; panicles much-branched, normally produced in one continuous period of bloom, terminal or both terminal and lateral together or in subgenus *Dichantherium* terminal panicles on mostly simple culms produced in spring and early summer, and a second crop of more numerous lateral or basal panicles produced in late summer or fall (often of cleistogamous spikelets) (descriptions are of spring phase only, autumnal phase often quite different); spikelets awnless, 2-flowered, the lower floret sterile or staminate, the upper floret perfect; glumes usually both present, the first typically shorter; lower lemma resembling second glume; upper (perfect) lemma firm to hardened, shiny and glabrous with inrolled margins.

☛ A huge genus of > 600 species in 6 subgenera making it the largest genus of grasses (Zuloaga 1987); the species are native from tropical to temperate areas throughout the world and a number are used as fodders, grains, or cultivated ornamentals. The segregate *Dichantherium* has been recognized by Gould (1974), Kartesz (1994), and others (e.g., Hatch et al. 1990) on the basis of such characters as having an overwintering rosette of short broad leaves, uniformly having the C₃ photosynthetic pathway, and possessing spring chasmogamous inflorescences and later in the season small, axillary, cleistogamous inflorescences. However, the overlap and blurring of these and other characters in Central and South American taxa brings the generic recognition of *Dichantherium* into question (Zuloaga 1987). We are thus following Lelong (1984), Zuloaga (1987), Webster (1988), Zuloaga et al. (1993), Zuloaga and Morrone 1996, and Jones et al. (1997) in treating *Dichantherium* (15 nc TX species) and *Steinchisma* (1 species in nc TX) as subgenera within *Panicum*. The other nc TX species of *Panicum* are scattered in 3 of the other 4 subgenera of the genus. Species here treated as *Urochloa* have previously been lumped with *Panicum*; some of these are included in the *Panicum* key as an aid in identification. (Latin: *panus*, an ear of millet) (subfamily Panicoideae, tribe Paniceae)

REFERENCES: Hitchcock & Chase 1910; Silveus 1942; Gould 1974; Allred & Gould 1978; Gould & Clark 1978; Lelong 1984, 1986; McGregor 1985a; Zuloaga 1987; Hansen & Wunderlin 1988; Webster 1988, 1992; Webster et al. 1989; Crins 1991; Zuloaga et al. 1993; Wipff & Jones 1994 [1995]; Zuloaga & Morrone 1996.

1. Basal leaves usually similar to those of the culm, only smaller, basal rosette absent; small axillary panicles absent in fall; plants annual or perennial; sometimes segregated as genus *Panicum* sensu stricto.
2. Plants annual, without rhizomes, enlarged hard or knotty bases, or densely clumped culms.

3. Inflorescence consisting of several \pm secund spike-like primary branches; spikelets subsessile or short-pedicelled; fertile lemma transversely rugose.
4. Spikelets 5–6 mm long _____ see **Urochloa texana**
4. Spikelets 2.4–3 mm long _____ see **Urochloa fasciculata**
3. Inflorescence a \pm diffuse panicle; spikelets short- or long-pedicelled; fertile lemma smooth.
5. Spikelets conspicuously warty under a hand lens (second glume and lower lemma verrucose or tuberculate); only at far e margin of nc TX _____ **P. brachyanthum**
5. Spikelets not warty; widespread in nc TX.
6. First glume about 1/4 as long as spikelet, obtuse or rounded _____ **P. dichotomiflorum**
6. First glume $>$ 1/4 as long as spikelet, acute or acuminate.
7. Spikelets 4.5–5 mm long _____ **P. miliaceum**
7. Spikelets 1.5–3.5 mm long.
8. Spikelets 1.8–3.5 mm long, long acuminate at tip; panicles nearly as broad as long; rare in nc TX _____ **P. philadelphicum**
8. Spikelets 1.5–2(–2.2) mm long, acute to slightly acuminate at tip; panicles usually distinctly longer than broad; includes species widespread in nc TX.
9. Palea of lower floret usually absent (do not be confused by lodicules); leaves yellow-green; inflorescences often with reddish or purplish coloration; fertile lemma lacking a crescent-shaped marking at its base; widespread in nc TX _____ **P. capillare**
9. Palea of lower floret present; leaves blue-green; inflorescences usually without reddish or purplish coloration; fertile lemma with a crescent-shaped marking at its base; on extreme w margin of nc TX _____ **P. hillmanii**
2. Plants perennial, often with rhizomes, enlarged hard or knotty bases, or culms densely clumped.
10. Spikelets short-pedicelled along one side of the branch axes, forming appressed spike-like inflorescence branches; inflorescence branches usually not themselves branched; first glume about as long as second _____ **P. obtusum**
10. Spikelets short- or long-pedicelled, in open or sometimes contracted or congested panicles; inflorescence branches usually themselves branched; first glume usually shorter than second.
11. Sterile palea enlarged and indurate at maturity, giving the spikelets an expanded appearance (spikelets at maturity gaping open at apex); spikelets 1.8–2.6 mm long, borne toward the ends of the few slender branches (subgenus *Steinchisma*) _____ **P. hians**
11. Sterile palea usually absent or minute if present; spikelets and branching various.
12. Plants with conspicuous, creeping, scaly rhizomes.
13. First glume $<$ 1/2 as long as spikelet; spikelets on short pedicels so appressed as to make the spikelets appear sessile; spikelets 2.8–3.5 mm long; panicles open or contracted, usually sparsely branched _____ **P. anceps**
13. First glume $>$ 1/2 as long as spikelet; spikelets on relatively long, only slightly appressed pedicels; spikelets 2.8–5 mm long; panicles usually open, much branched _____ **P. virgatum**
12. Plants without creeping scaly rhizomes.
14. Spikelets short-pedicelled (appearing nearly sessile) along the usually unbranched inflorescence branches or on short spur branches; spikelets 1.6–2.5 mm long; plants typically of low moist areas _____ **P. rigidulum**
14. Spikelets either long-pedicelled in open panicles OR if very short-pedicelled then the inflorescence open and its branches rebranched; spikelets 2.1–3.9 mm long; plants of various habitats.
15. Culms (at least the lower part) knotty, the conspicuously swollen nodes as much as twice as thick as the middle of the internodes _____ **P. antidotale**

15. Culms not as above.
16. Lower inflorescence branches in verticels of 3–7, pilose in the axils; inflorescences often nearly half the height of the entire plant; margin of nc TX _____ **P. bergii**
16. Lower inflorescence branches usually solitary, glabrescent in the axils; inflorescences usually 6–25 cm long; including species widespread in nc TX.
17. First glume ca. 1/4 as long as spikelet, abruptly narrowed to an acute apex _____ **P. coloratum**
17. First glume 1/2 as long as spikelets or longer, gradually narrowed to an acute to acuminate apex.
18. Leaf sheath margins often ciliate with a line of ascending hairs; nodes spreading-pilose; plants green _____ **P. diffusum**
18. Leaf sheath margins glabrous or with a tuft of hairs at the summit, not ciliate; nodes appressed-pubescent or glabrous; plants often glaucous _____ **P. hallii**
19. Basal leaves usually different from those of the culm, forming a basal rosette; small axillary panicles on reduced lateral shoots present in fall; plants perennial; (subgenus *Dichantherium*) sometimes segregated as genus *Dichantherium*.
19. Blades of basal and culm leaves all 15–40 times as long as wide, 1–4 mm wide.
20. Spikelets 2.1–4.2 mm long; leaf sheaths glabrous or pilose with spreading to ascending hairs.
21. Spikelets 2.1–3.0 mm long _____ **P. linearifolium**
21. Spikelets 3.0–4.2 mm long _____ **P. depauperatum**
20. Spikelets 1.7–2.1 mm long; leaf sheaths pilose with widely spreading to slightly reflexed hairs _____ **P. laxiflorum**
19. Blades of basal and lowest culm leaves 3–15 times as long as wide (of upper culm leaves up to 20 times), 2–30(–35) mm wide.
22. Spikelets 2.4–4.3 mm long.
23. Nodes with a dense ring of widely spreading to reflexed hairs.
24. Spikelets 2.6–3.2 mm long.
25. Node lacking a broad glabrous region; leaf blades 5–12 mm wide; culms 0.3–0.7 m tall, slender (< 2 mm thick) _____ **P. malacophyllum**
25. Node with a broad, conspicuous, glabrous region (in addition to a ring of hairs); leaf blades 3–30 mm wide; culms usually 0.8–1.5 m tall, stout (usually 2–4 mm thick) _____ **P. scoparium**
24. Spikelets 3.6–4.2 mm long.
26. Leaf blades velvety-pubescent beneath; ligule of hairs 3–4 mm long _____ **P. ravenelii**
26. Leaf blades not velvety-pubescent beneath, glabrous or with only scattered pubescence; ligule essentially absent _____ **P. boscii**
23. Nodes with spreading to ascending hairs, or glabrous.
27. Leaf blades usually 12 mm or less wide.
28. Spikelets narrowly obovate, gradually tapering to a narrow base, 3–3.9 mm long _____ **P. pedicellatum**
28. Spikelets ovate, oblong, or slightly obovate, not tapering gradually to a narrow base, 2.4–4 mm long.
29. Hairs of ligules 1.5–6 mm long.
30. Spikelets 2.4–2.7 mm long _____ **P. acuminatum** var. **villosum**
30. Spikelets usually 2.7–4 mm long _____ **P. oligosanthos**
29. Hairs of ligules absent or < 1.5 mm long.

31. Spikelets usually 2.7–4 mm long; second glume and lower lemma usually 5-nerved; widespread in nc TX _____ **P. oligosanthos**
31. Spikelets 2.4–2.8 mm long; second glume and lower lemma usually 7-nerved; rare in nc TX, reported only from Dallas and Lamar cos. _____ **P. aciculare**
27. Leaf blades (at least larger ones) usually 13–35 mm wide.
32. Leaf blades velvety-tomentose or puberulent beneath, glabrous or puberulent above; spikelets 2.4–2.8 mm long _____ **P. scoparium**
32. Leaf blades not velvety-tomentose or puberulent beneath (or if so, spikelets 2.8–4 mm long), often glabrous on both surfaces; spikelets 2.4–4 mm long.
33. Spikelets broadly elliptic to obovate, turgid, with heavy broad nerves; leaf blades 5–15 mm wide _____ **P. oligosanthos**
33. Spikelets narrowly elliptic to obovate, neither turgid nor strongly nerved; leaf blades (8–)13–35 mm wide.
34. Leaf blades usually < 10 cm long; leaf sheaths glabrous or pubescent on margins _____ **P. divergens**
34. Leaf blades mostly 10–20(–28) cm long; leaf sheaths, at least lower ones, papillose hispid with spreading hairs _____ **P. clandestinum**
22. Spikelets 1.3–2.4 mm long.
35. Leaf blades glabrous except near base or on margins.
36. Ligules 1.5–6.0 mm long _____ **P. acuminatum** var. **lindheimeri**
36. Ligules 1.3 mm or less long, or apparently absent.
37. Leaf sheaths with widely spreading to slightly reflexed hairs 2.5–3.5 mm long _____ **P. laxiflorum**
37. Leaf sheaths either with ascending hairs up to 2 mm long OR glabrous.
38. Blades of larger culm leaves 3–6 mm wide, narrowed or rounded at base, not auricled.
39. Spikelets 2.0–2.3 mm long, 1.0–1.3 mm wide _____ **P. aciculare**
39. Spikelets 1.3–2.0 mm long, 0.6–1.0 mm wide _____ **P. dichotomum**
38. Blades of larger culm leaves 5–30 mm wide, abruptly narrowed to subcordate base, slightly auricled-clasping _____ **P. sphaerocarpon**
35. Leaf blades sparsely to densely pubescent or pilose over one or both surfaces.
40. Spikelets 2.2–2.4 mm long; species rare in nc TX.
41. Blades of largest culm leaves usually 8–30 mm wide; hairs of ligules 1–1.3 mm long _____ **P. scoparium**
41. Blades of largest culm leaves usually 5–12 mm wide; hairs of ligules 1.5–6 mm long _____ **P. acuminatum** var. **villosum**
40. Spikelets 1–2.1 mm long; species common in nc TX _____ **P. acuminatum**

Panicum aciculare Desv. ex Poir., (bristle-like). Plant 30–75 cm tall; leaves with lower sheaths sparsely pilose, the upper sheaths and blades glabrous or with some pubescence. Sandy woods; Dallas Co. (Mahler 1988), also Lamar Co. (Carr 1994); mainly se and e TX. Apr–Jun, also late summer–fall. The variation within this taxon has sometimes been given no formal recognition (e.g., Gould & Clark 1978) or recognized at the species level (e.g., Lelong 1986); we are following Wipff and Jones (1994 [1995]) in recognizing it at the varietal level. While we have not seen material to determine varietal status of the 2 citations given above, it is possible that both of the following occur in nc TX. Lelong (1986) separated them (as species) as follows:

1. Spikelets 1.7–2.2 mm long; leaf blades 3.5–8 cm long and up to 4 mm wide _____ var. **aciculare**
1. Spikelets 2.4–2.8 mm long; leaf blades 5–15 cm long and up to 7 mm wide _____ var. **angustifolium**

var. **aciculare**. [*Dichantherium aciculare* (Desv. ex Poir.) Gould & C.A. Clark, *Panicum ovinum* Scribn. & J.S. Sm.]

var. **angustifolium** (Elliott) Wipff & S.D. Jones, (narrow-leaved). [*Dichantherium angustifolium* (Elliott) Gould, *P. angustifolium* Elliott]

Panicum acuminatum Sw., (long-pointed, tapering to tip). Plant 10–65 cm tall; leaf blades usually 3–12 mm wide.

1. Spikelets 1–2.1 mm long; widespread in nc TX.

2. Leaf sheaths usually densely long pilose, the hairs on upper part spreading at right angles, 2.5–4 mm long; culms usually pilose with nodes bearded _____ var. **acuminatum**

2. Leaf sheaths glabrous to with some pubescence (particularly on margins), if present then hairs on upper part ascending, 1–2 mm long; culms glabrous or internodes sparsely pilose

_____ var. **lindheimeri**

1. Spikelets 2.2–2.7 mm long; mainly e TX _____ var. **villosum**

var. **acuminatum**. WOOLLY ROSETTE GRASS, WOOLLY PANIC. Plant usually pilose. Sandy open woods; Bell, Denton, and Grayson cos.; widespread in TX. Apr–Jun, again late summer–fall. [*Dichantherium acuminatum* (Sw.) Gould & C.A. Clark var. *fasciculatum* (Torr.) Freckmann, *Dichantherium acuminatum* var. *implicatum* (Scribn.) Gould & C.A. Clark, *Dichantherium lanuginosum* (Elliott) Gould, *P. acuminatum* var. *fasciculatum* (Torr.) Lelong, *P. lanuginosum* Elliott]

var. **lindheimeri** (Nash) Lelong, (for Ferdinand Jacob Lindheimer, 1801–1879, German born TX botanist), LINDHEIMER'S ROSETTE GRASS, LINDHEIMER'S PANIC. Plant nearly glabrous or with sparse pubescence. Sandy or rocky ground, in sun or shade; se and e TX w to West Cross Timbers, also Edwards Plateau. Apr–Jun, again late summer–fall. [*Dichantherium acuminatum* var. *lindheimeri* (Nash) Gould & C.A. Clark, *Dichantherium lanuginosum* (Elliott) Gould var. *lindheimeri* (Nash) Fernald, *Dichantherium lindheimeri* (Nash) Gould, *P. lanuginosum* (Elliott) Gould var. *lindheimeri* (Nash) Fernald, *P. lindheimeri* Nash]

var. **villosum** (A. Gray) Beetle, (soft-hairy), WHITE-HAIRED ROSETTE GRASS, WHITE-HAIRED PANIC. Plant usually 20–60 cm tall; culms and leaf blades pilose; leaf sheaths with erect-spreading hairs to 3 mm long; spikelets 2.2–2.7 mm long. Sandy woods; Parker Co. (Gould 1975b), also Lamar Co. (Carr 1994); mainly e TX. Apr–Jun, also late summer–fall. [*Dichantherium acuminatum* (Sw.) Gould & C.A. Clark var. *villosum* (A. Gray) Gould & C.A. Clark, *Dichantherium lanuginosum* (Elliott) Gould var. *villosissimum* (Nash) Gould, *Dichantherium villosissimum* (Nash) Freckmann, *P. acuminatum* var. *villosum* (A. Gray) Beetle, *P. ovale* Elliott var. *villosum* (A. Gray) Lelong, *P. villosissimum* Nash] While we are following Jones et al. (1997) in recognizing this taxon as a variety, according to J. Wipff (pers. comm.), var. *acuminatum* and var. *villosum* are separated by only one weak character (amount and length of pubescence on the leaf sheaths and blades) which apparently intergrades completely; as a result, he suggests treating var. *villosum* as a synonym of var. *acuminatum*. However, Kartesz (1994) and J. Kartesz (pers. comm. 1997) treated var. *villosum* as a distinct species, *Dichantherium villosissimum*.

Panicum anceps Michx., (two-edged), BEAKED PANICUM. Perennial 30–100 cm tall with stout rhizomes; ligule a minute membranous collar 0.4 mm or less long. Low moist areas; se and e TX w to Grand Prairie and Edwards Plateau. Jul–Nov. [*P. anceps* var. *rhizomatum* (Hitchc. & Chase) Fernald, *P. rhizomatum* Hitchc. & Chase] Jones et al. (1997) recognized var. *rhizomatum*.

Panicum antidotale Retz., (acting as or of the nature of an antidote), BLUE PANIC. Perennial 0.5–2(–3) m tall. Resembling *P. hallii*, with ligules like that of *P. bergii*. Recommended by some for planting as a forage grass; widely introduced into TX; included based on citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990). Spring–fall. Native of India. 🌿

Panicum bergii Arechav., (derivation not known). Tufted perennial 50–100 cm tall; lower nodes with a collar of hairs; leaves with sheaths sparsely pilose, the blades densely so at base; ligule a short membranous base (ca. 0.5 mm long) with fringe of hairs to 2.5 mm long; panicles open, the lower branches in verticils of 3–7, the whole inflorescence disarticulating as a tumbleweed at maturity; spikelets glabrous. Low areas; Navarro Co.; se TX nw to e edge of nc TX. Late Apr–May. Native of s South America. [*P. pilcomayense* Hack.] We are following Jones et al. (1997) and J. Kartesz (pers. comm. 1997) for nomenclature of this species. 🌿

Panicum boscii Poir., (for its discoverer, Louis Augustin Guillaume Bosc, 1759–1828, French naturalist). Plant ca. 40–70 cm tall; leaves with sheaths and blades glabrous or with only scattered pubescence; leaf blades to 2.6(–3) cm wide. Wooded or low areas; Lamar Co. (Carr 1994) in Red River drainage; mainly e TX. Mainly Apr–Jul., also fall. [*Dichanthelium boscii* (Poir.) Gould & C.A. Clark]

Panicum brachyanthum Steud., (short-flowered), PIMPLE PANICUM. Glabrous annual with erect to decumbent culms to ca. 100 cm long; panicles few-flowered; spikelets 3–3.6 mm long, conspicuously warty, covered with short stiff hairs. Open, often sandy woods, fencerows, along highways; Lamar Co. (Carr 1994), also Henderson and Milam cos. near the e edge of nc TX; mainly se and e TX. *Panicum verrucosum* Muhl., also with warty spikelets, is known just e of nc TX in e Henderson Co. It has glabrous, much smaller spikelets 1.8–2.6 mm long.

Panicum capillare L., (hair-like), WITCH GRASS. Annual with erect to partly decumbent culms 8–100 cm long; leaf blades usually hirsute or pilose on both surfaces or blades glabrous on upper surface (occasionally merely ciliate marginally below); leaf sheaths with papilla-based hairs; ligules of hairs; panicles very open, large for size of plant, often with reddish or purplish coloration. Disturbed areas and banks of ponds and streams; nearly throughout TX, most common in nc TX. May–Oct. Superficially similar to *Digitaria cognata* which differs in having essentially glabrous leaves and usually lacking a first glume (or glume vestigial). Some authorities (e.g., Jones et al. 1997) recognize a number of varieties for this species.

Panicum clandestinum L., (hidden), DEER-TONGUE, DEER-TONGUE ROSETTE GRASS. Plant 50–150 cm tall. Sandy woods; collected at Dallas by Reverchon in 1875, not found there since (Mahler 1988); mainly e TX. Apr–Jun, again late summer–fall. [*Dichanthelium clandestinum* (L.) Gould]

Panicum coloratum L., (colored), KLEIN GRASS. Tufted perennial usually 60–135 cm tall from often knotty bases; ligule a fringed membrane 0.5–2 mm long including hairs; leaf sheaths glabrous or with papilla-based hairs; leaf blades glabrous or with pubescence. Introduced as a forage grass; Somervell Co. (R. O'Kennon, pers. obs.), also cited for vegetational areas 4 and 5 (Fig. 2) by Hatch et al. (1990); also Post Oak Savannah and Edwards Plateau. May–Sep. Native to Africa. 🌿

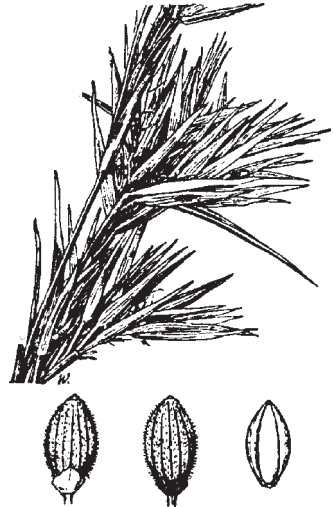
Panicum depauperatum Muhl., (impoverished), STARVED ROSETTE GRASS. Similar to *P. linearifolium* and possibly intergrading with it; plant to 35 cm tall; leaves pilose to hispid or nearly glabrous, the sheaths common thinly pilose, the blades often glabrous on upper surface. Woods, roadsides; Lamar Co., also Grayson Co. (Mahler 1988); mainly e TX w in Red River drainage. Apr–May. [*Dichanthelium depauperatum* (Muhl.) Gould]

Panicum dichotomiflorum Michx., (with forking inflorescence), FALL PANICUM, SPREADING WITCH GRASS. Coarse annual with culms 1–2 m long, erect or trailing; ligule a 0.5–1 mm long membrane ciliate with hairs ca. 2 mm long; leaf blades usually glabrous (rarely puberulent). Moist, disturbed soils; in nc TX w to Cooke and Tarrant cos.; widespread in TX. Aug–Nov.

Panicum dichotomum L., (2-forked or parted). Plant rather slender, 25–60 cm tall, glabrous except for nodes, summit of leaf sheaths, and margins of leaf blades near base; spikelets very small. Low sandy woods; included based on citation of vegetational areas 4 and 5 (Fig. 2) by



Panicum acuminatum var. *acuminatum* [H11]



Panicum acuminatum var. *lindheimeri* [H11]



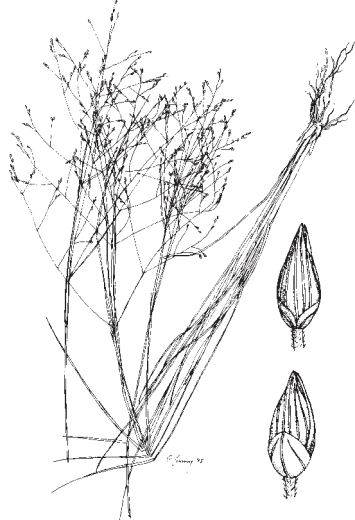
Panicum acuminatum var. *villosum* [US8]



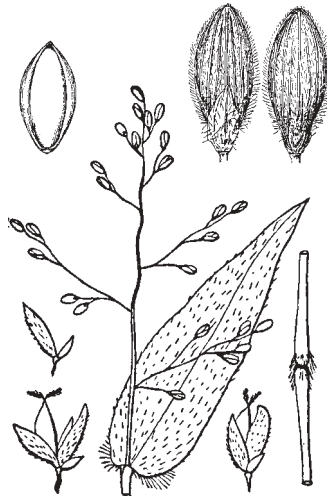
Panicum anceps [US8]



Panicum antidotale [G01]



Panicum bergii [HEA]



Panicum boscii [BB2]



Panicum brachyanthum [G01]

Gould (1975b) and Hatch et al. (1990); mainly se and e TX. Apr–Jun, also late summer–fall. [*Dichanthelium dichotomum* (L.) Gould, *P. barbulatum* Michx., *P. lucidum* Ashe, *P. microcarpon* Muhl. ex Elliott, *P. nitidum* Lam., *P. roanokense* Ashe, *P. yadkinense* Nash] Jones et al. (1997) recognized five varieties of this species in TX.

