

# TAXONOMY OF THE LYTHRACEAE IN THE SOUTHEASTERN UNITED STATES<sup>1</sup>

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ABSTRACT. Keys, distributions, and taxonomic and nomenclatural notes are given for seven genera and 16 species of Lythraceae occurring in southeastern United States. Changes in the treatment of southeastern Lythraceae include recognition of the adventive *ROOTALA INDICA* (Willd.) Koehne in Louisiana, uniting of *AMMANNIA TERES* Raf. of the United States with the Caribbean *A. LATIFOLIA* L., acceptance of the monotypic genus *DIDIPLIS*, and presentation of evidence for uniting *LYTHRUM ALATUM* Pursh and *L. LANCEOLATUM* Ell. as *LYTHRUM ALATUM* var. *LANCEOLATUM* (Ell.) T. & G. ex Rothrock, a previously overlooked combination. The chromosome number of *CUPHEA GLUTINOSA* Cham & Schlect. is reported for the first time.

## INTRODUCTION

This paper is an outgrowth of a floristic treatment of the Lythraceae written for a proposed *Vascular Flora of the Southeastern United States*, edited by A. E. Radford. Although the Lythraceae are represented in southeastern United States by only seven genera and 16 species, *Ammannia*, *Didiplis*, and *Lythrum* presented taxonomic problems requiring investigation beyond the geographical boundaries of the flora. The treatment of these genera therefore is more detailed than that of the rest of the family.

The curators of the following herbaria are gratefully acknowledged for loan of the material indicated: all Lythraceae, ALU, LAF, LTU, TENN, UNC, MISS, VDB, WVA; *Lythrum*, A, GA, GH, MO, TEX, and US; *Ammannia*, A, GH, MO, TEX, US, and WIS. I also wish to thank the many botanists who shared freely their special knowledge or gathered living material for me. These include Loran Anderson, Delsie Demaree, Joseph Ewan, Samuel Jones, Elizabeth Shaw, John W. Thieret, and Daniel Ward. I am indebted to Robert Ornduff for his helpful comments on the manuscript.

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<sup>1</sup> Based on manuscript compiled for the *Vascular flora of the southeastern United States*. The area covered is bounded by and includes Delaware, Maryland, West Virginia, Kentucky, Arkansas, and Louisiana. The format of the descriptions and method of citing distribution and synonymy basically follows Radford *et al.* (1967). Letters following synonyms cited at the end of species descriptions refer to the following recent floras of the eastern United States in which those names are used: S = Small, J.K., *Manual of the southeastern flora*, 1933; F = Fernald, M.L., *Gray's manual of botany*, 8th ed., 1950; G = Gleason, H.A. and A. Cronquist, *Manual of the vascular plants of the northeastern United States and adjacent Canada*, 1963; R = Radford, A.E., H.E. Ahles, and C.R. Bell, *Manual of the vascular flora of the Carolinas*, 1964.

## LYTHRACEAE Loosestrife Family

Herbs, shrubs, or small trees with quadrangulate or terete stems. Leaves simple, entire, decussately opposite, seldom alternate or whorled, exstipulate. Flowers perfect, regular or irregular; bracteoles 2, opposite on the pedicels; floral tube campanulate to cylindrical, persistent; calyx lobes 4–6, generally alternating with appendages; petals 0–6, crumpled, deciduous, inserted on the inner surface of the floral tube between the calyx lobes; stamens as many as or twice as many as the petals or numerous, inserted on the inner surface of the floral tube below the petals, anthers versatile; gynoecium often subtended at the base by a disc, stigma capitate or bilobed, style filiform, ovary superior, free in the floral tube, 2–4-locular; fruit a membranaceous capsule enclosed by the persistent floral tube, septicidally, septifragally, or loculicidally dehiscent, or indehiscent, splitting irregularly. Seeds 3 to many, the embryo straight, endosperm scant or none.

1. Floral tube campanulate to globose, about as long as wide.
  2. Plant woody, perennial, over 1 m tall; petals showy, 8–20 mm long.
    3. Flowers in axillary dichasia; petals 8–15 mm long; stamens 8–10; shrubs of shallow water . . . . . 1. *Decodon*
    3. Flowers in terminal panicles; petals 12–20 mm long; stamens numerous, more than 10; terrestrial trees or shrubs . 2. *Lagerstroemia*
  2. Plant herbaceous, annual or perennial, generally less than 50 cm tall; petals to 4 mm long or none.
    4. Appendages present in the sinuses of the calyx lobes, or if absent then the bracteoles nearly equal to the length of the floral tube; flowers 1 to many in the axils of leaves; petals 4 (rarely 0); capsule dehiscent.
      5. Middle and upper leaves attenuate at base; flowers solitary in the axils of leaves; capsule dehiscing septicidally, the outer wall of the capsule finely and densely transversely striate . . . . . 3. *Rotala*
      5. Middle and upper leaves cordate to auriculate at base; flowers (1–)3 to many in the axils of leaves; capsule dehiscing irregularly, the outer wall of the capsule smooth, not striate . . . 4. *Ammannia*
    4. Appendages absent in the sinuses of the calyx lobes; bracteoles minute on the pedicel; flowers solitary in the axils of leaves; petals 0; capsule indehiscent . . . . . 5. *Didiplis*
1. Floral tube cylindrical, elongate, about twice as long as wide.
  6. Flowers regular; floral tube entire in fruit; capsule dehiscing septicidally from the apex, the placenta included; seeds numerous, mostly more than 20 . . . . . 6. *Lythrum*
  6. Flowers irregular; floral tube and capsule splitting longitudinally along the upper side in fruit, the placenta then exerted; seeds 3–20. 7. *Cuphea*

## 1. DECODON J. F. Gmelin

1. *D. VERTICILLATUS* (L.) Ell., Swamp Loosestrife—Perennial shrubs, glabrous to velutinous, spreading by arching stems rooting at tips and with submerged stems basally thickened by spongy aerenchyma. Leaves opposite or whorled, lanceolate, shortly petiolate, 3–20 cm long, 0.5–5 cm wide. Inflorescence of 1–3 shortly pedunculate axillary dichasia at a node. Floral tube campanulate, greenish; flowers trimorphic with styles and stamens of 3 lengths; calyx lobes 4 or 5(–7), alternating with and mostly  $\frac{1}{2}$  the length of narrowly triangular, thickened appendages; petals 4 or 5(–7), rose purple, 8–15 mm long, about twice the length of the floral tube; stamens 8–10, the filaments of 3 possible lengths, 2 of the 3 lengths occurring in any one flower; capsule globose, loculicidal, 3–5-locular. Seeds 20–30, small, inverted-pyramidal. ( $n=16$ ) Summer. Swamps, edges of ponds and lakes in shallow water; all prov. SE /All/ A monotypic eastern North American genus distributed from southeastern Canada and Maine to Minnesota, south to Louisiana and Florida.

