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# A Survey of the Order Contortae in Tennessee

Melville B. Laite
*University of Tennessee, Knoxville*

To the Graduate Council:

I am submitting herewith a thesis written by Melville B. Laite entitled "A Survey of the Order Contortae in Tennessee." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Botany.

A. J. Sharp, Major Professor

We have read this thesis and recommend its acceptance:

Fred H. Norris, James T. Tanner

Accepted for the Council:
Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

August 13, 1953

To the Graduate Council:

I am submitting herewith a thesis written by Melville B. Laite entitled "A Survey of the Order Contortae in Tennessee." I recommend that it be accepted for thirteen quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Botany.

A. J. Sharp
Major Professor

We have read this thesis
and recommend its acceptance:

Fred H. Harris

James T. Tanner

Accepted for the Council:

E. G. Watson
Dean of the Graduate School

# A SURVEY OF THE ORDER CONTORTAE IN TENNESSEE

A THESIS

Submitted to
The Graduate Council
of
The University of Tennessee
in
Partial Fulfillment of the Requirements
for the degree of
Master of Science

by

Melville B. Laite

August 1953

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# INTRODUCTION

Although many of the orders and families of the flora of Tennessee have received critical analyses, no published accounts of the order Contortae have been found. The writer became interested in this order during general taxonomic studies and decided to carefully review the Tennessee material in the Contortae.

The order, Contortae, in this study included those families which were included by Fernald (1950) in the eighth edition of Gray's Manual of Botany: Loganiaceae, Gentianaceae, Apocynaceae, and Asclepiadaceae.

## Statement of the Problem

The problem has been to check all available Tennessee material in order to determine the taxonomic limits and distribution of the taxa belonging to the order Contortae (Gentianales of Bentham and Hooker and others) as represented in the flora of Tennessee. In addition, keys have been arranged for the identification of the families, genera, and species.

## Procedures

The pursuance of this problem has involved a survey of the available pertinent literature and the examination of, roughly, six

hundred specimens not including duplicates in several herbaria, viz., the University of Tennessee Herbarium, the Herbarium of Vanderbilt University, the Herbarium of East Tennessee State College, and the J. M. Shaver collection at Peabody College. In addition, identified specimens from other regions were used in checking the identifications of those specimens collected in Tennessee.

The specimens from the J. M. Shaver collection at Peabody College came in the absence of the writer. Dr. A. J. Sharp critically examined and recorded the data on those specimens so that they could be returned before an undue lapse of time.

Distribution maps were prepared and are found in the appendix.

## Limitations and Abbreviations

The works which proved useful in this study are included in the bibliography. The keys are modifications of existing ones and have been arranged so that they can be used in the identification of dried specimens, with the exception of the key to the families, where the characters (plants without milky sap and plants with milky sap) are used to separate the families Loganiaceae and Gentianaceae from the families Apocynaceae and Asclepiadaceae.

As previously stated an estimated six hundred specimens, not including duplicates from this and other areas, have been examined. Only one specimen from each county where found has been listed in this

work, which should be sufficient to give an indication of distribution.

The following abbreviations are used: (TENN) - Herbarium of the University of Tennessee; (ET) - Herbarium of East Tennessee State College; (VU) - Herbarium of Vanderbilt University; (P) - The J. M. Shaver collection at Peabody College.

The sequence of family, generic and specific names follows that of Gray's Manual of Botany, eighth edition. This manual or other standard manuals such as Gleason (1953) and Small (1933) may be referred to for descriptions of the species included in this study.

The synonyms for the species of Loganiaceae, Gentianaceae, and all of the Asclepiadaceae except the genus Gonolobus are taken from Britton and Brown (1923). The synonyms for the species of Gonolobus follow the treatment of Perry (1938), and the synonyms for the species of Apocynaceae are those of Woodson (1938).

## SURVEY OF LITERATURE

Lawrence (1951) indicated that the order Contortae was designated the Gentianales by Bentham and Hooker and others. He included the Oleaceae in the order and further stated that the order was subdivided by Engler and Diels into two suborders containing six families as follows: Oleineae including Oleaceae; Gentianaceae including Desfontaineaceae, Loganiaceae, Gentianaceae, Apocynaceae, and Asclepiadaceae. Lawrence also noted that Wettstein followed by Rendle, restricted the Contortae to contain only the suborder Gentianeae and segregated the Oleineae as the Oleales, considering the latter to have been derived from stocks allied to the Staphyleaceae, and the former to be advanced over the Tubiflorae. He further stated that Hallier included the six families of Engler and Diels within his Tubiflores and that the Salvadoraceae originally included in the order by Engler, were transferred by Engler and Gilg (1924) to the Sapindales.

Moore (1947) made some cytotaxonomic studies in the Loganiaceae. He indicated that the family has been regarded as an artificial group in which some genera have been referred to other families, e.g., Buddleja to the Scrophulariaceae, Gelsemium to the Apocynaceae, Polypremum to the Rubiaceae, etc. Though his cytological data agree with taxonomic evidence that the Loganiaceae is an artificial group, he felt that Gelsemium, Polypremum, and Buddleja should be retained in the family.

Some anatomical studies in the Gentianaceae were made by Lindsey (1938) to establish evidence for the Menyanthaceae. According to him, five genera (Nephrophyllidium, Menyanthes, Villarsia, Nymphoides and Liparophyllum) have been assigned to the Gentianaceae by most authors. Gilg (1895) divided the Gentianaceae into two subfamilies with the above five genera constituting the subfamily Menyanthoidae. Lindsey contends that because of certain anatomical findings the Menyanthaceae merits full family status as distinct from the Gentianaceae.

The subfamily status for the Menyanthoideae is retained by Fernald (1950).

Woodson (1930) stated that:

> Previous to Tournefort, nearly all of the plants then known which are now distributed between the families Apocynaceae and Asclepiadaceae were included in one monstrous group Apocynum. Furthermore, any plant which happened to yield latex was apt to be named Apocynum. One generic name, therefore, characterized multitudes of pre-Tournefortian polynomials applied to milk-yielding plants which were indiscriminately Euphorbiaceae, Asclepiadaceae, or Apocynaceae.

Woodson also wrote that the name "Apocynaceae" was first applied to the family by Lindley in 1836 and that the group was practically identical with the "Apocineae" as defined by Robert Brown (1809).

Woodson (1941) stated that the problem of Asclepiadaceae has been summarized well by Standley (1938), who said: "The family is noteworthy for the complicated structure of the flowers, more complicated, probably than those of any other family of plants."

Woodson (1941) noted that the classification of the Asclepiadaceae into major divisions is based upon the position of the pollinia. He further stated that the family owes its foundation to Robert Brown (1809), who separated the family as it is now recognized into five tribes: Periploceae, Secamoneae, Asclepiadeae, Verae, Gonolobae, and Stapelieae.

Shumann (1895) divided the family into two subfamilies, Periploideae and Cynanchoideae. In his arrangement the Cynanchoideae has four tribes, Asclepiadae, Secamoneae, Tylophoreae (Stapelieae of Brown), and Gonolobeae.

According to Woodson (1941), only the Cynanchoideae are present in the native flora of the New World with the three tribes Asclepiadeae, Gonolobeae, and Tylophorae.

## SYSTEMATIC TREATMENT

### Key to the Families of Contortae

1. Plants without milky sap.....2
1. Plants with milky sap.....3

2. Leaves stipulate or stipular lines between the leaves.....Loganiaceae
2. Leaves estipulate.....Gentianaceae

3. Filaments of stamens very short, distinct.....Apocynaceae
3. Filaments of stamens united forming a column or gynostegium.....Asclepiadaceae

### A Brief Description of the Families of Contortae in Tennessee with Keys to the Genera and Species - and Other Pertinent Data

### Loganiaceae

Herbs and slender wiry vines with opposite entire leaves and stipules or stipular lines between the leaves; flowers four or five-parted, and bisexual; ovary free from the calyx; corolla white or yellow.

### Key to the Genera and Species

1. Slender wiry vines; corolla large, yellow.....1. Gelsemium
1. Herbs.....2

2. Corolla tubular-funnel form; red and yellow.....2. Spigelia
2. Corolla small, urceolate, white.....3. Cynoctonum

1. Gelsemium Juss.

(Yellow Jessamine)

(1.) Gelsemium sempervirens (L.) Ait.

Synonymy:

Bigonia sempervirens L. Sp. Pl. 623. 1753.

Gelsemium nitidum Michx. Fl. Bor. Am. I:120. 1803.

Gelsemium sempervirens Ait. f. Hort. Kew. 2:64. 1811.

Specimens examined: Hamilton: north edge of Hamilton Co., 3 mi. from Sale Creek, E. Prather 248 (TENN); Lauderdale: bottom woodland, open lake, Sharp, Alfred and Eddie Clebsch 6358 (TENN); Rhea: creek-bottom alluvium, Richland Creek, edge of Dayton, Cain and Sharp 4394 (TENN).

2. Spigelia L.

(Pinkroot)

(1.) Spigelia marylandica L.

Synonymy:

Lonicera marylandica L. Sp. Pl. 175. 1753.

Spigelia marylandica L. Syst. Ed. 12, 734. 1767.

Specimens examined: Anderson: dolomite outcrop near Lake City (Coal Creek), Sharp and Cain 333 (TENN); Benton: high bottoms of Tenn. River adjacent to upland just west of Route 70, Shanks, F. Woods, J. Hardin, and R. Gilpin 15629 (TENN); Bledsoe: dry woods n. w. of

Pikeville, 1000', Harper 7821 (TENN); Blount: Road to Rich Mt., Sharp 1691 (TENN), Walland, Hudson (TENN); Bradley: near Cleveland, Sharp and Hesler 1105 (TENN); Cumberland: Wooded slope on Black Mt., 5 mi. s. e. of Crab Orchard, Sharp and F. Woods 7452 (TENN); Davidson: Woodland in Little Marrowbone Creek Region, W. E. Furniss 8882 (P); Cheatham: Road along R. R. about 1 mile west of Turnbull Creek, J. M. Shaver 8881 (P); Decatur: s. e. of Cozette, wooded slope near Cherry School, Sharp, Adams, and Felix 12919 (TENN); Dickson: along banks of Beaverdam Creek, s. e. of Burns, near Fitzgerald Farm, Sharp, E. and A. Clebsch 432 (TENN); Grainger: Buffalo Springs Fish and Game Preserve, rocky ground in woods, Morrison and Brown 4 (TENN); Hamilton: Lookout Mt., Sharp and Hesler 1023 (TENN); Hardeman: West of Pochahontas edge of spring, Sharp and E. Clebsch 6730 (TENN); Henderson: Dry slope near Cub Lake, Natchez Trace State Park, Sharp, Farichild, Alfred and E. Clebsch 9329 (TENN); Knox: in well drained clay loam, U. T. Farm, Jennison 330 (TENN); Lawrence: along east fork of Sugar Creek, near Fall River, Sharp, Fairchild, Alfred and E. Clebsch 9729 (TENN); Loudon: Quarry Bluffs near Lenoir City, Sharp and Cain 4499 (TENN); Marion: Near the mouth of the Little Sequatchie River, Sharp, Fairchild, and E. Clebsch 1948-26 (TENN); McNairy: Moist soil along creek north of Stantonville, Sharp, Alfred and E. Clebsch 208 (TENN); Rhea: Richland Creek Valley below Morgan Springs, Shanks, Sharp, and E. Clebsch 4392 (TENN); Roane: Near Kingston, Jennison, Sharp, and Hesler 1148 (TENN); Scott: Mouth of No Business Creek, South Fork River,

Sharp, Shanks, and Clebsch 3853 (TENN); Shelby: Near Ding. Bedfords Slough in wet soil, north of Baileyville, Sharp, E. Clebsch, and Goolsby 6548 (TENN); Unicoi: Near Loyston, Rice 981 (TENN); Union: Flowering along Crooked Creek Rd., Waldens Ridge, Island F, Norris Lake, Kelly (TENN); Warren: Old Woodland north bank of Collins River, Brown (ET); Wayne: East of Leatherwood, bluffs of Beech Creek, Sharp, Adams, and Felix 10184 (TENN); White: Calcareous Bluff below Great Falls Dam, near Webbs Camp on Cavey Fork, Shanks, Sharp, and E. Clebsch 5084 (TENN); Williamson: Between Nolensville and Triune, Cedar glade, Sharp, E. and A. Clebsch 3616 (TENN).

3. Cynoctonum J. F. Gmel.

(Miterwort)

(1.) Cynoctonum Mitreola (L.) Britt.

Synonymy:

Ophiorhiza Mitreola L. Sp. Pl. 150. 1753.

Anonymos petiolata Walt. Fl. Car. 108. 1788.

Cynoctonum petiolatum Gmel, Syst. 2:443. 1791.

Mitreola petiolata T. and G. Fl. N. A. 2:45. 1841.

Cynoctonum Mitreola Britton, Mem. Torr. Club 5:258. 1894.

Specimens examined: Coffee: Wooded wet barren four miles s. e. of Manchester, Shanks, Sharp, and E. Clebsch 5253 (TENN).

## Gentianaceae (Including Menyanthaceae)

Smooth herbs; leaves opposite, or whorled (alternate and petioled in Nymphoides), sessile, entire and without stipules; flowers regular with the stamens as many as lobes of the corolla; fruit usually 2-valved and septicidal many seeded capsule.

### Key to the Genera

1. Leaves opposite or whorled, and sessile.....2
1. Leaves alternate, petioled.....1. Nymphoides

2. Corolla-lobes convolute in the bud.....3
2. Corolla-lobes imbricate in the bud.....5

3. Style filiform, usually deciduous from capsule; corolla rotate.....2. Sabatia
3. Style short and thick, persistent, or absent.....4

4. Corolla funnelform, campanulate, or salverform, without nectariferous pits or glands at base; stamens borne on corolla-tube.....3. Gentiana
4. Corolla rotate with a fringed glandular spot on each lobe.....4. Swertia

5. Calyx 4-parted; corolla deeply 4-cleft, slenderly campanulate; stigma nearly sessile.....5. Bartonia
5. Calyx of 2 foliaceous sepals; corolla 4-lobed, ellipsoid-campanulate; style definite.....6. Obolaria

### 1. Nymphoides Hill

(Floating-Heart)

(1.) Nymphoides cordata (Ell.) Fern.

Synonymy:

Villarsia lacunosa Vent. Choix des Plantes, 9. 1803.

Limnanthemum lacunosum Griseb. Gent. 347. 1839.

Nymphoides lacunosum Kuntze, Rev. Gen. Pl. 429. 1891.

Nymphoides cordata (Ell.) Fern. Rhod. XI. 338. 1938.

Specimens examined: Obion: Upper Blue Basin of Reelfoot Lake, Walnut Log, Sharp, A. and E. Clebsch 6188 (TENN).

Only one specimen was available for examination.

## 2. Sabatia Adans.

### Key to Species

1. Branches of inflorescence all opposite; stems somewhat 4-angled or ridged; flowers in a panicle or corymb of cymes.....2
1. Branches of inflorescence all or nearly all alternate; stems less definitely 4-angled; flowers borne singly at tips of peduncles and branches.....1. S. campanulata

2. Principal leaves linear to ovate-lanceolate, firm, 1-3 nerved not clasping.....2. S. brachiata
2. Principal leaves clasping, cordate-ovate (or lower often sub-orbicular), 3-7 nerved; stem wing-angled.....3. S. angularis

### (1.) Sabatia campanulata (L.) Torr.

Synonymy:

Chironia campanulata L. Sp. Pl. 190. 1753.

Chironia gracilis Michx. Fl. Bor. Am. I:146. 1803.

Sabbatia gracilis Salisb. Parad. Lond. Pl. 32. 1806.

Sabbatia campanulata Torr. Fl. U. S. I:217. 1824.

Specimens examined: Bledsoe: Bog on Herbert Domain, Sharp 1664 (TENN); Blount: Wet open woods in Cades Cove, Meyer and Iltis 2482 (TENN); Carter: Swamp along Storey Creek, E. of Elizabethton, Sharp, Clark, Fairchild, Hernandez, and E. Clebsch 11777 (TENN); Coffee: N. E. of Forest Mills, barren, Sharp, Shanks, and E. Clebsch 5454 (TENN); Cumberland: Around Finger Like, N. E. of Crossville, Norris and Sharp 16176 (TENN); Franklin: Boggy area in open woods near Tullahoma, Sharp, Fairchild and E. Clebsch 9938 (TENN); Grundy: Between Tracy City and Coalmont, boggy meadow, Sharp, Shanks, and E. Clebsch 5435 (TENN).

(2.) Sabatia brachiata Ell.

Synonymy:

Chironia angularis var. angustifolia Michx. Fl. Bor. Am. I:146. 1803.

Sabbatia brachiata Ell. Bot. S. C. to Ga. I:284. 1917.

Sabbatia angustifolium Britton, Mem. Torr. Club 5:259. 1894.

Specimens examined: Coffee: Near Manchester, moist barrens toward Tullahoma, A. and E. Clebsch 4770 (TENN); Grundy: Oak barrens east of Altamont, Svenson 7137 (TENN); Lewis: Merriweather Lewis Nat. Mon., Little Swan Creek, low rich woods, King 153 (TENN); Van Buren: Falls Creek, sandy soil, Sharp 1636 (TENN); White: S. W. of clefty, boggy meadow, Sharp, Shanks, and E. Clebsch 2916 (TENN).

(3.) Sabatia angularis L. Pursh

Synonymy:

Chironia angularis L. Sp. Pl. 190. 1753.

Sabbatia angularis Pursh, Fl. Am. Sept. 137. 1814.

Specimens examined: Anderson: Open woods near Norris, Sharp 2760 (TENN); Bedford: 2 mi. S. E. of Shelbyville, cherty limestone outcrop, along factory creek, Sharp, A. and E. Clebsch 3695 (TENN); Benton: Moist gravelly soil in open field, Walker 16044 (TENN); Blount: Rich Mt., Cain (TENN); Carrol: N. W. of McMinnville, abandoned field, pink bloom, Sharp, Shanks, and E. Clebsch 5595 (TENN); Cheatham: Dry fields and borders of woods, Begram; Svenson 10338 (TENN); Claiborne: Hill between Big Barren and Little Barren Creek, Kelley 2343 (TENN); Coffee: E. of Hickerson, roadside, Sharp, Fairchild, and E. Clebsch 9881 (TENN); Cumberland: Slope above river N. E. of Crossville, Sharp and Norris 16134 (TENN); Grainger: Along creek bank, Buffalo Springs Fish and Game Preserve, 4 mi. S. of Rutledge, Morrison 86 (TENN); Hardin: E. of Savannah, along Steele Creek, pink blooms, Sharp, Fairchild, A. and E. Clebsch 9884 (TENN); Henderson: S. W. of Chesterfield, roadside near Cove Creek, Sharp, Fairchild, E. and A. Clebsch 9285 (TENN); Hickman: Moist soil beside creek, Beaver Dam Springs, Sharp, A. and E. Clebsch 47-304 (TENN); Knox: Two mi. S. W. of U. T. Farm, Hesler and Wilson 3016 (TENN); Lewis: Merriweather Lewis Nat. Mon. near entrance, low open woods, King 330 (VU); Marion: Calcareous rock crevices on bluffs along river

below Hales Bar Dam, Sharp, Fairchild, E. Clebsch 48-72 (TENN); Rutherford: La Vergne, 4 mi. north Broomsedge field at edge of woods, Quartermann 4029 (VU); Union: Wallens Ridge Crest, Walkers Ford Refuge, Kolter (TENN); Warren: N. E. of Morrison, pond edge, Sharp, Fairchild, and E. Clebsch 7548 (TENN); Wayne: S. E. of Waynesboro, bluffs along factory creek, Sharp, Fairchild, A. and E. Clebsch 6904 (TENN).

