

***LYSIMACHIA LEWISII* (PRIMULACEAE):
A NEW SPECIES FROM TENNESSEE AND ALABAMA**

DWAYNE ESTES

Botanical Research Institute of Texas
1700 University Drive
Fort Worth, Texas 76107
destes@brit.org

&

Austin Peay State University
Center of Excellence for Field Biology
Clarksville, Tennessee 37044

JOEY SHAW

Dept. of Biological and Environmental Sciences
The University of Tennessee at Chattanooga
Chattanooga, Tennessee 37403-2504

CHRIS MAUSERT-MOONEY

Austin Peay State University
Center of Excellence for Field Biology
Clarksville, Tennessee 37044

ABSTRACT

Lysimachia lewisii D.Estes, J.T. Shaw, and C. Mausert-Mooney **sp. nov.** (Lewis's yellow loosestrife), a new rare southeastern USA endemic, is described from central Tennessee and northern Alabama, where it is known from just three counties. This species has been confused in the past with *L. tonsa*, *L. hybrida*, and *L. lanceolata* but is probably most closely related to *L. tonsa*, *L. quadriflora*, and *L. radicans*. It grows in dry oak-hickory woodlands on ridges and upper slopes in dry, cherty, acid soils. A key is provided to differentiate this species from the other members of *Lysimachia* subg. *Seleucia* of Alabama and Tennessee.

In the past decade, several new plant species have been described from Tennessee (Wofford 2006; Estes & Small 2007; Estes & Beck 2011; Estes 2012; Estes 2013; Floden 2013; Schilling et al. 2013) and adjacent northern Alabama (Kral 1987; Simmers & Kral 1995; Sorrie et al. 2013). Currently more than a dozen undescribed species await description in Tennessee alone. Some of these discoveries were made while studying herbarium specimens and conducting fieldwork in conjunction with the development of the *Guide to the Vascular Flora of Tennessee* (Tennessee Flora Committee, in press). In this paper, we present one of these new species. The taxonomic affinities, geographic distribution, ecology, and collection history of this species are discussed.

LYSIMACHIA LEWISII D. Estes, J.T. Shaw, & C. Mausert-Mooney, **sp. nov.** **TYPE: Tennessee.**

Lewis Co.: Meriwether Lewis National Monument off Natchez Trace Parkway, 9.6 km by air SE of Hohenwald, on hiking trail NE of Old Spring, growing on SE-facing mid-slope in hollow that leads to Little Swan Creek, 31 July 2008, *T. Duke 106 with D. Estes* (holotype: APSC; isotypes: FSU, GA, GH, LSU, MO, NCU, NY, TENN, UARK, US, UWAL, VDB) (Figures 1–2).

Lysimachia lewisii is probably most closely related to *L. tonsa* (Alph. Wood) Alph. Wood ex Pax & R. Knuth, *L. radicans* Hook., and *L. quadriflora* Sims as judged by the nature of the cilia confined to the nodal region at the base of opposing leaf bases. It is distinguished from *L. tonsa* by its narrowly

elliptic-lanceolate, arcuate-recurving leaves, 0.5–1.2 cm wide and 4–9 times longer than wide (vs. in *L. tonsa* the leaves are ovate to ovate-lanceolate, non-arcuate, 15–44 mm wide, and 1.5–4.5 times longer than wide). It differs from *L. radicans* in its erect (vs. decumbent) habit, larger flowers and sepals, and preference for dry upland habitats (vs. swamps). It differs from *L. quadriflora* in its wider leaves and prominent petioles and in its upland habitat (vs. linear leaves that are sessile or subsessile, and calcareous wetland or streambank habitat). It differs from *L. lanceolata* Walter by its longer and more conspicuous eciliate petioles (vs. petioles ciliate throughout and onto proximal leaf blade margin in *L. lanceolata*), taller, more branched habit, larger corollas, and lack of rhizomes. It differs from *L. hybrida* Michx. in that its cilia are confined to the nodal region only instead of extending up the proximal half of the petiole, its leaves tend to be widest at the middle (vs. below the middle), and it occurs in dry uplands (vs. open wet meadows, natural ponds, and swamps).

