

**TAXONOMIC REVIEW OF *SOLIDAGO PETIOLARIS* AND *S.*  
*WRIGHTII*  
(ASTERACEAE: ASTEREAEE)**

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**ABSTRACT**

*Solidago petiolaris* is treated to include three morphogeographic entities. Plants east of the Mississippi River (Alabama, Florida, Georgia, South Carolina, North Carolina) are the typical variety; those west of the Mississippi (Louisiana, Arkansas, Texas, Oklahoma, Kansas, Nebraska, Missouri -- and including southern Illinois) comprise two additional taxa. Phyllaries of plants in the eastern portion of the western range (var. *angusta* [Torr. & Gray] A. Gray) are glandular and without other vestiture; phyllaries of plants in the western portion (var. *wardii* [Britt.] Fern.) are eglandular and finely strigose. *Solidago wrightii* is closely similar to *S. petiolaris*, especially where their ranges approach each other, and they show parallel trends of variation in leaf shape and involucre vestiture. Within *S. wrightii*, glandular plants apparently are populational variants without geographic coherence and are treated here as ***S. wrightii* forma *adenophora*** (Blake) Nesom, comb. et stat. nov. A narrow-leaved race near the southeastern corner of the range of the species (in Chaves Co. and Eddy Co., N.M., and Culberson Co., Tex.) is recognized as ***S. wrightii* var. *guadalupensis*** Nesom, var. nov. A collection by Charles Wright is selected as lectotype for *S. wrightii*.

**KEY WORDS:** *Solidago*, *S. petiolaris*, *S. wrightii* forma *adenophora*, *S. wrightii* var. *guadalupensis*, (ASTERACEAE: ASTEREAEE)

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*Solidago petiolaris* occurs primarily in two disjunct geographic segments. The typical plants are in the eastern range: Alabama, northern Florida, Georgia, South Carolina, and North Carolina. A disjunct and broader western range is west of the

Mississippi River (except for a few counties in southern Illinois): Louisiana, Arkansas, Texas, Oklahoma, Kansas, Nebraska, and Missouri. Another small area of disjunct populations occurs in northern Coahuila, Mexico (Sierra del Carmen, Sierra de la Encantada, Sierra del Jardin; Fig. 1). In an earlier survey of the species (Nesom 1990), I concluded that formal variants, previously recognized primarily on the basis of foliar features, were not justifiably recognized. The current set of observations, however, indicates that the previous study was short-sighted, as variants in vestiture clearly do occupy distinct regions within the western segment of the range.

Two expressions of phyllary vestiture occur in plants of the western segment of the species range. Those in the eastern half of the western segment have phyllaries with slightly raised glands, without other vestiture; the name *S. petiolaris* var. *angusta* (Torr. & Gray) A. Gray (type from Rapides Par., Louisiana) applies to these. Plants in the western half of the western segment have eglandular, finely strigose phyllaries; the name *S. petiolaris* var. *wardii* (Britt.) Fern. (type from Clark Co., Kansas) applies to these. Relatively few intermediates in vestiture occur where the two expressions meet or overlap.

Within the range of both var. *angusta* and var. *wardii*, phyllary vestiture often is suppressed and the phyllaries are glabrous or nearly so (without glands or without strigose hairs). Glabrous phyllaries of plants of var. *angusta*, however, often appear somewhat viscid. If only glabrous phyllaries have been observed for a particular county or parish, the map symbol for Fig. 1 is open.

In the original description of *Solidago angusta* Torr. & Gray (*S. petiolaris* var. *angusta*), the name apparently was intended to recognize plants with narrowly lanceolate to narrowly oblanceolate leaves (vs. the predominant lanceolate-elliptic to ovate-elliptic leaf shape). In some areas (e.g., Ouachita Par., La.) all plants of numerous collections produce the conspicuously narrow leaves; in other areas, more variability in leaf shape exists and intermediates are numerous, grading between narrower and broader forms. Counties and parishes in which distinctly narrow-leaved plants occur are indicated in Fig. 1, but in many places it is not possible to unambiguously distinguish taxa based on leaf shape. The name var. *angusta* can be used to refer to narrow-

leaved plants, but narrow-leaved plants occur within the range of those with glandular phyllaries, thus var. *angusta* also may refer to all of the latter, as here. A parallel trend in leaf width variation occurs in *S. wrightii* (see comments below).