Panicum diffusum Sw., (diffuse, spreading), SPREADING PANICUM. Perennial in small dense tufts; culms slender, spreading (rarely ascending), often branching, usually to ca. 30 cm long but occasionally much longer; nodes pubescent; ligule a membrane ca. 0.5–1 mm long ciliate with hairs 1–2 mm long; leaf blades usually glabrous or spreading pilose; leaf sheaths glabrous or with papilla-based hairs. Disturbed loamy or clayey soils; throughout most of TX. Apr–Nov. Zuloaga and Morrone (1996) indicated that this species is found on Carribean Islands and does not occur in the U.S.; Jones et al. (1997) lumped it with *P. hallii* var. *filipes*. Stephan Hatch (pers. comm.) considers this species to occur in TX and to be distinct from *P. hallii*.

Panicum divergens Kunth, (wide-spreading), VARIABLE ROSETTE GRASS. Culms 40–75 cm tall; larger leaf blades cordate at base, usually < 10 cm long, occasionally up to 15 cm. Sandy woods; Lamar Co. (Carr 1994) in Red River drainage; mainly se and e TX. Apr–Jun, again late summer–fall. [*Dichanthelium commutatum* (Schult.) Gould, *P. commutatum* Schult.] We are following Jones et al. (1997) for nomenclature of this species.

Panicum hallii Vasey, (for its discoverer, Elihu Hall, 1822–1882, American botanist and explorer of Rocky Mts.). Tufted perennial 12–80 cm tall; leaves sparsely pilose to glabrous; ligule a short, fibrous, readily splitting membrane, with fringe of hairs to 1.3 mm long; panicles open, rather small. Prairies, disturbed sites, commonest on limestone or calcareous clay. Apr–Nov.

1. Panicle branches usually > 15; spikelets 2–3 mm long; leaf sheaths without papilla-based hairs

_____ var. **filipes**

1. Panicle branches usually < 15; spikelets 3–3.7 mm long; leaf sheaths mostly with papilla-based

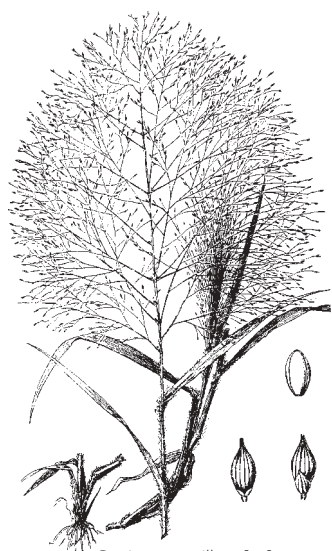
hairs _____ var. **hallii**

var. **filipes** (Scribn.) FR. Waller, (slender), FILLY PANICUM. In nc TX known only from Palo Pinto and Tarrant cos.; widely distributed in TX. [*P. filipes* Scribn.]

var. **hallii**. HALL'S PANIC. Nearly throughout TX.

Panicum hians Elliott, (gaping), GAPING PANICUM. Perennial with culms erect or decumbent at base; nodes glabrous or scabrous; leaf sheaths glabrous or with hairs on upper margins; ligule a short glabrous membrane ca. 0.5 mm long; panicles usually 6–20 cm long, the lower 1–3 cm of branches bare of spikelets; spikelets glabrous, 1.8–2.6 mm long, at maturity gaping open at apex; lemma and palea of perfect floret firm, but not tough and hard or grain-like; glumes both present, the first 1/3–1/2 as long as spikelet; lower lemma resembling second glume; upper (perfect) lemma with inrolled margins; palea of the lower (neuter) floret inflated, obovate, often apiculate, distinctive, larger than the lemma and giving the spikelet an expanded or gaping appearance. Low areas, moist soils, often in shade; Dallas, Grayson, and Hunt cos.; se and e TX w to Blackland Prairie and Edwards Plateau. Apr–Oct, typically early in growing season. Treated here in subgenus *Steinchisma* (Zuloaga 1987); sometimes segregated into the monotypic genus *Steinchisma* [as *S. hians* (Elliott) Nash].

Panicum hillmanii Chase, (for Fred Hillman, 1863–1954, botanist at U.S. Dept. of Agriculture), HILLMAN'S PANICUM. Annual 20–65 cm tall; similar to *P. capillare* and possibly conspecific with it; inflorescences usually without reddish or purplish coloration (such coloration often present in *P. capillare*); fertile lemma with a crescent-shaped marking at its base. Disturbed areas; Archer and Brown cos. (McGregor 1985a); mostly n and w TX. Mostly Jul–Oct. The validity of *P. hillmanii* as a distinct species was questioned by Correll and Johnston (1970) and Gould



Panicum capillare [H11]



Panicum clandestinum [US8]



Panicum coloratum [HEA]



Panicum depauperatum [US8]



Panicum dichotomiflorum [REE]



Panicum dichotomum [US8]



Panicum diffusum [HEA, USH]



Panicum divergens [H11]

(1975b); however, McGregor (1985a) concluded that it is distinct and Zuloaga and Morrone (1996) in a treatment of section *Panicum*, treated it as a distinct species. Jones et al. (1997) gave [*P. capillare* L. subsp. *hillmanii* (Chase) Freckmann & Lelong [ined.]] as a synonym.

Panicum laxiflorum Lam., (loosely-flowered), OPEN-FLOWER ROSETTE GRASS, OPEN-FLOWER PANIC. Plant 12–50 cm tall; leaf sheaths and blades pilose; margins of leaf blades with conspicuously long hairs, at least near base. Sandy woods, especially in low ground; Fannin and Lamar cos.; mainly e TX w to nc TX in Red River drainage. Apr–Jun, again late summer–fall. [*Dichanthelium laxiflorum* (Lam.) Gould]

Panicum linearifolium Scribn. ex Nash, (linear-leaved), SLIM-LEAF ROSETTE GRASS, SLIM-LEAF PANIC. Plant 15–50 cm tall; leaf sheaths pilose or rarely glabrous. Dry sandy woods or open ground; se and e TX w to West Cross Timbers, also Edwards Plateau. Mar–Jun, again late summer–fall. [*Dichanthelium linearifolium* (Scribn. ex Nash) Gould]

Panicum malacophyllum Nash, (soft-leaved), SOFT-LEAF ROSETTE GRASS, SOFT-LEAF PANIC. Plant 25–60 cm tall; leaf sheaths pilose; leaf blades densely soft-pubescent. Sandy or rocky woods; Bosque, Cook, Dallas, Hood, and Lamar cos.; in TX only in nc part. Apr–Jun, again late summer–fall. [*Dichanthelium malacophyllum* (Nash) Gould]

Panicum miliaceum L., (like millet grass—*Milium*), BROOMCORN MILLET, PROSO, HOG MILLET, RUSSIAN MILLET, COMMON MILLET. Coarse annual 20–100 cm tall; leaf sheaths with long papilla-based hairs; leaf blades variously pubescent to glabrous; ligule a fringed membrane ca. 1–3 mm long including the hairs; spikelets plump, broadly ovate to elliptic. Escapes cultivation in disturbed areas; Montague Co.; also reported from nw TX. Jul–Nov. Cultivated in Europe and Asia as a grain crop for humans, here more commonly as animal food. Native to the Old World, probably c Asia (Zohary & Hopf 1994). ☞

Panicum obtusum Kunth, (blunt), VINE-MESQUITE. Perennial 12–50 cm tall, from knotty, rhizomatous base, producing stolons up to 2 m long; culms erect or partly decumbent; nodes densely hairy (on stolons) or nearly glabrous (on erect culms); leaf blades usually ± glabrous; ligule a short membrane 1–2 mm long; inflorescences narrow, spike-like; spikelets swollen, ellipsoidal. Low prairies, roadsides; nearly throughout TX. Jun–Oct. A native weed, sometimes planted for pasture or erosion control.

Panicum oligosanthes Schult., (few-flowered). Culms spreading to erect, 15–65 cm long; ligules 0.1–4.2 mm long. Open woods or open areas. Apr–Jun, again late summer–fall.

1. Lower leaf sheaths pilose with appressed or ascending hairs without swollen bases; spikelets 3–4 mm long; ligules usually 1.6 mm or more long; leaf blades with lower surfaces tomentose or occasionally puberulent _____ var. **oligosanthes**
1. Lower leaf sheaths glabrous or pilose with ascending to spreading hairs from swollen bases; spikelets usually 2.7–3.6 mm long; ligules usually < 1.6 mm long; leaf blades with lower surfaces glabrous to puberulent, never tomentose _____ var. **scribnerianum**

var. **oligosanthes**. Sandy soils; e 1/2 of TX. [*Dichanthelium oligosanthes* (Schult.) Gould]

var. **scribnerianum** (Nash) Gould, (for Frank Lamson Scribner, 1851–1938, agrostologist, U.S. Dept. of Agriculture), SCRIBNER'S ROSETTE GRASS. Sandy soils, occasionally in limestone gravel; throughout TX. [*Dichanthelium oligosanthes* (Schult.) Gould var. *scribnerianum* (Nash) Gould, *P. helleri* Nash]

Panicum pedicellatum Vasey, (stalked), CEDAR ROSETTE GRASS, CEDAR PANIC. Plant 25–60 cm tall; lower leaf sheaths rather sparsely ascending-pilose, the upper pubescent or glabrous except on margins; leaf blades pubescent on upper surface, glabrous or nearly so on lower, with a few long



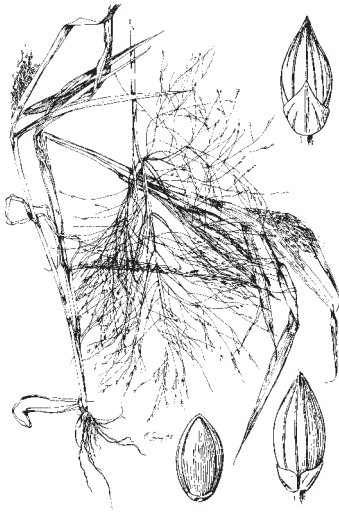
Panicum hallii var. *filipes* [us8]



Panicum hallii var. *hallii* [H11]



Panicum hians [go1]



Panicum hillmanii [HEA]



Panicum laxiflorum [us8]



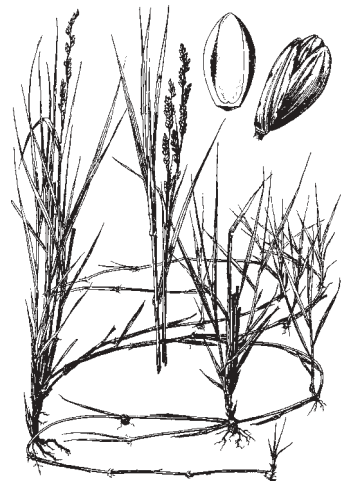
Panicum linearifolium [us8]



Panicum malacophyllum [us8]



Panicum miliaceum [us8]



Panicum obtusum [H11]

marginal hairs near base; ligule of hairs usually 0.3–1 mm long. Rocky limestone slopes; Bell, Bosque, Burnet, and McLennan cos.; s part of nc TX sw through Edwards Plateau. Mar–Jun, occasionally again late summer–fall. [*Dichanthelium pedicellatum* (Vasey) Gould]

Panicum philadelphicum Benth. ex Trin., (of Philadelphia), PHILADELPHIA WITCH GRASS, WOOD WITCH GRASS. Tufted annual 20–50(–60) cm tall; leaf sheaths with papilla-based hairs; leaf blades variously pubescent to nearly glabrous; ligule a fringe of hairs 0.5–1.5 mm long; panicles usually 1/3–1/2 as broad as long. Sandy or gravelly soils; Dallas Co. (Reverchon 1842, MO–Zuloaga & Morrone 1996); mainly e TX. Summer–early fall. Jones et al. (1997) treated this taxon as [*P. capillare* var. *sylvaticum* Torr.]

Panicum ravenelii Scribn. & Merr. (for Henry William Ravenel, 1814–1887, botanist and planter of South Carolina). Similar to *P. oligoanthes*; culms 30–80 cm long; leaf sheaths short-pilose; leaf blades densely pubescent beneath, pilose toward base on upper surface and on margins. Sandy woods; Dallas and Lamar cos.; mainly se and e TX. Apr–Jun, again late summer–fall. [*Dichanthelium ravenelii* (Scribn. & Merr.) Gould]

Panicum rigidulum Bosc ex Nees, (somewhat rigid), RED-TOP PANIC. Clump-forming perennial 30–125 cm tall; leaf sheaths glabrous or sometimes hispid; leaf blades glabrous or sparsely hispid; ligule a ragged, ciliate, short membrane, 0.5–1 mm long; spikelets rather crowded along panicle branches. Damp sandy woods and thickets, disturbed sites; Dallas, Lamar, Limestone, and Milam cos.; se and e TX w locally to nc TX and Edwards Plateau. Jun–Oct. [*P. agrostoides* Spreng.] A number of varieties are often recognized in this species (e.g., Lelong 1984; Kartesz 1994; Jones et al. 1997); however, all nc TX material seems to be of the type variety. Lelong (1986) gave a key separating four varieties.

Panicum scoparium Lam., (broom-like), VELVET ROSETTE GRASS. Culms course, tall, to ca. 150 cm; leaf sheaths usually velvety-pubescent; spikelets 2.2–2.8 mm long. Sandy woods and low areas; Lamar Co.; e TX w to ne part of nc TX. May–Jun, also fall. [*Dichanthelium scoparium* (Lam.) Gould]

Panicum sphaerocarpon Elliott, (spherical-fruited), ROUND-SEED ROSETTE GRASS, ROUND-SEED PANIC. Culms 20–80 cm tall; similar to glabrous forms of *P. acuminatum* var. *lindheimeri*; ligule minute or apparently absent; spikelets 1.4–2 mm long. Sandy soils, shaded or open areas; throughout most of TX except nw part. Late Mar–Jun, again late summer–fall. [*Dichanthelium sphaerocarpon* (Elliott) Gould]

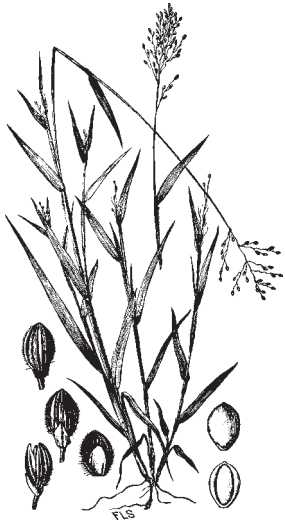
Panicum virgatum L., (twiggy, wand-like), SWITCH GRASS. Large rhizomatous perennial 0.6–2(–3) m tall; nodes glabrous; leaf blades 3–15 mm wide; leaf sheaths usually glabrous; ligule a fringed membrane 1.5–3 mm long; panicles large, usually 15–55 cm long; spikelets acuminate-pointed, 2.8–5 mm long. Low moist areas and prairies; throughout TX. Aug–Nov. A member of the original tall grass prairie; considered one of the “big four” tall grasses along with *Andropogon gerardii*, *Schizachyrium scoparium*, and *Sorghastrum nutans*; seen in two growth forms: 1) LOWLAND SWITCH GRASS—very large isolated clumps of often nearly 2(–3) m tall, usually in low moist areas, and 2) UPLAND SWITCH GRASS—in dryer sites, shorter not apparently clumped individuals with culms more scattered along the creeping rhizomes. Davis et al. (1995) pointed out additional differences and suggested the variation is possibly worthy of taxonomic recognition.

PASCOPYRUM WESTERN WHEAT GRASS

☛ A monotypic genus of w North America (J. Wipff, pers. comm.). (subfamily Pooideae, tribe Triticeae)

REFERENCES: Dewey 1975, 1983; Löve 1980; Gupta & Baum 1989.

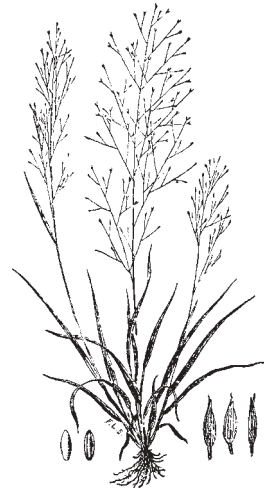
Pascopyrum smithii (Rydb.) Á. Löve, (for its discoverer, Charles Eastwick Smith, 1820–1900),



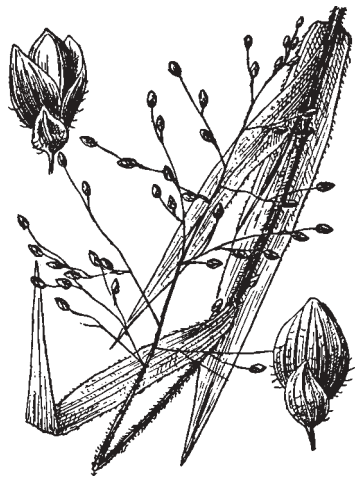
Panicum oligosanthes var. *scribnerianum* [US8]



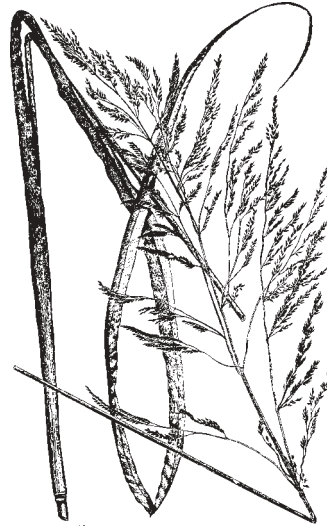
Panicum pedicellatum [US8]



Panicum philadelphicum [US8]



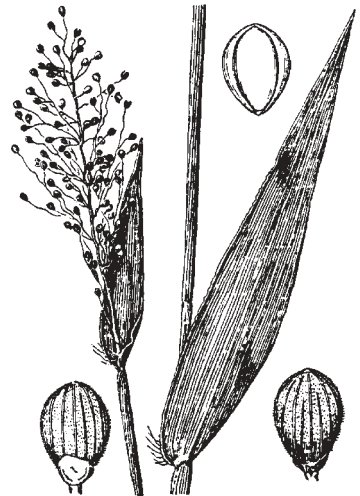
Panicum ravenelii [882]



Panicum rigidulum [RCA]



Panicum scoparium [H11]



Panicum sphaerocarpon [H11]

WESTERN WHEAT GRASS, BLUESTEM WHEAT GRASS. Rhizomatous erect perennial 35–100 cm tall; foliage glaucous, blue-green; leaf sheaths glabrous, auricled at summit; leaf blades noticeably scabrous on upper surface; ligule a short membrane; spikes slender, often dense, 6–20 cm long, erect, the internodes of the spike axis flattened but thick; spikelets in a zigzag arrangement on opposite sides of the spike axis, sessile, oriented so that their broadest dimension (not the keels of glumes) is toward the spike axis, awnless or short-awned, 1 or 2 per node, 5–12-flowered, disarticulating above glumes; $n = 56$. Prairies and roadsides, low areas; Archer, Clay, Comanche, Denton, and Jack cos.; nc TX s and w to w TX. [*Agropyron smithii* Rydb., *Elymus smithii* (Rydb.) Gould, *Elytrigia smithii* (Rydb.) Nevski] This species has been variously treated in *Agropyron*, *Elymus*, *Elytrigia*, or *Pascopyrum*. According to Dewey (1975), it is an octoploid that probably originated through hybridization between *Elytrigia dasytachya* and *Elymus triticoides* with subsequent chromosome doubling. While recognized in the genus *Elytrigia* by Dewey (1983), it is quite distinct morphologically from other members of the Triticeae, is unique cytogenetically, and doesn't fit well into any of the traditional genera. Further, there are nomenclatural problems with *Elytrigia* (J. Wipff, pers. comm.). For these reasons, we are following Löve (1980) and Kartesz (1994) in recognizing it in the monotypic genus *Pascopyrum*.

PASPALIDIUM

☛ A mainly tropical genus of ca. 30–40 species with a number of Australian endemics (Crins 1991; Mabberley 1987); related to and sometimes lumped with *Setaria* (e.g., Mabberley 1997). (Greek diminutive of *Paspalum*, in reference to a similarity to that genus) (subfamily Panicoideae, tribe Paniceae)

REFERENCES: Crins 1991; Webster 1995.

Paspalidium geminatum (Forssk.) Stapf, (twin), EGYPTIAN PASPALIDIUM. Erect glabrous perennial 35–80 cm tall, rhizomatous or stoloniferous; panicles with central axis; lateral branches of panicle 7–17, floriferous to base, appressed, with spikelets in 2 rows on the flattened branches; spikelets 2-flowered, the lower floret sterile, with glume-like lemma, the upper floret fertile, with hardened grain-like lemma; first glume broad, rounded to truncate, 1/4–1/3 as long as spikelet; second glume resembling sterile lemma. Shallow water or wet ground; Dallas and Grayson cos., also McLennan Co. (Mahler 1988); mainly se and e TX w to nc TX, also Wichita Co. (Mahler 1988) in e Rolling Plains. May–Aug. Sometimes placed in the genus *Panicum* [as *P. geminatum* Forssk.] or in *Setaria* [as *S. geminata* (Forssk.) Veldkamp] (Webster 1995). Gould (1975b) and Godfrey and Wooten (1979) treated this species as native indicating it occurred in both the Old and New Worlds; however, Crins (1991) considered it introduced and naturalized in the s U.S.; S. Hatch (pers. comm.) agrees with Crins. ☛

PASPALUM

Perennials (our species); ligule a membrane; inflorescences with a central axis and 1–many, spike-like, unilateral branches; spikelets subsessile or short-pedicelled on one side of a flattened branch, lanceolate to nearly circular, flattened on one face, 2-flowered, the lower floret sterile or staminate, the upper floret perfect; lower glume usually reduced or absent; upper glume and sterile lemma similar to each other; fertile lemma firm or hardened, usually smooth and shiny with firm inrolled margins.

☛ A genus of ca. 330 species of tropical and warm areas of the world, especially the Americas. Some are characteristic of the pampas; *P. pyramidale* Nees grows to 15 m tall in the Amazon. ☛ Ergot fungi, *Claviceps purpurea* (Fr.: Fr.) Tul., *C. paspali* F. Stevens & J.G. Hall, and related species, are known to grow on a number of Texas grasses including *P. dilatatum* and other *Paspalum* species. These fungi, whose overwintering structures (= sclerotia) replace some grains

in the grass inflorescence, often produce toxic alkaloids (e.g., ergocryptine and ergotamine) chemically similar to LSD; cattle can develop gangrene, have convulsions, or die after ingestion; significant livestock losses have occurred; humans can also be affected (see discussion under the genus *Secale*) (Sperry et al. 1955; Kingsbury 1964, 1965). (Probably from the Greek *paspalos*, millet or meal) (subfamily Panicoideae, tribe Paniceae)

REFERENCES: Chase 1929; Silveus 1942; Banks 1966; Allred 1982; Crins 1991.

1. Spikelets with long hairs around the margin, glabrous or short-pubescent on the faces; glume and sterile lemma abruptly pointed beyond the blunt fruit.
 2. Spikelets 1.8–2.2 mm wide; inflorescence branches (racemes) 2–8 _____ **P. dilatatum**
 2. Spikelets 1.1–1.4 mm wide; inflorescence branches 7–36 _____ **P. urvillei**
1. Spikelets glabrous or uniformly short- or long-pubescent; glume and sterile lemma not abruptly pointed beyond the fruit.
 3. Spikelets 3.6–4.8 mm long _____ **P. floridanum**
 3. Spikelets 1.6–3.5 mm long.
 4. Inflorescence branches 2, paired or less than 1 cm apart (1–2 additional branches occasionally present below); spikelets 2.7–3.5 mm long.
 5. Plants usually of upland habitats; culms erect, not rooting at the nodes; spikelets usually broadly ovate to broadly obovate (rarely elliptic), usually blunt or broadly acute at apex, usually 2.8–3.5 mm long; first glume always absent _____ **P. notatum**
 5. Plants of wet habitats; culms decumbent, rooting at the nodes; spikelets elliptic, usually tapering to a short acute apex, usually 2.7–3 mm long; minute first glume usually present _____ **P. distichum**
 4. Inflorescence branches 1–numerous, when 2, the branches 1–2 cm or more apart; spikelets 1.6–3 mm long.
 6. First glume present on some or all spikelets (usually 1/4–1/3 as long as spikelet); second glume and sterile lemma usually with brownish glandular blotches; plants without rhizomes; in nc TX known only from Tarrant Co. _____ **P. langei**
 6. First glume absent on all spikelets (sterile lemma of lower floret resembles second glume) or minute first glume present (*P. distichum*); second glume and sterile lemma without brownish glandular blotches; plants with or without rhizomes; widespread in nc TX.
 7. Lemma and palea of fertile florets dark brown and shiny at maturity; sterile lemma usually with transverse wrinkles along the margin _____ **P. plicatum**
 7. Lemma and palea of fertile florets green, light brown, or straw-colored at maturity; sterile lemma usually without wrinkles.
 8. Spikelets 2.4–3.4 mm long, markedly longer than wide to ca. as wide as long; culms partly decumbent, the longer rooting at the nodes OR erect, not rooting at the nodes.
 9. Spikelets 1.1–1.4 mm wide, one of each pair with a minute lower glume _____ **P. distichum**
 9. Spikelets 1.4–3.2 mm wide, without lower glume.
 10. Spikelets 1.4–1.8 mm wide, elliptic to obovate, pubescent or glabrous, in pairs in 4 rows or in 2 rows by abortion of upper spikelet of spikelet pairs; culms usually decumbent below and rooting at lower nodes _____ **P. pubiflorum**
 10. Spikelets 2–3.2 mm wide, broadly ovate, broadly obovate, or nearly orbicular, glabrous, borne singly in 2 rows; culms erect, not rooting in lower portion _____ **P. laeve**
 8. Spikelets 1.6–2.2 mm long, ca. as wide as long; culms erect, not rooting at lower nodes _____ **P. setaceum**

Paspalum dilatatum Poir., (dilated, widened, expanded), DALLIS GRASS, PASPALUM GRASS. Clump-forming perennial; culms low-spreading to erect, 25–120 cm long; lower leaf sheaths pilose, the upper glabrous except at summit; inflorescences of 2–8 branches, the branches 3–8 cm long.

