SUMMARY

1. The homothallic, isogamous sexual reproduction of *Gonium sociale* (Dujardin) Warming is described and illustrated.
2. Bacteria-free clonal cultures of the organism are maintained in the collection of algae at Indiana University (No. 14).

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# AN ANNOTATED LIST OF THE VASCULAR PLANTS OF THE GORGES OF THE FALL CREEK FALLS STATE PARK

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In the course of a phytosociological study of the vegetation of the gorges of the Fall Creek Falls State Park, a collection was made of the plants encountered there. In addition, habitat notes were made concerning all of the species collected.

Since so little material has been published with specific reference to the vegetation of the Cumberland Plateau in Tennessee, it appeared advisable to prepare a list of species collected, along with some of the habitat notes. In order to make the list as complete as possible, the herbarium of the University of Tennessee was consulted for additional species from the gorges. Wherever collections are cited for species included in the herbarium of the University of Tennessee, the name (s) of the collector (s) and the University of Tennessee collection number is given. Other species are represented by specimens collected by the author and deposited in the herbarium of Vanderbilt University. The scientific names of species and their arrangement correspond to those in Gray's Manual of Botany, 8th Edition (Fernald, 1950) unless noted specifically.

No information is presented here dealing with the general distribution of the true ferns, sedges of the genus *Carex*, or woody plants. This is because of the recent treatment of the

distribution of these groups by Shaver (1954), Underwood (1945), and Shanks (1952, 1953, and 1954) respectively.

There are four gorges which have considerable area within the Fall Creek Falls State Park. These are the Cane Creek Gulf, Fall Creek Gulf, Johnny Branch Gulf, and Piney Creek Gulf. They dissect the western escarpment of what Braun (1950) termed the "Cliff Section" of the Cumberland Plateau. Since this escarpment stands above the Highland Rim, the level of the floor of the gorges begins to approximate the level of the Highland Rim. Thus the gorges are geographically related both to the Highland Rim, of which they are an eastward extension, and to the Cumberland Plateau, from which they have been cut, and by which they are mostly surrounded.

There are great differences in degree and direction of exposure among the gorges and among different parts of the same gorge. In general the plant communities of the narrowest portions of all the gorges are quite similar, as are those on slopes in the wider portions with the same direction of exposure. The mature communities of the gorges have been designated as hemlock, hemlock-yellow birch, hemlock-basswood, mixed mesophytic, oak-hickory, and chestnut oak communities. In general, the communities in which hemlock is the sole dominant, or is one of of the two co-dominants, are confined to the deep, narrow portions of the gorges or to portions shaded most of the afternoon by cliffs. Mixed mesophytic communities are mostly confined to the north and/or east-facing slopes in the wide portions of the gorges and oak-hickory and chestnut oak communities to south and/or west-facing slopes. In addition, there are two stands in stages of secondary succession. One of these was clean-cut in 1921 and 1922. The other was cultivated in 1901, and served as a lumberyard in 1921-1922.

Sincere appreciation is due Dr. Elsie Quarterman of Vanderbilt University for her guidance, help, and evaluation in all phases of the work. Gratitude is also due Drs. A. J. Sharp and R. E. Shanks for their permission for the author to use the herbarium of the University of Tennessee to check the identification of the plants collected and to determine the distribution pattern of certain species.

LYCOPODIACEAE

*Lycopodium lucidulum* Michx. Present in small colonies in the deepest, narrowest parts of Fall Creek Gulf, Cane Creek Gulf, and Johnny Branch Gulf. Plants reproducing freely by propagula. Always associated with hemlock or hemlock-yellow birch stands. This may be the western limit of distribution of this species in Tennessee.

SELAGINELLACEAE

*Selaginella apoda* (L.) Fern. (N. H. Russell) U. T. no. 3247. "Spray under Fall Creek Falls in rock crevices."

OPHIOGLOSSACEAE

*Botrychium virginianum* (L.) Sw. Rare. Found mostly in mixed mesophytic stands with fairly open crown cover.

OSMUNDACEAE

*Osmunda regalis* L. var. *spectabilis* (Willd.) Gray. Present almost exclusively in the dry bed (in summer) of Cane Creek, or at the very edge of the creek bed. Growing in the soil between boulders.

SCHIZAEACEAE

*Lygodium palmatum* (Bernh.) Sw. (N. H. Russell). U. T. no. 3243, "Spray below Fall Creek Falls."

POLYPODIACEAE

*Cystopteris fragilis* (L.) Bernh. var. *protrusa* Weath. Common in communities dominated by deciduous trees. This apparently is the only variety of the species occuring in the gorges.

*Cystopteris bulbifera* (L.) Bernh. Present in local colonies on limestone at the base of cliffs. It is apparently restricted to rock from which seepage occurs for a considerable part of the year. Most common in Fall Creek Gulf.

*Onoclea sensibilis* L. Abundant among sandstone boulders near base of Cane Creek Falls. Rarely present in the dry bed of Cane Creek. Generally absent elsewhere.

*Dryopteris noveboracensis* (L.) Gray. Widely scattered throughout the gorges in varied habitats, but never abundant locally.

*Dryopteris hexagonoptera* (Michx.) Christens. Rare. Restricted to oak-hickory stands. Does not appear in large colonies, or reach maximum size.

*Dryopteris spinulosa* (O. F. Muell.) Watt var. *intermedia* (Muhl.) Underw. Abundant on sandstone boulders in the deep, narrow parts of gorges where hemlock is a dominant tree in the community. Usually present with *Polypodium virginianum*.

*Dryopteris marginalis* (L.) Gray. Common, but scattered. Usually present in relatively xeric habitats on sandstone boulders. This species never forms large colonies in the gorges as does the preceding species.