Plants of the disjunct cluster of populations in Coahuila produce a relatively narrow capitulescence, glabrous achenes, and glandular involucre and they appear to be appropriately identified as *Solidago petiolaris* var. *angusta*, even though they are closer geographically to populations of *S. wrightii* than to the nearest *S. petiolaris*. The pattern of disjunction is similar to that in *Symphyotrichum drummondii* and *S. oolentangiense* (Nesom 1993), and *Solidago nemoralis* also now is known to have the same disjunction (Nesom in prep.). On the other hand, populations of *Symphyotrichum laeve* var. *geyeri* in the same region of northern Coahuila are disjunct from closest part of their main range in the Guadalupe Mountains of Culberson Co., Texas, and northward in New Mexico.

Plants of the southeastern U.S.A. (var. *petiolaris*) are variable in phyllary vestiture but geographical patterns of variation are not evident. Phyllaries vary from minutely stipitate-glandular without other vestiture to sparsely or moderately puberulent-hirsute and eglandular, or they may produce a mixture of glands and nonglandular hairs. Upper stems and leaves also may be glandular or eglandular and vary in density of nonglandular hairs.

**Solidago petiolaris** Ait., Hort. Kew. 3:216. 1789. *Aster petiolaris* (Aiton) Kuntze, Revis. Gen. Pl. 1: 318. 1891. Type: U.S.A. Aiton's entry for the species is this: "S. caule erecto villosa, foliis ellipticis scabricalis petiolatis, racemis erectis, ligulis elongatis. Late-flowering Golden-rod. Nat. of North America. Cult. 1758, by Mr. Philip Miller. Fl. October-December. H. 4." (holotype: BM).

**a. Solidago petiolaris** var. **petiolaris**

*Solidago milleriana* Mackenzie in Small, Man. Southeast. Fl. 1350, 1509. 1933. Type: Mackenzie did not cite a type but noted (p. 1509) that *S. milleriana* was equivalent to "*Solidago petiolaris*

Authors, not Ait." Perhaps Mackenzie thought that Aiton's name had been misapplied, or perhaps he was proposing a new species for a southern segregate of *S. petiolaris*. A collection at NY is annotated in script (but apparently not in Miller's hand) as "*S. milleriana*" and may represent the name (South Carolina, *J.K. Small et al. s.n.*).

*Solidago harperi* Mackenzie in Small, Man. Southeast. Fl. 1352, 1509. 1933. Type: U.S.A. Georgia. Randolph Co.: dry woods near Grier's Cave, Midway (Lower Eocene) Geological Formation, 23 Oct 1902, *R.M. Harper 1778* (holotype: NY internet image!).

**b. *Solidago petiolaris* var. *angusta*** (Torr. & Gray) A. Gray, Proc. Amer. Acad. Arts 17: 189. 1882. *Solidago angusta* Torr. & Gray, Fl. N. Amer. 2: 204. 1842. Lectotype (Nesom 1990, p. 446): U.S.A. Louisiana. [Rapides Par.]: Alexandria, [no date, but ca. 1834–1840] *J. Hale s.n.* (NY! internet image; isolectotype: NY! internet image). Taylor and Taylor (1984, p. 238) cited the NY Hale collection as "holotype."

*Solidago lindheimeriana* Scheele, Linnaea 21: 599. 1848. *Aster lindheimerianus* (Scheele) Kuntze, Revis. Gen. Pl. 1: 318. 1891. Type: U.S.A. Texas. [Bexar or Comal Co.]: between New Braunfels and San Antonio, Oct 1848, *F.J. Lindheimer 417* (holotype: MO?; isotypes: GH!, US!).

