

Texas Species of Glandularia (Verbenaceae)

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TEXAS SPECIES OF *Glandularia* (VERBENACEAE)

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Abstract: Eight species of *Glandularia* are recognized as native to Texas: *G. bipinnatifida* (having two morphogeographical infraspecific categories, *G. b. var. bipinnatifida* and *G. b. var. ciliata* [Benth.] B. L. Turner, comb. nov.); *G. canadensis*; *G. delticola*; *G. polyantha*; *G. pulchella* (introduced and escaped from cultivation); *G. pumila*; *G. quadrangulata*; and *G. tumidula*. The latest monographer of the genus (R. E. Umber, 1979) recognized 10 species as occurring in Texas. Of these I cannot accept *G. wrightii*, which is treated as synonymous with *G. bipinnatifida var. ciliata*, or *G. verecunda* and *G. racemosa*, both of the latter treated as synonymous with *G. quadrangulata*. In addition, Umber's *G. bipinnatifida var. brevispicata* is treated as synonymous with *G. b. var. ciliata*. Further, *G. quadrangulata*, having appendiculate nutlets is also believed to possess forms with exappendiculate nutlets, the latter treated as *G. racemosa* and/or *G. verecunda* in his monograph. A key to the Texas taxa is provided, along with partial illustrations, synonymies and distribution maps.

Resumen: Se reconocen nativas a Texas ocho especies de *Glandularia*: *G. bipinnatifida* (con dos categorías infraespecíficas morfogeográficas, *G. b. var. bipinnatifida* y *G. b. var. ciliata* [Benth.] B. L. Turner, comb. nov.); *G. canadensis*; *G. delticola*; *G. polyantha*; *G. pulchella* (cultivada y ahora naturalizada); *G. pumila*; *G. quadrangulata*; y *G. tumidula*. El último autor en monografiar el género (R. E. Umber, 1979) reconoció 10 especies en Texas. De éstas, yo no puedo aceptar como válidas *G. wrightii*, que es tratada como sinónimo bajo *G. bipinnatifida var. ciliata*, o *G. verecunda* y *G. racemosa*, las últimas dos tratadas como sinónimos de *G. quadrangulata*. La entidad reconocida por Umber como *G. bipinnatifida var. brevispicata* se trata aquí como un sinónimo de *G. b. var. ciliata*. *Glandularia quadrangulata*, la cual tiene nuececillas apendiculadas, se cree también posee formas con nuececillas exapendiculadas, esta última tratada como *G. racemosa* y/o *G. verecunda* en su monografía. Se provee una clave para las especies en Texas, así como ilustraciones para algunas especies, sinonimia y mapas de distribución.

Keywords: Verbenaceae, *Glandularia*, *Verbena*, Texas

Glandularia is a segregate of the large genus *Verbena*. Most early workers treated the former as a subgenus or section of the latter, as did Moldenke in Correll and Johnston (1970) in their treatment of *Verbena* for the *Manual of the Vascular Plants of Texas*. Umber (1979), following the work of Schnack and Covas (1944), treated *Glandularia* as generically distinct, noting that the two taxa have differing base chromosome numbers ($x=5$ in *Glandularia*; $x=7$ in *Verbena*), along with yet other anatomical and chemical features which mark these as distinct. Indeed, it would appear, based largely upon diversity studies and ploidy levels, that *Glandularia* arose in South America, subsequently spreading to North

America, presumably by long distance dispersal, and vice versa for *Verbena*, both genera exhibiting an amphotropical distribution (cf. Umber, 1979).

The present treatment of *Glandularia* for Texas has been prompted by my inability to distinguish amongst several of the taxa recognized for the state by Umber, most notably his treatment of *G. bipinnatifida*, *G. wrightii*, *G. verucunda*, and *G. quadrangulata*.

Umber's only published work on *Glandularia* (based upon a doctoral thesis at Harvard University, completed in 1977) is remarkable in that he totally ignores the "monographic" studies of the sect. *Glandularia* of *Verbena* (s.l.) rendered by Moldenke (cf. his extensive listings in the

journal *Phytologia* through the years 1961–1979), including his treatment of the Texas species of that complex (Moldenke 1942, 1970).

Moldenke (1970), excluding cultivars, recognized 16 species of *Glandularia* as occurring in Texas. UMBER (1979), presumably without reference to Moldenke's work, reduced these to 10 species, while I recognize but 8 species as discussed below.

Moldenke (1942, 1970) provided detailed, rather accurate descriptions of the various taxa of *Glandularia* and I see little need to redescribe these in detail again. Rather, I have briefly described those taxa whose parameters appear to have expanded with the new inclusions here. I have also accounted for all of the scientific names that have been applied to Texas materials, along

with their dates of publication.