Glabrous specimens said to occur mostly inland (Gleason and Cronquist, 1963) have been called var. *laevigatus* T. & G. On the basis of admittedly limited herbarium material from beyond the southeastern states it appears that there are in fact relatively few entirely glabrous specimens and that, although these occur primarily inland, glabrous plants occur near coastal areas as well, e.g., Cameron Parish, La., Jones Co., N.C., Washington, D.C. Conversely, plants with the more common velutinous condition, although mostly coastal or in the Mississippi Valley, have also been collected inland, e.g., Noble Co., Ind. and Jefferson Co., N.Y. Distinctive geographical limits for the varieties based on degree of vestiture seem to be lacking, and in the absence of other discriminatory characters I prefer not to recognize varietal rank within the species.

## 2. LAGERSTROEMIA L.

1. *L. INDICA* L., Crape-Myrtle—Long-lived shrubs or small trees. Leaves  $\pm$  alternate, obovate or oblong-elliptic, sessile or shortly petiolate, 15–60 mm long, 5–40 mm wide. Inflorescence of showy multi-flowered terminal panicles. Floral tube subglobose, 10 mm long, on pedicels 3–15 mm long; calyx lobes 5–7, erect, shorter than the floral tube, appendages lacking; petals 5–7, purple, rose, or white, long-clawed, 12–20 mm long; stamens numerous; capsule subglobose, loculicidal, (3–)6-locular. Seeds flattened, winged, 3 or 4 per locule. ( $n=24, 25$ ) Spring–Fall. Native to Asia, widely cultivated throughout the SE and possibly naturalized to a limited extent.

## 3. ROTALA L.

Annual glabrous herbs, often much branched, 0.5–4 dm tall. Leaves opposite or whorled, linear to spatulate, attenuate at the base, mostly sessile. Flowers solitary, axillary, sessile or subsessile, 4(–6)-merous; pedicels bi-

bracteolate. Floral tube campanulate to globose or urceolate, 2–5 mm long, calyx lobes 4(–6), appendages present or wanting between the lobes; petals 4(–6), white to pink; stamens 4(–6); capsule with microscopic dense transverse striations on the outer wall, septicidally dehiscent, 2–4-locular. Seeds many, minute, ovoid, plano-convex.

1. Leaves linear to oblanceolate; floral tube bearing appendages between the calyx lobes; bracteoles less than  $\frac{1}{2}$  the length of the floral tube. . . . . 1. *R. ramosior*

1. Leaves obovate to spatulate; floral tube lacking appendages; bracteoles  $\pm$  equalling the length of the floral tube . . . . . 2. *R. indica*

1. *R. RAMOSIOR* (L.) Koehne, Tooth-Cup—Herb 0.5–4 dm tall. Leaves opposite or whorled, linear to oblanceolate, 10–50 mm long, 2–12 mm wide. Flowers axillary, sessile, bracteoles at the base of the floral tube less than  $\frac{1}{2}$  the length of the floral tube. Floral tube 2–5 mm long; calyx lobes alternating with triangular appendages of size nearly equal to the lobes; petals scarcely exceeding the calyx lobes, deciduous; capsule 2–4-locular. ( $n=16$ ) Mid-summer-Fall. Muddy or sandy shores or damp depressions; all prov. SE /All/ Also from Mass S to Fla, E to E Tex, US west coast, Cent. Am, S. Am, Antilles.

The species bears a superficial resemblance to both *Ammannia coccinea* Rottb. and *Ludwigia palustris* (L.) Ell. (Onagraceae), with which it is sometimes confused. The obvious characters in *Rotala*—i.e., upper leaf bases tapering, solitary flowers in the axils, and minute transverse striations on the capsule—easily distinguish it from *Ammannia*, which has upper leaf bases auriculate, generally 3 or more flowers in axillary cymes, and a microscopically smooth capsule wall. Easily observed characters of *Ludwigia palustris* that distinguish it from *R. ramosior* are the absence of appendages between the lobes and the presence on the floral tube below each calyx lobe of a thickened green band through which the outline of seeds may be seen in the dry state.

More robust plants of *R. ramosior* occurring inland from the coastal plain have been recognized as var. *interior* Fern. & Griscom on the basis of but slightly greater size of leaves, bracteoles, and capsules.

2. *R. INDICA* (Willd.) Koehne—Herb 0.5–3 dm tall. Leaves opposite, obovate to spatulate, 4–17 mm long, 1–8 mm wide, the margins thickened, translucent, the apex minutely mucronate on young leaves. Flowers subsessile on foliaceous branchlets; bracteoles  $\pm$  equalling floral tube in length, narrowly linear, acute. Floral tube 2–3 mm long; calyx lobes narrowly triangular, 1.5 mm long, lacking alternating appendages; petals much shorter than the calyx lobes, persistent; capsule 2-locular. Summer-Fall. Rice fields; Acadia Parish, La/Calif/ Native to S Asia.

A native of southern Asia, this species is thought to be an introduction through rice culture in California (Mason, 1957). It has recently also been found in rice fields in Louisiana (Thieret, 1972, and M. Piehl, 1974, pers.

comm.) According to Thieret (pers. comm., 1972) the species has persisted and spread in its second year in the area where it was first collected. For this reason and because it might be expected to appear in other rice growing areas of the southeast it has been included in this treatment.

#### 4. AMMANNIA L.

Annual glabrous herbs, 1–11 dm tall, with ascending branches. Leaves opposite, narrow, linear to lanceolate or oblanceolate, sessile, auriculate or cordate, rarely tapering to the base. Flowers small, 4-merous, in sessile or pedunculate axillary cymes, (1–)3–10 flowers per cyme; pedicels bibracteolate. Floral tube campanulate to urceolate, 2–6 mm long, greenish to rose-colored, 4-angled at anthesis; calyx lobes 4, alternating with short, horn-shaped appendages; petals 4 or 0, small, purple to pink, early deciduous; stamens 4(–8); capsule globose, irregularly dehiscent, outer wall smooth, not striate. Seeds many, minute, ovoid.

1. Style in fruit exserted, filiform, equal to or longer than the ovary; calyx lobes triangular, the apices acute . . . . . 1. *A. coccinea*

1. Style in fruit included, much shorter than the ovary; calyx lobes obtuse, the apices often minutely mucronate . . . . . 2. *A. latifolia*

1. *A. COCCINEA* Rottb.—Leaves linear and attenuate to narrowly oblong, 2–11 cm long, 2–10 mm wide, the apex acute, the base auriculate-cordate. Inflorescence a closely-flowered, short-pedunculate cyme, flowers (1–)3–5(–10) per cyme, peduncles to 3 mm long. Petals 4; style filiform, equal to or longer than the ovary, exserted in fruiting calyx; calyx lobes triangular, the apex acute; capsule 3–5 mm in diameter, included to barely surpassing the calyx lobes. Summer-Fall. Wet places; all prov. SE (except Ala?) /Mo, Ill, Ind, Ohio, NJ/ Also sporadic to west coast and in Mex, Antilles, S. Am.