**c. *Solidago petiolaris* var. *wardii*** (Britt.) Fern., Rhodora 10: 87. 1908. *Solidago wardii* Britt., Man. Fl. N. States 935. 1901. Type: U.S.A. Kansas. Clark Co.: 8 mi W of Ashland, 2 Oct 1897, *L.F. Ward s.n.* (holotype: NY! internet image; isotype: GH).

### Variation in *Solidago wrightii*.

*Solidago wrightii* occurs from central Arizona through most of New Mexico, into southeastern Colorado, and into trans-Pecos Texas (Fig. 2). The range extends southward in Mexico into Sonora, Chihuahua, Durango, and southwestern Coahuila (Sierra de Jimulco).

Plants originally described as *Solidago wrightii* var. *orientalis* Nesom (Nesom 1989) were later segregated as specific rank (Nesom 1990). *Solidago orientalis* (Nesom) Nesom, of Coahuila and Nuevo León, is distinct from *S. wrightii* in its stems, leaves, and phyllaries with a mixture of stipitate glands and hirtellous vestiture, serrate (vs. mostly entire) leaves, heads in an interrupted, elongate capitulescence of axillary clusters, and fewer (4–6) ray florets.

*Solidago wrightii* also is closely related to *S. petiolaris*, the latter distinct in its combination of cylindric capitulescence, eglandular leaves, and glabrous or glabrate achenes. As noted below, however, achene vestiture and capitulescence shape vary in *S. wrightii*, and no single character provides consistently diagnostic distinction between the two taxa.

1. Plants caespitose from thick, woody bases, not rhizomatous; uppermost leaves often minutely glandular (lens); heads in more or less flat-topped or broadly rounded corymboid cymes or an open, paniculate cluster of corymboid cymes, sometimes in a narrow, subcylindric panicle; achenes strigose, rarely glabrous (in var. *guadalupensis*).

.....**Solidago wrightii**

1. Plants from a short caudex, often with a thickened, primary rhizome (commonly not evident in collections), production of scale-leaved rhizomes sometimes evident; leaves usually eglandular; heads usually in a narrow, subcylindric panicle; achenes glabrous or sparsely strigose at the summit.....**Solidago petiolaris**

Blake (1929) used the name *Solidago wrightii* var. *adenophora* to describe plants with stipitate-glandular vestiture (without non-glandular hairs) on the phyllaries and stems. Stipitate-glandular plants are the most commonly collected expression of the species and apparently occur over its whole range but without a geographic pattern that would evidence the evolutionary coherence of the taxon. Otherwise, plants are eglandular or minutely and inconspicuously glandular. Intermediates are not as abundant as might be expected, and this probably has contributed to the persistent use of varietal rank for glandular plants. Intermediacy does occur, however, most commonly in plants with glandular phyllaries but hirsute-puberulous (eglandular) stems. In others, phyllaries show a mixture of

glandular and non-glandular hairs. Taylor and Taylor (1983, 1984) noted that intergrading variation occurs in vestiture although they distinguished two varieties based on capitulescence shape. Semple and Cook (2006) did not recognize glandular plants of *S. wrightii* with formal nomenclature, noting intergradation in vestiture.

In some parts of the range of *Solidago wrightii*, one vestiture form or another appears to be the predominant expression. For example, in the White Mountains of Lincoln and Otero counties, New Mexico, 13 of 14 collections studied have glandular stems and phyllaries; in the area of Grant-Catron-Sierra counties, both expressions occur commonly but 5 of 5 collections from Hillsboro Peak (Sierra Co.) are glandular. In Brewster Co., Texas, apparently all plants have glandular stems and phyllaries, but in adjacent Jeff Davis Co. (the type locality for the species), stems and phyllaries are hairy and essentially eglandular. Eglandular plants are uncommon in the Mexican range. In New Mexico, glandular plants have been collected at an elevational range of (6000–)6600–10,400 feet, while eglandular ones have been collected at (5650–)6800–9200 feet. Since the variability in vestiture seems to be a populational phenomenon, glandular variants are recognized here at the rank of forma, rather than variety.

