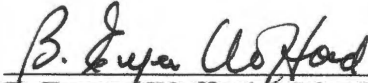


To the Graduate Council:

I am submitting herewith a thesis written by Chris A. Fleming entitled "The Vascular Flora of Fall Creek Falls State Park, Van Buren and Bledsoe Counties, Tennessee." I have examined the final paper copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Botany.

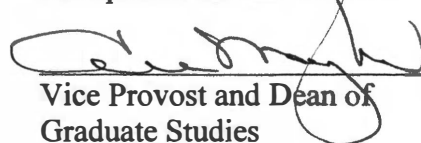

B. Eugene Wofford, Major Professor

We have read this thesis and
recommend its acceptance:





Acceptance for the Council:


Vice Provost and Dean of
Graduate Studies

Thesis
2003
.F54

**The Vascular Flora of Fall Creek Falls State Park,
Van Buren and Bledsoe Counties, Tennessee.**

A Thesis Presented for the
Master of Science Degree

The University of Tennessee,
Knoxville

Chris A. Fleming
August 2003

Dedication

This thesis is dedicated to my family for all of their support throughout my seemingly endless education and Dr. Ralph L. Thompson for opening my eyes to the wonders of botany.

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Abstract

A vascular plant inventory of Fall Creek Falls State Park (FCFSP), Van Buren and Bledsoe Counties, Tennessee was conducted during the growing seasons of 2001 and 2002. The park encompasses ca. 8,900 ha on the western escarpment of the Cumberland Plateau. A total of 881 taxa from 131 families were documented during this survey. Of these taxa, 301 were determined to be county records for either Van Buren or Bledsoe County, Tennessee. Non-native species are represented by 110 taxa, which is 12% of the total flora. Seventeen Federal or State listed taxa were documented, including *Nestronia umbellula*, which represents a physiographic record for the Cumberland Plateau in Tennessee. Voucher specimens were deposited in the herbarium of the University of Tennessee (TENN).

A total of 17 plant communities and eight microhabitats were delineated and described during this study.

An analysis of distribution trends was conducted to assess geographic affinities of the flora. The majority of the taxa (80%) lie within their distribution ranges with the rest either being extraneous (4%), endemic (3%), or non-native (12%).

A floristic comparison was conducted to compare the species richness of FCFSP to other previously surveyed areas on the Cumberland Plateau in Tennessee. This comparison demonstrated that this park has the second highest richness value of those sites.

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Introduction

We all live on a planet that is constantly changing and it can never be considered a static entity that has reached an equilibrium state. Whether these environmental changes are attributed to climate, humans, animals, or natural processes, they cannot be overlooked in regards to their impact. The role of humans has been documented throughout history and we are just beginning to realize to what extent our actions have and are presently shaping the ecosystems that exist today. It is well documented that native peoples, which inhabited North America prior to the arrival of Europeans, may have changed the landscape in many parts of this country (Delcourt & Delcourt 1997, Delcourt & Delcourt 1998, Delcourt *et al.* 1998, Vale 2002). Those landscape manipulations were likely for agriculture, hunting, increasing forest yields of specific timbers, and in constructing palisades for defensive measures against other groups of people. Unfortunately, in recent history the extent and severity of impact has been on a much vaster scale than in the past 15,000 years.

At present, humans are altering the landscape for reasons that can include: development, transportation, agriculture, fire suppression, and silviculture. Inadvertent or sometimes intentional, human introductions of foreign species from other parts of the world can possibly be detrimental to organisms or native ecosystems of North America. With these factors in mind, it becomes evident that preservation and protection of natural areas in North America is an imperative ecological action that needs to be pursued on a broad scale. If the high diversity of ecosystems in North America is to persist into the

future, representative areas must be preserved and maintained to protect the diversity and genetic integrity of taxa. Before such actions can be successful, natural ecosystems must be studied to provide information on both common and rare organisms and also on natural ecosystem cycles (i.e. fire regimes, climate influences).

