Again: Taxonomy of Yellow-Flowered Caulescent Oxalis (Oxalidaceae) in Eastern North America

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Abstract

The taxonomy of Oxalis sect. Corniculatae is revised for eastern North America and contrasted with previous classifications and circumscriptions, particularly those of Eiten and Lourteig. Eight taxa, some previously recognized as subspecies or varieties, are recognized here at species rank. Oxalis stricta L. and O. dillenii Jacq. sensu stricto are appropriately identified in the sense that Eiten used the names. Oxalis florida Salisb. (= O. dillenii subsp. filipes) is a distinct species primarily of the Atlantic states and Gulf coast, less common in more inland regions. Oxalis priceae Small is a distinct species of the southeastern USA without infraspecific taxa; disjunct populations occur in northeastern Mexico. Oxalis texana (Small) Fedde (= Oxalis priceae subsp. texana) is treated as a distinct species of east Texas and adjacent Louisiana and Arkansas. Oxalis texana is close in morphology to O. dillenii sensu stricto and occurs sympatrically with it but distinct in geography and morphology from O. priceae sensu stricto. Oxalis illinoensis Schwegm. is geographically and morphologically distinct from O. grandis Small. Neotypes are designated for O. hyomi and O. illinoensis.

Resumen

The taxonomy of Oxalis sect. Corniculatae is revised for eastern North America and contrasted with previous classifications and circumscriptions, particularly those of Eiten and Lourteig. Eight taxa, some previously recognized as subspecies or varieties, are recognized here at species rank. Oxalis stricta L. and O. dillenii Jacq. sensu stricto are appropriately identified in the sense that Eiten used the names. Oxalis florida Salisb. (= O. dillenii subsp. filipes) is a distinct species primarily of the Atlantic states and Gulf coast, less common in more inland regions. Oxalis priceae Small is a distinct species of the southeastern USA without infraspecific taxa; disjunct populations occur in northeastern Mexico. Oxalis texana (Small) Fedde (= Oxalis priceae subsp. texana) is treated as a distinct species of east Texas and adjacent Louisiana and Arkansas. Oxalis texana is close in morphology to O. dillenii sensu stricto and occurs sympatrically with it but distinct in geography and morphology from O. priceae sensu stricto. Oxalis illinoensis Schwegm. is geographically and morphologically distinct from O. grandis Small. Neotypes are designated for O. hyomi and O. illinoensis.

Yellow-flowered caulescent Oxalis (sect. Corniculatae) of North America has been the object of interest and study for more than a century. Small (1898, 1903, 1907) described a number of new taxa and brought the names into wide usage; he also treated sect. Corniculatae as a separate genus, Xanthoxalis Small. Wiegand (1925) provided a detailed and formal overview of the group and recognized many minor variants with formal names, with an emphasis of study on northern North America. Eiten's (1955, 1963) studies distilled the taxonomy to a set of more realistic taxa based on biological concepts rather than typological ones. Lourteig (1979) restudied the group and applied a very different set of names to the taxa, differing in part in the selection of types and in part in concepts of relationships and taxonomic ranks. Useful perspectives on problems of typification and nomenclature have been provided by Watson (1989) and Ward (2004), as noted below. Still, significant problems in identification have remained and confusion persists about which names are appropriate. In restudying, again, the eastern North American plants toward development of a treatment of Oxalidaceae for the Flora of North America series, I have come to a still different view, although it is far closer to Eiten's than Lourteig's. In fact, Lourteig's biology and nomenclature appears to have been retrograde in many ways compared to Eiten's.

In the taxonomic summaries below, synonymy is representative, showing the more commonly used names and some that allude to aspects of variability within the species. Additional synonymy can be found in Eiten (1955), Lourteig (1979), and Watson (1989). Closely related taxa of the western USA are Oxalis californica (Abrams) R. Knuth, O. albicans Kunth, O. pilosa Nutt. ex Torr. & Gray, and O. suksdorfii Trel.—these
KEY TO THE YELLOW-FLOWERED CAULESCENT OXALIS SPECIES OF EASTERN NORTH AMERICA

1. Stems evenly strigose from base to peduncles and pedicels.
2. Flowers 1 or 2–3(–5, rarely to 8) in umbelliform cymes, homostylyous; petals 5–11 mm long, completely yellow, without red lines

3. Petals 4–9(–11) mm long, yellow, without red lines

4. Stems nearly glabrous to sparsely or densely pilose or villous with septate hairs or a mixture of septate and nonseptate hairs; stoloniform rhizomes numerous on an individual plant and lignescent or lignaceous; flowers 1 or (2–)3–8 in umbelliform cymes above the level of the leaves; corolla throats prominently red-lined within; petals 10–18 mm long

