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SUBJECT: Preliminary Status Report on the Trillium pusillum Complex

Attached for your information and files is a copy of the subject report.  
Please call if you have any questions or comments.

*Robert*



Status Survey  
of the  
Trillium pusillum complex

Preliminary Report  
covering  
Task 1 Work Elements

by

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prepared and submitted  
15 Feb 1994

to

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Information for Taxa of the Trillium pusillum Complex

## 1. Classification and Nomenclature

## a. Scientific Name

Latin binomial and varietal epithets:

Trillium pusillum Michaux. 1803. Flora Boreali Americana, Vol. 1. p. 215. Type specimen: South Carolina. [Berkeley Co.?]. Basse Caroline, environ. Gaillard road, 35 M[iles] de Charlest[on]. In pinetis Carolinae inferioris. A. Michaux Herbarium (P).

T. pusillum var. virginianum Fernald. 1943. Rhodora 45: 396-398. Type specimen: Virginia. Dinwiddie Co. Rich loamy woods near stream, 5 miles east of Dinwiddie Court House. 9 May 1943. L.H. Lippitt s.n. (GH).

T. pusillum var. ozarkanum (Palmer & Steyermark) Steyermark. 1960. Rhodora 62:130-133. Based upon T. ozarkanum Palmer & Steyermark. 1935. Ann. Missouri Bot. Gard. 22: 375-759. Type specimen: Missouri. Barry Co. 3 miles south of Cassville. Cherty soil along slopes of a draw in upland oak-chinquapin woods. 20 Apr 1935. J.A. Steyermark 18628 (MO).

T. pusillum var. texanum (Buckley) Reveal & Broome. 1981. Castanea 46: 187-191. Based upon T. texanum Buckley. 1861. Proc. Philadelphia Acad. Sci. 1860: 443-445. Type specimen: Texas. Panola Co. 1860. S.B. Buckley (specimen not located).

T. pusillum var. monticulum Bodkin & Reveal. 1982. Brittonia 34: 141-143. Type specimen: Virginia. Rockingham Co. Shenandoah Mt., 1.5 km NNE of Briery Branch Gap and the jct. of Virginia Rt. 924 along Forest Service Road 85 (Flagpole Knob Road), on Hampshire

(Catskill) Formation of chiefly red sandstone with some flagstone, shales and mudrock in various stages of disintegration, at 1190 m (3900 ft) elev. 18 Apr 1981. J.L. Reveal & C.R. Broome 5586 (MARY).

Type specimens: Available information concerning holotype material was cited following each of the named taxa in the T. pusillum complex listed above. Additional locality/habitat data and duplicate specimens, if any, of these collections were included in the occurrence data outlined in Part 3 of this report.

#### b. Synonyms

Synonyms published for all taxa of the T. pusillum complex are outlined in Appendix I. This chart summarizes the nomenclatural history of the complex, a matter treated in detail later in this report, and indicates the chronological sequence of names that have been proposed. Full bibliographic citation is provided for each synonym as well as for publications that deal with classification in the Literature Cited.

#### c. Common Names

The common names that have come to be used for various elements of the T. pusillum complex are without exception direct translations of some form of the Latin names. The vernacular name most commonly applied to the species is "Least Trillium." A few publications have referred to it as "Dwarf Trillium." Wake-robin is sometimes used as a vernacular name for trillium, but it is more commonly given to sessile-flowered forms than those with pedicels and thus seems inappropriate for T. pusillum. Additional varieties

have been recognized and described during the same time that underlying problems of classification and nomenclature have continued, so universally accepted common names (especially for these relatively unknown plants) do not yet exist. The following list of common names for "varieties" follows the same chronology that equivalent valid scientific names were first proposed and published as outlined in Appendix I:

Least Trillium; Carolina Least Trillium.

Texas Trillium; Texas Least Trillium; Texas Wake-robin.

Ozark Trillium; Ozark Least Trillium.

Virginia Least Trillium; Virginia Trillium.

Montane Least Trillium.

#### d. History

As presently understood, the Trillium pusillum complex consists of five or six morpho-geographical taxa that are distributed in eastern North America, mostly within the southeastern region. Past efforts to treat the group taxonomically have largely been based upon limited research with just one or a few of these taxa and consequently must be regarded as highly speculative and subjective. No recent author has claimed comprehensive study of the entire complex to support a proposal for re-classification or changes of nomenclature for these taxa. The scarcity of old collections in herbaria together with the lack of citation and/or annotation of available vouchers by certain authors causes one to doubt whether **any** collections were actually examined by them in drawing their conclusions about the taxonomy of members

of this complex. To aid interpretation of taxonomic relationships suggested by various authors, an analysis was done of herbarium documentation available from 1743 to the present for this species. [Results of this analysis are summarized in Appendix IV.] As mentioned above, the nomenclatural history of various elements of the T. pusillum complex is outlined in Appendix I; changes in classification suggested for these taxa by various authors are also indicated. The following paragraphs review this history in detail, and the nomenclatural status of one additional as yet unnamed and undescribed variety is considered.

The earliest reference to a member of the T. pusillum complex was published by Gronovius (1743) for a specimen collected in Virginia by John Clayton, but the publication antedates the starting point for botanical nomenclature (Linnaeus, 1753) and therefore has no bearing upon relevant nomenclature per se. Linnaeus, however, is known to have worked with Gronovius in describing Clayton's collections. Thus, the Gronovian phrase name may warrant more than just passing interest for several reasons: (1) Linnaeus (1753) completely ignored it in dealing with the genus Trillium in *Species Plantarum*; (2) a duplicate of the Clayton collection exists in the Linnaean Herbarium (LINN) and was erroneously determined as T. sessile; and (3) nearly a century passed after T. pusillum was named by Michaux (1803) before the Clayton specimens were correctly identified as representatives of this species (Rendle, 1901). In the second edition of *Flora Virginica* (1762), Gronovius used the generic name Trillium in

treating these same Clayton specimens and also added "n. 536" to specify the exact collection, but he used polynomials rather than the binomial nomenclature of Linnaeus, so the revised Gronovian phrase name is illegitimate.

It is clear from an exhaustive search of the literature on the genus Trillium L. that T. pusillum Michaux (1803) is the earliest binomial available for this species. The habitat was given as pine woods of lower Carolina ["HAB. in pinetis Carolinae inferioris"], and Michaux's type specimens are located at P.

Just a few years later, the binomial T. pumilum was published by Pursh (1814). Pursh's Latin description contains almost exactly the same wording, just slightly edited and rearranged, as that of Michaux, the reference to which was cited. The first descriptor ("pumilum") in Michaux's description was treated as the species epithet by Pursh, more than likely by error. Although English versions of Michaux's habitat data and observations were presented by Pursh, no species information other than that already provided by Michaux was added. Since there is no type material for T. pumilum at PH as there is for most of the new taxa described by Pursh, it is quite possible that none was available when the name was published. Whether or not Pursh may have examined actual collections of T. pusillum prior to publication of T. pumilum may remain a matter for conjecture, but there is no evidence in print or in herbaria consulted that he ever saw a single specimen. In any case, on taxonomic grounds if not nomenclatural as well, the latter name is clearly a synonym of the former.

Rafinesque (1840) listed T. pusillum Michaux as occurring in "West Kentucky." This account seems to have been overlooked by authors who wrote later taxonomic treatments of the species. Only very recently was the fact pointed out that Rafinesque actually accepted Michaux's name for this species rather than giving it a new one as he did for many other Trillium taxa (Reed, 1982).

Trillium texanum Buckley (1861) was described on the basis of specimens he collected in eastern Texas (Panola County). None of the type material was located at any of the 20 herbaria known to hold Buckley collections (Lanjouw and Stafleu, 1954) during the 1960's when taxonomic research on Trillium was being conducted at Vanderbilt University. No reference was made to T. pusillum in describing T. texanum as a new species, so the characterization of this taxon as distinct was clearly intended by Buckley.

In his revision of North American Liliaceae, Watson (1879) stated that T. texanum was evidently the same as T. pusillum based upon information in the descriptions of these species. He did not claim to have examined collections or have directly observed specimens of either one in arriving at the decision that the names were synonymous. Cumulative herbarium records extant at GH and elsewhere suggest that collections probably were unavailable in American herbaria to enable such comparisons (see Appendix IV); specimens at GH dated as early as 1882 indicate that T. pusillum was being cultivated at the "Botanic Garden of Harvard University."

Rendle (1901) obtained photographs of the type specimen of Michaux's T. pusillum and other details about its morphology. He

compared that information with a duplicate of Clayton's number 536 at BM as well as the one at LINN and concluded that the specimens Gronovius had described in 1743 and again in 1762 were this species. This was the first time that the geographic range of T. pusillum was stated to include Virginia.

The Trillium treatment by Small (1903) stated that T. pusillum occurs in North Carolina as well as South Carolina, but no mention was made of Virginia nor did he give any indication of the basis for North Carolina in the range. There exists only one or two herbarium records of the occurrence of T. pusillum in North Carolina prior to 1903 (see Part 3 and Appendix IV), and one of these is in the form of an indirect reference written by T. G. Harbison on a sheet of specimens (now at NCU) of this same species from a locality in Berkeley County, South Carolina.

In a systematic treatment of the genus Trillium in North America, one that apparently was based entirely upon herbarium material at MO, Gates (1917) suggested that T. texanum "is a form of T. pusillum." He stated that the latter species occurs in pinelands of North and South Carolina but cited no collection as a voucher to document inclusion of North Carolina. There are no collections of T. texanum at MO that were collected prior to 1917, and no specimen treated under either species name at other herbaria bear annotations by Gates that confirm his ever having seen a specimen. The only collection of T. pusillum from the state of North Carolina that antedates Gates' publication is the one from Haywood County mentioned above. Gates, like Small before him, may

have corresponded with Harbison, who was about 20 years his senior and lived until 1936 (Lanjouw and Stafleu, 1957), and learned of T. pusillum in North Carolina by that means. Harbison himself never published the North Carolina record for this species, and he probably never saw the species in the field according to his own notes on the specimen at UNC cited above.

Only a decade later than Gates' monograph, Peattie (1927) addressed the subject of Trillium in North and South Carolina. He listed T. texanum as a synonym of T. pusillum, but the basis for this treatment was not revealed. No specimen of the former species in any of more than 80 herbaria we consulted during the 1960's was annotated as T. pusillum by Peattie, and the extreme scarcity of collections of T. texanum then available for study (see Appendix IV) makes firsthand study of this taxon by him, even by means of herbarium specimens, highly unlikely. Some herbarium collections of T. pusillum from both North and South Carolina were by then extant and may or may not have been studied.

Small (1933) stated that the treatment in his manual was in part prepared from the studies of Peattie, but it was not made clear exactly which part. The range given for T. pusillum by Small was clearly unlike that of Peattie (1927) and was much more inclusive: "Woods, Coastal Plain, S.C. to Va., and Ozark Plateau, Ark." This was the earliest reference to a locality for the species in uplands west of the Mississippi River.

Palmer and Steyermark (1935) described T. ozarkanum as distinct from T. pusillum and T. texanum on the basis of a number

of morphological traits coupled with a markedly different sort of habitat to which populations seemed to be limited. The Ozarkian plants tended to be significantly larger than those of the former species and to have five or more prominent veins in the leaves, and the populations were said to occur only in sloping, dry, cherty soils under oak dominated forest types.

Barksdale (1938) monographed the pedicellate species of Trillium of the southern Appalachians in an effort to clarify nomenclatural confusion and taxonomic treatment. His treatment, including T. texanum as a synonym of T. pusillum, closely follows that of Peattie (1927), but an expanded geographic range was indicated: "Eastern Va. to S.C., Texas, and the Ozark Plateau." He clearly was unaware that T. ozarkanum had been described as a distinct species three years earlier, but there was no pretense by Barksdale that he had any familiarity with T. pusillum:

There is much visual evidence which when coupled with distributional data leads one to believe that this species is a sport of T. catesbei [sic]. There is a possibility that the Texan and Ozark Plateau plant, T. texanum—Buckley, is biologically the better species, whereas T. pusillum may only be a derived impotent. This is merely conjectural. The author has so far been unable to secure living material of T. pusillum Michaux.

The only mountain specimens are from Haywood Co., N.C. The author has collected extensively in Haywood County but has not been so fortunate as to run across T. pusillum there.

In 1943, Fernald described T. pusillum var. virginianum based upon collections by others from the Coastal Plain of Virginia. The new taxon was distinguished as a sessile-flowered variety of an otherwise pedicellate-flowered species. Fernald did not refer to the Virginian collections of Clayton (no. 536) that Gronovius had

described exactly two centuries earlier and did not cite the paper by Rendle in which those plants had been determined to represent T. pusillum. His claim that flowers are either sessile or subsessile in those populations of the species in Virginia is not supported by one plant of Clayton no. 536 (LINN) that has a pedicel about 1 cm in length. The description by Fernald of a sessile-flowered variety having a well defined geographic range was the first formal use of varietal rank to treat a taxon related to, but spatially separated from, typical T. pusillum. This established a trend that has been followed by several subsequent authors.