Floristic studies have been performed all over the world for centuries and their importance has not waned, while respect for this type of work has. Palmer *et al.* (1995) feel that “floristic data are becoming more important for regional biological inventories, impact assessment, research, management decisions, and policy formation.” Unfortunately, the current trends in academia have shifted away from the natural science perspective of organisms and their communities and have instead focused more upon the molecular and cellular perspective. “The institutions that finance scientific research, be they governmental or private, are drawn to the leaders in any given field and may wrongly assume that the natural historian has comparatively little to contribute” (Wilcove and Eisner 2000). The belief that this type of taxonomic-based work is out-dated and irrelevant is unfortunate and in time its importance will become more apparent as the existing experts in traditional taxonomy and floristic botany retire or pass on. I hope to be among the relatively small group of people that continue along the paths that have been laid down in this field, while incorporating new techniques and technology. With this in mind, a floristic inventory was conducted within the boundaries of Fall Creek Falls State Park (FCFSP), Van Buren and Bledsoe Counties, Tennessee. This project will hopefully provide a service to the state of Tennessee and all parties interested in the flora of the Cumberland Plateau.

Fall Creek Falls State Park lies on the Western Escarpment of Cumberland Plateau (*sensu* Fenneman 1938) and is located 3.5 km east of Spencer, Tennessee. Presently, the park encompasses ca. 8900 ha. Recent purchases and land acquisitions have increased the total area of the park by more than 2400 ha in the past 4 years. Donald Caplenor (1965) originally studied the vegetation of the gorges located in FCFSP. This work was quite detailed, but included only the gorges owned by the park in the mid-1950's and predominately focused on woody vegetation. Many of his notes on herbaceous vegetation included only a generic level of identification. He published a list of the vascular plants of the gorges (Caplenor 1955, 1978) encountered while sampling the vegetation. However, this list is deemed incomplete by numerous botanists (Allawos 1994, Shaw 2001) since it included only the plants in the gorges, largely ignored the plateau surface, and many difficult plant groups such as grasses and sedges.

This vascular plant inventory includes a thorough survey of the gorges, plateau surface, and cliff faces within both the original park boundaries and newly acquired areas. This study provides much-needed baseline botanical information for FCFSP, which is in accordance with the Master Plan for Tennessee State Parks (TDEC 1999). Information pertaining to relative abundance and preferred habitat(s) for each taxon will aid with future management decisions. A general delineation of the plant communities, with associated taxa, is provided here in order to aid in the identification of habitats in need of protection or monitoring and to provide land managers with an overview of the forest types found within the park. An analysis of geographical distribution for each

plant species assists in the understanding of the origins of the present day vegetation and the existence of taxa that are disjunct from their usual distribution ranges. Comparison of the species richness recorded within FCFSP relative to other reserves on the Cumberland Plateau provides a baseline to help analyze the amount of protection afforded to the components of the Cumberland Plateau flora by this reserve. The lasting impacts of non-native plant species on the environment are just now being realized and information within this document pertaining to the presence and abundance of these species may prove valuable for eradication and management programs. Finally, the current land-use trends of areas surrounding the park were studied to better understand the importance of preserves such as this one in an ever-changing landscape.

Chapter 1: Study Area

Location

Fall Creek Falls State Park (FCFSP) is located in east-central Tennessee (Figure 1). The majority of the park is in the eastern part of Van Buren County with the remaining area situated on the western boundary of Bledsoe County (Figure 2). It lies between 35°35'55" and 35°45'42" N latitudes and 85°20'18" and 85°26'39" W longitudes. This park is situated within the Cumberland Plateau Physiographic Province as described by Fenneman (1938) (Figure 3). Topographic coverage includes portions of five Tennessee USGS 7.5 minute quadrangles: Bald Knob, Lonewood, Spencer, Sampson, Smartt-Mountain, and Brockdale.