5. Plants arising from slender, lignescent, stoloniform rhizomes without tubers; leaflets with upper shoulders usually rounded, margins often with a narrow purple margin; flowers produced above the level of the leaves; petals 10–14 mm long, throat yellow to very faintly or weakly red-lined within

6. Stems erect and radiating from taproot, rooting at most nodes; seeds brown, transverse ridges not white; stipules oblong with free marginal flanges and free distal auricles

7. Stems 20–60(–90) cm long, sparsely to very sparsely pilose with nonseptate hairs or a mixture of nonseptate and septate hairs or densely villous with septate hairs, arising singly from the base from a short herbaceous to lignescent rhizome; flowers usually (3–)5–7(–15) in regular (rarely irregular) cymes; capsules villous to puberulent and villous to glabrate

8. Oxalis illinoensis


Plants perennial, caulescent, arising from thin to ligneous taproots. **Stems** 4–10(–30) cm, several and radiating laterally from the taproot, creeping, rooting at the nodes and stolonlike, prostrate to distally ascending-erect, initially herbaceous but ligneous, sparsely and loosely strigose to strigose-villosus. **Stipules** present, membranous, margins with free flanges, distal auricles free. **Leaves** basal and cauline; leaflets 3, obcordate, lobed 1/5–1/3 length, (4–)6–12 mm, green on both surfaces or bronze-purple to maroon, margins often prominently villous-ciliate, petioles 1–5 cm. **Flowers** 1 or 2–3(–6) in irregular or umbelliform cymes, mostly homostylos; peduncles (1–2–4–8) cm; pedicles in fruit horizontal to deflexed; petals 4–8–mm, yellow. **Capsules** angular-columnar, gradually or abruptly tapering to apex, 8–17(–20) mm, sparsely puberulent to glabrate or glabrous. **Seeds** uniformly brown, transverse ridges brown. 2n = 24, 36, 42, 44, 48.

Flowering Mar–Aug, sporadically all year in Florida. Gardens, greenhouses, lawns, fields, roadsides, hammocks, beach margins, open pine woods, grasslands; 10–500(–2500) m; Nfld.!, Ont.!, P.E.I.!, Ala.!, Ark.!, Calif.!, Colo.!, Conn.!, D.C.!, Fla.!, Ill.!, Ind. (fide Kay Yatskievych), La.!, Me.!, Mass.!, Mo.!, N.J.!, N.C.!, Ore.!, Pa.!, S.C.!, Tex.!, Vt.!, Va.!, W.Va.!, introduced; native to Mexico, West Indies, Central America, South America; introduced Europe, Asia (India, China, Japan), Africa, Pacific Islands, Australia. The PLANTS Database shows records for Ariz., Ga., Nebr., Ohio, Okla., S.Dak., and Wash.

Many infraspecific taxa of *Oxalis corniculata* in the broad sense have been described over its cosmopolitan range, but their taxonomic status is uncertain and only the single entity is treated here. The reported variation in ploidy level is a concomitant of the complex morphological variation.

*Oxalis corniculata* in the USA is recognized by its relatively small flowers, sparsely hairy stems creeping and rooting at nodes, all procumbent and radiating from the taproot, and its well-developed stipules with broad, free marginal flanges and auricled apices. Peduncles and 1 or 2–3 leaves are produced at the nodes, short erect stems rarely. Plants flower as annuals but often become short-lived perennials through the colonial habit. Stems of *O. dillenii* sensu stricto may be decumbent or prostrate and rooting at the nodes, but they almost always are ligneous to ligneous, not evidently radiating from the taproot, and erect stems characteristically arise from the nodes. According to Eiten (1963), *O. dillenii* is able to form "vigorous, floriferous, but sterile hybrids with *O. corniculata*.”

Plants of *Oxalis corniculata* with bronze-purple to maroon leaves and pubescent capsules have been recognized as *O. corniculata* var. *atropurpurea* (e.g., in Florida, Ward 2004; in California, Abrams 1951). Such plants apparently occur sympatrically with the typical expression and it is not clear whether they are populational variants or whether they are at least partially reproductively isolated. In Malaysia, var. *atropurpurea* differs from typical *O. corniculata* in karyotype as well as in floral and vegetative morphology and is isolated by post-pollination reproductive barriers (Nair & Kuriachan 2004)—at least in that region its biological behavior indicates that var. *atropurpurea* should be treated at specific rank. Distinctive Australasian vari-
ants sometimes identified as *O. corniculata* have recently been treated as distinct species (e.g., de Lange et al. 2005). A form of *O. corniculata* is common in central Mexico (collections seen from Hidalgo, Jalisco, Edo. Mexico, Michoacan, Morelos, and Queretaro)—these plants produce large, prominent stipules and nearly glabrous stems, but the habit varies from procumbent to ascending and the stems rarely root at the nodes.