Wherry (1949) reported T. pusillum from Maryland and in doing so acknowledged that the documentary specimens were originally determined and reported about a decade earlier as "T. sessile L." by himself and others.

Fernald (1950) evidently did not find the evidence for recognition of T. ozarkanum Palmer & Steyermark to be as strong as his own for dealing with the Virginian populations of T. pusillum because he included the former name as a synonym of the latter. No arguments for this particular treatment were presented, but he must have considered the larger and more robust specimens of the Ozarkian populations to be within the range of variation typical of the species and closer to the typical variety than those he recognized as his var. virginianum.

Reed (1956) reported the occurrence of T. pusillum var. virginianum in Maryland. He further noted that this variety could be distinguished by its "sessile leaves," whereas in the typical

variety leaves were "petioled." No other author has suggested such a distinction between these varieties, and Reed's suggestion is not borne out by the morphology of the plants in question. The most generous concession that can be made toward Reed's scholarship in this case (a matter also brought into question by statements he made in a later publication cited below) is that maybe leaves were confused with flowers or else the terms for the types of stalks that support these structures in Trillium plants were misapplied, or both.

Steyermark (1960) chose to reduce the rank of T. ozarkanum to that of variety within T. pusillum for his Flora of Missouri (1963). Trillium pusillum var. ozarkanum (Palmer & Steyermark) Steyermark thus became the third taxon in varietal rank to be distinguished within the species, the other two being the typical one, var. pusillum, in South (and North?) Carolina and the other, var. virginianum Fernald, in Virginia and Maryland. Steyermark did not comment on the taxonomy in proposing the nomenclatural change in 1960, but in the Flora he distinguished the Ozark populations from the other varieties by:

. . . its longer peduncles, more strongly nerved, normally 5- instead of 3-nerved leaves, and sepals averaging longer and broader. The Ozark variety inhabits dryish woodland, the other varieties a damp woodland. Occurs in acid soils of shallow draws in thin cherty-flinty soils of oak-hickory, oak-pine, or oak-chestnut woodland in the southern Missouri Ozarks.

Browne (1961, 1967) reported T. pusillum from two counties in Kentucky, both of them from upland woods in the Highland Rim portion of the state. He believed the plants to represent var.

ozarkanum because the ecological conditions at the localities of occurrence were similar to those described for this variety.

In the period between the reports by Browne, Reed (1962) also treated the T. pusillum plants of Kentucky as var. ozarkanum, but he described them as having "sessile flowers." No author except Reed has suggested that T. pusillum var. ozarkanum includes any sessile-flowered plants, and there have been no subsequent reports of such specimens from Kentucky. Since Reed's documentation was kept in his private herbarium from which loans of specimens were not granted, one must conclude that his description was simply in error as to whether the flowers were sessile or stalked. Every flowering specimen of T. pusillum from Kentucky that I have examined during nearly 30 years of study of this species, including those cited by Reed in other herbaria, is distinctly pedicelled.

Ahles (1968) did not distinguish varieties within T. pusillum, but this species was described as having pedicels 0.5-2 cm long and erect. Its range was given as North Carolina, South Carolina, and Virginia. The Haywood County, NC, record obtained by Harbison and cited by Barksdale (1938) for which specimens exist at NCU and other herbaria was evidently discounted as valid because that county was not mapped, and the physiographic area involved (Blue Ridge Mountains) was not given among habitat and range data.

Freeman (1970) described T. texanum as distinct from other taxa of the T. pusillum complex, including the var. ozarkanum, on account of presence of stomata in the upper surface of leaves ("bracts") and several other consistent morphological differences.

Stomata of leaves occur only on the under surface in T. pusillum. This was the first description since Buckley's (1861) to note additional distinguishing characteristics for T. texanum despite passage of nearly a century of speculation concerning its supposed synonymous relationship with T. pusillum as first suggested by Watson (1879).

Nixon, Lewis, and Freeman (1977) discussed the rarity of T. texanum and reported it as endemic to eastern Texas. Later that same year, MacRoberts (1977) reported discovery of a population in extreme northwestern Louisiana (Caddo Parish).

Ihara and Ihara (1978) listed T. texanum and T. ozarkanum in synonymy with T. pusillum Michaux which was stated to consist of just two varieties: var. pusillum and var. virginianum Fernald. According to them, "The former entity is known to occupy somewhat dry, rocky habitats of the Ozark Mountains and its vicinity in Missouri, Arkansas and Texas, while the latter entity occurs in bogs or boggy habitats on the Piedmont Plateau in Maryland, Virginia, North and South Carolina." Regardless of any valid taxonomic basis for the proposed varietal entities, this nomenclatural treatment is untenable and unacceptable because the holotype for the species and consequently the nominate variety (var. pusillum) is from the Coastal Plain of South Carolina. The International Code of Botanical Nomenclature forbids exclusion of nomenclatural types of names that are accepted as valid and taxonomically correct. Since only a single variety was recognized within South Carolina by the Iharas, the plants in question

necessarily should have been treated under the name of the typical one rather than var. virginianum. The conclusions drawn by the Ithas reflect study of herbarium material brought together at Vanderbilt University during the mid-1960's, and at that time there appeared to be a disjunction between the populations of T. pusillum east of the Appalachian Mountains and others west of the Mississippi River. The merits of taxonomic recognition of eastern and western varieties of T. pusillum, which their treatment did in fact attempt to do, now has to be considered in the light of many later collection records obtained from the intervening states.

Roe (1978) presented a partial bibliographic review of geographical range data for T. pusillum (including var. pusillum, var. virginianum, and var. ozarkanum) and T. texanum. He added a new inland and upland locality for var. virginianum in the mountains of western Virginia and adjacent West Virginia, the first report of this variety from non-boggy woods. Roe considered T. texanum to be a probable variety of T. pusillum but did not formally treat it as such.

Freeman et al. (1979a, 1979b), without determination of varietal name, listed T. pusillum as an endangered species in the state of Alabama. It was then known from a single county in the northern part of the state and there formed an extensive population in a boggy floodplain covered by hardwood forest.

Morgan and McDaniel (1979) reported T. pusillum in southern Mississippi, evidently in a habitat situation very similar to the Alabama population, and considered it to be var. pusillum.

Concerning T. pusillum varieties, Reveal and Broome (1981) observed that: "The morphological differences used to distinguish the various phases of the species are minor, but appear to be strongly reinforced by geographical barriers." They formally treated T. texanum in varietal status for the first time, but not one specimen of the latter taxon was cited in proposing the change in rank for the combination T. pusillum var. texanum (Buckley) Reveal & Broome.

Reed (1982) concluded that the morphological differences between T. pusillum vars. virginianum and pusillum were sufficient for species treatment of both taxa and proposed the combination T. virginianum (Fernald) Reed for the former. Flowers were either sessile or subsessile on very short "peduncles" (1-4 mm long) in his species description, and the habitat was described as "damp or swampy woods or upland thickets or open areas, from near sea-level on the Delmarva Peninsula in Maryland and Virginia to piedmont areas in Virginia and eastern North Carolina to the eastern edge of the Appalachian Mountains." Reed stated that it is not at all unusual for species to exhibit differences in habitat preference such as that in T. virginianum (i.e., Coastal Plain swamps and montane upland woodland). He regarded the remainder of T. pusillum to comprise three varieties: var. pusillum (with a range in South Carolina, western North Carolina, Alabama, Georgia, Tennessee, and Mississippi); var. ozarkanum (in Arkansas, Missouri, and Kentucky); and var. texanum (just in Texas). He published T. pusillum var. texanum (Buckley) Reed as a new combination, apparently unaware

that this had been done the previous year by Reveal and Broome. Although the treatment of Trillium in Correll and Johnston (1970) was cited by Reed, he failed to properly credit the author who contributed that treatment (Freeman, 1970). Reed appears to have researched the subject of varietal status for T. texanum Buckley no further than the 1978 paper by Roe, which contained the same oversight. Other than Reed (1982), no other publication reports occurrence of T. pusillum in Georgia. In the absence of both cited vouchers and herbarium documentation of any kind, this report presently must be regarded as highly doubtful and probably erroneous.

Bodkin and Reveal (1982) segregated the montane populations of T. pusillum that just recently had been reported by Roe as var. virginianum as well as by Reed earlier that same year as part of his T. virginianum and named it T. pusillum var. monticulum. This action seems very inconsistent with the reasons given for changing the rank of T. texanum to varietal status in the same species a year earlier by Reveal and Broome (1981), namely that regional morphological differences were already considered to be "minor." From var. virginianum, which included only the Coastal Plain populations in their view, the new variety was distinguished by: ". . .the broader and shorter leaf and sepal ratios, typically notched petal apices, consistently sessile flowers (not at all pedicellate), slightly shorter style, and the reduced stature." This new variety became the fifth morpho-geographical taxon to be described and treated as a part of the T. pusillum complex.

As a result of statistical analysis of population samples from throughout the range of T. pusillum, Garrett (1982) determined that the populations at swampy sites in the central portion of the species range (including Kentucky, Tennessee, Alabama, and Mississippi) can as a group be distinguished from other varieties as readily or even more so than those varieties can be separated from each other. In fact, no consistent differences were found between var. virginianum and var. monticulum, but the centrally located populations were distinguishable from each of the regional "varieties" on the periphery of the species range. The populations on upland, sloping, rocky woods in Tennessee and Kentucky were still regarded as representing var. ozarkanum in her analysis and treatment. It was suggested that another varietal entity should be described, and the provisional name T. pusillum var. alabamicum Freeman & Garrett was employed for this system of populations. This name has not yet been published because the authors wanted to determine whether upland populations within the same general range were actually more closely related genetically to var. ozarkanum or to the proposed var. alabamicum. The same sort of information would also be useful in distinguishing var. alabamicum from var. pusillum.

In their monograph of Trillium, Samejima and Samejima (1987) did not recognize varieties within T. pusillum, and T. texanum was treated as synonymous. The distribution records available to the Samejimas were the same collections as those studied by the Iharas (1978). The geographic range maps based on those collections alone

suggest a large disjunction in the middle portion of the species distribution pattern, but many new records for that area have been discovered and published since 1960. Disjunctions between varietal elements of the T. pusillum complex simply are not so wide as they once were thought to be; the major distributional gap that appeared to be real in collection data available during the 1960's now has to be rightly attributed to insufficient floristic exploration in the southeastern states.

e. Alternative Systematic Treatments

All of the "varietal" elements of the T. pusillum complex except var. monticulum and the unnamed (e.g., still unpublished) taxon in Tennessee and adjoining states to the north, east, and south have at times been treated as species. Validly published binomial names are thus available for at least four of the taxa if taxonomic evidence that would justify species status for them were adequate. Cabe and Werth (1994a; 1994b) found that var. monticulum falls within the patterns of variability of the coastal populations of var. virginianum. This work further corroborated the evidence obtained by Garrett (1982) that none of the characteristics used to distinguish var. monticulum from var. virginianum are actually unique to the montane populations. Studies are now underway to determine the levels of differentiation among all the various elements. When completed, this research should permit a taxonomic treatment to be developed that will accurately reflect degrees of genetic divergence within the complex. Only then can appropriate

nomenclature be applied to the various taxa and the systematic treatment be regarded as reasonably correct.

## 2. Present Legal Status

### a. International

Trillium pusillum is accorded no international protection on account of presumed rarity or lack of it, nor is it a plant that has been exploited commercially.

### b. National

In the United States, the species (thus all of the varieties that compose the species) is presently ranked as C2. None of the substantive or procedural provisions of the Endangered Species Act apply to a species designated as a candidate for listing. Because of a peculiar geographical range pattern that includes just one or a very few extant localities in several states (LA, MD, MS, OK, SC, and WV), Trillium pusillum tends to be regarded as highly vulnerable by the natural heritage programs in certain states, but it is not even monitored by others. State laws, in certain cases, may provide such taxa some protection; candidacy for Federal listing and geographical range pattern (rather than threats to continued existence of this species) serve as the main basis for its inclusion on state lists.

## 3. Occurrences of Populations

Reports of occurrence of elements of the T. pusillum complex are available for more than 100 localities representing about 80 counties/parishes in 14 states. Since precise determination of the varietal identity of certain records cannot be made at the present

time and since we believe that no state other than possibly North Carolina is likely to have localities for more than just one of the distinguishable elements of the complex, the data for populations are presented here on a strictly geographical basis. Localities are arranged alphabetically by state and county, respectively, and the tentative varietal determination for the T. pusillum population(s) known or reported within each state (or county for NC) is indicated by a parenthetical letter following the area concerned:

- a - var. alabamicum (ined.)
- o - var. ozarkanum
- p - var. pusillum
- t - var. texanum
- v - var. virginianum (including var. monticulum)

A summary of occurrence data, tabulated both geographically and taxonomically, based upon cumulative available records is presented at the end of this section.