## 3. Gentiana L.

### Key to the Species

1. Corolla-lobes bristle-tipped.....1. G. quinquefolia
1. Corolla-lobes not bristle-tipped.....2

2. Calyx-lobes distinctly ciliate.....3
2. Calyx-lobes smooth margined or at most scabrous.....5

3. Corolla with nearly truncate summit; the firm true lobes obsolete, narrowed at summit, the broader intervening thin prolongation of the membranous bands forming a fimbriate-dentate border.....2. G. Andrewsii
3. Corolla-lobes rounded, 2-10 mm. long, as broad or broader than the intervening simple to cleft appendages.....4

4. Calyx-tube pubescent; stems slightly pubescent above.....3. G. decora
4. Calyx-tube not pubescent; stems glabrous.....4. G. Saponaria

5. Principal leaves narrowly obovate or ovate oblong, blunt.....5. G. villosa
5. Principal leaves linear to narrowly oblong, acute.....6. G. linearis

### (1.) Gentiana quinquefolia L.

Synonymy:

Gentiana quinquefolia L. Sp. Pl. 230. 1753.

Gentiana quinqueflora Lamb. Encycl. 2:643. 1786.

Specimens examined: Johnson: Crest of Iron Mt., north of Mountain City, Shanks, Woods, and Cooley 8783 (TENN); Knox: Edge of woods near Tennessee River west of Knoxville, Sharp 1694 (TENN); Union: Wallen's Ridge running opposite pine Burr, Island F, Norris Lake, Kelley (TENN).

(2.) Gentiana Andrewsii Griseb.

Synonymy:

? Gentiana alba Muhl. Cat. Ed. 2, 29. 1818.

? Gentiana clausa Raf. Med. Fl. I:210. 1832.

Gentiana Andrewsii Griseb. in Hook. Fl. Bor. Am. 2:55. 1834.

Dasystephana Andrewsii Small, Fl. S. E. U. S., 930. 1903.

Specimens examined: Carter: Dennis Cove, recreation area, Shanks, Woods, and Cooley 8818 (TENN); Johnson: Near head of Higgins Creek, east side of Rich Mt., Shanks, Cooley, and Woods 8856 (TENN); Unicoi: Near Beauty Spot above Erwin, Woods 16529 (TENN).

(3.) Gentiana decora Pollard

Synonymy:

Gentiana decora Pollard. Proc. Biol. Soc. Washington, 13. 131. Am. Bor. (No date).

Dasystephana decora Small, Fl. S. E. U. S., 930. 1903.

Specimens examined: Blount: In partly shaded sandy loam at

5000', Jennison 3525 (TENN); Monroe: Rich woods, Jenks Gap, Tellico River at 4000', Steinmetz (TENN).

(4.) Gentiana Saponaria L.

Synonymy:

Gentiana Saponaria L. Sp. Pl. 228. 1753.

Gentiana Catesbei Walt. Fl. Car. 109. 1788.

Dasystephana Saponaria Small, Fl. S. E. U. S., 930. 1903.

Specimens examined: Blount: Greenbrier Knob above Tremont, Sharp 8-405 (TENN); Carter: Top of Roan Mt. in sod, Shanks and Sharp 15352 (TENN); Cumberland: Blue flowers closed type, Shanks, Woods, and E. Clebsch 14101 (TENN); Dickson: Barren 1½ mi. east of Tennessee City, Shanks, Woods, Cooley, 14876 (TENN); Fentress: Boggy area along Glade Branch about 2 mi. east of Clarkrange, Shanks, Woods, and Cooley 141153 (TENN); Franklin: Damp places in oak woods, Martin (TENN); Lewis: Merriweather Lewis Nat. Mon. near entrance, low open woods, King 330 (VU); Lincoln: E. of Taft, wet woods, Sharp, E. and A. Clebsch 4882 (TENN); Morgan: Sandy soil near wartburg, Meyer 1749 (TENN); Robertson: Upland oak woods, N. W. of Pleasant View, Shanks, Woods, and Cooley 14482 (TENN); Sevier: With grass and sedges on open lea at 5600', Stupka 4622 (TENN).

(5.) Gentiana villosa L.

Synonymy:

Gentiana villosa L. Sp. Pl. 228. 1753.

Gentiana ochroleuca Froel. Gent. 35. 1796.

Dasystephana villosa Small, Fl. S. E. U. S., 931. 1903.

Specimens examined: Benton: Upland near Wolf Creek east of Holladay, Shanks, Woods, and Cooley 14983 (TENN); Coffee: Oak barrens 1 mi. w. of Tullahoma, Shanks, Woods, and Cooley 9145 (TENN); Dickson: Barren 1½ mi. e. of Tennessee City, Shanks, Woods, and Cooley 14878 (TENN); Grainger: Vicinity of Rutledge, Ault (TENN); Hardeman: Wooded swamp on route 100, north of Chickasaw State Forest, Sharp, A. and E. Clebsch 245 (TENN); Knox: Pine woods area, Hopewell at 1000', Sharp 264 (TENN); Lewis: Merriweather Lewis Nat. Mon., low open woods, King 341 (VU); McNairy: Pine-oak forest west of Romer, Shanks, Woods, and E. Clebsch 14651 (TENN); Rhea: East of Walden Ridge, above Spring City, Sharp 7266 (TENN); Stewart: With shortleaf pine on Tenn. Ridge west of Dover, Shanks 2196 (TENN); Tipton: Slope near Anglin Spring, Sharp and Felix 12173 (TENN); Union: Island F. near Maynardsville, Kolter (TENN).

(6.) Gentiana linearis Froel.

Synonymy:

Gentiana linearis Froel. Gent. 37. 1796.

Gentiana Saponaria var. linearis Griseb. in Hook. Fl. Bor. Am. 2:55. 1834.

Gentiana rubicaulis Schwein. in Keating's Narr. Long's Exp. 2:384. 1824.

Gentiana linearis var. lanceolata A. Gray, Syn. Fl. 2: Part I, 123. 1878.

Specimens examined: Sevier: Wet rocks, 6500', under main top of Mt. LeConte, Sharp 4560 (TENN).

## 4. Swertia L.

(Columbo)

### (1.) Swertia carolinensis (Walt.) Ktze.

Synonymy:

Frasera carolinensis Walt. Fl. Car. 87. 1788.

? Swertia carolinensis Baill. ex Gilg, in Engl. and Prantl., Naturl. Pflanzenfam. iv. 2. 1895.

Specimens examined: Bedford: U. S. Bombing Range, thickets northwest of Shelbyville, Sharp, Adams, and Felix 11233 (TENN); Dickson: Dry roadside woods S. E. of Burns, about 8 ft. tall, Sharp, A. and E. Clebsch 47-389 (TENN); Franklin: Roadside slope between Sherwood and Sewannee, Adams, Sharp, and Felix 10676 (TENN); Hamilton: Open woods Lookout Mt., Churchill (TENN); Hardin: Roadside slope east of Cerro Gordo, Sharp, Adams, and Felix 10122 (TENN); Hickman: Moist cherty slope, Hickman Springs, Sharp, Adams, and Felix 11944 (TENN); Houston: Open woods west of Erwin, Harger 7846 (TENN); Lawrence: Cherty hillside, south of Barnesville, Sharp, Adams, and Felix 11013 (TENN); Lewis: Bottoms and bluffs of Trace Creek near bridge on Tenn.

Highway 48, S. W. of Hohenwald, Sharp, Adams, and Felix 10074 (TENN); Montgomery: Near Yellow Creek along Rt. 13, Shanks, 2090 (TENN); Tipton: Slope east of Randolph, near Hurricane Creek, Sharp, Adams, and Felix 12004 (TENN); Warren: Above McMinnville toward Rifle Range, limestone slope, Sharp, Adams, and Felix 10213 (TENN).

## 5. Bartonia Muhl.

Leaves chiefly opposite on stem below the inflorescence.....1. B. virginica
Leaves chiefly alternate or scattered below the inflorescence.....2. B. paniculata

### (1.) Bartonia virginica (L.) BSP.

Synonymy:

Sagina virginica L. Sp. Pl. 128. 1753

Bartonia tenella Willd. Neue Schrift. Ges. Nat. Fr. Berlin 3:445. 1801.

Bartonia virginica B. S. P. Prel. Cat. N. Y. 36. 1888.

Specimens examined: Cumberland: Around Finger Lake, N. E. of Crossville, Sharp and Norris 16177 (TENN); Marion: On decayed stumps, border of Smoke Pond, Cumberland Plateau, Svenson 9520 (TENN).

### (2.) Bartonia paniculata (Michx.) Muhl.

Synonymy:

Centaurella paniculata Michx. Fl. Bor. Am. I:98. 1803.

Bartonia paniculata (Michx.) Muhl. Cat. 16. 1813.

Bartonia lanceolata Small, Fl. S. E. U. S., 932. 1903.

Specimens examined: Fentress: Acid swamp near Clark Range 20 mi. N. of Crossville; Boggy area along Glade Branch, about 2 mi. E. of Clarkrange, Bain 43 (TENN).

## 6. Obolaria L.

(Pennywort)

### (1.) Obolaria virginica L.

Synonymy:

Obolaria virginica L. Sp. Pl. 632. 1753.

Specimens examined: Anderson: Savages Garden, Coal Creek woods, Cain and Duncan 183-2 (TENN); Cheatham: damp shady hillside in ravine south of branch road off road from White's Bluff to near mouth of Harpeth Rd., 35.5 mi. from Nashville, J. M. Shaver 8887 (P); Davidson: Dry open young growth hillside, near first bridge, Little Marrowbone Creek, J. M. Shaver 8888 (P); Franklin: Rocky limestone slope along Sewannee Winchester road, Shanks 1872 (TENN); Grainger: Near Lea Lakes Dry Mountainside, Sharp 1221 (TENN); Grundy: Upper end of Goose Pond, Webb (TENN); Knox: Moist wooded slope, Timberlake Rd., Taylor 15046 (TENN); Lake: Edge of field east of Ridgely, Sharp, Adams, and Felix 11283 (TENN); Marion: Along Dry Creek above Richard City, Sharp, Adams, and Felix 10668 (TENN); Sullivan: Rich dark pine woods, Long (TENN); Tipton: Creek banks near Randolph, Sharp, Adams,

and Felix 12134 (TENN); Union: Hickory Star Landing under pine in ravine, Ford 1222 (TENN); White: At rock island on Sparta side of the bridge at the dam, open woodland, J. M. Shaver 8886 (P).

## Apocynaceae

Plants with milky juice; leaves mostly opposite without stipules; flowers regular 5-merous and 5-androus; corolla-lobes convolute and twisted in the bud; stamens inserted on the corolla, the filaments distinct; calyx free; ovaries 2 and distinct; style and stigmas united.

### Key to the Genera

1. Leaves alternate.....1. Amsonia
1. Leaves opposite.....2

2. Flowers solitary in axils.....2. Vinca
2. Flowers otherwise.....3

3. Vines.....3. Trachelospermum
3. Herbs.....4. Apocynum

### 1. Amsonia Walt.

#### (1.) Amsonia Tabernaemontana Walt.

Synonymy:

Tabernaemontana Amsonia L. Sp. Pl. Ed. 2, 308. 1762.

Amsonia Tabernaemontana Walt. Fl. Car. 98. 1788.

Amsonia salicifolia Pursh, Fl. Am. Sept. 184. 1814.

Amsonia Amsonia Britton, Mem. Torr. Club 5:262. 1894.

Amsonia salicifolia Pursh. Fl. Am. Sept. 184. 1814.

Amsonia Tabernaemontana var. salicifolia (Pursh) Woodson, Ann. Mo. Bot. Gard. 15:406. 1928.

Specimens examined: Anderson: Clinch River near Island Home Church, Varnell (TENN); Benton: Wet shady woodland by stream, 80 miles west of Nashville Hwy 1 (70), Tenn., Lipes Switch, J. M. Shaver 8896 (P); Bledsoe: Swamp on Walden Ridge 2220 ft., Harper 7771 (TENN); Blount: In woods loam, on slope, oak woods, Jennison 3822 (TENN); Carrol: S. W. of McKenzie roadside ditch, Sharp, Adams, and Felix 13048 (TENN); Cheatham: Sycamore Creek bank, Thomas 57 (VU); Crockett: N. of Alamo roadside ditch, Sharp, Adams, and Felix 12641 (TENN); Davidson: South of Conchville, dry limestone barrens, Sharp, Fairchild, and E. Clebsch 7576 (TENN); Decatur: Sharp, Adams, and Felix 12590 (TENN); Hickman: Along Sugar Creek near Spot, Sharp, Shanks, and E. Clebsch 5844 (TENN); Houston: Dry soil on limestone bluff, Erin, Harper 7852 (TENN); Knox: Cherokee Bluffs, Iltis 1691 (TENN); Lewis: Merriweather Nat. Mon., Little Swan Creek, open woods rather damp soil, King 67 (VU); Madison: S. E. of Jackson, between Perry Switch Road and railroad, Sharp, Adams, and Felix 12521 (TENN); Montgomery: Rocky slopes near Yellow Creek, Shanks 2728 (TENN); Obion: South of Troy, bottoms along Half-moon Lake, Sharp, Adams, and Felix 12390 (TENN);

Polk: Lower Hiawassee Gorge, near Hiawassee, Sharp, Adams, and Felix 11368 (TENN); Rhea: West of Dayton edge of escarpment, moist shady soil, Meyer 1375 (TENN); Rutherford: North of Murfreesboro moist pasture in Cedar Glades, Sharp 1588 (TENN); Stewart: White Oak Creek, B. Shanks (TENN); Wayne: East of Leatherwood, bluff of Beech Creek, Sharp, Adams, and Felix 10182 (TENN); Weakley: North of Martin Obion River Bottom, Sharp, Adams, and Felix 12331 (TENN); White: Sandy, pine bottom, Gulf, near Dodson, J. M. Shaver 8900 (P).

(2.) Amsonia Tabernaemontana var. salicifolia (Pursh) Woodson

Differs from the species in having leaves lanceolate and glaucous beneath with the inflorescence loose and relatively few-flowered.

Specimens examined: Sequatchie: Crossing of Sequatchie River, north of Sequatchie Road, Shanks, Hardin, and Woods 15583 (TENN).

## 2. Vinca L.

(Periwinkle)

### (1.) Vinca minor L.

Synonymy:

Vinca minor L. Sp. Pl. 209. 1753.

Vinca humilis Salisb. Prodr. 146. 1796.

Vinca ellipticifolia Stokes, Bot. Mat. Med. 1:495. 1812.

Vinca intermedia Tausch, Flora 19:386. 1836.

Specimens examined: Blount: Escape near cemetery at Cades Cove, about 1800', Jennison 2089 (TENN); Knox: U. T. Campus, Knoxville, Jennison 60 (TENN); Hamblen: Morgan (TENN); Sevier: Well-drained alluvium at roadside, about 1500', Smith 3946 (TENN); Sullivan: Bridge south fork of Holston River, Sharp and Underwood 445 (TENN).

## 3. Trachelospermum Lemaire

## (Climbing Dogbane)

### (1.) Trachelospermum difforme (Walt.) Gray

Synonymy:

Echites difformis Walt. Fl. Car. 98. 1788.

Echites perberula Michx. Fl. Bor. Am. 1:120. 1803.

Tabernaemontana populifolia Poir. in Lam. Encyc. Suppl. 5: 276. 1817.

? Echites tomentosa Raf. Fl. Ludov. 46. 1817. Not E. tomentosa Vahl. 1794.

Echites salicifolia Raf. New Fl. 4:59. 1838. Not E. salicifolia Willd. 1819.

Forsteronia difformis A. DC. Prodr. 8:437. 1844.

Thyrsanthus populifolius Miers, Apoc. S. Am. 99. 1878.

Thyrsanthus difformis Miers, Apoc. S. Am. 99. 1878.

Trachelospermum difforme (Walt.) A. Gray, Syn. Fl. N. Am. 2:85. 1878.

Specimens examined: Chester: N. of Henderson, bottoms of S. fork of Forked Deer River, Sharp, Fairchild, and A. and E. Clebsch 9411 (TENN); Crockett: Bottoms of Middle Forked Deer River, east of Elizabeth, Shanks, Woods, and Cooley 14743 (TENN); Lauderdale: N. W. of Arp, along Middle Fork of Forked Deer River, Sharp, Fairchild, A. and E. Clebsch 8060 (TENN); Obion: S. of Troy, bottoms near Half-moon Lake, 6379 (TENN); Shelby: Roadside ditch near Arlington, Sharp, Fairchild, and E. Clebsch 8198 (TENN); Weakley: West of Greenfield, south fork of Obion River, Sharp, Fairchild, and E. Clebsch 8339 (TENN).

## 4. Apocynum L.

(Dogbane. Indian Hemp)

### Key to the Species

1. Corolla at least three times the length of the calyx lobes.....1. A. androsaemifolium
1. Not as above.....2

2. Corolla about twice the length of the calyx lobes.....2. A. medium
2. Corolla barely exceeding the calyx.....3. A. cannabinum

### (1.) Apocynum androsaemifolium L.

Synonymy:

Apocynum fol. androsaemi L. Sp. Pl. 213. 1753.

Apocynum androsaemifolium L. Sp. Pl. Ed. 2. 311. 1762.

Apocynum muscipulum Moench, Meth. 464. 1794.

Apocynum androsaemifolium var. incanum A. DC. in DC. Prodr. 8:439. 1844.

Apocynum androsaemifolium f. pauciflora Peck, Ann. Rep. N. Y. State Mus. 47:158. 1894.

Apocynum silvaticum Greene, Leaflets 2:179. 1912.

Apocynum androsaemifolium var. puberulum Bég. and Bel. Mem. Accad. Lincei V. 9:671. 1913.

Cynopaema androsaemifolium Lunell. Am. Midl. Nat. 4:509. 1916.

Specimens examined: Bledsoe: Sandy soil, Walden's Ridge near Pikeville, Bain 4006 (TENN); Blount: In rich alluvium on trail from firetower to Rich Gap, Greene and Jennison (TENN).

(2.) Apocynum medium Greene

Synonymy:

Apocynum medium Greene, Pittonia 3:229. 1897.

Apocynum speciosum G. Mill. Proc. Bio. Soc. Wash. 13:83. 1899.

Apocynum urceolifer G. Mill. Proc. Bio. Soc. Wash. 13:85. 1899.

Apocynum Milleri Britton, Man. 739. 1901.

Apocynum divergens Greene, Leaflets 1:56. 1904.

Apocynum Andrewsii Greene, Leaflets 1:57. 1904.

Apocynum sarniense Greene, Leaflets 2:167. 1912.

Apocynum insigne Greene, Leaflets 2:178. 1912.

Apocynum ellipticum Greene, Leaflets 2:179. 1912.

Apocynum griseum Greene, Leaflets 2:181. 1912.

Apocynum androsaemifolium var. griseum Bég. and Bel. Mem. Accad. Lincei V. 9:714. 1913.

Apocynum pumilum var. Milleri Bég. and Bel. Mem. Accad. Lincei V. 9:686. 1913.

Apocynum macrophyllum Bég. and Bel. Mem. Accad. Lincei V. 9:713. 1913.

Apocynum pseudomedium Bég. and Bel. Mem. Accad. Lincei V. 9:714. 1913.

Apocynum Milleri var. pauciflorum Farwell, Rep. Mich. Acad. 17:170. 1916.

Apocynum medium var. sarniense Woodson, Ann. Mo. Bot. Gard. 17:111. 1930.

Specimens examined: Blount: Roadside, Cove Mt., Hesler, Sharp, and Wilson 1946 (TENN); DeKalb: Cherty slope along Route 56, N. E. of Smithville, white bloom, Sharp, Fairchild, and E. Clebsch 7511 (TENN); Hawkins: In moist soil at edge of pond, 9 miles N. E. of Mooresburg, Sharp and Underwood 4216 (TENN); Roane: near Harriman, Sharp and Underwood 2030 (TENN).

(3.) Apocynum cannabinum L.

Synonymy:

Apocynum cannabinum L. Sp. Pl. 213. 1753.

Apocynum platyphyllum Greene, Leaflets 2:166. 1912.

Apocynum cannabinum var. puberulum Bég. and Bel. Mem. Accad. Lincei V. 9:691. 1913.

Apocynum cannabinum var. incanum Bég. and Bel. Mem. Accad. Lincei V. 9:691. 1913.

Apocynum Greeneanum Bég. and Bel. Mem. Accad. Lincei V. 9: 701. 1913.

Cynopaena cannabinum Lunnell, Am. Midl. Nat. 4:509. 1916.

Apocynum cannabinum var. Greeneanum Woodson, Ann. Mo. Bot. Gard. 17:132. 1930.