Most of the closest relatives of *Oxalis corniculata* (in its American expression) occur in the Americas and West Indies and the species probably is native there, though probably south of the United States. In the USA, *O. corniculata* occurs mostly in urban and highly disturbed habitats, but along the Gulf coast it occasionally grows in less obviously disturbed sites. North of the Gulf Coast, its occurrence is mostly restricted to greenhouses and horticultural sites (lawns and gardens), suggesting that it is repeatedly introduced rather than persisting (and expanding) through seed production.

2. *Oxalis dillenii* Jacq., Oxalis Mon. 28. 1794. *Oxalis corniculata* L. var. dillenii (Jacq.) Trel. in A. Gray, Syn. Fl. N. Amer. 1(1):365. 1897. *Xanthoxalis dillenii* (Jacq.) Holub, Bot. Közlem. 59:38. 1972. Type: Jacquin noted in the protologue “Plantam non vidi. Omnia ex Dillenio desumps” (Plant not seen. I entirely selected from Dillenius), thus the name is based on the description and illustration by Dillenius in Hortus Elthamensis 2: f. 298, t. 221. 1732. The plant illustrated probably was raised from seed from a collection made by Mark Catesby, as Sherard and Dillenius had received nearly a full set of Catesby's specimens from eastern North America (Reveal 1983). It apparently is the specimen in Dillenius's herbarium under his phrase-name “Oxys lutea americana, humilior et annua,” *Dillenius* s.n. (Holotype: OFX).

Eiten (1955, p. 114) observed that “Although the original Dillenius plate is distinctive, there is also a plant in the Hortus Elthamensis herbarium which is almost surely the plant Dillenius used (Druce & Vines 1907, p. 176), and therefore, if unique, is the holotype.” Watson (1989, p. 361) also noted that “the Dillenian reference must be considered for holotype material, since his was the only cited work [i.e., cited by Jacquin].” Lourteig (1979) cited “Type: America, Hort. Elth. OFX.”


The neotype designated here replaces the one selected by Lourteig (1979), a collection selected from southern Mississippi, in conflict with Pursh's protologue—which unambiguously places the type locality in southeastern Georgia (see comments by Ward 2004)—and intended by Lourteig to represent a species (*O. texana*, as identified here) restricted to eastern Texas, southern Arkansas, and west and central Louisiana. Lourteig's selection is from Mississippi (Harrison Co.: Henderson Point, 18 Mar 1954, Demaree 34767—GH!; duplicate: USF) and is a plant of *O. dillenii* (as noted by Eiten 1963 and as annotated by him in 1965; confirmed as *O. dillenii* in the present study, 2009), out of geographical range for *O. texana*.


*Oxalis stricta* var. piletocarpa Wieg., Rhodora 27:123. 1925. Type: U.S.A. New Hampshire. [Cheshire Co.]: Alstead, old gravel pit, 1901, E.F. Williams (Holotype: GH!).

Plants perennial, caulescent, arising from a ligneous or lignescent rhizome, sometimes appearing taproot-like. **Stems** 10–25 cm, proximally ligneous to ligneoscent, 1.5–2 mm thick, usually 2–8 from the base, erect initially, often becoming decumbent to prostrate and rhizome-like, sometimes rooting at nodes, strigillose to striosome with antrorsely appressed, nonseptate, sharp-pointed hairs. **Stipules** usually greatly reduced at least above midstem, margins narrowly flanged or without any free portion, without free apical auricles. **Leaves** basal and cauline; leaflets 3, obcordate, lobed 1/5–1/3 length, (4–)6–15(–21) mm, green on both surfaces, glabrous adaxially, sparsely strigillose abaxially, petioles 1–4 cm. **Flowers** 1 or 2–3(–4, very rarely to 8) in umbelliform (rarely irregular) cymes, mostly homostylous; peduncles 1–6(–10) cm; pedicels in fruit deflexed (to horizontal), usually without bracteoles; petals 5–11 mm, yellow. **Capsules** angular-columnar, abruptly tapered at apex, 12–20(–25) mm, densely strigose-pilose with mixture of appressed and spreading hairs, with a puberulent understory. **Seeds** brownish, transverse ridges with strong grayish or white lines. 2n = 18, 20, 22, 20–24.