*Polystichum acrostichoides* (Michx.) Schott. Common in mesic, deciduous or mixed mesophytic stands.

*Dennstaedtia punctilobula* (Michx.) Moore. Present at the base of Cane Creek Creek Falls, otherwise probably absent from the gorges.

*Athyrium pycnocarpon* (Spreng.) Tidestr. Rare. Present only on the northeast-facing slope in Cane Creek Gulf near Piney Creek Gulf in rich mixed mesophytic forest.

*Athyrium thelypterioides* (Michx.) Desv. Present in Fall Creek Gulf on the east-facing slope near the falls.

*Camptosorus rhizophyllus* (L.) Link. Present on moss-covered sandstone boulders mostly in stands dominated by a mixture of deciduous species and hemlock. Not common.

*Asplenium montanum* Willd. Common in crevices near the top of most cliffs not directly exposed to noonday and afternoon sunlight. Occasionally present at the base of cliffs. This is one of the most common ferns of the gorges.

*Asplenium Trichomanes* L. Rare. Present only at the base of cliffs where there is some seepage, and usually on a hump or convexity of the cliff. Probably present only on west and/or north-facing cliffs.

*Asplenium platyneuron* (L.) Oakes. Rare. Present only in xeric habitats in the oak-hickory and chestnut oak communities. Individual plants and colonies are usually not well developed.

*Adiantum pedatum* L. Fairly common. Present mostly in mesic habitats where soil is deep and well developed. Occasional on steep north and/or east-facing slopes with little soil except in crevices.

*Polypodium virginianum* L.. Abundant in hemlock and hemlock-yellow birch communities on sandstone boulders. Present occasionally as an epiphyte on yellow birch.

*Polypodium polypodioides* (L.) Watt. (N. H. Russell). U. T. no. 3502. "Living elm at junction of Cane Creek and Fall Creek."

PINACEAE

*Tsuga canadensis* (L.) Carr. One of the co-dominant trees in all of the deep, narrow portions of the gorges, and in all habitats which are shaded from the direct rays of the sun at noon and in the afternoon.

*Pinus virginiana* Mill. Very rare in the gorges despite its abundance on the tops of the cliffs. Present only in very xeric sites, or in habitats which have fairly recently been disturbed. Within the gorges it is not an important species in seres following cultivation, as it is on the undissected plateau.

*Thuja occidentalis* L. Present only as scattered, dwarfed individuals on the face of the cliff just east and northeast of the Cane Creek Falls. This represents the southern limit of the known distribution of the species (Shanks, 1952 and 1954).

*Juniperus virginiana* L. Very rare in the gorges. This species was not found represented by individuals more than 15 feet tall

GRAMINEAE

*Arundinaria tecta* (Walt.) Muhl. Rare. Present only in the "flats" near Cane Creek in the wider (more northern) portion of the Cane Creek Gulf. This species was not found in fruiting condition.

*Festuca obtusa* Biehler. Very rare. This species is present only in the low, flat, rather poorly drained area near Cane Creek at the northern end of the park.

*Poa compressa* L.. Rare. Found scattered in forested areas where shade is not excessive. Never in large colonies.

*Poa cuspidata* Nutt. More common than most of the grass species present. This species is present mostly in mixed mesophytic forest, usually on steep, rich north and/or east-facing slopes.

*Uniola latifolia* Michx. Very rare. Present on the treeless slope just northwest of the Fall Creek Falls. Growing there in the same habitats as *Muhlenbergia tenuiflora*. Although referable to *U. latifolia*, most individuals have fewer than six flowers per spikelet.

*Sphenopholis nitida* (Biehler) Scribn. Very rare. Present on the same slope as *U. latifolia*. This was not collected elsewhere in the gorges.

*Brachyelytrum erectum* (Schreb.) Beauv. Fairly common, usually scattered in rather heavily wooded areas.

*Agrostis perennans* (Walt.) Tuckerm. Rare. Present on the east-facing slope of Fall Creek Gulf near the falls.

*Muhlenbergia tenuiflora* (Willd.) BSP. Rare, but more common than many of the grasses present in the gorges. Confined mostly to rich north and/or east-facing slopes.

*Danthonia spicata* (L.) Beauv. var. *longipila* Scribn. & Merr. This is the most frequently encountered grass species in the gorges. It is well scattered in the mixed mesophytic, oak-hickory, and seral communities. It appears as solitary plants or as small tufts, never as large colonies.

*Panicum laxiflorum* Lam. Of the species of *Panicum* found in the gorges, this is the sole one present to any extent in the mature forest. The others are present either in secondary seres or in cirmumscribed treeless areas. This species is present rarely in the mature mixed mesophytic stands.

*Panicum microcarpon* Muhl. Fairly common in one site only, an area which had been both a cornfield and a sawmill site, and is now in secondary succession. This is a rather low, flat area. Part of the site is not well drained.

*Panicum polyanthes* Schultes. Present in the treeless area just northwest of Fall Creek Falls. Not found elsewhere in the gorges.

*Panicum Boscii* Poir. Present in areas undergoing secondary succession.

*Andropogon scoparius* Michx. This species is growing sparsely in soil in crevices in the sandstones surrounding Piney Falls at the head of the Piney Gulf. These rocks are exposed to the sun in the morning, but are shaded at noon and in the afternoon. Despite proximity to the falls, this habitat was a xeric one at the time the species was collected (October 18, 1952).

### Cyperaceae

*Carex radiata* (Wahlenb.) Dew. Present only on low, flat, rather poorly drained soil in forest undergoing secondary succession. This species, like many in the Genus *Carex* is not present in the mature communities in the gorges. However, the site in which this and many other sedges grow is the only poorly drained area in the gorges. Thus it is impossible to separate successional factors from edaphic ones.