The nearest small cities in the vicinity of the park are Spencer, Sparta, Dayton, McMinnville, and Crossville. The city of Spencer, which is located ca. 3.5 km west of the park, is in closest proximity to the park. The other cities are located nearly equal distances from the park, approximately 37 km away as measured from a straight line originating from the center of the park. The nearest metropolitan cities, Nashville and Knoxville, TN, respectively located 176 km west and 207 km east of the park, are roughly a 2-hour drive from the park.

Park History

The protection of this area was initiated by the National Park Service in 1935 and resulted in the purchase of 6,384 hectares of land from private landowners. This original

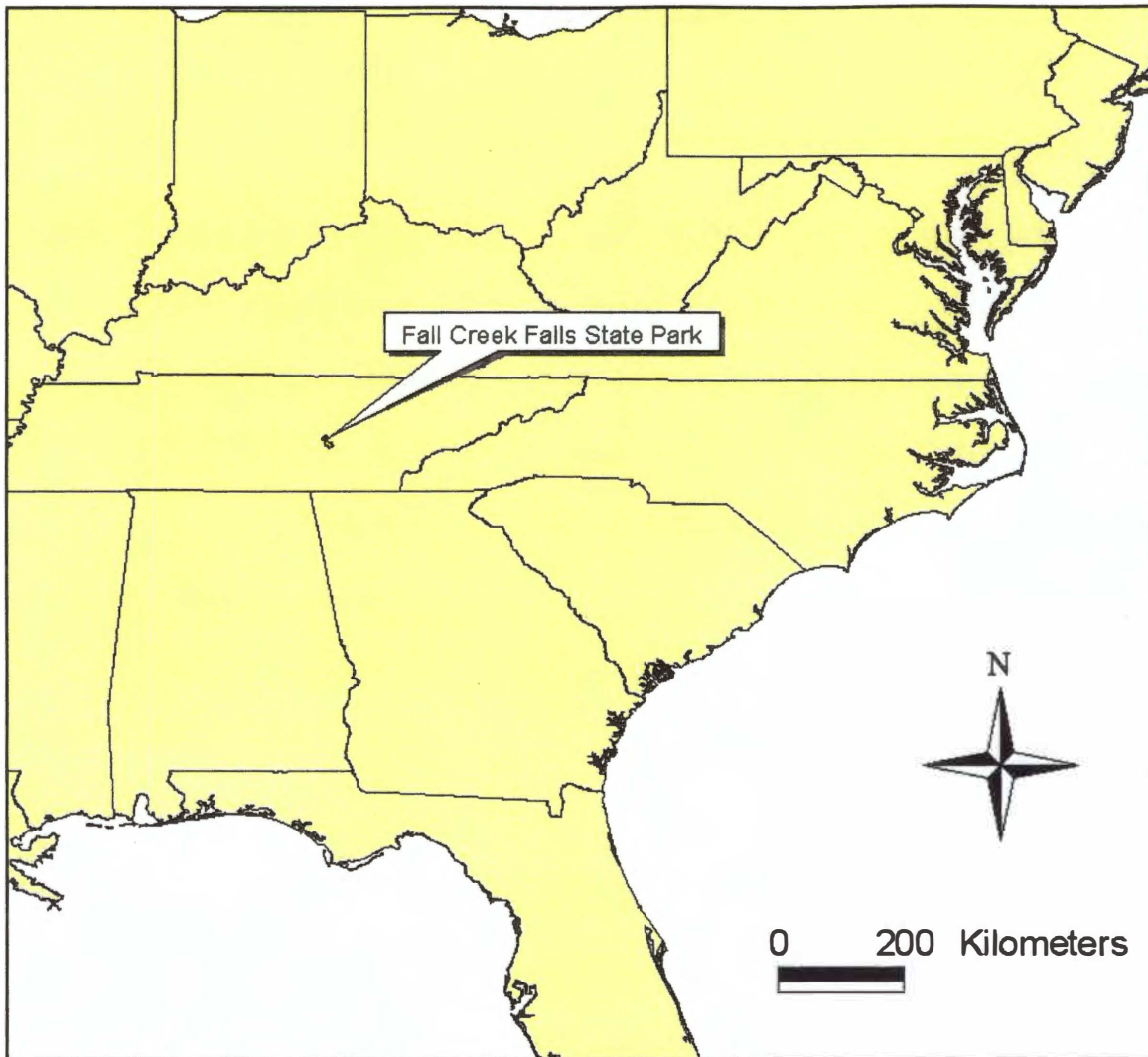


Figure 1. Location of FCFSP in United States.

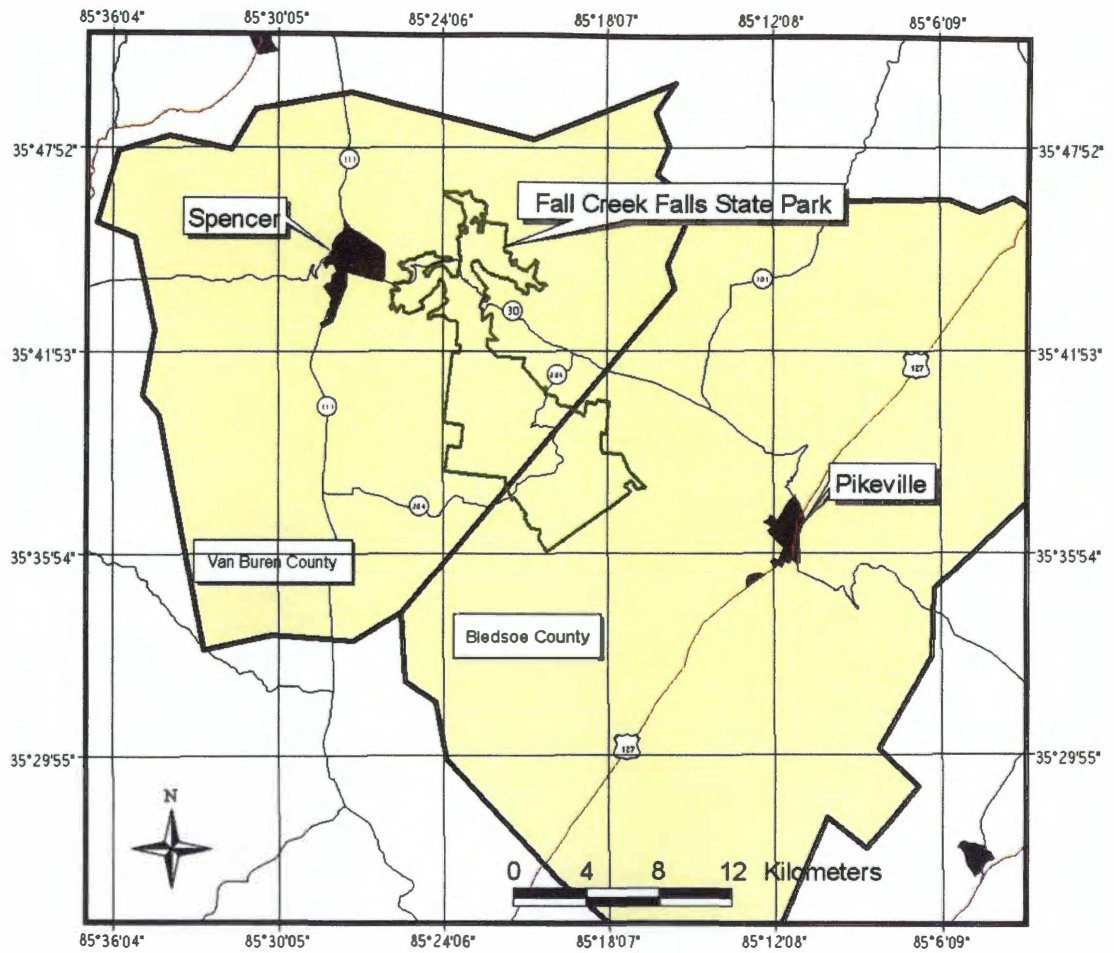


Figure 2. Location of FCFSP, Van Buren and Bledsoe Counties, Tennessee.