Standard herbarium acronyms (Holmgren et al., 1990) were used whenever possible to indicate repositories for specimens cited; a list of all herbaria that were either visited or specimens borrowed for this study is presented as Appendix II. Occurrence records (OR's) and site data obtained from state natural heritage programs generally are cited at the end of each locality entry; in most cases the heritage program OR's were based upon the same specimens or later collections from the same localities as the documentary specimens held by herbaria. Heritage program records include many

annotations and corrections and give more accurate directions to particular sites than most specimen labels, but some of the heritage inventory data also presently need to be amended. Abbreviations coined and used for the various natural history programs that provided information are listed in Appendix III; all of these abbreviations contain either "NH" or "DC" at some point to avoid confusion with herbarium acronyms. None of the standardized acronyms cited herein contain these letter combinations. Authors of published reports that were not otherwise substantiated prior to this report were cited following the relevant information and are completely referenced in the Literature Cited.

#### a. Extant Populations

##### ALABAMA (a):

Jackson Co.: Just E of confluence of Yellow Branch and Little Paint Creek along highway to Grant, approx. 34°36'N, 86°16'W. Grant Quad. 8 Apr 1979. T.S. Patrick 1029 (AUA). Same loc. 21 Mar 1981. J. Garrett 004 (AUA).

Oak-hickory bottoms by U.S. 72, 5.3 mi. SE of Paint Rock. 4 Apr 1982. R. Kral 68111 (VDB).

6 mi. E of Paint Rock on S side of U.S. 72. 1 Apr 1984. R. Kral 71143 (VDB).

Limestone Co.: 1.5 mi. W of Greenbrier Rd. in Beaverdam Creek drainage, Wheeler Wildlife Refuge. T4S, R3W, Sec. 25. 14 Mar 1981. J. Garrett 003 (AUA). This site is along the boardwalk across floodplain of Beaverdam Creek in Wheeler Wildlife Refuge just S of I-565/U.S. 72/Ala. 20; it is accessible from Greenbrier Rd. (3rd exit E of I-65) on E side of Beaverdam Creek. Visited by J.D. Freeman, A.R. Diamond, & S.C. Gunn on 12 Mar 1993.

E side of Harris Station Road along floodplain of small creek on Wheeler Wildlife Management Area, 0.55 mi. NW of bridge over Swan Creek; ca. 1.7 mi. NW of Orrville and 5 mi. N of Decatur. Tanner Quad. 18 Apr 1987. D.H. Webb 5274 (VDB).

Madison Co.: Ca. 6 mi. SE of the entrance to Monte Sano State Park, Huntsville; floodplain E of Flint River, just SW of U.S. Hwy.

431. 20 Mar 1972. J.D. Freeman 739 (AUA, GH, VDB). Same loc. 28 Mar 1973. R. Kral 49410 (VDB). Same loc. 30 Mar 1978. W.M. Dennis & T. Goldsby s.n. (VDB). Same loc. 21 Mar 1981. J. Garrett 001 and 002 (AUA). This site is near the last of several bridges E of Flint River, on S side of U.S. Hwy. 72. Visited by J.D. Freeman & A.R. Diamond on 13 Mar 1993.

E side of Huntsville Spring Branch, S of Martin Road. 2 Apr 1978. C. Drost 13 (AUA). This is an extensive population W of subdivision in S area of Huntsville; it is mostly on land of Spring Creek Hunting Club and has restricted access. Visited by J.D. Freeman & A.R. Diamond on 13 Mar 1993.

T4S, R1E, Sec. 35. Farley Quad. 21 Jun 1985. S. Weber s.n. (VDB).

Marshall Co.: Bottoms of tributary of Paint Rock Creek, ca. 5 mi. N of Grant. 13 Apr 1981. R. & M. Kral 66884 (VDB).

Bottoms of Upper Paint Rock Creek, N of Grant. 8 Jun 1981. R. Kral 67378 (VDB).

Hardwood bottoms by Ala. 63 just S of its jct. with U.S. 72. 22 Apr 1990. R. Kral 77343 (VDB).

Morgan Co.: 1 mi. due W of Lacon, hardwood bottoms along Flint Creek. 15 Mar 1980. J.D. Freeman 996 (AUA-9 sheets, dupls. to be dist.). Same loc. 26 Mar 1986. R. Kral 73136 (VDB). This is an extensive population, just N of abandoned section of old county road and E of paved county road. Visited by J.D. Freeman, A.R. Diamond, & S.C. Gunn on 12 Mar 1993.

#### ARKANSAS (o):

Benton Co.: 1.9 mi. N jct. ct. 264/112, N of Cave Springs, ct. rd. W of Ark. 112. 31 Mar 1979. R. Kral 63225 with R. Carter (VDB-2 sheets).

W of Cave Springs 0.6 mi. on 264. 31 Mar 1979. R. Kral 63224 with R. Carter (VDB).

5.1 mi. N of jct. Hwy. 112 and Hwy. 68, 0.6 mi. W on dirt road/T18N, R31E, Sec. 14. Springdale Quad. 27 Mar 1980. J. Allen 34 (UARK).

Boone Co.: Between industrial park on N and Skyline Drive to the S, Baker Prairie RA./T18N, R20W, Sec. 5. Gaither Quad. 23 Apr 1984. S. Orzell & B. Pell (ARNHC).

W edge of Harrison city limits; north of Capp's Rd. May 1972. J.A. Rees, Jr. s.n. (UARK). Harrison, one block S of Hester

Drive/T18N, R20W, Sec. 15. Harrison Quad. 24 Apr 1980. M. Oxner s.n. (UARK).

Unnamed paved road S of Dry Jordan Creek, W of Harrison; W side of road. 12 Apr 1992. A.R. Diamond 8092 with J.D. Freeman (AUA). This is a population of scattered plants on NW-facing slope just S of creek.

Carroll Co.: Mountainside, S of Berryville. 5 Apr 1953. M. Wycliffe s.n. (UARK). N face of Crystal Mountain, just N of microwave tower via dirt road E of Ark. Hwy. 21, 3.2 mi. N of Co. Hwy. 4 at Metalton. 11 Apr 1992. A.R. Diamond 8088 with J.D. Freeman (AUA). This is an extensive population, probably the same one documented by the above collection. Noted strong flower odor on warm afternoon; flowers smell like wild honey.

Madison Co.: Whippoorwill Farm. Hindsville Quad./T17N, R26W, Sec. 5. Due W down W-facing slope from farmhouse, area bounded to the W by jeep trail running N-S at bottom of the ravine. 13 May 1987. B. Pittman et al. (ARNHC). Same loc./T17N, R26W, Sec. 33. NE to river via farm road on W side of house; cross river at intermittent stream bisecting bluff, follow stream N and enter ravine to NW. 14 May 1987. B. Pittman et al. (ARNHC).

3 mi. NNE of Huntsville on War Eagle Creek/T17N, R26W, Sec. 34. Huntsville Quad. 19 Apr 1980. D. O'Leary 76 (UARK).

Withrow Springs. 15 Apr 1928. Moore & Demaree 4803 (UARK-2 sheets, UMO, US). Withrow Springs State Park. 11 Apr 1974. P.L. Redfearn, Jr. 29313 (NCU, WILLI). Same loc. 30 Mar 1979. R. Kral 63193 (VDB). Same loc./Along Hwy. 23W, primarily on hillsides above picnic tables/T17N, R26W, Sec. 2. Forum Quad. 19 Apr 1983. J. Rettig & K. Smith (ARNHC).

Montgomery Co.: Ouachita Mts. 762 on slopes along Crooked Creek/T4S, R27W, Sec. 4. Big Fork Quad. 24 Mar 1981. P. Dalton & R. Bye 8110 (UARK).

Ouachita National Forest, along tributary to Wehunt Creek/T3S, R27W, Sec. 34. Big Fork Quad. Last obs. 6 May 1988. V. Bates (1988). (ARNHC).

Ouachita National Forest, Little Missouri Falls Recreation Area/T4S, R27W, Sec. 6. Big Fork Quad. Last obs. 6 May 1988. V. Bates (1988). (ARNHC).

Newton Co.: 1 mi. NE of Hwy. 21 at Boxley, on N-facing slope on banks of Buffalo R. 340 m. elev. 15 Mar 1977. S. Emme 12 (UMO).

Along Add's Creek, ca. 1/2 mi. N of Ponca. T16N, R22W, Sec. 24. 29 Apr 1967. P.L. Redfearn, Jr. 21355 (UNC, SMS, SMU). S side of Add's Creek, along unnumbered dirt road ca. 100 yards NW

of its jct. with Ark. Hwy. 43. 12 Apr 1992. A.R. Diamond 8095 with J.D. Freeman (AUA-7 sheets, dupls. to be dist.).

S side of Leatherwood Creek, 0.4 and 0.45 mi. up creek at low water bridges/T16N, R22W, Sec. 30. Ponca Quad. 6 May 1981. J. Rettig & K. Smith (ARNHC).

Follow Hwy. 43 E from Ponca 3.2 mi. to the Center Point Trailhead. Follow the trail 2.5 mi., look on N side near Goat Trail jct. 8 Apr 1991. J. Apel (ARNHC).

Lost Valley, 2.6 mi. NE of Boxley, 4.4 mi. E of Fayetteville, 93°23'W, 36°01'N. 1100-1300 feet. 27 Mar 1955. H. Iltis 5239 (WIS). Lost Valley, ca. 4 mi. SW of Ponca. 1500 feet. 19 Mar 1963. P.L. Redfearn, Jr. 11892 (FSU, SMS). Lost Valley State Park, 2 mi. SW of Ponca. T16N, R23W, Sec. 26. Elev. 1200 feet. 4 Apr 1964. P.L. Redfearn, Jr. 14356 (CLEMS, DHL, FLAS, FSU, GA, GEO, GH, KE, SMS-2 sheets, SMU, TENN, UMO, US). Same loc. 3 Apr 1965. P. Cornwell 1, A. Eshbaugh 5, & P.L. Redfearn 16953 (VDB-6 sheets). Same loc. 8 Apr 1974. R.L. Thompson 15 (UARK). Same loc./Osage Quad. 26 Mar 1977. G. Burkhalter s.n. (APCR).

Murray Quad./T16N, R23W, Sec. 36. E off Hwy. 43 onto dirt road (first road S of Lost Valley Road) directly across from Paul Villines' farm. Follow road across Buffalo River into area between Dry and Running Creeks. Walk up Dry Creek to W side of drainage. 10 Jun 1991. B. Hinterthur (ARNHC).

Polk Co.: Tall Peak (ca. 2340 feet), about 16 mi. SE of Mena, Ouachita National Forest. 9 Apr 1955. A. McWilliam s.n. (UARK). Scattered along Forest Service Rd. (gravel) to Tall Peak Lookout Tower (now abandoned)/T4S, R29W, Sec. 24 and R28W, Sec. 19. 23 Mar 1985. S. Orzell & E. Bridges (ARNHC).

Roaring Branch Research Natural Area/T4S, R28W, Sec. 26 and 27. Athens Quad. 19 Apr 1984. S. Orzell & B. Pell (ARNHC). Headwaters of Blaylock Creek and tributaries/T4S, R28W, Sec. 17 and 20. Nichols Mt. Quad. 23 Mar 1985. S. Orzell & E. Bridges (ARNHC).

Along upper reaches of Saline River along road 38, W of Raspberry Mt./T4S, R28W, Sec. 19. Nichols Mt. Quad. 24 Mar 1985. S. Orzell & E. Bridges (ARNHC).

Pulaski Co.: 150 yards NW of dam, bottom 1/3 of E-facing slope/T2N, R25W, Sec. 34. Ferndale Quad. 6 Apr 1981. J. Rettig (ARNHC).

KENTUCKY (a?):

Casey Co.: In shaded hollow, short distance SE of Pricetown, 4 mi. S of Liberty off U.S. Hwy. 127. 28 Apr 1961. G.W. Murphy 92 (KY).

Pricetown, S of Liberty and E of U.S. 127. Highland Rim Province. 13 May 1961. E.T. Browne, Jr. 4089 (KY). Pricetown. Liberty Quad. Osage Geological Region. Elev. 1000 feet. 29 Apr 1962. G.W. Murphy 372 (KY, NCU). Sitename: Pricetown. Ca. 0.2 mi. on unnamed rd. headed SE from jct. with Walnut Hill Rd., E side of rd., behind older white house in ravine. 37°16'58"N, 84°57'10"W. First obs. 1961; last obs. 17 Apr 1993 (KYNHP).

Unnamed site: "Walnut Hill." 37°17'02"N, 84°58'17"W. SW of Liberty on KY. 127, W on Walnut Hill Rd., ca. 1.0 mi.; first ravine to S after curve in road after paved road ends. First obs. 1993; last obs. 19 Jun 1993 (KYNHP).

Christian Co.: McGauey Swamp, wooded remnant on west end. 2 Apr 1993. E.W. Chester 12965 (ASPC, AUA).

Warren Co.: Unnamed site: "Hardcastle." 38°55'26"N, 86°19'11"W. E on Ky. 234 from Hardcastle, S on Green Hill road ca. 1.1 mi.; forest is ca. 400 feet W of road. Polkville Quad. First obs. 1993; last obs. Apr 1993. E. Craft (KYNHP).