Two long-styled species of *Ammannia* have been cited from southeastern United States (Fernald, 1950), *A. coccinea*, characterized by closely (1–)3–5(–10)-flowered sessile or nearly sessile cymes and *A. auriculata* Willd., with smaller, more-numerous flowered (3–15 flowers) long-pedunculate cymes. *Ammannia coccinea* is frequently collected throughout eastern and central United States and ranges southward into South America via the Caribbean and Mexico. *Ammannia auriculata* is a species of world-wide distribution, occurring in Africa, Asia, Australia, Latin America and is infrequently collected in the United States from Texas north to South Dakota and possibly also in California, but to my knowledge is not present within the boundaries of the *Vascular Flora*.

*Ammannia coccinea* and *A. auriculata* are sympatric over a very wide area, i.e., the central United States, Mexico, the Caribbean, and northern South America. Throughout the area of sympatry, specimens representing apparent hybrids or introgressants have been collected. These resemble *A. coccinea* most closely, but they display the elongate peduncle of *A.*

*auriculata* and are most often identified as that species. The possible introgressants are also found infrequently outside the range of *A. auriculata* in the southeastern states bordering the Mississippi River. Other characters such as flower number and capsule size, although statistically significant in separating the two species, may or may not be sufficiently distinct on any one individual to be a useful distinguishing feature. A biosystematic study of these species is currently in progress.

Occasional specimens of *A. coccinea* from well outside the range of *A. auriculata* are found with the most mature cymes fully elongated into short branches, succeeding younger cymes with slightly elongate to sessile peduncles (cf. *Godfrey 64910* from Florida, LAF, TEX, UNC; and *Thorne 5628* from Georgia, GH). In this case it would appear that elongate peduncles must be attributed to a genetic change not connected with hybridization.

2. *A. LATIFOLIA* L.—Leaves lanceolate to narrowly elliptic or spatulate, 5–14 cm long, mostly about 8 mm wide, the apex obtuse to subacute, the base of middle and upper leaves auriculate, the lowest cuneate. Inflorescence a closely flowered, short-pedunculate cyme, flowers 3–10 per cyme, peduncles to 3 mm long. Petals 4 or 0; style much shorter than the ovary, included in fruiting calyx; calyx lobes broad, rounding, the apex often minutely mucronate; capsule 4–6 mm in diameter, included. Summer-Fall. Brackish waters; cp. Md, Va, NC, GA, Fla, Miss, La/NJ, Tex/ Also Mex, S. Am., Antilles. *A. teres* Raf.—F, G, R; *A. koehnei* Britt.—S.

Two short-styled species of *Ammannia* are commonly recognized from the Atlantic and Gulf coasts, *A. teres*, distributed from New Jersey to Florida and westward to Texas, and *A. latifolia*, primarily a Caribbean species reaching northward into southern peninsular Florida. The major difference between the two taxa is the purported presence of petals in *A. teres* and their absence in *A. latifolia*. Leaf shape and size and capsule size have also been used to separate the species.

In the course of a revisionary study of the genus I have tabulated these characters for United States, Caribbean, and Latin American specimens. No geographically-limited character was found by which more than one species or even variety could be defined. Although petals occur on all plants examined from New Jersey to northern Florida, they also occur sporadically throughout the Caribbean on 30% of the specimens examined. At least four other species of *Ammannia* have petals that vary from 0–4, so that variability of this character within a species is not unusual for the genus.

Leaf size is not significantly different between the two species even at the northern and southern range extremes. The upper leaf shape is primarily lanceolate to spatulate in the north, becoming more commonly linear-lanceolate from North Carolina southward, with spatulate-leaved specimens occurring infrequently in the Caribbean. Capsule size is more variable in the north, but the difference in mean size at the geographic extremes is less than 0.5 mm.

Because of the lack of stable morphological characters which can be geographically characterized, only one short-styled species of *Ammannia*, *A. latifolia*, is recognized in eastern United States. Although this species is variable, it is without definable infraspecific groups. *Ammannia teres* is relegated to synonymy. The complete synonymy and more extensive data supporting these changes will be presented in a revision of *Ammannia* in the Western Hemisphere (Graham, unpub.)

Fernald's *A. teres* var. *exauriculata* is merely a form in which the basal auriculate lobes on some of the upper leaves are much reduced. This apparently sporadic character is known also from collections from the Bahamas (*Small & Carter 8965*, US) and from Yucatan (*Lundell & Lundell 8188*, MEXU).

#### 5. DIDIPLIS Raf.

1. D. DIANDRA (DC) Wood, Water-Purslane—Delicate annual aquatic herbs, 1–4 dm long. Leaves thin, opposite, 5–30 mm long, 0.5–4 mm wide, narrowly linear or elliptic, the submersed leaves linear, truncate at the base, the emersed leaves narrowly elliptic, shorter with tapering base. Flowers minute, greenish, 4-merous, solitary, axillary; calyx lobes 4, broadly triangular, intersepalal appendages lacking; petals none; stamens 2–4, included; style short or wanting; capsule globose, indehiscent, irregularly splitting, 2-locular. Seeds many, small, spatulate, the distal end enlarged and curved. Late Spring-Summer. Margins or shallow waters of lakes, ponds, temporal pools; all prov? SE /All?/ Reported from Tex to Fla, north to Minn and Va, but SE herbaria contain specimens only from Ky, La, Miss, NC, and Va. A monotypic genus endemic to eastern North America. *Peplis diandra* Nutt. ex DC.—F, R.

The decision to recognize *Didiplis* as a monotypic genus endemic to North America versus placing it in *Peplis* (cf. Graham, 1964) is based on Webb's (1967) convincing arguments for the merging of the European species of *Peplis* with *Lythrum*. According to Webb, morphological similarities or actual overlap in characters of habit, petal and stamen number, shape of the floral tube, and type of capsule dehiscence, especially as evidenced in the little-known European *Lythrum thesioides* Bieb. and *L. borysthenicum* (Schrank) Litv. (*Peplis erecta* Req. ex Moris) erase the distinctions between the two genera. One apparent exception is *Didiplis diandra*, a species with 4-merous, rather than 6-merous flowers which lack the appendages (epicalyx) found on all other species of *Lythrum* and *Peplis*. The flowers of *Didiplis*, often produced on totally submerged plants, are solitary, minute, and greenish, with both appendages and petals lacking, probably reduced in response to the aquatic environment.

In *Lythrum* the 4-merous floral condition is present in a few species, such as *L. thymifolia* L. and *L. tribracteatum* Salzm. ex Sprengel and appendages may be conspicuously reduced ("subnullae" fide Koehne, 1903, p. 59) or inconspicuous, to 0.5 mm long or less, as in *L. tribracteatum* (Webb, 1968,

p. 302). The presence of such character states in *Lythrum* suggests that *Didiplis* is no more easily separated from *Lythrum* than is *Peplis*. Without studying the European species involved and lacking sufficient study material of *Didiplis* itself, I choose to follow Webb's suggestion for the present, that *Didiplis* be treated as a monotypic American genus.

*Didiplis diandra* is a delicate aquatic herb of shallow, often ephemeral waters. Though most floras record its range as covering much of eastern United States, there are only 12 herbarium specimens present in the southeastern herbaria whose collections I studied. It is probably overlooked by collectors because of its inconspicuous habit and flowers. In view of its questionable taxonomic status, it is hoped botanists will be aware of the need for more extensive flowering and fruiting collections, from both submersed and emersed populations.

