

The awnless or scarcely awned lemmas separate this species from *E. canadensis* and *E. villosus* and the setaceous or subsetaceous glumes separate it from *E. virginicus*.

This species is known to Minnesota only by a single specimen in the United States National Herbarium (Fort Snelling, Minnesota, August 3, 1890, *E. A. Mearns* 4). The identification has been confirmed by Dr. J. R. Swallen who has also kindly sent us a copy of the label. A mixture of labels may have been involved (Vasey's identification was *E. canadensis* !), but assuming not, then it seems almost certain that this species no longer grows at Fort Snelling. Local botanists have never collected the species there in spite of frequent trips to the area, even in the 1890's. Intensive development of the area during two wars has eradicated much of the original flora. Inasmuch as the Minnesota "station" is an isolated eastern occurrence, there is the possibility that it was an ephemeral adventive from the West.

Under the circumstances, we feel that it is best to exclude this species from the state flora until such a time as its occurrence may be more satisfactorily established.

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## DISTRIBUTIONAL NOTES AND SOME MINOR FORMS FROM OKLAHOMA

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The following notes are concerned primarily with plants collected by the author in 1944 and 1945, mostly in south-central Oklahoma in the Arbuckle Mountains and vicinity. This area has often been botanically investigated by classes, and other parties, but has seldom been reported on as a phytogeographic area. Ernest J. Palmer spent parts of two days collecting there in 1934 while on a more extensive botanizing trip which included other parts of the state. In the Arbuckles he found and reported several species which he considered to be characteristic of the limestone areas of the Edwards Plateau in Texas. He suggested that the Arbucklean flora might constitute a northeastern

outpost of the flora of the Edwards Plateau<sup>1</sup>. Milton Hopkins also mentions similarities in the flora of the two regions in his discussion of the range of *Juniperus Ashei* (*J. mexicana*)<sup>2</sup>. Additional evidence concerning the southwestern affinities of the flora of the xeric slopes of the Arbuckles will be presented here.

The vegetation of the Arbuckle region varies from the heavily forested areas along the Washita River and some of the larger creeks (where such mesic species as *Sanicula gregaria*, *Taenidia integerrima*, *Zizia aurea* and *Dasistoma macrophylla* may be found), through mesic grassland dominated principally by *Andropogon scoparius*, to xeric slopes dominated by species listed later.

A contrast in vegetation is often found in the grassland on the north and south sides of the low limestone hills which run in a general east-west direction in the central and southern parts of the Arbuckles. The creek-bottoms and valleys between the hills are often wooded, as sometimes are the arroyos running up the hillsides. The limestone plateau which comprises the top of the Arbuckles is grass-covered, as usually are the hillsides, especially in the Arbuckle limestone. On the north sides of the hills, as on the plateau, the grassland is usually mesic in character, being composed primarily of *Andropogon scoparius* with varying amounts of *Andropogon Gerardi*, *Sorghastrum nutans* and *Panicum virgatum* growing where extra water is available, and smaller amounts of *Bouteloua curtipendula*, and other species with a lower water requirement, growing on the less favored sites. The southern slopes of the hills are often characterized by a more xeric grassland vegetation. The principal species are: *Bouteloua hirsuta*, *Bouteloua curtipendula*, *B. rigidiseta*, *Triodia elongata*, *Triodia pilosa* and *Panicum Hallii*. The latter may be fairly abundant locally. However, even on the south slopes, where faults in the rock strata, or separation of up-ended layers, have permitted the accumulation of a deep soil and the concentration of run-off water, *Andropogon scoparius* again becomes dominant. Even in the fall and winter the difference between the kinds of vegetation on the two slopes can be recognized from a distance

<sup>1</sup> Palmer, E. J., *Notes on some plants of Oklahoma*. Journ. Arn. Arb. 15: 132-134. 1934.

<sup>2</sup> Hopkins, Milton, *Notes from the Herbarium of the University of Oklahoma*—I, RHODORA 40: 425-429. 1938.

by the contrasting coloration. The grasses on the northern sides, predominantly *Andropogon scoparius*, cure to a brownish or red-brown color. The southern slopes are a lighter color as many of the species growing there dry to a light, yellowish or grayish color. In extreme cases it is almost as if the two sides of the hill were separated several hundred miles geographically and climatically. This seems to be due to the probability that the available water supply on these sites is critically near the minimum amount needed for the growth of *Andropogon scoparius*. Consequently, the increased evaporation on the south-facing slopes reduces the amount of available water below the minimum required for the perpetuation of *Andropogon scoparius*. More xeric species, having lower water requirements, are consequently found on these sites. This is not to be taken as precluding the probability that the distribution of certain species may be correlated primarily with the presence of limestone, or other different substrates of immature soils. Thus the xeric vegetation on limestone hills may differ from that on granite, climatic conditions being similar.

