

## HISTORICAL AND CURRENT DISTRIBUTION OF THE STATE-ENDANGERED *TRIFOLIUM REFLEXUM* (FABACEAE) IN TENNESSEE

EDWARD W. CHESTER  
Department of Biology  
Austin Peay State University  
Clarksville, Tennessee 37044  
chestere@apsu.edu

### ABSTRACT

The earliest literature accounts of *Trifolium reflexum* L. in Tennessee are from the period 1878-1901 and indicated presence of the species in Davidson County. In some cases, these reports were vouchered by existing herbarium specimens, but the reports and specimens apparently were overlooked in accounts of the state's flora until 1968. Recognition as a species of conservation concern came in 1999 and state-endangered status was granted in 2004. Based on verified herbarium specimens and field work, *T. reflexum* occurs, or once occurred, in seven counties across the state, usually with one known site per county. However, most collections were made more than 60 years ago and only one small population in each of two counties is known to be extant.

At least 15 species of *Trifolium* are known from Tennessee, but only two are native, each state-endangered (Tennessee Flora Committee 2015). *Trifolium calcaricum* Collins & Wiebolt is known from three counties in Middle Tennessee and one county in southwestern Virginia (Atlas of Tennessee Vascular Plants 2019; USDA NRCS 2019). *Trifolium reflexum* L., the subject of this report, is known from a few localities across the state. The species is widely distributed in midwestern USA, but occurrences are scattered eastward and it is listed endangered in Illinois, Indiana, Kentucky, and Tennessee and possibly extirpated in Maryland and Pennsylvania (Chapel & Vincent 2013; USDA, NRCS 2019). Recent publications have provided historical information and current distributions for Kentucky (Campbell et al. 1988; Vincent 2001) and Ohio (Vincent 1991). Extensive descriptions and habitat preferences can be found in Vincent (1991, 2001) and Isely (1990, 1998), among others.

The objectives of this study are (1) to summarize literature concerning *T. reflexum* in the state, especially noting the publication history leading to the current designation of endangered, and (2) to document the known distribution of the species in Tennessee based on verified herbarium specimens.

Literature was accumulated from published accounts, from various databases, and from theses obtained from lending libraries. Records from the Natural Heritage Program, Tennessee Department of Environment and Conservation, were made available by concerned and helpful personnel. Herbaria within Tennessee were visited or curators contacted for information. Several out-of-state herbaria were contacted, especially those indicated by the Southeast Regional Network of Expertise and Collections (SERNEC) database to include Tennessee specimens of *T. reflexum*.

### Review of Tennessee literature

**The Killebrew-Gattinger Years.** The first observed mention of *Trifolium reflexum* for the state was that of J.B. Killebrew (1831-1906), Tennessee's first Commissioner of Agriculture beginning in 1872. In a book dealing with Tennessee grasses and forage plants, Killebrew (1878) noted that *T. reflexum* was a "valuable forage species found round Nashville." This work was later expanded (Killebrew 1898) and when referring to pastures, he noted that "the wild clovers are numerous and nutritious, including Buffalo Clover (*Trifolium reflexum*)." Apparently, these reports were not vouchered with specimens, but Killebrew credited A. Gattinger (see next) with providing information on native species.

Augustin Gattinger (1825-1903) is recognized as the premier botanist for the state (Oakes 1932; Bishop and Priestley 2015). His first list of Tennessee vascular plants (Gattinger 1887) noted that *T. reflexum* was found in “Cedar barrens, rocky hills along Franklin Pike, Nashville” and as one of several “plants of the glades and bluffs.” Gattinger later noted (1901) the presence of *T. reflexum* along “Banks of Cumberland River, below Nashville.” His personal collection was sold to the University of Tennessee before his death but was lost when the entire Tennessee herbarium was destroyed by fire in 1934. However, Gattinger had exchanged specimens, or more often sent specimens as gifts, to several in- and out-of-state herbaria and colleagues (Oakes 1932). About 300 of these specimens, including two of *T. reflexum* (see citations), have returned as a result of purchases or gifts and now are on deposit at TENN (B.E. Wofford, pers. comm., 29 March 2019).