The present study is based upon several thousand or more specimens on file at LL, SRSC, TEX, including a wide range of specimens from Mexico, all of which I have appropriately annotated. This material has served for the construction of the maps shown in Figures 1 to 7.

In addition, I have studied, over several years now, populations of the various species in central and trans-Pecos Texas. UMBER also studied populations in this area, but I believe that at least some of his observations were faulty in that he tended to emphasize in his evaluations single traits over combinations of traits, the latter serving better to characterize naturally occurring taxa, especially as these are correlated with coherent geographical areas.

Key to Texas species of *Glandularia* (excluding the cultivar, *G. x hybrida*)

1. Nutlets decidedly ovoid, widest well above the base, or else the nutlets ca 4 mm long, terminated by an ovate appendage.
 2. Nutlets ovoid, narrowed apically, not surmounted with an appendage. 8. *G. tumidula*
 2. Nutlets subcylindric, broadened at the very base and bearing a large ovate appendage at the apex. 7. *G. quadrangulata*
1. Nutlets not as described in the above, mostly 2.5–3.5 mm long, subcylindric and peanut-like (in shape and sculpturing), but often expanded at the very base.
 3. Leaves finely dissected, the ultimate segments decidedly linear, mostly 0.3–1.0 mm wide; cultivated and/or naturalized species. 5. *G. pulchella*
 3. Leaves not as described in the above, mostly coarsely dissected, the ultimate segments mostly lanceolate to ovate, 1 mm wide or more.
 4. Corolla lobes, when expanded, mostly (2)3–4 mm across.
 5. Vestiture of stems mostly composed of numerous glandular trichomes, among which often occur a scattered array of longer eglandular trichomes. 6. *G. pumila*
 5. Vestiture of stems mostly pilose with eglandular hairs, among which sometimes occur an array of short-glandular hairs.
 6. Corollas white or nearly so; trans-Pecos Texas. 7. *G. quadrangulata*
 6. Corollas pale pink to pale lavender.
 7. Midstem leaves mostly 1.0–2.8 cm long, sessile or nearly so. 7. *G. quadrangulata* (exappendiculate forms)
 7. Midstem leaves mostly 3–6 cm long, usually with well-defined petioles. 3. *G. delticola*
 4. Corolla lobes, when expanded, mostly 5–18 mm across.
 8. Leaves, mostly 1.8–2.5 times as long as wide; corolla tubes mostly 15–20 mm long; eastern Texas on sandy soils. 2. *G. canadensis*
 8. Leaves, mostly 0.8–1.2 times as long as wide; corolla tubes mostly 8–15 mm long; widespread but usually occurring in silty-clay or calcareous soils of central, western and southern Texas.
 9. Leaves not deeply dissected, the lobes only rarely incised to 1/2 the distance to midribs; southern Texas. 4. *G. polyantha*
 9. Leaves deeply dissected, the lobes mostly incised to 4/5 the distance to midribs, or nearly so; central and western Texas. 1. *G. bipinnatifida*

1. *GLANDULARIA BIPINNATIFIDA* (Nutt.) Nutt.,
Trans. Amer. Phil. Soc., n.s. 5:184. 1837.

I recognize two morphogeographical varieties of this taxon, as follow:

1. Calyces and upper stems without glandular trichomes, or nearly so; bracts subtending the flowers mostly as long as or longer than the calyces; primarily a taxon of deep clay soils, mid-grass biomes of central U.S.A. . . var. *bipinnatifida*
1. Calyces and upper stems clearly adorned with both glandular and non-glandular trichomes; bracts subtending the flowers mostly 1/2–4/5 as long as the calyces; primarily a taxon of shallow soils, short-grass biomes along front range of the Rocky Mountains var. *ciliata*

- 1A. *GLANDULARIA BIPINNATIFIDA* var. *BIPINNATIFIDA*. Fig. 8, 9.

Verbena bipinnatifida Nutt., 1821.

Verbena demareei Moldenke, 1940.

Diffusely branched ascending or sprawling perennial herbs to 60 cm high; stems hirsute, eglandular; leaves petiolate, 2–6 cm long, bipinnately or tripinnately parted; flowering spikes 2–4 cm long, usually much elongating in fruit; bractlets mostly linear-lanceolate, eglandular, as long as or longer than the subtended calyces; calyces mostly 7–10 mm long, hispid-hirsute; corollas pale lavender to purple, the tubes up to 1.5 times as long as the calyx, the limb 8–10 mm across; nutlets unappendaged.