An example of several species southwestern in affinities was found growing on an igneous canyon-wall along a creek 8 miles west and 3 miles south of Davis, Murray County. Here were collected: *Cheilanthes Eatonii*, *Pellaea Wrightiana*, *Leptochloa dubia*, *Abutilon incanum* and *Galium texense*.

Some of the xeric species found on limestone include: *Triodia pilosa*, *Triodia elongata*, *Bouteloua rigidiseta*, *Panicum Hallii*, *Sida procumbens* and *Galium texense*.

**SPHENOPHOLIS OBTUSATA** (Michx.) Scribn., var. **LOBATA** (Trin.) Scribn. forma **purpurascens** (Vasey ex Rydb. and Shear) comb. et stat. nov. *Eatonia obtusata*, var. *purpurascens* Vasey ex Rydb. and Shear, U. S. Dept. of Agri., Div. of Agrostology, Bull. 5: 30. 1897. Plants similar to *S. obtusata*, var. *lobata*, but differing primarily in having the glumes and upper parts of the lemmas colored dark purple, were found in a creek-bottom prairie, 3 miles east and 3 north of Sulphur, Murray County, on May 24, 1946. They were collected as *Waterfall* No. 6486.

Dr. Edward Palmer collected the type of var. *purpurascens*<sup>1</sup> "in the Indian Territory, chiefly on the False Washita, between

<sup>1</sup> The author is grateful to Dr. E. P. Killip, Head Curator of the Department of Botany, Smithsonian Institution, United States National Museum, Washington, D. C., for the loan of the type.

Fort Cobb and Fort Arbuckle, 1868". It is numbered 404, and designated by Vasey as *Eatonia obtusata*, var. *purpurascens*. Rydberg and Shear validated this herbarium name as "a form with purplish panicles". They also cited their numbers 252, 252½ and 2002 from Nebraska, and Kearney 271 from the same state, as representing var. *purpurascens*.

Since the principal differentiating characteristic seems to be the minor one of glume and lemma coloration, the author believes these plants should receive only formal designation, whether or not their occurrence proves to be sporadic throughout the entire range of the variety. It might also be noted that some of our specimens referable to var. *lobata* on the basis of having short panicles with appressed, rounded branches do not have puberulent sheaths. If the panicle characteristics, variable though they are, be accorded more taxonomic significance than the sheath characteristic, then it would appear that var. *lobata* should be considered as having sheaths varying from glabrous to pubescent. A second possibility is that plants with glabrous sheaths merely represent a merging with the typical variety.

*SPHENOPHOLIS OBTUSATA*, var. *PUBESCENS* (Scribn. and Merr.) Scribn. In checking the material of *Sphenopholis obtusata* from our state, there were found two sheets that agree with the characteristics of var. *pubescens* as set forth by Fernald<sup>1</sup>, and also by Lamson-Scribner<sup>2</sup>. These sheets are: *Milton Hopkins* 1696, dry rocky woods . . . 9 miles northwest of Wilburton, Latimer County, May 7, 1937; *Elbert Little* 1083, Muskogee County, May 15, 1927. This variety appears to be an addition to our state flora.

*SPOROBOLUS PYRAMIDATUS* (Lam.) Hitchc. This species is a rarity in the Arbuckles where it grows on saline soil, as did *Waterfall* 6074, taken from saline sand in the Secondary Wilcox Formation, about 3 miles north of Springer, Carter County. An abundant associate was *Distichlis stricta*, another indicator of salinity. The latter species is common farther west and northwest in the state.

*STIPA LEUCOTRICHA* Trin. and Rupr. is locally abundant in the Arbuckle Mountain area and southward through the tight, limestone-derived "blacklands". It is often associated with *Buchloe dactyloides*, and, when abundant in this region, should

<sup>1</sup> Fernald, M. L., *Another Century of Additions to the Flora of Virginia*, RHODORA 43: 533. 1941.

<sup>2</sup> Lamson-Scribner, F., *The Genus Sphenopholis*. RHODORA 8: 143. 1906.

probably be considered as an indicator of overgrazing of about the same significance as the latter species.

*LESQUERELLA OVALIFOLIA* Rydb., var. *ALBA* Goodman. This white-flowered *Lesquerella* is locally abundant in the Arbuckles, sometimes coloring hills white in the early spring. It is usually found on thin, shallow soil on limestone hills. In near-climax condition it grows with such grasses as *Bouteloua curtipendula*, *Bouteloua hirsuta* and *Triodia elongata*; under overgrazing the *Lesquerella* increases in abundance, as do such species as *Triodia pilosa*.

In the spring of 1947, the var. *alba* was first collected from the Wichita Mountains (*Goodman and Waterfall* 5694). Previously it had been known only from the Arbuckles where it was discovered. Peculiarly enough, in the Arbuckles it has been found only on limestone, not on granite, while in the Wichitas it grows on granitic soils.