Erect, rarely reclining, perennial herbs, (22–) 36–73 (–92) cm tall. **Roots** simple, fleshy from a small rootstock; rhizomes lacking. **Stems** initially simple but in age developing few to many spreading-ascending branches distally, with (8–) 9–15 (–18) nodes, 6-angled and more or less rhombic in cross-section, the two opposing faces narrower than the other four, each angle distinctly raised forming a narrow ridge, pale reddish-brown and dotted with numerous pale spots, finely granular-puberulent with reddish glands. **Leaves** simple, opposite, petiolate; **petioles** slender, initially flat but becoming narrowly U-shaped in cross section, finely granular-puberulent with reddish glands, opposing petioles somewhat joined at the node by a narrow hyaline flange of tissue bearing small cilia where petiole bases connect at nodes, those at mid-stem (10–) 12–22 (–25) mm long; **leaf blades** narrowly lanceolate, lance-elliptic, to narrowly oblong, and sometimes slightly falcate, those at the stem base wider and shorter relative to cauline leaves and mostly ovate-lanceolate, cauline leaves often bearing reduced leafy stems in their axils giving the appearance of false-whorls, the blades spreading to ascending, flat to broadly U-shaped in cross-section, and often longitudinally recurved or sickle-shaped, (2–) 4–7 (–9) cm long, (0.5–) 0.7–1 (–1.2) cm wide, (4–) 4.8–8 (–9) times longer than wide, 4–8 veined with the veins alternate, reddish or greenish and slightly impressed adaxially and raised abaxially, sparsely covered with small reddish glands but otherwise smooth, margins entire but with a thickened, finely papillose border, bases broadly cuneate to narrowly rounded, leaf apices acute-acuminate, adaxial surfaces green, abaxial surfaces somewhat paler, both surfaces slightly shiny and sparsely covered with small, red, sessile glands. **Flowers** at first solitary in median and upper leaf axils along the main stem but soon developing at the terminus of distal lateral branches in the axils of reduced leaves; the leafy axillary branches have short internodes giving the appearance of congested cymes, the arrangement of the flowers throughout the distal half of the plant gives the impression of an elongated leafy thyrse; **pedicels** slender, ascending, (0.4–) 0.9–2.3 (–3.2) cm long, covered with small red sessile glands; **calyx** 5-lobed, the lobes (4.0–) 5.0–7.0 (–8.0) mm long and (2.0–) 3.0–5.0 (–6.0) mm wide, appearing distinct but actually slightly connate at the base, spreading to slightly reflexed in flower but becoming erect, somewhat campanulate in fruit, lanceolate with acuminate apices, abaxial surfaces concave in fresh material, green, and sparsely covered with red sessile glands, prominently 5-veined with the veins somewhat reddish; **corolla** rotate with 5 bright yellow corolla lobes, (1–) 1.3–2.5 (–3) cm across, the lobes broadly ovate, elliptical, or rarely orbicular, (0.3–) 0.5–0.9 (–1) cm long and (0.3–) 0.4–0.7 (–0.8) cm wide, margins irregularly and somewhat raggedly serrate-dentate, apices acute, round, or truncate into the abruptly short-caudate apex, bases rounded into broad claw-like bases before becoming connate at the very base, veins of corolla lobes numerous and straight, abaxial and adaxial surfaces glandular-puberulent, the base of the adaxial surface of the corolla lobes raised forming a densely glandular and reddish 5-lobed nectary, the apex of each nectary lobe bearing a narrowly ovate staminodium, (0.2–) 0.3–0.7 (–1.0) mm long; **stamens** 5, each alternating with the staminodia and opposite the corolla lobes; **filaments** pale yellowish and glandular, (2–) 2.5–4.6 (–6) mm long; **anthers** 5, basifixed, pale creamy yellow, (3–) 3.2–5.9 (–8) mm long; **pollen** cream to white; **pistil** green, (0.4–) 0.5–0.8 (–1.2) mm long, **ovary** green and glabrous, (0.2–) 0.3–0.6 (–0.9) mm high and (0.1–) 0.1–0.3 (–0.5) mm wide, **style** pale green, (2.0–) 3.0–6.0 (–8.0) mm long, **stigma** scarcely

differentiated from style, 0.1–0.3 (–0.4) mm long. **Capsules** globose, brown at maturity, style withering. **Seeds** 10 per capsule, ovoid, sharply trigonous in cross section, finely honeycomb reticulate, surface reddish-brown, the raised walls of the reticulations whitish, giving the seed a reddish-frosted appearance, 1.5–2.0 mm long and 1.0–1.4 mm wide. **Chromosome number** unknown. **Common Name** Lewis's Yellow Loosestrife.



Figure 1. Holotype of *Lysimachia lewisii*.