Abundant weed in disturbed sites, lawns, and roadsides; throughout TX. May–Nov. Native of South America. Ergot alkaloids can be present—see generic synopsis. 🌿🇺🇸

Paspalum distichum L., (two-spiked), KNOT GRASS, ETERNITY GRASS, JOINT GRASS, FORT THOMPSON GRASS. Perennial 20–60 cm tall, with trailing and rooting culms sometimes several meters long; leaf sheaths usually glabrous or pilose; inflorescences of 2, occasionally 3–4 branches, the branches ca. 2–6 cm long; second glume minutely pubescent. Moist or wet areas along ponds, lakes, and streams; Bell, Dallas, Ellis, and Grayson cos., also Lamar Co. (Carr 1994); throughout TX. Jun–Oct. [*P. distichum* var. *indutum* Shinnery] While some authorities recognize var. *indutum* (e.g., Jones et al. 1997), we are following Allred (1982) and J. Kartesz (pers. comm. 1997) in lumping this variety.

Paspalum floridanum Michx., (of Florida), FLORIDA PASPALUM, BIG FLORIDA PASPALUM, BIG PASPALUM. Rhizomatous perennial; culms erect, 1–2 m tall; leaf sheaths and blades nearly or completely glabrous or ± densely hirsute; inflorescences usually of 2–5 branches, the branches 4–13 cm long; spikelets glabrous. Grasslands and open woodlands; se and e TX w to East Cross Timbers, also Edwards Plateau. Aug–Nov. [*Paspalum floridanum* var. *glabratum* Engelm. ex Vasey] Jones et al. (1997) recognized var. *glabratum*.

Paspalum laeve Michx., (smooth). Tufted perennial to ca. 100 cm tall; leaf sheaths glabrous to pilose, inflorescences of (2–)3–6 branches, the branches usually 4–10 cm long. Prairies, open woods, disturbed or moist areas, often on sand. Jul–Oct.

1. Spikelets 2.7–3.2 mm wide, ca. as wide as long _____ var. **circulare**

1. Spikelets 2–2.5 mm wide, conspicuously longer than wide _____ var. **laeve**

var. **circulare** (Nash) Fernald, (circular), ROUND-SEED PASPALUM. Lamar Co. (Carr 1994); mainly se and e TX.

var. **laeve**, FIELD PASPALUM, SMOOTH PASPALUM. Lamar Co. (Carr 1994) in Red River drainage; mainly se and e TX.

Paspalum langei (E. Fourn.) Nash, (for Johann Martin Christian Lange, 1818–1898, Danish botanist), RUSTY-SEED PASPALUM, LANGE'S PASPALUM. Cespitose perennial 30–100 cm tall; leaf blades 7–18 mm broad, often marginally crisped; inflorescences with 2–5 branches, the branches usually 4–8 cm long; spikelets 2.2–2.6 mm long; first glume present on some or all spikelets; second glume and sterile lemma pubescent. Shaded ditchbanks; Tarrant Co.; mainly se and e TX. Apr–Nov.

Paspalum notatum Flügge, (marked), BAHIA GRASS. Rhizomatous perennial; culms erect, usually 20–75 cm tall; inflorescences usually of 2(–3) spicate branches, the branches 4–12(–15) cm long, paired or one slightly below other; spikelets broadly ovate or broadly obovate (rarely elliptic), glabrous. Introduced as a pasture grass and for erosion control; sandy loam, forest openings, and roadsides. Jun–Nov. Native to Latin America. 🌿🇺🇸

1. Spikelets 3.3–4 mm long, 2.3–3 mm wide; inflorescences of 2(–3–4) primary branches _____ var. **latiflorum**

1. Spikelets 2.5–3.2 mm long, ca. 2 mm wide; inflorescences of 4–5 primary branches _____ var. **saurae**

var. **latiflorum** Döll, (broad-flowered). Grayson, Limestone, and Tarrant cos.; mainly e and s TX, also Edwards Plateau. 🌿🇺🇸

var. **saurae** Parodi, (derivation unclear, possibly from Greek: *saurós*, lizard). Introduced into the U.S. as PENSACOLA BAHIA GRASS. Possibly present in nc TX but no specimens have been seen.

🌿🇺🇸

Paspalum plicatulum Michx., (plicate, folded like a fan), BROWN-SEED PASPALUM, PLAITED PASPALUM. Tufted or clumped perennial 50–100 cm tall; inflorescences usually of 3–10 branches



Panicum virgatum [RCA]



Pascopyrum smithii [USB]



Paspalidium geminatum [HI1]



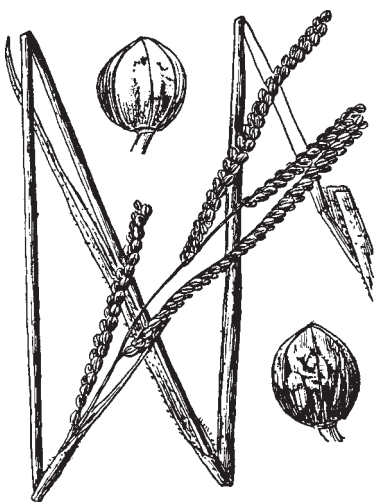
Paspalum dilatatum [HI1]



Paspalum distichum [MAS]



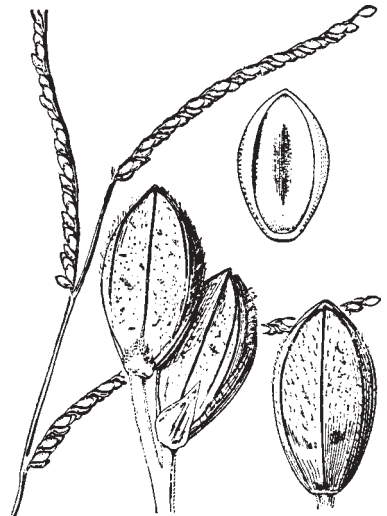
Paspalum floridanum [USB]



Paspalum laeve var. *circulare* [BB2]



Paspalum laeve var. *laeve* [RCA]



Paspalum langei [HI1]

each commonly 3–10 cm long; spikelets 2.4–2.8 mm long; glume glabrous or minutely pubescent. Sand or sandy loam, often in open woods; Milam Co. at the e edge of nc TX; mainly se and e TX, also Edwards Plateau. Mar–Nov.

Paspalum pubiflorum Rupr., (hairy-flowered). Perennial with culms decumbent below, often rooting at the lower nodes, usually 40–80 cm tall; leaf sheaths glabrous or the lower pilose; inflorescences of 2–5(–7) branches, the branches usually 3–10 cm long; spikelets glabrous or pubescent. Ditches and other moist areas. Mainly May–Nov.

1. Spikelets glabrous _____ var. **glabrum**

1. Spikelets pubescent _____ var. **pubiflorum**

var. **glabrum** Vasey ex Scribn., (smooth, without hairs), SMOOTH-SEED PASPALUM. Collin and Cooke cos., also Parker, Rockwall, and Tarrant cos. (Gould 1975b); reported from vegetational areas 1, 3, 4, 7, and 8 (Fig. 2) by Gould (1975b) and Hatch et al. (1990) but supposedly much less frequent in TX than var. *pubiflorum* (Gould 1975b).

var. **pubiflorum**. HAIRY-SEED PASPALUM, HAIRY-FLOWER PASPALUM. Included based on citation of vegetational areas 4 and 5 (Fig. 2) by Hatch et al. (1990); throughout most of TX.

Paspalum setaceum Michx., (bristle-like), THIN PASPALUM. Clump-forming perennial; culms 20–100 cm long; leaf sheaths and blades pilose to glabrous except on margins, often with fine pubescence with or instead of long hairs; inflorescences of 1–5 branches, the branches 3–17 cm long; spikelets glabrous or pubescent. Disturbed sites, roadsides; throughout TX. May–Oct. [*P. ciliatifolium* Michx., *P. stramineum* Nash, *P. setaceum* Michx. var. *caliatifolium* (Michx.) Vasey, *P. setaceum* Michx. var. *stramineum* (Nash) D.J. Banks, *P. setaceum* Michx. var. *muhlenbergii* (Nash) D.J. Banks] Banks (1966) divided this species into a number of varieties.

Paspalum urvillei Steud., (for its discoverer, Jules Sébastien Cesar Dumont d'Urville, 1790–1842, French hydrographer and explorer), VASEY GRASS, URVILLE'S PASPALUM. Clump-forming perennial; culms erect or bent at base, 50–200 cm tall; lower leaf sheaths densely short-bristly with fine, stiff hairs that catch and stick to the skin when touched; upper leaf sheaths glabrous; inflorescences of 7–36 erect branches, the branches 4–10(–14) cm long. Low disturbed areas; Denton, Grayson, Kaufman, and Tarrant cos., also Lamar Co. (Carr 1994); se and e TX w to nc TX, also Edwards Plateau. Late May–Oct. Native of South America. ☞

PENNISETUM

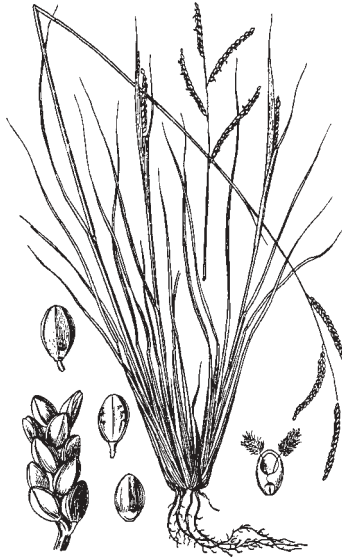
☞ A genus of 130 species of tropical and warm areas of the world; some are used as fodders, lawn grasses, and for their grains. A number of *Pennisetum* species including *P. alopecuroides* (L.) Spreng, *P. americanum* (L.) Leeke, *P. ciliare* (L.) Link, *P. macrostachyum* Trin., and *P. setaceum* (Forssk.) Chiov. (FOUNTAIN GRASS) are cultivated as ornamentals for their large and showy inflorescences and may long persist vegetatively. (Latin: *penna*, a feather, and *seta*, a bristle, referring to the feathery bristles around the spikelets) (subfamily Panicoideae, tribe Paniceae)

REFERENCES: Chase 1921; Crins 1991.

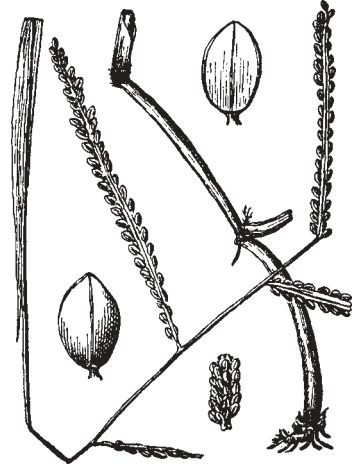
Pennisetum villosum R. Br. ex Fresen., (softly hairy), FEATHERTOP. Perennial, tufted, 20–70 cm tall; leaf sheaths glabrous except on margins and summit; ligule a ciliate membrane with hairs ca. 1 mm long; inflorescence a spike-like contracted panicle, tan or yellowish, feathery, 4–10 cm long, with conspicuous fascicles of bristles 2–5 cm long, the inner bristles plumose with silky hairs; bristles separate to base, disarticulating with spikelets; spikelet one per fascicle of bristles, 8–9 mm long, of 2 florets, the lower floret sterile with glume-like lemma, the upper floret fertile. Cultivated as an ornamental, tending to persist or a transitory escape; Dallas and Parker cos. (R. O'Kennon, pers. obs.); Hatch et al. (1990) also cited vegetational areas 3 and 10 (Fig. 2). Jun–Oct. Native of Africa (Ethiopia). ☞



Paspalum notatum var. *latifolium* [HEA]



Paspalum plicatulum [US8]



Paspalum pubiflorum var. *glabrum* [882]



Paspalum pubiflorum var. *pubiflorum* [501]



Paspalum setaceum [RCA]



Paspalum urvillei [H11]



Pennisetum villosum [BA1]

Pennisetum ciliare (L.) Link. (ciliate, fringed with hairs), (BUFFEL GRASS) [*Cenchrus ciliaris* L.], an Old World species introduced into s TX as a forage grass, is cited by Hatch et al. (1990) for vegetational area 4 (Fig. 2) but apparently occurs on to the s of nc TX. It resembles a *Setaria* in having short bristles (4–10 mm long), but these are united at the base and the bur (bristles and spikelet) falls as a unit, whereas in *Setaria* the spikelets disarticulate above the bristles. This species, which was introduced in the 1940s by the Soil Conservation Service, is now a problematic invader of native habitats in some parts of sw North America (Tellman 1997). ☞

PHALARIS CANARY GRASS

Glabrous-erect-tufted annuals; inflorescence a very dense, tightly contracted, ovoid or spike-like panicle; spikelets sessile, strongly laterally compressed, with 1 terminal perfect floret and 2 sterile reduced or scale-like lemmas below; glumes keeled and winged in upper half, ± equal, awnless; fertile lemma appressed-pubescent, awnless; rachilla disarticulating above glumes, the sterile lemmas falling with the fertile one; caryopsis plump.

☞ A genus of ca. 20 species native to Europe, the Mediterranean, n Asia, and the Americas; some are valuable as fodder. (Ancient Greek name for a grass) (subfamily Pooideae, tribe Aveneae)

REFERENCE: Anderson 1961.

1. Caryopses (= fruits) 1.7–2.3 mm long; glumes 4.2–6(–6.7) mm long; reduced lemmas 1.5–2.5 mm long, 1/3–1/2 as long as fertile lemma; fertile lemmas 3–4.7 mm long; native species widespread in nc TX _____

P. caroliniana

1. Caryopses 3.9–4.2 mm long; glumes 7–9 mm long; reduced lemmas 2.5–4.5 mm long, more than 1/2 as long as single fertile lemma; fertile lemmas 4.5–6.8 mm long; rare introduced species _____

P. canariensis

Phalaris canariensis L., (of the Canary Islands), CANARY GRASS. Culms 25–70(–100) cm tall; ligule a membrane 2–6 mm long; leaf blades 5–15(–20+) cm long, 3–10 mm wide; panicles short, thick, 1.5–3(–4) cm long, 10–18 mm wide; glumes glabrous or sparsely hispid, ± pale with dark green along the lateral nerves. Waste areas, probably coming up from discarded bird seed; Bell, Coryell (HPC), and Brown (Stanford 1971) cos.; also se and e TX and Edwards Plateau. Mar–Jun. Native of the w Mediterranean. Important as a source of commercial bird feed; this is the canary seed of commerce (Gould 1975b; Mabberley 1987). ☞

Phalaris caroliniana Walter, (of Carolina), WILD CANARY GRASS, CAROLINA CANARY GRASS, SOUTHERN CANARY GRASS. Culms usually 25–70(–100) cm tall; ligule a membrane 1–5 mm long; leaf blades 6–15(–20) cm long, 3–10(–13) mm wide; panicles cylindrical to narrowly elliptical in outline, spike-like, usually up to 6(–12) cm long, 8–13(–20) mm wide; glumes with lateral nerves glabrous or scabrous with 5 or less spicules. Moist areas, ravines, disturbed sites; throughout TX. Apr–Jun.

Some individuals of *P. caroliniana* have elongate inflorescences up to 12 cm long (*Whitehouse 15711*, Dallas Co, BRIT/SMU) reminiscent of *P. angusta* Nees ex Trin. The latter species has inflorescences 6–15 cm long, 8–10 mm thick, culms to 1.5 m tall, glumes mostly 3.5–4 mm long, and lateral nerves of glumes scabrous with 9 or more spicules. While known just to the e of nc TX in vegetational areas 1, 2, and 3 (Hatch et al. 1990), we have no definite reports of *P. angusta* from nc TX.

PHLEUM TIMOTHY, CAT-TAIL GRASS

☞ A genus of 15 species of temperate Eurasia, North America, and temperate South America including cultivated forage grasses. (Greek: *phleos*, a kind of reed) (subfamily Pooideae, tribe Poeae)

REFERENCE: Piper & Bort 1915.

Phleum pratense L., (of meadows), TIMOTHY. Clump-forming perennial 30–100(–120) cm tall, glabrous except for scabrous leaf-blades; ligule a membrane 3–6 mm long; inflorescence a slender, dense, cylindrical, pencil-like spike usually 5–9 cm long and 5–9 mm thick; spikelets strongly compressed, 1-flowered; glumes with coarsely ciliate keel, abruptly short awned; lemmas awnless. Collected at Dallas in 1874 by Reverchon (whether wild or cultivated not known), and along railroad at Mineola, Wood Co. in e TX, in Jun, 1900 (Mahler 1988). Native of Eurasia. A cool-climate pasture grass, not now cultivated in nc TX except experimentally; a common cause of hay fever where cultivated. 🌿

PHRAGMITES

☞ A cosmopolitan genus of 3 species. (Greek: *phragmites*, growing in hedges, apparently from its hedge-like growth along ditches) (subfamily Panicoideae, tribe Arundineae)

REFERENCE: Clayton 1968.

Phragmites australis (Cav.) Trin. ex Steud., (southern), COMMON REED, REED, NAL, DANUBE GRASS. Rhizomatous perennial; culms 2–4 m tall, usually unbranched; leaf blades mostly 1.5–6 cm wide; panicles densely flowered, 15–40 cm long; spikelets 10–15 mm long, usually with 4–8 florets; rachilla joints long hairy, the hairs to 10 mm or more long; glumes and lemmas glabrous. Wet areas of ponds, low areas, and roadsides, usually tight clay soils; Grayson and Kaufman cos.; throughout TX. Native of North America, South America, Eurasia, Africa, and Australia. Mostly Jul–Nov. [*P. communis* Trin.] The grains were eaten by Native Americans (Mabberley 1987).

PHYLLOSTACHYS BAMBOO

☞ A genus of 55 species of BAMBOOS native from the Himalayas to Japan, especially China; often forming thickets by spreading rhizomes; includes most frequently cultivated hardy BAMBOOS; species variously used for paper, timber, fishing rods, edible shoots, and cultivated ornamentals. (Greek: *phyllum*, a leaf, and *stachys*, a spike, referring to the leafy inflorescences) (subfamily Bambusoideae, tribe Bambuseae)

REFERENCE: Borowski et al. 1996.

Phyllostachys aurea Carrière ex Rivière & C. Rivière, (golden), GOLDEN BAMBOO, FISHPOLE BAMBOO, YELLOW BAMBOO. Woody rhizomatous perennial forming extensive colonies; culms 2–8 m tall, glabrous, green to yellowish, flattened on 1 side above point on node where branches originate; branches 2(–3) per node, 1 of these larger than the other; leaf blades narrowly lanceolate, 5–12(–15) cm long, 1–2 cm wide, basally cuneate to rounded, apically acuminate, glabrous on both surfaces except with short pubescence along midvein near attachment to petiole, the margins entire to scaberulous, with a short but distinct petiole ca. 3–5 mm long; leaf sheaths glabrous except for 2 tufts of bristles at apex; flowers or fruits usually not seen. Widely cultivated in TX; persists and spreads vegetatively; can cover large areas; several extensive colonies spreading on sandy soils in n Grayson Co., also Tarrant Co.; also Bell, Bosque, Callahan, Collin, Dallas, Erath, Kaufman, Limestone, McLennan, Palo Pinto, Parker, and Williamson cos. (Borowski et al. 1996). Borowski et al. (1996) documented the occurrence of this species in TX. We have observed only one flowering collection from nc TX; *Phyllostachys* species generally flower only after intervals of many years. Native of China. [*Bambusa aurea* Hort] 🌿

A variety of other exotic bamboos, including *Bambusa* species and additional species of *Phyllostachys* are cultivated in nc TX (e.g., *P. nigra* (Lodd.) Munro, BLACK BAMBOO, with black culms). Our only native bamboo, *Arundinaria gigantea*, is limited to the extreme ne portion of nc TX.

POA BLUE GRASS

Annuals or perennials; tips of leaf blades sometimes cupped; ligule a membrane; panicles open or contracted; spikelets relatively small, usually with 2–6(–10) florets, awnless, disarticulating above glumes and between florets; lemmas acute or obtuse, rounded or keeled on back, often with long, kinky hairs at base.

☛ A genus of 200+ species of temperate and cold areas of the world including tropical mountains; some are important pasture and lawn grasses. (Ancient Greek name for grass or fodder) (subfamily Pooideae, tribe Poeae)

REFERENCE: Marsh 1952.

1. Florets developing into bulbils (often dark purple at base) with lemmas prolonged to 5–15 mm long as if sprouting; culms swollen at base; rare in TX, known only from Denton Co. _____ **P. bulbosa**
1. Florets not developing into bulbils; culms not swollen at base; including species widespread in nc TX.
 2. Plants annual, 3–45 cm tall; keel of glumes not scabrous-ciliate (*P. annua*) or minutely scabrous-ciliate (*P. chapmaniana*).
 3. Lemmas with long, kinky, cobwebby hairs at base, with 3 strong and 2 faint nerves; anthers 0.1–0.2 mm long; rare in nc TX _____ **P. chapmaniana**
 3. Lemmas usually without long hairs at base (but long-pubescent on margins and keel, with 5 strong nerves; anthers 0.5–1.3 mm long; widespread in nc TX _____ **P. annua**
 2. Plants perennial, 15–100 cm tall; keel of glumes minutely to strongly scabrous-ciliate.
 4. Plants with slender creeping rhizomes; lemmas acute or with awn-like tip, pubescent only on keel or marginal nerves; inflorescences tightly contracted to somewhat spreading, ± densely flowered; in various habitats including grasslands and other open areas.
 5. Culms and basal leaf sheaths strongly flattened, sharply keeled _____ **P. compressa**
 5. Culms and basal leaf sheaths terete or only slightly flattened, not sharply keeled.
 6. Lower lemmas 3.9–6.4 mm long; plants dioecious; lowest node of inflorescences usually with (4–)5 branches; native species widespread in nc TX _____ **P. arachnifera**
 6. Lower lemmas usually 2.5–3.2 mm long; plants not dioecious, the florets perfect; lowest node of inflorescences usually with (2–)3–4 branches; introduced species known in nc TX only from Cooke and Lamar cos. _____ **P. pratensis**
 4. Plants without rhizomes; lemmas subacute or obtuse, often pubescent over the surface, at least on lower part; inflorescence branches widely spreading, loosely flowered; in wooded habitats _____ **P. sylvestris**

Poa annua L., (annual, yearly), ANNUAL BLUEGRASS, LOW SPEAR GRASS, DWARF MEADOW GRASS. Glabrous annual; panicles small, compact, erect; lemmas long-pubescent on margins and keel. Disturbed sites; throughout TX. Mar–May, occasionally as early as late Fall. Native of Europe. 🇺🇸

Poa arachnifera Torr., (spider-bearing, its long white hairs giving the appearance of a spider web), TEXAS BLUE GRASS. Sod-forming, glabrous perennial 20–60 cm tall; panicles dense, rather narrow, erect; florets unisexual, the sexes on different plants; lemmas of pistillate spikelets with long-ciliate keel and dense basal tuft of long, cobwebby hairs; lemmas of staminate spikelets with keel inconspicuously ciliate toward base and rather sparse basal tuft of cobwebby hairs. Calcareous or sandy clay prairies and oak openings; in much of e 1/2 of TX. Late Mar–Apr. Frequent in original prairie, though not abundant; increases under light disturbance, disappears early under heavy grazing.