Flowering Feb–May(–Oct). Pastures, roadsides, lawns, river bottoms, sandy, rocky, or gravelly soils;
Oxalis dillenii - 9/29/09 12:41:16 PM

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3. Stems usually arising singly from the base, 20–60(–90) cm, erect or later leaning or falling over; cymes, produced well above the level of the leaves, distylous; peduncles (3–)5–10(–15) cm; pedicels in fruit commonly glabrate, petioles 2–7 cm.

Leaves obcordate, lobed 1/5–1/3 length, 3.5–12 mm, green on both surfaces, strigose-hirsute on both surfaces, less narrowly flanged or without any free portion, without free apical auricles.

Stems usually 2–8 from the base, 10–25 cm, erect initially, often becoming decument to prostrate and rhizome-like, sometimes rooting at nodes; stem vestiture strigose to strigillose from base to peduncles and pedicels with antrorsely appressed, nonseptate, sharp-pointed hairs; plants arising from a taproot, producing ligneous or lignescent rhizomes or stolons; flowers 1 or 2–3(–5, rarely to 8) in umbelliform cymes (Oxalis dillenii

3. Stems usually arising singly from the base (rarely 2–3 together), 20–60(–90) cm, erect or later leaning or falling over and decumberent; stem vestiture very sparsely to sparsely or moderately pilose or villous with nonseptate hairs or a mixture of nonseptate and septate hairs or densely villous with septate hairs; plants arising from a thin, short herbaceous to ligneous rhizome; flowers usually (3–)5–7(–15) in regular (rarely irregular) cymes (Oxalis stricta


Oxalis recurva Ell. var. macrantha (Trel.) Wieg., forma sericea Wieg., Rhodora 27:138. 1925. Type: U.S.A. ALABAMA: no other data, Dr. Cabell s.n. (HOLOTYPE: GH!).


Plants perennial, caulescent, arising from a ligneous or ligneous taproot, usually with ligneous, stoloniform (or offset-like) rhizomes rooting at nodes and producing erect stems from the nodes. Stems proximally ligneous, usually 2–8 from the base, 5–20(–40) cm, erect or usually becoming decumbent, villous-hirsute with nonseptate hairs spreading or deflexed or spreading in dissimilar orientations. Stipules with margins narrowly flanged or without any free portion, without free apical auricles. Leaves basal and cauline; leaflets 3, obcordate, lobed 1/5–1/3 length, 3.5–12 mm, green on both surfaces, strigose-hirsute on both surfaces, less commonly glabrate, petioles 2–7 cm. Flowers 1 or (2–)3–8 in umbelliform cymes, less commonly irregular cymes, produced well above the level of the leaves, distyloid; peduncles (3–)5–10(–15) cm; pedicels in fruit...
deflexed to horizontal, often bracteolate; petals (13–)14–20 mm, yellow, with prominent red stripes at the base (corolla throat). **Capsules** angular-cylindric, abruptly tapered at apex, 10–15 mm, sparsely to densely villous with long, deflexed, nonseptate hairs, less commonly puberulent with short, straight, deflexed hairs. **Seeds** usually with white transverse ridges. 2n = unknown.

Flowering Mar–May. Dry limestone areas, glades, cedar barrens, chalk prairies, limestone bluffs and outcrops, sandstone cliffs, rocky slopes, talus, sandy hedgerows, oak-pine, longleaf pine; 5–300 m; Ala.!, Fla.!, Ga.!, Ky.!, Miss.!, N.C.!, S.C.?, Tenn.!, Mexico (Nuevo León!).

*Oxalis priceae* is a distinctive species of the southeastern USA, recognized by its villous to villous-hirsute stems, flowers in umbelliform cymes, and large yellow to yellow-orange corollas with red lines in the throat. The lines in the throat remain visible after drying and usually can be seen on herbarium specimens even from the outside of the flower. A similar pattern also occurs in *O. texana*, *O. illinoiensis*, and *O. grandis*.

Plants of *Oxalis priceae* in Mississippi and eastern Louisiana grow in pineland and have slightly smaller corollas than those eastward. Vouchers for Louisiana records are cited here. Jefferson Par.: at Gretna, opposite New Orleans, 6 May 1899, Ball 352 (GH); Rapides Par.: Red River valley, near Zimmerman RR Sta., frequent in dryer spots beneath tall pines on crest of hills, 24 Apr 1948, Ewan 17608 (MO); St. Tammany Par.: 5 mi S of Pearl River, US 90, hwy embankment, 30 Apr 1953, Ewan 18546 (GH).