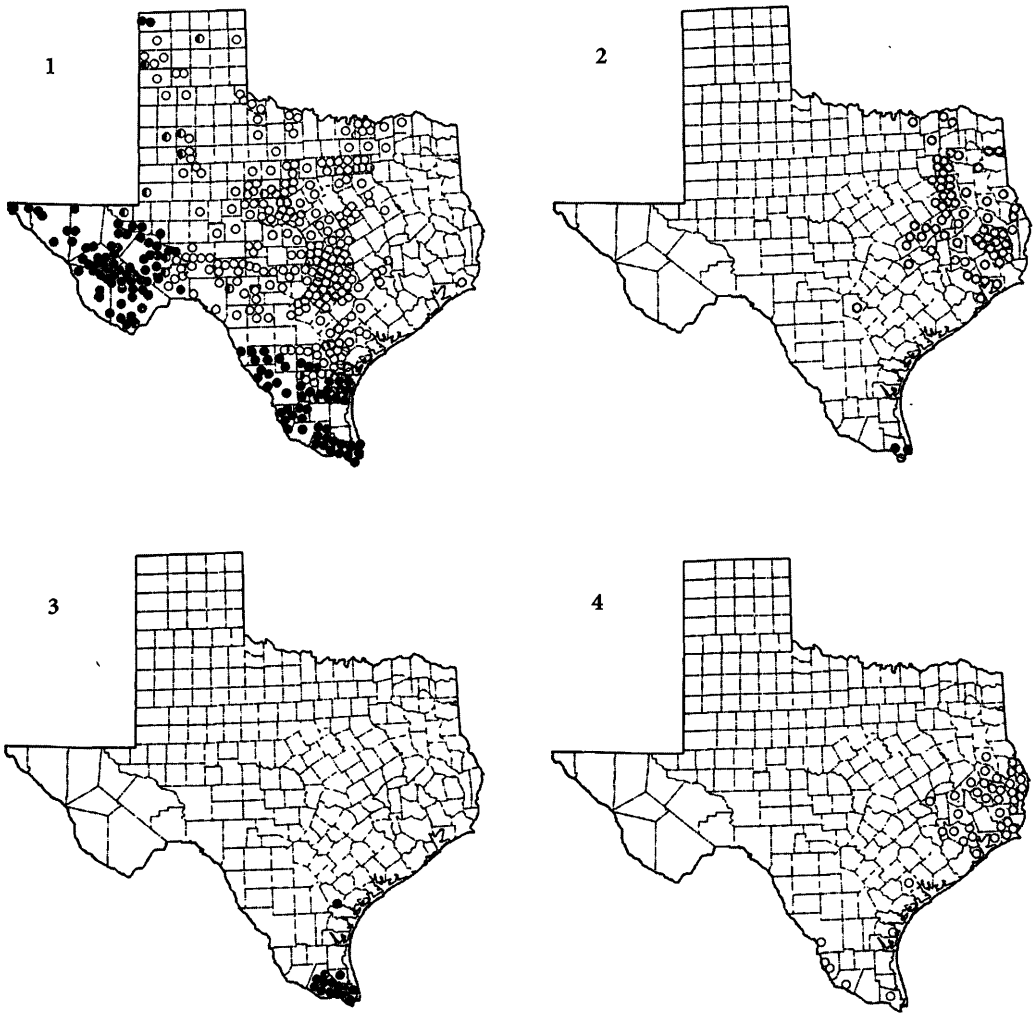
Umber (1979) noted that his concept of *Glandularia bipinnatifida* included "... several growth forms or ecotypes which have been given specific or varietal status by other authors." Taxonomic recognition of these forms in his view was "... unwarranted based on morphological and chemical characters. The characters in this species show clinal and more or less random variation."

I cannot agree with Umber's assess-

ments, as quoted in the paragraph above. My examination of nearly 1,000 sheets of this complex housed at LL, TEX shows very clearly that the mass of the specimens can be divided into two morphogeographical units, as noted in the key and Fig. 1. Indeed, variation of the characters concerned are not at all clinal or random in distribution over the range of the species. Variation in *Glandularia bipinnatifida* var. *bipinnatifida* is not nearly so great as occurs in var. *ciliata*, discussed below, most of the synonymic names having been proposed for that element of the species. *Glandularia bipinnatifida* var. *bipinnatifida* does, however, appear to intergrade with *G. b.* var. *ciliata* along their regions of contact, as suggested in Fig. 1.

Glandularia bipinnatifida var. *bipinnatifida* is relatively uniform over most of its distribution, but just west of the Pecos River in trans-Pecos Texas it appears to intergrade over a relatively short distance into *G. b.* var. *ciliata*. Indeed, at a single site 56.6 mi E of Fort Stockton in easternmost Pecos Co. along IH 10, I collected what appeared to be clear intermediates between the two taxa (Turner 97-43), these occurring next to fairly typical individuals of *G. b.* var. *pinnatifida* (Turner 97-44). Once the Pecos River is reached going eastward (only ca 15 mi or so), the populations of *G. bipinnatifida* var. *ciliata* are largely replaced by *G. b.* var. *bipinnatifida*.