A distinctive narrow-leaved race of *Solidago wrightii* is endemic to the Guadalupe Mountains of northwestern Culberson Co., Texas, and adjacent Eddy Co., New Mexico, and apparently disjunct slightly northward to the east flank of the Sacramento Mountains in Chaves Co., New Mexico (Figs. 2, 3). These variants are recognized here as *S. wrightii* var. *guadalupensis*. The plants occur over limestone substrate, similar to habitats of var. *wrightii* in the Sacramento Mountains, but southward in Texas, *S. wrightii* occurs only in the volcanic Davis Mountains (Jeff Davis Co.) and on igneous "plugs" in the predominantly limestone Del Norte Mts. and Glass Mts. (both in Brewster Co.). The narrow-leaved plants occur at lower elevations than typical *S. wrightii* in New Mexico (4800–7100 ft vs. [5650–]6600–10,400 ft), but populations of var. *wrightii* in Jeff Davis Co. occur at similarly low elevation.

The populations of *Solidago wrightii* in Jeff Davis and Brewster Co. are disjunct and ecologically distinct from those in the

broader contiguous range of the typical expression, and it would not be surprising if the trans-Pecos populations were more closely related cladistically to var. *guadalupensis* than to the rest of var. *wrightii*. Morphologically, however, the similarity of the Texas plants of var. *wrightii* to those in the broader range is taken here as justifying their convarietal treatment. Assignment of rank to the geographically juxtaposed var. *guadalupensis* is equally problematic -- it might with justification be considered a weakly differentiated species.

Var. *guadalupensis* is morphologically discontinuous from populations of var. *wrightii*, but the former produces nearly glabrous achenes, similar to those in *S. petiolaris*. Collections of *Solidago wrightii* in southeastern Colorado and eastern New Mexico (including Harding, Quay, and Union counties) have glabrous achenes and relatively elongate capitulescences (also similar to *S. petiolaris*), but the plants have glandular phyllaries, stems, and leaf surfaces. *Fletcher 5800* (UNM) from Harding Co. and *Williams s.n.* (UNM) from Quay Co. have minutely glandular leaf surfaces, hirsute-glandular involucre, and are similar in overall habit to others of var. *wrightii* from northern New Mexico.

The closest documented geographical approach of *Solidago wrightii* to *S. petiolaris* are plants of the latter in Cimarron Co., Oklahoma (*Taylor 23743-BRIT*, *Waterfall 9728-SMU*; Fig. 1) and others in the Texas panhandle, which have eglandular, villous-strigose phyllaries typical of *S. petiolaris* var. *wardii*. Thus, even though consistent diagnostic characters do not separate the two species and trends in variation in vestiture and leaf shape in *S. wrightii* are paralleled by similar trends in *S. petiolaris*, each taxon has a geographic coherence and the two are distinct at their point of near-contiguity in range.

**Solidago wrightii** A. Gray, Proc. Amer. Acad. Arts 16: 80. 1881. *Solidago bigelovii* var. *wrightii* (A. Gray) A. Gray, Proc. Amer. Acad. Arts 17:190. 1882. Lectotype (designated here): U.S.A. New Mexico, "collected in expedition from western Texas to El Paso, New Mexico, May-Oct 1849, C. Wright 281 (GH; isolectotype: US internet image!). In the protologue, Gray cited "*S. petiolaris*, var., Gray Pl. Wright. 1. 94. *S.*

*californica*, var., Rothrock, in Wheeler Rep., vi. 145. – W. Texas to Arizona, Wright, Bigelow, Rothrock." The entry in *Plantae Wrightianae* is "281. SOLIDAGO PETIOLARIS, Ait.; Torr. & Gray, Fl. 2. p. 203; var. Mountains between the Limpia and the Rio Grande; Aug." The entry in the Wheeler Report notes that "This form (730) from Mount Graham, Arizona, and at an altitude of 9,000 feet, may prove a distinct species."