Poa bulbosa L., (bulbous), BULBOUS BLUE GRASS. Densely tufted, glabrous perennial 20–50 cm tall; culms swollen at base; florets usually developing into asexual bulbils often dark purple at base; lemmas glabrous, strongly nerved, the tips prolonged as if sprouting. Spreading from cul-



Phalaris canariensis [GOT, PBL]



Phalaris caroliniana [USB]



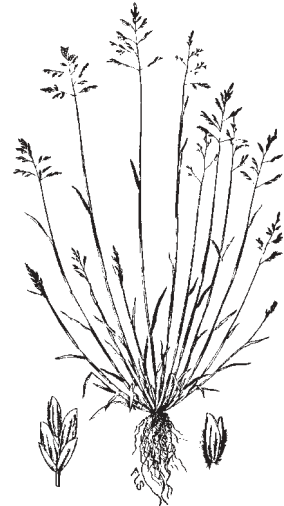
Phleum pratense [H11]



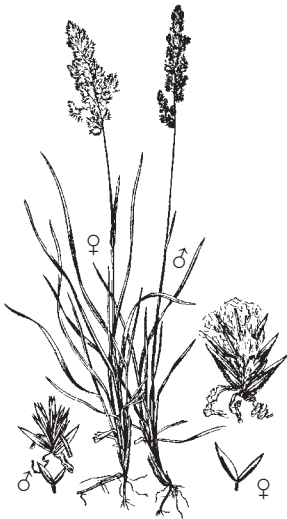
Phragmites australis [REE]



Phyllostachys aurea [KEW]



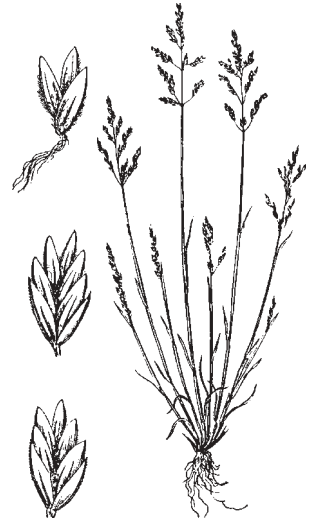
Poa annua [USB]



Poa arachnifera [USB]



Poa bulbosa [H11]



Poa chapmaniana [USB]

tivation at Denton Agricultural Experiment Station (Shinners 1958a); otherwise unknown in TX. Apr–May. Native of Europe. 🌿

Poa chapmaniana Scribn., (for Alvin Wentworth Chapman, 1809–1899, Florida botanist), CHAPMAN'S POA, CHAPMAN'S BLUE GRASS. Annual to ca. 30 cm tall; similar to *P. annua*, sometimes difficult to distinguish and possibly not specifically distinct from that species; spikelets with cleistogamous florets. Lawns, field, and roadsides; included based on citation of vegetational areas 4 and 5 (Fig. 2) by Gould (1975b); otherwise reported in TX only from e TX (Gould 1975b). Late fall–spring.

Poa compressa L., (flattened), CANADA BLUE GRASS. Rhizomatous perennial 10–60(–80) cm tall; culms and basal leaf sheaths strongly flattened, sharply keeled; panicle branches appressed or only slightly spreading; lemmas with or without long hairs at base. Cultivated as a forage grass, escaping?; included based on citation for vegetational area 5 (Fig. 2) by Gould (1975b); otherwise reported in TX (Gould 1975b; Hatch et al. 1990) only from vegetational areas 6, 9, and 10 (Fig. 2). Apr–Jun. Native of Europe. 🌿

Poa pratensis L., (of meadows), KENTUCKY BLUE GRASS, JUNE BLUE GRASS. Sod-forming, glabrous perennial 15–100 cm tall; panicles typically rather loose, with at least the lower branches spreading; lemmas pubescent on keel and marginal nerves, cobwebby at base. Disturbed areas, also appearing occasionally in lawns; Lamar Co., also Cooke Co. (Mahler 1988); scattered in n and w TX. May. Native of the Old World (despite the common name) and possibly also to the northern mountainous areas of North America (Gould 1975b; Sutherland 1986). It is one of the most popular lawn grasses in cooler parts of the country; a number of lawn and pasture strains have been introduced into the U.S. (Gould 1975b; Sutherland 1986). According to Cory (1950), this species was first collected in n TX in 1949. 🌿

Poa sylvestris A. Gray, (of woodland), WOODLAND BLUE GRASS, SYLVAN BLUE GRASS. Tufted perennial 40–100 cm tall; panicles open, erect, the lower branches reflexed in age. Woods in limestone ravines, low woods; Fannin and Grayson cos. in Red River drainage, also Dallas Co. (Mahler 1988), not collected there recently; otherwise only far e TX. Apr–May.

POLYPOGON


Annuals or perennials; ligule a membrane; inflorescence a dense, contracted panicle; spikelets small, 1-flowered; glumes falling with rest of spikelet; lemma 1/2–3/4 times as long as the glumes; palea equaling the lemma.

☛ A genus of 10 species of warm temperate areas and tropical mountains. (Greek: *polys*, much, and *pogon*, beard, presumably because of the conspicuous awns of some species) (subfamily Pooideae, tribe Aveneae)

1. Glumes long awned (awns 5–9 mm long); plants annual _____ **P. monspeliensis**
 1. Glumes awnless; plants perennial _____ **P. viridis**

Polypogon monspeliensis (L.) Desf., (of Montpellier in s France), RABBIT'S-FOOT, ANNUAL BEARD GRASS, BEARD GRASS, RABBIT'S-FOOT GRASS. Plant 15–75 cm tall, largely glabrous; ligules 4–10 mm long; inflorescences appearing bristly-woolly because of long yellowish awns, ca. 2–15 cm long, 1–2.5 cm broad; spikelets 1.5–2 mm long (not counting conspicuous awns of glumes). Low areas, sometimes in shallow water; throughout TX. Late May–Jul. Native of Europe. 🌿

Polypogon viridis (Gouan) Breistr., (green), WATER BENT GRASS. Plant glabrous; culms bent at base or trailing, 15–45(–70) cm long; ligules 2–7 mm long; inflorescences 4–12 cm long, 1–3 cm broad; spikelets 1.3–2(–2.5) mm long, awnless. About springs and in creek beds; Bell and Burnet

cos.; s part of nc TX s and w to w TX. Apr–Jul. Native to Mediterranean region. [*Agrostis semiverticillata* (Forssk.) C. Chr., *P. semiverticillatus* (Forssk.) Hyl.] 

SACCHARUM PLUME GRASS, SUGARCANE

Large, stout, reed-like perennials; leaf blades elongate, flat; inflorescence a large, dense, often conspicuously hairy, terminal panicle; spikelets all alike, perfect, in pairs, 1 sessile and one pedicellate, 2-flowered, the upper floret fertile; inflorescence branches disarticulating below the spikelets, the pedicels falling with the sessile spikelets; glumes large, usually with a tuft of long hairs at base, the hairs (in our species) about as long as or longer than the spikelets; lemma of upper floret of each spikelet with a long awn.

☛ The genus, as treated here including *Erianthus*, has 35 species of tropical and warm areas of the world. It includes *S. officinarum* L. (SUGARCANE), native to tropical se Asia, which is the source of ca. 1/2 of the world's sugar: (Greek: *sacchar*, sugar, referring to the sweet sap) (subfamily Panicoideae, tribe Andropogoneae)

REFERENCES: Mukherjee 1958; Gandhi & Dutton 1993; Webster & Shaw 1995.

1. Awn of lemma slightly flattened at base, loosely twisted and geniculate (= bent) below middle; culms usually glabrous below the inflorescence; hairs at base of spikelets ca. as long as spikelets; lemma of upper floret 3-nerved _____ **S. brevibarbe**
1. Awn of lemma terete (= round), straight; culms villous (= long hairy) below the inflorescence; hairs at base of spikelets slightly shorter to often much longer than spikelets; lemma of upper floret 1-nerved _____ **S. giganteum**

Saccharum brevibarbe (Michx.) Pers. var. **contortum** (Elliott) R.D. Webster, (sp.: short-bearded; var.: contorted), BENT-AWN PLUME GRASS, BEARD GRASS. Culms usually 1.5–2.5 m tall, the nodes appressed-hispid when young, glabrous with age; ligule a membrane with hairs 1–3 mm long; leaf blades to 80 cm or more long, usually 8–18 mm wide, scabrous; panicles 20–50 (rarely more) cm long; spikelets 6–8 mm long (excluding awns), with basal hairs whitish or twany; lemma awn 15–22 mm long. Usually moist, sandy soils; Hopkins and Lamar cos. in ne part of nc TX; mainly se and e TX. Sep–Nov. We are following Webster and Shaw (1995) for nomenclature of this taxon; it is sometimes recognized in the genus *Erianthus* [as *Erianthus contortus* Baldwin]. [*S. contortum* (Elliott) Nutt.]

Saccharum giganteum (Walter) Pers., (gigantic), SUGARCANE PLUME GRASS. Very large; culms 1–3 m tall in dense clumps, the nodes with a dense ring of hairs 1–6 mm long; ligule and nearby area densely villous; leaf blades to 90 cm or more long, 4–20 mm wide; panicles 10–50 cm long; spikelets 5–8 mm long (excluding awns), with basal hairs abundant, brownish; lemma awn 12–25 mm long. Usually moist sandy soils; Milam and Henderson cos. near e margin of nc TX; mainly se and e TX. Sep–Nov. Sometimes recognized in the genus *Erianthus* [as *E. giganteus* (Walter) P. Beauv.].

SACCIOLEPIS

☛ A genus of 30 species of tropical and warm areas, especially Africa. (Greek: *saccion*, small bag, and *lepis*, scale, referring to the saccate second glume) (subfamily Panicoideae, tribe Paniceae)

REFERENCES: Judziewicz 1990; Crins 1991.

Sacciolepis striata (L.) Nash, (striated, striped), AMERICAN CUPSCALE. Perennial rooting at creeping basal nodes; culms to 1.5 m or more tall; ligule a fringed membrane < 0.5 mm long; inflorescence a narrowly cylindrical panicle, 8–25 cm long, ca. 10–15 mm broad; spikelets on short

pedicels, glabrous, awnless, basally asymmetrical, 3.5–5 mm long, 2-flowered, the lower staminate, the upper perfect; first glume ca. 1/4 or less as the second; lower lemma about as long as second glume; upper (perfect) lemma hardened, smooth, shiny, ca. 1.5–2 mm long. Moist sand, pond margins; Lamar Co. in Red River drainage; mainly se and e TX. Late Aug–Nov.

SCHEDONNARDUS TUMBLE GRASS, TEXAS CRAB GRASS

☛ A monotypic genus of the s U.S. Mabberley (1997) indicated that this species is a conspicuous feature of deserted towns in Western films. (Greek: *schedon*, near, and *Nardus*, from its resemblance to that genus) (subfamily Chloridoideae, tribe Cynodonteae)

Schedonnardus paniculatus (Nutt.) Trel., (with flowers in panicles), TUMBLE GRASS, TEXAS CRAB GRASS. Tufted perennial 8–50(–70) cm tall or long; leaves crowded toward base of plant; leaf sheaths compressed, keeled, glabrous; leaf blades spirally twisted on drying; ligule a membrane 1–3 mm long; inflorescence as long as or longer than the leafy portion of the culm, spreading to partly decumbent, finally breaking away and acting as a tumbleweed, the main axis becoming loosely coiled, with a few widely spaced spicate branches. Various soils; throughout TX. A minor member of original prairie, increasing under disturbance; rather common on disturbed sites. Apr–Oct.

SCHIZACHYRIUM BLUESTEM

☛ A mainly tropical genus of 60 species, particularly in savannas; formerly treated in a more inclusive *Andropogon*. (Greek: *schizo*, to divide or split, and *achna*, chaff, referring to toothed lemma) (subfamily Panicoideae, tribe Andropogoneae)

REFERENCES: Gould 1967; Carman & Briske 1985; Butler & Briske 1988; Briske & Anderson 1992.

Schizachyrium scoparium (Michx.) Nash, (broom-like), LITTLE BLUESTEM. Perennial 50–200 cm tall, non-rhizomatous, green or glaucous; ligule a firm membrane 1–3 mm long; flowering culms with each leafy branch terminating in a spicate raceme; racemes 2.5–5 cm long; disarticulation at base of sessile spikelets so that associated pedicel and section of raceme fall with sessile spikelet; spikelets in pairs, the sessile spikelets perfect, 6–8 mm long, 2-flowered, the upper fertile; pedicellate spikelets staminate or neuter, narrow, shorter than sessile spikelets. Prairies and woodland openings; nearly throughout TX. Aug–Dec. One of our most important native grasses, often a vegetational dominant, and one of the “big four” tall grass prairie species along with *Andropogon gerardii*, *Panicum virgatum*, and *Sorghastrum nutans*. [*Andropogon scoparius* Michx. var. *frequens* FT. Hubb., *S. scoparium* (Michx.) Nash var. *frequens* (FT. Hubb.) Gould]

SCLEROCHLOA HARD GRASS

☛ A monotypic genus of s Europe and w Asia. (Greek: *scleros*, hard, and *chloa*, grass, referring to thick glumes) (subfamily Pooideae, tribe Poeae)

REFERENCE: Brandenburg et al. 1991b.

Sclerochloa dura (L.) P. Beauv., (durable, hard), HARD GRASS. Tufted, glabrous, prostrate to erect annual 3–10(–18) cm tall or long; ligule a membrane 1–2 mm long; inflorescences spike-like, dense, often 1-sided, 1–3(–4.5) cm long; spikelets ca. 3–4-flowered, usually 6–11 mm long; glumes and lemmas blunt, prominently nerved. Roadsides, waste places, or disturbed areas; Dallas and Ellis cos., also sometimes extensive, but local populations were found in Collin, Denton, Fannin, Grayson, and Red River cos. in April 1998 (e.g., *Rabele & Diggs 1318*); nc TX and Edwards Plateau; first collected in the U.S. in 1895 and in TX in 1944 (Brandenburg et al. 1991b) Apr. Native of Europe. ☛



Poa compressa [us8]



Poa pratensis [us8]



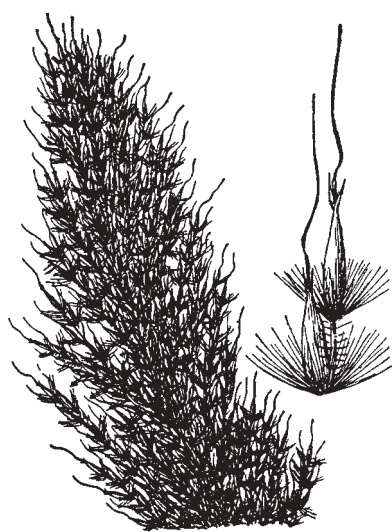
Poa sylvestris [us8]



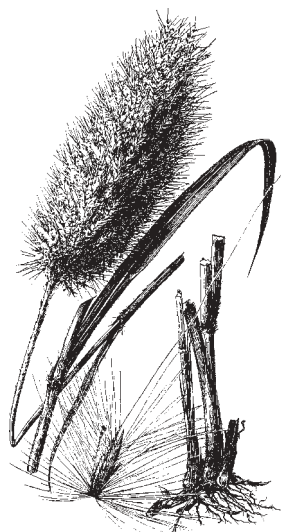
Polypogon monspeliensis [H11]



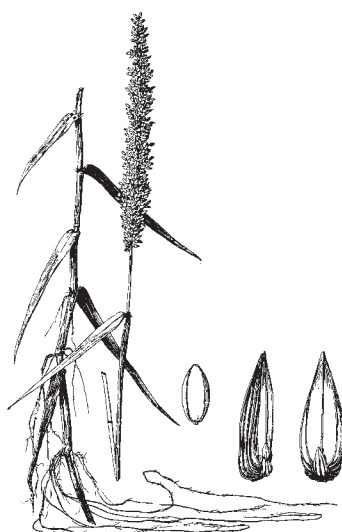
Polypogon viridis [MAS]



Saccharum brevibarbe var. *contortum* [BB2]



Saccharum giganteum [H11]



Sacciolepis striata [H11]



Schedonnardus paniculatus [us8]

SECALE RYE

☛ An Eurasian and s African genus of 3 species including RYE. (Ancient Latin name for rye) (subfamily Pooideae, tribe Triticeae)

REFERENCE: Bowden 1959b.

Secale cereale L., (pertaining to agriculture, from Ceres, goddess of farming), RYE. Annual vegetatively similar to WHEAT (*Triticum*); spikelets usually 2-flowered, both flowers perfect; glumes narrowly lanceolate-subulate, ca. 1–3.5 mm wide, acute or acuminate, apparently 1-nerved; lemmas with awns 5–60 mm long. Occasionally cultivated in much of TX, chiefly in sandy soils; found rarely as a transitory waif on roadsides or in disturbed areas; Grayson and McLennan cos. Apr–May. RYE, an Old World species brought into domestication later than WHEAT or BARLEY, is believed to have evolved from weeds (possibly *S. montanum* Guss.) invading the fields of early WHEAT and BARLEY farmers; large fruited forms were brought into cultivation in e Turkey (Mabberley 1987; Heiser 1990a). RYE and a number of other grasses are susceptible to infection by ergot fungi, e.g., *Claviceps purpurea* (Fr.: Fr.) Tul., which through the production of LSD-like alkaloids can cause hallucinations, psychosis, gangrene of the extremities (due to vasoconstriction), convulsions, and death in humans and livestock. The condition was referred to in ages past as Saint Anthony's Fire. The reference to fire resulted from the assumption that the burning sensations and blackened (gangrenous) limbs were retribution for sins. Saint Anthony, supposedly with special powers to protect against fire, infection, and epilepsy, was often prayed to for help by those with the condition. Large scale epidemics of ergotism in Europe prior to 1800, from eating bread made with contaminated grain, resulted in 1,000s of deaths; isolated instances still occur where grain purity is not controlled; ergotism is blamed by some for the hysteria that resulted in the Salem witch trials in 17th century Massachusetts (Kingsbury 1964; Caporael 1976; Mabberley 1987; Matossian 1989; Blackwell 1990; Mann 1992). ☛

SETARIA BRISTLE GRASS, FOXTAIL, FOXTAIL-MILLET

Annuals or perennials; ligule a ciliate membrane; panicles usually dense, contracted, spike-like, sometimes less dense with lower branches somewhat spreading (*S. scheelei*); all or at least some spikelets subtended by an involucre of 1–several persistent bristles; spikelets disarticulating above the bristles, awnless, of 2 florets, the lower floret sterile with glume-like lemma, the upper floret fertile with hardened grain-like lemma.

☛ A genus of ca. 150 species of tropical and warm areas; some are used for hay, pasture, silage, or cereal grain. (Latin: *seta*, a bristle, referring to the bristles subtending the spikelets) (subfamily Panicoideae, tribe Paniceae)

REFERENCES: Pohl 1951, 1962; Emery 1957a, 1957b; Rominger 1962; Crins 1991; Webster 1993.

1. Plants very large, usually 1.5–4 m tall; inflorescences very long and thick, 14–45(–50) cm long, 1.5–3 cm in diam.; leaf blades 10–35 mm wide _____ **S. magna**
1. Plants < 1.5 m tall; inflorescences often much smaller in length, diam. or both (can be large in *S. italica*, but plant is much smaller and spikelets larger); leaf blades up to 16(–21) mm broad, usually narrower.
 2. Bristles (short) present at base of terminal spikelets only (sometimes below a few other spikelets); plants resembling a *Panicum*.
 3. Leaf blades 13–20 cm long, usually tapering to an extremely narrow base, often involute; spikelets usually (2.5–)3–4 mm long; bristles shorter to longer than spikelets (rarely > 6 mm long) _____ **S. reverchonii**
 3. Leaf blades 5–13 cm long, not or only slightly narrowing toward base, flat; spikelets 2.5–3 mm long; bristles usually shorter than the spikelets _____ **S. ramiseta**
2. Bristles present on nearly all spikelets; plants not resembling a *Panicum*.

4. Bristles 1–3 below each spikelet; panicles variable in shape and length, the axis obscured or visible.
5. Bristles antrorsely scabrous (with up-pointing barbs visible with lens, the free end of the barbs above or distal to the attached end).
6. Plants annual; bristles on average > 1 per spikelet (1–3 below each spikelet); inflorescences chunky and extremely dense in appearance (axis not visible or visible in only a very few places).
7. Panicles not lobed or interrupted, usually green, usually 10(–15) cm or less long; spikelets ca. 1.8–2.6 mm long, falling entire; fertile lemma finely rugose _____ **S. viridis**
7. Panicles often lobed or interrupted, purple or yellow, often large and heavy, up to 30 cm long; spikelets ca. (2.5–)3 mm long, the caryopsis (= fruit) deciduous from glumes and sterile lemma; fertile lemma smooth or nearly so _____ **S. italica**
6. Plants perennial; bristles mostly 1(–2) below each spikelet; inflorescences usually elongate, not chunky, not extremely dense in appearance (thus much of axis visible).
8. Leaf blades narrow, 2–8 mm wide; panicles usually cylindric, not tapered, usually 6–15 cm long; bristles mostly 4–15 mm long _____ **S. leucopila**
8. Leaf blades broad, (5–)9–20 mm wide; panicles usually strongly tapered from a wide base to a narrow apex, (7–)11–35 cm long; bristles (10–)15–35 mm long _____ **S. scheelei**
5. Bristles retrorsely scabrous (with down-pointing barbs visible with lens, the free end of the barbs below or proximal to the attached end) _____ **S. verticillata**
4. Bristles 4–12 below each spikelet; panicles cylindric, 3–15 cm long, so dense that axis is obscured.
9. Plants perennial with knotty rhizomes _____ **S. parviflora**
9. Plants annual with fibrous roots only _____ **S. pumila**

Setaria italica (L.) P. Beauv., (of Italy), FOXTAIL-MILLET, ITALIAN-MILLET, GERMAN-MILLET, HUNGARIAN-MILLET. Annual similar to but larger and coarser than *S. viridis*; leaf blades to 16(–21) mm wide; panicles up to 30 cm long and to 3 cm thick; spikelets ca. (2.5–)3 mm long; bristles to ca. 12 mm long. Denton (damp limestone soil), Grayson (planted for erosion control along Hwy 82), and Tarrant cos., also Parker Co. (R. O'Kennon, pers. obs.); apparently now being widely used to stabilize soil following highway construction; Hatch et al. (1990) cited vegetational areas 4, 7, and 8 (Fig. 2) for TX; Gould (1975b) said that *S. italica* does not persist in the state. Jul–Aug. Related to and interfertile with its wild ancestor *S. viridis*; native of Eurasia; FOXTAIL-MILLET appears to be an old domesticate first brought into cultivation in e Asia; it is used as a cereal grain and sometimes seen as birdseed (Mabberley 1987; Zohary & Hopf 1994). ☞

Setaria leucopila (Scribn. & Merr.) K. Schum., (white-haired). Tufted perennial 20–100 cm tall; bristles mostly 4–15 mm long; fertile lemma finely rugose and with transverse wrinkles. Well-drained soils, sometimes with abundant moisture; Bell Co.; mainly w 1/2 of TX. May–Nov.

Setaria magna Griseb., (large), GIANT BRISTLE GRASS, GIANT FOXTAIL GRASS. Coarse annual; culms to 1–2 cm thick at base; panicles 14–45(–50) cm long and 1.5–3 cm in diam.; bristles 10–20 mm long; spikelets 2–2.5 mm long; fertile lemma smooth and shiny; caryopsis deciduous from glumes and sterile lemma. Wet sand; mainly coastal TX, disjunct w to Tarrant Co. (Trinity River bottom, Fort Worth Nature Center). Oct. This is the largest *Setaria* species in North America.

Setaria parviflora (Poir.) Kerguelén, (small-flowered), KNOT-ROOT BRISTLE GRASS. Perennial 15–150 cm tall, with knotty rhizomes; leaf sheaths slightly compressed, keeled; leaf blades pilose near base; inflorescences dense and stiff; bristles yellowish, tawny, greenish, or purplish, 5–10 mm long; spikelets 2.1–3.0 mm long; fertile lemma rugose. Stream banks, disturbed sites; throughout TX. May–Nov. [*S. geniculata* (Lam.) P. Beauv.]

Setaria pumila (Poir.) Roem. & Schult., (dwarf), YELLOW BRISTLE GRASS. Annual with fibrous

roots, similar to *S. parviflora*, differing in its slightly larger spikelets and panicles with relatively fewer spikelets per verticil; bristles yellow at maturity; spikelets 2.7–3.3 mm long. Disturbed soils; nearly throughout TX. Jun–Sep. Native to Europe. [*S. glauca* of authors, not (L.) P. Beauv., *S. lutescens* (Weigel) F.T. Hubbard] This species has long gone under the name *S. glauca*, but because of nomenclatural considerations, *S. pumila* is the appropriate binomial (Clayton & Renvoise 1982). Known to cause mechanical injury to the mouths of livestock; the bristles easily penetrate flesh and remain there because of tiny upwardly directed barbs (Kingsbury 1964). 🇺🇸

Setaria ramiseta (Scribn.) Pilg., (branching bristles). Perennial similar to *S. reverchonii*, differing by characters in the key, its occurrence in non-limy soils, and a more s distribution. Sandy loam, dry uplands; s TX n to s parts of region 5 and 8 (Gould 1975b), also Callahan Co. (Correll & Johnston 1970). Spring–Jun, occasionally later. [*Panicum ramisetum* Scribn.]