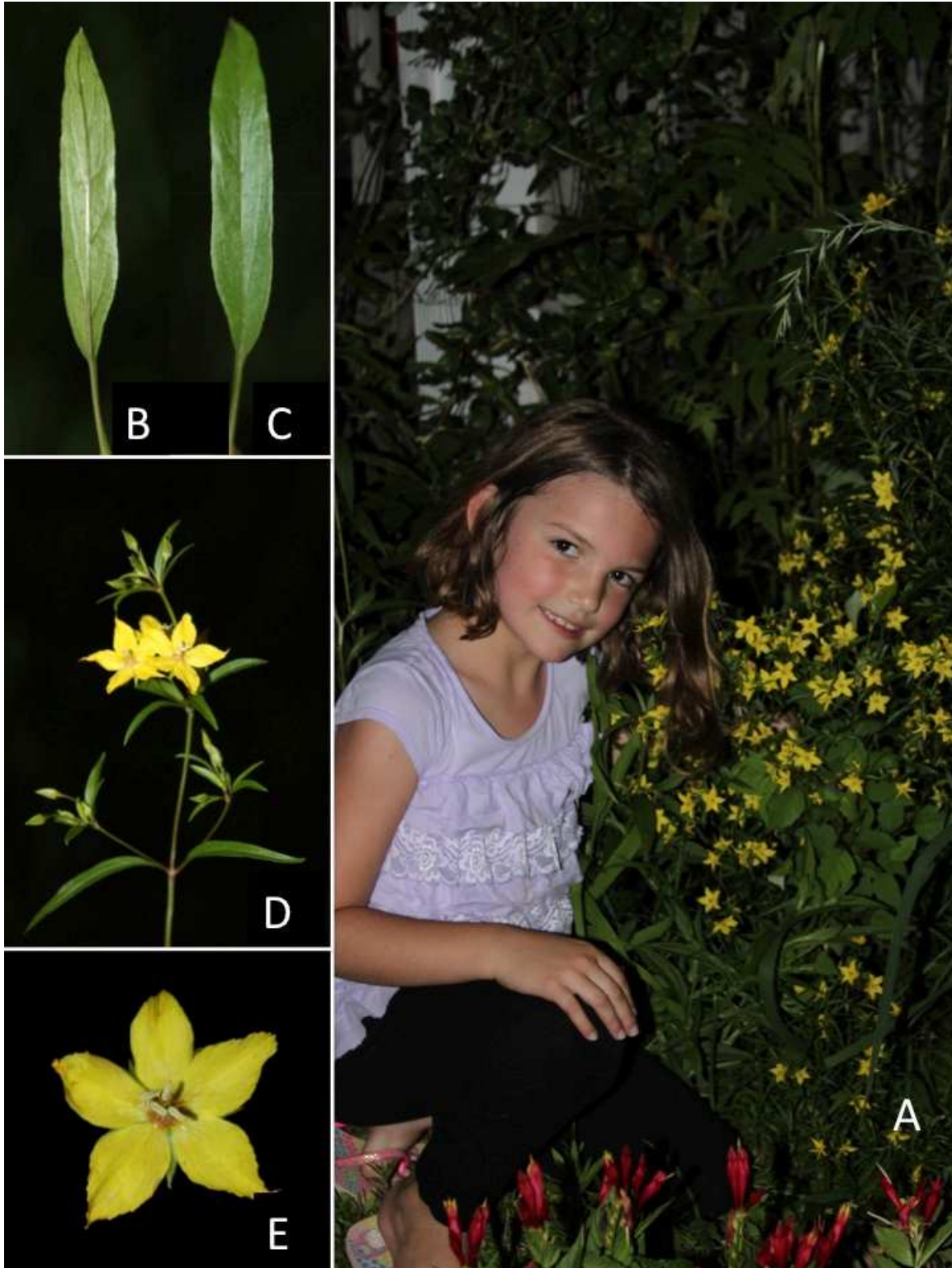


Figure 2. Photographic plate of *Lysimachia lewisii*. A. Habit of plant in first author's (Estes) garden. This plant is approximately 1 m tall, which is similar to that of plants in the wild. B-C. Mid-cauline leaves showing abaxial and adaxial surfaces, respectively. D. Portion of upper flowering branch; note recurving leaves. E. Flower adaxial view; note ovate corolla lobes with acuminate apices.

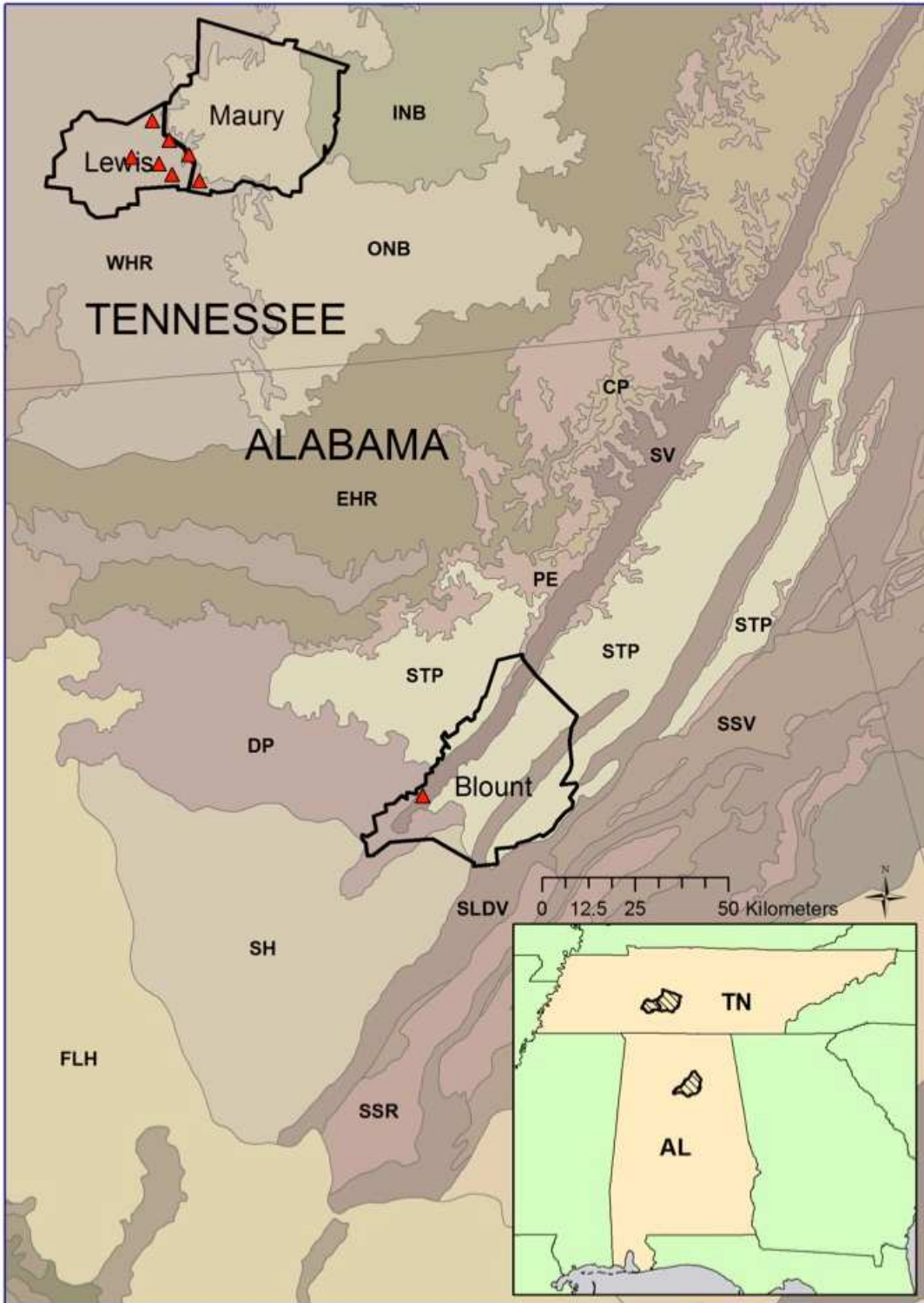


Figure 3. Known distribution of *Lysimachia lewisii* in relation to EPA Level IV Ecoregions. CP = Cumberland Plateau; DP = Dissected Plateau; EHR=Eastern Highland Rim; FLH = Fall Line Hills; INB = Inner Nashville Basin; ONB = Outer Nashville Basin; PE = Plateau Escarpment; SH = Shale Hills; SLDV = Southern Limestone and Dolomite Valleys; SSR = Southern Sandstone Ridges; SSV = Southern Shale Valleys; STP = Southern Table Plateau; SV = Sequatchie Valley.