During the spring of 1997, I again examined the zone of contact between *Glandularia bipinnatifida* var. *bipinnatifida* and *G. b.* var. *ciliata* in trans-Pecos Texas. The latter variety was abundant along U.S. Highway 90 between Marfa (Presidio Co.) and Sanderson (Terrell Co.), occurring in relatively small patchy populations having mostly pale lavender corollas. Immediately to the north of Sanderson and continuing northeastwards along State Highway 2400 towards Sheffield, *G. b.* var. *ciliata* was replaced by nearly continuous populations of *G. b.* var. *bipinnatifida* having darker lavender flowers (Fig. 8). The spring of 1997 was a banner year for *Glandularia* in Texas.

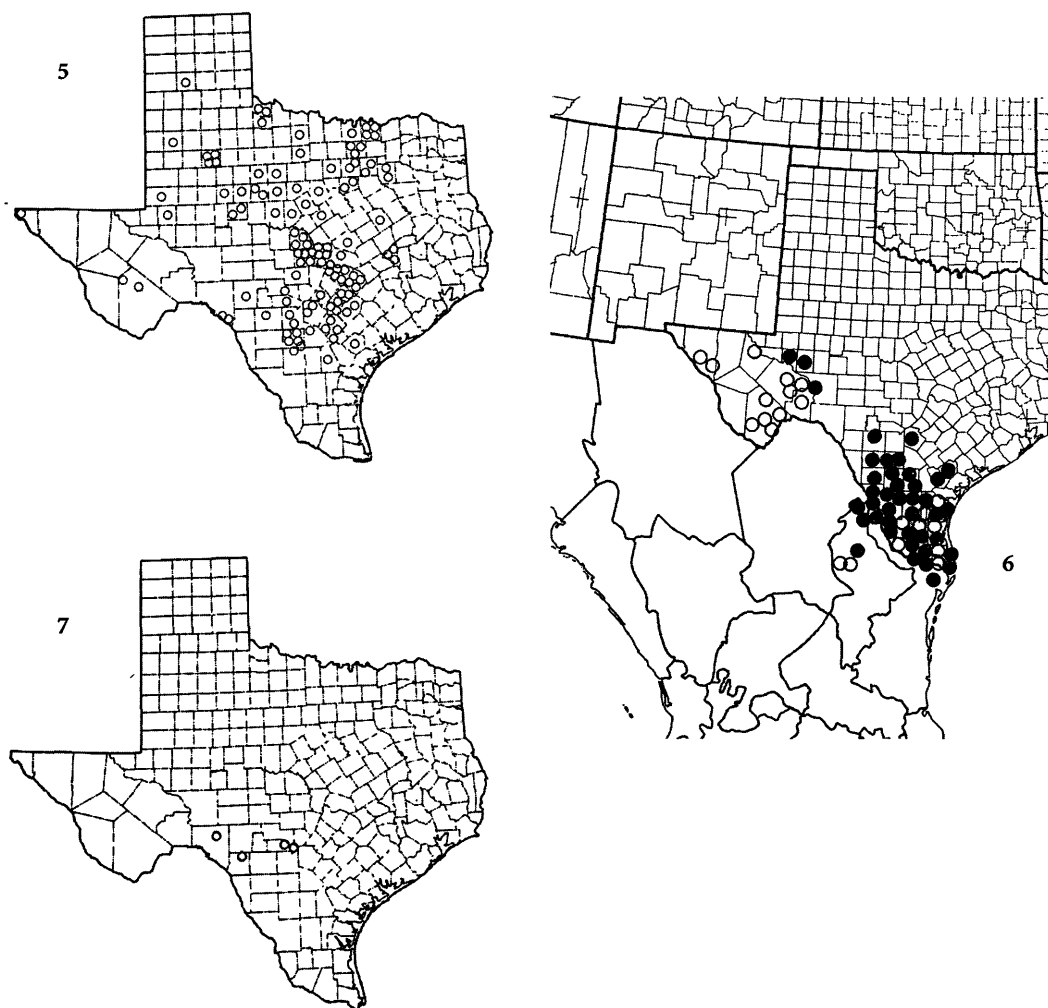


FIGS. 1-4. Distribution of *Glandularia* species in Texas. 1. *G. bipinnatifida* var. *bipinnatifida* (open circles); var. *ciliata* (closed circles); intermediates (half-closed circles). 2. *G. canadensis* (open circles) and *G. delticola* (closed circles). The isolated collection of the former from Cameron Co. (southernmost Texas), is surely introduced at this site. 3. *Glandularia polyantha*. 4. *Glandularia pulchella*.

Indeed, I drove from the Pecos River eastwards along IH 10 to Kerrville (some 300+ km), and there was only rarely a gap of more than 500 meters between populations of *G. b.* var. *bipinnatifida*.