Setaria reverchonii (Vasey) Pilg., (for Julien Reverchon, 1837–1905, a French-American immigrant to Dallas and important botanical collector of early TX), REVERCHON'S BRISTLE GRASS. Tufted erect perennial 20–80 cm tall; culm bases hard, swollen; leaf sheaths pilose on margins and at summit; leaf blades scabrous; ligule a short, membranous-based ring of hairs; fertile lemma conspicuously rugose. Rock outcrops or gravelly soils on limestone; mainly Blackland Prairie (Austin Chalk) s and w to w TX. Apr–Jun, Sep. [*Panicum reverchonii* Vasey]

Setaria scheelei (Steud.) Hitchc., (for Karl Wilhelm Scheele, 1742–1786, German chemist), SOUTHWESTERN BRISTLE GRASS, SCHEEL'S BRISTLE GRASS. Coarse perennial 70–130 cm tall; bristles (10–)15–35 mm long; spikelets 2.1–2.6 mm long; fertile lemma rugose. Fencerows, ravines, open woods, often in shade; Bell and McLennan cos.; s part of nc TX s and w to w TX. May–Nov.

Setaria verticillata (L.) P. Beauv., (whorled), HOOKED BRISTLE GRASS, BUR BRISTLE GRASS, FOXTAIL GRASS. Annual; leaf sheath margins pilose; spikelets 2–2.3 mm long; fertile lemma finely rugose. Gould (1975b) reported *McCart* 9281 from Brown Co.; other TX specimens are from Brewster, Dimmit and El Paso cos. Native to Europe. 🇺🇸

Setaria viridis (L.) P. Beauv., (green), GREEN BRISTLE GRASS, GREEN FOXTAIL GRASS. Annual up to 100 cm tall; leaf sheaths slightly compressed; leaf blades mostly 3–10 mm wide; inflorescences rather soft and flexible; bristles usually green; spikelets 1.8–2.6 mm long; fertile lemma finely rugose. Disturbed sites; Blackland Prairie s and w to w TX. May–Jul. Native of Eurasia. While this species is often treated as having a number of varieties (e.g., Kartesz 1994; Jones et al. 1997), we are following Gould (1975b) in not recognizing infraspecific taxa in nc TX. 🇺🇸

SORGHASTRUM INDIAN GRASS

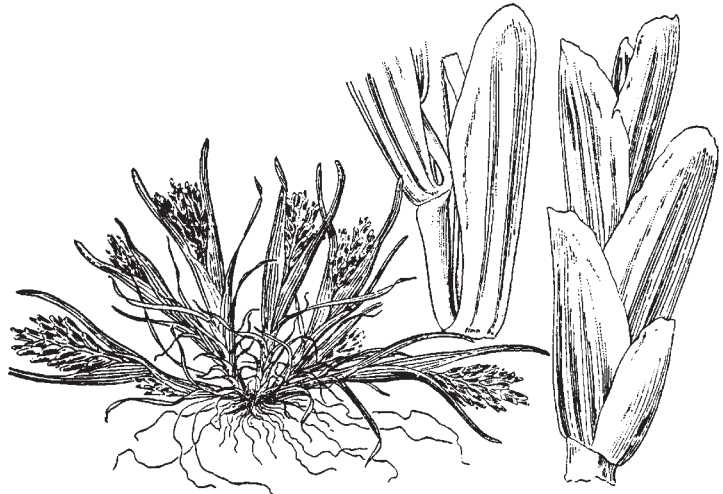
Coarse perennials; leaf blades flat, often conspicuously bluish green; inflorescence a long exerted panicle; spikelets in pairs, one sessile and fertile, one vestigial, in ours reduced to a hairy pedicel; disarticulation so that associated pedicel and section of the inflorescence branch fall with sessile spikelet; fertile spikelet 2-flowered, the upper, fertile lemma with a geniculate and twisted awn.

☛ A genus of 17 species of Africa and tropical and warm areas of the Americas. (Named from its resemblance to the genus *Sorghum*) (subfamily Panicoideae, tribe Andropogoneae)
REFERENCE: Davila 1988.

1. Awns of lemmas mostly 23–35 mm long, usually twice-geniculate; spikelets at maturity usually dark brown _____ ***S. elliottii***
1. Awns of lemmas usually 12–17 mm long, once-geniculate; spikelets at maturity light brown or straw-colored _____ ***S. nutans***



Schizachyrium scoparium [us8]



Sclerochloa dura [HI1]



Secale cereale [HI1]



Setaria italica [usd]



Setaria leucopila [go1]



Setaria magna [us8]



Setaria parviflora [HI1]



Setaria pumila [RCA]

Sorghastrum eliottii (C. Mohr) Nash, (for Stephen Elliott, 1771–1830, Carolinian botanist), SLENDER INDIAN GRASS, LONG-BRISTLED INDIAN GRASS. Not rhizomatous; culms usually 0.8–1.8 m tall; ligules 1–4 mm long; panicles narrow, looser than in *S. nutans*, sparsely flowered, 15–30 cm long; spikelets usually 5.5–7 mm long. Sandy wooded areas; Fannin Co. (Talbot property), also collected by Reverchon in Dallas Co. in 1876, also Lamar Co. (Carr 1994); mainly se and e TX. Sep–Nov.

Sorghastrum nutans (L.) Nash, (nodding), YELLOW INDIAN GRASS, INDIAN REED. **State grass of Oklahoma** (S. Barber, pers. comm.). Rhizomes short, scaly; culms erect, up to 2.5 m tall; ligule a stiff membrane 2–5 mm long; panicles loosely contracted, up to 30 cm long, yellowish; spikelets usually 6–8 mm long. Moist areas, open woodlands, grasslands; throughout TX. Sep–Nov. One of the dominants in the original tall grass prairie and considered one of the “big four” tall grasses along with *Andropogon gerardii*, *Panicum virgatum*, and *Schizachryium scoparium*; important forage grass and indicator of good range conditions. [*S. avenaceum* (Michx.) Nash]

SORGHUM

Robust annuals or perennials; ligule a ciliate membrane; inflorescence an open or contracted panicle; spikelets in pairs, one sessile and perfect, the other pedicelled and staminate; disarticulation below sessile spikelets so that associated pedicel and section of inflorescence branch fall with spikelet; perfect spikelet 2-flowered, the upper fertile lemma usually awned or awnless.

☞ A mainly Old World genus of 24 species (Mexico, 1 species) including *S. bicolor*, the world's fourth most important cereal after WHEAT, CORN, and RICE; this species, which is more tolerant of drought than most cereals, is of particular importance in Africa and Asia where it feeds millions of people (Heiser 1990a). ☞ Some *Sorghum* species, under certain conditions, can be fatally poisonous to livestock due to the presence of hydrocyanic acid (Sperry et al. 1955). (derivation unclear, possibly from *sorgho*, the Italian name of the plant, or perhaps from Latin *syricus*, Syria, and *granum*, grain, the presumed place of origin of *S. halepense*) (subfamily Panicoideae, tribe Andropogoneae)

REFERENCES: Snowden 1936; Celarier 1958; Duvall & Doebley 1990.

1. Plants perennial, with rhizomes.

2. Plants usually 3–4 m tall; rhizomes short; spikelets 5–6.5 mm long; pedicellate spikelets falling with a part of the pedicel; caryopses (= fruits) 3–3.8 mm long; possibly present in nc TX (no specimens seen) _____ **S. alnum**

2. Plants usually < 2 m tall; rhizome system extensive; spikelets 4.5–5.5 mm long; pedicellate spikelets disarticulating cleanly at the nodes; caryopses 2–3 mm long; extremely abundant in nc TX _____ **S. halepense**

1. Plants annual, without rhizomes _____ **S. bicolor**

Sorghum alnum Parodi, (nourishing). Rhizomatous perennial similar to *S. halepense*. Seeded in pastures; included based on citation for vegetational area 5 by Hignight et al. (1988); also s TX and Edwards Plateau. Summer–fall. Native to Argentina. Duvall and Doebley (1990) considered this taxon to be a hybrid between *S. halepense* and a diploid from *S. bicolor* subsp. *arundinaceum* (Desv.) de Wet & J.R. Harlan (subsp. *arundinaceum* is the wild relative of cultivated SORGHUM). Jones et al. (1997) treated this taxon as *S. ×alnum* Parodi [*S. bicolor* × *S. halepense*]. ☞ ☞

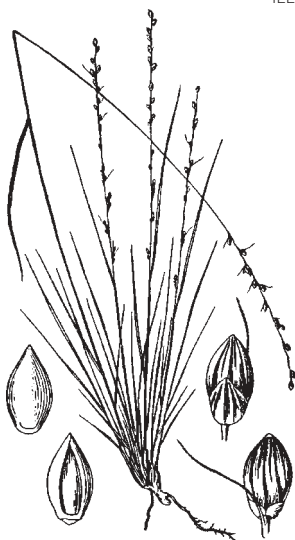
Sorghum bicolor (L.) Moench, (two-colored). Large succulent annual ca. 0.8–2.5 m tall; leaf blades 1–5 cm or more wide; inflorescences variable. Summer–fall. Probably native of Africa. Poisonous in a manner similar to *S. halepense* (Hardin & Brownie 1993). ☞ ☞ ☞

1. Panicles compact; lemma of perfect spikelets awnless _____ subsp. **bicolor**

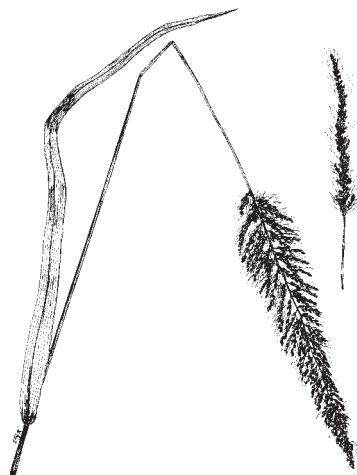
1. Panicles open; lemma of perfect spikelets awned _____ subsp. **drummondii**



Setaria ramiseta [H11]



Setaria reverchonii [US8]



Setaria scheelei [G01]



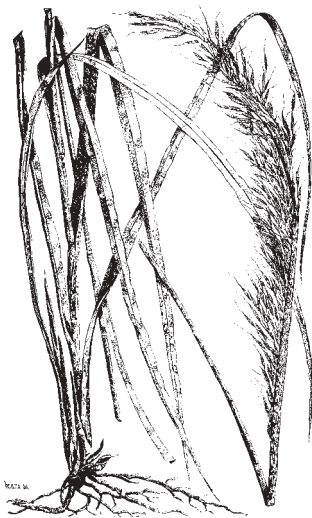
Setaria verticillata [MAS]



Setaria viridis [RCA]



Sorghastrum elliottii [H11]



Sorghastrum nutans [H11, RCA]



Sorghum aluum [HEA]

subsp. **bicolor**. SORGHUM, MILO, SORGO, KAFIR, HEGARI, BROOM-CORN, GUINEA-CORN, KAOLANG. Widely cultivated in TX; found as a transitory escape along roadsides, railroads, and field margins; Brown, Grayson, Montague, and Tarrant cos. [*S. vulgare* Pers.] Thought to have been brought into cultivation in Sudan ca. 1000 BC.; cultivated for its grain, sweet juice, broom material, silage, and as a forage plant; a staple in Africa, India, and China; it thrives under drier conditions than appropriate for corn (Mabberley 1987). ☞☞

subsp. **drummondii** (Nees ex Steud.) de Wet & J.R. Harlan, (for its discoverer, Thomas Drummond, 1780–1835, Scottish botanist and collector in North America). SUDAN GRASS. Awn of lemma ca. 10 mm long. Cultivated and possibly escapes; included based on citation for vegetational area 5 by Hignight et al. (1988). [*S. sudanese* (Piper) Stapf] Jones et al. (1997) treated this taxon as *S. ×drummondii* (Steud.) Millsp. & Chase [*S. arundinaceum* × *S. bicolor*]. While this plant is valuable as forage, because of cyanide production at certain stages, caution is advised.

☞☞

Sorghum halepense (L.) Pers., (of Aleppo or Haleb, a city in n Syria), JOHNSON GRASS. Coarse rhizomatous perennial 25–200 cm tall; leaf sheaths glabrous; leaf blades pilose above at base; ligule a membrane with fringe of hairs; panicles varying from narrow and dense to loose and open, yellow-brown or red-brown to purple-brown; lemma awnless or with awn 1–1.5 mm long. Fields, roadsides, disturbed areas; throughout TX. May–Nov. Native of the Mediterranean region; introduced into TX in the 1880s; now one the most abundant grasses in nc TX and a pernicious invader of native habitats. While normally edible, this species can be poisonous to livestock when young, during dry weather, or after a frost, drought, or period of high temperatures; the poisonous principle is dhurrin, a cyanogenic glycoside (Pammel 1911; Burlage 1968; Hardin & Brownie 1993). ☞☞

SPARTINA CORD GRASS, MARSH GRASS

☞ A genus of 17 species primarily of coastal America, Europe, and n Africa; typically halophytic (= tolerant of salty or alkaline conditions. (Greek: *spartine*, a cord, possibly from the appearance of the inflorescence branches) (subfamily Chloridoideae, tribe Cynodonteae)

REFERENCE: Mabberley 1956.

Spartina pectinata Link, (comb-like), PRAIRIE CORD GRASS, TALL MARSH GRASS, SLOUGH GRASS. Rhizomatous perennial 1.5–2.5 m tall; ligule a ring of hairs 1–3 mm long; inflorescence branches 8–40, appressed, 4–15 cm long; spikelets 1-flowered, closely placed, sessile, 10–25 mm long including scabrous awns of the glumes; anthers 4–6 mm long. Low moist areas, swales, fresh or brackish water; Comanche, Grayson (Hagerman Nat. Wildlife Refuge), and Fannin cos.; also Rockwall Co. (Wallace Prairie) (Mahler 1988); Blackland Prairie and Edwards Plateau w and n to nw TX. Aug–Oct. Other *Spartina* species are important salt marsh grasses.

SPHENOPHOLIS WEDGE GRASS, WEDGESCALE

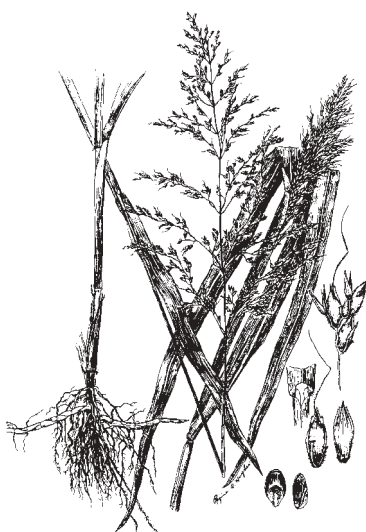
☞ A genus of 5 species ranging from Canada to Mexico. (Greek: *sphen*, a wedge, and *pholis*, scale, referring to the shape of the broadly obovate or cuneate second glume) (subfamily Pooideae, tribe Aveneae)

REFERENCE: Erdman 1965.

Sphenopholis obtusata (Michx.) Scribn., (obtuse, blunt), PRAIRIE WEDGESCALE. Annual 15–100 (–120) cm tall; similar in aspect to *Koeleria* but with second glume much more obovate and more blunt at apex; culms single or tufted; leaf sheaths glabrous or pubescent; ligule a membrane 1.5–3 mm long, glabrous or ciliate; inflorescence a narrow panicle, dense, spike-like; inflorescence axis glabrous or minutely scabrous; spikelets shiny, 2–3-flowered, 1.5–5 mm long,



Sorghum bicolor subsp. *drummondii* [USD]



Sorghum halepense [RCA]



Spartina pectinata [H11]



Sphenopholis obtusata [H11]



Sporobolus compositus var. *clandestinus* [H11]



Sporobolus compositus var. *compositus* [US8]



Sporobolus compositus var. *drummondii* [882]



Sporobolus compositus var. *macer* [H11]



Sporobolus cryptandrus [US8]

awnless, disarticulating below glumes; apex of second glume conspicuously obovate. Low, open or partly shaded ground, clayey or sandy soils; throughout most of TX. Apr–Jun.

SPOROBOLUS DROPSEED

Annuals or perennials; ligules minute, largely a ciliate fringe on vestigial membranous base; inflorescences spike-like or open-panicked, often partly included within a sheath; spikelets 1-flowered, awnless; glumes shorter than or equaling the lemma, 1-nerved; lemmas usually 1-nerved; fruit falling free from lemma and palea, the seed coat not fused to the pericarp (therefore not a true caryopsis).

☛ A genus of 160 species in the Americas, Asia, Africa, and Europe; some have edible grains. (Greek: *sporos*, seed, and *ballein*, to cast forth, referring to the deciduous grains) (subfamily Chloridoideae, tribe Eragrostideae)

REFERENCES: Clayton 1965; Riggins 1977; Brown 1993; Wipff & Jones 1995; Peterson et al. 1997.

1. Panicles contracted, the branches appressed; plants annual or perennial.
 2. Plants with evident short, creeping, scaly rhizomes _____ **S. compositus** var. **macer**
 2. Plants without creeping, scaly rhizomes.
 3. Culms 1–2 m tall, (2–)3–7 mm in diam. at base; panicles mostly 25–70 cm long; spikelets 2.6–3.2(–4) mm long; mainly far w TX and Panhandle (only Bosque Co. in nc TX) _____ **S. giganteus**
 3. Culms 1.2 m or less tall, 1–3 mm in diam. at base (to 5 mm in *S. asper* which has spikelets 4–7 mm long); panicles 1–30(–40) cm long; spikelet length various; widespread in nc TX.
 4. Plants annual; panicles usually 1–5 cm long.
 5. Florets glabrous.
 6. Glumes shorter than floret; lemmas 1-nerved; lower leaf sheaths not papillose-pilose _____ **S. neglectus**
 6. Glumes longer than floret; lemmas 3-nerved (midnerve more conspicuous); lower leaf sheaths papillose-pilose _____ **S. ozarkanus**
 5. Florets pubescent.
 7. Glumes as long as or longer than floret; lower leaf sheaths and blades papillose-pilose; lemmas 3-nerved (midnerve more conspicuous) _____ **S. ozarkanus**
 7. Glumes shorter than floret; lower leaf sheaths and blades usually not papillose-pilose; lemmas 1- or 3-nerved _____ **S. vaginiflorus**
 4. Plants perennial; panicles usually 5–30 cm long.
 8. Spikelets 1.4–2 mm long; inflorescences mostly exerted from sheaths _____ **S. indicus**
 8. Spikelets 4–7 mm long; inflorescences usually at least partly included within sheaths.
 9. Lemmas glabrous; panicles 5–30 cm long; pericarp gelatinous when wet.
 10. Terminal sheaths 0.8–2(–2.5) mm wide when folded; culms 1–2(–2.5) mm wide near base; primary panicle branches 8–18, not crowded _____ **S. compositus** var. **drummondii**
 10. Terminal sheaths (1.3–)1.5–6 mm wide when folded; culms (1.4–)2–5 mm wide near base; panicle branches 12–35, crowded _____ **S. compositus** var. **compositus**
 9. Lemmas appressed-pubescent; panicles 5–10 cm long; pericarp loose when wet _____ **S. compositus** var. **clandestinus**
1. Panicles open, the branches ascending OR widely spreading; plants perennial.
 11. Pedicels 3–8(–12) mm long; spikelets 4–6(–7.2) mm long; known locally only from Lamar Co. in extreme ne portion of nc TX _____ **S. silveanus**
 11. Pedicels 0.2–ca. 2 mm long; spikelets 1.5–2.8 mm long; widespread in nc TX.
 12. Panicles 3–15(–18) cm long, exerted beyond sheath, the lower branches visibly whorled; sheath summit without collar of hairs; culms 10–30(–50) cm tall _____ **S. pyramidatus**
 12. Panicles 15–30(–40) cm long, partially included within sheath, the branches not visibly

whorled (often hidden within sheath); sheath summit with collar of hairs; culms 35–120 cm tall _____

S. cryptandrus

Sporobolus compositus (Poir.) Merr., (compound). Perennial; spikelets in contracted terminal panicles, often with cleistogamous spikelets in axillary panicles; spikelets 4–7 mm long. [*S. asper* (Michx.) Kunth] This species long went under the name *S. asper*, but because of nomenclatural considerations, *S. compositus* is the appropriate binomial (Kartesz & Gandhi 1995). Key to varieties included in key to species.

var. **clandestinus** (Biehler) Wipff & S.D. Jones, (concealed), PURPLE-FLOWER DROPSEED. Spikelets 5–7 mm long. Grasslands, disturbed sites; widespread in e 1/2 of TX. Aug–Oct. [*S. asper* (Michx.) Kunth var. *clandestinus* (Biehler) Shinnery, *S. clandestinus* (Biehler) Hitchc.] We are following Wipff and Jones (1995) for nomenclature of this taxon. While it has often been recognized at the specific level (e.g., Kartesz 1994), because var. *clandestinus* differs morphologically from var. *compositus* in only minor ways, Wipff and Jones (1995) argued that it is most appropriately recognized at the varietal level.

var. **compositus**. TALL DROPSEED, LONG-LEAF RUSH GRASS, ROUGH RUSH GRASS. Cespitose, without rhizomes. Grasslands, disturbed sites; widespread in e 1/2 of TX. Sep–Nov.

var. **drummondii** (Trin.) Kartesz & Gandhi, (for its discoverer, Thomas Drummond, 1780–1835, Scottish botanist and collector in North America), MEADOW DROPSEED. Cespitose, without rhizomes. Grasslands, disturbed sites; widespread in e 1/2 of TX. Aug–Nov. Jones et al. (1997) lumped this variety with var. *compositus*.

var. **macrer** (Trin.) Shinnery, (thin, meager), MISSISSIPPI DROPSEED. Similar to var. *compositus*. Open woods, margins of woods; included based on citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990); mainly e TX. Aug–Nov.

Sporobolus cryptandrus (Torr.) A. Gray, (with hidden flowers), SAND DROPSEED, COVERED-SPIKE DROPSEED. Perennial; summit of sheaths with tufts of long white hairs 2–4 mm long; panicles 15–30(–40) cm long, 2–12 cm wide, usually partially enclosed by the subtending sheath; lemmas as long as spikelet. Grasslands, disturbed sites; throughout TX except far e part. May–Nov. The grains were consumed by Native Americans (Mabberley 1987).

Sporobolus giganteus Nash, (gigantic), GIANT DROPSEED. Large perennial. Loose sand; Bosque Co. (Carr 1989) in Lampasas Cut Plain; mainly far w TX, Edwards Plateau, and Panhandle. Summer–fall.

Sporobolus indicus (L.) R. Br., (of India), SMUT GRASS. Perennial; spikelets 1.4–2 mm long; pericarp mucilaginous, the seed often sticking instead of falling readily. Moist soils, often in disturbed areas; included based on citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990); mainly se and e TX, also Edwards Plateau. Mar–Dec. Native to Asia. ☞

Sporobolus neglectus Nash, (overlooked), PUFF-SHEATH DROPSEED. Annual; erect or decumbent; terminal panicles contracted, 2–5 cm long, often only apical portion exerted from subtending sheath; axillary panicles shorter, almost entirely enclosed by sheaths; sheaths somewhat inflated; spikelets (1.3–)1.6–2.8 mm long; lemmas white or purple-tinged, glabrous. Disturbed sites; Bosque, Grayson, and Mills cos; nc TX and Edwards Plateau. Aug–Nov. Jones et al. (1997) treated this species as *S. vaginiflorus* var. *neglectus* (Nash) Scribn.

Sporobolus ozarkanus Fernald, (of the Ozarks), OZARK DROPSEED. Annual; culms 4–50 cm tall; spikelets 2.3–3.8(–4.2) mm long. Limestone areas, roadsides; Grayson, Johnson, and Wise cos., also Fort Hood (Bell or Coryell cos.—Sanchez 1997); nc TX and Edwards Plateau. Aug–Oct. Jones et al. (1997) lumped this species with *S. neglectus* (treated by them as *S. vaginiflorus* var. *neglectus*).

Sporobolus pyramidatus (Lam.) Hitchc., (pyramidal), WHORLED DROPSEED. Perennial; panicles 3–15(–18) cm long, becoming pyramidal and exerted at maturity, the lower branches whorled; spikelets 1.5–2 mm long; lemmas 1.2–2 mm long. Open, disturbed sites; mainly Post Oak Savannahs and w through most of TX. Mar–Nov.