Wayne Co.: From Monticello junction (90 & 1275) on 90E, 6.8 mi. to Meadow Creek bridge; in marsh immediately after bridge via dirt road just E of house. Elev. 900 feet. Mill Springs Quad. 3684-87; Fraser Quad. 3684-86. 3 Apr 1979. R. Hannan, L.R. Phillippe, R. Caldwell s.n. (AUA, TENN). Sitename: Meadow Creek Swamp. On Ky. 90, 6.8 mi. E of jct. Ky. 1275, at bridge over Meadow Creek immediately after 76 gas station, E of Monticello. 36°55'52"N, 84°44'43"W. First obs. 1979; last obs. 13 Apr. 1990 (KYNHP). Same loc./ca. 1.5 mi. N of Touristville on Ky. 90, NE of Monticello. 6 Jul 1980. M.E. Medley & R. Cranfill 2487 (KYNHP).

#### LOUISIANA (t):

Caddo Par.: ① Just off United Gas Road #2, 1 mi. N of jct. with Myrtis-Texas line road; T22N, R16W, Sec. 33. 23 Mar 1977. D.T. MacRoberts 2160 (ASTC). ② Ca. 2 1/2 mi. SW of Rodessa. E of Vivian/Atlanta Hwy. SE side of creek. T23N, R16W, Sec. 28. 7 Apr 1990. A.R. Diamond 6798 with J.D. Freeman (AUA). ③ E side of Vivian/Atlanta Hwy. T23N, R16W, Sec. 33. 7 Apr 1990. A.R. Diamond 6800 with J.D. Freeman (AUA). ④ Sitename: Sweet Bay Hummock. 32°56'59"N, 94°01'51"W. About 1.5 mi. S of Hwy. 168, S of United Gas Rd. #2. About 4 mi. E of Rodessa. E side of United Gas Rd. #1. McLeod Quad. T23N, R16W, Sec. 28. Elev. 200 feet. First obs. 1977; last obs. 7 Apr 1990. N. Gilmore (LANHI).

#### MARYLAND (v):

Worcester Co.: Milburn Branch, Millburn Landing State Park at Pocomoke Creek. 25 Apr 1982. S.R. Hill 11120 (SRH).

#### MISSISSIPPI (a):

Jones Co.: Headwaters of Bogue Homa Lake, off of Pool Creek Road near Free State Beagle Club road. 14 Mar 1980. J.D. Freeman 995 (AUA-7 sheets, dupls. to be dist.). Same loc. 19 Mar 1989. A.R. Diamond 5737 with J.D. Freeman (AUA). Same loc. 8 Apr 1990. A.R. Diamond 6805 with J.D. Freeman (AUA). This is an extensive population.

MISSOURI (o):

Barry Co.: Unnamed site: "Brock Springs." 36°40'08"N, 9°35'56"W. Slope of the old Mineral Springs Road, 90 yards E of barn. T23N, R27W, Sec. 33. Cassville Quad. Elev. 1350 feet. First obs. 1980; last obs. 12 Apr 1984. S.W. Morgan & G.T. Maupin (MODC).

3 mi. S of Cassville. 20 Apr 1935. J.A. Steyermark 18628 (MO-2 sheets, UMO-1, isotypes; US-holotype of var. ozarkanum). Report on same population: Morgan, S.W., and V.K. Wallace (1987). Same loc./In woods behind Sunset Motel, T22N, R27E, Sec. 9. 13 Apr 1983. S.W. Morgan s.n. (AUA). Unnamed site: "Sunset Woods." 36°38'21"N, 93°51'12"W. 3-4 mi. S of Cassville along Mo. 112. Cassville Quad. Elev. 1450 feet. First obs. 1930; last obs. 25 Apr 1985. S.W. Morgan (MODC).

Sitename: Hilltop Woods. 36°39'08"N, 09°52'03"W. About 0.9 mi. W of Hilltop on gravel road. R22N, R27W, Sec. 5. Cassville Quad. Elev. 1380 feet. First obs. 1981; last obs. 12 May 1984. S. Chaplin & D. Figg (MODC).

Sitename: Hoover Woods. 36°40'49"N, 93°52'28"W. N- to NE-facing slope near watertower in W Cassville. R23N, R27W, Sec. 29. Cassville Quad. Elev. 1360 feet. First obs. 1981; last obs. 24 Apr 1985. Wallace (MODC).

Unnamed site: "Walnut Springs." 36°40'54"N, 93°51'17"W. 0.5 mi. E of Cassville, patch of woods on NE corner of 13th and Vine Sts. T23N, R27W, Sec. 28. Cassville Quad. Elev. 1340 feet. First obs. 1983; last obs. 7 Apr 1992. Zieher (MODC).

Sitename: Wildwood North. 36°41'12', 93°51'06"W. Wildwood North Estates Subdivision. 1.4 mi. NW of jct. of Hwy. 76 and 86 with Hwy. 37 in Cassville. T23N, R27W, Sec. 21. Cassville Quad. Elev. 1360 feet. First obs. 1983; last obs. 12 Apr 1984. M. Wallace (MODC).

Sitename: Browning Woods/unnamed site: "Flat Creek." 36°43'33"N, 93°51'02"W/36°43'00"N, 93°50'53"W. About 2.25-3.0 mi. NNE of Cassville on Hwy. Y, 0.25 mi. SE of Ash Cave. T23N, R27W, Sec. 9. Cassville Quad. Elev. 1280-1300 feet. First obs. 1985; last obs. 24 Apr 1985. M. Wallace (MODC).

Howell Co.: Unnamed site: "Web Hollow." 36°53'12"N, 91°40'30"W. 7.0 mi. S of Mt. View. Hwy. W to farm lane in SE 1/4 of Sec. 25.

Farm lane goes W and drops into Web Hollow 1 mi. to W. T26, R7W, Sec. 36. Mountain View Quad. Elev. 800 feet. First obs. 1986; last obs. 14 Apr 1987. H. Nigh (MODC).

Sitename: Taber Property. 36°49'45"N, 91°50'36"W. From Olden go E 3.75 mi. on paved road (Olden Road), S 0.25 mi. on gravel road to trailer on W side of road; plants are behind trailer. T25N, R8W, Sec. 20. White Church Quad. Elev. 1100 feet. First obs. 1985; last obs. 22 May 1990. Ryan (MODC).

Unnamed site: "Little Creek Tributary." 36°50'10"N, 91°50'35"W. From Olden go E 3.75 mi. on paved road (Olden Road), NE 300 ft. on Rd. 235 to Little Creek crossing, W-side of stream on slight N-facing slope. T25N, R8W, Sec. 17. White Church Quad. Elev. 1100 feet. First obs. 1990; last obs. 22 May 1990. Summers (MODC).

Lawrence Co.: Along Honey Creek, 1/2 mi. W of Elliott. 21 Apr 1953. E.J. Palmer 55359 (F, SMU, UMO, WIS). Same loc. 4 Jun 1953. E.J. Palmer 55812 (F, UMO). Unnamed site: "Honey Creek." 37°02'33"N, 93°45'49"W. Honey Creek, 0.25 to 0.5 mi. W of Elliott. T27N, R26W, Sec. 22 and 15. Mt. Vernon Quad. Elev. 1225 feet. First obs. 1953; last obs. 6 Jun 1988. Humphrey (MODC).

Ca. 4 mi. SE of Mount Vernon, cherty knoll S of Honey Creek. T27N, R26W, Sec. 22. 11 Apr 1992. A.R. Diamond 8085 with J.D. Freeman (AUA). This woodland site is probably the same as the above, about 6-7 acres with scattered patches of Ozark Trillium.

Unnamed site: "Spring River tributary." 37°00'57"N, 93°50'42"W. From Hwy. HH take gravel road E 1.0 mi. to creek crossing, walk upstream. T27N, R27W, Sec. 26. Mt. Vernon Quad. Elev. 1300 feet. First obs. 1988; last obs. 18 May 1988. T. Nigh (MODC).

Shannon Co.: 2 mi. S of Birch Tree along Hwy. 80. B. Bauer 11245. 29 Apr 1941 (F). Same loc./T27N, R5W, Sec. 34. 3 May 1947. J.A. Steyermark 64262 (F, MO). Unnamed site: "Birch Tree." 36°57'48"N, 91°29'05"W. Just SW of intersection of Hwy. 99 and Y, 1.5 mi. S of Birch Tree. Walk W into draw from Hwy. 99, just 100 meters S of intersection. T27N, R5W, Sec. 14. Birch Tree Quad. Elev. 1000 feet. First obs. 1941; last obs. 1 May 1989. Wallace & Eberly (MODC).

Unnamed site: "Birch Creek tributary." 36°57'29"N, 91°29'20"W. Birch Creek S from Hwy. Y, S on Hwy. 90 0.5 mi., turn W on Grassy Lane along USFS boundary; plants occur between USFS boundary and intermittent creek. T26N, R5W, Sec. 3. Birch Tree Quad. Elev. 980 feet. First obs. 1989; last obs. 1 May 1989. Wallace & Eberly (MODC).

NORTH CAROLINA:

Camden Co. (v): Sitename: Great Dismal Swamp Wildlife Refuge. 36°29'15"N, 76°26'38"W. NW of Insurance Ditch, ca. 1 mi. NE of its jct. with County Line Ditch, across log bridge near red posts at inholding of Moses White. Lynchs Corner Quad. First obs. 1985; last obs. 1985. M. Lane (NCNHP).

Clay Co. (a): Ca. 14 mi. WSW of Franklin and 1.1 mi. W of confluence of Buck Creek and Nantahala River along the river. 17 May 1986. J.D. Freeman s.n. with L.L. Gaddy (AUA). Same loc./2.5 mi. SE of Nantahala Lake. 16 Apr 1988. J.D. Freeman s.n. with T. Patrick & A.R. Diamond (AUA-3 sheets, dupls. to be dist.).

Currituck Co. (v): Sitename: Buckskin Creek-Great Swamp. 36°26'27"N, 76°03'45"W. E of end of SR 1209 (off of SR 1203), into edge of swamp on mesic "islands" with Quercus michauxii. Currituck Quad. First obs. 1990; last obs. Mar 1990. M. Lane (NCNHP). Same sitename. 36°26'55"N, 76°03'05"W. S of Good Hope Zion Church (about midway between Currituck and Sligo on NC 168), into edge of swamp on mesic "islands" with Quercus michauxii. Currituck Quad. First obs. 1990; last obs. Mar 1990. M. Lane (NCNHP).

Gates Co. (v): Sitename: Merchants Millpond State Park. 36°26'33"N, 76°40'02"W. Merchants Millpond: N edge of Lassiter Swamp, just S of backpack camping area. Merchants Millpond Quad. First obs. 1982; last obs. 1 Apr 1988. M. Schafale & C. Durost (NCNHP).

Halifax Co. (p/v?): Unnamed site: "Hales Millpond." 36°14'13"N, 77°31'49"W. Skunk cabbage and red maple swamp crossed by SR 1128, ca. 1 mi. S of jct. of SR 1126 between Crowells Crossroads and Tillery; plants seen on W side of 1128 but may well be elsewhere as well. Dawson Crossroads Quad. Elev. 100 feet. First obs. 1990; last obs. 1 May 1990. S.W. Leonard (NCNHP).

Johnston Co. (p/v?): Unnamed site: "Reedy Branch." 35°32'43"N, 78°23'04"W. In floodplain along Reedy Branch, ca. 0.3 mi. SE of the SR 1501 bridge, due E of the Johnston Co. Airport buildings. Powhatan Quad. Elev. 125 feet. First obs. 1992; last obs. 26 Mar 1992. L. Jernigan (NCNHP).

Nash Co. (p): Left side of U.S. Rt. 264, about 2 mi. E of Middlesex. 25 Mar 1976. R. Robinson s.n. (NCSC). (Reed, 1982). Sitename: Turkey Creek Preserve. 35°46'45"N, 78°09'50"W. Both sides of U.S. 264A about 2 mi. E of Middlesex. Middlesex Quad. Elev. 160 feet. First obs. 1976; last obs. 3 Apr 1988. A.S. Weakley (NCNHP).

Pender Co. (p): 3.4 mi. SE of Maple Hill on N.C. 50. 29 Jun 1963. H.E. Ahles 58370 with A. McCrary (NCU). Same data. 29 Jun 1963. A. McCrary 616 (NCU). Same loc. 23 Mar 1979. J. Garrett s.n. (AUA-3 sheets). Same loc. 8 May 1981. S.W. Leonard 7491 (VDB). Sitename: Watkins Savanna Meadowrue Site. 34°38'15"N, 77°39'15"W.

N side of NC. 50, ca. 0.5 mi. W of Onslow Co. line, in hardwood swamp and adjacent powerline right-of-way. Maple Hill Quad. Elev. 30 feet. First obs. 1963; last obs. 16 Jun 1987. A.S. Weakley, et al. (NCNHP).

Sitename: Sandy Run Savanna. 34°37'51"N, 77°40'11"W. In wooded hardwood drain near savanna, between cornfield and last house on Hunt Club Rd. (turn S off NC 50 0.15 mi SE of jct. with S.R. 1532, ca. 0.5 mi.). Maple Hill Quad. Elev. 25 feet. First obs. 1987; last obs. 17 May 1987. A.S. Weakley, et al. (NCNHP).

Sitename: Lanier Quarry Savanna. 34°37'50"N, 77°40'30"W. In hardwood drains N and W of small wet savanna just S of graveyard. Maple Hill Quad. Elev. 25 feet. First obs. 1987; last obs. 1991. A.S. Weakley et al. (NCNHP).