Westward from the Pecos River along IH 10, *Glandularia bipinnatifida* var. *ciliata* replaces *G. b.* var. *bipinnatifida*, as already noted. Populations of the former are only

rarely continuous, the taxon occurring mostly in small patches 2-5 km apart, much as along highway 90, as mentioned in the previous paragraph. North of Interstate 10, along State Highway 67, the *G. b.* var. *ciliata* was first detected about 5 mi W of Given (Turner 97-58). Variable populations with variable individuals occur in the contact zone of the two taxa, these mostly confined



FIGS. 5-7. Distribution of *Glandularia* species in Texas. 5. *Glandularia pumila*. 6. *Glandularia quadrangulata*: specimens with appendiculate anthers (closed circles); specimens with exappendiculate anthers (open circles). Additional explanation in text. 7. *Glandularia tumidula* (open circles).

to a relatively narrow band 8-50 km along either side of the Pecos River in Texas. I surmise that this intergradation is a selection phenomenon along this transition zone between the more mesic habitats of central Texas and those of a more xeric nature in western Texas (i.e., such variation being due to primary intergradation, as opposed to secondary intergradation with allopatric hybridization a factor). At least I never detected the co-occurrence of distinct pop-

ulations of these two taxa with clear-cut putative hybrids in the area concerned.

1B. GLANDULARIA BIPINNATIFIA VAR. CILIATA
(BENTH.) B. L. TURNER, COMB. NOV. FIG.
10, 11.

Verbena ciliata Benth., Pl. Hartw. 21. 1839. TYPE:
MEXICO. GUANAJUATO: Leon, 1839, Hartweg
176 (HOLOTYPE K; ISOTYPES GH, NY, according to
Umber, 1979, none of these examined by me).



FIG. 8. Population of *Glandularia bipinnatifida* var. *bipinnatifida* ca 45 km northeast of Sanderson (Terrell Co., Turner 97-89).



FIG. 9. *Glandularia bipinnatifida* var. *bipinnatifida* (cf. Fig. 8).



FIG. 10. Population of *Glandularia bipinnatifida* var. *ciliata* (Brewster Co., Turner 97-75.)



FIG. 11. *Glandularia bipinnatifida* var. *ciliata* (cf. Fig. 10).

Verbena wrightii A. Gray, 1878.
Verbena ambrosifolia Rydb. ex Small, 1903.
Verbena pubera Greene, 1903.
Verbena ciliata var. *pubera* (Greene) Perry, 1933.
Verbena wrightii f. *albiflora* Moldenke, 1965.
Glandularia wrightii (A. Gray) Umber, 1979.
Glandularia bipinnatifida var. *brevispicata* Umber, 1979.

Essentially as described for *Glandularia bipinnatifida* var. *bipinnatifida* but the bractlets subtending the calyces narrowly lanceolate and mostly shorter than the subtended calyces; additionally the vestiture is much more variable, this usually hirsute with spreading glandular hairs or various lengths, or these intermixed with eglandular hairs, rarely eglandular throughout.

Umber (1979) recognized *Glandularia wrightii* as a distinct species, distinguishing this from his concept of *G. bipinnatifida* (s.l.) by a number of fuzzy characters that, in my opinion, do not serve to distinguish anything but fuzzy concepts. Most of the collections from the trans-Pecos area of Texas were referred by Umber (through annotation, LL-TEX) to *G. bipinnatifida*. Perry (1933) also recognized *G. wrightii* as a distinct species but perceptively noted that "The main characters [which separate the two] appear to be the glandular somewhat viscid pubescence of the calyx, the very short acute-subulate calyx-teeth, and the somewhat compact spikes." These are the very characters that distinguish *G. b. var. ciliata* from *G. b. var. bipinnatifida*. She noted, in addition, that "On account of its strong variability, this species has been difficult to define." Careful examination of plants belonging to this complex from throughout the southwestern U.S.A. and Mexico has convinced me that the more western glandular elements of *G. bipinnatifida* (including *G. wrightii*, the type from near El Paso, Texas) belong to but a single widespread taxon, *G. b. var. ciliata*, the latter varietal name legitimized with the description of *Verbena ciliata* var. *longidentata* Perry.

Umber placed *Verbena ciliata* var. *longidentata* in synonymy under his broad con-

cept of *G. bipinnatifida*, but since the former name is typified by material from near Matamoros, Mexico (Tamaulipas), it is more likely that this name is synonymous with *G. polyantha* Umber, the latter essentially endemic to the more lowland, Gulf Coastal regions of southern Texas and Mexico. At least I know of no collections of *G. bipinnatifida* from this region, although Umber shows several such collections from this area. I take the latter to be but misidentifications of *G. polyantha*, to judge from his annotation labels (LL-TEX).