*Carex cephalophora* Muhl. Present sparingly in the same site as *C. radiata.*

*Carex Jamesii* Schwein. Although not as abundant locally as *C. plantaginea,* this, with *C. albursina,* is the most widely distributed *Carex* in the gorges. Also, like *C. albursina,* it is found on the mesic slopes in all parts of the gorges.

*Carex communis* Bailey. Fairly common in the more openly forested areas. Also present in the treeless areas near Fall Creek Falls.

*Carex hirsutella* Mackenz. Present in the flat, poorly drained area covered with young secondary forest.

*Carex debilis* Michx. var. *pubera* Gray. Present in the same area as *C. hirsutella, C. radiata, C. cephalophora, C. amphibola* var. *globosa,* and *C. intumescens.*

*Carex amphibola* Steud. var. *globosa* Bailey. See note under *C. debilis* var. *pubera.* Rare.

*Carex plantaginea* Lam. This species is abundant in the hemlock and hemlock-yellow birch communities in the narrow portions of the gorges. Sometimes in these communities plants of this species form an almost continuous ground cover. It requires considerable soil for growth, and is not present on boulders unless they are heavily mantled with soil. In this respect it differs from *Polypodium virginianum* of the same community.

*Carex digitalis* Willd. Sparingly present in fairly xeric deciduous forest, as in the oak-hickory community and an area formerly dominated by chestnut.

*Carex albursina* Sheldon. Found in the hemlock-dominated communities, along with *C. plantaginea,* and in mature mixed mesophytic communities. This appears, in the gorges at least, to be a species of mature mesophytic forests.

*Carex intumescens* Rudge. See note under *C. debilis* var. *pubera.*

### Araceae

*Arisaema triphyllum* (L.) Schott. This species is widely scattered in the gorges, but is never abundant. It is found mostly in soil between boulders where there is a considerable collection of humus.

### Juncaceae

*Juncus tenuis* Willd. Present in the flat, poorly drained, formerly cultivated area covered with young secondary forest. Accompanied generally by the species of *Carex* enumerated in the note under *C. debilis* var. *pubera.* Fairly common in this restricted area.

*Juncus effusus* L. var. *solutus* Fern. & Wieg. Only one clone of the species was located. It was present in damp clay soil at the edge of Cane Creek just north of the mouth of Fall Creek. (Identified by A. J. Sharp and C. Gilly.)

LILIACEAE

*Uvularia perfoliata* L. Rather widely distributed throughout the gorges. Most abundant in mixed mesophytic forest.

*Uvularia sessilifolia* L. This species is less abundant, and less widespread than the preceding one. It is most common in xeric communities.

*Erythronium americanum* Ker. Locally common on north and/or east-facing slopes where the soil is well developed, and where the crown cover is not excessively heavy. Most abundant in an area which was once dominated by chestnut and is now in secondary succession.

*Smilacina racemosa* (L.) Desf. Common and widespread in all of the gorges.

*Disporum lanuginosum* (Michx.) Nicholson. Common and widespread in all of the gorges.

*Disporum maculatum* (Buckl.) Britt. Present, but less common than *D. lanuginosum*.

*Polygonatum pubescens* (Willd.) Pursh. Not abundant, but widely distributed.

*Medeola virginiana* L. Present mostly in deciduous forest, especially where the crown cover is not heavy. Abundant only where there is considerable humus.

*Trillium cuneatum* Raf. Rare. Present only in mixed mesophytic stands on north and/or east-facing slopes.

*Trillium recurvatum* Beck. Very rare, found only in a very rich flat area near the junction of Cane Creek and Fall Creek. It is associated there with *T. grandiflorum*, *Orchis spectabilis*, *Carex plantaginea* and seedlings of *Acer saccharum*. This may be near the eastern limit of the distribution of this species in Tennessee.

*Trillium erectum* L. Fairly common in mixed mesophytic stands only.

*Trillium grandiflorum* (Michx.) Salisb. Restricted to the best developed examples of the mixed mesophytic community where the soil is well developed, and humus is abundant.

*Smilax ecirrhata* (Engelm.) S. Wats. Fairly common in low, flat areas near Cane Creek.

*Smilax rotundifolia* L. Common. Present in almost all situations, except in the narrowest portions of the gorges where hemlock is abundant.

*Smilax Bona-nox* L. Fairly common on west and/or south-facing slopes. Rarely found in well-developed hemlock or mixed mesophytic forest.

*Smilax tamnoides* L. var. *hispida* (Muhl.) Fern. Not common. Present usually in more mesophytic situations than other species of *Smilax*, as in the best developed mixed mesophytic stands.

*Smilax glauca* Walt. Apparently present only in the most xeric habitats, as in the oak-hickory and chestnut oak communities on the southwest-facing slopes. Individual plants are usually not well developed.

DIOSCOREACEAE

*Dioscorea quaternata* (Walt.) J. F. Gmel. Common, particularly in mixed mesophytic communities.

AMARYLLIDACEAE

*Hypoxis hirsuta* (L.) Coville. Common along the edge of Cane Creek in the soil between boulders only.

ORCHIDACEAE

*Orchis spectabilis* L. Very rare. Present only in deep humus at the edge of a small spring near the junction of Cane Creek and Fall Creek, mixed mesophytic stand.

*Triphora trianthophora* (Sw.) Rydb. Locally abundant on mesophytic north and/or east-facing slopes in Piney Creek Gulf and Cane Creek Gulf near the junction of the two.

*Goodyera pubescens* (Willd.) R. Br. Fairly common in low, flat, wooded areas near Cane Creek.