## 6. LYTHRUM L.

Perennial, rarely annual, herbs or small shrubs, stems often prominently 4-angled, 1–12 dm tall. Leaves glabrous or rarely pubescent, opposite, alternate, or whorled, ovate to linear, sessile or shortly petiolate, reduced in the inflorescence. Flowers regular or nearly so, homomorphic or heteromorphic with styles and stamens of 2 or 3 lengths, 6-merous, axillary, 1 or 2 at a node or in terminal spikes; pedicels bibracteolate. Floral tube cylindrical, greenish, 8–12-nerved, 4–8 mm long; calyx lobes alternating with appendages; petals 6, rose-purple, purple, pink, or white, deciduous; stamens 6 or 12; ovary 2-locular, with or without a thickened ring at the base; capsule septicidal or septifragal. Seeds many, small, ovoid.

1. Flowers solitary or paired in the axils; stamens usually 6.
  2. Leaves mostly opposite along the entire stem, mostly shorter than the internode above.
    3. Leaves oblong, base obtuse; stems short, 1–4 dm tall, several from a creeping rhizome . . . . . 1. *L. flagellare*
    3. Leaves linear to narrowly lanceolate, base attenuate; stems tall, 3–15 dm, slender, wand-like . . . . . 2. *L. lineare*
  2. Leaves mostly alternate, generally only the lowermost opposite, the middle and upper ones alternate, mostly longer than the internode above.
    4. Branch leaves distinctly, abruptly reduced in size from stem leaves, openly spaced on branches; appendages and calyx lobes equal in length . . . . . 3. *L. curtissii*
    4. Branch leaves gradually reduced in size from stem leaves, crowded and overlapping in inflorescence; appendages 2x the length of the calyx lobes . . . . . 4. *L. alatum*
1. Flowers numerous in showy terminal spikes; stamens usually 12.
  - . . . . . 5. *L. salicaria*

In the most recent treatment of *Lythrum* in the United States (Shinners, 1953) at least seven, possibly eight, species are reported to occur in southeastern United States. My studies of the genus, including examination of type material not seen by Shinners, suggest that there are five species of *Lythrum*, one comprising two varieties, in the area covered by the proposed *Vascular Flora*.

1. *L. FLAGELLARE* Shuttl. ex Chapm.—Slender, herbaceous perennial with several erect to decumbent stems arising from a woody creeping rhizome, 1–4 dm tall; stems nearly terete, sparsely branched. Leaves strictly opposite, sessile or subsessile, oblong to obovate, 5–13 mm long, 2–6 mm wide, scarcely or not at all reduced in the inflorescence, the apex and base rounded. Flowers solitary, dimorphic; pedicels 0–1.5 mm long. Floral tube 4–5 mm long, gradually widening toward the distal end; appendages about 2× the length of the calyx lobes; petals pale purple to purple, 3–4 mm long; hypogynous ring 0.5 mm tall and 0.5 mm wide. Spring. Wet places; cp. Fla. Infrequently collected endemic, known from Collier, Hendry, Lee, Manatee, Okeechobee, Orange, and Sarasota counties.

This rare Florida endemic is distinguished by short stems from a creeping rhizome and small, oblong, strictly opposite leaves which are scarcely reduced in the inflorescence. The species is very closely allied to the widespread Mexican *L. acinifolium* (DC) Koehne, differing in growth habit and size of stems and lower leaves. Both species are perennial from a creeping rhizome. Stems of *L. acinifolium* tend to be woody and erect with at least some stems up to 7 dm tall. Stems of *L. flagellare* are less woody, up to 4 dm tall and often decumbent. Lowermost leaves of *L. acinifolium* tend to be somewhat larger than in *L. flagellare*. The species cannot be separated by floral morphology. A definitive statement of their relationship awaits an understanding of the range of variability in the Mexican species.

2. *L. LINEARE* L.—Perennial with basal offshoots, the stems slender, wand-like, the upper portion of the plant much branched, 3–15 dm tall. Leaves of stems and inflorescence mostly opposite, narrowly linear to lanceolate, sessile, 5–40 mm long, 1–4 mm wide, mostly shorter than the internode above, slightly fleshy. Flowers paired in the axils, oriented nearly parallel to the stem, dimorphic; pedicels 0.5–1.5 mm long. Floral tube 3–5 mm long; calyx lobes and appendages subequal in length; petals pale purple or white, 3–4 mm long; basal stipe of ovary scarcely or not at all thickened into hypogynous ring, abaxial and adaxial sides of the stipe 0.5 mm tall. ( $n=10$ ) Summer. Brackish marshes; cp. SE.

The species is tall, slender, with narrow, linear, opposite leaves which are mostly shorter than the internode above. The petals are pale purple to white and often shorter than the floral tube. The ring at the base of the ovary is not at all thickened, as it is in all other native species of *Lythrum* in the Southeast. *Lythrum lineare* has a more open, less coarse aspect than does *L. alatum* var. *lanceolatum* (Ell.) Rothrock, a species with which it

may grow and is occasionally confused. The species is very strictly distributed in brackish waters of the coastal plain from Delaware in the north (possibly north to Long Island, fide Fernald, 1950, though I have seen no specimens from there), south to southernmost Florida and west into Louisiana. It is not known from Texas, as reported by Fernald (1950), collections so labeled representing either *L. alatum* var. *lanceolatum* or *L. californicum* S. Wats. A possible hybrid with *L. curtissii* (see the following species) has been collected in Georgia.

3. *L. CURTISSII* Fernald—Slender, much branched perennial, 5–10 dm tall, stems 4-angled; branches numerous, short, ascending, flexuous, highly floriferous. Leaves thin, yellow-green, oblong to elliptic, the apex obtuse or acute, the base tapering, the lower leaves mostly opposite, the middle and upper ones mostly alternate, sessile or subsessile; stem leaves 20–75 mm long, 5–15 mm wide; branch leaves distinctly and abruptly much reduced, 3–15 mm long. Flowers mostly solitary, often oriented at a 45–90° angle with the stem, dimorphic; pedicels slender, 0.5–1.5 mm long; bracteoles present at the top of the pedicel. Floral tube 3–6 mm long, the distal end and nerves often purple-tinged; calyx lobes and appendages  $\pm$  equal in length; petals deep to pale purple with darker central vein, 2 mm long; hypogynous ring 0.5 mm tall. ( $n=10$ ) Summer. Wet places, rare; cp. Fla, Ga. Endemic known from Calhoun and Miller Co., Ga. and Gadsen, Liberty, and Franklin counties, Fla.