Umber (1979) also placed *Verbena andrieuxii* Schauer in synonymy under *Glandularia bipinnatifida*, but examinations of a photoholotype, LL (also examined by Umber!), and comparison of recent collections from the state of Oaxaca, Mexico, whence the type, leads me to place the plant concerned in synonymy with the pubescent phase of *G. teucrifolia* (Mart. & Gal.) Umber (Turner, in prep.).

Finally, it should be noted that Umber's *Glandularia bipinnatifida* var. *brevispicata* (the type from Otero Co., New Mexico) is, in my opinion, but a regional variant of *G. b. var. ciliata*, if that. His description of the short spikes, calyx teeth, viscid inflorescence, ascending habit, dark foliage, and acrid-smelling flowers, applies to my concept of *G. b. var. ciliata* (except for the acrid-smelling flowers, which I cannot evaluate). Umber (in his Fig. 7) also maps specimens of his var. *brevispicata* as occurring in the Central Plateau region of northern Mexico, all of these referable to *G. b. var. ciliata*, in my treatment (Turner, in prep.).

2. *GLANDULARIA CANADENSIS* (L.) Nutt.,
 Trans. Amer. Phil. Soc., n.s. 5: 184. 1837.

Verbena canadensis (L.) Britt., 1894.

Sparsely or diffusely branched ascending or decumbent perennial herbs to 50 cm high; stems glabrous to variously hirsute, but not densely so; leaves extremely variable

mostly 3–10 cm long, 1.5–4.5 cm wide, deeply pinnately divided to merely 3-parted, appressed pubescent to glabrate; flowering spikes 2–5 cm long, elongating in fruit; bractlets linear-lanceolate, as long as or shorter than the subtended calyces; calyces 10–14 mm long, sparsely glandular-pubescent, rarely not; corollas varying from pink to purple, the limbs mostly 10–16 mm across; nutlets exappendiculate.

My concept of this taxon is about the same as that of Perry (1933) and Umber (1979). Because of its very large corollas and relatively elongate weakly dissected leaves, it is readily distinguished in the field, occurring primarily in sandy soils of eastern Texas (cf. Fig. 2).

3. *GLANDULARIA DELTICOLA* (Small) Umber, Syst. Bot. 4: 98. 1979.

Verbena delticola Small, 1933.

Verbena cameronensis L. I. Davis, 1941.

Verbena lundelliorum Moldenke, 1941.

My concept of this taxon is about the same as that of Perry (1933) and Umber (1979). It is superficially similar to *G. polyantha* but readily distinguished from the latter by its much smaller corollas and seemingly prostrate habit, as noted by Umber. While occurring over a broad range of eastern Mexico, it is known to Texas only by collections from along the Rio Grande River, where it is mostly associated with palm groves.

4. *GLANDULARIA POLYANTHA* Umber, Syst. Bot. 4: 98. 1979.

Verbena ciliata var. *longidentata* Perry, 1933.

Verbena polyantha (Umber) Moldenke, 1980.

As noted by Umber (1979), plants of his newly described species, the type from Cameron County, Texas, were long placed under *G. delticola*. Except for its distinctive

leaves it might with some justification be treated as part of the *G. pinnatifida* complex. Indeed, Perry (1933) treated at least some of the specimens positioned by Umber in his concept of *G. polyantha* in her concept of *Verbena ciliata* var. *longidentata*; the type of the latter is from Matamoros, Mexico, and has all of the attributes of Umber's *G. polyantha*, except for its more deeply divided leaves. Umber provided an excellent full description which I need not improve upon here.

5. *GLANDULARIA PULCHELLA* (Sweet) Tronscosco, Darwiniana 13: 473. 1964.

Verbena pulchella Sweet, 1829.

This widely introduced cultivar, native to South America, has become relatively common in the southeastern U.S.A., as noted by Umber (1979). The species is readily distinguished from yet other Texas species by its deeply dissected leaves, the ultimate segments linear.

6. *GLANDULARIA PUMILA* (Rydb.) Umber, Syst. Bot. 4: 94. 1979. Fig. 12 a–b.

Verbena pumila Rydb. in Small, 1903.

Verbena inconspicua Greene, 1903.

Diffusely branched mostly prostrate or procumbent perennial herbs 2–5 cm high; stems hirsute with mostly short glandular hairs, these after intermixed with eglandular hairs; leaves mostly 1.5–3.5 cm long, variously dissected but oftentimes merely tripartite with lobed divisions; spikes mostly 1–3 cm long, not much elongating in fruit; bractlets linear-lanceolate to narrowly lanceolate, as long as the subtended calyces, hispid-hirsute with mostly glandular hairs; calyces 5–6 mm long, usually to some extent glandular-pubescent; corollas deep lavender to purple, the tubes slightly extending beyond the calyx, the limbs mostly 2.5–4.5 mm across; nutlets exappendiculate.