OKLAHOMA (o):

LeFlore Co.: Rich Mountain: from Kiamichi Valley Vista on SH 1, go 0.15 mi. W to Radio Facility Building blacktop. Turn N and park where blacktop begins to curve. An old dirt road continues from straight portion of blacktop. Go 50 meters on this old dirt road to 30m x 30m study site. T3N, R26E, Secs. 5, 6, 31, and 32. First obs. 1991; last obs. 1991. I. Butler (OKNHI).

SOUTH CAROLINA (p):

Dorchester Co.: National Audubon's Biedler Forest Sanctuary in Four Hole Swamp, along old road to Goodson Lake. 11 Mar 1977. R.D. Porcher 1246 (CITA, NCU). Unnamed site: "Biedler Forest Sanctuary." 33°12'58"N, 80°21'04"W. 1.3 mi. N, 47°E from the jct. of S.C. 138 and S.C. 28. Pringletown Quad. (SCNHT). Site visited by R.D. Porcher & J.D. Freeman in Mar 1985: many plants observed.

TENNESSEE (a):

Coffee Co.: Manchester Quad.; May Prairie; 1.3 mi. SE of I-24 on U.S. 41. 13 Apr 1982. T. Smith 112 (VDB). Unnamed site: "May Prairie State Natural Area." 35°26'57"N, 86°01'36"W. SE of Manchester on Rt. 41A and 1.5 mi. SE of I-24 exit. Just into woods on N side of prairie, about halfway between spring and E property line. Manchester Quad. Elev. 1080 feet. First obs. ?; last obs. 7 Apr 1988. W. Christie & S.C. Gunn (TNDC).

Cumberland Co.: W-facing slope of Brady Mt., from Hinch Mt. access rd. to summit of Dorton Knob, elev. 2900 feet. Cumberland Plateau Prov. Grassy Cove Quad. 21 Apr 1985. T.S. Patrick 5512 with J. Garrett (AUA, TENN-3 sheets, dupls. to be dist.). Same loc./ca. 10 mi. S of Crossville. 8 May 1986. J.D. Freeman s.n. with T.S. Patrick et al. (AUA). Sitename: Brady Mountain Protection Planning Site. 35°48'24"N, 84°59'04"W. SW-facing slope of Brady Mt. starting just N of Dorton Knob in saddle and extending

downslope to Jewett Rd. between jeep road up mountain and another around S end of Dorton Knob. Elev. 2500 feet. First obs. 1984; last obs. 14 Apr 1990. P. Somers, D. Horn, M. Rhinehart (TNDC). Same sitename. 35°47'48"N, 84°58'28"W. SE-facing slope of Dorton Knob on Brady Mountain on W side of old trail leading S from Key Reed Gap. This area could be incorporated into Brady Mt. site. Elev. 2500 feet. First obs. 1991; last obs. Apr 1992. B. Brown (TNDC).

Dekalb Co.: Indian Creek Youth Camp, ca. 1 mi. NE of Dowelltown; lower 1/3 of slope above Indian Creek, between creek and gravel road to main camp area. 20 Apr 1992. H.R. DeSelm (pers. comm.).

Franklin Co.: Unnamed site: "Yeatman Yard." 35°09'52"N, 85°53'50"W. On NE rim of Lost Cove just SW of Eva Lake, in backyard of H. and J. Yeatman. Go S of Sewanee ca. 2.5 mi. on Rt. 156; go ca. 1 mi to SW to land running W to home on rim. Sewanee Quad. Elev. 1800 feet. First obs. 1990; last obs. 17 Mar 1991. P. Somers (TNDC).

Lincoln Co.: Trotters Branch of Flint River, 0.2 mi. E of New Hope. Flintville Quad. 35°02'15"N, 86°29'17"W. 29 Apr 1980. T.S. Patrick 1113 with C. Simmons (TENN, VDB). Same loc. 27 Mar 1982. T. Smith s.n. (VDB). Same loc. 30 Mar 1983. C.J. Garrett s.n. (AUA). Sitename: Trotter's Woods. 35°02'15"N, 86°29'17"W. 0.2 mi. E of New Hope. Flintville Quad. First obs. 1980; last obs. 2 Apr 1983. C.J. Garrett (TNDC).

N bank of Flint River, ca. 1 mi. S of Flintville. 2 Apr 1983. D. Horn 109 (VDB). Unnamed site: "Flint Riverbank." 35°03'03"N, 86°25'25"W. On bank of the Flint River, E of county road; small population. Flintville Quad. First obs. 1983; last obs. 4 Apr 1983. D. Horn (TNDC).

Ca. 1 mi. S of Flintville, S bank of Flint River near jct. with Big Huckleberry Creek. 4 Apr 1983. D. & S. Horn 110 (VDB). Sitename: Flint River Bottom Registered State Natural Area. 36°02'47"N, 86°25'42"W. Confluence of Flint River and Big Huckleberry Creek, W of county road. First obs. 1983; last obs. 4 Apr 1983. D. Horn (TNDC).

Putnam Co.: Unnamed site: "Cookeville High School." 36°09'36"N, 85°28'44"W. About 1 mi. E of center of Cookeville and immediately E of Cookeville High School. Cookeville East Quad. Elev. 1100 feet. First obs. 1982; last obs. 1993. D. Combs (TNDC).

Sumner Co.: Pearson Hollow, S of Westmoreland. J. Alcorn 125. 11 Apr 1975 (VDB). Same loc. 5 May 1975. J. Alcorn 302 (VDB). Same loc. 28 Mar 1976. J. Alcorn 1113 (VDB). Phillips Hollow off of Boot Camp Rd., SW of Westmoreland. 21 Apr 1975. R. Kral 56444 (VDB). Taylor Hollow, 2.5 mi. S of Westmoreland. 6 May 1979. R. Carter 1753 (VDB). Same loc./west end of, SW of Westmoreland. 7

Apr 1980. R. Kral 63252 (VDB). Unnamed site: "Taylor Hollow." 36°31'23"N, 86°13'52"W. South of Westmoreland; go 3 mi. S of Rt. 52 on Rt. 31A to Phillips Hollow, go E of Pearson Hollow running N, then Taylor Hollow running NE. Westmoreland Quad. Elev. 740 feet. First obs. 1975; last obs. 1993. M. Pyne (TNDC).

#### TEXAS (t):

Cass Co.: About 3 1/2 mi. from Hughes Springs on road to Avinger. 18 May 1968. D.S. Correll & H.B. Correll 35746 (GH, NCU, VDB). Same loc./Rt. 49, about 3 mi. SE of Hughes Springs. 9 Apr 1969. D.S. Correll 36935 (AUA, GH, NCU). Same loc. 1 Apr 1979. R. Kral 63228 (VDB). Same loc. 7 Apr 1990. A.R. Diamond 6789 with J.D. Freeman (AUA-2 sheets). Unnamed site: "Hughes Springs." 32°56'41"N, 94°34'10"W. Same loc./directions. Avinger Quad. Elev. 250 feet. First obs. 1968; last obs. 7 Apr 1990. (TXNHP).

Nacogdoches Co.: About 3 mi. E on Camp Tonkawa Road from U.S. 59. 10 Apr 1970. E.S. Nixon 1838 (ASTC). Same loc. 14 Apr 1970. E.S. Nixon 1806 (ASTC, AUA). Same loc. 9 Mar 1976. P. Cox & B. Young 87 (ASTC). Along Farm Road 1087 between Hwy. 59 and the Tonkawa Boy Scout Camp. 10 Apr 1974. E.S. Nixon, R.L. Willett, C.R. Ellis 6929 (ASTC). 3 mi. E of U.S. 259 on Co. 1087, road to Tonkawa Camp. 20 Apr 1980. R. Kral 64795 (VDB). Unnamed site: "Camp Tonkawa Road." 31°50'25"N, 94°31'30"W. Farm road 1087, 2.8 mi. E of U.S. 259, E of creek, S side of road. Garrison West Quad. Elev. 400 feet. First obs. 1970; last obs. 6 Apr 1990. (TXNHP). This site was visited by J.D. Freeman & A.R. Diamond on 6 Apr 1990.

Same loc./at Naconiche Creek, N of Nacogdoches. Elev. ca. 650 feet. 13 Mar 1991. S. & G. Jones 6220 (VDB).

#### VIRGINIA (v):

Augusta Co.: Sitename: Elliott Knob. 38°09'23"N, 79°19'35"W. [Great North Mtn.] Along ridgeline of Hogback Ridge, ca. 1.0 mi. S of Elliott Knob. Elliott Knob Quad. Elev. 4200 feet. First obs. 1978; last obs. 1985. P.R. Cabe, F. Day, & J. Gavin (VANHP).

Charles City Co.: Sitename: Dockman Swamp. 37°24'25"N, 77°01'52"W. Dockman's Swamp; roughly 0.4 mi. upstream from Rt. 614 crossing (about 0.5 mi. E of Va. Rt. 155). Providence Forge P.O. (New Kent Co.). Providence Forge Quad. Elev. 50 feet. 23 Apr 1974. D.M.E. Ware 5285 with T.F. Wieboldt (NCU, WILLI). (VANHP).

Gloucester Co.: Tributary to Coleman Swamp, E side of U.S. Rt. 17, just S jct. Rt. 1301; near Gloucester. 19 Mar 1984. D.M.E. Ware 8936 with P.R. Cabe (VDB, WILLI). W of Rt. 17, across and S from Rt. 1301. 2 Apr 1983. P.R. Cabe 122 with F. Day (VDB, WILLI). Unnamed site: "Coleman Swamp." 37°18'03"N, 76°30'44"W. Same loc. data. Clay Bank Quad. First obs. 1983; last obs. 29 Mar 1984. (VANHP).

Grayson Co.: Sitename: Fairview Wetland. 36°35'16"N, 80°53'67"W. From headwaters of small creek/branch E of Fairview School along creek ca. 1 mi. to its confluence with Chestnut Creek. Vicinity of the Glades, S of Galax. Cumberland Knob Quad. Elev. 2520 feet. 28 Apr 1992. J.D. Freeman s.n. with T. Rawinski & R. Freeman (AUA-3 sheets, dupls. to be dist.). First obs. 1991; last obs. 23 May 1993. (VANHP). Site visited by J.D. Freeman & B. Rush on 23 May 1993.

Greensville Co.: Sitename: Massie Branch. 36°34'37"N, 77°37'20"W. S side of Massie Branch, 2.7 mi. NE of Turner Crossroads and ca. 4 mi. SW of Skippers. Skippers Quad. Elev. 140 feet. First obs. 1984; last obs. 17 Apr 1984. T.F. Wieboldt s.n. (VPI). (VANHP).

Hampton City: Unnamed site: "Magruder Boulevard." 37°04'36"N, 76°23'50"W. Woods W of Magruder Blvd. just S of St. Rt. 172 interchange. Newport News North Quad. First obs. 1990; last obs. 20 Apr 1990. R. Wright & E. Crawford unpublished report (VANHP).

James City Co.: 4 mi. W of Williamsburg, Long Hill Swamp. 3 May 1931. W.G. Guy & D. Stetson s.n. (GH-collected by P.W. Warren fide note in packet, NY, US). About 3 mi. W of Williamsburg. 4 May 1949. J.T. Baldwin, Jr. 12550 (GH). Same loc. 15 May 1949. J.T. Baldwin 12580 (GH). Same loc. 15 May 1949. J.T. Baldwin & E.P. Killip 40149 (US). Same loc. 11 Jun 1949. B. Mikula 898 (NCU, WILLI). Near Williamsburg. 23 Mar 1957. O.H. Weiss s.n. (VPI). W of Williamsburg near Powhatan Creek. 30 Mar 1959. O.H. Weiss s.n. (VPI). Powhatan Swamp. 29 Mar 1963. O.H. Weiss 316 (VPI). Powhatan Swamp, 4 mi. NW of Williamsburg. 21 Apr 1951. F.R. Fosberg 33345 (US). Same loc. 5 May 1951. F.H. Sargent s.n. (GA, KANU, MIN, NCSC, OKL, SMU, WIS, WVA). Headwaters of Powhatan Creek beside Longhill Road. 5 Apr 1973. J.T. Baldwin, Jr. 17063 (AUA, NCU, WILLI). Longhill Swamp, just W of Lafayette High School and N of Longhill Road. Williamsburg P.O. 6 Apr 1976. D.M.E. Ware 6527 (WILLI). Same data. 1 May 1976. D.M.E. Ware 6535 (WILLI). Same loc. 12 Apr 1980. R. Kral 64753 & 64754 (VDB). Same loc. 21 Apr 1983. P.R. Cabe 124 (VDB, WILLI). Sitename: Long Hill Swamp. VANHP has mapped 9 localities since 1980 and 3 earlier ones for this site. Early collections from the area often bear inadequate data to pinpoint any specific source within the swamp, and some collections that were mapped by VANHP for other places in the Williamsburg area probably are also in fact from Long Hill Swamp (e.g., O.H. Weiss s.n.--cited above). All Long Hill Swamp localities are within the Norge Quad.