Many collections of *Solidago wrightii* have been made in Texas from the Davis Mountains (Jeff Davis Co.) and from the Guadalupe Mountains (northwestern Culberson Co.); elsewhere in the state, it has been collected only from the Del Norte Mountains and Glass Mountains (Brewster Co.). Charles Wright collected in Jeff Davis Co. and it is probable that the type collection was made there. Shaw (1987) described the 1849 collecting trip of Wright, who accompanied an army wagon train under the command of Captain S.G. French. The group skirted the eastern margin of the Davis Mountains, passing through Limpia Canyon (present-day Hwy 17) and collecting further in the area of "Wild Rose Pass" of the canyon, about 10 miles northeast of Fort Davis. From there, they passed around the southern end of the Davis mountains and continued west to Chispa Mountain and the nearby settlement of Lobo in southernmost Culberson County. Collections variously labeled "mountains west of Limpia Pass," "mountains beyond the Limpia," and "hills between Limpia and Rio Grande," were made on 26-28 August at the southern end of the Davis Mountains (Geiser 1935). Wright's field notes indicate that he made three collections of Compositae at the southern end of the Davis Mountains (Johnston 1940): 1034 (Wright's field number), "Mt. valleys beyond Limpia Pass," 26 Aug 1849; 1043, "hills beyond Limpia Pass," 27 Aug 1849; and 1055, "mountains beyond Limpia Pass, dense bunches or branched from the root. fl. yellow," 28 Aug 1849. Wright's field number apparently is not associated with the lectotype, but it seems likely that 1055 was his collection of the goldenrod; Asa Gray assigned the number "281" to the collection.

**Solidago bigelovii** A. Gray, Proc. Amer. Acad. Arts 16: 80. 1881. *Aster brittonii* Kuntze, Revis. Gen. Pl. 1: 315. 1891 [nom. nov., based on *Solidago bigelovii* A. Gray, non *Aster bigelovii* A. Gray]. Type: U.S.A. New Mexico. [Grant Co.]: Copper mines, 1851, *C. Wright 1182* (holotype: GH; isotypes: PH, US internet image!). In the protologue, Gray noted that "*S. bigelovii* is a New Mexican species founded on *S. petiolaris*, var., Gray in Bot. Mex. Bound. 79, collected by Bigelow, Wright, and Parry ... ." The entry in the Boundary Survey is "SOLIDAGO PETIOLARIS, Ait.; Torr. & Gray, l.c. Cobre, New Mexico, etc."

**Solidago wrightii** forma **adenophora** (Blake) Nesom, comb. et stat. nov. Based on *Solidago wrightii* var. *adenophora* Blake, J. Wash. Acad. Sci. 19: 269. 1929. Type: U.S.A. Arizona. Mt. Lemmon, 7500 ft, 4 Sep 1926, *G.J. Harrison 3016* (holotype: US! internet image!).

**Solidago wrightii** var. **guadalupensis** Nesom, var. nov. Type: U.S.A. Texas. Culberson Co.: Guadalupe Mts., south McKittrick Canyon, 27 Sep 1962, *D.S. Correll 26048* (holotype: LL!; isotype: SMU!).

*A Solidagini wrightii* typico similis involucris glandulosis sed differt foliis lanceolatis vel lineari-lanceolatis et acheniis glabris.

Upper stems sparsely to densely hirsutulous-puberulent to puberulent, eglandular. Leaves mostly lanceolate, midstem 3–6 cm long, 4–7 mm wide, narrowly lanceolate to linear-lanceolate on distal 1/3, sparse and bracteate immediately below and into capitulescence. Capitulescence subcorymboid. Phyllaries glabrous to minutely sessile-glandular, without other vestiture, usually viscid when eglandular. Achenes glabrous (mostly) to sparsely strigose (rarely, e.g., *Correll 13869*).