A species with slender, flexuous, pyramidal ascending branches and many small delicate flowers, it is a rare endemic of southwestern Georgia and adjacent counties in Florida. Besides its unique habit, it is distinguished by having main stem leaves distinctly larger than the branch leaves and purple petals generally only 2 mm long. A specimen suggestive of both *L. curtissii* and *L. lineare* has been collected at or near the type locality of *L. curtissii* (Kral 28630, VDB). It is a plant with linear leaves, alternate on the upper stem and gradually decreasing in size toward the summit, leading it to be keyed with difficulty to *L. lineare*. The flowers tend to be held more erect than is typical of *L. curtissii* and are at the large end of the size range for that species with petals 4–5 mm long as opposed to 2 mm in typical *L. curtissii*. However, the petals are of the deep purple hue characteristic of *L. curtissii* rather than pale as in *L. lineare*, the appendages are longer than found in either species, and a hypogynous ring, normal in *L. curtissii* but lacking in *L. lineare*, is present. *Lythrum lineare* is not known to occur as far inland as Calhoun Co., Ga. Both species are known from Franklin Co., Fla., but no evidence of hybridization has been noted in collections from that county.

4. *L. ALATUM* Pursh—Perennial herb with basal offshoots, the stems slender to robust, up to 1 m tall, virgate, the upper part of the plant much branched. Leaves dark green above, green to gray-green beneath, sessile, ovate to oblong with rounded to subcordate base or lanceolate with tapering base, the lower stem leaves opposite to mostly subopposite, 10–76 mm long,

2–14 mm wide, the middle and upper leaves subopposite to mostly alternate, reduced in size, crowded and overlapping on the branches. Flowers solitary, axillary, held nearly erect, bibracteolate on pedicels 1–3 mm long, dimorphic, with either style or stamens exerted. Floral tube 3–7 mm long, green; appendages ca.  $2\times$  the length of the calyx lobes; petals purple, 2–6.5 mm long; thickened hypogynous ring present at the base of the ovary, narrowed on the ventral (abaxial) side. ( $n=10$ )<sup>2</sup> Summer. Wet soils, ditches, thickets; all prov. SE /All/ Common throughout eastern and central US. The more robust southern plants with lanceolate leaves and tapering leaf bases are referred to var. *lanceolatum* (Ell.) T. & G. ex Rothrock. *L. lanceolatum* Ell.—F, R, S.

Most widespread of the United States species of *Lythrum*, *L. alatum* has been divided by various authors into as many as four species. Shinnars (1953) recognized as present in the Southeast *L. alatum*, *L. lanceolatum*, *L. dacotanum* Nieuwl., and provisionally *L. cordifolium* Nieuwl. He considered *L. alatum* and possibly *L. cordifolium* as rare southeastern endemics and felt that the epithet *alatum* had been incorrectly applied to the common midwestern plants that he referred to *L. dacotanum*. Floras treating southeastern United States or adjacent areas have recognized *L. alatum* and *L. lanceolatum* as distinct species (Fernald, 1950; Small, 1933; Radford, Ahles, and Bell, 1964), as varieties of a single species (Torrey & Gray, 1840; Gleason & Cronquist, 1963; Long and Lakela, 1971), or have followed Shinnars' taxonomic and nomenclatural interpretations (Blackwell, 1970; Correll and Correll, 1972). The taxa have been distinguished primarily on the basis of leaf shape, secondarily by quantitative (though overlapping) differences in leaf size and floral tube and petal length, and by position of the bracteoles on the pedicel.

*Lythrum* is considered a notoriously difficult genus due to the vegetative variability within a species and the superficial similarities among the species. In addition, introgression appears to occur in areas of sympatry, further blurring species distinctions. Analysis of the variability in this widespread complex centering around *L. alatum* was conducted as a basis for defining the number of species or infraspecific taxa present in the Southeast. Approximately 200 specimens were selected from collections spanning the entire range of all species involved and were scored for leaf shape (by tracings of the longest leaf), and for leaf length and width, floral tube and petal length, and bracteole position. Type material of *L. alatum*, *L. dacotanum*, *L. cordifolium*, and *L. lanceolatum* (using a photograph of the type) was included in the study.

To more easily observe any clinal changes that might be present, I divided the specimens into ten geographical areas. On the basis of the most conspicuous and easily determined character, leaf base shape, the areal bound-

<sup>2</sup> A published count of  $n=5$  (Smith, E. B., 1963 in Madroño 17:117) has been corrected to  $n=10$  based on material from the same locality (R. Ornduff, pers. comm., 1974).

aries were drawn to include all plants with round to subcordate-based leaves (*L. alatum* of most authors) in areas 1–5 and plants with tapering leaf bases (*L. lanceolatum* of several authors) in areas 6–10. These two major categories were also compared with each other (Fig. 1; Tables 1 and 2).

Although *L. alatum* is dimorphic in stamen and style length, no other gross morphological differences were correlated with this condition. Long-styled and short-styled plants both showed the same variability in the features measured and so were not considered separately in the survey.



Fig. 1. Variability in leaf shape throughout the range of *Lythrum alatum*. Outline tracing of actual longest leaf on each plant examined with groups 1-10 selected to represent total diversity in shape for each area. Leaf tracings from type material of *L. alatum*, *L. cordifolium*, *L. lanceolatum*, and *L. dacotanum* are indicated by the letters A, C, L, and D, respectively. Geographical limits of areas 1-10 are listed in Table 1.

Table 1. Variability in selected characters of *Lythrum alatum*, arranged according to the following geographic areas. 1. Maine-W. Va, 2. Ohio, Mich, Ind, Ill, Wis, 3. Minn, N & S Dak, N. Okla, 4. Ia, Mo, N. Ark, 5. Ky, Tenn, N. Ala, N. Ga, 6. Va-S. Ga, 7. Fla, 8. S. Ala-Miss, 9. La-S. Ark, 10. Tex-S. Okla. n=number of plants scored.

Character	Area	n	min-max	mean	standard deviation
Leaf length/width	1	3	3.7 - 4.7	4.4	0.58
	2	6	3.6 - 7.0	5.2	1.5
	3	10	2.1 - 7.3	3.9	1.4
	4	6	2.8 - 6.7	4.2	1.3
	5	7	2.6 - 5.3	4.0	1.1
Totals	1-5	32	2.1 - 7.3	4.3	1.3
	6	8	2.5 - 8.4	5.9	2.2
	7	7	4.5 - 8.5	5.7	1.3
	8	6	4.2 - 8.8	6.3	1.9
	9	8	2.8 - 12.5	6.5	3.2
	10	5	3.6 - 9.0	5.3	2.2
Totals	6-10	34	2.5 - 12.5	6.0	2.2
Longest floral tube length, mm	1	6	5.0 - 6.0	5.3	0.42
	2	19	4.0 - 6.0	5.4	0.58
	3	19	5.0 - 7.0	5.5	0.56
	4	12	4.0 - 6.0	5.0	0.55
	5	17	4.5 - 6.0	5.1	0.39
Totals	1-5	73	4.0 - 7.0	5.3	0.51
	6	20	4.0 - 6.0	4.7	0.62
	7	22	4.0 - 6.0	4.8	0.57
	8	21	3.0 - 7.0	5.2	1.10
	9	20	4.0 - 6.0	4.7	0.62
	10	7	4.0 - 6.0	5.0	0.76
Totals	6-10	88	3.0 - 7.0	5.0	0.72
Longest petal length, mm	1	4	4.0 - 6.0	5.3	1.0
	2	19	4.0 - 6.5	4.8	0.82
	3	19	3.0 - 6.0	4.8	0.76
	4	12	3.0 - 6.0	4.6	0.88
	5	14	3.0 - 5.0	3.9	0.73
Totals	1-5	68	3.0 - 6.5	4.6	0.87
	6	18	2.0 - 5.0	3.9	0.92
	7	19	2.0 - 5.0	3.9	0.72
	8	18	2.0 - 5.5	4.1	0.92
	9	15	3.0 - 5.5	4.2	0.56
	10	5	4.0 - 5.0	4.4	0.54
Totals	6-10	75	2.0 - 5.5	4.0	0.79

Table 2. Bracteole position on pedicels of *Lythrum alatum*, arranged according to geographical areas listed in Table 1.