Sitename: Chisel Run. 37°16'45"N, 76°44'48"W. Ca. 0.5 mi. NW of State Rt. 615. More or less due NE from the radio tower and from the center of cutover pine stand (gypsy moth cut). Williamsburg Quad. Elev. 55 feet. First obs. 1990; last obs. 3 May 1990. D.M.E. Ware Field Survey (VANHP).

By cty. rt. 615 at Mt. Pleasant Baptist Church near Williamsburg. 12 Apr 1979. R. Kral 64751 (VDB). Sitename: Mount Pleasant Church Site. 37°16'22"N, 76°44'55"W. Headwaters of Mill Creek, St. Rt. 615 (Ironbound Rd.) across from radio station WMBG AM-740, and just SE of Mt. Pleasant Church. Williamsburg Quad. Elev. 50 feet. First obs. 1978; last obs. 9 May 1990. D.M.E. Ware & B.D. Saunders Field Survey (VANHP).

Unnamed site: "Skimono Creek." 37°22'16"N, 76°44'10"W. Edge of wooded stream bottom swamp on York Co. [NOTE! J.D.F.] side of Skimono Creek, ca. 1 mi. downstream from Fenton Mill Road [Rt. 602]. Margin of small swampy bottomed ravine feeding Skimmino Creek; immediately W of Hewins Cabin, Camp Skimmino, near Williamsburg. Edge of floodplain of Skimmino Creek, ca. 800 ft. E of crossing of Fenton's Mill Road, near Williamsburg. Williamsburg Quad. First obs. 1979; last obs. 20 Apr 1983. D.M.E. Ware 7324 & 7327 (WILLI). (VANHP).

Nansemond Co./City of Suffolk: Dismal Swamp; near Jericho Ditch Road. 20 Mar 1971. S. Waters 221 (VDB). SW of Jericho Ditch, 0.25 mi. S of Williamson Ditch. 5 Mar 1975. L.J. Musselman 4835 (NCU, WILLI). Sitename: Dismal Swamp Megasite. 36°43'10"N, 76°31'58"W. 0.25 to 0.5 mi. S of Williamson Ditch; 50 feet E of foot bridge on Jericho Ditch; on either side of Jericho Ditch road NW. Suffolk Quad. First obs. 1971; last obs. 13 Mar 1981. (VANHP).

Rockingham Co.: Shenandoah Mt., approx. 0.3 mi. N of Hone Quarry Ridge jeep trail. George Washington National Forest. 30 Apr 1976. G.F. Roe 1271 (WILLI). Same loc./1.5 km NNE of Briery Branch Gap and the jct. of Virginia Rt. 924 along Forest Service Road 85 (Flagpole Knob Road), on Hampshire (Catskill) Formation of chiefly red sandstone with some flagstone, shales and mudrock in various stages of disintegration. 1190 m (3900 ft) elev. 18 Apr 1981. Reveal & Bodkin 5586 (MARY-holotype of var. monticulum; CAS, JMU, NY, US, isotypes). (Bodkin and Reveal, 1982). Sitename: Hone Quarry Ridge Trail. 38°29'30"N, 79°12'43"W. Near border of clearing along ridge crest, Shenandoah Mtn., ca. 1 mi. N of Briery Branch Gap. Just above jct. with Hone Quarry Ridge Trail. Reddish Knob Quad. Elev. 4000-4020 feet. First obs. 1975; last obs. 22 May 1993. (VANHP). This site was visited on 22 May 1993 by J.D. Freeman & B. Rush.

Sussex Co.: Sitename: Airfield Mill Pond. 36°54'57"N, 77°01'53"W. S of Rt. 729, W of Rt. 628. Along W side of stream feeding Airfield Pond just N of "Swamp Road" leading to 4-H Buffalo Pen. Ca. 8 km. SW of Wakefield; between Rt. 729 and Swamp Road. Manry Quad. Elev. 90 feet. First obs. 1981; last obs. 15 Apr 1983. P.R. Cabe & J. Garvin 120 (WILLI). (VANHP).

WEST VIRGINIA (v):

Pendleton Co.: 0.3 mi. N of Hone Quarry Ridge jeep trail on Shenandoah Mt. at 4000 feet. George Washington National Forest. 14 May 1975. G.F. Roe 1067 (WILLI). Same loc. 30 Apr 1976. G.F. Roe 1270 (WILLI). Same loc. 3 May 1986. J.D. Freeman s.n. with M. Stanley (AUA). Site was visited on 22 May 1993 by J.D. Freeman & B. Rush.

b. Extirpated Populations

MISSOURI (o):

Barry Co.: Unnamed site. 36°34'07"N, 93°50'23"W. Eagle Rock Quad. T21N, R27W, Sec. 3. S of Roaring River along 112. Elev. 1440 feet. First obs. 1970; last obs. 1970. 1970: Very limited numbers. 1985: M. Wallace searched; none found. 1988: Humphrey--unsuccessful search. Cause of disappearance not given. (MODC).

Unnamed site. 36°39'13"N, 93°52'22"W. Cassville Quad. T22N, R27W, Sec. 5. Junction of roads connecting Hilltop and Cassville. Elev. 1340 feet. First obs. 1980; last obs. 1980. 1985: Baumgardt & M. Wallace--plants gone, installation of cable through area destroyed them. (MODC).

Lawrence Co.: Unnamed site. 37°03'57"N, 93°41'46"W. Chesapeake Quad. T27N, R25W, Sec. 8. Cherty oak woods near Aurora. Elev. 1345 feet. First obs. 1966; last obs. 18 Apr 1966. M. Wallace 1663A (SO). 1981: Timme--unsuccessful search. 1988: Bicknese & Humphrey--unsuccessful search, little potential habitat left. (MODC).

McDonald Co: Unnamed site. 36°42'33"N, 94°05'36"W. Rocky Comfort Quad. T23N, R29W, Sec. 17. Near Rocky Comfort. First obs. 1960; last obs. 30 Apr 1960. 1984: M. Wallace--unsuccessful search. 1988: Currier--unsuccessful search. Most of forest is grazed, most of section is cleared. (MODC).

SOUTH CAROLINA (p):

Berkeley Co.: Pinopolis. May 1895. F.P. Porcher s.n. (GH-mounted on same sheet with specimen labeled "source not recorded" but probably a duplicate of the following). Same loc. May 1897. M.P. Ravenel s.n. (CU, GH). St. John's, Berkeley. May 1898. F.P. Porcher s.n. [Dist. J.H. Mellichamp] (NCU-2 sheets, US#959739--mounted on same sheet with E.E. Magee collection from Haywood Co., North Carolina). R.D. Porcher (pers. comm.), grandson of F.P. Porcher, provided the following annotation by F.P.P. concerning this collection from the latter's copy of Flora of the Southern United States by A.W. Chapman (1860): "Near Fanny Branch, Pinopolis, May '95. Sent to Mellichamp and Chapman. Dr. Chapman writes me that it is T. pusillum Mx. Scarce. Dr. C. says Michaux discovered it a century ago--in the pine woods of Carolina. Not seen since as far as I know except by Dr. W. Rea of Wilmington, NC.

It was not seen by Elliott." Dr. R.D. Porcher further states, "Fanny Branch is in Berkeley Co. near Pinopolis, but is today under the waters of Lake Moultrie." Unnamed site: "Fanny Branch." 33°13'30"N, 80°02'00"W. Moncks Corner Quad. (SCNHT).

c. Historical Populations, Current Status Unknown

ARKANSAS (o):

Benton Co. 1 mi. N and 1/4 mi. E of Cave Springs. 25 Apr 1970. B.L. Fagala 35 (UARK).

Lake Atlanta, Rogers/T19N,R29W, Sec. 8. Rogers Quad. 8 Apr 1967. J. Sampier 5 (APCR).

Monte Ne. 27 Mar 1927. J.F. Normand s.n. (TEX). Same loc. Mar 1950. W. Guess s.n. (WIS). Same loc. 12 Apr 1959. R.G. French 278 (UARK). Same loc./5 mi. SE of Rogers. Elev. ca. 1000-1300 feet. 12 Apr 1949. D.M. Moore 490213 (UARK). Same loc. 18 Apr 1962. M.B. Clark 1423. (UARK). Same loc./T19N, R29W, Sec. 28. Rogers Quad. 26 Apr 1974. P. Wagner 7467 (NLU).

Near Osage Creek, NW of Elm Springs. Apr 1921. J.T. Buchholz s.n. (NY, US, WIS).

Willola. 1 May 1931. E.A. Ruddick 293 (WIS).

Madison Co.: 4 mi. SE of Clifty. 6 Apr 1958. D.L. Marsh 643 (KANU, NY).

Rich woods, near Huntsville. 10 May 1924. E.J. Palmer 24801 (UMO).

10 mi. E of Huntsville. 3 Apr 1971. H. Wenzler 15 (UARK).

Newton Co.: Ponca, near Boxley. 18 Apr 1940. N.C. Fassett 20583 (WIS).

Leatherwood Valley, 1-2 mi. S of Ponca on the Buffalo R. Apr 1971. J.H. Huber & W.E. Elder 360 (UMO).

Sneed's Creek Rd., 2.4 mi. E of hwy. 43. T16N, R22E, Sec. 8. 6 Apr 1975. G. Oleson 21 (UARK).

Polk Co.: Albert Pike Recreation Area, Ouachita National Forest. Elev. 700-1500 feet. 31 May 1951. D.M. Moore 510016 (UARK).

Both sides of F.S. rd. 25, extension of State Hwy. 375 at the Mine Creek Crossing, Ouachita National Forest, about 23 mi. SE of Mena. 2 Jun 1976. J.C. Lambert s.n. (AUA). Plants from this site were cultivated in Mountain Fork Arboretum, Mena, AR, according to J.C. Lambert (pers. comm.).

N of Shady Lake. 27 Mar 1948. D.M. Moore 480011 (UARK-2 sheets, 1 of which is erroneously labeled "Hempstead Co.")

2 mi. S of Wilhelmina State Park, 2 mi. SE of Hwy. 88 and approx. 1 mi. N on dirt road. 28 Mar 1971. B. Moore 47 (UARK).

Washington Co.: SE of Elm Springs. 5 Apr 1923. J.T. Buchholz s.n. (NY).

About 1 mi. S of Elm Springs. 10 Apr 1923. J.T. Buchholz s.n. (UARK).

SW of Elm Springs. 1 Jun 1923. J.T. Buchholz s.n. (MO).

Elm Springs; alt. 1200 feet/T18N, R31W, Sec. 25. Springdale Quad. 3 Apr 1940. D.M. Moore 400009 (OKL, OKLA, SMU, UARK).

Elm Spring Road, NE of Tontitown. 5 Jun 1923. J.T. Buchholz s.n. (NY-2 sheets). Near Tontitown. 5 Jun 1925. E.J. Palmer 26998 (P, UMO, VDB).

Goshen. 16 Apr 1928. J.E. Benedict s.n. (PENN).

#### KENTUCKY (a):

Marion Co.: In woods on top of knob, about 3 mi. W of Bradfordsville, SE Marion Co. Mississippian Limestone bedrock. Highland Rim Province. 17 Apr 1965. J. Keith s.n. (KY). Unnamed site: "Peck Ford Knob." 37°29'54"N, 85°12'45"W. Bradfordsville Quad. First obs. 1965; last obs. 17 Apr 1965. M. Evans revisited site Apr 1984, population not found (KYNHP).

#### MARYLAND (v):

Worcester Co.: Carey's Creek. 26 Apr 1935. C.F. Beaven 196 (DUKE, PH). Near Pokomoke City, along Carey's Creek. 3 May 1947. A.V. Smith s.n. (LCU). Same loc./2 mi. ENE of Pocomoke City, in Pocomoke Swamp. 4 May 1947. R.R. Tatnall, G.R. Proctor, and E.T. Wherry s.n. (Wherry, 1949; Reed, 1982). Site examined by A.O. Tucker in 1979, but he failed to find plants (Reveal and Broome, 1981). Reveal and Broome also state that the locality of Beaven's original collection was along Pilchard Creek, not Carey's; this is perhaps only a change of the name.

Locality data not given. C.F. Reed 36292 (Reed, 1956). Rt. 502, 2 mi. SE of Stockton. 30 May 1955. Reed 36292 (Reed, 1982).

Near Powell Creek just N of the Accomack Co., Va., line. "Unvouchered report" (Reveal and Broome, 1981).

#### MISSOURI (o):

Barry Co.: Roaring River State Park. Apr 1930. H.H. Leake s.n. (UMO). Same loc./5 mi. S of Cassville. 13 Apr 1930. C. Shoop s.n. (F, UMO).

Taney Co.: Unnamed site: "School of the Ozarks." 36°37'08"N, 93°13'55"W. School of the Ozarks campus, N of the dairy in cherty oak-cedar woods between dairy and Airport Road. T22N, R21W, Sec. 8. Hollister Quad. Elev. 880 feet. First obs. 1966; last obs. 1966. J. Prugh 1663B (SO). (MODC).