Specimens examined: Anderson: Roadside Andersonville Pike, Jennison, Underwood, and Sharp 112 (TENN); Carroll: S. of McLenoresville, roadside slope, Sharp, Adams, and Felix 13128 (TENN); Carter: Sinking Creek, (ET); Chester: North of Henderson, roadside, Sharp, Fairchild, A. and E. Clebsch 9395 (TENN); Davidson: Mill Creek, 6 mi. from Nashville, Elmhill Road, J. M. Shaver 8903 (P); Gibson: E. of Neboville, bottoms of N. Fork of Forked Deer River, Sharp, Fairchild, and E. Clebsch 8279 (TENN); Grainger: Morrison and Brown (TENN); Hamilton: Lookout Mt., Sharp and Hesler 1000 (TENN); Haywood: S. of Brownsville, roadside, Fairchild, Sharp, and E. Clebsch 8206 (TENN); Henry: Roadside soil north of Osage, Sharp, A. Clebsch and E. Clebsch

6001 (TENN); Knox: Love Creek section, near Knoxville, Horton and Sharp 3714 (TENN); Marion: Roadside slope above Hales Bar Dam, Fairchild, Sharp, and E. Clebsch 48-101 (TENN); McNairy: E. of Finger bottoms of Tar Creek, roadside, Sharp, Fairchild, A. and E. Clebsch 9395 (TENN); Obion: East of Union City, roadside ditch near Weakley Co. line, Sharp, Adams, and Felix 12344 (TENN); Polk: A few miles east of Ocoee by U. S. 64, Ford and Russell 2336 (TENN); Roane: Open oak barrens on Walden's Ridge above Rockwood, about 2000', Woods and Cooley 13815 (TENN).

Apocynum cannabinum var. pubescens (Mitchell) A. DC.

Differs from the species in having both leaves and inflorescence pubescent.

Apocynum cannabinum var. pubescens (Mitchell) A. DC. Prodr. 8: 440. 1844.

Specimens examined: Davidson: Two miles northwest of Lavergne, Hwy 1, near Mount View School, J. M. Shaver 8905 (P).

## Asclepiadaceae

Plants with milky sap; leaves opposite or whorled, entire; differing from Apocynaceae in the commonly valvate corolla and in the singular connection of the anthers with the stigmas.

## Key to the Genera

1. Stems erect or decumbent, never twining.....2
1. Stems twining.....3

2. Corona-heads prominently crested within; leaves alternate.....1. Asclepiodora
2. Corona-heads each with an incurved horn within; leaves mostly opposite.....2. Asclepias

3. Leaves cordate.....4
3. Leaves not cordate.....3. Periploca

4. Flowers greenish-white.....4. Ampelamus
4. Flowers not as above.....5. Gonolobus

## 1. Asclepiodora Gray

(Spider-Milkweed)

### (1.) Asclepiodora viridis (Walt.) Gray

Synonymy:

Asclepiodora viridis Walt. Fl. Car. 107. 1788.

Asclepiodora viridis A. Gray, Proc. Am. Acad. 12:66. 1876.

Specimens examined: Davidson: Cedar Glades, near Conchville Pike, J. M. Shaver 8912 (P); Wilson: South of Lebanon, limestone crevices, Shanks and Sharp 1492 (TENN).

## 2. Asclepias L.

### Key to the Species

1. Plants hirsute.....1. A. tuberosa
1. Plants not as above.....2

2. Leaves distinctly petioled.....3
2. Leaves sessile or clasping.....8

3. Corolla pink to rose-purple (rarely white).....2. A. incarnata
3. Corolla greenish, yellowish, white or merely purplish-tinged.....4

4. Principal leaves gradually attenuate to long slender tips.....5
4. Principal leaves not attenuate to long slender tips.....7

5. Larger leaf-blades 1-5.5 cm. broad, 5-15 cm. long; corolla-lobes 2.5-6 mm. long; hoods 2-4.5 mm. long.....6
5. Larger leaf-blades 4-10 cm. broad, 1.2-3 dm. long; corolla-lobes 6-10 mm. long; hoods 4-6 mm. high; pedicels strongly deflexed.....3. A. phytolaccoides

6. Leaves 8-15 pairs becoming somewhat approximate toward stem; seeds without coma.....4. A. perennis
6. Leaves 2-5 pairs or whorls those of at least 1 node often in whorls of four.....5. A. quadrifolia

7. Leaves (4-6 pairs), ovate, oval or obovate, tapering to slender petioles.....6. A. variegata
7. Leaves more numerous, lance-oblong to broadly oval, rounded or tapering to short thick petiole.....7. A. syriaca

8. Leaves opposite broad sessile and clasping..8. A. amplexicaulis
8. Leaves mostly whorled, narrowly linear, not clasping.....9. A. verticillata

## 2. Asclepias L.

(Milkweed)

### (1.) Asclepias tuberosa L.

Synonymy:

Asclepias tuberosa L. Sp. Pl. 217. 1753.

Specimens examined: Bledsoe: Sandy soil, open woods, 8 mi. E. of Pikeville, Bain 3742 (TENN); Blount: Cades Cove, Sharp 9140 (TENN); Campbell: Along road in limestone soil about 1000', Knoxville, Williams and Lamb (TENN); Davidson: with very short sepals. Old grassy field, Little Marrowbone Creek region near Eaton' Creek Road, J. M. Shaver 2746 (P); Grainger: Lea Lakes, Sharp and Hesler 1644 (TENN); Knox: Carter's School, Sharp and Underwood 2137 (TENN); Montgomery: Rossview, about 8 mi. N. E. of Clarksville, Oliver 56 (TENN); Rhea: Near Watts Bar Dam, moist bottoms near edge of lake, Shanks, Sharp, and E. Clebsch 4194 (TENN); Sevier: In well-drained soil, Sevierville, Jennison 1738 (TENN); Union: Rhodelia unit Norris Lake Forest, Morrison (TENN); Washington: Johnson City Wilds (ET); White: S. W. of clefty sandy roadside, Shanks, Sharp, and E. Clebsch 2902 (TENN).

(2.) Asclepias incarnata L.

Asclepias incarnata L. Sp. Pl. 215. 1753.

Specimens examined: Blount: Cades Cove, Greene and Jennison 4334 (TENN); Cumberland: Crab orchard, Porter and Harbison 3064 (TENN); Grainger: Buffalo Springs Fish and Game Preserve, Rutledge, Morrison (TENN); Greene: 3 mi. S. E. of Bulls Gap, wet meadow near highway 11E, Sharp and Shanks 1389 (TENN); Hawkins: Moist swampy soil near Edison, Underwood and Sharp 4209 (TENN); Knox: River banks

near U. T. Farm, Hesler 3008 (TENN); Shelby: Between Raleigh and Pearly, Loosahatchie River bottoms, Sharp, Fairchild, and E. Clebsch (TENN); Sullivan: Low wet ground, Blountville, Hubricht B1604 (TENN); Obion: N. E. Kenton bottoms of So. Fork of Obion River, Sharp, Fairchild, and E. Clebsch 8357 (TENN).

Asclepias incarnata var. pulchra (Ehrh.) Pers.

Synonymy:

Asclepias pulchra Ehrh.; Wild. Sp. Pl. 1:1267. 1798.

Asclepias incarnata var. pulchra Pers. Syn. 1:276. 1805.

Differs from the species in having stems, branches, and pedicels densely pubescent or slightly hirsute, with leaves averaging wider and pubescent on both sides.

Specimens examined: Blount: Slough along Little Tennessee at 800 ft., Sharp and Jennison 874 (TENN); Carter: Swamp along Storey Creek E. of Elizabethton, Sharp, Fairchild, E. Clebsch and Hernandez 11751 (TENN); Johnson: 5½ mi. s. w. of Mt. City, boggy area on Stout Farm, Sharp and Shanks 7096 (TENN); Lauderdale: W. of Henning, virgin timber, Sharp, A. and E. Clebsch, and Fairchild 8110 (TENN); Washington: campus, East Tenn. State, Dulaney (ET).

(3.) Asclepias exaltata (L.) Muhl.

Synonymy:

Asclepias Syriaca var. exaltata L. Sp. Pl. Ed. 2, 313. 1762.

Asclepias exaltata Muhl. Cat. 28. 1813.

Asclepias phytolaccoides Pursh, Fl. Am. Sept. 180. 1814.

Specimens examined: Blount: Rich Mt., Sharp 1680 (TENN); Sevier: Pine Ridge on Mt. Harrison, Cain (TENN).

(4.) Asclepias perennis Walt.

Synonymy:

Asclepias perennis Walt. Fl. Car. 107. 1788.

Specimens examined: Chester: North of Henderson, bluff along S. Fork of Forked Deer River, Sharp, Fairchild, and Clebsch (TENN); Dyer: South of Tatumville along Forked Deer River, Sharp, Clebsch, and Fairchild 8267 (TENN); Lauderdale: Hatchie River Bottom, south of Ripley, Woods and Cooley 13563 (TENN); Obion: Walnut log, Bank of Bayou de Chien, (TENN); Shelby: Eudsley's Bottoms S. W. of Memphis, Norris, Sharp, and Shanks 16338 (TENN); Weakley: N. E. of Greenfield, bottom of Middle Fork of Obion River, Sharp and Clebsch 7805 (TENN).

(5.) Asclepias quadrifolia Jacq.

Synonymy:

Asclepias quadrifolia Jacq. Obs. Part 2, 8. Pl. 33. 1767.

Specimens examined: Anderson: Near Lake City, Sharp, Cain, and Jennison 338 (TENN); Blount: Cove Mt., Cain and Duncan 440:2 (TENN); Claiborne: Cumberland Gap, Bain (TENN); Davidson: Ridgetop, 1 mi. south of moist ravine 1196 (VU); Franklin: South of Sewanee, rocky limestone slope, Sharp 1278 (TENN); Knox: Cherokee Bluffs, Knoxville,

Greene and Draper (TENN); Lewis: Merriweather Lewis Nat. Mon., Little Swan Creek, King 129 (VU); Loudon: Lenoir City, woods 2 mi. south, Cain and Sharp 4456 (TENN); Madison: S. E. of Jackson, dry ridge, Sharp, Adams, and Felix 12514 (TENN); Rhea: Near Dayton, Sharp and Hesler 1049 (TENN); Sevier: Vicinity of Gatlinburg, Jennison 2407 (TENN); Sullivan: On bluffs, Bluff City, 843 (TENN); Union: Chestnut ridge near Loyston, Rice 990 (TENN); Washington: East Tenn. State College campus, Jackson (ET); White: Plateau slope west of Bon Air, Shanks, Woods, Hardin, Barclay, and Gilpin 15605 (TENN).

(6.) Asclepias variegata L.

Asclepias variegata L. Sp. Pl. 217. 1753.

Specimens examined: Anderson: Edge of woods in Norris area, Cole 778 (TENN); Blount: Along road over Cove Mt. to Cades Cove, Cain, Duncan, and Greene 636 (TENN); Bradley: Near Cleveland, Sharp and Hesler 1109 (TENN); Campbell: Between Careyville and Turley, Sharp, Shanks, and E. Clebsch 3808 (TENN); Carrol: North of Yuma, Sharp, Fairchild, and Clebsch 8413 (TENN); Cumberland: Cumberland Mt. State Park, Sharp, Shanks, and E. Clebsch 4230 (TENN); Decatur: Between Cozette and Sugartree, moist slope, Sharp, Adams, and Felix 12912 (TENN); Dickson: Near Van Leer, Shanks 2116 (TENN); Dyer: Dry roadside ditch along mixed wood pasture, well-drained, Norman, Iltis,

and Wilson 1739 (TENN); Grundy: Sandy soil on plateau near Foster Falls, white blooms, Sharp, Fairchild, and Clebsch 48-147 (TENN); Franklin: Alto Road, Webb 192 (TENN); Hamilton: Lookout Mt., Sharp and Hesler 1004 (TENN); Knox: Opening in oak woods, University Farm, Shanks (TENN); Lewis: Merriweather Lewis Nat. Mon., Dyestone Hollow, open woods, King 131 (VU); McNairy: North of Leapwood, ridge near county line, Sharp, Fairchild, and Clebsch 9582 (TENN); Monroe: Tellico River Gorge, Sharp 688 (TENN); Montgomery: King and Queen's Bluff along Cumberland River, A. and E. Clebsch (TENN); Morgan: Between Harriman and Wartburg, Sharp and Underwood 2032 (TENN); Pickett: Pickett State Park, Sharp, Shanks and E. Clebsch 4159 (TENN); Roane: Near Kingston 1146 (TENN); Sevier: In well-drained acid soil on slope near Fighting Creek Gap at 2500 (TENN); Jennison 1739 (TENN); Union: Near U. S. TVA CCC 22, Morrison (TENN).

(7.) Asclepias syriaca L.

Synonymy:

Asclepias syriaca L. Sp. Pl. 214. 1753.

Asclepias cornuti Dec. in DC. Prodr. 8:564. 1844.

Specimens examined: Knox: East Knoxville, Hesler and Sharp 1609 (TENN); Hawkins: Moist soil near Eidson, Underwood 4208 (TENN).

(8.) Asclepias amplexicaulis Sm.

Synonymy:

Asclepias amplexicaulis J. E. Smith, Georgia Insects, 1:13. 1797.

Asclepias obtusifolia Michx. F. Bor. Am. 1:115. 1803.

Specimens examined: Carroll: N. of Terry, bottoms of Rutherford Fork, Sharp, Adams, and Felix 13127 (TENN); Chester: Near Chickasaw State Park, Adams, and Felix 12668 (TENN); Coffee: East of Hickerson, roadside, Sharp, Clebsch, and Fairchild 9876 (TENN); Hardeman: North of Saulsbury, dry ridge soil, Fairchild, Clebsch, and Sharp 8224 (TENN); Henderson: Southwest of Scotts Hill, roadside,9469 (TENN); Henry: Southeast of Paris, along West Sandy Creek, 12932 (TENN); Knox: Dry slope south of Knoxville with Rubus and Sassafras, Shanks and Ford 3012 (TENN); Lewis: Southeast of Hohenwald, Sharp, Shanks, and E. Clebsch 5765 (TENN); Scott: No Business Creek, Sharp, Shanks, and Clebsch 3904 (TENN); Rhea: Above Dayton, Sharp, Shanks, and Clebsch 4273 (TENN); Roane: Open oak barrens on Walden's Ridge, Shanks, Cooley, and Woods 13765 (TENN); Van Buren: Falls Creek Falls State Park, 2973 (TENN).

(9.) Asclepias verticillata L.

Asclepias verticillata L. Sp. Pl. 217. 1753.

Specimens examined: Anderson: Roadside near Norris, Cole 797 (TENN); Bledsoe: Between Shoemate Gap and Mt. Crest, Shanks, Sharp, and E. Clebsch 3465 (TENN); Blount: Near quarry, Cades Cove, Sharp 8152 (TENN); Cumberland: Southwest of Crossville, openings in post oak - black-jack oak barrens, Norris and Shanks 2472 (TENN); Davidson:

Cedar Glades, Smith's Springs, S. of airport and S. of Nashville, J. M. Shaver 2993 (P); Grainger: Clinch Mt. between Bean Station and Tazewell, Sharp 1923 (TENN); Knox: Young's High School, Knoxville, Wilson 2969 (TENN); Lewis: Merriweather Lewis Nat. Mon., Little Swan Creek, open woods, King 182 (VU); Marion: Steep slopes above south Pittsburgh, Fairchild, E. Clebsch, and Sharp 48-15 (TENN); Maury: Between Culleoka and Columbia, Sharp, Shanks, and E. Clebsch 5788 (TENN); Montgomery: Lock C Road, West of Woodlawn, Shanks 2332 (TENN); Rutherford: North of Lavergne, calcareous barrens, Fairchild, E. Clebsch, and Sharp 7593 (TENN).

### 3. Periploca L.

(Silkvine)

#### (1.) Periploca graeca L.

Periploca graeca L. Sp. Pl. 211. 1753.

Specimens examined: Knox: Climbing over tree along road near U. T. Campus, Perry (TENN).

### 4. Ampelamus Raf.

(Sandvine)

#### (1.) Ampelamus albidus (Nutt.) Britt.

Synonymy:

Gonolobus laevis Michx. Fl. Bor. Am. 1:119. 1803.

Enslenia albida Nutt. Gne. 1:164. 1818.

Ampelamus albidus Britton, Bull. Torr. Club 21:314. 1894.

Specimens examined: Davidson: Edge of cornfield, Radnor Hills, J. M. Shaver 3055 (P); Knox: Gallahers Ferry Rd., Clinch River bluffs, Sharp, 16600 (TENN); Tipton: Richardson's Landing, banks of Mississippi River, Sharp, Fairchild, and E. Clebsch 8085 (TENN).

## 5. Gonolobus Michx.

(Angle-pod)

### Key to the Species

1. Follicles costate-angled, not muricate.....1. G. gonocarpos
1. Follicles not costate-angled, muricate.....2

2. Flower buds bluntly ovoid; corolla rotate..2. G. carolinensis
2. Flower buds oblong-conical; limb of corolla ascending.....3

3. Corolla-lobes broadly linear, dark purple.....3. G. Shortii
3. Corolla-lobes slenderly linear, grayish brown outside, purple within.....4. G. obliquus

### (1.) Gonolobus gonocarpos (Walt.) Perry

Synonymy:

Vincetoxicum gonocarpos Walt. Fl. Carol. 104. 1788, in part (fide A. Gray).

Gonolobus macrophyllus Michx. Fl. Bor. Am. 1:119. 1803.

Gonolobus laevis var. macrophyllus Gray, Proc. Am. Acad. xii, 76. 1877.

Specimens examined: Anderson: Quarry Hill near Norris, Varnell (TENN); Decatur: Bottoms along Lick Creek near Cozette, Woods, Sharp, and E. Clebsch 14968 (TENN); Knox: Old Sevierville Pike, Sharp 236 (TENN); Lake: Walnut Log brush, cut over land, Moore H540 (TENN); Marion: Near Sequatchie River, Jasper, Sharp and Underwood 2581 (TENN); Shelby: At edge of Cow Island, S. W. of Memphis, Sharp and Norris 16319 (TENN); Wilson: Cedar of Lebanon State Park, thin limestone soil, Sharp 1568 (TENN).

(2.) Gonolobus carolinensis (Jacq.) Schultes

Synonymy:

Gonolobus carolinensis (Jacq.) Schultes, Syst. Veg. vi. 62. 1800.

Cynanchum carolinense Jacq. Coll. ii. 288. 1788.

Vincetoxicum acanthocarpos Walt. Fl. Car. 104. 1788.

Gonolobus hirsutus Michx. Fl. Bor. Am. i. 119. 1803.

Vincetoxicum carolinense (Jacq.) Britton, Mem. Torr. Bot. Club, v. 265. 1894.

Odostephana carolinense (Jacq.) Alexander in Small, Man. 1077. 1933.

Specimens examined: Davidson: West of Nashville, Sharp 1494 (TENN); Rutherford: Dry limestone, burnt ridge, 7 mi. S. W. of Murfreesboro, Svenson 8996 (TENN).

(3.) Gonolobus Shortii Gray

Synonymy:

Gonolobus Shortii Gray, Bot. Gaz. viii. 191. 1883.

Gonolobus obliquus var. Shortii Gray, Syn. Fl. Ed. 1, ii. 104. 1878.

Vincetoxicum Shortii (Gray) Britton, Mem. Torr. Bot. Club. v. 266. 1894.

Odostephana Shortii (Gray) Alexander in Small, Man. 1077. 1933.

Specimens examined: Knox: Thickets, Knoxville, Ruth (TENN).

(4.) Gonolobus obliquus (Jacq.) Schultes

Synonymy:

Gonolobus obliquus (Jacq.) Schultes, Syst. Veg. vi. 64. 1820.

Cynanchum obliquum Jacq. Coll., i. 148. 1786.

Vincetoxicum obliquum (Jacq.) Britton, Mem. Torr. Bot. Club, v. 266. 1894.

Odostephana obliqua (Jacq.) Alexander in Small, Man. 1077. 1933.

Specimens examined: Hamilton: Lookout Mt., Sharp and Hesler 1058 (TENN); Knox: Thicket, Ruth 344 (TENN).