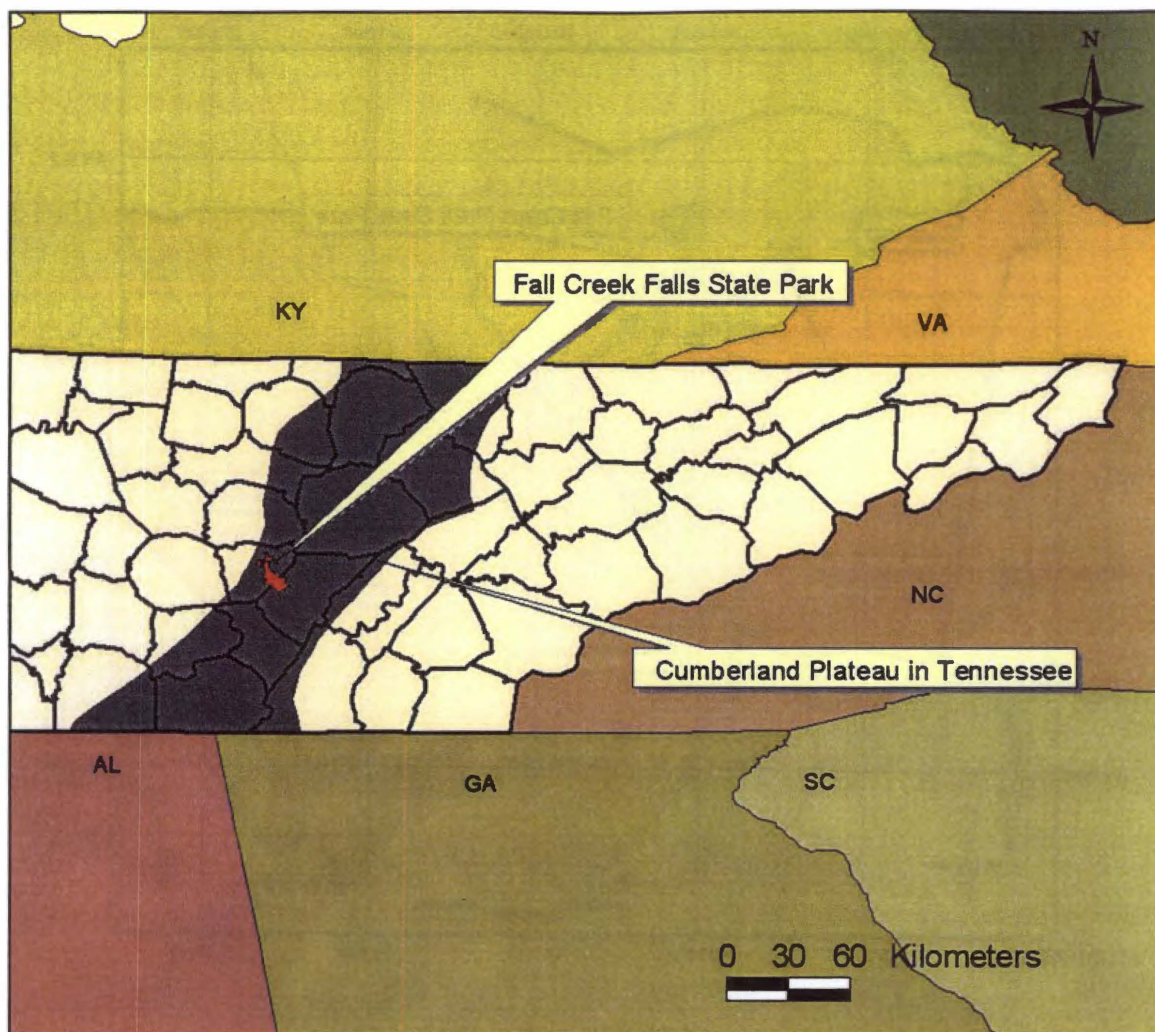


Figure 3. Location of FCFSP on Cumberland Plateau (*sensu* Fenneman 1938) in Tennessee.

purchase centered on the watersheds of Cane Creek and Piney Creek. At that time, the price of the land averaged less than seven dollars an acre due to the poor state and unproductiveness of the land. The National Park Service developed the area as a “Recreational Demonstration Area” by utilizing the services of the Civilian Conservation Corps and the Works Progress Administration (Medley 1987). These organizations worked to build the initial infrastructure of the newly established area, which included trails, overlooks, roads and bridges. In 1944, The U.S. Department of the Interior transferred the area to the State of Tennessee in the form of a quitclaim deed that restricted the state to use the land “exclusively for public park, recreational and conservation purposes” (Coleman 1967).

Major construction began throughout the park in 1970 and on June 8, 1972, Fall Creek Falls State Park was dedicated as Fall Creek Falls State Resort Park. Presently, the park boasts amenities such as a lodge, cabins, lake, swimming area, golf course, campsites, and a village area that provides the visitor with many activities. These recreational facilities utilize a small portion of the overall park acreage and are restricted to the upper plateau surface. Established hiking trails are found throughout the park, both on the plateau surface and in the gorges.

The mission statement of the Tennessee State Park System is “to preserve and protect, in perpetuity, unique examples of natural, cultural, and scenic areas and provide a variety of safe, quality experiences through a well-planned and professionally managed system of state parks” (TDEC 1999). At present, the park is divided into three areas: Developed