#### NORTH CAROLINA:

Haywood Co. (a): Low ground, 2700 feet. May 1895. T.G. Harbison s.n. (US#959738-mounted on same sheet as US#959737-same data except May 1898). Waynesville. 2 May 1898. E.E. Magee s.n./Biltmore Herb. 3564 (NCU-recently remounted and labeled as if collected by T.G. Harbison with no date given, US#959740-mounted on same sheet with US#959739 by F.P. Porcher from Berkeley Co., S.C.). These Haywood Co. specimens probably represent parts of the same collection and have been erroneously labeled in various ways; partial clarification is offered in a note written by Harbison on a collection of T. pusillum from Berkeley Co., South Carolina: "May 1898. Mr. Porcher [F.P.]. Sent to Ashe by Dr. Mellichamp. This must be a scarce plant. I have never found it growing. In 1895 a little girl [E.E. Magee] at Waynesville, N.C., brought one to me, so it is not entirely a coastal plain species." Since this was written in May 1898 or later, Harbison could hardly have collected the species in 1895. The date of "May 1898" on some the Haywood Co. specimens probably refers to the time the Porcher collection was received from Mellichamp, but it was mistakenly used as a collection date for both the former and the latter when duplicates in the Biltmore Herbarium were labeled and distributed. Porcher also collected specimens in 1895 according to his own notes and a specimen at GH (see Berkeley Co., S.C., under Extirpated Populations).

Wake Co. (p/v): About 5 mi. S of Raleigh, head of Yates' Pond. 20 Apr 1950. W.B. Fox & D. Adams 3561 (DUKE). Same loc. 20 Apr 1970. S.K. Ittenbach 83 (GH). Unnamed site: "Yates Pond." 35°43'15"N, 78°41'30"W. Lake Wheeler Quad. First obs. 1950; last obs. 1971. Habitat destroyed by beaver ponds; population possibly extirpated. (NCNHP).

#### SOUTH CAROLINA (p):

Calhoun Co.: 0.2 mi. NE of county line between Cameron and Orangeburg (Calhoun Co. line) on S.C. 33. 31 Mar 1957. H.E. Ahles 21700 with J.G. Haesloop (FSU, GA, NCU, NY, USF, VDB). Unnamed site: "Cameron." 33°33'02"N, 80°43'45"W. Cameron Quad. R.D. Porcher searched in early 1980, could not find. (SCNHT). J.D. Freeman searched in Mar 1985, could not find.

Dorchester Co.: NW of Four Holes Swamp on U.S. 178. 1 Apr 1957.  
H.E. Ahles 21890 with J.G. Haesloop (NCU).

TENNESSEE (a):

Franklin Co.: Bluebell Island of Elk River. 8 Apr 1973. H.C. Yeatman s.n. (TENN-photo only). Sitename: Bluebell Island Registered State Natural Area. 35°17'27"N, 85°55'15"W. Bluebell Island in Elk River, 0.5 mi. W of Patterson Ford Bridge and Rt. 50. Alto Quad. First obs. ?; last obs. 8 Apr 1973. H. Yeatman. 3 extensive searches of island, 1979-80, by T. Patrick did not find any plants of this species. (TNDC).

TEXAS (t):

Cass Co.: Unnamed site: "Linden Seep." 33°04'10"N, 94°23'43"W. About 3 mi. NW of Linden, about 1 mi. W of Douglassville Highway. Cartersville Quad. Elev. 350 feet. First obs. 1969; last obs. 19 Mar 1969. (TXNHP).

Unnamed site: "Linden Airport Lake." 33°09'52"N, 94°22'50"W. N of Linden on Hwy. 59 [Hwy. 8], W of hwy. about 1 mi. in deeply wooded area, Linden Airport Lake. Cartersville Quad. Elev. 400 feet. First obs. 1970; last obs. 25 Mar 1970. (TXNHP).

Houston Co.: Grapeland. 26 Mar 1918. E.J. Palmer 13179 (BKL, MO, UMO, US, VDB, WIS). Unnamed site: "Grapeland." 31°28'55"N, 95°28'53"W. Same loc. Grapeland Quad. Elev. 450 feet. (TXNHP).

Smith Co.: Unnamed site: "Sheff's Woods." 32°29'35"N, 95°15'35"W. SW corner of woods on small island in seep and low boggy area. Tyler North Quad. Elev. 450 feet. First obs. ?; last obs. 1971. Sight record by G. Ajilvsgi; interviewed by T. Allday-Bondy, 25 Jul 1984. (TXNHP).

VIRGINIA (v):

Accomack Co.: Low woods between Horntown and Silva. 22 Apr 1956. Reed 37437 (Reed, 1982).

Wet woods just NW of Silva. 14 Apr 1957. Reed 38636 (Reed, 1982). Same loc. 13 Apr 1963. Reed 61313 (Reed, 1982).

Just W of Silva near Mollard Mill Pond Creek. 30 May 1955. Reed 36626 (Reed, 1982).

Sitename: Swans Gut Creek. 37°59'50"N, 75°25'35"W. Silva (sign post) 1/2 mi. W and 1/2 mi. E at small creek; presumably plants on 1 mi. stretch with Silva as the midpoint. Chincoteague West Quad. Elev. 35 feet. Sight record by F.A. Churchill in letter to J. Wurdock dated Dec 1974. (VANHP).

1 mi. S of Wattsville. 22 Apr 1956. Reed 37447 & 37448 (Reed, 1982).

Dinwiddie Co.: 5 mi. E of Dinwiddie Court House. 9 May 1943. L.H. Lippitt s.n. (GH-holotype of var. virginianum; mounted on same sheet with P.W. Warren 413 from Norfolk Co./Chesapeake City, VA). Unnamed site: "Dinwiddie Stream." 37°04'44"N, 77°29'48"W. Same data, Rich loamy woods near stream. Carson Quad. Elev. 130 feet. First obs. 1943; last obs. 9 May 1943. (VANHP). Area searched in Apr 1966 by J.D.Freeman; no plants of species found.

James City Co.: Centreville Road, Williamsburg. 16 Jun 1968. A. Barans 728 (NCU, VDB, WILLI-annotated "Longhill Road" by S.A. Ware).

Norfolk Co./Chesapeake City: W of Wallaceton, Great Dismal Swamp. 24 Apr 1926. P.W. Warren 413 (GH-mounted on same sheet with L.H. Lippitt s.n. from Dinwiddie Co., VA, the holotype of var. virginianum). Sitename: Dismal Swamp Megasite. 36°35'41"N, 76°24'59"W. Along the path from Wallaceton to Lake Drummond. Lake Drummond Quad. Elev. 18 feet. First obs. 1926; last obs. Apr 1926. (VANHP).

Surry Co.: 1 mi. N of Beachland. 22 Jun 1949. B. Mikula 1501 (GH). Same loc. 4 Jul 1949. B. Mikula 2234 (GH). 2.4 mi. S of Surry city limits (ca. 1 mi. N of Beachland). 25 Apr 1966. J.D. Freeman 499 (AUA-3 sheets, dupls. of be dist., VDB). Unnamed site: "Beachland Swamp." 37°06'01"N, 76°49'16"W. Same loc. Runnymede Quad. First obs. 1949; last obs. 25 Apr 1966. (VANHP).

#### d. Populations with Ambiguous/Inadequate Locality Data

Locality data lacking: [before] 1945. Mr. Cheshire (NY).

Probably cultivated: Botanic Garden of Harvard Univ., fl. white, turning carneous. 1882. Source not recorded--from Bussey (?) (GH-mounted on same sheet with collection from Pinopolis [Berkeley Co.], S.C., 1895, by Porcher). Same loc. 188-. 10 May 1898. Without collector (GH). Botanic Garden, Cambridge. 2 May 1899. R.G. Leavitt s.n. (LL). NEW JERSEY. Bergen Co.: Hort. Geo. C. Woolson. 4 May 1890. G.V. Nash s.n. (NY).

#### ALABAMA (a):

Madison Co.: Butler's Bottom, along Paint Rock River, E of Huntsville, in Upper Piedmont (Reed, 1982). The Paint Rock River forms the county line between Madison and Marshall cos., but that area is SE of Huntsville. North of the mutual boundary between these counties, the Paint Rock flows entirely within Jackson Co., and this portion of that river is actually E of Huntsville.

#### ARKANSAS (o):

Northwest Arkansas. without date. J.T. Buchholz s.n. (SMU).

In Boone Chert, in woods, very rocky chert soil region. 28 May 1921. J.T. Buchholz s.n. (MO-sheet bears two collections, one in flower and the other in fruit, that certainly were collected on different dates, probably in Apr in flower and late May or Jun in fruit). On Boone Chert, flinty limestone soil. Osage Creek. 20 Apr 1922; 10 May 1922. J.T. Buchholz s.n. (GH-both collections mounted on same sheet). All other J.T. Buchholz collections from "Osage Creek" apparently were from Benton Co. and were obtained during 1921; his collections of this species during 1923, on the other hand, were all from various localities in Washington Co.

Polk Co.: Locality data lacking. Mar 1981. P. Dalton & R. Bye s.n. (UARK). (ARNHC).

Washington Co.: Along gravel road NE of Huntsville, approx. 2.5 mi. just W of old barn. 8 Apr 1979. C. Carlton 42 (UARK). Unnamed site by ARNHC, but mapped as Spring Valley Quad. T17N, R28W, Sec. 11. Since Huntsville is in Madison Co. and any site in Washington Co. closer to Fayetteville than Huntsville, the label data are ambiguous and inadequate for mapping.

#### KENTUCKY (a):

West Kentucky. Petals incarnate. C.S. Rafinesque (1840).

#### MISSOURI (o):

Lawrence Co.: On a cherty hillside in open woods. Along roadside. Humus soil, but very little. 30 Mar 1967. D.C. Hamm 5 (UMO).

Polk Co.: NE of Bolivar. Rocky moist slope near stream. Spring 1963. R. Kerr & B. Graves s.n. (SMS-locality questioned by P.L. Redfearn, Jr., curator; this is the only known collection attributed to this county).

Shannon Co.: Locality data lacking. 12 May 1944. B. Bauer s.n. (MO).

#### NORTH CAROLINA? (p):

Locality data lacking. Without date. Curtis. [Rev. M.A. Curtis] A.W. Chapman Herb. (NY-possibly the specimen from vicinity of Wilmington, N.C., mentioned in entry concerning Porcher collections from Berkeley Co., S.C., under Extirpated Populations above).

#### SOUTH CAROLINA (p):

Locality data lacking. Porcher s.n. A.W. Chapman Herb. (MO-this collection almost certainly came from Fanny Branch near Pinopolis, Berkeley Co., S.C., listed under Extirpated Populations above. A

probable duplicate at US does not indicate the source for the Chapman Herb. specimen.)

Basse Caroline, environ Gaillard road, 35 M[iles] de Charlest[on]. A. Michaux Herb. (P-holotype, photos of holotype at FSU, GH, and also published in Rhodora 45: pl. 772; possible isotype labeled "Michaux" in Herb. Richard also at P). The type locality probably was along the road from Charleston to Gaillard's Island on the Santee River near the present Lake Marion; if so the site would be in Berkeley Co.

TEXAS (t):

Harrison Co.: Unnamed site: "Hallsville." 32°30'57"N, 94°31'52"W. E of Hallsville. Hallsville Quad. Elev. 300 feet. Sight record by G. Ajilvsgi; interviewed by T. Allday-Bondy, 25 Jul 1984. (TXNHP).

Panola Co.: Unnamed site. Type locality for var. texanum. Low woods and banks of streams. 1860. S.B. Buckley (1861). Not found in county since original discovery.

Rusk Co.: Sight record by G. Ajilvsgi; interviewed by T. Allday-Bondy, 25 Jul 1984. (TXNHP).

Wood Co.: Sight record by G. Ajilvsgi; interviewed by T. Allday-Bondy, 25 Jul 1984. (TXNHP).

VIRGINIA (v):

Cultivated at Bussey Greenhouse from plants received from William and Mary College, Va. Without date. E. Anderson s.n. (MO).

Accomack Co.: Locality data not given. C.F. Reed 36627, 36636, 37457, 37460, & 37485 (Reed, 1956).

Charles City Co.: Unnamed site: "Charles City." 37°20'33"N, 77°04'15"W. No data except site. Charles City Quad. 15 Apr 1958. O.H. Weiss s.n. (NCU, VDB, VPI-2 sheets). (VANHP).

Chesterfield Co./City of Richmond: Originally from Banks of James River, near Richmond, but cultivated in garden of Mrs. A.B. Bauer, 1600 Westwood Ave., Richmond. 25 Apr 1936. W.L. Hunt s.n. (NCU). Possibly from Henrico Co. (see below for other similar data).

Unnamed site: "Chesterfield." 37°22'42"N, 77°30'47"W. No data except site. Chesterfield Quad. First obs. 1943; last obs. 31 Mar 1943. S. Lusby s.n. (VPI). (VANHP). [Note that Lusby and Massey collected specimens later the same year that were mapped for Henrico Co. by VANHP.]

Dinwiddie Co./Prince George Co. line: Unnamed site: "Carson." 37°02'13"N, 77°23'48"W. No data except site. Carson Quad. Elev. 130 feet. First obs. 1933; last obs. 12 Apr 1933. B. Rives s.n. (US). (VANHP).