Area	No. of Plants with Bracteole Position at		
	Base	Mid	Upper
1	7	3	4
2	15	0	3
3	9	2	8
4	9	0	3
5	7	3	4
	47	8	22 = 77
% of total	61%	10%	29%
6	4	2	17
7	3	1	17
8	7	3	28
9	6	9	28
10	1	1	5
	21	16	95 = 132
% of total	16%	12%	72%

The most obvious differences among the specimens lie in the leaves. After the leaf shape of the longest leaf of each specimen was traced the leaf tracings (Fig. 1) were selected to provide a picture of the leaf variability within each area and a tracing representative of the extremes and middle of the geographic range for each area. Shinnars' distinctions, based on leaf length/width ratios between *L. lanceolatum* and *L. dacotanum* ( $4-15\times$  as long as wide) and his *L. alatum* ( $1\frac{1}{2}-3\frac{1}{2}\times$  as long as wide) are not maintained, these ratios also being found throughout most of the range of *L. alatum* (Fig. 1). Ovate to oblong leaves with rounded bases are typical of northern and midwestern plants while plants of the south have lanceolate leaves with tapering bases. No clinal differences can be recognized in this character since round-based ovate leaves broadest at the base become lanceolate in shape when there is a change to tapering base, the broadest width being transferred upward toward the middle of the leaf. There is considerable overlap in leaf length/width ratios of the two major areas, north and south (Table 1). The lanceolate leaves tend to be longer and narrower than ovate leaves but more variable, and there is no gradual shift to longer, narrower leaves from north to south.

For floral tube and petal length the maximum size on each specimen was recorded (Table 1). Floral tubes and petals of the northern and central plants tend to be slightly larger than those in the south, but the differences are scarcely significant taxonomically. Again, there is no clinal change in size of either character.

*Lythrum alatum* is said to have bracteoles at the base of the pedicel and

*L. lanceolatum* to have bracteoles on the upper half of the pedicel. In the northern areas (1–5) 61% of the plants examined had bracteoles positioned at the base of the pedicel (Table 2). In southern areas (6–10) the position is reversed with 72% of the plants scored having bracteoles on the upper part of the pedicel just below the floral tube. Although there is a significant difference in this character between plants of the north and south, its practical value in identification of individual specimens is limited by its variability. Again, there is no obvious shift in bracteole position in a clinal manner from north to south.

For the five characters examined only leaf shape provides a definitive taxonomic character. The other four characters are too similar to be utilized in identification and are certainly too similar to provide a basis for recognition of more than one species.

Greenhouse-grown plants provided two additional taxonomic features not always evident on herbarium specimens. Plants representing populations of *L. alatum* from six states grown under uniform conditions showed marked differences in stature and production of winter shoots. The southern plants i.e., those from Mississippi, Arkansas, and Texas, were taller with sturdier, more substantial stems than those from Kansas, Michigan, and Ohio. Herbarium specimens of the southern plants most often have a single main stem while specimens from the northern and central states most often have several slender stems closely arising from an enlarged rootstock. Stature correlates with shape of the leaf base. The robust, tall plants all have tapering leaf bases, and the shorter, slender-stemmed plants have rounded to cordate-based leaves.

A second feature, the production of prostrate, dark green, somewhat fleshy winter shoots, does not appear to be correlated with leaf base type. The shoots develop from the rootstock or from buds on the lower portions of older stems as the aerial stems die or become dormant. In the greenhouse, winter shoots are maintained into the spring when buds on the erect dormant stems begin growth. The shoots apparently do not become erect or persist into the summer but may give rise to new erect stems by rooting nodally and internodally where they contact the soil. Greenhouse grown plants from Kansas (with cordate-based leaves), Texas, Arkansas, and Mississippi (all with lanceolate leaves) display winter shoots; those from Michigan and Ohio do not. Production of winter shoots may be a genetically-based response to moderate climatic conditions.

The evidence presented in this study supports recognition of only one species in the *L. alatum* complex in the Southeast, with two varieties defined primarily by stature, leaf shape, and geographical range. The following nomenclatural notes, partial synonymies, and distribution map for *L. alatum* are based on specimens from the herbaria listed in the acknowledgments. They are not meant to be complete with respect to the species as it occurs beyond the range of the southeastern flora, as in the Caribbean region. The

few synonyms not included represent later names and hence their absence is of no nomenclatural consequence with respect to this primarily floristic study.

*Lythrum alatum* Pursh, Fl. Am. Sept. 1: 334. 1814. Type: "In Lower Georgia. Enslen. June. July. v.s. in Herb. Enslen." (W!; possible isotype, W!) Fig. 2, a & b. The holotype of *L. alatum* Pursh at Vienna bears the epithet in the author's own hand, as attested to on the holotype by Prof. Joseph Ewan, who has made a thorough study of the work of Frederick Pursh (Ewan, 1952). The holotype and possible isotype are typical of the northern and midwestern plants of this species with ovate, round, or cordate-based leaves. The leaves of the holotype, described by Pursh as subcordate and opposite, are primarily alternate, though the lowermost leaves, which are often opposite in *Lythrum*, are lacking on the type. In size and shape the leaves fall within the variability displayed by the complex (see Fig. 1, area 5). The flower length of 5 mm also lies within the range of the complex. On the basis of morphology there is no doubt that the epithet *alatum* was correctly applied by Torrey & Gray and later authors and should not be reserved for an unknown rare endemic of coastal or southern Georgia as has been suggested (Shinners, 1953).

The exact geographical location of the type locality, recorded by Pursh as "Lower Georgia," is unknown. According to Ewan (1955) "we can learn little from the specimens as to Enslen's route in the South for there are no localities on the form labels." Any part of the state that could be considered "Lower Georgia," interpreted by Shinners as coastal or southern Georgia, lies outside the present range of the cordate-leaved *L. alatum*. That the plant could actually have come from the northwestern corner of Georgia, within its present-day boundaries, is very remote. Early maps of Georgia (Lewis, 1805; Low, 1810) show only two major trails through only a part of the area, that part of Georgia being firmly in control of the Cherokees until the 1830s (L. DeVorse, Univ. Ga., Dept. of History, pers. comm., 1974). Ewan (pers. comm., 1974) suggests the possibility that the specimen was collected by John Lyon in the vicinity of Augusta, Georgia, in June 1803 and subsequently shared with Aloysius Enslen. Pursh apparently saw Enslen's collections in Philadelphia (Fl. Am. Sept., p. 12). The Enslen herbarium subsequently was acquired by the Vienna Botanical Museum in 1822.