## RESULTS

The several families of the order Contortae contain herbs, shrubs, and some woody and herbaceous vines. Leaves of the Contortae are most always opposite, the flowers are actinomorphic with four or five calyx-segments, the latter being mostly convolute in the bud. The andraoecium consists of four or five lowly inserted epipetalous stamens, these being more or less typical except in Asclepiadaceae, where the stamens are rarely distinct and are usually adnate or adherent to the gynoecium producing a structure known as the gynostegium. The ovaries are bicarpellate, united or where below the united anthers, distinct. The ovules have endosperm and one integument.

The family Loganiaceae is described by Lawrence (1951) as containing some thirty-two genera and eight hundred species. The family is represented in the United States by six genera and eleven species; the genera he lists as follows (the number following the genus is the number of indigenous species unless otherwise stated, this being also true in subsequent paragraphs): Spigelia (3), Gelsemium (1), Cynoctonum (3), Polypremum (1), Coelostylis (1), and Buddleja (2).

According to herbarium records in Tennessee, there are three of these indigens present here, being represented by three genera with one species each; these are Gelsemium sempervirens, Spigelia marilandica, and Cynoctonum Mitreola. Gattinger (1901) reported Polypremum procumbens from Tennessee.

The family Gentianaceae includes, according to Lawrence (1951), some seventy genera and eight hundred species. He lists the approximate number of genera and species indigenous in the United States as follows: Centarium (5), Sabatia (15), Gentiana (40), Pleurogyne (1), Frasera (8), Swertia (10), Halenia (2), Bartonia (5), Eustoma (3), Lapithea (2), Microcala (1), Obolaria (1), Leiphaemos (1), Menyanthes (1), and Nymphoides (2).

In surveying records in Tennessee it was found that the Gentianaceae is represented by six genera and fourteen species which are as follows: Sabatia brachiata, S. angularis, S. campanulata; Gentiana quinquefolia, G. Andrewsii, G. decora, G. Saponaria, G. villosa, and G. linearis; Swertia caroliniensis; Bartonia virginica and B. paniculata; Obolaria virginica; Nymphoides cordata. In addition, Gattinger (1901) reported Sabatia lanceolata. Gentiana clausa should also occur here.

The family Apocynaceae contains about three hundred genera and thirteen hundred species, Lawrence (1951). Lawrence states that only nine genera and thirty-three species are indigenous in this country. These indigens he lists as follows: Amsonia (17), Apocynum (7), and Trachelospermum (1); Angadenia, Urechites, Echites, and Vallesia are represented by one or two species each; Cycladonia (1), and Microsiphonia (2).

This study has revealed that the family is represented in Tennessee by four genera, six species, and two varieties which are as

follows: Amsonia Tabernaemontana, A. Tabernaemontana var. salicifolia; Vinca minor (not indigenous); Trachelospermum difforme; Apocynum androsaemifolium, A. medium, A. cannabinum, and A. cannabinum var. pubescens.

In the case of the Asclepiadaceae, there are several conflicting opinions regarding its taxonomy. It is difficult to give more than very approximate estimates as to the number of genera and species involved. Lawrence (1951) gives the following account of this situation:

> The taxonomic status of the family is in need of a thorough revision, and opinions differ as to the number of genera involved. Rendle (1925) placed it at 280, Willis (1931) at 300, but if Woodson's more critical and considered view (1941) that the North American species represent only 9 genera is proved the most correct, the number of the family may not exceed 75-100 at most. The number of species for the family is perhaps 1800. Woodson (1941) re-evaluated the genera of this country (reducing the number to about one-third) to be as follows: Asclepias, the largest North American genus (including Acerates, Asclepiodora, Podostigma, Solanoa, Gomphocarpus of American auth.), Cynanchum (including Gonolobus and Vincetoxicum of most American auth.), Gonolobus (including Lachnostoma of North American auth.), and Sarcostemma (including Philibertia and Funastrum).

This group is represented in Tennessee by five genera and fifteen species. Based on Fernald's treatment (1950) the following representatives are found in Tennessee: Asclepiodora viridis; Asclepias tuberosa, A. incarnata, A. incarnata var. pulchra, A. perennis, A. quadrifolia, A. phytolaccoides, A. variegata, A. Syriaca, A. amplexicaulis, and A. verticillata; Ampelamus albidus; Gonolobus

gonocarpos, G. carolinensis, G. Shortii, and G. obliquus; Periploca graeca (not indigenous). Gattinger (1901) reported Asclepias purpurascens L. from Tennessee.

## DISCUSSION OF RESULTS

There doesn't seem to be any taxonomic problem in the Loganiaceae in Tennessee. The species which were examined were easily separated on the basis of a few, very distinct, characters.

Some problems worthy of mention appear in the family Gentianaceae. The family is usually divided into two subfamilies, the Gentianoideae and the Menyanthoidae, the latter being represented evidently by only one species in Tennessee, viz., Nymphoides. In other cases the two subfamilies are treated as separate families. Lindsey (1938) has given morphological and anatomical evidence to support this treatment. The division in the Gentianaceae is very marked when one considers the fact that the Gentianoideae contains terrestrial plants with leaves opposite and sessile and the Menyanthoideae contains aquatic or marsh plants with leaves alternate and petioled.

No difficulty was encountered in separating the genera of the Gentianaceae, but difficulty arose in delimiting some species. The determination of Gentiana Andrewsii Griseb., may be questionable as it is usually described as a lowland plant and most of the specimens which were examined were collected at moderately high elevations. Geographically and in many other respects, the plant which was identified as G. Andrewsii may be G. clausa Raf.; however, some of the floral characters do not appear to fit that species. The corolla of the plant

which was identified as G. Andrewsii has a nearly truncate summit with the firm true lobes obsolete and narrowed at the summit. The corolla of G. clausa is described as scarcely opening with roundish lobes slightly incurved.

The only major difficulty encountered in the Apocynaceae appears in the genus Apocynum. The leaf characters given by Woodson (1930) which should separate the three species in Tennessee did not prove to be very useful on dried specimens; however, the characters given for the length of the corolla as compared with length of the calyx seemed to prove quite satisfactory (note key to species of Apocynum).

The writer used to experience a rather pleasant satisfaction at being able to recognize a few species of Asclepias, but was totally unaware of the magnitude of the Cynanchum - Vincetoxicum - Gonolobus mix-up. Woodson (1941) stated that a lifetime would be too short to perfect a complete system of the North American Asclepiads. He further states that the student of the Asclepiads is impelled to the defeatist attitude that only two choices are available in classification to "lump" genera or to "split" them and if he continues the study of Milkweeds sufficiently long, he probably will find himself tossed from horn to horn of the dilemma. To say that Woodson is correct would be a gross understatement.

The major difficulty in the Asclepiadaceae was encountered in the identification of Gonolobus. At first an attempt was made to

follow Woodson's treatment, but this course was abandoned because of a lack of sufficient plant material. The writer therefore resorted to the treatment of Perry (1938) which was incorporated by Fernald (1950) in Gray's Manual of Botany, eighth edition. With the limited number of specimens available for study, the accuracy of the determinations in this group may be questionable.

There are seven major physiographic regions in the state of Tennessee which extend in general north and south across the state. Beginning with the westernmost region these are the Mississippi Flood Plain, West Tennessee Slope, Highland Rim, Central Basin, Appalachian Plateau, Ridge and Valley Province, and Blue Ridge Province. These regions are shown on Map I with a color key given.

The distribution of the species of this order is shown in Table I according to physiographic regions.

Records show that Spigelia marilandica and Obolaria virginica are the only species represented in all physiographic regions. It is probably safe to predict that Asclepias tuberosa will be found in all physiographic regions and in greater abundance than records now indicate. The plant has evidently been neglected by collectors in Tennessee.

Thirteen species and two varieties are extremely limited in distribution, each being restricted to one physiographic region. This distribution is summarized as follows: Cynoctonum Mitreola and Sabatia brachiata in the Highland Rim; Nymphoides cordata in the Mississippi Flood Plain; Gentiana Andrewsii in the Blue Ridge Province; Gentiana

TABLE I

TABLE OF SPECIES DISTRIBUTION

| Map No. | Species and varieties | A | B | C | D | E | F | G | TR | TC |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | Gelsemium sempervirens | 1 | | | | 2 | | | 3 | 3 |
| 3 | Spigelia marilandica | 1 | 6 | 6 | 2 | 5 | 5 | 1 | 7 | 26 |
| 4 | Cynoctonum Mitreola | | | 1 | | | | | 1 | 2 |
| 5 | Nymphoides cordata | 1 | | | | | | | 1 | 2 |
| 6 | Sabatia campanulata | | | 3 | | 2 | 1 | 1 | 4 | 11 |
| 7 | S. brachiata | | | 2 | | | | | 1 | 2 |
| 8 | S. angularis | | 3 | 2 | 1 | 2 | 1 | 1 | 6 | 16 |
| 9 | Gentiana quinquefolia | | | | | | 2 | 1 | 2 | 4 |
| 10 | G. Andrewsii | | | | | | | 3 | 1 | 4 |
| 11 | G. decora | | | | | | 1 | | 1 | 2 |
| 12 | G. Saponaria | | | 4 | 1 | 3 | 2 | 1 | 5 | 11 |
| 13 | G. villosa | 1 | 3 | 4 | | 1 | 1 | | 5 | 10 |
| 14 | G. linearis | | | | | | 1 | | 1 | 2 |
| 15 | Swertia carolinensis | 1 | 2 | 8 | 1 | 1 | | | 5 | 13 |
| 16 | Bartonia virginica | | | | | 2 | | | 1 | 2 |
| 17 | B. paniculata | | | | | 1 | | | 1 | 1 |
| 18 | Obolaria virginica | 1 | 1 | 4 | 1 | 1 | 4 | 1 | 7 | 13 |
| 19 | Amsonia Tabernaemontana | | 5 | 8 | 2 | 1 | 2 | 1 | 6 | 19 |
| 20 | A. Tabernaemontana var. salicifolia | | | | | 1 | | | 1 | 1 |
| 21 | Vinca minor | | | | | | 4 | 3 | 2 | 7 |
| 22 | Trachelospermum difforme | 3 | 4 | | | | | | 2 | 7 |
| 23 | Apocynum androsaemifolium | | | | | 1 | 1 | 1 | 3 | 3 |
| 24 | A. medium | | | 1 | | 1 | 3 | 1 | 4 | 6 |
| 25 | A. cannabinum | | 7 | | | 4 | 2 | 2 | 4 | 15 |
| 26 | A. cannabinum var. pubescens | | | | 1 | | | | 1 | 1 |
| 27 | Asclepiodora viridis | | | | 2 | | | | 1 | 2 |
| 28 | Asclepias tuberosa | | | 1 | 1 | 3 | 4 | 3 | 5 | 12 |
| 29 | A. incarnata | 2 | 2 | | | 1 | 5 | 3 | 5 | 13 |
| 30 | A. incarnata var. pulchra | 1 | 1 | | | | 2 | 4 | 4 | 8 |
| 31 | A. exaltata | | | | | | 1 | 1 | 2 | 2 |
| 32 | A. perennis | 4 | 6 | | | | | | 2 | 10 |
| 33 | A. quadrifolia | | | 3 | 1 | 2 | 7 | 2 | 5 | 15 |
| 34 | A. variegata | 1 | 4 | 5 | | 6 | 7 | 3 | 6 | 26 |
| 35 | A. syriaca | 1 | | | | | 1 | | 2 | 2 |
| 36 | A. amplexicaulis | | 5 | 2 | | 4 | 3 | | 4 | 14 |
| 37 | A. verticillata | | | 2 | 3 | 4 | 3 | 1 | 5 | 13 |

TABLE I

TABLE OF SPECIES DISTRIBUTION (CONTINUED)

| Map No. | Species and varieties | A | B | C | D | E | F | G | TR | TC |
|---|---|---|---|---|---|---|---|---|---|---|
| 38 | Periploca Graeca | | | | | | 1 | | 1 | 1 |
| 39 | Ampelamus albidus | 1 | | | 1 | | 1 | | 3 | 3 |
| 40 | Gonolobus gonocarpos | 2 | 1 | | 1 | 2 | 1 | | 5 | 7 |
| 41 | G. carolinensis | | | | 2 | | | | 1 | 2 |
| 42 | G. Shortii | | | | | | 1 | | 1 | 1 |
| 43 | G. obliquus | | | | | | 2 | | 1 | 2 |

Key to letters and numbers used in table:

A - Mississippi Flood Plain
B - West Tennessee Slope
C - Highland Rim
D - Central Basin
E - Appalachian Plateau
F - Ridge and Valley Province
G - Blue Ridge Province
TR - Total Physiographic Regions
TC - Total Counties

Numbers indicate the number of counties a species or variety is found within each physiographic region except for the numbers under TR and TC which are explained above.

decora, G. linearis, Periploca graeca, Gonolobus Shortii, and G. obliquus in the Ridge and Valley Province; Bartonia virginica, B. paniculata and Amsonia Tabernaemontana var. salicifolia in the Appalachian Plateau; Apocynum cannabinum var. pubescens, Asclepiodora viridis, and Gonolobus carolinensis in the Central Basin. Seven of these plants are each found in only one county with the other six distributed as follows: Sabatia brachiata is found in two adjacent counties (Map 7), Gentiana Andrewsii in three adjacent counties (Map 10), Bartonia virginica in two counties which are not adjacent (Map 16), Asclepiodora viridis in two adjacent counties (Map 27), Gonolobus carolinensis in two adjacent counties (Map 41), and Gonolobus obliquus in two counties which are not adjacent (Map 43).

The disposition of the species not discussed may be determined by referring to Table I and to the maps in the appendix.

## SUMMARY

A survey of the literature as applicable to this order is presented.

Four families are included in this study, viz., Loganiaceae, Gentianaceae, Apocynaceae, and Asclepiadaceae. A brief description of each family is given.

Keys to the families, genera, and species are arranged.

Thirty-nine species and three varieties of Contortae are represented in Tennessee and are listed as follows:

Species of Contortae in Tennessee

Loganiaceae

Gelsemium sempervirens (L.) Ait.

Spigelia marilandica L.

Cynoctonum Mitreola (L.) Britt.

Gentianaceae

Nymphoides cordata (Ell.) Fern.

Sabatia campanulata (L.) Torr.

S. brachiata Ell.

S. angularis Pursh

Gentiana quinquefolia L.

G. Andrewsii Griseb.

G. decora Pollard

G. Saponaria L.

G. villosa L.

G. linearis Froel.

Swertia carolinensis (Walt.) Ktze.

Bartonia virginica (L.) BSP.

B. paniculata (Michx.) Muhl.

Obolaria virginica L.

Apocynaceae

Amsonia Tabernaemontana Walt.

A. Tabernaemontana var. salicifolia Pursh

Vinca minor L.

Trachelospermum difforme (Walt.) Gray

Apocynum androsaemifolium L.

A. medium Greene

A. cannabinum L.

A. cannabinum var. pubescens (Mitchell) A. DC.

Asclepiadaceae

Asclepiodora viridis (Walt.) Gray

Asclepias tuberosa L.

A. incarnata L.

A. incarnata var. pulchra (Ehrh.) Pers.

A. exaltata (L.) Muhl.

A. perennis Walt.

A. quadrifolia Jacq.

A. variegata L.

A. syriaca L.

A. amplexicaulis Sm.

A. verticillata L.

Periploca graeca L. (introduced)

Ampelamus albidus (Nutt.) Britt.

Gonolobus gonocarpos (Walt.) Perry

G. carolinensis (Jacq.) Schultes

G. Shortii Gray

G. obliquus (Jacq.) Schultes

The species listed below were reported by Gattinger (1901). This report could not be verified since no specimens were available.

Polypremum procumbens L.

Sabatia lanceolata (Walt.) T. & G.

Asclepias purpurascens L.

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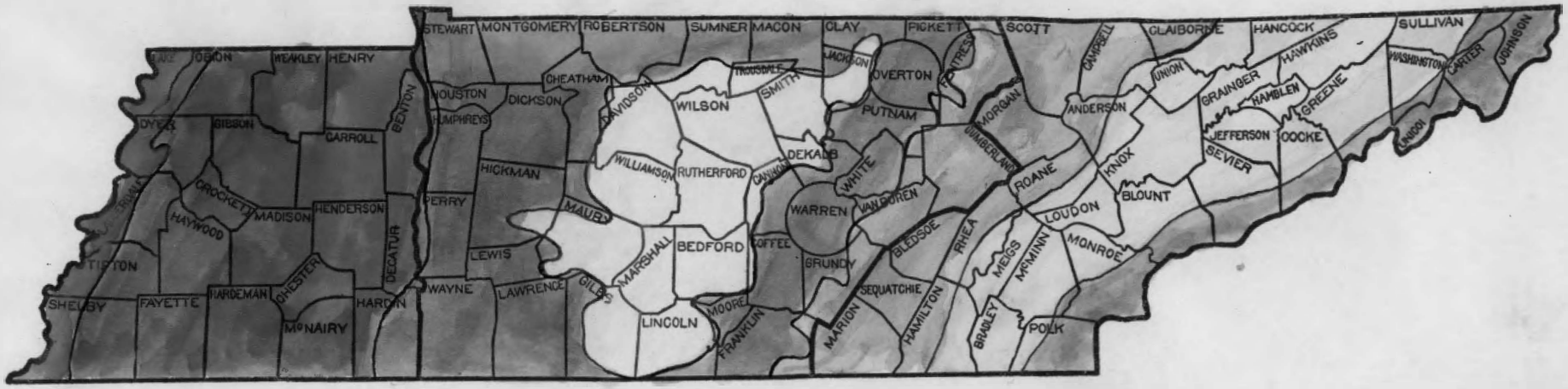
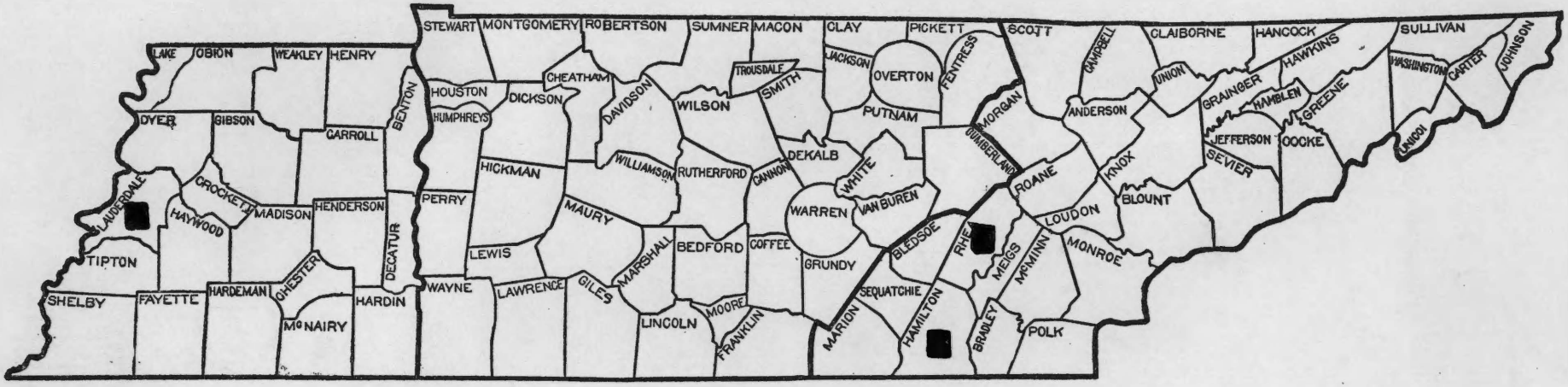
# APPENDIX