Additional collections examined. **Tennessee.** Lewis Co.: Meriwether Lewis National Monument, Natchez Trace Parkway, roughly 6.5 mi SE of Hohenwald, 15 Jun 1946, *King 379* (US); "The Farm" swim hole along Cox Branch just upstream from confluence with Cow Pen Branch, 6.6 km by air NNW of Summertown, 14 Jul 2008, *Duke 62* with Estes (APSC); Meriwether Lewis State Park, TN, Natchez Trace Parkway, 7 mi E Hohenwald, 22 Jun 1982, *Carter 3072* (VDB); Natchez Trace Parkway, 4.6 mi NE Jct US 412, 1 Jun 1991, *Kral 78900* (VDB); Natchez Trace Parkway, Devil's Backbone, 14.7 km by air NE of Hohenwald, 31 Jul 2008, *Duke 89* with Estes (APSC, NCU, TENN, VDB); Big Swan Creek, 17 Jun 2003, *Bailey s.n.* with McCoy and Bowen (TENN); Cathey's Creek approximately 2.5 mi West of Maury Co. line on N. side of the creek, 27 Jun 1998, *Estes 00216* (TENN); Cathey's Creek Road, 16.7 km by air NE Hohenwald, 17 Jul 2008, *Duke 63* with Estes and Bailey (APSC); Langford Branch on Route 99, 6 Jun 1981, *DeSelm s.n.* (TENN); 8.3 km by road E of Gordonsburg, 0.5 km W of jct. of US Hwy 412 with Ridgetop Rd., headwaters area of Langford Branch, 14 Jul 2008, *Duke 60* with Estes (APSC, EKY, NCU, TENN, VDB); Overhead Bridge Road, 3.9 mi NW Mount Joy on N side of Overhead Bridge Road, 18 Jul 2008, *Duke 50* with Estes and Bailey (AMNH, APSC, NCU, TENN, UWAL, VDB); Ridgetop Road, 15.5 km by air ENE of Hohenwald, 17 Jul 2008, *Duke 41* with Estes and Bailey (APSC, GA, MISS, MO, NCU, TENN, UWAL, VDB, VPI); Walton Road, 6 km S by air from Hampshire (Maury Co.), just W of jct. of Walton Rd. and Baptist Branch Rd, 31 Jul 2008, *Duke 66* with Estes (APSC, VDB); Tiger Bennett Road, 15.1 km by air ESE of Hohenwald, 31 Jul 2008, *Duke 74* with Estes (APSC, FSU, NCU, TENN, UARK, VDB); Holloway Road, 3.7 km by air NE of Summertown, 31 Jul 2008, *Duke 73* with Estes (APSC). Maury Co.: by US 43, at first summit above Rockdale, 27 Jul 1972, *Kral 47836* (TENN, VDB); same site, 26 Jun 1970, *Kral 39749* (VDB); Brandon Lane, 5.3 km by air mi NW of Mount Joy on E side of Brandon Lane, 31 Jul 2008, *Duke 84* with Estes (APSC, JSU, NCU, UWAL, TENN, VDB); Baptist Branch Road, 5.3 km by air S of Hampshire, 31 Jul 2008, *Duke 67* with Estes (AMNH, APSC, NCU, TENN, UWAL, VDB); Stillhouse Hollow Falls State Natural Area, 5.1 km by air NE of Summertown, 14 Jul 2008, *Duke 57* with Estes (APSC, VDB); Rattlesnake Falls, 5.1 km by air ENE of Summertown, 14 Jul 2008, *Duke 64* with Estes (APSC); Rattlesnake Falls, 22 Jun 2000, *Estes 00756* with Chester (TENN). **Alabama.** Blount Co.: 2.5 air mi SW of Blount Springs, along US 31, 26 Jul 1997, *Keener 266* (UNA) with Haynes and Ginzburg.

Etymology

The epithet *lewisii* is chosen to honor renowned early American explorer Meriwether Lewis (1774-1809), famous for co-leading the Lewis and Clark Expedition. The type locality of *Lysimachia lewisii* is located very near to where Lewis died mysteriously in 1809 along the Natchez Trace. Today the site is part of the Meriwether Lewis National Monument just off the Natchez Trace Parkway and is owned and managed by the US National Park Service. Lewis County, formed in 1843, was named in honor of Lewis. *Lysimachia lewisii* is nearly endemic to Lewis County with more 90 percent of the known occurrences restricted to the eastern third of the county.

Phenology

Lysimachia lewisii flowers from May to August with fruits developing from July to September.

Distribution and Ecology

Lysimachia lewisii is nearly endemic to the dissected uplands of the Western Highland Rim of south-central Tennessee and the Cumberland Plateau of northern Alabama (Figure 3). In Tennessee it is restricted to eastern Lewis County (headwaters region of Langford Branch, Big Swan Creek, Little Swan Creek, Cathey's Creek, and Big Bigby Creeks) and extreme southwestern Maury County (headwaters of Falls Creek and Big Bigby Creek). Searches in nearby portions of Giles, Hickman, and Lawrence counties have not been successful. Given the very narrow range of *L. lewisii* in Tennessee, it was quite surprising to discover herbarium specimens documenting its collection 175 km to the south in Blount County, Alabama. The Alabama populations are found in the drainage of the Mulberry Fork of the Black Warrior River in the Dissected Southern Cumberland Plateau Ecoregion (Griffith et al. 2001).