**The Sharp Years.** A.J. Sharp (1904-1997), long-time Professor at The University of Tennessee, apparently prepared the first list of Tennessee rare plants (Sharp 1948). That list of 25 species included “wildflowers that are in danger of becoming extinct in Tennessee.” Later, Sharp (1974) expanded the list to about 90 species that included “most of the rare or threatened plants in Tennessee.” Jesse M. Shaver (1888-1961), Professor at George Peabody College in Nashville (now a part of Vanderbilt University) and colleague of Sharp, published a listing of about 15 species (Shaver 1957) that he considered rare. None of these publications, or the eventual checklist of Tennessee vascular plants (Sharp et al. 1960) and addendum (Sharp & Baker 1964), included *Trifolium reflexum*. Apparently there were no *T. reflexum* specimens at TENN prior to 1964.

William Mahler (1930-2013) completed a doctoral program mentored by Sharp that included a dissertation on the legumes of the state (Mahler 1968). Distribution data were obtained mostly from specimens found in Tennessee herbaria and *Trifolium reflexum* was mapped from Davidson County. Apparently, a Gattinger collection had been located elsewhere and returned to TENN, although records are lacking and Mahler did not document sources. A revised publication (Mahler 1970) added Lewis and Madison counties. Again, vouchers were not cited, but apparently the specimens identified later in this report were the sources for the two additional counties.

**Recent Years.** The USDA, Soil Conservation Service (1975) published a list of about 100 Tennessee rare species. The apparently in-house list was prepared “with assistance from several Tennessee universities and other federal agencies” and did not include *T. reflexum*. An *ad hoc* committee of mostly East Tennessee botanists (see literature cited, Committee for Tennessee Rare Plants, for membership) met in 1976 and developed a list of rare species. The list was published (Committee for Tennessee Rare Plants 1978), but *T. reflexum* was not recognized.

In 1980 a Scientific Advisory Committee (SAC) of 11 state-wide botanists was appointed by the Commissioner, Tennessee Department of Conservation (now Department of Environment and Conservation) to assist the Department’s Heritage Program in developing an “official” categorized list of Tennessee rare plants and to update/revise the list every third year. Paul Somers, State Botanist at the time, chaired the Committee which first met in January 1981 (correspondence in the author’s files). Revisions suggested by the SAC, which meets each third year, are included in an updated list under the direction of the state botanist. *Trifolium reflexum* was not recognized in the SAC’s early deliberations or in the first journal-published list (Somers 1989). The soon-developed Wofford and Kral (1993) checklist included the species but without rarity designation.

Recognition as a rare entity in the state came when Dr. Eugene Wofford, then TENN Curator, contacted Carl Nordman, then State Botanist, and suggested recognition of Special Concern (e-mail from Wofford to Nordman on 14 May 1998, on file Tennessee Natural Heritage Program, copy author’s files). That status was assigned in the official list of October 1999, and then elevated to Endangered in 2004 under the leadership of then State Botanist Claude Bailey (personal communication with Todd Crabtree, current State Botanist). Endangered status has continued in subsequent and the current list

(Tennessee Natural Heritage Program 2016) and in state-wide accounts of the flora (Atlas of Tennessee Vascular Plants 2019; Chester et al. 1997, 2009; Tennessee Flora Committee 2015).

### Summary

Literature reports for the period 1878-1901 indicate the presence of *Trifolium reflexum* in Davidson County. Some reports are supported by vouchers, but the species did not appear in later Tennessee literature until 1968. Its recognition as a species of conservation concern began in 1999 (designated special concern) and 2004 (designated endangered). Verified collections are from seven Tennessee counties ranging across the state. Collections possibly are from two sites in Davidson County and one site in other reported counties. However, collections are historic from the following five counties (the number of years since the last collection is given in parentheses): Davidson (121), Lewis (74), Madison (59), Montgomery (45), Shelby (99), or an average of 80 years. Label data are vague for four counties, making site relocation impossible; the Montgomery County site, with good location data, was visited in 2018 without success in locating representatives. Blount and Polk counties, with one known site in each, represent known extant populations.