SALICACEAE

*Salix caroliniana* Michx. Fairly common along the banks of Cane Creek. Apparently absent elsewhere.

JUGLANDACEAE

*Juglans cinerea* L. Common only in sites which have previously been clean-cut only, or clean-cut and cultivated. In the gorges an abundance of this species appears to indicate secondary succession.

*Juglans nigra* L. Rare. Sometimes a component of well-developed mesophytic communities. Probably most abundant in an area once dominated by chestnut.

*Carya cordiformis* (Wang.) K. Koch. Common. This is a member of the mixed mesophytic, hemlock-basswood, oak-hickory, and secondary seral stands.

*Carya ovata* (Mill.) K. Koch. Fairly common. Present in the same situations as *C. cordiformis* but never as abundant.

*Carya tomentosa* Nutt. Rare, but widely distributed.

*Carya glabra* (Mill.) Sweet. Common to abundant in mixed mesophytic, hemlock, oak-hickory and chestnut oak stands.

*Carya ovalis* (Wang.) Sarg. Rare or absent except in the oak-hickory community, where it is common.

CORYLACEAE

*Corylus americana* Walt. Present in a low-grade mesophytic stand on a south-facing slope in the Piney Creek Gulf. Absent elsewhere.

*Ostrya virginiana* (Mill.) K. Koch. Common throughout the gorges except in the narrowest portions.

*Carpinus caroliniana* Walt. Less common than *Ostrya virginiana* and present mostly in xerophytic sites.

*Betula lutea* Michx. f. Abundant in the narrow portions of all the gorges, where it is second only to hemlock in abundance among the arborescent species.

*Alnus serrulata* (Ait.) Willd. Common in some sites along the creeks where shading is not excessive. Otherwise absent.

FAGACEAE

*Fagus grandifolia* Ehrh. A dominant species in all of the mixed mesophytic communities, occupying the most favorable sites.

*Castanea dentata* (Marsh.) Borkh. Present only as rare seedlings and saplings. No fruit-bearing trees were found within the gorges. Formerly so abundant in one gentle northeast-facing slope as to earn the name "chestnut orchard" for the site.

*Quercus alba* L. Present in mixed mesophytic stands, abundant in west and/or south-facing slopes.

*Quercus Prinus* L. Abundant high on west and/or south-facing slopes near the cliffs. This species is the sole dominant of the most xeric stands within the gorges. It is abundant only in habitats directly exposed to noonday and afternoon sun.

*Quercus rubra* L. Fairly common throughout except in the narrowest portions of the gorges.

*Quercus velutina* Lam. Generally rare. Present in xeric habitats.

ULMACEAE

*Ulmus rubra* Muhl. Fairly common in the mixed mesophytic stands.

*Ulmus americana* L. Fairly common in flat areas in the broad portions of the gorges. Not as common as *U. rubra* in the mixed mesophytic stands.

*Ulmus Thomasi* Sarg. (D. W. Pfitzer). U. T. no 3187. "Along Cane Creek near junction with Falls Creek."

*Ulmus alata* Michx. Rare. Present mostly in xeric habitats, and in secondary seres.

*Celtis occidentalis* L. Rare. Present mostly in secondary seres.

MORACEAE

*Morus rubra* L. Found only in an area which had formerly been cultivated and had served as a sawmill site.

URTICACEAE

*Laportea canadensis* (L.) Wedd. Common in mixed mesophytic and hemlock-dominated stands, frequently accounting for most of the herb cover.

ARISTOLOCHIACEAE

*Asarum canadense* L. Rare. Present mostly in scattered colonies on north and/or east-facing slopes.

*Aristolochia durior* Hill. Common on the north-facing slope of the wider part of Piney Creek Gulf. Absent elsewhere. The site at which it is present is also that supporting the greatest abundance of *Aesculus octandra*.

POLYGONACEAE

*Tovara virginiana* (L.) Raf. Rare and scattered throughout.

*Polygonum sp.* Rare and scattered. Usually found in low, flat areas near the creeks.

PORTULACACEAE

*Claytonia caroliniana* Michx. Present in a very rich mesic area near the junction of Cane Creek and Fall Creek.

CARYOPHYLLACEAE

*Stellaria pubera* Michx. Present in same site as *Claytonia caroliniana*, but somewhat more widespread.

*Silene rotundifolia* Nutt. Present on sandstone boulders in Fall Creek Gulf. This species may also be present in the narrow portions of the other gorges. Collections in the herbarium of the University of Tennessee indicate that it is largely confined to the western margin of the Cumberland Plateau.

RANUNCULACEAE

*Ranunculus recurvatus* Poir. (H. H. Iltis). U. T. no. 3158. "Rich mixed woods of Cane Creek Gorge."

*Trautvetteria caroliniensis* (Walt.) Vail. Rare. Apparently present only along the edge of Cane Creek.

*Anemonella thalictroides* (L.) Spach. Common in mixed mesophytic stands. Generally absent elsewhere.

*Hepatica americana* (DC.) Ker. Rare. Less common than *H. acutiloba* with which it is sometimes found. Usually, however, *H. americana* is on south and/or west-facing slopes, whereas *H. acutiloba* is common on slopes facing east and/or north.

*Hepatica acutiloba* DC. See note under *Hepatica americana*.

*Anemone quinquefolia* L. Rare. Present mostly on gentle, humus-covered north and/or west-facing slopes.

*Clematis virginiana* L. Very rare. An individual of this species was noted only once. It was collected on a north-facing slope near Piney Creek Falls.

*Aquilegia canadensis* L. Fairly common on cliffs and on very steep talus slopes.

*Delphinium tricorne* Michx. Rare. Mostly present in rich mixed mesophytic stands only.

*Cimicifuga racemosa* (L.) Nutt. Present in scattered, localized colonies at base of cliffs, and along creek banks.