Flowering (May–)Jun–Aug(–Sep); 4800–7100 feet elevation; cliff crevices, slopes and ridges, mine tailings, canyon bottoms, gravel alluvium of stream beds, always over limestone, in vegetation of acacia-juniper-dasyliirion-lechuguilla, oak, oak-maple, and yellow pine-maple-hophornbeam-madrone.

Additional collections examined: **New Mexico. Chaves Co.:** E side of Sacramento Mts., 1 mi NE of windmill in Mule Canyon, 6200 ft, 25 Jul 1979, *Fletcher 3994* (UNM); E side of Sacramento Mts., cracks of E facing limestone scarp, Center Sec 4 T16S R16E, 6700 ft, 17 Jun 1981, *Fletcher 5205* (UNM). **Eddy Co.:** Carlsbad Caverns Natl. Monument, Hayhurst Ridge N, shoulder of sideslope, limestone, oak, 5855 ft, 15 Sep 2000, *Arbetan PA022-F3* (UNM); Guadalupe Mts., Lincoln National Forest, Devils Den Canyon, S to the end of rim road 540, then 2 mi SSW on Forest trail 202, mine tailings on NNW-facing slopes, oak, ca. 7200 ft, 6 Sep 1986, *Brunt 9* (NMC); Carlsbad Caverns Natl. Monument, Hayhurst NW, head of drainage (narrow canyon), limestone, oak-maple, 6155 ft, 14 Sep 2000, *Chauvin YC049-F1* (UNM); 44 mi SW of Carlsbad, Big Canyon, South Fork, 5200 ft, 28 Sep 1989, *Dunmire s.n.* (UNM); Guadalupe Mts., 12 Jul 1939, *Hershey s.n.* (NMC); E slope of Guadalupe Mts. about 48 air km SW of Carlsbad at Sitting Bull Falls, reached by NM Hwy 137, canyon bottom, limestone, *Mimosa*, *Juniperus*, *Dasyllirion*, lechuguilla, *Juglans* in canyon, 1340 m, 21 Jun 1976, *Spellenberg 4199* (NMC); Guadalupe Mts., canyon system below and to W, NW, and E of Devil's Den Spring, 6900–7100 ft, 13 Jul 2000, *Worthington 30161* (UNM); Carlsbad Caverns Natl. Monument, Hayhurst Ridge N, limestone, oak, 5714 ft, 16 Sep 2000, *Yanoff SY014-F1* (UNM). **Texas. Culberson Co.,** Guadalupe Mts.: south McKittrick Canyon, frequent on canyon floor in open yellow pine, maple, *Ostrya*, madrone woodland, 4800 ft, 14 Sep 1978, *Anderson 4652* (BRIT); McKittrick Canyon, on rocks near stream, 18 Jul 1984, *Brown 7757* (BRIT); S of McKittrick Canyon, 2.4 km S, 1.0 km W Pratt Lodge, ca 1/2 km SW of Turtle Rock, open gravel alluvium, 5500 ft, 9 Sep 1975, *Burgess 3710* (TEX); stony mt. sides, 8 Aug 1931, *Clark 4267* (UNM); along mountain stream above Pine Spring Camp, 15 Aug 1946, *Correll 13869* (SMU); north McKittrick Canyon, gravelly stream bed, 18 Aug 1946, *Correll 13948* (LL, SMU); south fork of McKittrick Canyon, 21 Jun 1964, *Correll & Hanson 29808* (LL); mouth of McKittrick Canyon, along stream, 2 Jul 1958, *Correll & Johnston 19150* (LL); Pine Springs Canyon, 7 Sep 1961, *Correll & Johnston 24275* (LL); Pine Sping Canyon, 6800 ft, 2 Jun 1949, *Hinckley & Hinckley 12* (LL); above Frijole, canyon near spring, 9 Aug 1945, *Lundell 14399* (SMU); above McKittrick Canyon, open rocky ridge, 25 Jul 1931, *Moore & Steyermark 3629* (LL); Smith Canyon, shaded arroyos, 17 Jul 1945,