Areas, Wildlife Management Areas, and Class II Natural Areas (TDEC 1989). The Developed Areas within the park are limited to the upper plateau surface and include the recreation amenities described above. The Wildlife Management Areas are administered by the Tennessee Wildlife Resources Agency (TWRA) and are used to manage for game taxa by planting and maintaining feed plots of plant taxa deemed beneficial to the target wildlife. Most of newly acquired gorge areas are designated as a Class II Natural Area, which is a designation limiting development in order to preserve the biological resources of an area.

Boundaries

At present, the park encompasses ca 8,900 hectares after recent land purchases and acquisitions. Stuart Carroll (personal communication 2000) stated that these new additions include more than ca. 2,400 ha of largely gorge habitat. These areas include: (1) an extension of Cane Creek Gorge north of the original park boundary (2) Camps Gulf and environs, located ca. 1.0 mi north of junction of Hwy 30 along Hwy 285 (3) a portion of Dry Fork Gulf located southeast of Spencer. The majority of land within the park is on the upper surface of the Cumberland Plateau with the rest situated in the numerous rugged gorges that dissect the plateau surface. Some of the larger gorges in the park are: Cane Creek Gorge, Fall Creek Gorge, Piney Creek Gorge, Walling Mill, Camps Gulf, and Dry Fork. Most park boundaries are demarcated by Tennessee State Park signs affixed to large trees.

Accessibility

The park is accessible via Tennessee State Highways 284, 285, and 30. State Highway 30 is oriented towards the northwest and passes along the eastern boundary of the park and inside the park as it leads into Cane Creek Gorge and out of Dry Fork Gorge en route to Spencer, TN. This highway provides the primary access route to the gorges and in the bottom of Cane Creek Gorge it intersects with State Highway 285, which heads north towards the Camps Gulf. State Highway 284 extends through the park, from the north entrance to the south entrance.