*Actaea pachypoda* Ell. Fairly common in mixed mesophytic stands.

*Xanthorhiza simplicissima* Marsh. Abundant along the creeks, forming a border. Absent elsewhere.

BERBERIDACEAE

*Podophyllum peltatum* L. Scattered. At no place in the gorges is this a dominant species in the herb layer.

*Caulophyllum thalictroides* (L.) Michx. Rare. Scattered in mixed mesophytic stands.

MAGNOLIACEAE

*Magnolia acuminata* L. Rare. Present in mixed mesophytic stands.

*Magnolia macrophylla* Michx. Scattered. Fairly common only in Cane Creek Gulf along the east side of Cane Creek.

*Magnolia tripetala* L. Fairly common only in the narrow portions of the gorges where hemlock and yellow birch are abundant. Elsewhere generally absent.

*Liriodendron Tulipifera* L. The most widespread tree species in the gorges. Occurring in all situations, yet abundant only in secondary seres.

CALYCANTHACEAE

*Calycanthus fertilis* Walt. Common, and widespread.

ANNONACEAE

*Asimina triloba* (L.) Dunal. Fairly common, particularly on east and/or north-facing slopes.

LAURACEAE

*Sassafras albidum* (Nutt.) Nees. Scattered and widespread. Most common on the more xeric south and/or west-facing slopes where oaks and hickories are also abundant.

*Lindera Benzoin* (L.) Blume var. *pubescens* (Palmer and Steyerm.) Rehd. Fairly common and widespread.

PAPAVERACEAE

*Stylophorum diphyllum* (Michx.) Nutt. Rare. Present in mixed mesophytic stands.

*Dicentra Cucullaria* (L.) Bernh. Fairly common locally in rich mixed mesophytic stands.

CRUCIFERAE

*Dentaria diphylla* Michx. Fairly common in rich mixed mesophytic stands and east and/or north-facing slopes. This species is found generally in the same situation as *D. laciniata*, but is not as abundant.

*Dentaria laciniata* Muhl. See note under *Dentaria diphylla*.

CRASSULACEAE

*Sedum pulchellum* Michx. Very rare and scattered.

*Sedum ternatum* Michx. Locally abundant throughout on moss-covered sandstone boulders.

SAXIFRAGACEAE

*Saxifraga virginiensis* Michx. Fairly common at the base of cliffs, and on boulders in wet areas. Specimens were collected on May 3 which were in full bloom, but were diminutive.

*Tiarella cordifolia* L. Common and widespread. Most abundant in mixed mesophytic stands.

*Heuchera villosa* Michx. Collected only at base of bluff near Fall Creek Falls. Relative abundance and distribution not noted.

*Heuchera parviflora* Bartl. var. *Rugelii* (Shuttlw.) Rosend., Butt. and Lak. Same data as for *H. villosa*.

*Heuchera americana* L. Fairly common along relatively exposed, damp cliffs.

*Hydrangea arborescens* L. *Hydrangea* is fairly common throughout except in xeric habitats. Specimens have been collected in the gorges referable to *H. arborescens* L. var. *Deamii* St. John.

*Itea virginica* L. Fairly common along the creeks, especially on islands.

*Ribes cynosbati* L. Abundant in communities dominated by hemlock.

HAMAMELIDACEAE

*Hamamelis virginiana* L. Common in mixed mesophytic and oak-hickory stands. Rare or absent in other communities.

*Liquidambar Styraciflua* L. Present in mixed mesophytic communities. Common only in secondary seres. This species is an important member of the stand developing in a formerly cultivated plot.

PLATANACEAE

*Platanus occidentalis* L. Scattered individuals present along the creeks.

ROSACEAE

*Spiraea virginiana* Britt. A few individuals present on a small island in Cane Creek about 300 yards northwest of the junction of Cane Creek and Fall Creek.

*Amelanchier arborea* (Michx. f.) Fern. Rare and scattered.

*Crataegus* sp. Present only on xeric south and/or west-facing slopes in oak-hickory and chestnut oak stands.

*Potentilla canadensis* L. Fairly common in secondary seres. Not present in heavily wooded sites.

*Geum canadense* Jacq. Scattered widely in areas dominated by deciduous species.

*Rubus phoenicolasius* Maxim. Two large colonies of plants of this species are present in the secondary stand which is developing on a formerly cultivated plot.

*Rubus occidentalis L.* Present in small colonies on east and/or north-facing slopes in some localities in which there is absence of tree cover.

*Rubus canadensis* L. Scattered colonies on xeric south and/or west-facing slopes. Other species of *Rubus* were collected, but have not been identified. These were mostly in habitats similar to that of *R. canadensis.*

*Agrimonia rostellata* Wallr. Common only in secondary seres and along old, abandoned logging roads.

*Agrimonia pubescens* Wallr. Present in secondary seres.

*Prunus serotina* Ehrh. Rare throughout. No large trees of this species were noted.

LEGUMINOSAE

*Cercis canadensis* L. Not very abundant but present in most stands except those dominated by hemlock.

*Cladrastis lutea* (Michx. f.) K. Koch. Fairly common. Present mostly on on upper, rocky zone of north and/or east-facing slopes.

*Robinia Pseudo-Acacia* L. Scattered throughout. Most common on xeric south and/or west-facing slopes.

*Desmodium nudiflorum* (L.) DC. Widely scattered and rather common in stands dominated by deciduous trees. This is one of the most prominent herbaceous species in the oak-hickory community.

*Desmodium glutinosum* (Muhl.) Wood. Fairly common and widespread.

*Desmodium canadense* (L.) DC. Noted only in secondary seres.