Two other collections of cordate-leaved *L. alatum* are known from outside the apparent present range. One is an 1898 collection of A. S. Hitchcock from Citrus Co., Fla (MO, Fig. 3). The other is the type collection of *L. cordifolium* Nieuwl., S.B. Buckley s.n., no date, "N.C. to Ga. & Fla." (holotype, US!) or more specifically "Florida" (isotypes, NY, GH!) Both the Hitchcock and Buckley collections have unusually small leaves for *L. alatum*, but the flowers are identical to those of *L. alatum*. The basal parts and lower leaves are lacking on all the specimens. Difference in leaf size alone is not a sufficient basis for considering *L. cordifolium* as a species apart from *L. alatum* in view of the variability of this character in the species



Fig. 2. a. Photograph of type of *Lythrum alatum* Pursh (W), b. Closeup of flowering branch of the type.



LYTHRACEAE  
 42, 1892  
*Lythrum venustum* Pursh  
 21, 1892, 1892  
 Dr. J. M. Coulter Feb. 1892

*Lythrum venustum*  
 Lythrum venustum  
 Amer. bot. Exsicc.  
 Lythrum venustum (Pursh) DC.

**Typus**

a.

and in the genus as a whole. *Lythrum cordifolium* is regarded here as synonymous with the typical variety of *L. alatum*. The disjunct occurrence of these cordate-leaved specimens in Georgia and Florida would seem to indicate either that the range of this variety was once more extensive than it is at the present time, or that plants of this type occasionally are introduced into areas beyond the principal range. That the Hitchcock and Buckley specimens occur at the extremity of the species range may account for their unusually small leaves. It is of interest to note here that the range of a species very closely related to *L. alatum*, *L. californicum* S. Wats., has been severely restricted in northern California in recent years by man's activities and is now rare except for a few areas in southern California (Ornduff, pers. comm., 1974). Possibly *L. alatum* var. *alatum* has been eliminated from the southeastern coastal plain for the same reasons.

*Lythrum dacotanum* is also relegated to synonymy, the type represented by a robust, cordate-leaved specimen scarcely differing from the type of *L. alatum* except in its larger leaf size.

4a. LYTHRUM ALATUM Pursh var. ALATUM. *L. cordifolium* Nieuwl., Am. Midl. Nat. 3: 265-266. 1914. Type: N.C. to Ga. & Fla., S. B. Buckley s.n. (US no. 48371!; isotypes, GH!, NY), non *L. cordifolium* Sessé & Moc., 1888. *L. dacotanum* Nieuwl., Am. Midl. Nat. 3: 266-267. 1914. Type: Sioux Falls, S.Dak., Aug 1892, J. J. Thornber s.n. (US no. 240979!; isotype, US no. 516395!) The nominal variety is distinguished from var. *lanceolatum* by its generally slender stems up to 8 dm tall and ovate to oblong leaves with subcordate to rounded leaf bases. ( $n=10$ ) All prov. Ark, Ala, Ga, Miss, Tenn, Ky, WV, Va.<sup>3</sup> /All, except Tex/

*Lythrum alatum* var. *alatum* is incorrectly recorded as occurring in Louisiana and Texas (Fernald, 1950) and north-central Texas and the Texas panhandle (Correll and Johnston, 1970). These plants are, for the most part, *L. californicum*, which also has rounded leaf bases but linear-lanceolate, slightly fleshy, glaucous leaves, or *L. alatum* var. *lanceolatum*, or possibly hybrids or introgressants of the two. Probable hybrids of *L. alatum* var. *alatum* and *L. californicum* have been collected in northern Oklahoma and southwestern Kansas. *Lythrum californicum* and *L. alatum* are obviously closely related as indicated by the similar morphology and apparent ability to interbreed. A study of *L. californicum* in western United States and Mexico is needed to determine if its specific rank is justified or if it should be included within the *L. alatum* complex.

4b. LYTHRUM ALATUM var. LANCEOLATUM (Ell.) T. & G. ex Rothrock in G. M. Wheeler, Rept, U.S. Geographical Surveys West of the 100th Meridian, VI-Botany: 120. 1879. *L. lanceolatum* Ell., Sketch. 1: 544-545. 1821.

<sup>3</sup> An additional southern locality for *L. alatum* var. *alatum* has come to my attention, but I have not seen the specimen. S.B. Jones in Lythraceae for the Mississippi Flora Project (unpublished) cites a single specimen from Desoto Co., which is the northwesternmost county in the state and lies along the southern line of distribution of the variety.



Fig. 3. Verified geographical distribution in the United States of *Lythrum alatum* var. *alatum* with round to cordate leaf bases and var. *lanceolatum* with tapering leaf bases.

Type: "Hab. in humidis. Flor. Jun. Jul." (US photo of type at CHARL!)  
 The variety differs from var. *alatum* by its robust stems up to 1 m tall and the lanceolate leaves with tapering bases. ( $n=10$ ) cp. SE except Md, Del, WV, Ky, Tenn /Tex, Ok/ Also Antilles.

This varietal combination has been attributed to Torrey and Gray but appears never to have been validly published by them. According to Art. 33 of the *International Code of Botanical Nomenclature* (1972) the author must definitely indicate the epithet to be used in that particular combination. Torrey and Gray did not indicate any name to be used in combination with *L. alatum*, but rather described two intraspecific categories, *alpha* and *beta*, and cited after the descriptions the species on which the descriptions were

based. Although *beta* is based on *L. lanceolatum* Ell. the combination is not made specifically. The first citation of the combination is by Gray, Pl. Lind. 6: 188. 1850, but the varietal name is enclosed by parentheses suggesting Gray did not accept the combination. The first validly published combination then was not made until 1879 by J. T. Rothrock.

The variety hybridizes freely with *L. californicum* outside the range of the southeastern flora in central Texas and Oklahoma and possibly also with *L. lineare*. Shinnars (1953) observed specimens from Florida that suggested to him the influence of hybridization of the variety with *L. lineare*. Although their ranges are sympatric along the Atlantic and Gulf Coastal Plains from Virginia to Louisiana I have seen no specimens difficult to place. Hybridization between the two taxa, if it occurs, is probably infrequent. In general the taxa occupy slightly different habitats, *L. lineare* thriving in very wet soils and in brackish waters and hence restricted to the coastal plain, while *L. alatum* var. *lanceolatum* tolerates more variable habitats with regard to water supply and may be found well inland in habitats where water is only seasonally plentiful.

5. *L. SALICARIA* L.—Erect perennial, glabrous to often pubescent, to 12 dm tall. Leaves opposite or whorled, lanceolate, sessile, mostly longer than the internode above, 2–10 cm long, 0.5–1.5 cm wide, the base obtuse to cordate. Flowers in showy terminal bracteate spike-like inflorescences, trimorphic with styles and stamens of 3 lengths. Floral tube 4–6 mm long; appendages 2–3× longer than the calyx lobes; petals 6, rose purple, 7–9 mm long; stamens mostly 12; hypogynous ring absent. ( $n=15, 25, 30$ ) Summer. Marshes, lake and river margins. Rare, WVa, Va, Watauga Co., NC. /Throughout the NE/ Naturalized from Europe.