MAP I

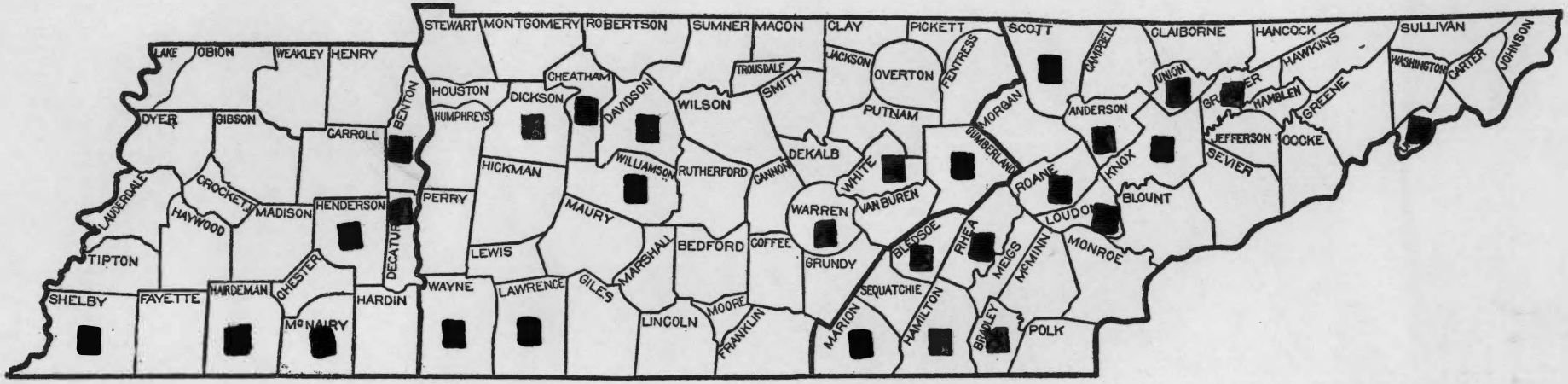
PHYSIOGRAPHIC REGIONS OF TENNESSEE

- Mississippi Flood Plain
- West Tennessee Slope
- Highland Rim
- Central Basin
- Appalachian Plateau
- Ridge and Valley Province
- Blue Ridge Province



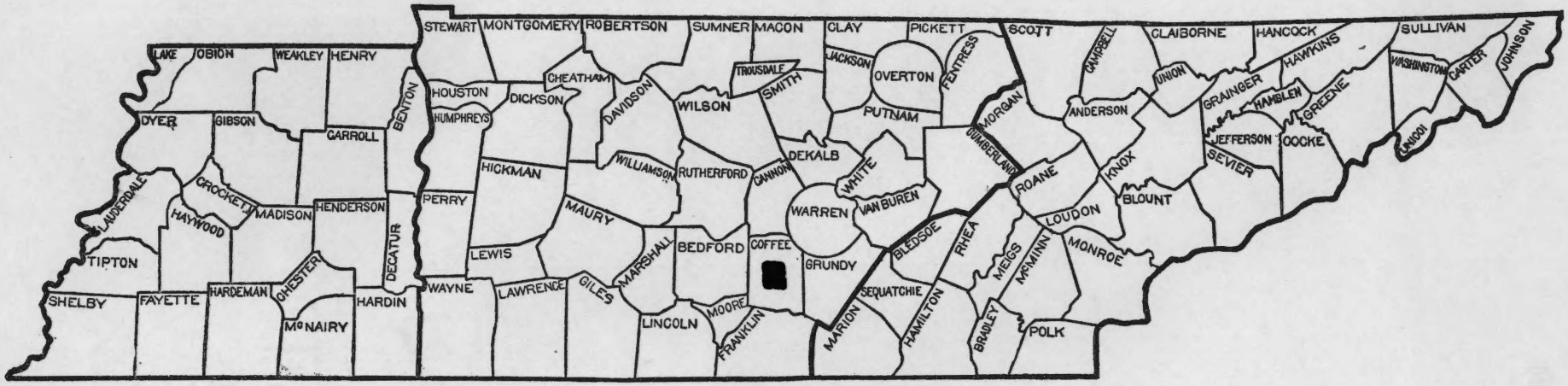

MAP 2

Gelsemium sempervirens (L.) Ait.



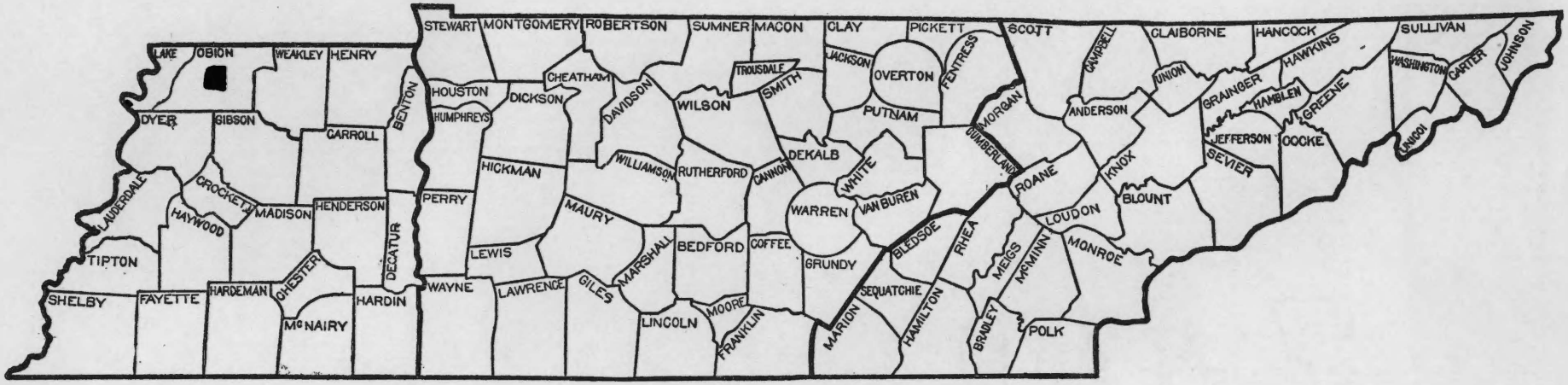

MAP 3

Spigelia marilandica L.



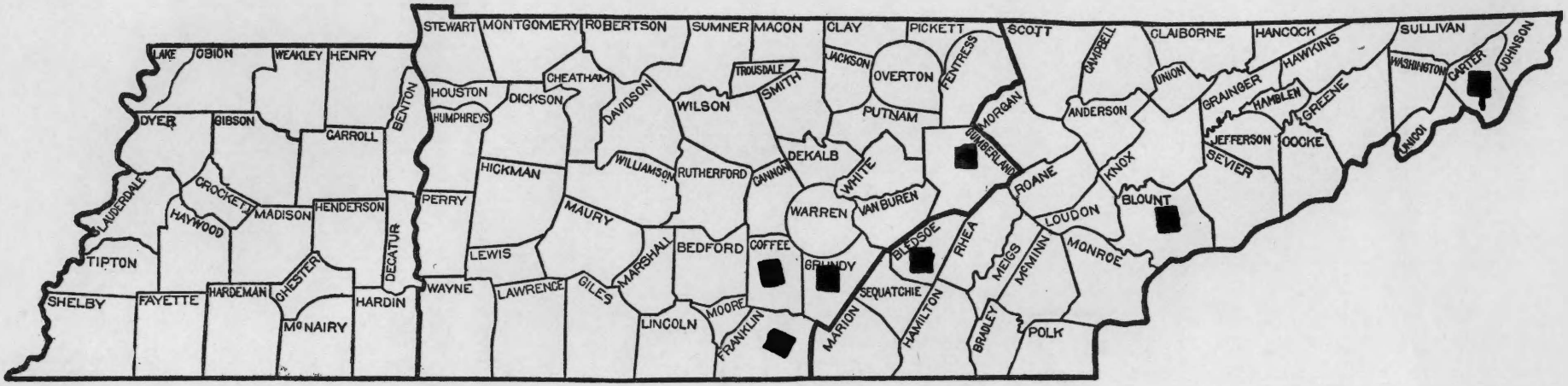

MAP 4

Cynoctonum Mitreola (L.) Britt.



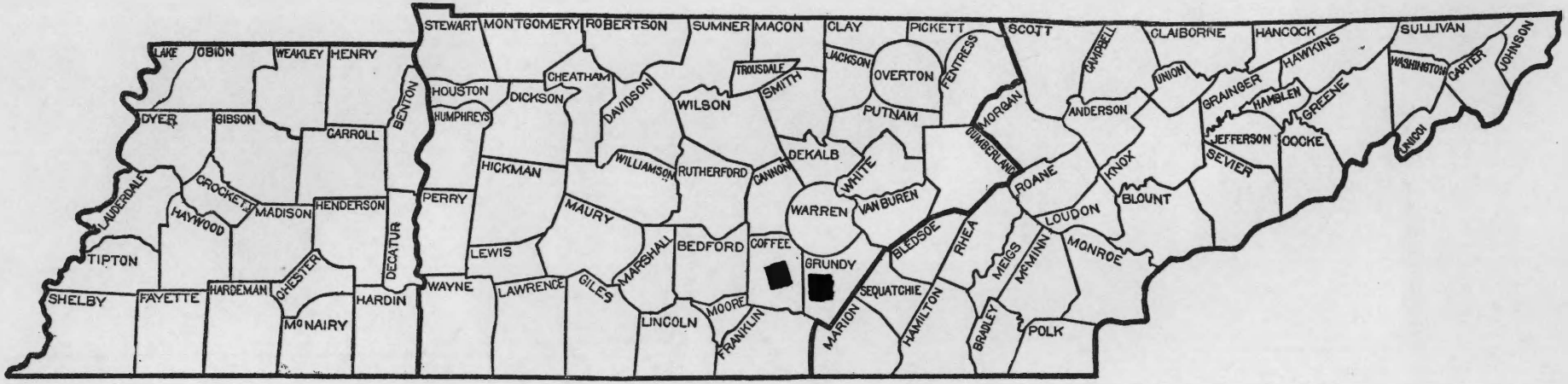

MAP 5

Nymphoides cordata (Ell.) Fern.



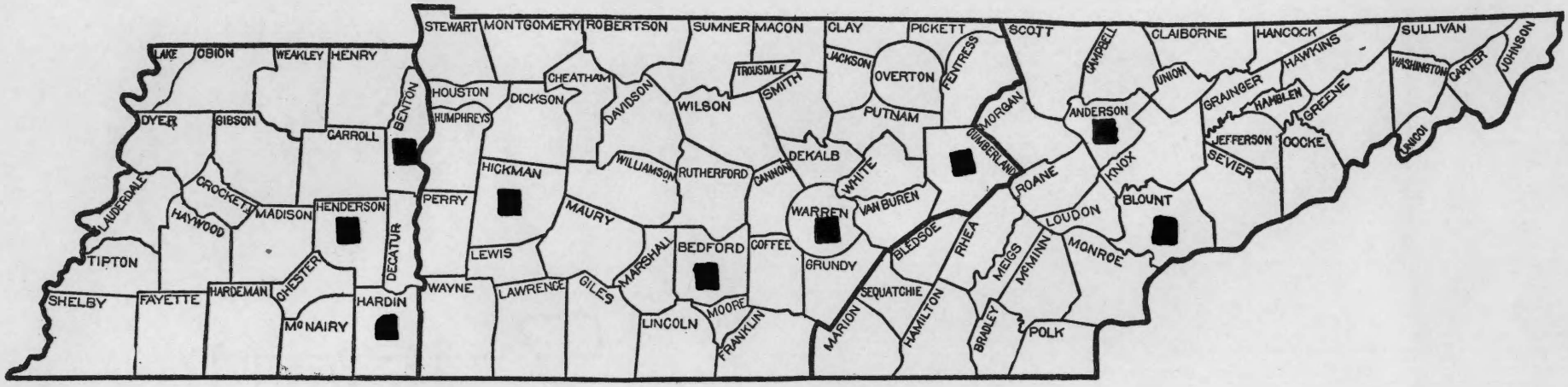

MAP 6

Sabatia campanulata (L.) Torr.



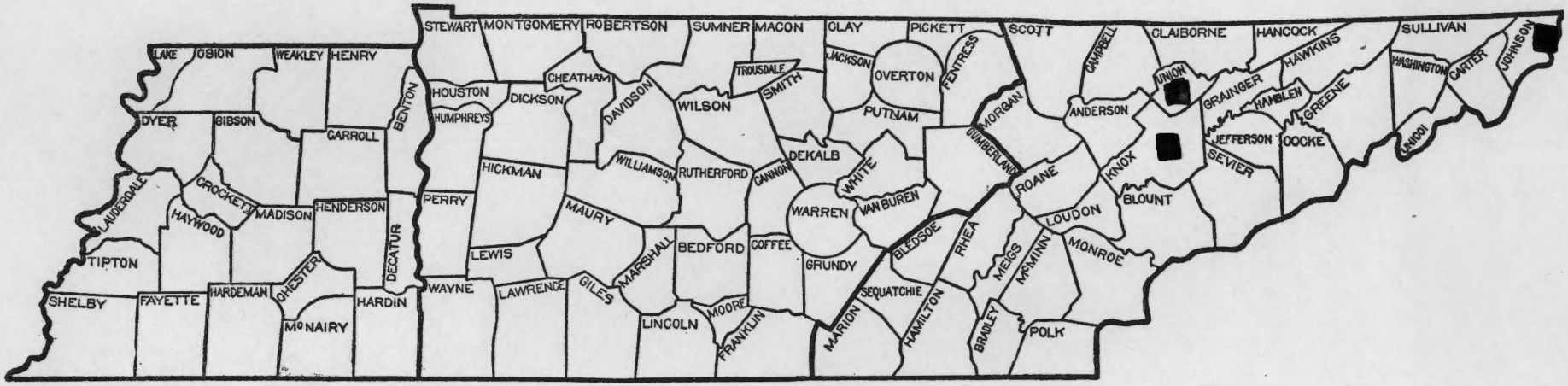

MAP 7

Sabatia brachiata Ell.



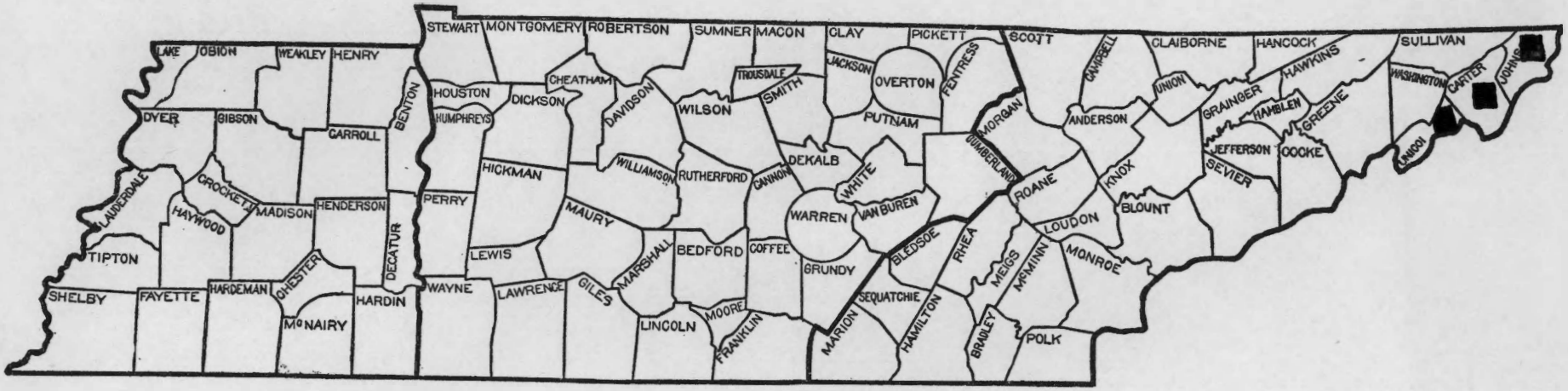

MAP 8

Sabatia angularis L. Pursh



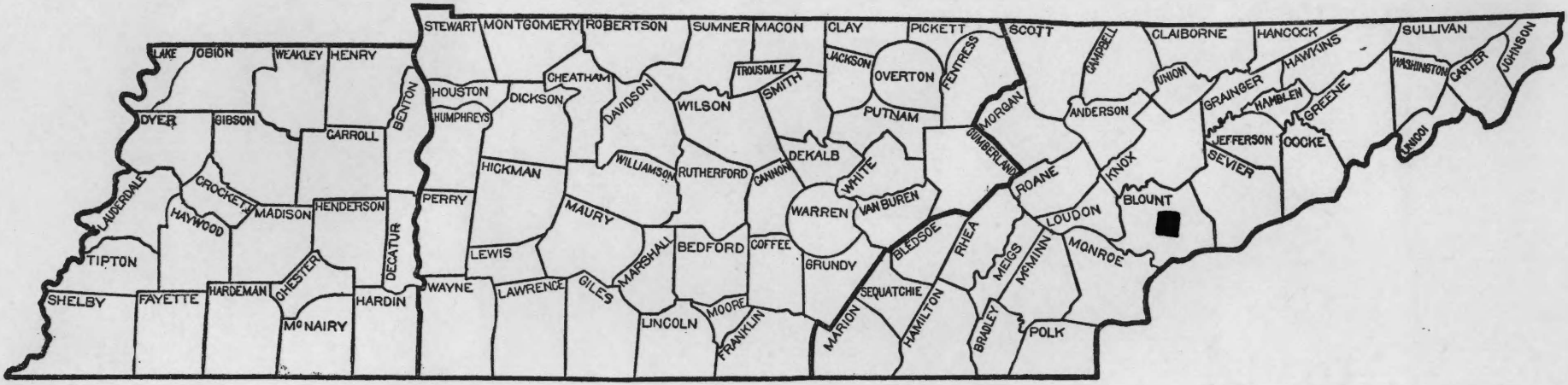

MAP 9

Gentiana quinquefolia L.



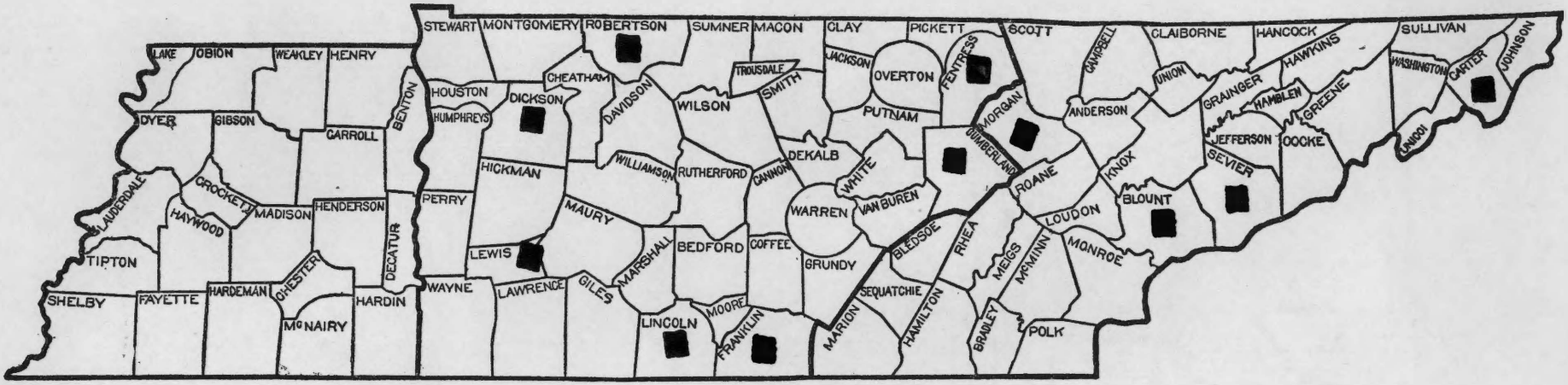

MAP 10

Gentiana Andrewsii Griseb.