Two collections from a single area in North Carolina are typical *Oxalis priceae*, at the northeastern extremity of its main range. Stanly Co.: rocky slopes below bluffs of Yadkin River, near Charlotte, 20 Apr 1932, Palmer 39985 (GH); steep moist banks above the Yadkin River, just above the second or lower power dam east of Badin, 10 May 1963, Wilbur 6826 (GH). Similarly, a collection of *Oxalis priceae* from eastern Tennessee appears to be disjunct. Cocke Co.: near Del Rio, siliceous bluffs along Newport Rd., 18 Apr 1963, *Sharp et al.* 17255 (TENN digital image!). Further study may fill in the known distribution, especially in Georgia and South Carolina, so that the Cocke Co. and Stanly Co. localities no longer appear disjunct.

Two collections from montane Nuevo León, Mexico, are unmistakably *Oxalis priceae*, disjunct from the closest localities in the southeastern USA by about 900 kilometers. Nuevo León. Mpio. Santiago, along the Cola de Caballo-Laguna Sanchez road into high sierra SE of Monterrey, between Puerto Genovevo and the Cola de Caballo-Laguna Sanchez road, 15 Mar 1994, Mayfield 1887 (TEX); Mpio. Bustamante, along switchbacks of road below the Grutas de Bastamante, ravines and bluffs along road from opening of cave to ca. 4 road km below cave, Quercus-Cercis-Brahea-Ungnadia-Fraxinus greggi, dark, rich, rocky soil in talus slopes, 1000 m, fairly common in moist ravine to E of cave opening, 18 Mar 1994, Mayfield 1908 (TEX).


**Plants** perennial, caulescent, arising from a woody taproot, caespitose with stems arising from a caudex or with rhizome-like offsets or stolons rooting at the nodes. **Stems** 5–15 cm, proximally liguline to liguline, erect to ascending, strigose to striigulose with antrorsely appressed to ascending nonseptate hairs. **Stipules** usually with margins very narrowly flanged, usually with rounded and slightly free apical auricles. **Leaves** basal and cauline, leaflets 3, cordate, lobed 1/5–1/3 the length, (4–)6–12(–18) mm long, green to purple on both surfaces, glabrous to sparsely strigose adaxially, sparsely strigose abaxially; petioles 2–6 cm long. **Flowers** (2–)3–5(–8) in umbelliform cymes, very rarely irregular cymes, distylyous, peduncles 4–10 cm; pedicels horizontal to deflexed in fruit, without bracteoles; petals (10–)12–16(–17) mm long, yellow, with prominent red lines at the base (corolla throat). **Capsules** angular-columnar, abruptly tapered at apex, 8–15 mm long, moderately to densely puberulent to puberulent-villous. **Seeds** brownish, transverse ridges distinctly whitish. 2n = unknown.

Flowering Mar–May(–Jun). Commonly in undisturbed habitats and usually in deep, loose sand, but also fields, roadsides, and edges and openings in woods, pine, pine-oak, and mixed hardwoods; 10–200 m; Ark.!, La.!, Tex.!
Oxalis texana is very similar to O. dillenii—differing from O. dillenii primarily in its more numerous flowers per inflorescence and larger, distyloous flowers with red-lined corolla throats. The distinctive red striping in the corolla throat remains visible after drying and usually can be seen on herbarium specimens even from the outside of the flower. Plants of O. texana also are distinct in their relatively larger taproots and habit either caespitose or with short stolon-like offsets. Plants of O. dillenii with larger flowers on elevated peduncles might be mistaken for O. texana, yet the two taxa exist sympatrically in the range of O. texana, and it seems clear that they are separate species. Oxalis priceae and O. texana are separate in geography and in a number of morphological features.

Lourteig (1979) used the name Oxalis lyonii Pursh for the species identified here as O. texana, and her illustrations of O. lyonii were drawn from a Texas collection identified here as O. texana (Lourteig 1979, Fig. 7, a-e). Turner et al. (2003) followed Lourteig’s nomenclature and mapped the same species as O. lyonii. Lourteig neotypified O. lyonii to place it within her concept of O. texana (as identified here) and included O. [Xanthoxalis] texana in synonymy—her neotype, however, is from southern Mississippi, outside of the range of O. texana, and is instead a collection of O. dillenii (as noted by Eiten 1963 and annotated by him in 1965; confirmed as O. dillenii by Nesom 2009). Further comments regarding O. lyonii are in the synonymy of O. dillenii in the present paper.