This attractive early introduction from Europe is common throughout the Northeast but rarely reaches into southeastern United States. The species differs from all other *Lythrum* in the Southeast in having showy, rose-purple petaled flowers whorled in terminal spikes. There is no published record of the chromosome number  $n=20$  cited in Radford *et al.* (1964) and it is presumed to be a typographical error.

#### 7. CUPHEA P.Br.

Annuals or short-lived perennials, 1–6 dm tall with viscid, glandular hairs on stems and flowers. Leaves opposite or whorled, ovate to lanceolate, elliptic or linear, sessile or petiolate. Flowers irregular, 6-merous, 1–3 at a node, often interaxillary, in leafy racemes, the pedicels bibracteolate. Floral tube cylindrical, green or purple and green, distinctly 12-nerved, the base gibbous or spurred; calyx lobes 6, alternating with 6 short appendages; petals 6(–3), pale to deep purple, deciduous; stamens 11, alternately unequal, the 2 upper (adaxial) ones inserted deeper in the calyx tube than the others; ovary subtended at the base by a curved disc; capsule splitting longitudinally the length of the adaxial wall, the upper side of the persistent floral tube also

splitting, the placenta projecting out of the capsule and floral tube; seeds 3–20, dorsio-ventrally flattened. (*Parsonsia* P.Br., S.)

1. Leaves whorled; flowers opposite or whorled on pedicels 5–15 mm long.

. . . . . 1. *C. aspera*

1. Leaves opposite; flowers alternate on pedicels 0–5 mm long.

2. Floral tube green, 4.5–6 mm long, glabrous within; stamens much shorter than the floral tube . . . . . 2. *C. carthagenensis*

2. Floral tube purple-green, 6–10 mm long, villous within; stamens equal to or exceeding the floral tube.

3. Leaves petiolate, 20–55 mm long; stems erect, much branched; upper calyx lobe largest . . . . . 3. *C. viscosissima*

3. Leaves sessile, 7–17 mm long, stems mostly decumbent, unbranched or sparsely branched; calyx lobes equal in size . . . 4. *C. glutinosa*

1. *C. ASPERA* Chapm.—Short-lived perennial, 2.5–4 dm tall, branched, with tuberous roots. Leaves sessile, mostly whorled, linear to lanceolate, 10–25 mm long, 1.5–5 mm wide. Flowers opposite or whorled, 7–9 mm long, pedicels 5–15 mm long; floral tube purple-green, bearing dense, appressed, non-glandular hairs and erect glandular ones, villous within, calyx lobes equal in size; petals 6, pale purple, the upper two largest; stamens equal to or exceeding the floral tube; seeds 3. ( $n=24$ ). Summer. Pine flatwoods; ep. Fla. Endemic, known only from Franklin and Gulf counties, in the vicinity of Port St. Joe and Apalachicola. *Parsonsia lythroides* Small—S.

This is the only species of *Cuphea* in the United States with whorled leaves and opposite or whorled flowers. It is most closely related to the Brazilian *C. hyssopoides* St.-Hil.

2. *C. CARTHAGENENSIS* (Jacq.) Macbr.—Erect or sprawling, much-branched annual, 1–6 dm tall. Leaves opposite, shortly petiolate to subsessile, elliptic, 12–55 mm long, 5–25 mm wide. Flowers alternate, 4.5–6 mm long, pedicels 0–2 mm long; floral tube green, sparsely hispid, glabrous within, calyx lobes equal in size; petals 6, purple, subequal; stamens much shorter than the floral tube; seeds 4–8. ( $n=8$ ) Summer-Fall. Moist sunny ditches and disturbed places; ep. NC, SC, Ga, Fla, Ala, Miss, La /Tex Also Mex-S.Am., Pacific islands. *Parsonsia balsamona* (Cham. & Schlect.) Stand.—S.

The most widely occurring species in the genus, *C. carthagenensis* is probably native to South America but has been reported from the Galápagos Islands, Hawaiian Islands, and as far west as the Fiji and Philippine islands. It is a relatively recent introduction into the United States. Small (1933) records its range as peninsular Florida. The earliest United States collections I have seen are from Onslow Co., N.C., 1923 (*Alexander s.n.*, UNC) and Highlands Co., Fla., 1925 (*Small 12660*, UNC). Collections of the species become much more common after 1950. Many of the early ones are misidentified as *C. viscosissima*.

3. *C. VISCOSISSIMA* Jacq. Clammy Cuphea, Blue Waxweed—Erect, much-branched annual, 1–6 dm tall, often the viscid upper stems purplish red. Leaves opposite, with petioles 3–15 mm long, ovate to mostly narrowly lanceolate, 20–55 mm long, 6–20 mm wide. Flowers alternate, 8–10 mm long, pedicels 1–5 mm long; floral tube deep purple-green, with dense purple viscid glandular hairs, villous within, the upper calyx lobe larger than the others; petals 6, the upper two largest, deep purple; stamens equal to or exceeding the floral tube; seeds 7–10. ( $n=6$ ) Summer-Fall. Pastures, disturbed places; all prov. SE, except Miss, La /All, except Tex/ Also northward to NH, west through central Ohio, Ind, and Ill to Kansas. *Cuphea petiolata* (L.) Koehne—F, G. *Parsonsia petiolata* (L.) Rusby—S.

This species is the most common and widespread *Cuphea* in the United States.

4. *C. GLUTINOSA* Cham. et Schlect.—Short-lived perennial, erect to decumbent, sparsely branched, 1–4 dm tall, the stems and leaves often purple tinged. Leaves sessile, opposite, ovate-lanceolate to oblong, 7–17 mm long, 3–7 mm wide. Flowers alternate, 6–9 mm long, pedicels 0–3 mm long; floral tube purple-green with dense weak non-glandular hairs and sparser glandular ones, villous within, calyx lobes equal in size; petals 3–6, pale purple to purple, subequal or the upper two slightly smaller, early deciduous; stamens equal to or exceeding the floral tube; seeds (6–)8(–10). ( $n=14$ )<sup>4</sup> Spring and Fall. Open woods and pastures, cp. La /Tex/ Also S. Am.

A widespread South American species, first collected in the United States in 1884 in Vermilion Parish, Louisiana. It is now known also from the adjacent parishes of Acadia, Lafayette, and Iberia and from Jackson and Tyler counties, Texas. The species was overlooked by Small and is not included in his *Manual* (1933). It is not included in Correll and Johnston, *Manual of the vascular plants of Texas* (1970).

Occasional specimens of the Mexican *C. procumbens* Gómez Ortega are encountered in eastern United States herbaria. They are, to my knowledge, garden escapes that do not persist.

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<sup>4</sup>The first report for this species is based on meiotic material from the following collection (MICH): La.; Lafayette Parish; ca. 2 mi NE of Milton, Mai 1972, *John Thieret s.n.*

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