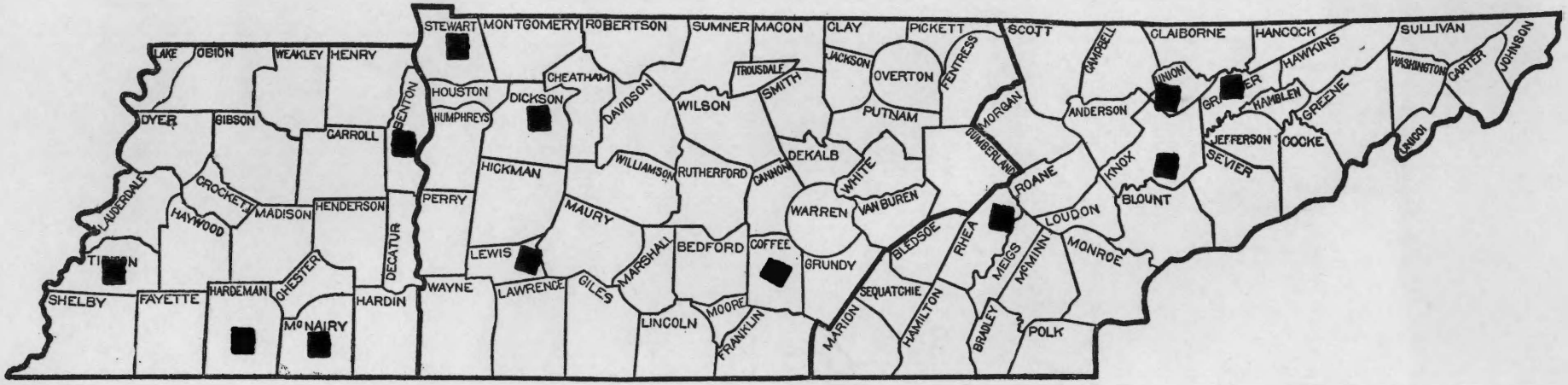

MAP 11

Gentiana decora Pollard



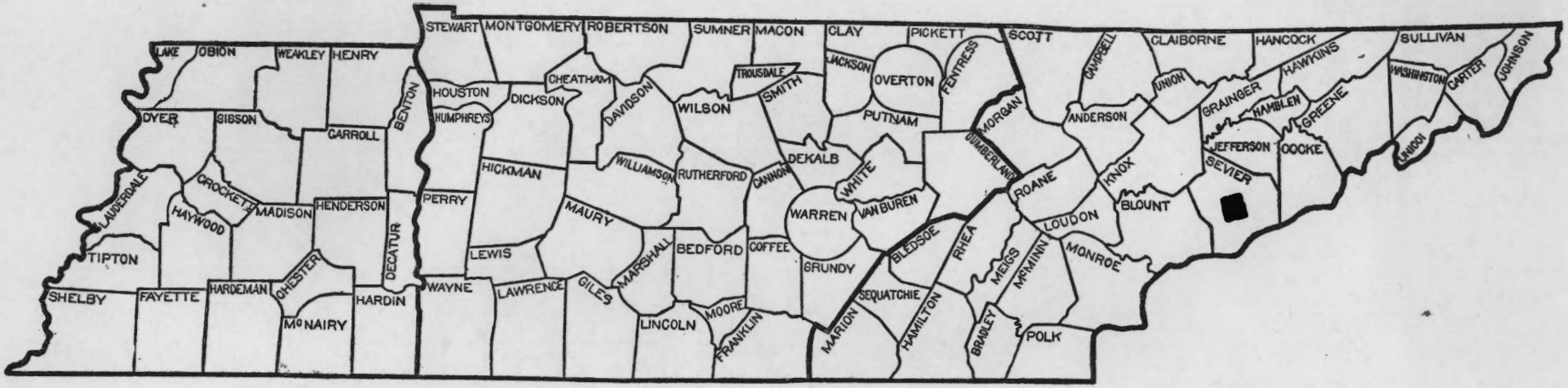

MAP 12

Gentiana Saponaria L.



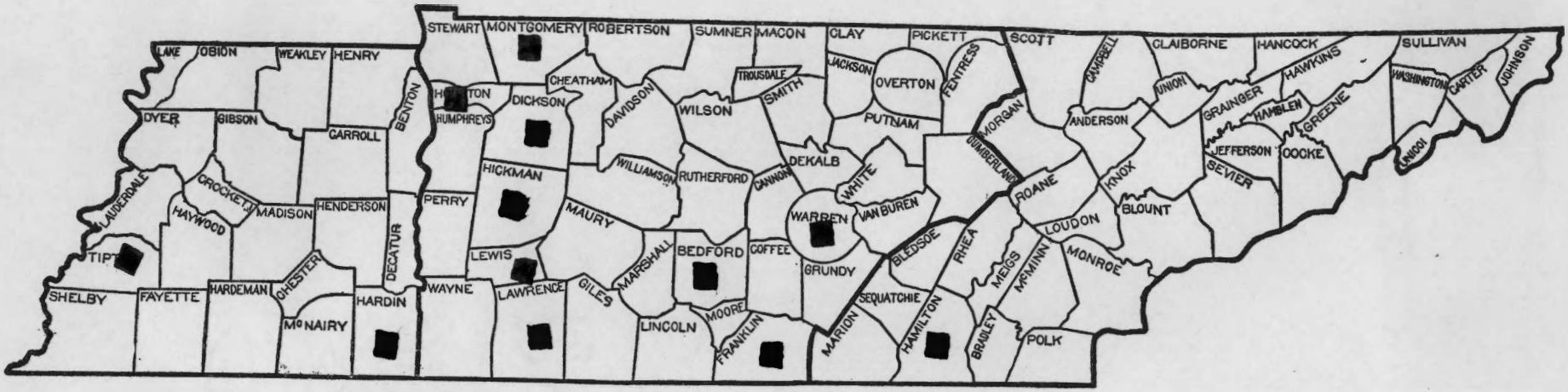

MAP 13

Gentiana villosa L.



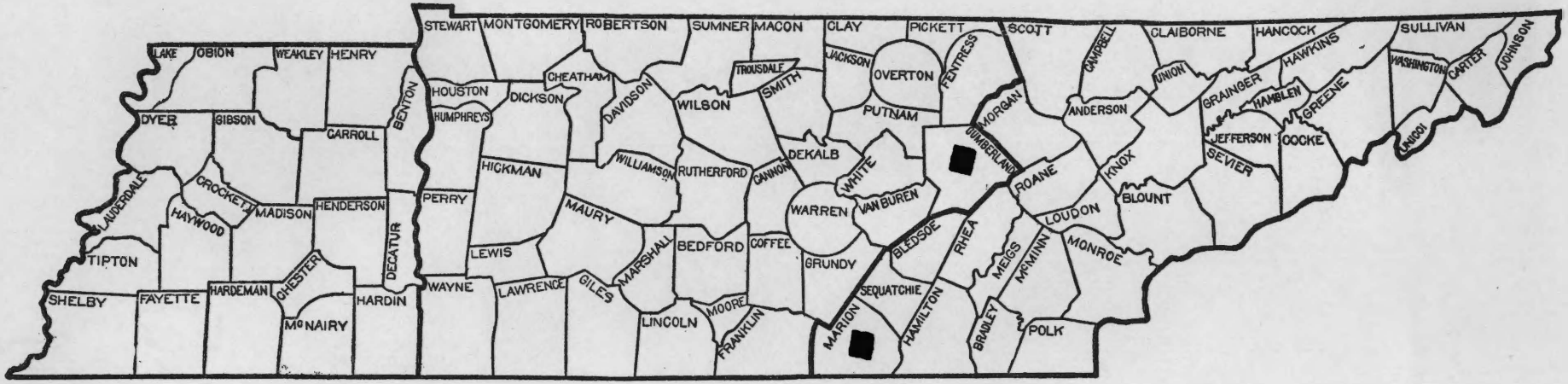

MAP 14

Gentiana linearis Froel.



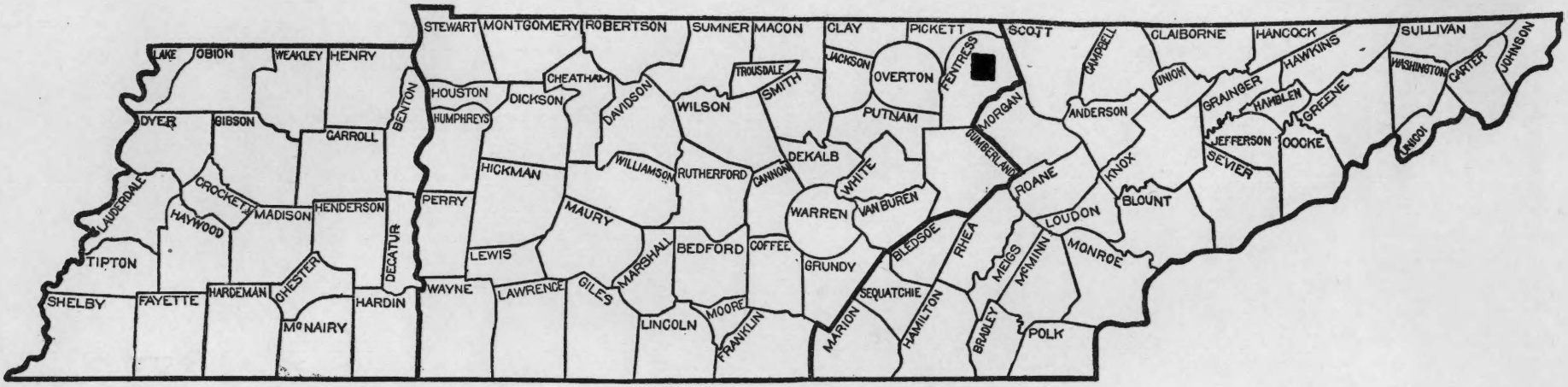

MAP 15

Swertia carolinensis (Walt.) Ktze.



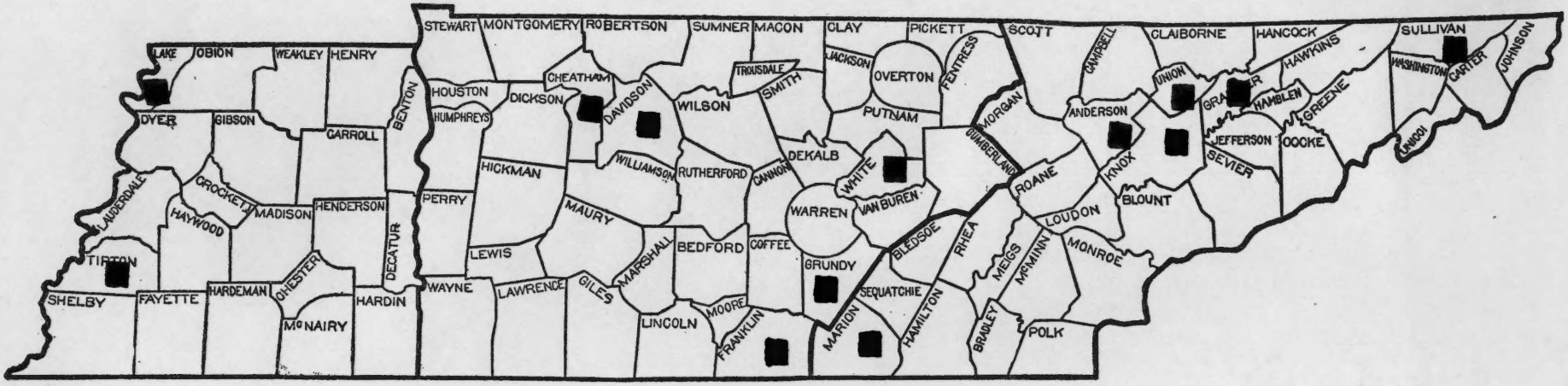

MAP 16

Bartonia virginica (L.) BSP.



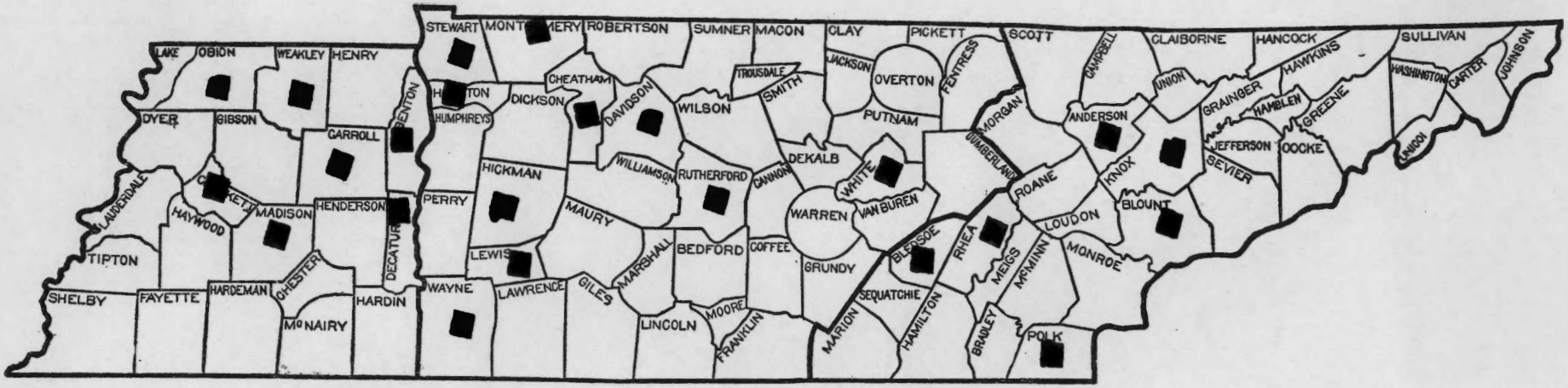

MAP 17

Bartonia paniculata (Michx.) Muhl.



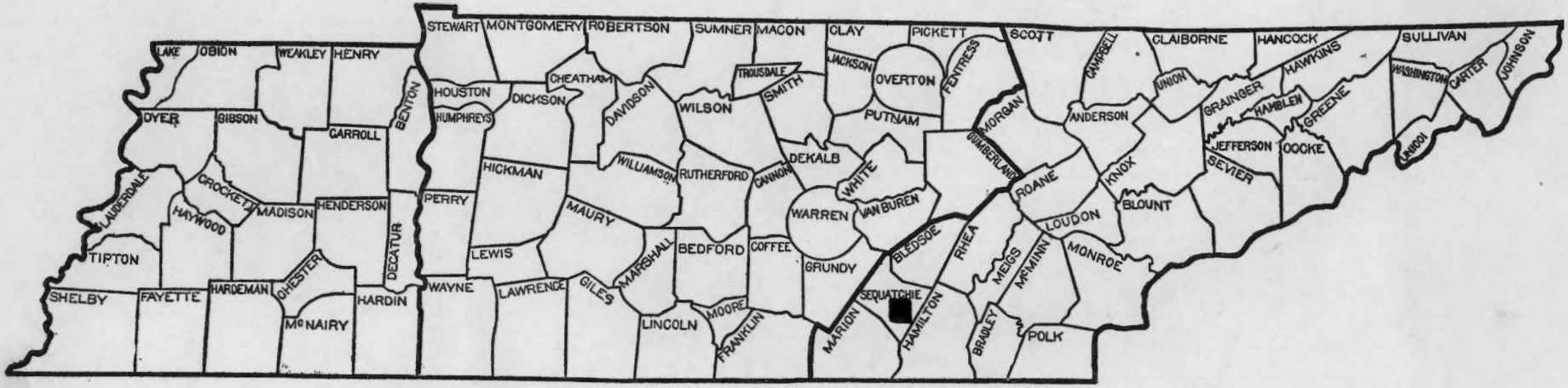

MAP 18

Obolaria virginica L.



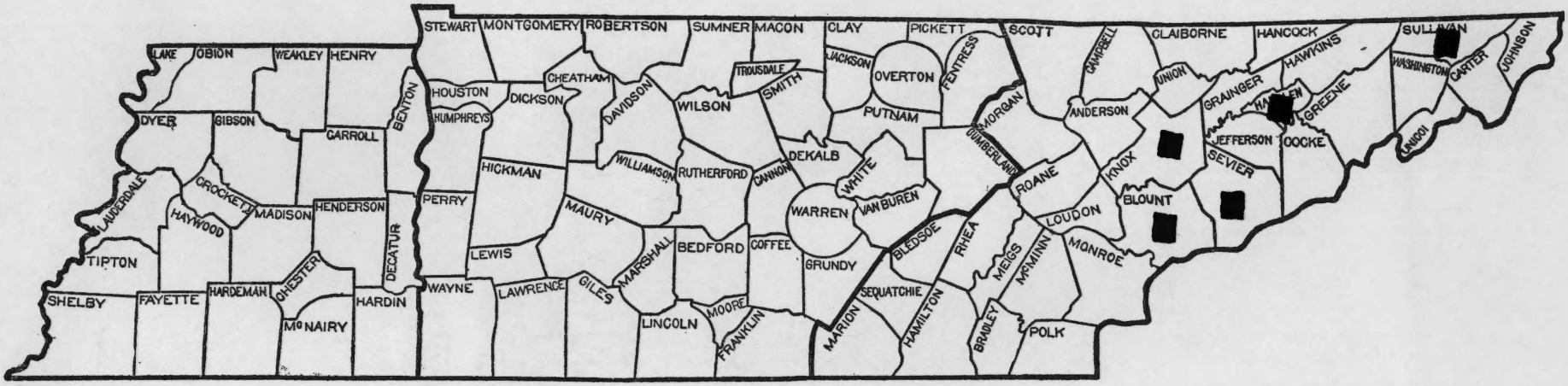

MAP 19

Amsonia Tabernaemontana Walt.



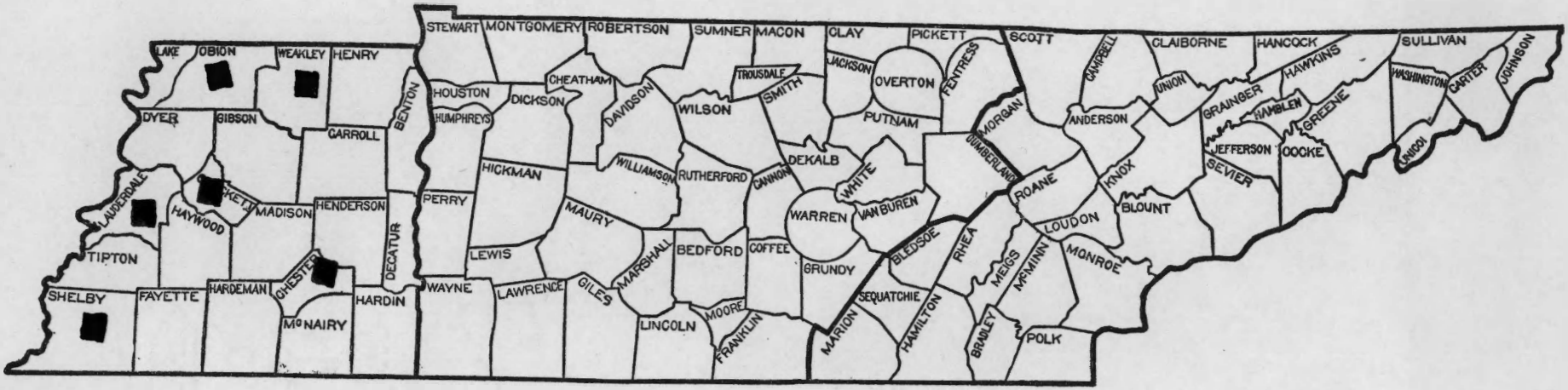

MAP 20

Amsonia Tabernaemontana var. salicifolia Pursh Woodson



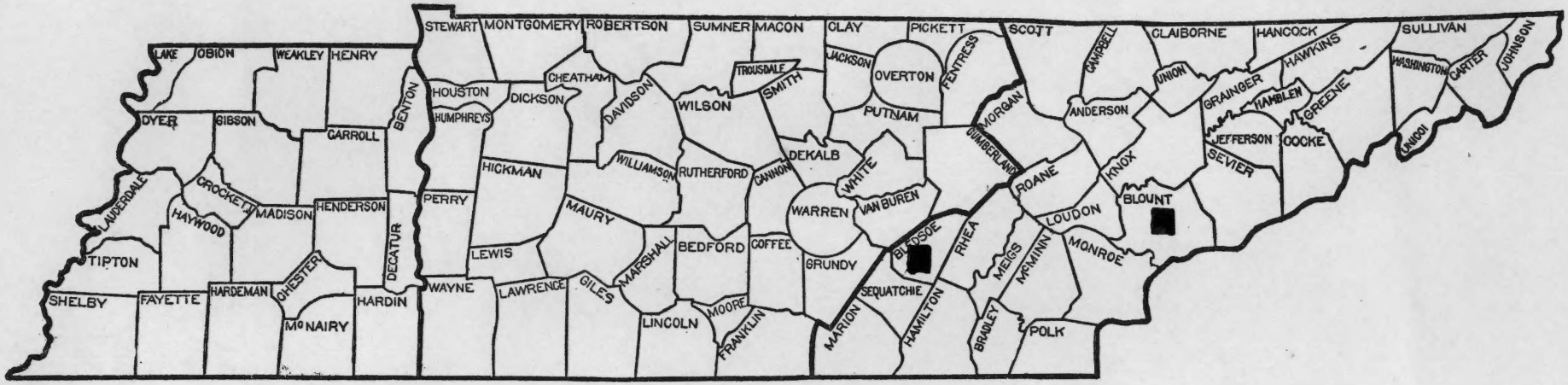

MAP 21

Vinca minor L.