*Desmodium cuspidatum* (Muhl.) Loud. Noted only in the oak-hickory community.

OXALIDACEAE

*Oxalis montana* Raf. Fairly common on mesic slopes near the junction of Fall Creek and Cane Creek. This may be a significant extension of the range of this species. Collections in the herbarium of the University of Tennessee are from Johnson and Sevier Counties only.

*Oxalis grandis* Small. Rare. Present in mixed mesophytic stands.

GERANIACEAE

*Geranium maculatum* L. Rare. Present in mixed mesophytic stands.

EUPHORBIACEAE

*Euphorbia mercurialina* Michx. Rare. Present in the oak-hickory community in xeric sites among sandstone boulders. Absent elsewhere.

BUXACEAE

*Pachysandra procumbens* Michx. Rare. Present mostly on the northwest-facing slope of Piney Creek Gulf near Cane Creek Gulf.

ANACARDIACEAE

*Rhus radicans* L. Common throughout.

AQUILFOLIACEAE

*Ilex opaca* Ait. Common in mixed mesophytic and hemlock-dominated stands.

CELASTRACEAE

*Euonymus americanus* L. Abundant in mixed mesophytic stands, but not present in other communities.

STAPHYLEACEAE

*Staphylea trifolia* L. Present in the deep, narrow portions of the gorges in hemlock-dominated stands.

ACERACEAE

*Acer pensylvanicum* L. Common in the deep narrow gorges, and in other areas which are shaded by cliffs most of the afternoon. This species is probably near the western limit of its distribution in Tennessee. It has been collected in Franklin County (Shanks, 1953).

*Acer saccharum* Marsh. Common in mixed mesophytic stands in favorable sites.

*Acer rubrum* L. Common throughout except in consociations of hemlock, and in oak-hickory stands.

HIPPOCASTANACEAE

*Aesculus octandra* Marsh. Generally rare. Common only on the northwest-facing slope of Piney Creek Gulf. The largest individual trees in the gorges belong to this species.

BALSAMINACEAE

*Impatiens pallida* Nutt. Rare. Found sometimes in habitats similar to those of *I. capensis* but rarer than the latter.

*Impatiens capensis* Meerb. Present locally growing in rich humus soil in mixed mesophytic and hemlock-dominated stands.

RHAMNACEAE

*Rhamnus caroliniana* Walt. Very rare. Only one individual of this species was noted. It is in a formerly cultivated plot in the Cane Creek Gulf.

VITACEAE

*Parthenocissus quinquefolia* (L.) Planch. Fairly common everywhere except in the oak-hickory community.

*Vitis aestivalis* Michx. Rare and scattered. Some specimens were referable to *V. aestivalis* Michx. var. *argentifolia* (Munson) Fern.

*Vitis rotundifolia* Michx. Fairly common throughout. Most abundant in the oak-hickory community trailing on exposed heaps of sandstone boulders.

TILIACEAE

*Tilia heterophylla* Vent. Abundant on north and/or east-facing slopes. These trees were referred to *T. heterophylla* even though the leaves on lower branches were not typically covered with a tomentum, as were those of the upper branches.

THEACEAE

*Stewartia ovata* (Cav.) Weath. Fairly rare, but widely distributed. Most common in the oak-hickory community.

VIOLACEAE

*Hybanthus concolor* (T. F. Forst.) Spreng. Rare. Collected only in a formerly cultivated plot.

*Viola cucullata* Ait. Individuals of this species in flower were collected on the northeast-facing talus of Cane Creek Gulf near Piney Creek Gulf. During most of the study, the acaulescent violets were not in flower and were not indentified to species. Therefore, the relative abundance and distribution of the non-flowering acaulescent violets which could not be readily determined in the field were not determined.

*Viola papilionacea* Pursh. Collected in a mixed mesophytic stand in Cane Creek Gulf. (See note under *V. cucullata*.)

*Viola blanda* Willd. Common along the creeks and in low, wet places (sometimes on decaying stumps) in the deep, narrow portions of the gorges.

*Viola primulifolia* L. Rare. One colony only found on the northwest-facing slope of Cane Creek Gulf near Fall Creek Gulf.

*Viola hastata* Michx. Rather rare, but widely distributed throughout except in the most xeric habitats.

*Viola pensylvanica* Michx. var. *leiocarpa* (Fern. & Wieg.) Fern. Fairly common only in rich mixed mesophytic stands with abundant humus.

*Viola canadensis* L. Fairly common in habitats with deep humus mostly on north and/or west-facing slopes.

*Viola conspersa* Reichenb. Fairly common throughout except in xeric habitats.

*Viola rostrata* Pursh. Present mostly on steep slopes in sites free from shading, as the steep east-facing slope just north of Fall Creek Falls.

PASSIFLORACEAE

*Passiflora lutea* L. Very rare.

NYSSACEAE

*Nyssa sylvatica* Marsh. Fairly common except in the hemlock-dominated stands. Most common in the oak-hickory community.

ARALIACEAE

*Aralia spinosa* L. Present in the deepest, narrowest portions of the gorges only.

*Panax quinquefolius* L. Very rare and scattered. Apparently not restricted to any definite habitat.

*Panax trifolius* L. Locally common in mixed mesophytic stands.

UMBELLIFERAE

*Sanicula gregaria* Bickn. Fairly common throughout in deciduous stands.

*Sanicula trifoliata* Bickn. Present only in mesic sites. In the gorges this species does not appear to tolerate a xeric habitat as well as *S. gregaria*.

*Sanicula canadensis* L. Collected only in secondary seres. Status otherwise unknown.

*Osmorhiza Claytoni* (Michx.) C. B. Clarke. Common in the former "chestnut orchard" which was almost clean-cut in 1921 or 1922. Absent or rare elsewhere. This may indicate an affinity of the species for some stage of secondary succession in mixed mesophytic forest.