Sporobolus silveanus Swallen, (for William Arents Silveus, 1875–1953, TX botanist and attorney), SILVEUS' DROPSEED. Perennial; culms 0.9–1.2 m tall; panicles somewhat open, 20–50 cm long, 10–12(–15) cm wide; spikelets purple, 4–6(–7.2) mm long. Sandy soils, prairies and forest openings; Lamar Co. (Tridens Prairie) in ne corner of nc TX; mainly se and e TX. Sep–Nov.

Sporobolus vaginiflorus (Torr. ex A. Gray) A.W. Wood, (with flowers in the sheaths), POVERTY DROPSEED, SOUTHERN POVERTY GRASS. Annual; panicles terminal and axillary, contracted, 1–4 cm long, 2–5 mm wide, usually partially enclosed within subtending sheaths; lemmas often mottled with dark purple, short appressed-pubescent. Disturbed sites, sandy or clay soils; widespread in e 1/2 of TX. Sep–Nov.

STENOTAPHRUM

☛ A genus of 7 species of tropical and warm areas of the world. (Greek: *steno*, narrow and *taphros*, trench, from grooved inflorescence axis) (subfamily Panicoideae, tribe Andropogoneae)

REFERENCES: Sauer 1972; Crins 1991.

Stenotaphrum secundatum (Walter) Kuntze, (with parts arranged along one side), ST. AUGUSTINE GRASS. Decumbent or ascending, stoloniferous, sod-forming perennial to ca. 30 cm tall; leaf sheaths compressed, keeled, with a few hairs at summit; leaf blades cupped or creased lengthwise; ligule a very short ring of hairs; inflorescences spike-like, with wide, flattened, corky axis; spikelets 4–5 mm long, awnless, 2-flowered, the lower floret staminate or neuter, the upper floret perfect, appressed and sunken into one side of the axis; first glume smaller than second. Commonly planted as lawn-grass, escaping locally; tends to freeze back in very severe winters; Grayson and Tarrant cos.; se and e TX w to nc TX and Edwards Plateau. Jun–Aug. Native to the tropics (South America?), probably not native to the United States. ☛

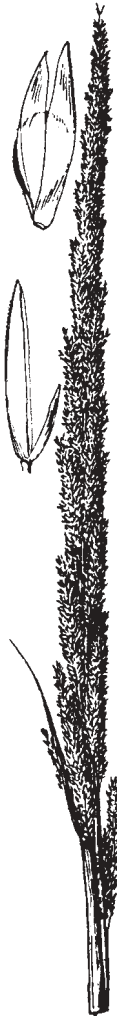
TRIDENS

Tufted perennials with erect culms; ligule a ciliate membrane; panicles contracted or open; spikelets 4–12-flowered; first glume 1-nerved; lemmas 3-nerved, glabrous or pubescent, rounded on the back, obtuse or acute, usually ± 2-toothed or rounded-truncate at apex, the nerves often slightly mucronate.

☛ A genus of 18 species of warm areas of the Americas (e. U.S. to Argentina) and one species in Angola. Recognized as the genus *Triodia* by Hitchcock (1935). (Latin: *tri*, three, and *dens*, tooth, from the 2-toothed lemma tip often with a mucro from between the teeth) (subfamily Chloridoideae, tribe Eragrostideae)

REFERENCES: Tateoka 1961; Peterson et al. 1997.

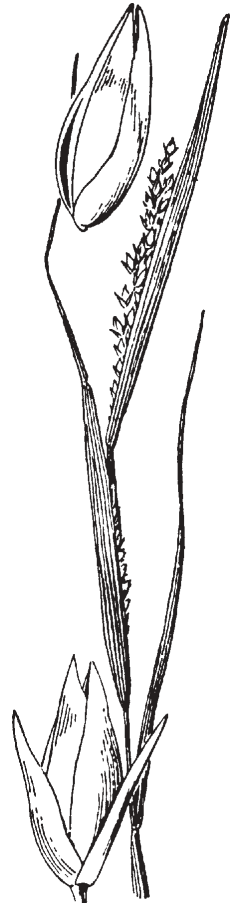
1. Panicles open, ± loosely flowered, neither densely flowered nor spike-like, the panicle branches with conspicuous naked (= without spikelets) portions at base.
 2. Leaf blades mostly 3–10 mm wide; panicles mostly 15–35 cm long; plants 60–180 cm tall; spikelets 5–9 mm long _____ **T. flavus**
 2. Leaf blades mostly 1–3 mm wide; panicles mostly 5–16 cm long; plants 20–75 cm tall; spikelets usually 6–13 mm long _____ **T. texanus**
1. Panicles contracted, densely flowered or elongate and spike-like, the panicle branches without



Sporobolus giganteus [H11]



Sporobolus indicus [REE]



Sporobolus neglectus [H11]



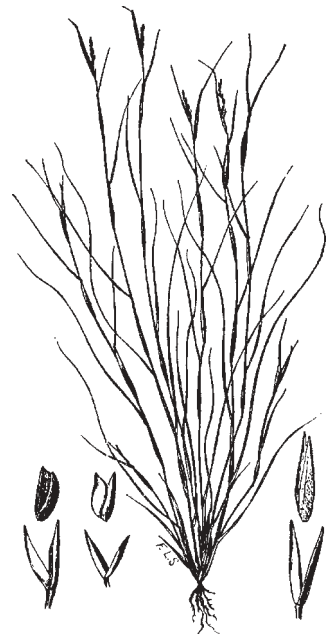
Sporobolus ozarkanus [ROE]



Sporobolus pyramidatus [GO1]



Sporobolus silveanus [H12]



Sporobolus vaginiflorus [US8]

conspicuous naked basal portions, usually with spikelets nearly to base or apparently so (branches usually tightly appressed at base).

3. Glumes much longer than lemmas, usually as long as the entire spikelet or longer; plants 50–170 cm tall _____ **T. strictus**
3. Glumes slightly longer to shorter than lemmas, much shorter than entire spikelet; plants 20–80(–90) cm tall.
4. Lemmas glabrous or hairy only at extreme base; lemmas awnless _____ **T. albescens**
4. Lemmas ciliate or puberulent to well above the base on nerves (at least lower third of lemma with pubescence on nerves); lemmas awnless or awned.
5. Lemmas awnless; nerves usually with pubescence to well above middle _____ **T. muticus**
5. Lemmas short awned, the midnerve excurrent (= mucro); nerves with pubescence on lower 1/3–1/2 of lemma _____ **T. congestus**

Tridens albescens (Vasey) Wooton & Standl., (whitish), WHITE TRIDENS, WHITETOP. Plant 30–60 (–90) cm tall, glabrous; panicles 6–30 cm long; spikelets purplish-tinged, thus appearing banded.

Tridens congestus (L.H. Dewey) Nash, (congested, crowded together), PINK TRIDENS. Plant 30–75 cm tall, glabrous; panicles 5–10 cm long; glumes and lemmas thin, papery, usually pink-tinged; lemma apex deeply cleft. Clay, disturbed sites, low moist areas; Grayson Co., also Dallas and McLennan cos. (Mahler 1988); also se TX; endemic to TX. Apr–Nov. 📍

Tridens flavus (L.) Hitchc., (pale yellow), PURPLETOP, REDTOP. Plant 60–180 cm tall, glabrous; lower leaf sheaths laterally compressed and keeled, often giving base of plant a flattish aspect; panicles 15–35 cm or more long, drooping, the branches viscid, flexuous; spikelets green or purplish. Old fields and woods; in much of TX. Aug–Nov.

Tridens muticus (Torr.) Nash, (pointless, cut off). Plant 20–80 cm tall; culm nodes often bearded; panicles narrow, elongate, 7–20(–25) cm long; spikelets short-pedicelled, appearing sessile, not densely crowded, purplish. Dry disturbed sites. Apr–Nov.

1. Second glume 3–7-nerved, usually 6–8 mm long; leaf blades usually 3–4 mm wide _____ var. **elongatus**
1. Second glume 1-nerved, usually ca. 5 mm long or less; leaf blades usually 1–2 mm wide _____ var. **muticus**

var. **elongatus** (Buckley) Shinnery, (elongated), ROUGH TRIDENS. Dry disturbed sites; Bell, Denton, Stephens, and Williamson cos.; in much of c and n TX.

var. **muticus**. SLIM TRIDENS. Dry disturbed sites; Bell Co.; in much of TX.

Tridens strictus (Nutt.) Nash, (erect), LONG-SPIKE TRIDENS. Plant 50–170 cm tall, glabrous; panicles 10–36 cm long, the branches erect-appressed; glumes conspicuously longer than rest of spikelet. Sandy or clayey soils, disturbed sites; Cooke, Dallas, Denton, Fannin, Grayson, Lamar, Limestone, and McLennan cos.; se and e TX w to East Cross Timbers and Edwards Plateau. Jul–Nov.

Tridens texanus (Wats.) Nash., (of Texas), TEXAS TRIDENS. Plant 20–75 cm tall; panicles mostly 5–16 cm long, the branches flexuous, bare of spikelets basally; spikelets with 6–12 florets, usually purple or rose-purple at maturity, conspicuous (superficially similar to *Eragrostis secundiflora* subsp. *oxylepis*); lemmas pubescent on nerves below middle; glumes ca. 1/2 as long as lemmas. Plains and dry slopes, often in protection of shrubs; Brown Co. (HPC) on sw margin of nc TX; s and se TX n to Edwards Plateau and edge of nc TX. May–early Jun, late Aug–Nov.

TRIPLASIS

☛ A genus of 3 species occurring from the se United States to Costa Rica. (Greek: *triplosios*, trifarious, threefold, from the tip of the lemma) (subfamily Chloridoideae, tribe Eragrostideae)

REFERENCE: Peterson et al. 1997.



Stenotaphrum secundatum [us8]



Tridens albescens [us8]



Tridens congestus [H11]



Tridens flavus [H11]



Tridens strictus [us8]



Tridens muticus var. *elongatus* [us8]



Tridens muticus var. *muticus* [us8]

Triplasis purpurea (Walter) Chapm., (purple), PURPLE SAND GRASS. Tufted annual; culms 40–100 cm long, spreading-erect or decumbent at base, with 1-flowered cleistogamous spikelets in the axils of enlarged sheaths; ligule a short, dense ring of hairs; panicles open, 3–11 cm long, with a few sparingly rebranched primary branches; spikelets usually with 2–4 florets, 6–10 mm long, usually purple; lemmas notched, mucronate or short awned due to the midnerve extending from between the two lobes of the notch, silky pubescent on the 3 nerves. Sandy soils, forest margins, stream banks, and open areas; Dallas, Grayson, Parker, Somervell, and Tarrant cos.; throughout TX. (Jul–)Sep–Oct(–Nov).

TRIPSACUM

☛ A New World genus of 13 species ranging from the s U.S. to Paraguay, especially Central America. (Supposedly from Greek: *tribein*, to rub, perhaps in allusion to the polished spike-like inflorescence) (subfamily Panicoideae, tribe Andropogoneae)
REFERENCES: Cutler & Anderson 1941; Larson & Doebley 1994.

Tripsacum dactyloides (L.) L., (finger-like), EASTERN GAMMA GRASS. Large, clump-forming, hard-based, rhizomatous perennial 0.5–2(–3) m tall; leaf sheaths glabrous; leaf blades pilose above; ligule a short, membranous-based ring of hairs; lower pistillate portion of inflorescence hard, rounded, cylindrical, breaking up at the nodes into bead-like units, the spikelets 2-flowered, 6–8 mm long, awnless, the upper floret perfect, the lower sterile, the glumes hardened and fused with inflorescence axis and other spikelet parts; terminal portion of inflorescence staminate, unbranched or with 2–3 branches, falling in age, with crowded, paired, unawned, 2-flowered spikelets 6–10 mm long, the glumes papery. Prairies, depressions, or low areas; in nc TX mainly Blackland Prairie w to Denton and Tarrant cos.; throughout TX, but more common in the e part. Late Apr–Jun, less commonly to Oct.

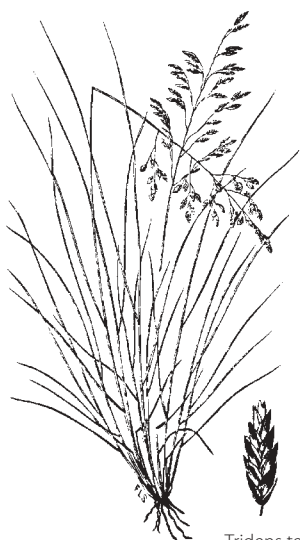
TRISETUM

☛ A temperate genus of ca. 70 species. (Latin: *tres*, three, and *seta*, a bristle, from the awned and 2-toothed lemma) (subfamily Pooideae, tribe Aveneae)

Trisetum interruptum Buckley, (interrupted, not continuous), PRAIRIE TRISETUM. Annual 7–50(–60) cm tall; leaf sheaths pubescent; ligule an asymmetrical, ragged-margined membrane 1.5–2 mm long; panicles narrow, spike-like; spikelets 2–3-flowered, 4–6 mm long (excluding awns); lemmas with 2 slender apical teeth, awned from back at or just below base of the teeth, the awns 5–8 mm long, twisted and geniculate. Disturbed sites; throughout most of TX. Apr–May. Jones et al. (1997) treated this taxon in the genus *Sphenopholis* as *S. interrupta* (Buckley) Scribn.

TRITICUM WHEAT

☛ A genus of 4 species ranging from the Mediterranean to Iran; it includes BREAD WHEAT, the most important temperate cereal (representing ca. 90% of total world WHEAT production). Worldwide, wheats (several species) rank first in grain production and account for more than 20% of total food calories consumed by humans. Wheats are also superior to many other grain crops because of their high (8–14%) protein content (Zohary & Hopf 1994); they are particularly important for bread-making because gluten, the characteristic protein, makes bread dough stick together and gives it the ability to retain gas, thereby making it ideal for making leavened (or risen) bread (Heiser 1990a). WHEAT is the most widely cultivated plant in the world and is considered one of the first two cultivated plants (BARLEY—*Hordeum vulgare*, is the other); as such it was probably important in the development of early civilization in the Near East (Heiser 1990a). (The classical name for wheat) (subfamily Pooideae, tribe Triticeae)
REFERENCES: Bowden 1959b; Gupta & Baum 1986, 1989; Zohary & Hopf 1994.



Tridens texanus [H12, US8]



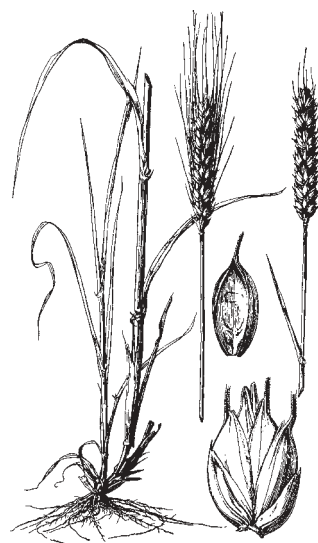
Triplasis purpurea [BB2]



Tripsacum dactyloides [H11]



Trisetum interruptum [US8]



Triticum aestivum [H11]



Urochloa ciliatissima [G04]



Urochloa fasciculata [G01]



Urochloa platyphylla [US8]

Triticum aestivum L., (summer), BREAD WHEAT, WHEAT. Glabrous annual 40–100 cm tall; leaf blades prolonged at base into 2 narrow, thin, early-withering, pointed auricles on summit of leaf sheath; ligule a membrane 2–3 mm long; spikelets sessile, solitary at each node, borne on opposite sides of the zigzag spike axis; spikes unbranched, rather stiff, bilateral, terminal, 5–12 cm long and ca. 1 cm thick; spikelets 2–5-flowered with only lower 2 or 3 perfect; glumes broadly ovate, 3.6 mm or more wide, asymmetrical, awnless or awned, 3(–more)-nerved; lemmas broad, slightly keeled, awnless or awned, the awn to 150 mm or more long. Commonly cultivated, in nc TX chiefly in Blackland Prairie and Grand Prairie; frequently seen as a transitory escape along highways, railroads, and waste places; throughout TX. Apr–May. Along with RICE and CORN, WHEAT is one of the three most important food plants for humans worldwide. It is a hexaploid (= 6 sets of chromosomes) species believed to have originated in sw Asia through hybridization between the wild diploid *Aegilops squarrosa* L. and a tetraploid cultivated species, *Triticum turgidum* L. (RIVET WHEAT) (Zohary & Hopf 1994). WHEAT is sometimes infected by the rust fungus *Puccinia graminis* Pers. (black stem rust of wheat) which can cause significant economic losses; this heterecious (= using more than 1 host to complete its life cycle) rust also infects some species in the genus *Berberis* (e.g., the introduced *B. vulgaris* L.—EUROPEAN BARBERRY); as a result, the sale or transport of certain BARBERRY species is illegal in the U.S. and Canada. 🌿

UROCHLOA SIGNAL GRASS

Annual or perennial; often rooting at lower nodes; spikelets 2-flowered, the lower sterile or staminate, the upper perfect; glumes usually both present, the first typically shorter; lower lemma resembling second glume; upper (perfect) lemma hardened, glabrous, with inrolled margins.

☛ A genus of ca. 110 species (including most of *Brachiaria*) of tropical, subtropical, and warm areas of the world. All nc TX species have previously been treated in the genus *Brachiaria* (e.g., Kartesz 1994); however, we are following Morrone and Zuloaga (1992) and Jones et al. (1997) in treating them in *Urochloa*; *Brachiaria* (only ca. 1–3 species) is presently considered a small originally Old World genus now more widely introduced (Morrone & Zuloaga 1992). Some *Urochloa* species resemble either *Panicum* or *Paspalum* and at times have been placed in those genera. (Presumably from Greek: *uro*, tail, and *chloa*, grass) (subfamily Panicoideae, tribe Paniceae)

REFERENCES: Webster 1988; Morrone & Zuloaga 1992; Wipff et al. 1993.

1. Spikelets conspicuously arranged on one side of a flattened winged inflorescence branch ca. 2 mm wide; inflorescences of (2–)3–5(–6) widely spaced spike-like branches; plant superficially resembling a *Paspalum* _____ **U. platyphylla**
1. Spikelets not conspicuously arranged on one side of an inflorescence branch, the inflorescence branch neither flattened nor winged; inflorescence branches not widely spaced, sometimes main branches rebranched; plant superficially resembling a *Panicum*.
 2. First glume ca. 2/3–3/4 the spikelet length; spikelets 3–6 mm long; second glume densely long hairy or not so.
 3. Spikelets 5–6 mm long; second glume with scattered hairs, not densely long hairy _____ **U. texana**
 3. Spikelets 3–4.5 mm long; second glume densely long hairy _____ **U. ciliatissima**
 2. First glume 1/4–1/3 the spikelet length; spikelets 2.4–3 mm long; second glume glabrous _____ **U. fasciculata**

Urochloa ciliatissima (Buckley) R.D. Webster, (very fringed with hairs), FRINGED SIGNAL GRASS. Perennial 10–50 cm tall; culms erect or usually decumbent below and rooting at nodes; ligules short, of hairs, ca. 0.5 mm long; panicles few-flowered, with few, short, spreading or ascending branches; first glume glabrous, ca. 3/4 as long as spikelet; upper glume densely long hairy; ster-

ile lemma glabrous, except for pilose margins. Rocky or sandy open sites; Burnet, Erath, McLennan, and Somervell cos.; throughout TX. May–Sep. [*Brachiaria ciliatissima* (Buckley) Chase]

Urochloa fasciculata (Sw.) R.D. Webster, (clustered, growing in bundles), HURRAH GRASS, BROWNTOP, BROWN-TOP SIGNAL GRASS, FIELD GRASS. Annual with spreading to erect, branching culms 10–85 cm long, often rooting at lower nodes; ligules of hairs to ca. 1 mm long; panicles with appressed or erect-spreading branches; spikelets globose-ovoid, with a small point at tip; first glume 1/4–1/3 as long as spikelet; glumes and lower lemma glabrous. Dried-up pond or stream margins, roadsides, disturbed sites; throughout most of TX. May–Oct. [*Brachiaria fasciculata* (Sw.) Parodi, *Panicum fasciculatum* Sw. var. *reticulatum* (Torr.) Beal]

Urochloa platyphylla (Munro ex C. Wright) R.D. Webster, (broad-leaved), BROAD-LEAF SIGNAL GRASS. Coarse annual with decumbent and spreading culm bases, often rooting at lower nodes; inflorescence branches 2–6 cm long, widely spaced, winged; first glume 1/4–1/3 as long as spikelet; glumes and lower lemma glabrous. Disturbed areas, roadsides, ditches; in much of the e 1/2 of TX. Apr–Nov. [*Brachiaria platyphylla* (Munro ex C. Wright) Nash, *Paspalum platyphyllum* Griseb, not Schult.]

Urochloa texana (Buckley) R.D. Webster, (of Texas), TEXAS PANICUM, TEXAS SIGNAL GRASS, TEXAS-MILLET, COLORADO GRASS. Coarse annual, 40–120 cm tall, often creeping and rooting at lower nodes; ligules of hairs to 1 mm long; panicles compact with erect-appressed branches; first glume ca. 2/3 as long as spikelet, strongly 5–7 nerved; second glume and lower lemma with scattered hairs. Moist, disturbed soils; throughout TX. May–Nov. [*Brachiaria texana* (Buckley) S.T. Blake, *Panicum texanum* Buckley]

VULPIA

SIXWEEKS GRASS, SIXWEEKS FESCUE GRASS, ANNUAL FESCUE

Ours annuals; leaf blades 0.1–2.5 mm wide; leaf sheaths open, glabrous; ligule a short membrane; inflorescence a usually contracted, ± 1-sided panicle or spicate raceme; spikelets with 3–many florets; lemmas not toothed at apex, awned or awnless, the backs rounded, not plainly nerved except at apex.

☛ A genus of 22 species found in temperate areas, especially the Mediterranean and w America. *Vulpia* has been treated as part of the genus *Festuca* by some workers. (two possible derivations: named for J.S. Vulpius, pharmacist-botanist of Baden, Germany; or *vulpes*, fox, from the many long awns of the panicle) (subfamily Pooideae, tribe Poeae)

REFERENCES: Lonard & Gould 1974; Darbyshire & Warwick 1992.

1. Lower glume often very small, inconspicuous, 0.5–1.5 mm long, not more than 1/3 as long as upper; inflorescences often not completely exerted from sheath; lemma awns 7.5–22 mm long _____ **V. myuros**
1. Lower glume 1.6–5 mm long, half as long as the upper or more; inflorescences usually well-exserted from sheath; lemma awns 0–12 mm long.
 2. Lemmas awnless or with awn shorter than lemma body; lemma awns 0–7 mm long; spikelets with 5–17 florets _____ **V. octoflora**
 2. Lemmas (except lowest) usually with awn longer than lemma body; lemma awns 3–12 mm long; spikelets with 3–7 florets.
 3. Lemma of lowermost floret 2.5–3.5 mm long; spikelets 3.5–5 mm long (excluding awns); first glume 1.3–2.5 mm long; caryopsis (=fruit) 1.5–2 mm long _____ **V. sciurea**
 3. Lemma of lowermost floret 3.5–7.5 mm long; spikelets 5–10 mm long (excluding awns); first glume 3.5–5 mm long; caryopsis 3.5–5.5 mm long _____ **V. bromoides**

Vulpia bromoides (L.) Gray, (like *Bromus*), BROME SIXWEEKS GRASS. Plant 5–50 cm tall; panicles 5–15 cm long, well-exserted; second glume 4.5–7 mm long; lemmas glabrous or puberulent. Prairies, disturbed habitats; Hunt Co. (Clymer Meadow), also Hamilton Co. (Stanford 1971); mainly e TX. Spring. Native of Europe. [*Festuca bromoides* L., *V. dertonensis* (All.) Gola] 🇺🇸

Vulpia myuros (L.) C.C. Gmel., (mouse-tail), RAT-TAIL SIXWEEKS GRASS. Plant 15–70 cm tall; panicles narrow, 3–25 cm long, usually only partially exserted from the sheath; spikelets with 3–7 florets; lemmas scabrous or ciliate, with awns 7.5–22 mm long. Disturbed areas, roadsides; Bell and Hunt cos.; e TX w to e part of nc TX. Apr–May. Native of Europe. [*Festuca myuros* L.] 🇺🇸

Vulpia octoflora (Walter) Rydb., (eight-flowered), COMMON SIXWEEKS GRASS. Plant 10–60 cm tall; panicles rather dense, usually narrow, erect or with slightly drooping tip; lemmas glabrous or pubescent. Disturbed sandy or sandy clay soils, limestone gravel, eroding clay; throughout TX. Apr–May. This species is frequently seen growing on seed harvester ant mounds. Three varieties separated by Gould (1975b) as follows occur in nc TX; however, they intergrade and are separated with extreme difficulty.