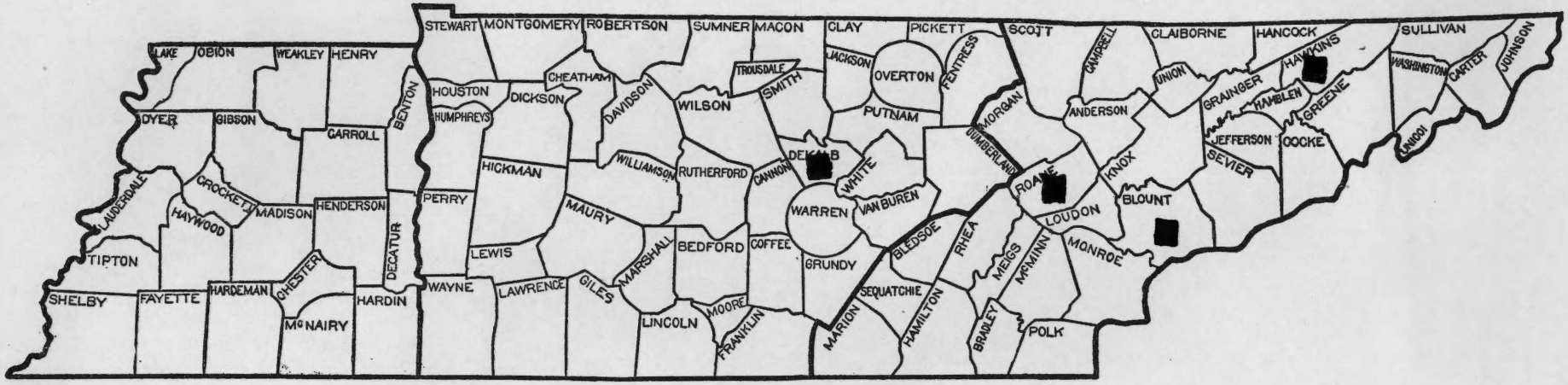

MAP 22

Trachelospermum difforme (Walt.) Gray



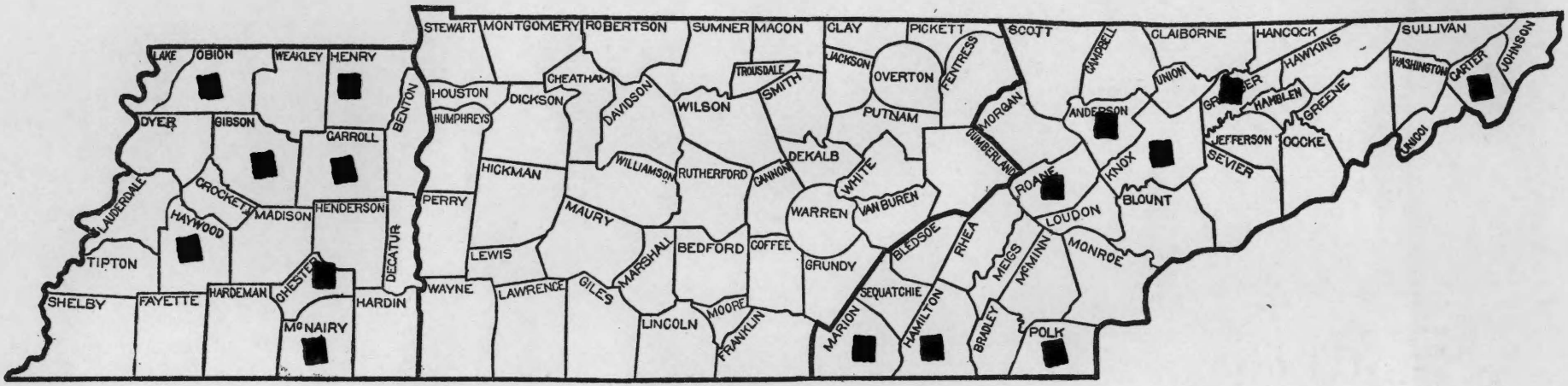

MAP 23

Apocynum androsaemifolium L.



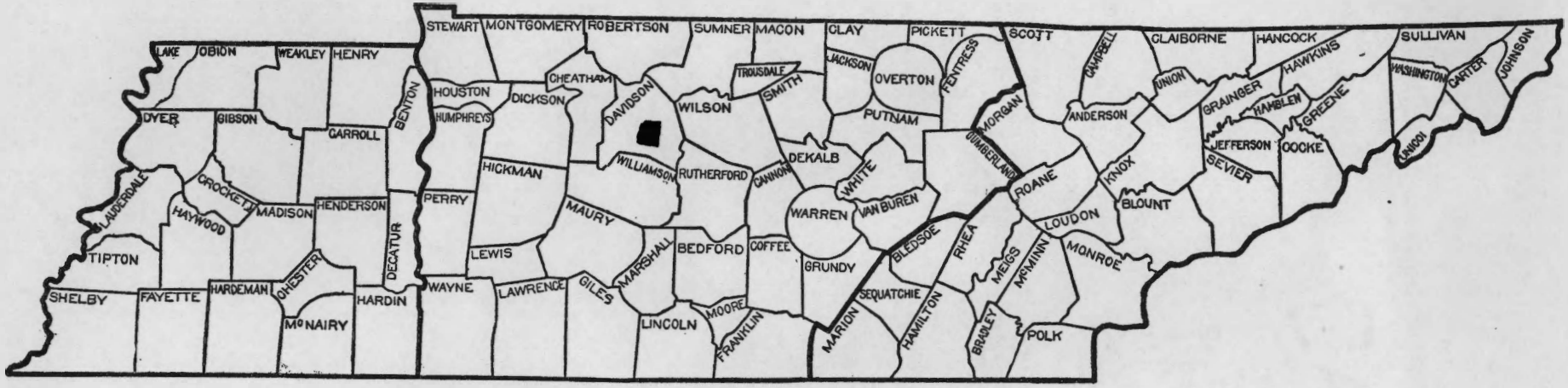

MAP 24

Apocynum medium Greene



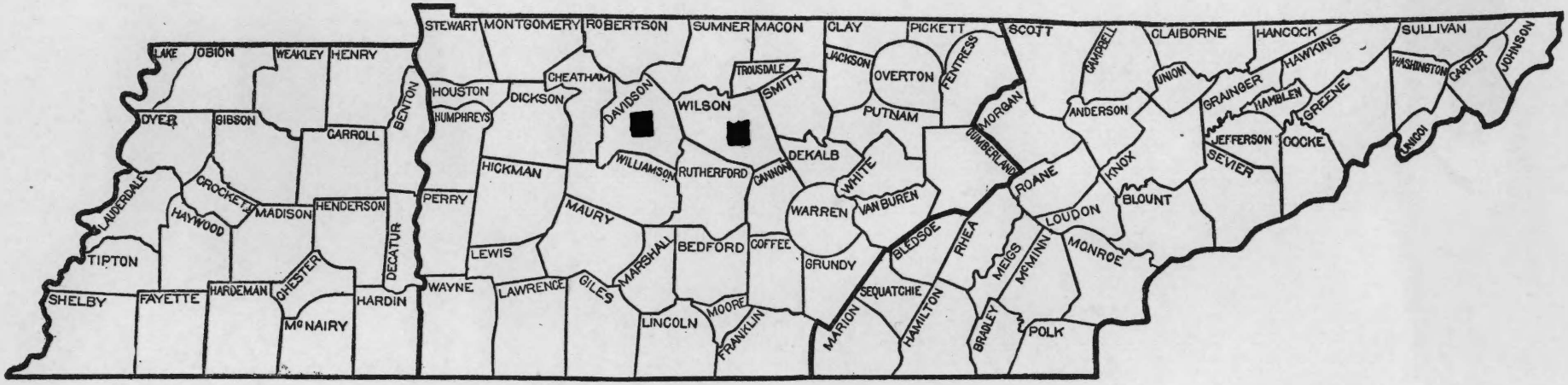

MAP 25

Apocynum cannabinum L.



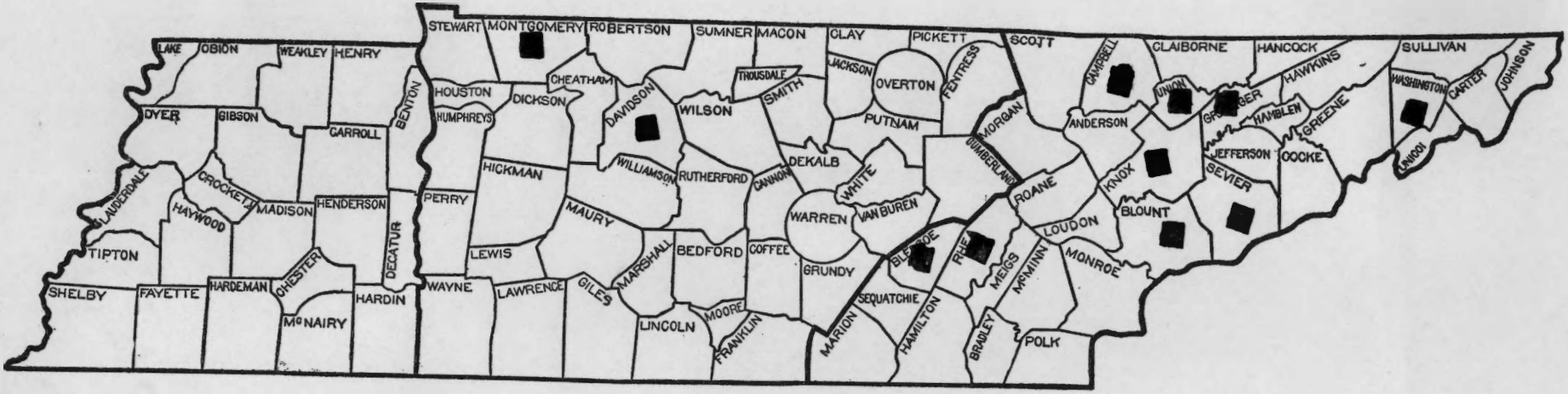

MAP 26

Apocynum cannabinum var. pubescens (Mitchell) A. DC.



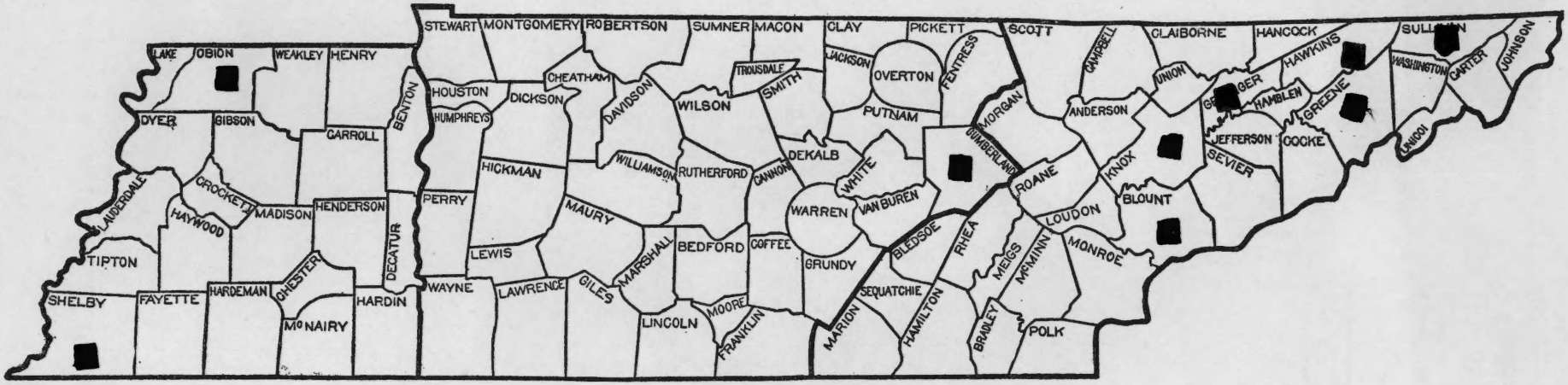

MAP 27

Asclepiodora viridis (Walt.) Gray



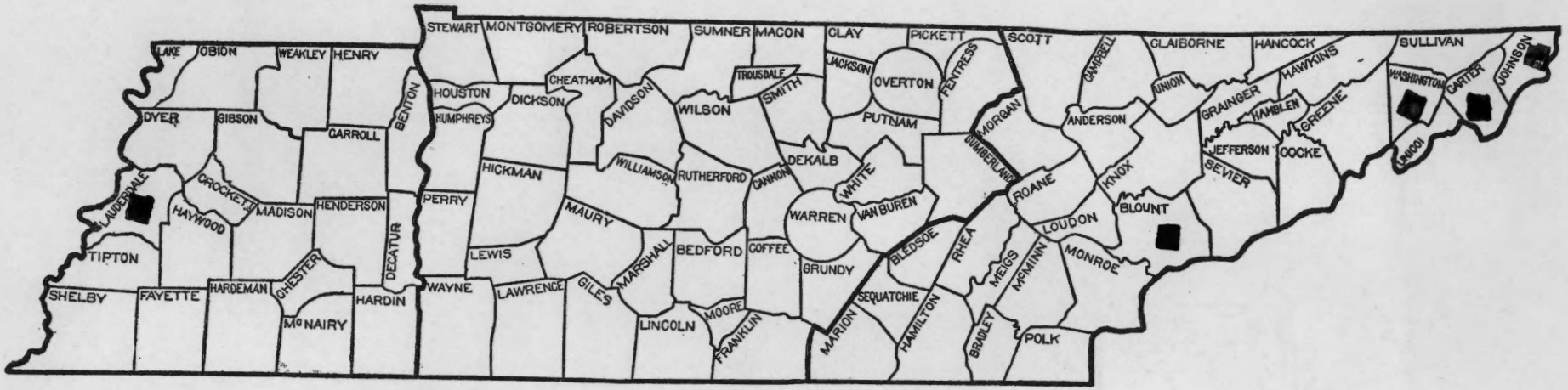

MAP 28

Asclepias tuberosa L.



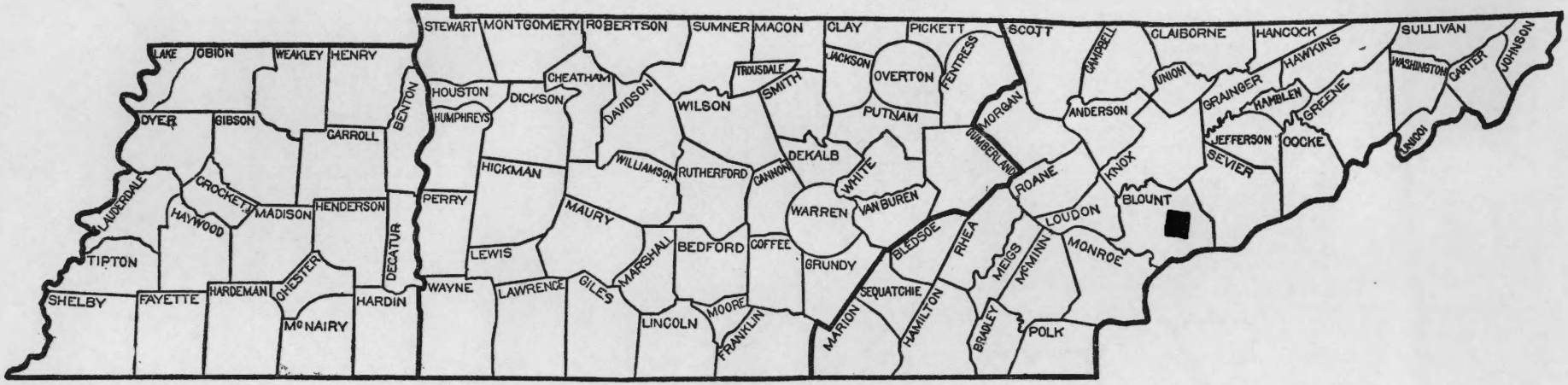

MAP 29

Asclepias incarnata L.



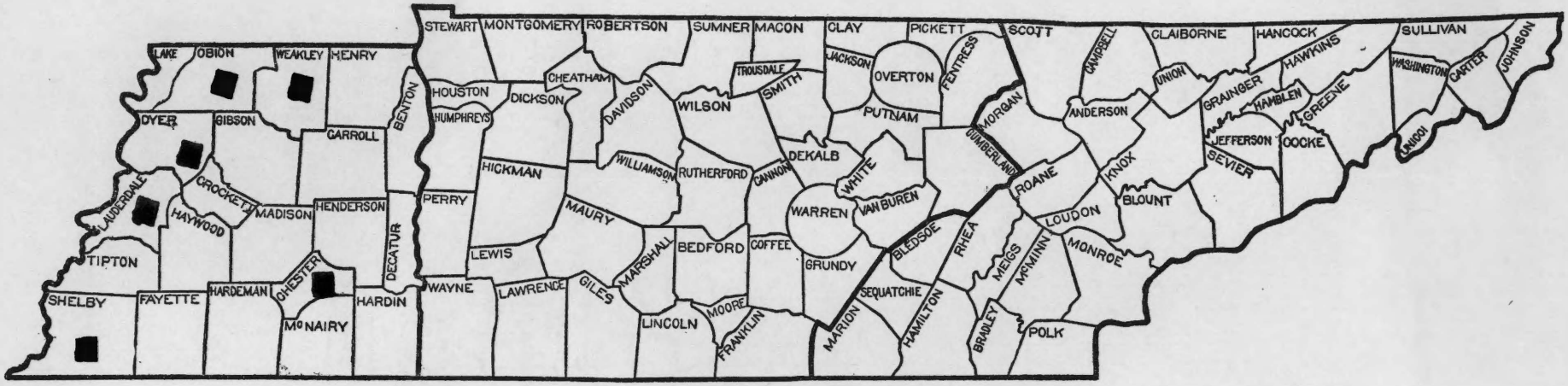

MAP 30

Asclepias incarnata var. pulchra (Ehrh.) Pers.



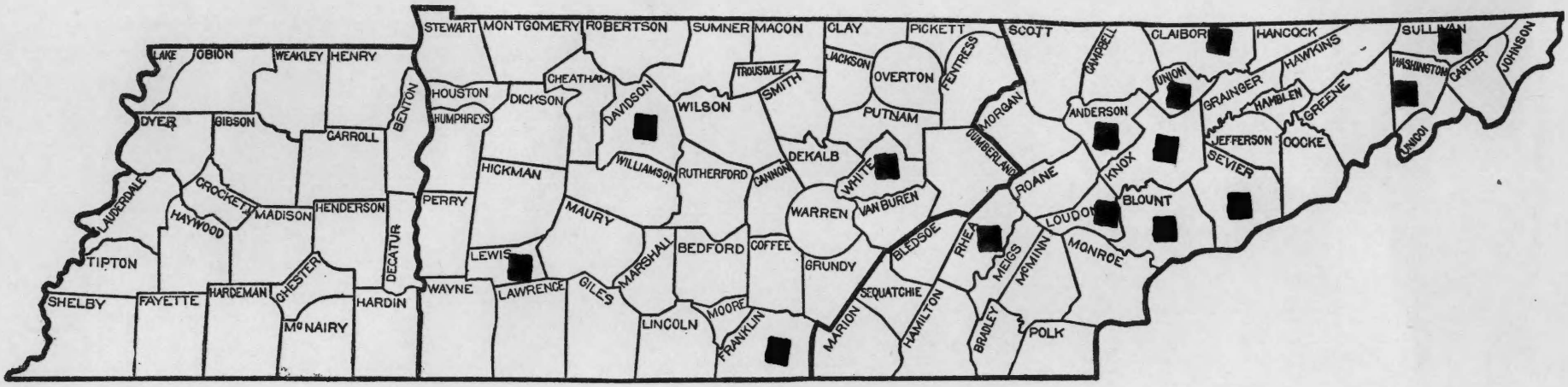

MAP 31

Asclepias exaltata (L.) Muhl.