Tennessee populations are associated with xeric to submesic, acidic, oak-hickory woodlands and forests (Fig. 4) developed over Mississippian-aged Fort Payne chert and are within the Western Highland Rim Ecoregion (Griffith et al. 1998), part of the Interior Low Plateaus Physiographic Province. Tennessee populations occur at elevations ranging from 267-320 meters above sea level. The single known Alabama population occurs on a dry, acidic, forested, upper slope similar to that of Tennessee populations. The geology at the Alabama site is also of Mississippian age but the population occurs at or near the contact zone between the Fort Payne chert and the Hartselle sandstone at an elevation of approximately 160 meters above sea level.



Figure 4. Typical dry woodland habitat of *Lysimachia lewisii*, near Rattlesnake Falls, Maury County, Tennessee. Photo by Dwayne Estes, 17 May 2011.

Many of the known populations of *Lysimachia lewisii* occur in relatively closed oak-hickory forests. Under these conditions this species is usually quite rare with low population density and few individuals restricted to light gaps or trails. The largest populations tend to occur in open woodlands or woodland edges (30-70% canopy coverage) with a rich herbaceous understory. Some of these are associated with roadside embankments along the edge of dry oak-hickory woodlands. It is quite likely that historically (especially prior to the widespread construction of roads) these sites would have been fire-maintained woodlands. Fire has been largely suppressed from these woodlands for several decades and in its absence *L. lewisii* has taken refuge in edges, roadside embankments, trail margins, and light gaps because these sites provide open habitats that simulate the historical nature of the open, fire-dependent woodlands that would have kept the canopy in a more open state.

Tree species commonly associated with *Lysimachia lewisii* include *Carya tomentosa*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Quercus alba*, *Q. coccinea*, *Q. montana*, and *Q. stellata*. Shrubs and woody vines include *Amelanchier arborea*, *Hypericum hypericoides*, *H. stragulum*, *Rhododendron alabamense*, *Smilax glauca*, *S. rotundifolia*, *Toxicodendron radicans*, *Vaccinium pallidum*, *V. stamineum*, and *Vitis aestivalis*. Common herbs include *Chimaphila maculata*, *Coreopsis major* var. *major*, *Cunila origanoides*, *Eupatorium pubescens*, *Solidago erecta*, *S. hispida*, *S. nemoralis*, *S. odora*, *Pteridium aquilinum*, *Symphytichum patens*, and *Tephrosia virginiana*.

Conservation

We suggest this species should be considered for state-listing as a rare species in both Alabama and Tennessee and we recommend a global rank of G2 since there are fewer than 20 known populations comprising less than 3,000 individuals (suggested ranks follow guidelines by NatureServe 2015). We suggest this species be given a state rank of S1 in Alabama and S2 in Tennessee. This rare species seems to be limited to the Duck River Drainage Basin in Tennessee and the Mulberry Fork of the Warrior River Drainage in Alabama. Population density is usually low and more rigorous assessment is needed. Primary threats to this species may include prolonged fire suppression, conversion of forests and woodlands to loblolly pine plantations, and residential development. The impact from invasive species on *Lysimachia lewisii* seems to be minimal at this point.

Taxonomic discussion

Lysimachia has traditionally been assigned to the Primulaceae (e.g., Coffey & Jones 1980) but some have proposed that the family be subdivided into a number of smaller families. Under this narrower concept *Lysimachia* has been assigned to the Myrsinaceae (Anderberg & Ståhl 1995; Hao et al. 2004). It seems that the broad concept of Primulaceae sensu lato is now again favored (Stevens 2001 onwards). The issue of family placement is beyond this publication but we follow Stevens (2001 onwards) in recognizing *Lysimachia* as a member of the Primulaceae.

Lysimachia is widely distributed in the Northern Hemisphere with the highest diversity occurring in southwestern China (Hu 1994; Hu & Kelso 1996). 12 species are native to North America with most of these centered in the eastern and southeastern portion of the USA. Ray (1956) assigned the North American species to four subgenera. The largest of these, subg. *Seleucia* Bigelow, is characterized by opposite, entire, and glabrous leaves, presence of staminodia, super-volute corolla lobes (each petal encloses a fertile stamen in bud), and a distinct pollen morphology (Coffey & Jones 1980). Coffey and Jones (1980) treated the same group as sect. *Seleucia* and recognized seven species: *L. ciliata* L., *L. graminea* (Greene) Hand.-Maz., *L. hybrida*, *L. lanceolata*, *L. quadriflora*, *L. radicans* Hook., and *L. tonsa*.

Past collections of *Lysimachia lewisii*, collected from 1946-2003, have been identified as *L. hybrida*, *L. lanceolata*, *L. tonsa*, and *L. quadriflora*. In its overall gestalt, *L. lewisii* (Fig. 1) most closely resembles *L. hybrida* (Fig. 5). In fact, collections made by the first author in 1998 and 2000 were initially identified as *L. hybrida*. The nature of the petioles and preference for wetland habitats immediately separates *L. hybrida*. Some collectors identified specimens of *L. lewisii* as *L. lanceolata* but that species differs in its smaller stature, rhizomatous habit, and leaves with shorter petioles that are ciliate throughout (Fig. 6). *Lysimachia lewisii* is perhaps most closely related to *L. tonsa* (Fig. 7), *L. radicans* (Fig. 8), and *L. quadriflora* (Fig. 9). Among these three species, *L. lewisii* shares the same distribution of cilia, which are restricted to nodal regions and do not extend up the petioles. Most specimens of *L. tonsa* have broadly ovate leaves and are clearly distinct from *L. lewisii* although a few populations on dry oak-pine ridges in east-central Alabama (Talladega Mountains) and west-central Georgia (Pine Mountain) are narrowly ovate. *Lysimachia lewisii* is the only entity within subg. *Seleucia* with the following characteristics: narrowly elliptic-lanceolate and distinctly petiolate leaves, eciliate petioles, non-rhizomatous habit, and dry-xeric upland oak-hickory woodland habitat.