1. Spikelets excluding awns usually 4.5–5 mm long; awn of lowermost floret 0.3–3 mm long _____ var. **glauca**
1. Spikelets excluding awns 5.5–10 mm long; awn of lowermost floret 2.5–6.5 mm long.
 2. Lemmas sparsely to densely pubescent _____ var. **hirtella**
 2. Lemmas glabrous or slightly scabrous _____ var. **octoflora**

var. **glauca** (Nutt.) Fernald, (whitened with a coating or bloom). Denton, Grayson, Lamar, Navarro, and Somervell cos.; e TX w to Rolling Plains and s to Edwards Plateau. [*Vulpia octoflora* var. *tenella* (Willd.) Fernald]

var. **hirtella** (Piper) Henrard, (somewhat hairy), HAIRY SIXWEEKS GRASS. McLennan and Palo Pinto cos., also Lamar Co. (Carr 1994); nearly throughout TX.

var. **octoflora**, COMMON SIXWEEKS GRASS. Se and e TX w to West Cross Timbers and Edwards Plateau. Apparently the most common variety in nc TX. [*Festuca octoflora* Walter]

Vulpia sciurea (Nutt.) Henrard, (squirrel), SQUIRREL SIXWEEKS GRASS, SIXWEEKS FESCUE. Plant 15–60 cm tall; panicles narrow, elongate, drooping toward tip; second glume 2.5–4 mm long; lemmas pubescent. Loose sandy soils; Bell, Limestone, Parker, and Wise cos.; e TX w to West Cross Timbers and Edwards Plateau. Apr–early May. [*Festuca sciurea* Nutt.]

WILLKOMMIA

☛ A genus of 3 species of the tropics, s Africa, and s United States. (Named for Heinrich Moritz Willkomm, 1821–1895, successively professor of botany at Tharandt, Dorpat, and Prague, and student of Spanish flora) (subfamily Chloridoideae, tribe Cynodonteae)

REFERENCE: Hitchcock 1903.

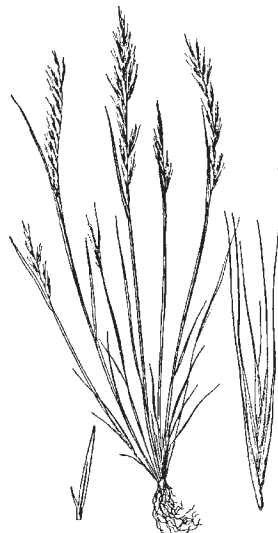
Willkommia texana Hitchc., (of Texas), TEXAS WILLKOMMIA. Tufted perennial with culms 20–40 cm tall; leaves mostly basal; ligules minute, 0.6 mm or less long; inflorescence a very narrow spike-like panicle 7–18 cm long, 3–10 mm broad, with spikelets in 2 rows along the short (ca. 2–3 cm long) appressed branches; spikelets 1-flowered, sessile, awnless, 3.1–5 mm long, second glume slightly longer than lemma. Bare clay soils; restricted to vegetational areas 1 and 2 according to Gould (1975b) and 2 and 3 (Fig. 2) by Hatch et al. (1990); endemic to TX. However, the description (Hitchcock 1903) indicated that the type is from Ennis (Ellis Co.) in the ec part of nc TX. While we have not seen the type or other specimens from nc TX, the species is included based on the type locality. 🇺🇸



Urochloa texana [Go1, us8]



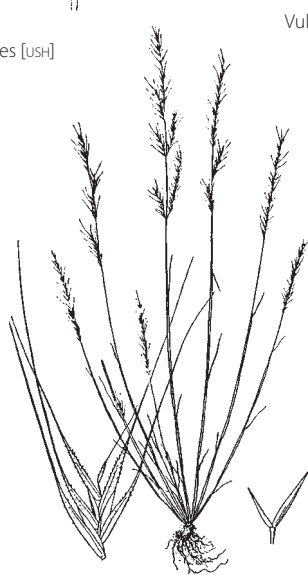
Vulpia bromoides [us8]



Vulpia myuros [us8]



Vulpia octoflora var. *octoflora* [us8]



Vulpia sciurea [us8]



Willkommia texana [H11]

ZEA MAIZE, CORN

☛ A Central American and Mexican genus of 4 species including MAIZE, one of the most important New World crops. (Old Greek name for some grass) (subfamily Panicoideae, tribe Andropogoneae)

REFERENCES: Finan 1948; Iltis 1972, 1983, 1987; Doebley & Iltis 1980; Iltis & Doebley 1980; Crosswhite 1982; Doebley 1990, 1996; Gaut & Doebley 1997.

Zea mays L., (from an aboriginal name), MAIZE, CORN. Large, coarse, monoecious annual to several meters tall with succulent culms; leaves 2-ranked; leaf blades very broad, flat, with auricled base; pistillate spikelets numerous in several rows on a much thickened axis (= cob), the whole inflorescence covered by modified leaves or bracts (= shucks); elongated, unbranched styles (= silk) extending from the inflorescence; staminate spikelets resembling those of *Tripsacum*, in pairs on a terminal panicle (= tassel) with spike-like branches. Widely cultivated and occasional as a transitory escape along roads, disturbed sites, or waste areas; Grayson Co. (G. Diggs, pers. obs.); throughout TX. May-Jul, sporadically to Oct. MAIZE is derived from and interfertile with a wild Mexican grass, TEOSINTE—*Zea mexicana* (Schrad.) Kuntze (TEOSINTE is possibly more appropriately treated taxonomically as *Z. mays* L. subsp. *mexicana* (Schrad.) H.H. Iltis). MAIZE has long been cultivated (since at least ca. 5,600 years ago) by Native Americans from North to South America; but is thought to have originated in Mexico (Mabberley 1987; Heiser 1990a; Doebley 1990); it was very important in pre-Colombian Mesoamerica as part of the maize/beans/squash agricultural system. Along with WHEAT and RICE, MAIZE is one of the three most important food plants for humans worldwide; while world MAIZE production is nearly as great as that for either WHEAT or RICE, a much higher percentage of MAIZE is used for animal food (Chrispeels & Sadava 1977). Cultivars with hard endosperm that explodes when heated are known as popcorns; other cultivars with colored grains were used ritually by Native Americans. The common name MAIZE is derived from a Native American word, *mahiz* (Rupp 1987). The leaves of CORN sometimes have lesions caused by the rust fungus *Puccinia sorghi* Schwein. (J. Hennen, pers. comm.). ☞

ZIZANIOPSIS CUT GRASS

☛ A genus of 5 species of tropical and warm areas of the Americas. (Named from *Zizania*, and Greek: *opsi*, sight or appearance, from resemblance to the genus *Zizania*) (subfamily Oryzoideae, tribe Oryzae)

Zizaniopsis miliacea (Michx.) Döll & Asch., (pertaining to millet, *Milum*), SOUTHERN WILD RICE, MARSH-MILLET, GIANT CUT GRASS, WATER-MILLET. Coarse, largely glabrous, rhizomatous perennial 1.5-2.5(-3) m tall, forming beds in wet ground or shallow water; leaf blades to 1.2 m long and 35 mm wide, with scabrous, cutting margins; ligule a prominent membrane 6-20 mm long; panicles large, 30-60 cm long, loose, with staminate and pistillate spikelets intermixed; spikelets 1-flowered, without glumes; lemma and palea similar to each other (resembling 2 glumes), strongly ribbed; staminate lemma acuminate; pistillate lemma short-awned. Marshes, creek bottoms, and lakeshores; se and e TX w to Dallas, Collin, Grayson, Hunt, Tarrant, and Williamson cos., also Edwards Plateau. May-Sep.

PONTEDERIACEAE

WATER-HYACINTH OR PICKEREL-WEED FAMILY

Glabrous perennial herbs; leaves basal or alternate, simple, entire, often with or sometimes without a distinct petiole; flowers solitary or in spikes, the inflorescence subtended by a spathe-like bract; sepals 3, colored and petal-like; petals 3, one (the uppermost) differing slightly or greatly

in size, shape, or coloration; perianth parts united in lower part to form a very slender basal tube; stamens 3 or 6; pistil 1; ovary superior; fruit a many-seeded capsule or a 1-seeded urticle.

☛ A small (32 species in 6 genera) family of freshwater aquatic herbs of tropical and warm areas, especially in the Americas, with a few in the n temperate zone. Some are problematic weeds; a number are cultivated as ornamentals. (subclass Liliidae)

FAMILY RECOGNITION IN THE FIELD: Rooted or free-floating, wet area or aquatic herbs; flowers of ten conspicuous, the perianth petaloid; inflorescence a solitary flower or a spike, subtended by a spathe-like bract.

REFERENCES: Dahlgren et al. 1985; Eckenwalder & Barrett 1986; Rosatti 1987.

1. Flowers numerous, in spikes; perianth funnellform; stamens 6.
2. Perianth 4–6 cm long; petioles inflated; plants typically free-floating _____ **Eichhornia**
2. Perianth 1–2 cm long; petioles not inflated; plants typically rooted in mud _____ **Pontederia**
1. Flowers solitary; perianth salverform; stamens 3 _____ **Heteranthera**

EICHHORNIA WATER-HYACINTH

☛ A genus of 8 species of rhizomatous or floating aquatics; all native to the New World tropics except 1 African species—Barrett 1988). (Named for Johann Albrecht Friedrich Eichhorn, 1779–1856, of Berlin)

REFERENCE: Barrett 1988.

Eichhornia crassipes (Mart.) Solms, (with a thick stalk), COMMON WATER-HYACINTH. Normally floating on surface of water; with abundant fibrous roots; leaf blades flat, ovate to rhombic or reniform, shorter than the swollen, spongy-inflated petioles, the base broadly cuneate; inflorescence spicate or branched-spicate, well-exserted on a peduncle from a spathe; perianth slightly 2-lipped, with basal tube, the 6 segments free above, showy, bluish lavender, the upper petal with yellow spot surrounded by blue at base; fruit a many-seeded dehiscent capsule. Sometimes cultivated; established as a wild plant in lakes, ponds, and slow streams; Dallas (Mahler 1988) and Denton (G. Dick, pers. comm.) cos., also escaping cultivation in Tarrant Co. (Fort Worth Botanic Garden) (R. O'Kennon, pers. obs.); mainly s and e TX. Late Jun–Sep. Native of Brazil. This species was apparently introduced into the U.S. at the 1884 Cotton States Exposition in New Orleans (Tveten & Tveten 1993); it is an aggressive and problematic weed in some areas, such as Florida, where it can choke waterways; it has an extremely rapid growth rate and is considered by some to be the world's most serious aquatic weed. This species is considered a “harmful or potentially harmful exotic plant” and it is illegal to release, import, sell, purchase, propagate, or possess it in Texas (Harvey 1998). However, this species has the ability to remove large amounts of inorganic pollutants dissolved in water (Woodland 1997) and in some parts of the world is thus useful in wastewater cleanup efforts. ☞

HETERANTHERA MUD-PLANTAIN

Herbs submersed or rooted in mud; leaves linear, ribbon- or grass-like, without a distinct blade or with ovate to elliptic or elliptic-lanceolate blade; flowers solitary (our species), from a spathe; perianth ± radially symmetrical; fruit a many-seeded capsule.

☛ A genus of 12 species of tropical and warm areas of Africa and in the Americas n to North America. (Greek: *hetera*, different, and *anthera*, anther, from the dissimilar anthers of the first described species)

1. Leaves sessile, linear, grass-like, pellucid; plants completely submersed except for flowers; flowers pale yellow; spathe sessile in axils of leaves _____ **H. dubia**
1. Leaves petiolate, with an expanded, ovate to elliptic or elliptic-lanceolate, thickish blade; plants

1340 POTAMOGETONACEAE

rooted in mud, forming rosettes and emerged or the leaves floating at the water surface; flowers light blue to purplish blue to white; spathe peduncled _____ **H. limosa**

Heteranthera dubia (Jacq.) MacMill., (dubious), GRASS-LEAF MUD-PLANTAIN, WATER STAR-GRASS. Flowers usually exposed at or above the water surface; stamens all alike; anthers coiled with age. Small streams and quiet waters; included based on citation of vegetational area 4 (Fig. 2) by Hatch et al. (1990); mainly s and c TX. Apr–Jun.

Heteranthera limosa (Sw.) Willd., (of muddy places), BLUE MUD-PLANTAIN. Plant 6–25 cm tall, tufted, becoming rhizomatous; leaves long-petioled; flowering stem with a terminal sheathing spathe; upper petal with a pair of light yellow dots at base; stamens dimorphic, 2 with short yellow anthers, the third with an elongate, light blue or yellow anther; anthers not coiled. Shallow water or wet places; Grayson Co., throughout much of TX but often inconspicuous and rarely collected. Jun–Oct.

PONTERERIA PICKEREL-WEED

☛ A New World genus of 5 species. (Named for Guilio Pontedera, 1688–1756, professor at Padua) REFERENCE: Lowden 1973.

Pontederia cordata L., (cordate, heart-shaped), PICKEREL-WEED, WAMPEE. Plant 40–80 cm tall, from thick, short-rhizomatous base; leaves mostly basal, petioled, the petioles with long-clasping basal portion; leaf blades shorter than the petioles, narrowly ovate to triangular-lanceolate, with rounded-truncate to deeply cordate base; inflorescence a slender terminal spike from a spathe; perianth 2-lipped, violet-blue, the upper petal with a central yellow-green spot or pair of spots; fruit a 1-seeded urticle. Margins of lakes, ponds, and streams; Dallas Co. (Mahler 1988), mainly se and e TX, also Edwards Plateau. Jun–Oct. [*P. cordata* var. *lancifolia* (Muhl. ex Elliott) Torr.] Sometimes cultivated as an ornamental; the fruit is said to be edible (Mabberley 1987).

POTAMOGETONACEAE PONDWEED FAMILY

Aquatic rhizomatous herbs; leaves in ours alternate or closely crowded, all submerged or with blades both submerged and floating, sessile or petioled; flowers perfect, in pedunculate axillary spikes; perianth 4-merous; stamens 4; carpels 4, free, sessile; ovaries superior; fruits drupe-like, 1-seeded.

☛ A small (ca. 90 species in 3 genera—R. Haynes, pers. comm.) cosmopolitan family of perennial, rooted aquatics. The third genus in the family is the monotypic, Old World genus *Groenlandia* (with opposite leaves). Molecular analyses (Duvall et al. 1993) indicated a relationship of the Potamogetonaceae with the Alismataceae. (subclass Alismatidae)

FAMILY RECOGNITION IN THE FIELD: aquatics with leaves all submerged or often both submerged and floating—the floating ones ± elliptic and rather leathery with a waxy, water-repellent upper surface; flowers small, inconspicuous, 4-merous, in dense, pedunculate, axillary spikes not subtended by bracts.

REFERENCES: Morong 1893; Taylor 1909a; Haynes 1978; Dahlgren et al. 1985; Larsen & Barker 1986.

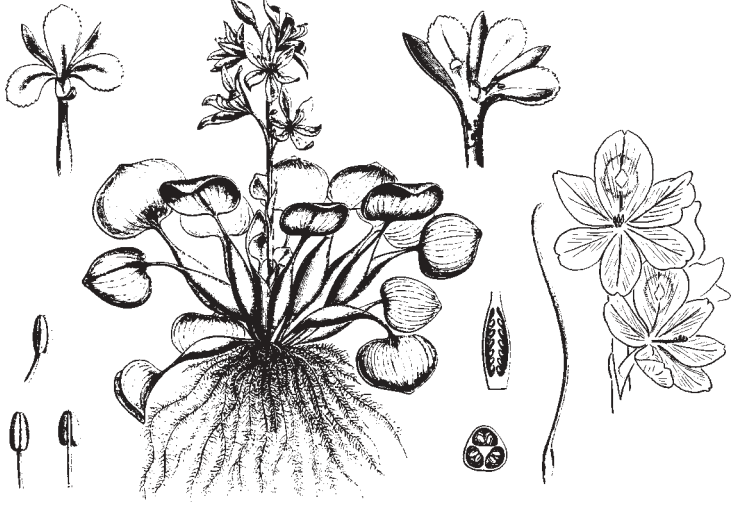
1. Floating leaves present or absent; stipules free of the leaf base or adnate for < 4(–10) mm, often early deteriorating; submerged leaves translucent, flat, without grooves or channels, of variable width, sometimes less but often much wider than 1 mm (to 45 mm wide); including species widespread in nc TX _____ **Potamogeton**
1. Floating leaves absent; stipules adnate (= fused) to the leaf base for a distance of 10–30 mm, the free portion projecting as a ligule < half as long as the adnate portion; submerged leaves opaque, turgid, channeled, 0.2–1 mm wide; rare in nc TX _____ **Stuckenia**



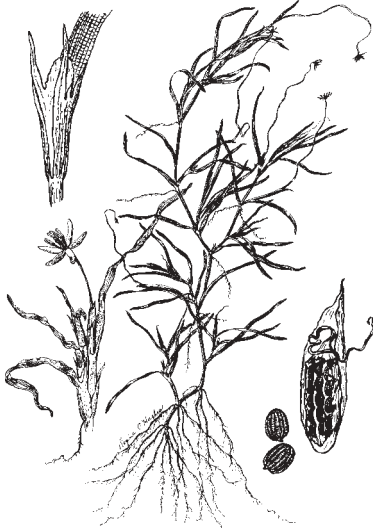
Zea mays [FUC, HIT, US8]



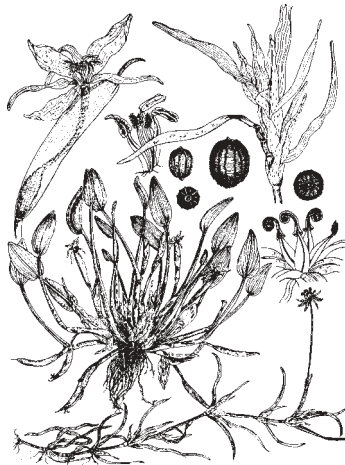
Zizaniopsis miliacea [US8]



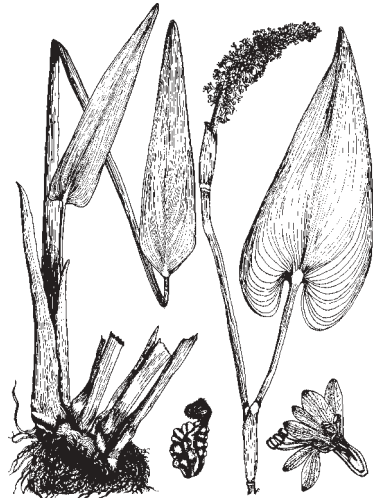
Eichhornia crassipes [BT3, EN2]



Heteranthera dubia [REE]



Heteranthera limosa [CO1]



Pontederia cordata [CO1]

POTAMOGETON PONDWEED

Leaves with blades both submerged (filiform to lanceolate, thin and flexuous) and floating (\pm elliptic and rather leathery with a waxy upper surface) or all leaves submerged, sessile or petioled; flowers in pedunculate axillary spikes, these usually held above the water.

☞ A cosmopolitan genus of ca. 90 species. PONDWEEDS are an important source of food for waterfowl. Because *Potamogeton* species are aquatic and difficult to collect, and because identification can be problematic, the group is neither well-collected nor well known. They are found in lakes, ponds, streams, or other aquatic habitats. Some species of *Potamogeton* exhibit hydrophily or water-mediated pollination (Cox 1988). (Ancient name from Greek: *potamos*, river, and *geiton*, a neighbor, from the aquatic habitat)

REFERENCES: St. John 1916; Fernald 1932; Ogden 1943, 1966; Haynes 1968, 1974, 1986; Reznicek & Bobbette 1976; Stuckey 1979; Catling & Dobson 1985; Haynes & Hellquist 1996.

1. Submerged leaves 2.5 mm or less wide, mostly 20 times or more longer than wide, linear; floating leaves if present with blades < 40 mm long.
 2. Small floating leaves with blades 5–40 mm long usually present; stipules adnate to the base of the submerged sessile leaf blades for mostly 1–4 mm; embryo coil plainly visible through the papery thin walls of the fruit _____ **P. diversifolius**
 2. Leaves all alike, submerged; stipules free of the submerged sessile leaf blades; fruit walls firm, the embryo coil obscured by the wall of the fruit.
 3. Fruits with an undulate to dentate, dorsal ridge or keel; stipules with evident veins appearing as ridges extending the length of the stipules _____ **P. foliosus**
 3. Fruits dorsally smooth and rounded; stipules with veins usually not very evident _____ **P. pusillus**
1. Submerged leaves either > 2.5 mm wide OR < 20 times longer than wide, linear-lanceolate to lanceolate, oblanceolate, oblong, or elliptic; floating leaves if present with blades usually > 40 mm long.
 4. Leaves all submerged, sessile, weakly to strongly clasping at base; leaf margins finely toothed, often undulate-criped _____ **P. crispus**
 4. Leaves usually not all submerged, floating leaves commonly present by flowering time, occasionally absent; submerged leaves sessile or petiolate, not clasping the stem; leaf margins entire or nearly so, not undulate-criped.
 5. Floating leaves with petioles 4–20 cm long, the petioles usually longer than blades; submerged leaves sessile or tapering to petioles up to 3.5 cm long (*P. pulcher*) or often much longer, (2–)3–13 cm (*P. nodosus*), acute to blunt-tipped, sometimes disintegrating by fruiting time (*P. nodosus*); widespread in nc TX.
 6. Floating leaf blades cuneate or rounded at base, with 9–21 veins; submerged leaves tapering gradually to a petiole (2–)3–13 cm long; mature fruits usually reddish; widespread in nc TX _____ **P. nodosus**
 6. Floating leaf blades usually cordate, rarely rounded at base, with 21–29 (sometimes more) veins; submerged leaves tapering rather abruptly to a sessile base or short petiole (to 3.5 cm long); mature fruits light-brown to olive-green; rare in nc TX _____ **P. pulcher**
 5. Floating leaves with petioles 2–9 cm long, the petioles usually shorter than blades; submerged leaves sessile or tapering to petioles up to 4 cm long, acute to abruptly acuminate or mucronate, usually persistent; rare in nc TX _____ **P. illinoensis**

Potamogeton crispus L., (crimped), CURLY MUCKWEED. Leaves all submerged, sessile, with finely toothed and ruffled margins, linear-oblong to linear-oblanceolate, oblong, or oblanceolate, 3–10 cm long, 3–15 mm wide. Scattered localities in TX including Dallas, Burnet, Travis, Hays, and Wichita cos., also Grayson and Randall cos. (Ogden 1966). Jun. Native of Europe. ☞

Potamogeton diversifolius Raf., (diverse-leaved), WATER-THREAD PONDWEED. Submerged leaves sessile, linear, 1–8 cm long, 0.3–1.5 mm wide; floating leaves sometimes absent, if present, the blades 5–40 mm long, 5–20 mm wide, the petioles mostly 5–40 mm long. Denton Co., also Burnet, Henderson, Kaufman, Mills (Ogden 1966), and Lamar (Carr 1994) cos.; mainly se TX and Trans-Pecos, scattered elsewhere. May–Sep.

Potamogeton foliosus Raf., (leafy), LEAFY PONDWEED. Leaves all submerged, sessile, linear, 1.3–8.2 cm long, 0.3–2.3 mm wide. Williamson Co. (Ogden 1966); s part of nc TX s and w to Edwards Plateau and Trans-Pecos. May–Oct. [*P. foliosus* var. *macellus* Fernald]

Potamogeton illinoensis Morong, (of Illinois), SHINING PONDWEED, CORNSTALK PONDWEED, ILLINOIS PONDWEED. Submerged leaves sessile or tapering to a petiole to 4 cm long, with blades 5–20 cm long, 10–45 mm wide, elliptic to oblong-elliptic, linear-lanceolate, or lanceolate; floating leaves sometimes absent, if present, the blades 4–8(–19) cm long, 1–4(–7) cm wide. Bell, Burnet, Lampasas, and Williamson cos. in extreme s and sw parts of nc TX (Ogden 1966); mainly c TX, Edwards Plateau, and Trans-Pecos. Apr–Jun.

Potamogeton nodosus Poir., (knotty), LONG-LEAF PONDWEED. Submerged leaves often disintegrated by flowering time or sometimes persistent, tapering to a petiole, with blades 10–20(–30) cm long, 10–20(–35) mm wide, linear-lanceolate to lanceolate-elliptic; floating leaves with blades 4–10(–13) cm long, (1.5–)2–3(–4.5) cm wide. Brown, Cooke, Dallas, Denton, Fannin, Grayson, Hill, McLennan, Parker, and Tarrant cos.; nearly throughout TX. Apr–Jun. This is the most common PONDWEED in nc TX.

Potamogeton pulcher Tuck., (handsome), HEART-LEAF PONDWEED. Submerged leaves sessile or tapering to a short petiole, the blades oblong to lanceolate or linear-lanceolate, to 18 cm long and 35 mm wide (usually smaller), usually persistent, only rarely disintegrating by flowering time; floating leaves with blades 4.5–9(–11) cm long, 2–5.5(–8.5) cm wide. Included based on citation of vegetational areas 4 and 5 (Fig. 2) by Hatch et al. (1990); mainly e TX. Apr–May.