FIG. 12. *Glandularia pumila* (Brewster Co., Turner 96-215 [TEX]) a. showing prostrate growth; b. Close-up of raceme.



FIG. 13. *Glandularia quadrangulata* (Crockett Co. Turner 97-01 [TEX]). a. prostrate growth habit; b. Close-up of raceme.

My concept of this taxon is about the same as that of Umber (1979), except that he recognized the species as occurring in southern Texas. I take most of the latter to be misidentifications of exappendiculate forms of *Glandularia quadrangulata* (cf. discussion under the latter).

Glandularia pumila is relatively rare in trans-Pecos Texas; I know it from this region by relatively few collections: El Paso Co., *Worthington* 4295 (TEX); and Brewster Co., *Ertter* 4723, (TEX); *Turner* 97-15, (TEX).

7. GLANDULARIA QUADRANGULATA (Heller)
Umber, Syst. Bot. 4: 100. 1979. Fig. 13a, b.

Verbena quadrangulata Heller, 1895.

Verbena racemosa Eggert, 1902.

Verbena pulchella Greene, 1903.

Verbena pumila f. *albiflora* Standley, 1929.

Glandularia verecunda (Eggert) Umber, 1979.

Verbena verecunda (Umber) Moldenke, 1980.

Diffusely branched prostrate to semi-erect sprawling perennial herbs mostly 2–15 cm high; stems hirsute, eglandular; leaves short-petiolate to sessile, variously pinnately parted with narrow to relatively broad divisions; flowering spikes mostly 1–3 cm long, not much elongating in fruit; bractlets narrowly lanceolate, hirsute with eglandular hairs, rarely not, as long as or somewhat shorter than the calyces; calyces 5–6 mm long, hirsute with eglandular hairs; corollas white or creamy white to very pale lavender, the tubes emerging from the calyces for 0.1–4.0 mm; nutlets with conspicuous ovate appendages, or these absent.

My concept of this taxon is about the same as that of Umber, except that I recognize the species as occurring in two forms: a typical form having nutlets with well-defined ovate appendages, and an atypical form lacking such appendages. The two forms occur together over a broad region (Fig. 6) and may occur in the same population, as noted by Umber on *Umber* 3, (TEX) (which he identified as a *Glandularia vere-*

cunda): “indistinguishable from *G. quadrangulata* except for the seeds.” I treat *G. verecunda* as an exappendiculate form of *G. quadrangulata*; the plants from south Texas and elsewhere which Umber identified as *G. verecunda* are clearly exappendiculate forms of *G. quadrangulata*. This variation in nutlet shape has also plagued nearly all previous workers, the exappendiculate forms being misidentified as either *G. pumila* (which to my knowledge does not occur in southernmost Texas), *G. racemosa* (including *G. verecunda* sensu Umber), *G. delticola*, or *G. racemosa*.

In the early stages of this study I was inclined to accept *Glandularia racemosa* (the type from near Sierra Blanca, Hudspeth Co., Texas, not examined) as distinct, but subsequent field work at or near the type locality, and examination of a large suite of herbarium specimens has convinced me that it readily nestles into *G. quadrangulata*, differing from the latter only by its exappendiculate nutlets. Umber (1979) distinguished *G. racemosa* from *G. quadrangulata* (in his key to species) by the nutlet commissure, which was said to be 1/2 the width of the nutlet and “definitely not reaching the top of the nutlet” and further, that the nutlet at its base was cylindrical and without a broadened base. Examination of a large suite of collections (LL, TEX) annotated by Umber as *G. racemosa* shows that these “key characters” do not hold. The commissure width of these specimens range from 0.4–0.6 mm, which is about the same as the commissure variation found in his *G. verecunda* and *G. quadrangulata* (0.4–0.8). Indeed, other than the appendiculate nutlets in the latter collection, I can find nothing to distinguish between the various names I have listed in synonymy with the present. Perry (1933) also maintained *G. racemosa* but distinguished this from *G. quadrangulata* (in addition to the nutlet appendages) by its more exerted corolla tubes, a character that will not serve to discriminate between these; in the specimens from trans-Pecos Texas, the tube

exsertion varies from 0.5 to 5.0 mm, with an average of about 3.0 mm (13 specimens measured).

Populational forms of exappendiculate *G. quadrangulata* occur throughout most of trans-Pecos Texas and northern Mexico, but in southern Texas and along the Pecos River in trans-Pecos Texas, mixed "populations" occur (e.g., *Turner* 97-1 and *Turner* 97-45 from Crockett Co., and near Sheffield, Texas, Pecos Co., *Turner* 97-167 [all TEX]).