Figure 5. *Lysimachia hybrida*. This species resembles *L. lewisii* but differs in its preference for wetland habitats, leaves often widest below the middle, petioles ciliate in the proximal half, and lower stems often enlarged in diameter and with adventitious roots.

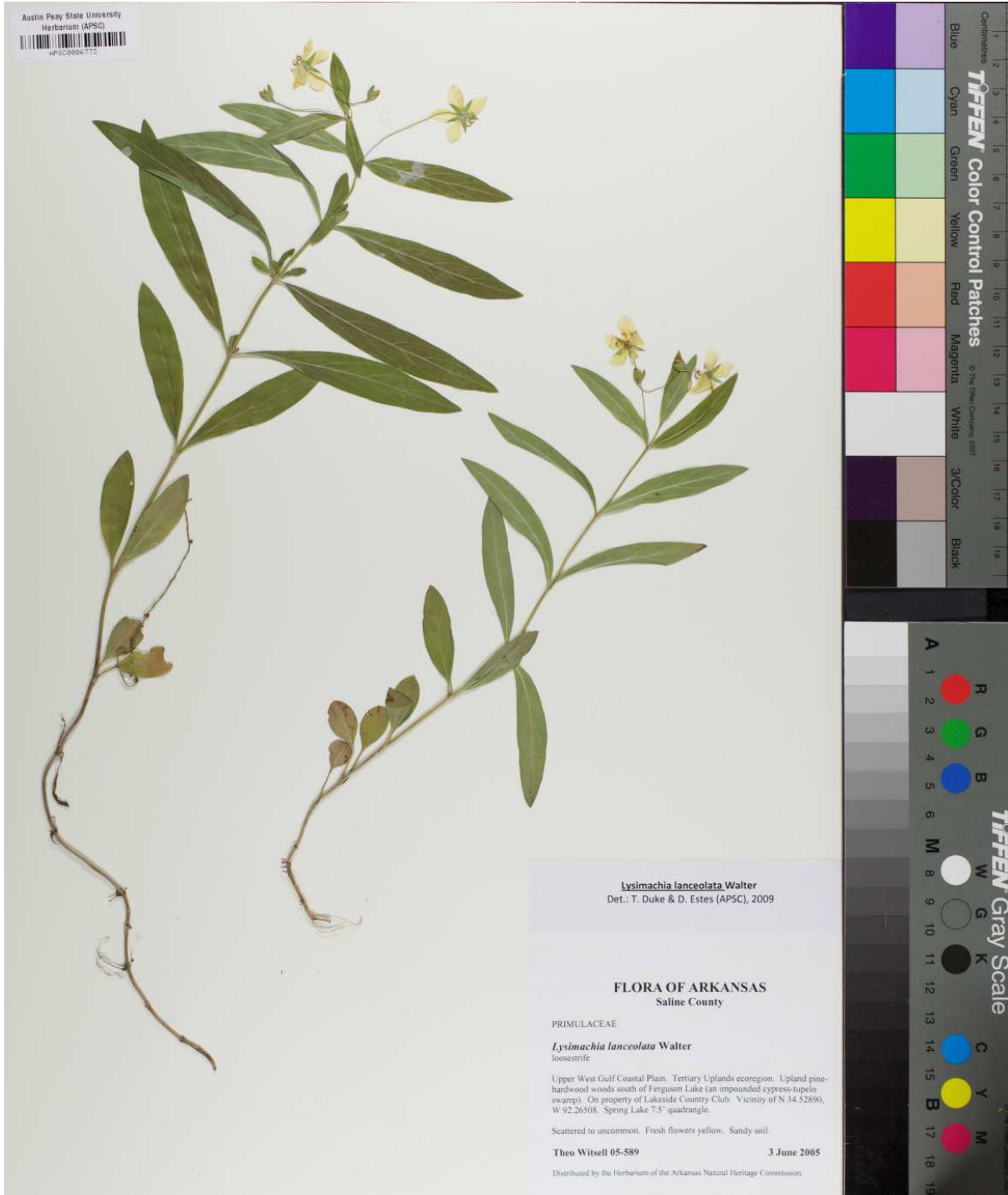


Figure 6. *Lysimachia lanceolata* (broad-leaved form). This is the form typical of the interior portions of the eastern USA. It mostly occurs west of the Appalachian Plateaus westward to the Great Plains. It differs from *L. lewisii* in its shorter petioles that are ciliate throughout, generally different leaf shape, more rounded corolla lobes, smaller stature, and creeping rhizomatous habit.