*Erigenia bulbosa* (Michx.) Nutt. Locally common throughout.

*Cicuta maculata* L. Rare. Found only along the edges of Cane Creek.

*Cryptotaenia canadensis* (L.) DC. Present in the site of a formerly cultivated plot. Rare and scattered in mixed mesophytic stands.

CORNACEAE

*Cornus florida* L. Common in mixed mesophytic and oak-hickory stands. Absent or very rare in stands dominated by either hemlock or chestnut oak (*Quercus Prinus* L.).

*Cornus stolonifera* Michx. (R. E. Shanks and H. H. Iltis). U. T. no. 3397. "Gorge at mouth of Falls Creek."

*Cornus alternifolia* L.f. Fairly common in the narrow portions of the gorges only, or in portions shaded most of the afternoon.

PYROLACEAE

*Chimaphila maculata* (L.) Pursh. Rare. Present mostly in fairly xeric habitats.

ERICACEAE

*Rhododendron maximum* L. Abundant wherever hemlock was the dominant species. Generally absent elsewhere.

*Rhododendron arborescens* (Pursh) Torr. Scattered in the oak-hickory community.

*Kalmia latifolia* L. Abundant in stands dominated by species of oak or hickory (south and/or west-facing slopes). Otherwise absent or rare.

*Oxydendrum arboreum* (L.) DC. Present and fairly common in every community except in secondary seres, where it is absent. Next to *L. Tulipifera*, this is the most widely distributed tree species.

*Epigaea repens* L. Present in localized xeric, sandy, exposed habitats, especially on ledges of cliffs.

*Gaultheria procumbens* L. Present in much the same habitats as *Epigaea repens*.

*Gaylussacia baccata* (Wang.) K. Koch. Fairly common on xeric south and/or west-facing slopes.

*Vaccinium arboreum* Marsh. Same general distribution as *Gaylussacia baccata*, but more common. A prominent feature of the oak-hickory and chestnut oak community, this species is sometimes found in mixed mesophytic and hemlock-dominated stands.

*Vaccinium stamineum* L. Fairly common. Same general distribution as *G. baccata*.

*Vaccinium vacillans* Torr. Fairly common. Same general distribution as *G. baccata*.

*Vaccinium corymbosum* L. Rare. Same general distribution as *G. baccata*.

*Polycodium candicans* Small. (Small, 1933) Rare. Same general distribution as *G. baccata*.

PRIMULACEAE

*Lysimachia* sp. Rare in openings in mixed mesophytic stands. Fairly common in formerly cultivated plot.

EBENACEAE

*Diospyros virginiana* L. Rare. Present only in the oak-hickory community.

OLEACEAE

*Fraxinus americana* L. var. *biltmoreana* (Beadle) J. Wright. Present in mixed mesophytic, oak-hickory, and secondary seral stands. Not common anywhere.

*Fraxinus pennsylvanica* Marsh. (H. H. Iltis). U. T. no. 3229. "Bottom of Cane Creek Gorge."

LOGANIACEAE

*Spigelia marilandica* L. Present along the edge of Cane Creek and in the oak-hickory community.

ASCLEPIADACEAE

*Asclepias quadrifolia* Jacq. Rare. Collected on a northwest-facing slope in Cane Creek Gulf in a mixed mesophytic stand. No pattern of distribution noted.

POLEMONIACEAE

*Phlox divaricata* L. Fairly common in mixed mesophytic stands. Absent elsewhere.

*Phlox glaberrima* L. Rare. Present along the edge of Cane Creek near the mouth of Piney Creek.

HYDROPHYLLACEAE

*Hydrophyllum canadense* L. Fairly common in mixed mesophytic stands. Absent elsewhere.

*Phacelia bipinnatifida* Michx. Fairly common in the mixed mesophytic stands and in some of the hemlock-dominated stands. Otherwise absent.

BORAGINACEAE

*Cynoglossum virginianum* L. Rare. Generally restricted to north and/or east-facing slopes. Fairly common in a formerly cultivated area only.

VERBENACEAE

*Verbena urticifolia* L. Rare. Collected in a formerly cultivated area only.

LABIATAE

*Prunella vulgaris* L. var. *lanceolata* (Bart.) Fern. Fairly common along the edges of the creeks.

*Pycnanthemum* sp. Rare. Collected in a formerly cultivated area only.

*Collinsonia canadensis* L. Rare. Present in the dry beds of the creeks in midsummer.

SOLANACEAE

*Physalis heterophylla* Nees var. *nyctaginea* (Dunal) Rydb. Rare. Collected in the formerly cultivated area only.

SCROPHULARIACEAE

*Chelone glabra* L. var. *elatior* Raf. Rare. Present along the edges of Cane Creek and Piney Creek.

*Gerardia* sp. Rare. Present in the oak-hickory stand. No member of this genus was found elsewhere.

*Pedicularis canadensis* L. Rare. Present in the formerly cultivated area only.

BIGNONIACEAE

*Bignonia capreolata* L. Rare to fairly common in all communities. Usually represented by small individuals only.

OROBANCHACEAE

*Conopholis americana* (L.) Wallr. Rare. Present in moist, low, mixed mesophytic stands where beech is common.

ACANTHACEAE

*Ruellia humilis* Nutt. Rare. Collected in the oak-hickory communities only.

RUBIACEAE

*Galium Aparine* L. (H. H. Iltis and N. H. Russell). U. T. no. 3166. "Rich mesophytic woods of Cane Creek Gorge."

*Galium triflorum* Michx. Rare. Collected in the formerly cultivated area only.