Oxalis recurva Ell., Sketch Bot. S. C. 1: 526. 1821. Oxalis floridensis Salisb. var. recurva (Ell.) Aihles, J. Elisha Mitchell Sci. Soc. 80:173. 1964. Oxalis recurva Jacq. subsp. recurva (Ell.) C F Reed, Phytologia 63:411. 1987. Type: U.S.A. South Carolina. In cultus at pascuis circa Charleston, Apr, Elliott s.n. (CHARL, photo-GH!). Eiten (1963) noted that the type specimen, lacking flowers, of O. recurva has habit and stem vestiture that would place it with equal probability as either O. priceae [subsp. priceae] or O. floridensis. Geography places it with the latter, though Eiten chose to keep it as a “nomen dubium.” Elliott’s protologue noted “Very common near Charleston, intermingled with the O. stricta, with which it has been confounded.”


Plants perennial, caulescent, arising from slender lignescent stolons, youngest plants from short, slender taproots. Stems usually single from the base, (5–)8–30(–35) cm, erect or rarely leaning and decumbent, subglabrous to sparsely pilose-villous with very fine hairs spreading in irregular orientation, sometimes stigose distally or just beneath the flowers and pilose-villous on proximal portions. Stipules obsolescent, without free margins or apical auricles. Leaves basal and cauline, leaflets 3, obcordate, lobed 1/5–1/3 length, 4–11 mm long, green on both surfaces, sparsely stigose abaxially; petioles 2–5 cm. Flowers 1 or 2(–3, rarely 4–6) in umbelliform cymes at level of the leaves or slightly above, tristyloous; peduncles (2–)3–8 cm; pedicels reflexing to ascending, often bracteolate; petals 5–9(–11) mm, yellow. Capsules angular-cylindric, 8–12(–15) mm, glabrous to sparsely puberulent. Seeds brownish, including transverse ridges. 2n = 16.

Oxalis florida is recognized by its mostly erect stems, sparse and spreading cauline vestiture without multicellular hairs, obsolescent stipules, relatively small, and yellow flowers without red lines in the throat; the distal stems and peduncles are thin compared to other species. It is a species primarily of the Atlantic states and Gulf coast, much more sparsely represented in more inland regions. It is known from a cluster of counties in southeastern Missouri (Butler, Carter, Ripley, and Wayne cos.; MO!), and from southern Arkansas (Ashley, Bradley, and Ouachita cos.; BRIT!, NLU!) northward to apparently isolated localities in Arkansas (e.g., Yell Co.; MO!). The voucher for the West Virginia record perhaps was a waif—Tucker Co.: Otter Creek Lumber Co., near Hendriks, dry grounds along railroad track, 10 Sep 1904, Greenman 400 (GH). A collection annotated by Eiten as O. dillenii var. filipes is interpreted here as O. dillenii with slightly reduced vestiture, perhaps resulting from damaged stems: Polk Co: 12 Apr 1941, Tharp s.n. (GH).

Mulcahy (1964, p. 1048) found that both Oxalis priceae sensu stricto and O. priceae subsp. coloraea (identified here mostly as O. florida) exhibit a high degree of self-fertility, the former strictly distylyous, the latter tristylyous. “A further difference between the 2 subspecies is that subspecies priceae forms very dense and extensive clones, some of which extend for several meters, while subspecies coloraea forms rather diminutive clones, very few of which contain more than 3–4 flowering stalks.”

Lourteig (1979) also treated Oxalis florida at specific rank. For Florida, Ward (2004, p. 35) noted that “the differences between O. dillenii subsp. dillenii and subsp. filipes (= O. florida) “are appreciable and intermediates seem few.” Ward did not find significant variation within O. priceae, listing Xanthoxalis coloraea as a synonym.

Eiten (1963, p. 268) observed that Oxalis dillenii subsp. filipes “is distinctive in its most characteristic form but intergrades with [subsp. dillenii], both in forming intermediate homogeneous populations and also, in disturbed ground, variable hybrid swarms. The most distinctive portion of this variable subspecies is concentrated in the northern Appalachians. The morphological evidence is conflicting as to whether it originated from [subsp. dillenii] or directly from O. corniculata.”

Wiegand (1925, p. 124) also observed a measure of intermediacy in Oxalis florida, noting that “O. florida and O. filipes have much the appearance of hybrids between [O. stricta and either O. dillenii or O. corniculata] as no new characters are found in either species. The frequency of their occurrence in the east and absence in the west, where the possible parents both occur is against this hypothesis.”