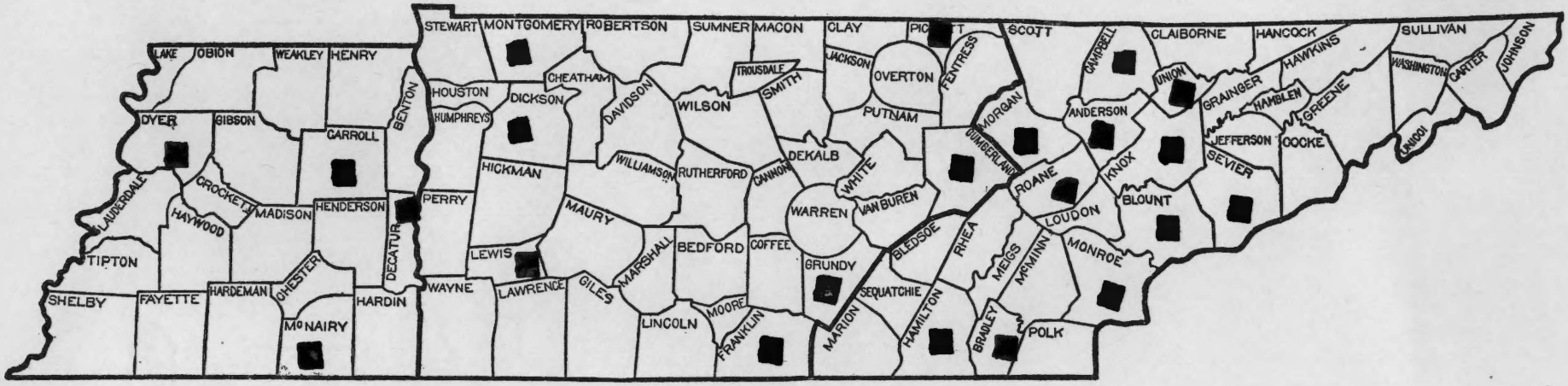

MAP 32

Asclepias perennis Walt.



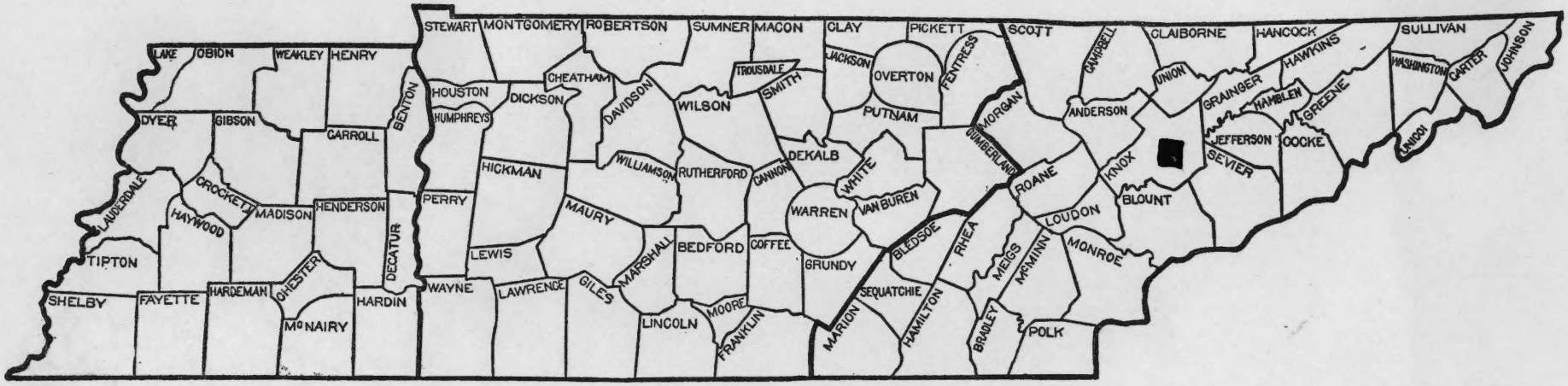

MAP 33

Asclepias quadrifolia Jacq.



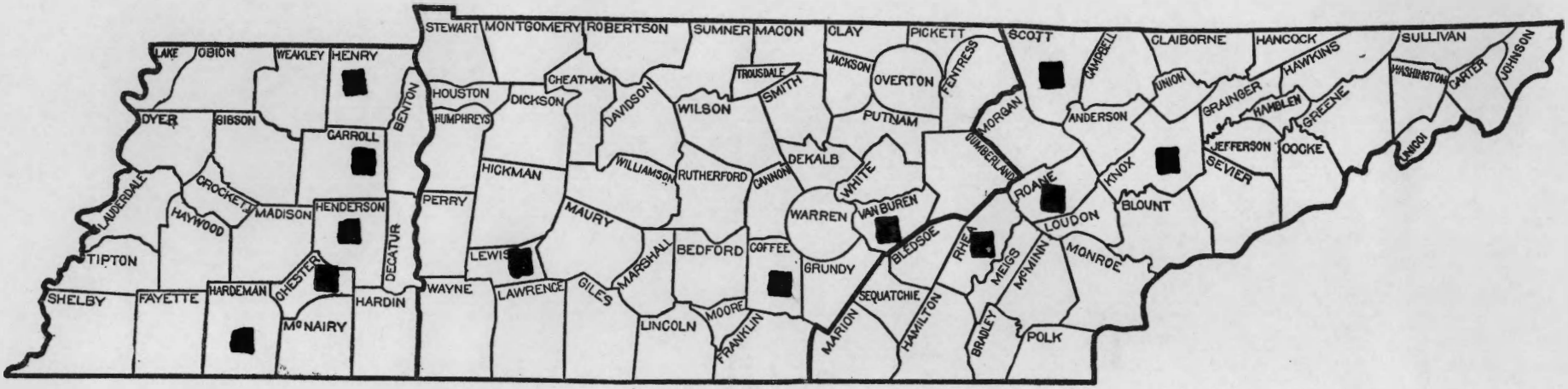

MAP 34

Asclepias variegata L.



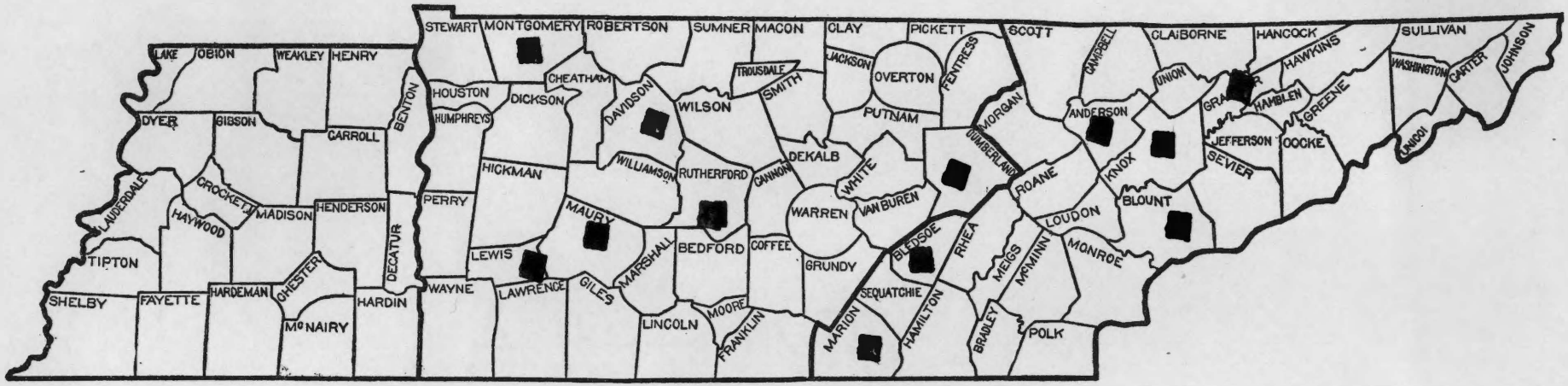

MAP 35

Asclepias syriaca L.



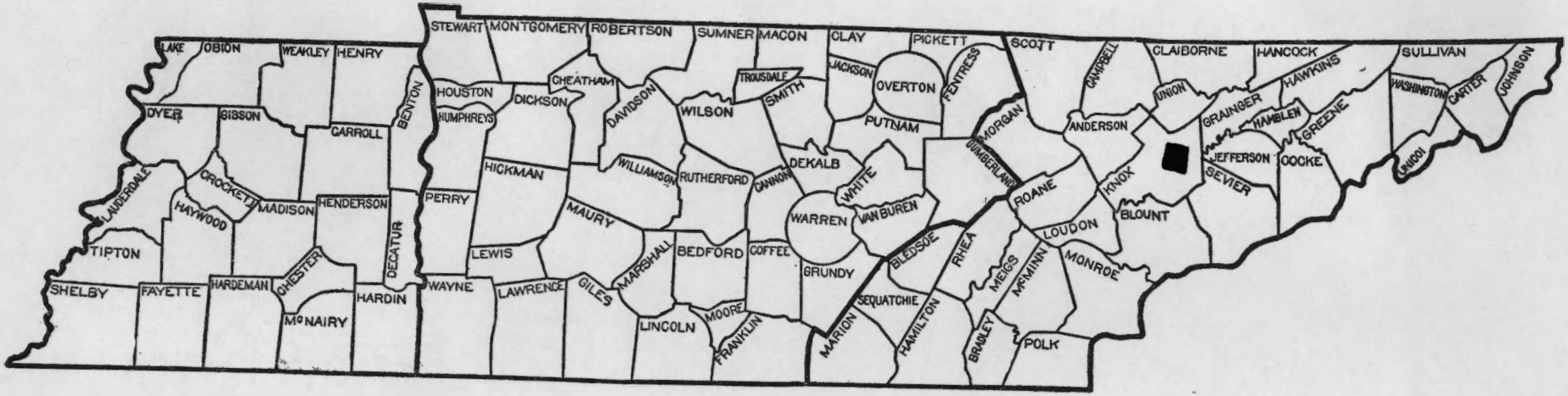

MAP 36

Asclepias amplexicaulis Sm.



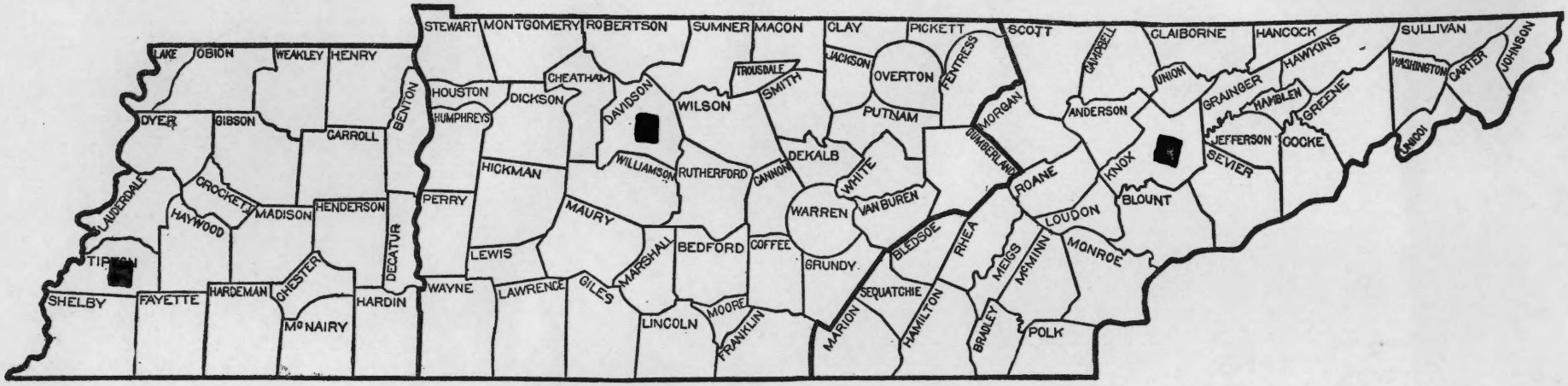

MAP 37

Asclepias verticillata L.



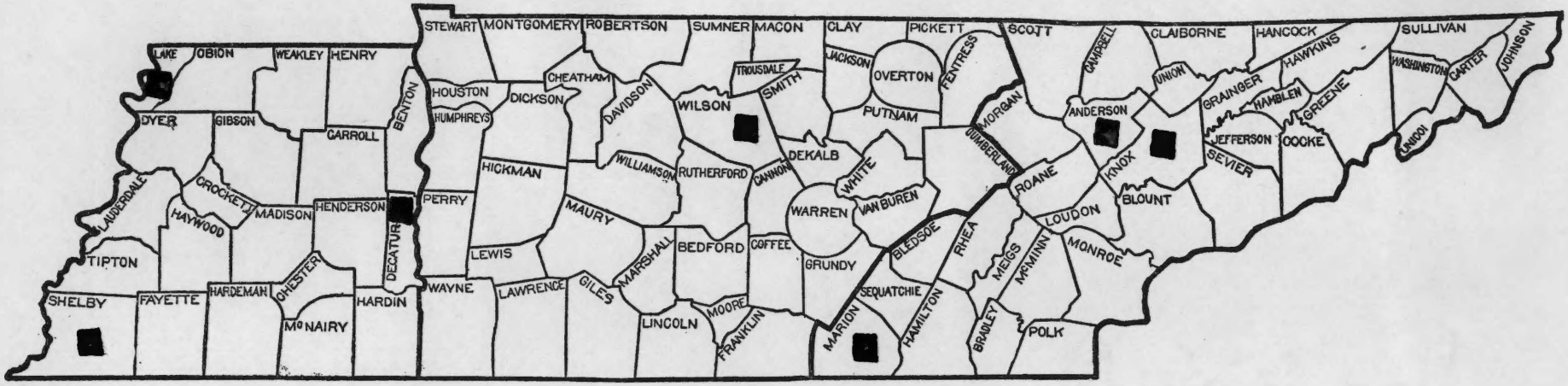

MAP 38

Periploca graeca L.



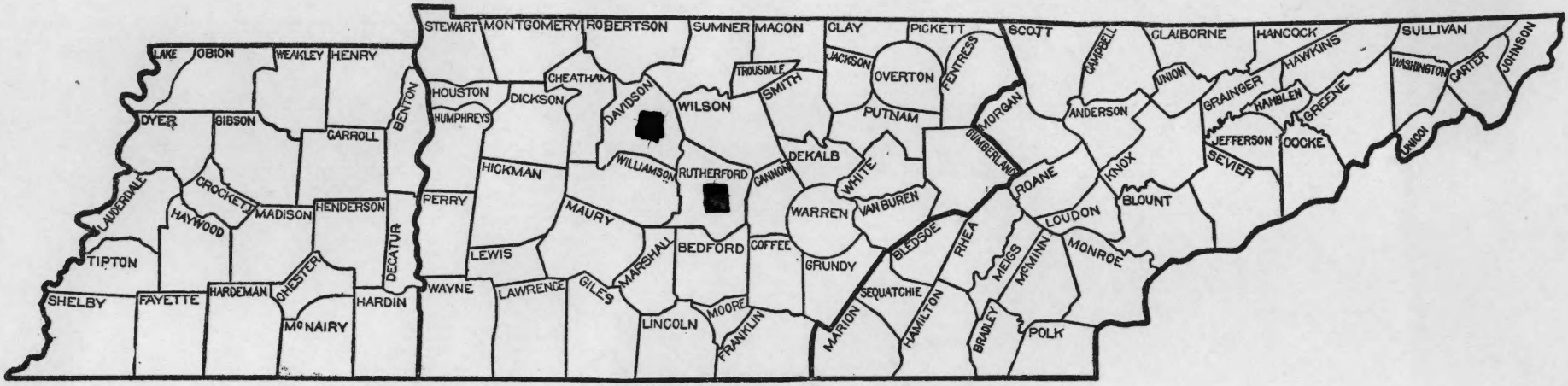

MAP 39

Ampelamus albidus (Nutt.) Britt.



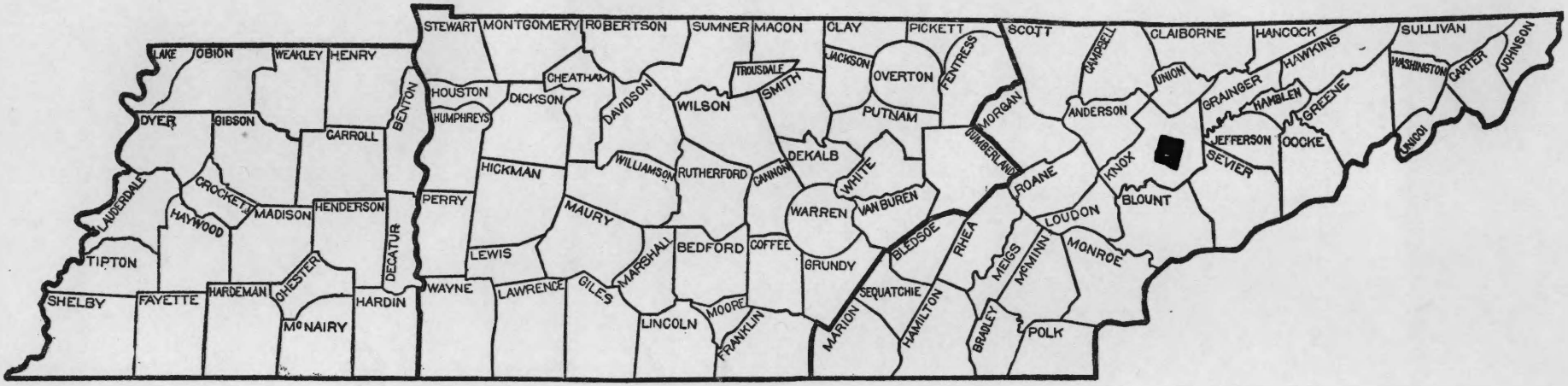

MAP 40

Gonolobus gonocarpos (Walt.) Gray



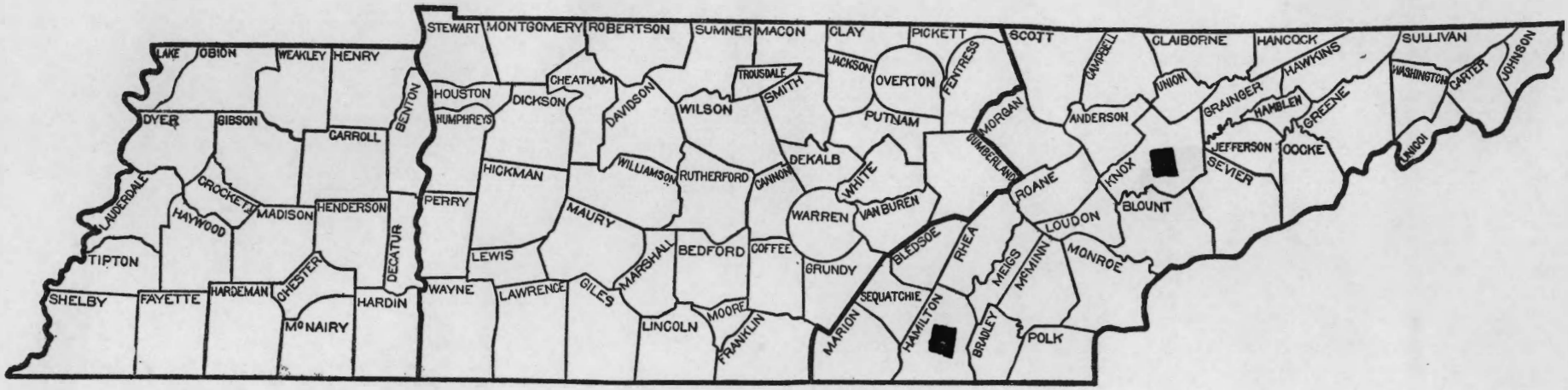

MAP 41

Gonolobus carolinensis (Jacq.) Schultes




MAP 42

Gonolobus Shortii Gray




MAP 43

Gonolobus obliquus (Jacq.) Schultes