*Muller 8297* (SMU); Smith Canyon infrequent in limestone crevices, 6200 ft, 10 Jul 1949, *Turner 1261* (SMU); lower McKittrick Canyon below Pratt Lodge, limestone soil, 5000 ft, 30 Aug 1950, *Warnock 9420* (SMU); south McKittrick Canyon, limestone soil, 5500 ft, 3 Aug 1952, *Warnock 10972* (LL, SMU); south rim of Pine Springs Canyon, on boulders, 23 Sep 1946, *Whitehouse 17114* (SMU-2 sheets).

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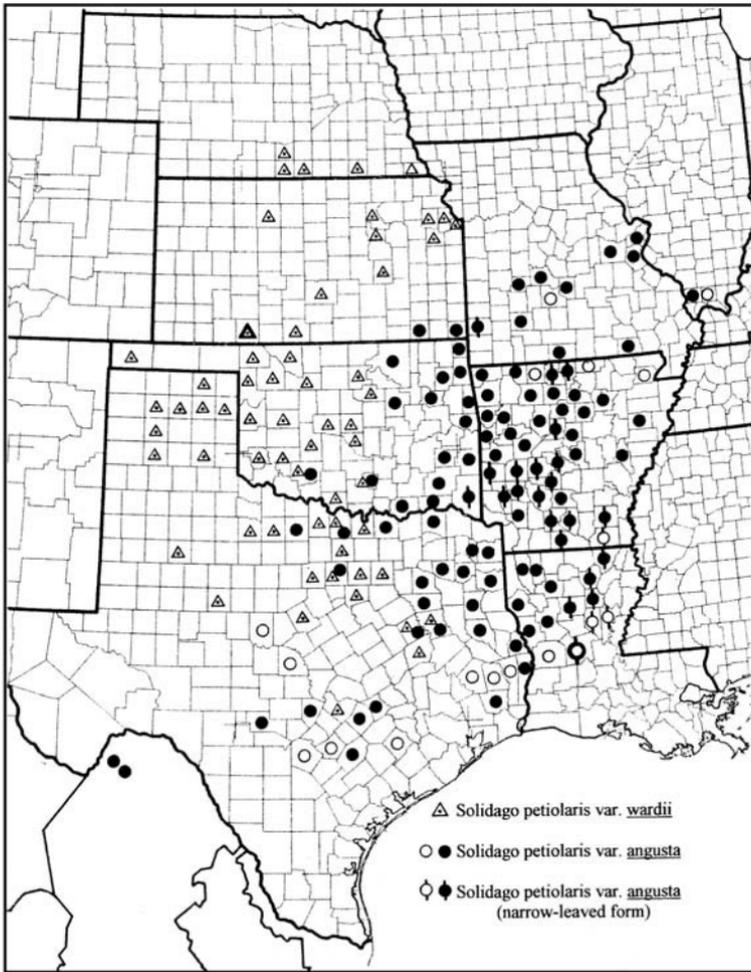


Figure 1. Western distribution of *Solidago petiolaris*: var. *angusta* and var. *wardii*. Bold symbols indicate type localities for the two varieties.