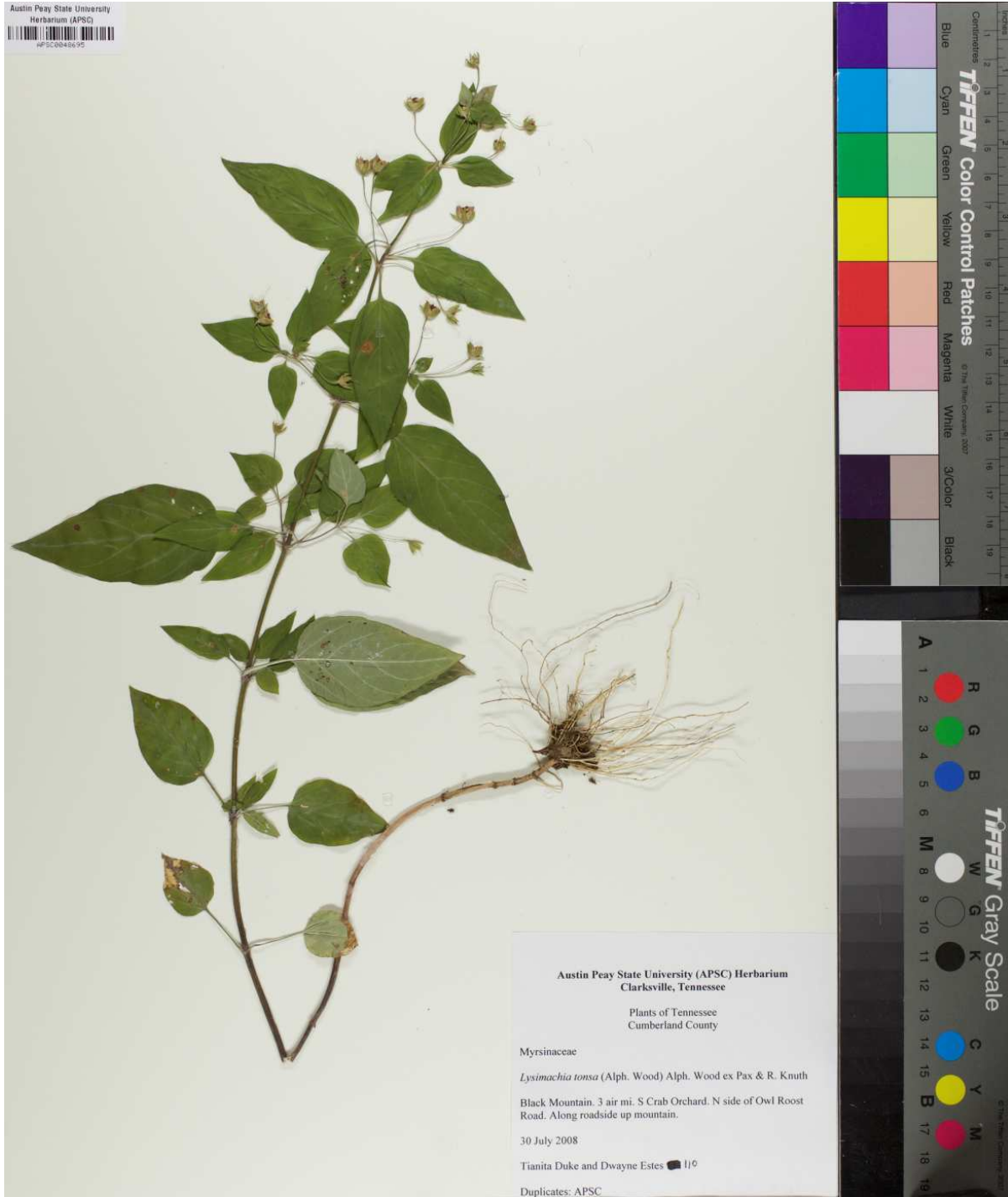


Figure 7. *Lysimachia tonsa*. *Lysimachia lewisii* has been identified by some authors as *L. tonsa*, a species, which usually has ovate to ovate-lanceolate leaves. The two species are similar in their glabrous petioles with cilia confined to the very base at the node and in their preference for growing in dry to submesic acidic woodlands.