Finally, it should be noted that both appendiculate and exappendiculate forms of *G. quadrangulata* have been collected at the same locality on the same date by the same collector in sandy soils along the Rio Grande in trans-Pecos Texas (*Fletcher* 1224, 1226 [SRSC]). Except for the appendage variability, these two collections are identical.

8. GLANDULARIA TUMIDULA (Perry) Umber, *Syst. Bot.* 4: 94. 1979.

Verbena tumidula Perry, 1933.

Because of its peculiar ovoid nutlets, this species is unlikely to be confused with another. In early flower, however, it is superficially similar to *Glandularia bipinnatifida*, and has been identified as such by various authors, especially among Mexican collections. Indeed, Umber himself misidentified a Coahuilan collection of *G. tumidula* as *G. gooddingii* (Briq.) Solbrig, mapping this as such in his Fig. 8, considerably out of range of the latter, an element of the Sonoran Desert flora.

OTHER TAXA

GLANDULARIA X HYBRIDA (Grönland & Rümpler) Nesom & Pruski, *Brittonia* 44: 495.1992.

Verbena hybrida Gronland & Rümpler

This is a common, very attractive and commonly cultivated ornamental. It is grown in gardens throughout the temperate

world and its origin is moot, as discussed in more detail by Nesom & Pruski (1992). Moldenke (1963) has provided a prolonged account (32 pages!) of the history and nomenclature, including common names, of this taxon (this reference not cited by Nesom and Pruski).

I have not accepted this taxon as part of the Texas flora because it does not appear to persist when escaping cultivation. I have, however, examined two atypical collections from Texas (Bexar Co.: *Crockett* 231 [LL]; Cameron Co. *Knobloch* s.n. 20 Feb 1981, [TEX]) that were apparently collected along highways; both were identified as *Verbena canadensis* initially, but these appear to be atypical cultivars of *Glandularia* x *hybrida*, although it is possible that these are exceptional disjunct populations and/or individuals of *G. canadensis*. Both Moldenke and Umber annotated the Crockett collection as *G. canadense*, but I sense the two plants to be but aberrant leaf forms of the cultivated *G. x hybrida*.

NAMES OF TAXA OF *Glandularia* REPORTED OR ACCEPTED FOR TEXAS BY MOLDENKE (1942, 1970, 1980) AND UMBER (1979) AND THEIR DISPOSITION:

Glandularia bipinnatifida var. *brevispicata* Umber = *G. bipinnatifida* var. *ciliata*

Glandularia gooddingii Briq.: Reported for Texas by Moldenke (1970, as *Verbena*) but the material concerned is mostly eglandular forms of *G. bipinnatifida* var. *ciliata*.

Glandularia wrightii (A. Gray) Umber = *G. bipinnatifida* var. *ciliata*

Verbena ambrosifolia Rydberg ex Small = *G. bipinnatifida* var. *ciliata*

Verbena cameroensis L. I. Davis = *G. delticola*

Verbena ciliata Benth. = *G. bipinnatifida* var. *ciliata*.

Verbena ciliata var. *longidentata* Perry = *G. polyantha*?

Verbena elegans HBK.: So far as known, this handsome species, which is native to

the higher elevations of Mexico (1000–2300 m) does not occur in Texas, although reported by Moldenke (1970) to occur in Duval and Hidalgo Counties. The latter collections (Lewis & Oliver 5410 and E. J. Walker 32, not examined; cited by Moldenke in *Phytologia* 9:88.1963) are either misidentifications of cultivated and escaped forms of *V. x hybrida* and/or introduced cultivar forms of *V. canadensis*. I have referred similar cultivars from south Texas (e.g., *Knobloch s.n.*, Cameron Co.) to *Glandularia x hybrida*, although these may, indeed, be cultivars of *G. canadensis*, if not introduced (but not persistent) elements of *G. elegans*.

Verbena lundelliorum Moldenke = *G. delticola*.

Verbena oklahomensis Moldenke: According to Moldenke (1970) this name applies to putative hybrids between *Glandularia bipinnatifida* var. *bipinnatifida* and *G. canadensis*. While inadvertently treated without the hybrid notation in Correll & Johnston (1970), Moldenke (*Phytologia* 224: 27.1972) corrected this editorial lapse. Moldenke reports a single collection from Lampasas Co., Texas (Mahler 1241; cf. *Phytologia* 10: 284.1964). Such hybrids might well occur in Texas, but I suspect the latter collection to be but an atypical element of *G. bipinnatifida* var. *bipinnatifida*, mainly because populations of *G. canadensis* do not occur in Lampasas County to my knowledge, thus the natural hybrid between the putative taxa concerned is unlikely to occur there.

Verbena hybrida Grönland & Rumpler = *G. x hybrida*.

Verbena wrightii A. Gray = *Glandularia bipinnatifida* var. *ciliata*.

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