Henrico Co.: Unnamed site: "Westwood Woods." 37°35'37"N, 77°30'44"W. N of Westwood Golf Course [Richmond]. Bon Air Quad. Elev. 205 feet. First obs. 1931; last obs. 8 May 1931. R.F. Smart and E.C. Pritchard s.n. (URV). (VANHP). Same loc. as above?: N of University Road, University of Richmond. M.E. Billings 245. 8 May 1931 (GH).

Unnamed site: "Patterson Avenue." 37°35'51"N, 77°36'52"W. Patt[erson] Ave. extended [Richmond]. Bon Air Quad. First obs. 1943; last obs. 20 Apr 1943. S. Lusby & A.B. Massey s.n. (VPI). (VANHP).

e. Population Reports Believed Erroneous

GEORGIA (p):

Reported for the state by Reed (1982). Documentation was not cited to substantiate any basis for the inclusion of Georgia as part of the known range of the species. It is possible that Reed had heard directly or indirectly from W.H. Duncan that T. pusillum was found in Georgia, because some of the early collections of T. persistens Duncan (1971) were erroneously believed to be the former species before it was concluded that they were indeed distinct.

KENTUCKY (o):

Russell Co.: "Rufus M. Reed, in correspondence to author [C.F. Reed], Feb. 19, 1962, reported that he found the delicate little snow trillium in a damp ravine bottom some years ago while doing some engineering work there. He possibly saw T. pusillum. This region is just south of the area in Casey County where Browne [1961] reported his specimens." (Reed, 1962). It is possible that the plants observed were indeed T. pusillum, but, without any specimens or a locality smaller than a whole county to be searched, the report could perhaps be verified at the present time only with extreme difficulty. The plants in question could also be T. nivale, the snow trillium, the name for which Reed actually (accidentally?) used in making this report.

On the next three pages are summarized the data presented above concerning known and reported localities for the T. pusillum complex. One can easily assess the general occurrence records for each variety based upon these summaries.

## Summary of Population Occurrence Data by State and County:

Number of Populations/Collection Sites:

<u>State and County</u>	<u>Extant</u>	<u>Extirp.</u>	<u>Status ?</u>	<u>Ambiq./Inad.</u>
Alabama (total)	(12)			(1)
(a) Jackson	3			
Limestone	2			
Madison	3			1
Marshall	3			
Morgan	1			
Arkansas (total)	(23)		(21)	(2)
(o) Benton	3		5	
Boone	3			
Carroll	1			
Madison	3		3	
Montgomery	3			
Newton	6		3	
Polk	3		4	1
Pulaski	1			
Washington			6	1
Kentucky (total)	(5)		(1)	
(a) Casey	2			
Christian	1			
Marion			1	
Warren	1			
Wayne	1			
Louisiana				
(t) Caddo	1			
Maryland				
(v) Worcester	1		3	
Mississippi				
(a) Jones	1			
Missouri (total)	(14)	(4)	(5)	
(o) Barry	7	2	1	
Howell	3			
Lawrence	2	1	1	
McDonald		1		
Polk			1	
Shannon	2		1	
Taney			1	
North Carolina (tot.)	(10)		(2)	
(v) Camden	1			
(a) Clay	1			
(v) Currituck	1			
(v) Gates	1			
(?) Halifax	1			

(a) Haywood			1	
(?) Johnston	1			
(p) Nash	1			
(p) Pender	3			
(?) Wake			1	
Oklahoma				
(o) Leflore	1			
South Carolina (tot.)	(1)	(1)	(2)	
(p) Berkeley		1		
Calhoun			1	
Dorchester	1		1	
Tennessee (total)	(9)		(1)	
(a) Coffee	1			
Cumberland	1			
DeKalb	1			
Franklin	1		1	
Lincoln	3			
Putnam	1			
Sumner	1			
Texas (total)	(2)		(4)	(4)
(t) Cass	1		2	
Harrison				1
Houston			1	
Nacogdoches	1			
Panola				1
Rusk				1
Smith			1	
Wood				1
Virginia (total)	(21)		(9)	(11)
(v) Accomack			5	5
Augusta	1			
Charles City	1			1
Chesterfield				2
Dinwiddie			1	1
Gloucester	1			
Grayson	1			
Greenville	1			
Hampton City	1			
Henrico				2
James City	12		1	
Nansemond	1			
Norfolk			1	
Rockingham	1			
Surry			1	
Sussex	1			
West Virginia				
(v) Pendleton	1			

Summary of Population Occurrence Data for T. pusillum by Variety.Number of Populations/Collection Sites:

<u>Variety</u>	<u>Extant</u>	<u>Extirp.</u>	<u>Status?</u>	<u>Ambig./Inad.</u>
var. <u>pusillum</u>	5	1	2	
var. <u>virginianum</u> <sup>1</sup>	22		12	11
var. <u>ozarkanum</u>	38	4	26	2
var. <u>texanum</u>	3		4	4
var. <u>monticulum</u> <sup>2</sup>	4?			
var. <u>alabamicum</u> , ined.	28		3	1
interm. <u>pus./virg.</u> <sup>3</sup>	2		1	

1 - Coastal populations only.

2 - Montane populations only; combine with Coastal for var. total.

3 - Intermediate between var. pusillum and var. virginianum.

#### 4. Physical Habitat and Habitat Requirements

##### a. General Environment and Habitat

Most of the populations of T. pusillum occur in swampy habitats, but those in the Ozark Mountains (var. ozarkanum) seem to be restricted to rather dry, cherty upland ridges and slopes. Some of the populations in Kentucky, Tennessee, North Carolina, and Virginia also occupy somewhat dry woodland. Sites for T. pusillum in these states are predominantly typical and wet, regardless of the variety represented. And soils seem to be deeper and richer in the upland sites in these same states than is the case in the Ozarks. Only in the states of South Carolina, Alabama, Mississippi, Louisiana, and Texas are all known populations of T.

pusillum varieties limited to wet habitats. A wide variety of tree species dominate these woodlands; hardwoods--including various oak species, sweetgum, blackgum, beech, and hazel alder--are common associates in most localities, both in swampy areas and sloping upland.

It is clear that populations of all members of the T. pusillum complex respond to local disturbance by more prolific flowering and fruiting than one commonly finds in older, more stable woodlands. Such disturbance includes both natural and man-made sorts, such as tree fall, logging, road building, ditch digging, and even transplanting. This is evidence that the species perhaps does best as a seral component during the first couple of decades of plant succession in an area; as a perennial it may persist indefinitely thereafter and flower less and less as a population until another disturbance recurs. Plants flower so early in the season that the forest canopy offers little shade until the fruits are nearing maturity. Competition from low growing herbs and introduced vines (like Japanese honeysuckle) seem to crowd out T. pusillum plants.

b. Physical Characteristics of the Habitat

Aside from commonly wet substrata (during the flowering period at least) for most populations, the soil type at most localities is of a gummy consistency. Many localities support floristic associations that suggest high soil acidity. In most swampy sites, T. pusillum grows in close association with sphagnum moss, and in mountains on the Virginia-West Virginia border the plants are most common near to ericaceous shrubs in humus developed from leaves of

conifers. The substratum here is mainly red sandstone. Many, if not most, of the swampy sites with T. pusillum in Alabama, Mississippi, Tennessee, and Kentucky are developed over limestone substrata; soils are generally circumneutral in these areas. In Grayson Co., Virginia, an extensive population is present in a glade that has developed over a serpentine formation, and the soil is very basic. This variety of substrata and soil types, coupled with the observation that T. pusillum has been successfully transplanted from many different states to a common garden near Auburn, Alabama, makes it unlikely that soil pH alone is a major factor that restricts this species.

Based upon published information, ecological parameters have not been measured in any population of T. pusillum. It is not uncommon for populations that are separated by relatively short distances to appear to occupy distinctly different types of woodland. Observation of a number of these population pairs over a number of years, analysis of data sets for these populations and others, and transplantation to a common garden where flowering and fruiting success have occurred all led to the following hypotheses concerning T. pusillum populations:

(1) Seral development of a woodland significantly affects population development and flowering; older, undisturbed localities generally will have a smaller percentage of plants flowering than younger, disturbed ones.

(2) The level of competition from other plant species may limit population development; population decline occurs where heavy

shading occurs and where other herbs or vines compete for the same space.

(3) Other than man, no effective long-range dispersal agent has been identified for Trillium seed or plants, and ants enable only local dispersal; thus, genetic differences among populations are mainly a function of the distances that separate them. As indicated above, physical characteristics of habitat for the species are quite varied, and these features are only slightly less variable for each of the varieties.

## Literature Cited

- Ahles, H.E. 1968. Trillium L. Pp. 289-293, In: A.E. Radford, H.E. Ahles, and C.R. Bell. Manual of the vascular flora of the Carolinas. University of North Carolina Press, Chapel Hill, NC. lxi + 1183 pp.
- Barksdale, L. 1938. The pedicellate species of Trillium found in the southern Appalachians. J. Elisha Mitchell Sci. Soc. 54: 271-294.
- Bates, V. 1988. Ouachita National Forest sensitive plant survey, Caddo and Womble Ranger Districts. U.S.D.A.-Forest Service. 3 vols.
- Bodkin, N.L., and J.L. Reveal. A new variety of Trillium pusillum (Liliaceae) from the Virginias. Brittonia 34: 141-143.
- Browne, E.T. 1961. Some new or otherwise interesting reports of Liliaceae from the southeastern states. Rhodora 63: 304-311.
- \_\_\_\_\_. 1967. Herbarium and field notes on Kentucky plants. I. New state records, rarities and a new form. Castanea 32: 77-84.
- Buckley, S.B. 1861. Descriptions of several new species of plants: Trillium texanum. Proc. Philadelphia Acad. Sci. 1860: 443-445.
- Cabe, P.R., and C.R. Werth. 1994a. The Trillium pusillum complex in Virginia. I. Morphological investigations. Castanea: in press.
- \_\_\_\_\_. 1994b. The Trillium pusillum complex in Virginia. II. Isozyme evidence. Castanea: in press.
- Correll, D.S., and M.C. Johnston. 1970. Manual of the vascular plants of Texas. Texas Research Foundation, Renner, TX. xv + 1881 pp.
- Duncan, W.H., J.F. Garst, and G.A. Neece. 1971. Trillium persistens (Liliaceae), a new pedicellate-flowered species from northeastern Georgia and adjacent North [sic] Carolina. Rhodora 73: 224-248.
- Fernald, M.L. 1943. Virginian botanizing under restrictions. I. Field-studies of 1942 and 1943. Rhodora 45: 352-413. (Trillium pusillum var. virginianum, pp. 396-398, pl. 772 and 773)
- \_\_\_\_\_. 1950. Gray's Manual of Botany, 8th Ed. American Book Co., New York. lxiv + 1362 pp. (Trillium, pp. 443-446.)

- Freeman, J.D. 1970. Trillium. Pp. 407-409, In: D.S. Correll and M.C. Johnston. Manual of the vascular plants of Texas. Texas Research Foundation, Renner, TX. xv + 1881 pp.
- \_\_\_\_\_, A.S. Causey, J.W. Short, and R.R. Haynes. 1979a. Endangered, threatened, and special concern plants of Alabama. J. Alabama Acad. Sci. 50: 1-25.
- \_\_\_\_\_. 1979b. Endangered, threatened, and special concern plants of Alabama. Auburn University Agr. Exp. Sta., Botany and Microbiology Department Ser. Bull. No. 3. 25 pp.
- Garrett, C.J. 1982. Taxonomic relationships among Trillium taxa allied with Trillium pusillum. M.S. Thesis, Auburn University, AL. 76 pp.
- Gates, R.R. 1917. A systematic study of the North American genus Trillium, its variability, etc. Ann. Missouri Bot. Gard. 4: 3-92.
- Gronovius, J.F. 1743. Flora Virginica, Part 2. (Paris, pp. 44-45).
- \_\_\_\_\_. 1762. Flora Virginica, 2nd Ed. (Trillium, p. 56).
- Holmgren, P.K., N.H. Holmgren, and L.C. Barnett. 1990. Index Herbariorum. Part I: The herbaria of the world, 8th Ed. Regnum Vegetabile 120: 1-693.
- Ihara, M., and K. Ihara. 1978. A biosystematic study on the pedicellate-flowered species of North American Trillium. (1) Geographical distribution of major groups and their gynoeceum norms. J. Geobotany 25: 139-172.
- Lanjouw, J., and F.A. Stafleu. 1954. Index herbariorum. Part II. Collectors A-D. Regnum Vegetabile 2: 1-174. (S.B. Buckley, p. 105).
- \_\_\_\_\_. 1957. Index herbariorum. Part II. Collectors E-H. Regnum Vegetabile 9: 175-295. (R.R. Gates, p. 218; T.G. Harbison, p. 255).
- Linnaeus, C. 1753. Species plantarum. (Trillium, pp. 339-340).
- MacRoberts, D.T. 1977. Additions to the Louisiana flora. Sida 7: 221.
- Michaux, A. 1803. Flora Boreali-Americana, Vol. I. (Trillium, p. 215).
- Morgan, D., and S. McDaniel. 1979. Trillium pusillum (Liliaceae) in Mississippi. Sida 8: 209.