Potamogeton pusillus L., (very small), BABY PONDWEED. Leaves all submerged, sessile, linear, 0.9–6.5 cm long, 0.2–2.5 mm wide. Denton Co., also Dallas Co. (Ogden 1966); scattered mainly in e 1/2 of TX. Late May–Jun.

STUCKENIA

A ± cosmopolitan genus of 4 species previously treated as *Potamogeton* subgenus *Coleogeton* (R. Haynes, pers. comm.); Haynes has further indicated that this segregate will be recognized in the treatment of Potamogetonaceae for *Flora of North America*. (Derivation unknown, not given by original author)

REFERENCES: St. John 1916; Ogden 1966; Haynes 1968, 1986; Larson & Barker 1986; Haynes & Les 1996.

Stuckenia pectinatus (L.) Börner, (comb-like), FENNEL-LEAF PONDWEED, SAGO PONDWEED, SAGO. Rhizomatous, aquatic, perennial herb, often growing in large masses; rhizomes sometimes with tuberous bulblets; stems ca. 1 mm in diam., much branched above, 0.3–1 m long; leaves all submerged, alternate, sessile, filiform to narrowly linear, 3–12(–15) cm long, 0.2–1 mm wide, marginally entire; stipules fused with the leaf base for 10–30 mm and forming a sheath enfolding the stem (leaf thus seemingly arising from apex of sheath), the free portion of the stipules less than half as long as fused portion (i.e., adnate for 2/3 or more of their length); peduncles axillary, 3–25 cm long, flexuous, the inflorescences thus submerged; inflorescence a capitate or cylindrical, often interrupted spike with 2–5(–7) whorls of flowers, in fruit to 5 cm long; fruits 2.5–4 mm long, apiculate. Included based on citation of vegetational area 4 (Fig. 2) by Hatch et

al. (1990); widespread in TX. May–Oct. [*Coleogeton pectinatus* (L.) Les & R.R. Haynes, *Potamogeton pectinatus* L.] The fruits and vegetative parts are important wildlife food (Correll & Correll 1972).

SMILACACEAE

GREENBRIER OR CATBRIER FAMILY

☛ A small (320 species in 3 genera) family of the tropics to temperate zones; it has often been lumped into the Liliaceae or even combined with the Dioscoreaceae (Tyrl et al. 1994). (subclass Liliidae)

FAMILY RECOGNITION IN THE FIELD: woody, *prickly* (painfully so) vines with tendrils and alternate, *net-veined*, ± leathery leaves; flowers (small, inconspicuous) and fruits (small berries) in axillary *umbels*.

REFERENCES: Dahlgren et al. 1985.

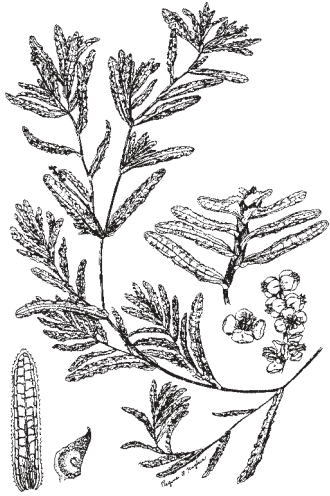
SMILAX GREENBRIER, CATBRIER

Dioecious woody trailers or climbers from tough rhizomes or woody tubers; ± prickly; leaves alternate, short-petioled, bearing tendrils from the petioles; leaf blades several-ribbed (main veins) and net-veined, glabrous or nearly so; flowers in peduncled axillary umbels; perianth green or yellow-green to bronze, small; sepals and petals each 3; stamens 6; pistil 1; ovary superior; fruit in nc TX species a 1–3-seeded blackish or blue-black berry ca. 4–9 mm long.

☛ A genus of ca. 300 species of tropical and temperate areas of the world. Most *Smilax* species are easily recognized in the field as woody vines armed with prickles; they frequently make moving through nc TX forests difficult or painful—hence the common names such as BULLBRIER, HELLFETTER, and DEVIL GREENBRIER. The sarsaparilla of commerce is obtained from a South American species; it was used medicinally as a tonic, for digestive disturbances, or in treating rheumatism; the active substances are steroidal saponins (Dahlgren et al. 1985). *Smilax* species are an important secondary food for white-tailed deer (Martin et al. 1951) (Ancient Greek name of an evergreen oak)

REFERENCE: Coker 1944.

1. Lower surface of leaf blades glaucous (= whitened, silvery, or bluish gray); peduncles longer (usually much longer) than petioles of subtending leaves; stems neither with numerous weak bristle-like dark prickles (only stiff prickles are present) nor leaf blades with indented sides; fruits usually covered with a bloom (= coating of white wax or powder) and bluish, sometimes blackish; only on extreme e margin of nc TX _____ **S. glauca**
1. Lower surface of leaf blades ± the same green color as upper surface; peduncles longer or shorter than petioles of subtending leaves; often either stems with numerous, weak, bristle-like prickles OR leaf blades with indented sides; fruits black, rarely covered with a bloom; widespread in nc TX.
2. Leaf bases cordate to truncate or rounded; peduncles (= stalk of inflorescence) 1.5 or more times as long as petioles of the subtending leaves, to 70 mm long; fruits usually 1-seeded; widespread in nc TX.
3. Stems with relatively weak, somewhat bristle-like, usually dark prickles; leaf margins not thickened; leaves drying and fading to an ashy-green color; leaf blades of flowering branches ovate or rounded in outline, the sides ± curved outward, almost never indented, the base rounded to cordate _____ **S. tamnoides**
3. Stems with rigid, broad-based, pale or only dark-tipped prickles; leaf margins often thickened (as if with a rib (= vein) forming the edge); leaves drying and fading to a tan color; leaf blades of flowering branches triangular to reniform (= kidney-shaped), the sides often in-



Potamogeton crispus [REE]



Potamogeton diversifolius [MAS]



Potamogeton foliosus [MAS]



Potamogeton illinoensis [MAS]



Potamogeton nodosus [LUN]



Potamogeton pulcher [GWO]



Potamogeton pusillus [REE]



Stuckenia pectinatus [MAS]

dented to nearly straight or curved outward, the base nearly truncate to widely cordate

S. bona-nox

2. Leaf bases often cuneate (= wedge-shaped-triangular) or cordate to truncate or rounded; peduncles usually less than 1.5 times as long as petioles of the subtending leaves, to 15 mm long or if longer the stems without dark slender prickles and leaf blades without indented sides and thickened margins; fruits 1–3-seeded; rare in nc TX.

4. Typical mature leaf blades lanceolate to elliptic-lanceolate, usually 2 times as long as wide or longer, basally cuneate; stems terete

S. smallii

4. Typical mature leaf blades ovate to nearly rounded, usually less than 1.5 times as long as wide, basally rounded to cordate; stems terete to 4-angled

S. rotundifolia

Smilax bona-nox L., (goodnight, from the Spanish: *buenos noches*, for the West Indian species recorded by Clusius), SAW GREENBRIER, FIDDLE-LEAF GREENBRIER, STRETCHBERRY, CHINA-BRIER, BULLBRIER, CATBRIER, ZARZAPARRILLA, TRAMP'S-TROUBLE, FRINGED GREENBRIER. Forming low tangles or climbing on shrubs or trees; leaf blades varying greatly in size and shape; peduncles to 30 mm long; fruits ellipsoid to subglobose, to 6 mm long and 3.5–5 mm wide. Open woods, old fields, pastures, sandy or rocky soils; widespread in the e 1/2 of TX. Apr–May. This is one of the two abundant nc TX GREEN-BRIERS.

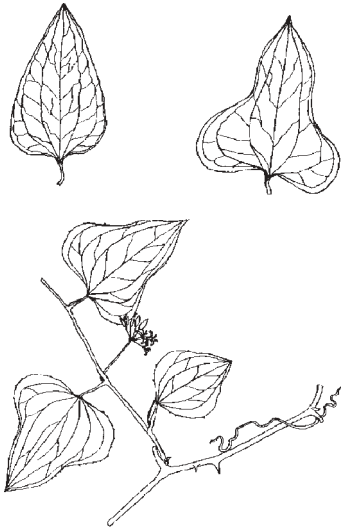
Smilax glauca Walter, (whitened with a coating or bloom), SAWBRIER, CATBRIER, CAT GREENBRIER, WILD SARSAPARILLA, GLAUCOUS-LEAF GREENBRIER, SOWBRIER, SARSAPARILLA-VINE. Freely climbing; stems often glaucous, with scattered stiff slender prickles; leaf blades elliptic to ovate or reniform, to 13 cm long and 10 cm wide, the bases rounded to subcordate; peduncles to 30(–38) mm long, usually 1.5–3 times as long as the subtending petiole. Sandy thickets, woods, fields, and along streams; Henderson, Lamar, and Milam cos.; se and e TX w to e margin of nc TX. May–Jun. If the leaf glaucousness is lost, the terete (not 4-angled) stems and peduncles, often much longer than the subtending petioles, can help distinguish this species from *S. rotundifolia*, while the rounded to subcordate leaf bases can separate it from *S. smallii*.

Smilax rotundifolia L., (round-leaved), COMMON GREENBRIER, BULLBRIER, HORSEBRIER. High-climbing and forming thickets; stems terete or 4-angled; peduncles usually to ca. 15 mm long, usually a little shorter to a little longer than the petiole of the subtending leaf; fruits globose, 5–8 mm in diam., usually 12 or less per cluster at maturity. Thickets and woods, moist to dry areas; Bosque Co. (Carr 1989), also Fort Hood (Bell or Coryell cos.—Sanchez 1997); mainly se and e TX, also Edwards Plateau.

Smilax smallii Morong, (for its discoverer, John Kunkel Small, 1869–1938, botanist at NY Bot. Garden), SMALL'S GREENBRIER. Often high climbing; stems armed only below; leaf bases cuneate; peduncles ca. 4–10 mm long; fruits ca. 6 mm in diam. Along creeks, woodlands; Milam and Henderson cos. near e margin of nc TX, also a Reverchon collection from Dallas; mainly se and e TX. May–Jun.

Smilax tamnoides L., (resembling *Tamnus*, a genus of Dioscoreaceae), CHINAROOT, HELLFETTER, BRISTLE GREENBRIER, DEVIL GREENBRIER, HAGBRIER, WILD SARSAPARILLA. Usually high-climbing; peduncles 15–65 mm long; fruits to ca. 9 mm long. Stream bottom woods, sandy or less often silty clay soils; se and e TX w to West Cross Timbers and Edwards Plateau. Apr. [*S. hispida* Muhl. ex Torr.] This is one of the two abundant nc TX GREENBRIERS.

Smilax renifolia Small, (kidney-leaved), endemic to the Edwards Plateau, is reported from vegetational area 4 (Fig. 2) by Hatch et al. (1990). However, no definitive specimens have been seen from nc TX. Field observations on the Edwards Plateau (R. O'Kennon) raise doubts about the distinctiveness of *S. renifolia* from *S. bona-nox*. Also, Coker (1944), in a treatment of the woody species of *Smilax* in the U.S., indicated that the type of *S. renifolia* is actually *S. bona-nox*. While



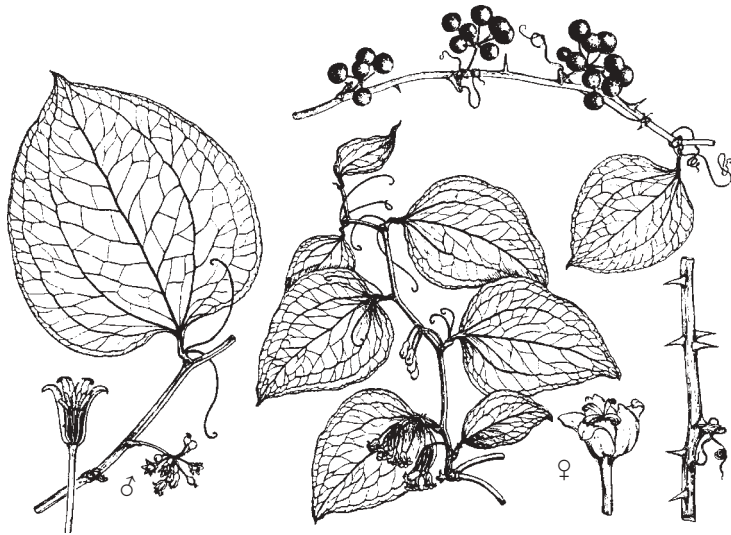
Smilax bona-nox [BT3]



Smilax glauca [G&F]



Smilax smallii [JEM]



Smilax rotundifolia [JEM]



Smilax tamnoides [JEM]

distinguishing *S. renifolia* by its reniform or deltoid-reniform, mostly broader than long leaf blades (vs. typically panduriform to broadly ovate, usually longer than broad in *S. bona-nox*), Correll and Johnston (1970) likewise indicated *S. renifolia* "... should probably be treated as a geographic variant of *S. bona-nox*, its closest ally." ↩

TYPHACEAE CAT-TAIL FAMILY

☛ A very small (10–12 species), cosmopolitan family represented by a single genus. (subclass Commelinidae)

FAMILY RECOGNITION IN THE FIELD: large, wet area, perennial herbs with elongate, linear, spongy, 2-ranked leaves and dense, felty, brownish, cylindrical inflorescences divided into male and female portions.

REFERENCES: Wilson 1909; Dahlgren et al. 1985; Thieret & Luken 1996.

TYPHA CAT-TAIL

Coarse, wet area perennial herbs to ca. 3 m tall, forming clumps of beds from rhizomes; stems erect, simple, terete; leaves alternate, with closed, tubular sheath continuous with the grass-like blade; flowers in a dense terminal spike, without perianth, imperfect; staminate flowers at summit of spike, consisting of a single stamen (falling early); pistillate flowers below, consisting of a single persistent pistil on a pedicel bearing long hairs; ovary superior; the many crowded flowers making a felty, brownish, cylindrical mass; fruit a minute, wind-dispersed nutlet.

☛ CAT-TAILS provide food and habitat for a variety of animals, but are often considered pests because they spread rapidly and displace other species. Some are eaten by humans and the leaves can be made into mats or other articles. (Named from *typhe*, the old Greek name)

REFERENCES: Hotchkiss & Dozier 1949; Smith 1967; Lee & Fairbrothers 1969; Lee 1975.

1. Staminate and pistillate portions of spike with a gap of 1–4 cm between them; leaves nearly flat to strongly convex (= outwardly curved) on back; stigmas thread-like, nonfleshy, deciduous

_____ **T. domingensis**

1. Staminate and pistillate portions of spike touching; leaves flat on back; stigmas lance ovoid, fleshy, persistent _____

_____ **T. latifolia**

Typha domingensis Pers., (of Santo Domingo), NARROW-LEAF CAT-TAIL, SOUTHERN CAT-TAIL, TULE. Plant 2–3 m tall; leaf blades 0.6–1.8 cm wide (fresh), 0.5–1.5 cm wide (dry), light yellowish green; leaf sheath of uppermost leaves tapered to blade, not auricled, with brownish mucilage glands on sheath only, not on inner surface of blade; bracts present on each pistillate flower; inflorescence as tall as or slightly overtopped by the leaves. Often very abundant in ditches, bogs, stock tanks, and lake margins, in shallow water or wet ground; throughout most of TX. Apr–Jul. During pioneer days, the creeping rhizomes "... were eaten, the abundant pollen was mixed with flour for the making of pancakes, and the young female inflorescences were boiled and eaten like miniature roasting ears" (Crosswhite 1980).

Typha latifolia L., (broad-leaved), COMMON CAT-TAIL, BROAD-LEAF CAT-TAIL, TULE ESPADILLA. Plant to ca. 3 m tall; leaf blades 1.0–2.3 cm wide (fresh), 0.6–1.6 cm wide (dry); bracts of pistillate flowers absent or present on a few flowers. Ditches, bogs, stock tanks, and lake margins, in shallow water or wet ground; throughout most of TX. Apr–Jun. These rhizomatous plants often spread to form large stands.

Typha angustifolia L., (narrow-leaved), is cited for e TX to the e of nc TX (Hatch et al. 1990). It supposedly differs from *T. domingensis* in being smaller (1–1.5 m tall), having dark green, narrower leaves, 0.4–1.2 cm wide (fresh), 0.3–0.8 cm (dry), having leaf sheaths auricled, with brownish mucilage glands extending above sheath onto the inner surface of the blade, and

with inflorescences much overtopped by the leaves. Jones et al. (1997) lumped *T. angustifolia* with *T. domingensis*; we have been unable to consistently separate the two species with confidence. John Kartesz (pers. comm. 1997) indicated that *T. angustifolia* does not occur in TX.

XYRIDACEAE YELLOW-EYED-GRASS FAMILY

☛ A small (260 species in 5 genera) family of mainly tropical and warm area herbs with a few in temperate regions; they usually occur in wet habitats. (subclass Commelinidae)

FAMILY RECOGNITION IN THE FIELD: grass-like or rush-like, moist or wet area herbs with basal leaves and long naked flowering stalks terminated by small, head-like or cone-like spikes with conspicuous brownish *bracts* subtending the usually yellow flowers.

REFERENCES: Kral 1983; Dahlgren et al. 1985.

XYRIS YELLOW-EYED-GRASS

Perennial, tufted or solitary, grass- or rush-like scapose herbs; leaves basal, linear to filiform; flowering stalks (= scapes) terminated by a head-like or cone-like spike of spirally imbricated brownish, woody bracts; flowers opening in morning, 1 per upper bract; lower bracts usually sterile; sepals 3, dimorphic, the 2 lateral ones keeled and persistent, the outer one covering the flower in bud and deciduous; petals 3, yellow (rarely whitish), composed of a broad blade and a long, narrow claw hidden by the subtending bract, unfolding in the morning; stamens 3; staminodia 3; ovary superior; fruit a dehiscent capsule.

☛ A genus of ca. 240 or more species of tropical and warm areas of the world. A number of other species occur just to the e of nc TX and can be distinguished using the treatment by Kral (1966a). (Greek: *xyrís*, name of some plant with 2-edged leaves, from *xýron*, a razor)

REFERENCES: Blomquist 1955; Kral 1960b, 1966a; Bridges & Orzell 1987.

1. Leaves 3–20 mm wide, linear to broadly linear, flat in cross-section; spikes 5–30 mm long with bracts 5–8 mm long; petal blades 3–10 mm long; staminodia bearded with long hairs.
2. Spikes usually 5–15 mm long, of rather loosely imbricated bracts, the tips of the bracts not appressed; petal blades ca. 3–4 mm long; keel of lateral sepals lacerate (look under bracts) _____ **X. jupicai**
2. Spikes 10–30 mm long, of tightly imbricated bracts, the tips of the bracts closely appressed; petal blades ca. 8–10 mm long; keel of lateral sepals ciliate-scabrid _____ **X. ambigua**
1. Leaves < 3 mm wide, filiform to linear-filiform, terete, oval, or blocky in cross-section; spikes 4–7 mm long with bracts 4.5 mm or less long; petal blades 3–4(–5) mm long; staminodia beardless _____ **X. baldwiniana**

Xyris ambigua Beyr. ex Kunth, (ambiguous). Solitary or in small tufts; leaves 10–40 cm long, 3–20 mm wide; base of inner leaves with very prominent dark longitudinal veins in sharp contrast to the white or pale intervening tissue; scapes (15–)70–100 cm long. Moist sandy areas, bogs, ditches, lake shores, savannahs; c Henderson Co. near e margin of nc TX; mainly se and e TX. May–Jul.

Xyris baldwiniana Schult., (for its discoverer, William Baldwin, 1779–1819, botanist and physician of Pennsylvania). Growing in large tufts; leaves 10–30 cm long; scapes 20–40(–50) cm long. Moist sandy areas, bogs, ditches, savannahs; c Henderson Co. near e margin of nc TX; mainly e TX. May–Jul. This is the only U.S. species with beardless staminodia.

Xyris jupicai Rich., (derivation unknown). Solitary or in small tufts; leaves 10–60 cm long, 3–10 mm wide; scapes 20–70(–90) cm long. Moist sandy areas, ditches, lakeshores; c Henderson and Limestone cos., also Lamar Co. (Carr 1994); se and e TX w to e edge of nc TX. Jun–Aug. Kral (1966a) considered this species to probably be adventive from Latin America.

ZANNICHELLIACEAE

HORNED-PONDWEED FAMILY

☛ A very small (ca. 12 species in 4 genera) but cosmopolitan family of submerged aquatic herbs; it is one of relatively few families that exhibit hydrophily—water-mediated pollination; in *Zannichellia* pollination actually occurs underwater (hypodydrophily) in contrast to some cases of hydrophily in which pollination occurs at the water surface (epihydrophily; e.g., *Vallisneria* in the Hydrocharitaceae) (Philbrick 1991, 1993). The family was previously treated by some authorities as part of the Potamogetonaceae or in the Zosteraceae (Tyrl et al. 1994). (subclass Alismatidae)

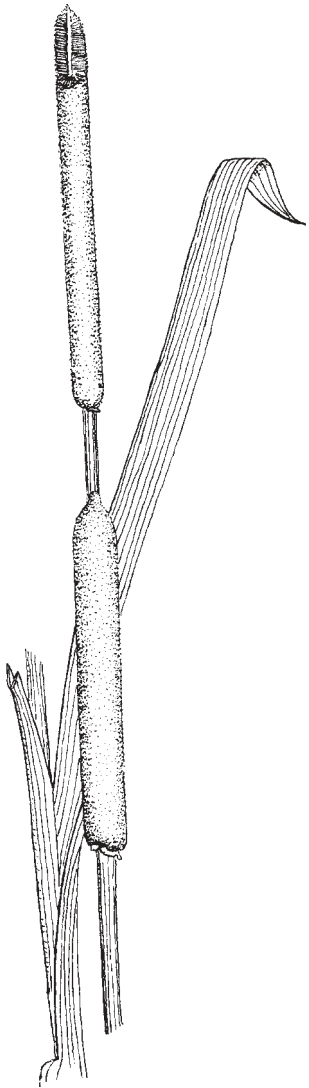
FAMILY RECOGNITION IN THE FIELD: the single nc TX species is a submerged aquatic herb with opposite or apparently whorled, entire, almost *thread-like* leaves and small, curved, stalked fruits. REFERENCES: Morong 1893; Taylor 1909a; Tomlinson & Posluszny 1976; Dahlgren et al. 1985; Haynes & Holm-Nielsen 1987.

ZANNICHELLIA HORNED-PONDWEED

☛ A cosmopolitan genus of 1-5 species; pollination occurs underwater. (Named for Gian Girolamo Zannichelli, a Venetian botanist, 1662-1729)

REFERENCE: Reese 1967.

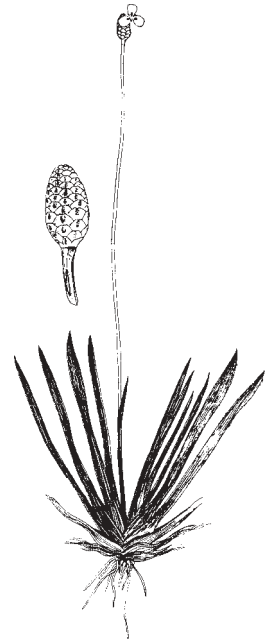
Zannichellia palustris L., (marsh-loving), COMMON POOLMAT, HORNED-PONDWEED. Monoecious, submerged, aquatic herb; stems much-branched; leaves opposite but sometimes appearing whorled, very narrow, ca. 0.5 mm wide, to 10 cm long, entire, not sheathing basally; stipules sheathing, membranous, to 4 mm long; inflorescences axillary, usually 2-flowered (1 flower staminate and 1 pistillate, the 2 together appearing as a single flower); perianth absent; staminate flower of only a single stamen; pistillate flower of (2-)4(-8) carpels; ovaries superior; fruits pedicellate nutlets 2-4 mm long including the beak (= persistent style), oblong, curved, ridged or dentate on back. In water of lakes or streams; McLennan Co., also Denton Co. (G. Dick, pers. comm.); widely scattered in TX. Apr-Jul. The foliage and fruits are important foods for waterfowl (Kaul 1986e).



Typha domingensis [BT3]



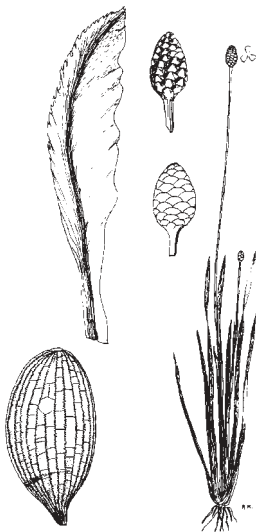
Typha latifolia [REE]



Xyris ambigua [S10]



Xyris baldwiniana [S10]



Xyris jupicai [S10]



Zannichellia palustris [MAS]