*STILLINGIA TEXANA* Johnston, var. **latifolia**, var. nov., a varietate typica differt foliis latioribus et crenatis.

In July 1946, the author collected from limestone soil in the Arbuckle Mountains a *Stillingia* apparently referable to *Stillingia texana* by virtue of the small fruits (ca. 7 mm. in diameter). However, the leaf-width was broader by two or three times than the leaf-width usually associated with *S. texana*, and the margins were crenate. Furthermore, the collection is considerably north of known records for the species, and thus in an area where variation might be expected.

Material of *S. texana* (including *S. sylvatica*, var. *linearifolia* Torr., *S. linearifolia* (Torr.) Small, not Wats., and *S. angustifolia* Engelm. as applied to the early Texas collections, not the Florida material) was borrowed from the Gray Herbarium of Harvard University, the herbaria of the Missouri Botanical Garden, University of Texas and Southern Methodist University.<sup>1</sup> A study of this material shows that *S. texana* commonly ranges from north-central Texas, as shown by numerous collections from near Dallas and Fort Worth, westward to Shakelford County (*Waterfall* 4345), then southwest to Taylor and Coke Counties. From the Fort Worth-Dallas area south and southwest to the Austin-Fredericksburg-San Antonio region the species often has been collected. Following the description of

<sup>1</sup> The author is indebted to the curators of the herbaria mentioned for the loan of material needed in this study.

the type Torrey<sup>1</sup> cites the following distribution: "Ravines on the San Pedro River and on limestone rocks higher up on the Rio Grande". It has been collected in Coahuila, Mexico: Marsh 80, Musquiz, Coahuila, 1935; Wynd and Mueller 225, Hacienda Mariposa, ravine near Santa Anna, June 22, 1936; Wynd, Hacienda San Rafael, about 10 miles southwest of Hacienda Mariposa along Sabinas Creek, Aug. 18, 1937. The labels on several collections state that the species was found on limestone soil, or limestone outcrops. The author's collections in north-central Texas, as well as the present one, are from such sites.

The relative narrowness of the leaves seems to be a fairly constant vegetative characteristic of the typical variety, *STILLINGIA TEXANA* Johnston, var. **typica** nom. nov. (*S. sylvatica*, var. *linearifolia* Torr., Botany of the Mexican Boundary, 201. 1859). A number of measurements indicate that the majority of the leaves are from 10 to 15 times longer than wide. Contrastingly, the leaves of var. *latifolia* are 5 to 7 times longer than wide. This leaf-width approaches that of *S. sylvatica*, var. *salicifolia*. From the latter variety *S. texana*, var. *latifolia* may be distinguished by the size of the fruits which average about 7-8 mm. in diameter and about 6-7 mm. in height in both var. *typica* and var. *latifolia*, as contrasted with a diameter of about 14-15 mm. and a height of 12-14 mm. in *S. sylvatica*, var. *salicifolia*. The expanded upper part of the gynophore averages ca. 6 mm. in width in *S. texana*, and ca. 10 mm. in width in *S. sylvatica*.

The leaf-margins of *S. texana*, var. *typica* are often serrulate, the apices of the teeth being tipped with prominent conical glands. This characteristic is somewhat variable. The teeth may become more and more rounded, and the apical glands nearer and nearer the sinuses until the margins are crenate with glands in, or approaching, the bases of the sinuses. The serrulate-glandular leaves are much more numerous on the examined specimens than the crenate-margined leaves.

The TYPE of *Stillingia texana*, var. *latifolia* is in the Bebb Herbarium of the University of Oklahoma. It is: *Waterfall* 6523, limestone hillside in the Arbuckle Mountains, 5 miles west and 2½ south of Davis, Murray County, July 15, 1946. An ISOTYPE is in the Gray Herbarium.

<sup>1</sup> Torrey, John. Botany of the Mexican Boundary, 201. 1859.

*SIDA PROCUMBENS* SW. This perennial, procumbent *Sida* of the southwest is found fairly frequently, but not in abundance, on xeric limestone sites in the Arbuckles. It is represented in our herbarium by the following, all from Murray County: *Waterfall* 6060, limestone hill,  $1\frac{1}{2}$  miles southeast of Big Canyon, June 20, 1945; *Waterfall* 6396, limestone near White Mound, Arbuckle Mountains. The following sheets, variously misidentified, belong here: *Ed Dale* 647, limestone hillside near Prices Falls, Aug. 15, 1942; *Becker, Kennedy* and *Waterfall* 5294, Viola limestone, Arbuckle Mountains; *Hopkins* 4765, Viola limestone, Arbuckle Mountains.