Inn Road, Gorge Scenic Drive, and State Highway 284 serve as primary access roads within the portion of the park located upon the plateau. Inn Road originates at the Cascades Nature Center and provides access to many of the developed recreation areas of the park such as the Village area, Inn, campsites, cabins, lake, and golf course. Gorge Scenic Drive, which branches from Inn Rd. ca. 1.6 km north of Inn, leads to numerous overlooks and trailheads. State Highway 284, which bisects the park, is the primary access route to the southern portion of the park. Numerous maintained roads lead to areas such as the group campsites, horse stables, fire tower, and maintenance facility. The upper plateau surface is dissected by a few gravel and dirt roads that provide access to some of the more remote regions of the park.

There are a few old roads that access the gorges, with the primary one originating from State Highway 30 and leading to the old Wheeler Homestead in Cane Creek Gorge.

Another leads into the same gorge, but originates from private property and descends nearly parallel to the Lower Loop Overnight Trail on the east side of the gorge. Camps Gulf and environs both have unmaintained roads that provide access to nearly the entire area. The roads only provide access to a small portion of the park, therefore the plateau surface and gorges not in close proximity to the aforementioned access points were surveyed primarily by utilizing the established park trail system and off-trail hiking along the creeks, across the plateau, and within the gorges.

Chapter 2: Cumberland Plateau Overview

Physiography and Topography

Fall Creek Falls State Park (FCFSP) is located in the Cumberland Plateau section of the Appalachian Plateau Physiographic Province as described by Fenneman (1938). The Appalachian Plateau (Figure 4) extends from central New York to northern Alabama. The Cumberland Plateau near FCFSP is classified as the Mid-Cumberland Plateau by Smalley (1982). The plateau developed during the Appalachian mountain building episode, approximately 260 million years ago, due to extensive folding and faulting of the of rock layers (Luther 1977). These geologic processes resulted in a raised plateau surface that is mostly capped with resistant sandstone over less resistant shale and limestone layers intermixed with some sandstone layers.

In Tennessee, the Cumberland Plateau covers ca. 11,400 km². The northern terminus of the plateau in Tennessee is approximately 89 km across, but the width gradually decreases toward the Alabama state line, where it is only ca. 61 km across. The present day plateau is the result of geologic processes and weathering that has taken place since its inception. Elevation of the plateau surface within the park averages around 510 m, while the bottoms of gorges range in elevation from 290 m to 330 m.

Topography of the plateau surface within the park is gently undulating with only a few areas of notable relief (>60 m). The park is positioned along the deeply incised western escarpment of the plateau. This side of the plateau differs from the eastern side