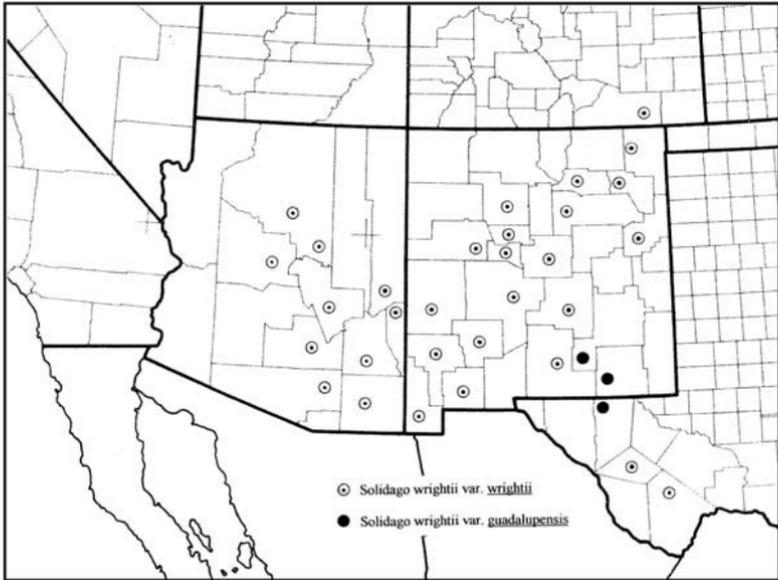


Figure 2. County-level distribution of *Solidago wrightii* in the U.S.A. The distribution continues southward into Mexico (see text).

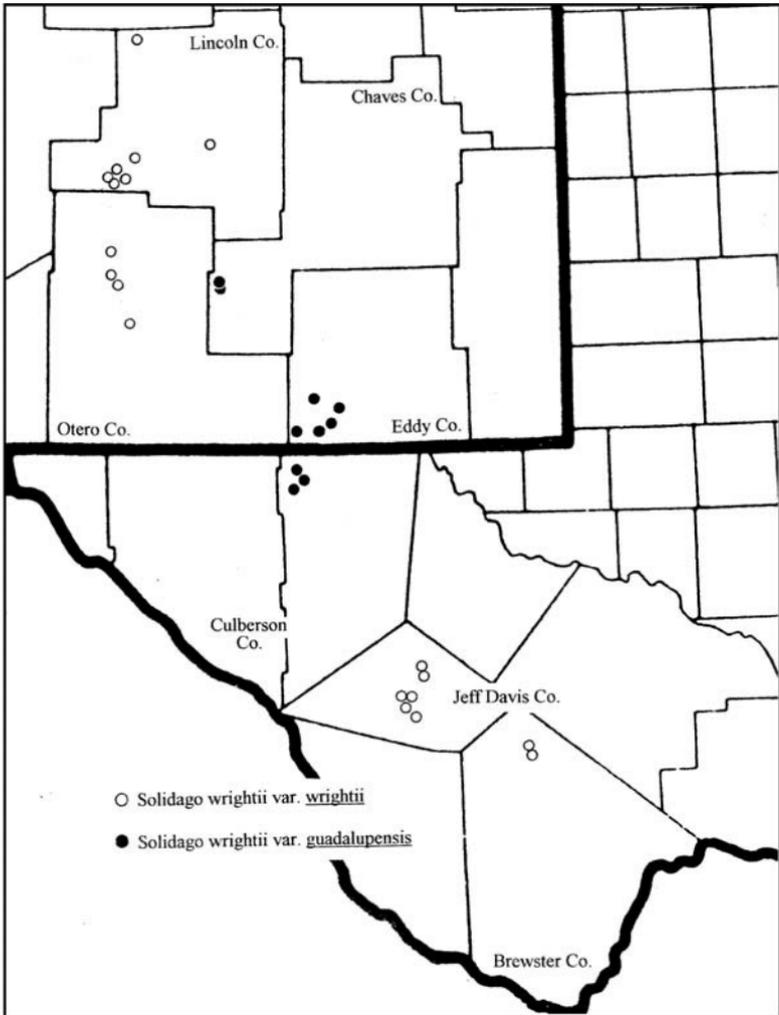


Figure 3. Detailed distribution of *Solidago wrightii* var. *guadalupensis* and closest populations of var. *wrightii*.