In Eiten’s view (1963), the difference between Oxalis priceae subsp. coloraea and O. dillenii subsp. filipes, both treated here as synonyms of O. florida, was primarily in flower size. Subsp. filipes keyed under “Flowers 13 mm long or less,” while subsp. coloraea keyed under “Flowers 10 mm long or more.” The arbitrary difference in flower size apparently is reflected in his comment that he identified a duplicate (F) of the type of Xanthoxalis coloraea as O. dillenii subsp. filipes.

Ward (2004, p. 35) noted that Eiten was incorrect in claiming that the name Oxalis florida Salisb. is illegitimate. “The name [phrase-name] cited in synonymy by Salisbury (1796) was pre-Linnaean which, since not available for his use, does not disturb the legitimacy of O. florida.”


The protologue noted “Habitat in Virginia.”

Lourteig (1979) identified this species as Oxalis fontana, typified by a plant from northern China, and applied the name O. stricta to the species identified by Eiten (1955, 1963) and here as O. dillenii. The basis for the difference lies in selection of lectotypes for O. stricta. Lourteig (1979), and earlier Robinson (1906), opined that Linnaeus worked with Gronovius and was most likely to have been familiar with a John Clayton specimen in the Gronovius collection (Clayton 474, BM, photo-GH!, BM-Clayton-digital image)—this plant identified here as O. dillenii. Eiten (1955), followed by Jarvis (2007), noted that selection of a Morison illustration as lectotype of O. stricta best characterizes the species long-naturalized and weedy in Europe and probably known first-hand by Linnaeus. The situation has been excellently summarized by Ward (2004).


Type: U.S.A. MISSOURI: Jackson Co.: NW Jackson Co., dry ground, 28 May 1893, B.F. Bush 30 (HELOTYPE: NY, NY-digital image!, NHTYPE: GH!)

Plants annual to short-lived perennial, caulescent, arising from a thin, short rhizome. Stems usually arising singly from the base (rarely 2–3 together), erect or later leaning or falling over and decumbent, 20–60–(90) cm, villous with nonseptate hairs, spreading septiculate hairs present on stems and petioles, commonly concentrated at nodes, sometimes only on petioles. Stipules obsolescent, without free margins or apical auricles. Leaves basal and cauline; leaflets 3, obcordate, lobed 1/5–1/3 length, (8–)10–20(–30) mm, light green to yellowish-green on both surfaces, petioles 2–8 cm. Flowers rarely 1 usually (3–)5–7(–15) in regular cymes, usually arising within level of the leaves or slightly above, homostylous or slightly to strongly heterostyous; peduncles 3–9(–11) cm; pedicels in fruit erect to ascending, often bracteolate; petals (6–)8–11 mm, yellow. Capsules columnar, nearly terete, abruptly tapering toward apex, 8–15 mm, villous with septiculate hairs to glabrate. Seeds brown, transverse ridges rarely whitish. 2n = 18, 24.


Oxalis stricta is recognized by its tall, erect stems from a short, simple rhizome, presence of septiculate hairs, cymose inflorescence, and relatively small flowers. Septate hairs on the stems and petioles are easily recognized (lens), especially because of their brownish crosswalls, but they vary greatly in density, as do the nonseptate hairs. In “villicaulis” and “pilosella” forms, as well as “var.” bushii, the septiculate hairs are dense and evenly distributed on the stems, but more often they are localized around the nodes and intermixed with nonseptate hairs. Often they are few in number, and, in rare cases, plants with greatly reduced vestiture overall apparently lack septiculate hairs.

The rhizomatous habit, lacking taproots, of Oxalis stricta and its close relatives O. grandidis and O. illinoensis is distinctive and a basic biological difference. The bases of Oxalis plants often are incompletely collected, however, especially in the other species, which commonly develop stoloniform or rhiziform branches above the taproot.

Oxalis stricta in western states is uncommon and probably adventive. Reports of the species from Texas


Plants perennial, caulescent, arising from slender, ligneous, stoloniform rhizomes without tubers. Stems erect, usually single from the base (rarely 2–3 together), (10–)25–60(–100) cm before branching, nearly glabrous to sparsely or densely pilose or villous with a mixture of sepalate and nonseptate hairs. Stipules absent. Leaves cauline, mostly on the distal half of the stem; leaflets 3, obcordate, lobed 1/5 length, 5–25(–30) mm, upper shoulders of lobes usually rounded, rarely flattened, green on both surfaces, margins sometimes narrowly brownish-purple, ciliate, petioles 5–7.5 cm. Flowers 1 or 2–4(–8) in regular or irregular cymes or umbelliform cymes produced above the level of the leaves, tristylos; peduncles 7–12 cm; pedicels in fruit erect to ascending; petals 10–14 mm, yellow, throat yellow to faintly or weakly red-lined within. Capsules ovoid to ovoid-oblong, 6–10 mm long. Seeds xxxx, xxxx xxxx xxxx xxxx. 2n = 28 (fide Weller & Denton 1976, reporting unpublished counts by Ornduff).