### Verified collections data

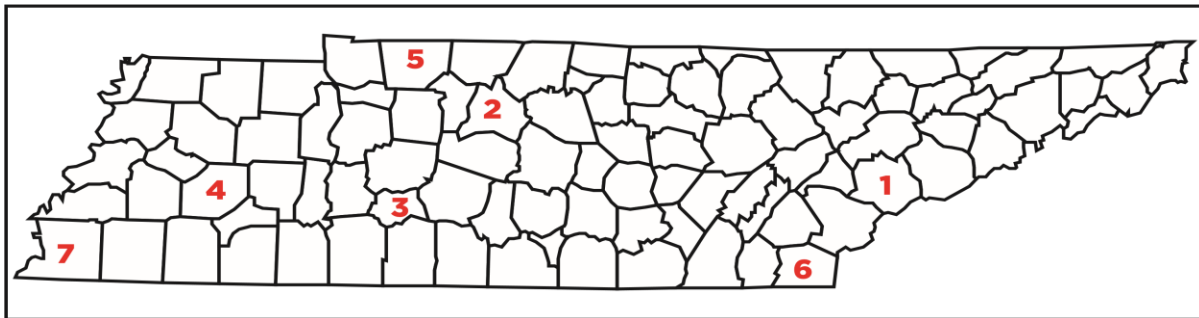


Figure 1. Tennessee counties with verified collections of *Trifolium reflexum* (see list of vouchers numbered by county).

Blount Co. (1): Calderwood Quad, dry woods at intersection of Highway 129 and gated road to Calderwood Dam, overlook pull off, 13 May 1998, *Wofford and Clebsch 98-18* (TENN, examined June 2017, duplicate at LSU reported by SERNEC, not seen; TENN specimen annotated M. Vincent 1999). Recent visits by others verified the continued presence of the species at the site (Todd Crabtree, current State Botanist, pers. comm., 26 October 2017).

Davidson Co. (2): Dry pastures, May 1878, *Gattinger s.n.* (TENN, image APSC; annotated W. Mahler 1968 and M. Vincent 1994); rocky ground around Nashville, 1898, *Gattinger s.n.* (TENN, image APSC; duplicate CM, image APSC; both originals and duplicate annotated M. Vincent 1991).

Lewis Co. (3): Little Swan Creek, Meriwether Lewis National Monument, roadside in low woods, 25 May 1945, *King 110* (VDB at BRIT, image APSC; annotated W. Mahler 1968 and R. Kral 1993).

Madison Co. (4): Near Jackson, 18 May 1960, *Shelby, s.n.* (TENN, examined June 2017; annotated W. Mahler 1968 and M. Vincent 1994). Extensive collecting for a floristic survey of the county (Beardsley 1973) did not locate the species.

Montgomery Co. (5): Shaded roadside on road to Hematite Public Use Area, 21 May 1974, *Chester 2711* (APSC, examined January 2019, and TENN, examined June 2017; both annotated M. Vincent 1994). The Public Use Area was closed in the 1980s and the gated road now is little-used; the roadside site has succeeded into dense thickets and *T. reflexum* was not observed when visited in 2018.

Polk Co. (6): North edge of Clemmer trail, right on trail edge, 14 May 2013, *Shaw and Estes s.n.* (UTCH, image APSC). This site is remote and although not recently visited, continued presence of the species is expected (D. Estes, pers. comm., 5 March 2019).

Shelby Co. (7): Open woods, moist ground along small stream near Memphis, 12 May 1920, *Palmer 17450* (MO, image APSC). Extensive collecting for a floristic survey of the county (Thompson 1975) did not locate the species.

#### **SERNEC reports based on misidentifications.**

Obion Co.: Walnut Log lawn, 27 Apr 1941, *Eyles 7740* (GEO, image APSC). The sheet label indicates “O’Brien County, Pennsylvania.” However, Walnut Log is a community on the east side of Reelfoot Lake and the former site of a field station managed by the Tennessee Academy of Science. Eyles did a floristic study of the area (Eyles & Eyles 1943), working out of the Academy field station, and this specimen was probably part of that study although the number is not included in the publication. The specimen appears to be *T. repens* L.

Weakley Co.: Roadside, Hwy 22, 8 May 1974, *Bansler 137* (UTM, observed November 2018). The specimen is *T. pratense* L.

White Co.: Near Doyle, along roadsides, 11 Jul 1963, *Sparkman 14* (HTTU, image APSC). The specimen appears to be *T. pratense* L.

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