I find no record of the species in our flora, but it is possible that G. W. Stevens collected it, or had knowledge of an Oklahoma sheet. On p. 286 of his Manuscript Flora<sup>1</sup> he has this key:

- Plant erect, annual, with fine pubescence.....1. *Sida spinosa*  
 Plant decumbent or prostrate, perennial,  
 pubescence with spreading hairs.....2. *S.*

His species No. 2 is unnamed, but the plants at hand will readily key there.

*OENOTHERA SPACHIANA* T. & G. Plants referable to this species were collected as *Waterfall* 6461 from sand at the edge of post-oak—black-jack woods 4 miles west and 3 north of Sulphur, Murray County. The petals were yellow, drying to a pink color. In our herbarium are sheets from Latimer and Hughes Counties. Munz<sup>2</sup> lists collections from "Weoka" (Wewoka?), Atoka and Mannsville. The present collection is from somewhat farther west than the above, and from an additional county.

*LUDWIGIA NATANS* Ell., var. *ROTUNDATA* (Griseb.) Fern. and Griseb. On Aug. 9, 1945, the author found this variety growing along a creek running through limestone hills, 1 mile east and 4 south of Hennepin, Murray County. It was collected as No. 6109. In our herbarium there are two sheets that may be referred to this variety. They are: *A. H. Vanfleet*, sin. num., muddy ditch near Rodgers, Aug. 6, 1905; and *Fred Barkley* 1447, Canadian River southwest of Norman, Cleveland County, July 13, 1937.

Fernald and Griscom<sup>3</sup> state that the range of var. *rotundata*

<sup>1</sup> Stevens, G. W. *The Flora of Oklahoma*. Unpublished MSS. Original deposited in the Widener Library of Harvard University. 1916.

<sup>2</sup> Munz, Philip A. *Studies in the Onagraceae X. The subgenus Kneiffia* . . . Bull. Torr. Bot. Club 64: 289-290. 1937.

<sup>3</sup> Fernald, M. L. and Ludlow Griscom, *Three Days of Botanizing in Southeastern Virginia*. RHODORA 37: 175. 1935.

includes "... Georgia and Florida to Texas". Munz<sup>1</sup> says "... Atlantic coast to Rocky Mountains". The first statement of range does not include our state; the latter is inclusive enough to do so. At any rate the above citation of specimens definitely includes the plant in our flora.

*CENTAURIUM BEYRICHII* (T. & G.) Robins., forma **albiflorum** forma nov., corollis albidis. TYPE: *Waterfall* 6529, limestone hillside, 2 miles east and 2 north of Sulphur, Murray County, July 21, 1946. The type is in the Bebb Herbarium of the University of Oklahoma. ISOTYPES are in the herbaria of Missouri Botanical Garden and the New York Botanical Garden. The typical, pink-flowered form of the species is found locally abundant on limestone slopes in the Arbuckles, but is not widely distributed. The white-flowered form is fairly abundant in the area from which it was collected.

*SABATIA ANGULARIS* (L.) Pursh, is occasionally found in wet soil along creeks running through prairies in the Arbuckles. The common species of our area, abundant on prairies, is *S. campestris*.

*SABATIA CAMPESTRIS* Nutt., forma *ALBIFLORA* D. M. Moore. The white-flowered form has previously been reported from Arkansas, the state from which it was described in 1941. It is fairly common on prairies in the Arbuckle region where it is found sporadically with the pink-flowered form.

*SCUTELLARIA WRIGHTII* Gray, forma **alba**, forma nov., corollis albidis. TYPE: *Waterfall* 6455, limestone hillside in the Arbuckle Mountains, 8 miles west and 2 south of Davis, Murray County; type placed in the Bebb Herbarium of the University of Oklahoma. The white-flowered form is quite rare.

*GALIUM TEXENSE* Gray has been previously reported<sup>2</sup> from the Wichita Mountains in Oklahoma. *Waterfall* 6457, from igneous canyon-walls, 8 miles west and 3 south of Davis, extends the range known to us about 80 miles eastward within the state. It is another xeric species found here near its probable northeastern limit of range.

*ARTEMISIA ANNUA* L. Plants referable to this species were collected as *Waterfall* 6530 along the Washita River southwest of Daugherty, Murray County, August 5, 1946. I find no previous record of this weedy *Artemisia* within the state.

#### UNIVERSITY OF OKLAHOMA

<sup>1</sup> Munz, Philip A. *Studies in the Onagraceae XIII. The American Species of Ludwigia*. Bull. Torr. Bot. Club 71: 156. 1944.

<sup>2</sup> Hopkins, Milton. *Notes from the Bebb Herbarium of the University of Oklahoma—II. RHODORA* 45: 276-277. 1943.



Waterfall, U. T. 1948. "Distribution notes and some minor forms from Oklahoma." *Rhodora* 50, 91–98.

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