Flowering May–Aug. Sandy woods and alluvial soils; 100–1100 m. Ala.!, D.C.!, Ga.!, Ind.!, Ky.!, Md.!, N.C.!, Ohio.!, Penn.!, S.C.!, Tenn.!, Va.!, WVa.!

A report of Oxalis grandis from southern Mississippi (Forrest Co.; Carter & Jones 1968) is far out of range and habitat for the species and probably is based on a misidentification, perhaps of Oxalis priceae, which also is large-flowered.

Oxalis illinoensis Schwegm., Phytologia 50:467. 1982. Type: U.S.A. TENNESSEE. Macon Co.: by Tenn. [Hwy] 10, S side of and below Lafayette, steep, deep hardwood ravine, clay loam, 5 May 1975, R. Kral 59218 (NEOTYPE, designated here: MO; ISONEOTYPE: VDB!). The neotype and isoneotype clearly show the diagnostic features of the rhizome and inflorescence. Alas, the collection is not from Illinois, but the geographically geometric center of the range is in eastern Kentucky and the species barely occurs in Illinois (comments below). The holotype was deposited at SIU but cannot now be located there and is presumed to have been destroyed: Illinois. Pope Co.: Wooded floodplain forest along Little Lusk Creek at Martha’s Woods, 4 miles ENE of Eddyville, 11 May 1968, J.E. Schwegman 1661.

Plants perennial, caulescent, arising from slender, herbaceous rhizomes at intervals producing white fusiform tubers or tuberlike thickenings. Stems erect, usually single from the base (rarely 2–3 together), 15–40 cm, nearly glabrous or sparsely to densely villous with a mixture of sepalate and nonseptate hairs. Stipules obsolescent, without free margins or apical auricles. Leaves cauline; leaflets 3, obcordate, lobed 1/5 length, (12–)20–30(–35) mm, upper shoulders of lobes flat, green on both surfaces, margins green, ciliate, petioles 4–7.5 cm long. Flowers 1–3(–6) in regular or irregular cymes produced mostly at the level of the leaves, tristylos; peduncles 3–10 cm, pedicels in fruit erect to ascending; petals 12–18 mm, yellow, throat strongly red-lined within. Capsules oblong-ovoid, 7–10 mm. 2n = unknown. Seeds xxxx, xxxx xxxx xxxx xxxx.
Flowering Apr–Sep. Slopes, bluffs, ravines, floodplains, mesic forests, sometimes forming the dominant ground cover, commonly on limestone, shale, or calcareous loess substrate; 200–500 m; s Ill., s Ind., w Ky., and c Tenn.!

Differences between *Oxalis illinoensis* and *O. grandis* are subtle but they appear to be correlated with geography; the tuberous portions of the *O. illinoensis* rhizomes are diagnostic but they commonly are broken off during collection. *Oxalis illinoensis* apparently occupies the western part of the range of *O. grandis* sensu lato; the two species appear to be closely contiguous (non-overlapping or barely overlapping) in range in Tennessee (Univ. of Tennessee Herbarium 2008; personally confirmed by study of many collections at BRIT/VDB and MO). Michael Homoya (pers. comm.), of the Indiana Dept. of Natural Resources, observes that the two species overlap in range in southern Indiana, where they are mostly separated by habitat, with "*Oxalis grandis* on the drier, more acidic slopes, and *O. illinoensis* in the mesic, alkaline environments." *Oxalis illinoensis* in Illinois is known from only three counties immediately bordering Indiana and Kentucky, and is state-listed as endangered (S1, Illinois Endangered Species Protection Board 1999). John Schwegman (pers. comm.) observes that he has never seen *O. grandis* in Illinois, nor have I seen any collections (MO). County-level distribution records in Indiana and Kentucky shown by USDA, NRCS (2008) need to be reexamined.

Medley (1993) has observed that *Oxalis illinoensis* and *O. grandis* intergrade, and a hybrid population is said to exist in Indiana (Heikens 2003, citing unpublished and undocumented observations by S. Olson).

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