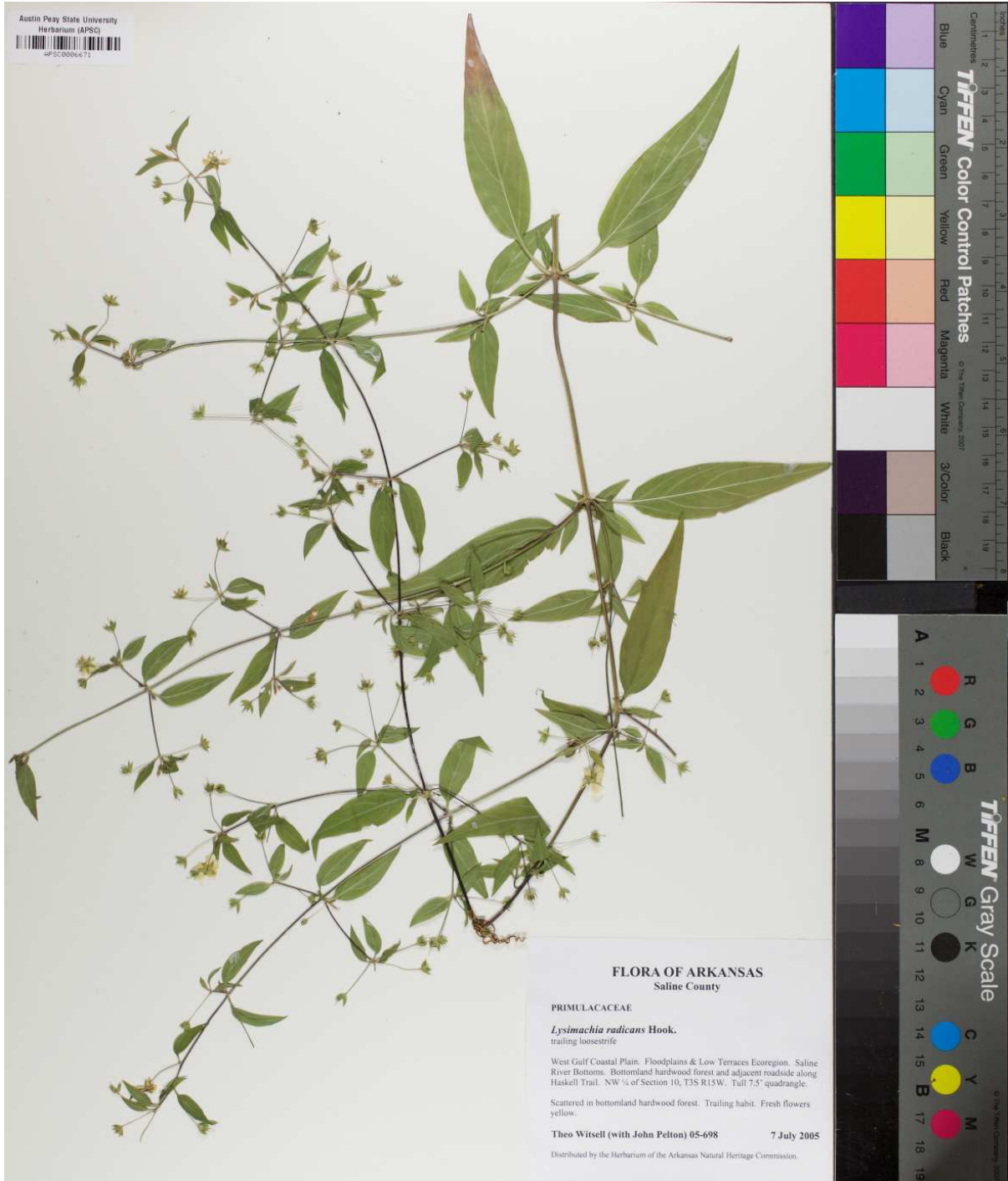


Figure 8. *Lysimachia radicans*. This species is similar to *L. lewisii* but differs in its decumbent habit, in stems rooting at the nodes, leaves which are typically widest below the middle, much smaller flowers, and preference for growing in swamps and marshes.



Figure 9. *Lysimachia quadriflora*. Some specimens of *Lysimachia lewisii* may resemble broad-leaved extremes of *L. quadriflora*. *Lysimachia quadriflora* differs in its consistently narrower leaves that are sessile to subsessile, leaf margins that are frequently revolute (at least on specimens), and preference for growing in calcareous wetlands and damp streambanks.

Below is an updated key is provided to distinguish the entities of subg. *Seleucia* in Alabama and Tennessee.

Key to the species of *Lysimachia* subg. *Seleucia*

1. Leaves linear, 1–7 mm wide, 10–20× longer than wide, mid-cauline leaves sessile or short petiolate, petioles when present 1–5 mm long.
 2. Stems 2–10 dm tall; petioles with cilia at base only, rarely ciliate their entire length, cilia not extending onto margins of leaf bases; flowers 16–26 mm in diameter ***Lysimachia quadriflora***
 2. Stems 1–3 dm tall; petioles ciliate their full length with cilia usually extending distally onto margins of leaf base; flowers 7–20 mm in diameter.
 3. Leaves 1–2 (3) mm wide; flowers 7–14 mm in diameter ***Lysimachia graminea***
 3. Leaves 3–7 mm wide; flowers 11–20 mm in diameter ***Lysimachia lanceolata* (narrow form)**
1. Leaves lanceolate, narrowly elliptic-lanceolate, or narrowly oblong, 5–60 mm wide, mostly 1.5–10× longer than wide, mid-cauline leaves usually with well-developed petioles 5–20+ mm long (except in *L. lanceolata* where petioles are mostly <5 mm).
 4. Petioles ciliate along their entire length.
 5. Leaves ovate to ovate-lanceolate, 17–60 mm wide ***Lysimachia ciliata***
 5. Leaves narrowly oblong, elliptic, lanceolate, or oblanceolate, 5–20 mm wide.
 6. Plants lacking creeping rhizomes; stem bases usually somewhat swollen and >4 mm in diameter, often with adventitious roots; leaf bases mostly rounded to broadly cuneate; petioles ciliate mostly only in basal half but sometimes with a few cilia extending into distal half of petiole; plants of wetlands ***Lysimachia hybrida***
 6. Plants with well-developed long-creeping rhizomes; stem bases not swollen, <4 mm in diameter, lacking adventitious roots; leaf bases cuneate; petioles evenly ciliate from petiole base to apex and extending onto lower leaf edge; plants of mesic to dry sites, rarely of wet areas ***Lysimachia lanceolata* (broad form)**
 4. Petioles eciliate or with cilia confined to proximal half only.
 7. Stems decumbent to prostrate and often rooting at the nodes; corolla lobes 3–5 mm long ***Lysimachia radicans***
 7. Stems erect or sometimes reclining on other vegetation but not prostrate and rooting at the nodes; corolla lobes 5–12 mm long.
 8. Cilia extending up proximal half of petioles; plants of wetlands; stem bases usually somewhat swollen and often with adventitious roots ***Lysimachia hybrida***
 8. Cilia absent from petioles, restricted to the nodal region between opposing petiole bases; plants of dry to mesic upland habitats; stem bases not swollen, lacking adventitious roots.
 9. Leaves ovate to ovate-lanceolate, bases rounded to truncate, abruptly contracted to the petiole, widest point located in the proximal one-quarter to one-third of the blade, 1.5–4.5× longer than wide, mid-cauline leaves 15–44 mm wide ***Lysimachia tonsa***
 9. Leaves narrowly lanceolate, bases cuneate and generally gradually contracted to the petiole, widest point located near the middle to just below the middle of the blade, 4–9× longer than wide, mid-cauline leaves 5–12 mm wide ***Lysimachia lewisii***

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