*Galium circaezans* Michx. Fairly common and widespread.

*Galium latifolium* Michx. Rare. Collected in the secondary seres only.

*Mitchella repens* L. Abundant in stands dominated by hemlock, common in mixed mesophytic stands, and absent in all other communities.

*Cephalanthus occidentalis* L. Fairly common along the creeks.

*Houstonia purpurea* L. Rare. Collected in the formerly cultivated area only.

CAPRIFOLIACEAE

*Viburnum rufidulum* Raf. Rare. Collected on the northeast-facing slope of Cane Creek Gulf. Not nearly as common as *V. acerifolium*.

*Viburnum dentatum* L. Very rare. Collected in Fall Creek Gulf near Fall Creek Falls.

*Viburnum acerifolium* L. Common in all communities.

*Sambucus pubens* Michx. Rare. Present in the narrowest portions of the gorges, or in cliff-shaded habitats in the wider portions. This is the only site in the Cumberlands from which the species has been reported (Shanks, 1953).

CAMPANULACEAE

*Campanula americana* L. Rare. Usually present in low places near the creeks.

*Campanula divaricata* Michx. Rare. Steep slope by path leading into Fall Creek Falls northwest of the falls.

*Lobelia cardinalis* L. Rare. Present in the dry creek beds in summer.

COMPOSITAE

(Notes dealing with the Compositae are not as complete in most cases as those for the other groups. Chief reasons are the inability of the author to identify many composites except in flower or fruit, and the paucity of field work done in the autumn when most composites are flowering.)

*Vernonia* sp. Rare. A few plants present in the formerly cultivated area only.

*Elephantopus carolinianus* Willd. Absent from all areas except the formerly cultivated area, where it is fairly common.

*Eupatorium dubium* Willd. Fairly common throughout in areas not heavily shaded, as near the creeks in some places, and in parts of the oak-hickory and chestnut oak communities.

*Eupatorium rugosum* Houtt. Rare. Present as scattered individuals along the creeks.

*Eupatorium coelestinum* L. Rare. Confined to the oak-hickory community.

*Solidago caesia* L. Fairly common throughout.

*Solidago Curtisii* T. & G. Collected on northeast-facing slope in Cane Creek Gulf in a mixed mesophytic stand.

*Solidago juncea* Ait. Collected near the pool at the foot of Fall Creek Falls.

*Solidago patula* Muhl. Collected on the northeast-facing slope in Cane Creek Gulf in a mixed mesophytic stand.

*Solidago rugosa* Ait. Collected from the base of a cliff near Piney Falls.

*Aster divaricatus* L. Fairly common throughout in mesic habitats.

*Aster Lowrieanus* Porter. Collected near the pool at the foot of Fall Creek Falls.

*Aster sagittifolius* Wedemeyer. Collected on steep, east-facing slope just northwest of Fall Creek Falls.

*Aster lateriflorus* (L.) Britt. Collected on the bank of Cane Creek near the mouth of Piney Creek. Fairly common at that locality.

*Antennaria plantaginifolia* (L.) Hook. Abundant in the chestnut oak community. Absent elsewhere.

*Antennaria solitaria* Rydb. Rare. Confined to stands dominated by hemlock.

*Polymnia canadensis* L. Fairly common throughout.

*Heliopsis helianthoides* (L.) Sweet. Collected in a low, moist, flat area near Cane Creek.

*Rudbeckia umbrosa* C. L. Boynt. & Beadle. Collected on the west bank of Cane Creek just south of the mouth of Piney Creek.

*Helianthus decapetalus* L. Collected on the bank of Piney Creek near Cane Creek.

*Helianthus microcephalus* T. & G. Collected in a low, mesic area near Cane Creek.

*Actinomeris alternifolia* (L.) DC. Fairly common in areas in which shading is not excessive.

*Coreopsis tripteris* L. Collected in a mesic area near Cane Creek.

*Senecio* sp. Fairly common in the oak-hickory and chestnut oak communities.

*Arctium* sp. Rare. Confined to the formerly cultivated area.

*Taraxacum* sp. Very rare. Confined to the formerly cultivated area.

*Prenanthes alba* L. Fairly common in mixed mesophytic stands. Absent elsewhere.

*Hieracium venosum* L. Rare. Present only in oak-hickory and chestnut oak communities.

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## News of Tennessee Science

(*Continued from Page* 82)

*Tennessee Eastman Company:*

James Guillet has returned to the Research Laboratories at Tennessee Eastman Company after an absence of two and one-half years. During this time he completed the requirements for his Ph.D. degree at Cambridge University in England.

Dr. Gilbert Henri Amat of Paris, France, was a recent visitor at Tennessee Eastman Company. Dr. Amat, who is in this country for one year as a representative of the French National Research Council, was much impressed by the cooperation between industry and colleges in the United States. He feels that this cooperation is one of the main differences in research in France and the U. S. He also noted that American laboratories have better equipment and employ more advanced methods.

Troubled for years by pesky starlings, Tennessee Eastman Company has tried various ways of chasing them from the plant area without noticeable success. They still frequent buildings and lines, making it hazardous for pedestrians and owners of freshly washed cars. Another idea for getting rid of starlings is now being tried. A distress call is sent out and the birds don't like it. The reason: it's their own distress call, the sound they make when hurt or captured. TEC is trying out a "Bird-E-Vict," an amplifying device through which a metal tape is run. Sounds from the tape blare out through two loudspeakers. The equipment is set up where the starlings roost. When they are comfortably settled, the Bird-E-Vict is started and the birds fly off. After the birds are given time to settle down again, the distress call is repeated. The main problem is that there are many flocks that roost in the area. Another flock may fly in and take the place of a group which has successfully been routed.

(*Continued on Page* 113)