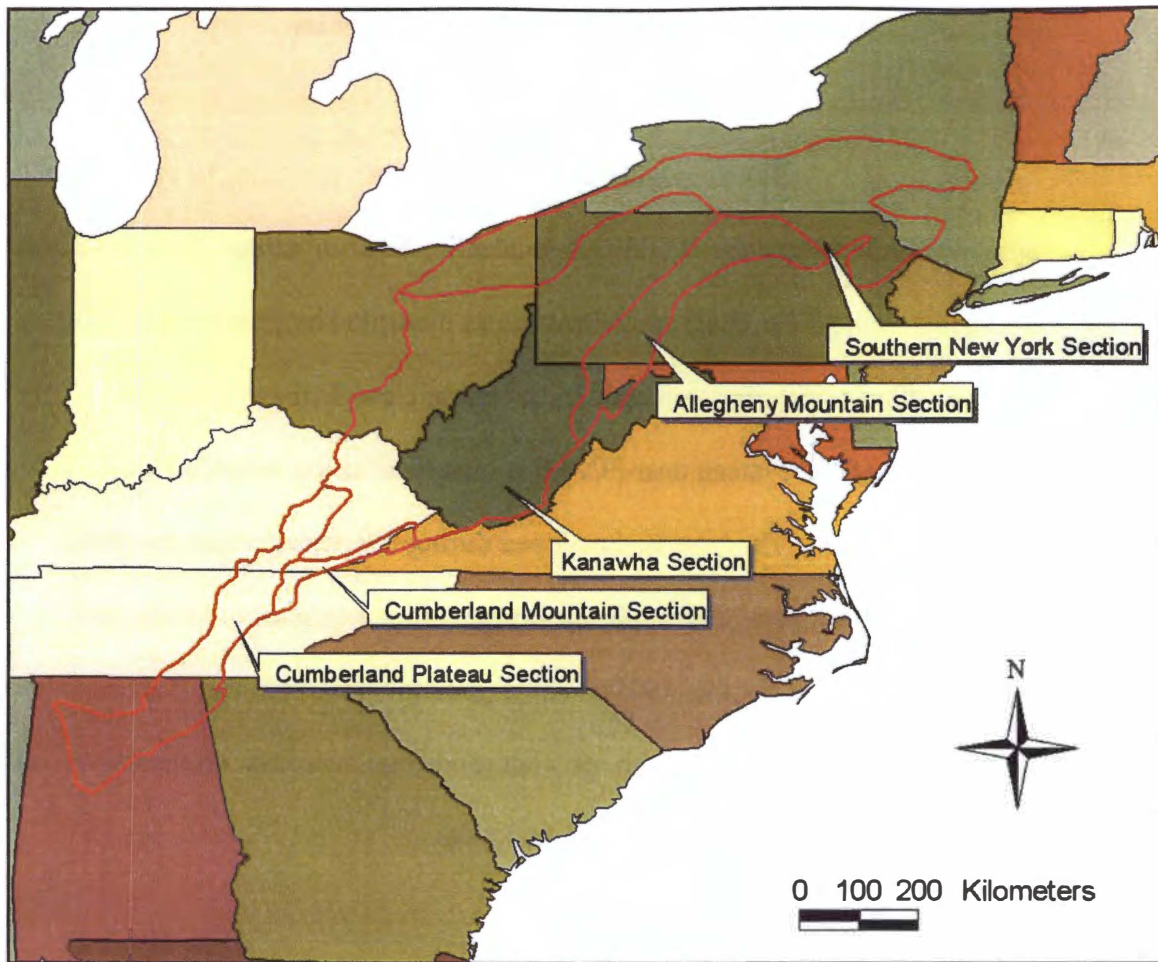


Figure 4. Approximate outline of the Appalachian Plateau and associated sections as described by Fenneman (1938).

due to the exposure of shale layers that have been eroded by weathering and fluvial processes. The eastern side of the plateau is more abrupt and vertical due to the folding and faulting of sandstone layers during the Appalachian Mountain building episode. Along the eastern boundary, sandstone layers are more tilted toward the east and in some places stand vertical along the eastern escarpment, which forms somewhat of a protective cap over the less resistant shale (Luther 1977). The gorges, which extend back into the plateau, vary in topography based on their position relative to where they begin or originate at the edge of the plateau. The closer the gorge is to its origin, it is generally more narrow, higher in elevation, and more rugged.

Geologic and erosion processes along the western escarpment have produced a series of spectacular waterfalls, expansive cave systems, and gorges. Since the protective sandstone layers are absent along the western edge, streams on the plateau surface commonly empty into gorges that have formed from the erosion of the underlying shale and limestone layers. This fluvial erosion forms plunge basins that allow for water currents to continue undercutting the overlying sandstone and underlying limestone and shale layers. Over time, this activity has produced the sheer cliff faces and gorges that are found throughout FCFSP.

Geology

Sewanee Conglomerate of the Crab Orchard Mountain Group dominates the upper plateau surface with small areas of Warren Point Sandstone, which is from the Gizzard Group. These rocks are of Pennsylvanian age and form the majority of the

sandstone cap rock on the plateau surface. The Sewanee Conglomerate and the Warren Point Sandstone are primarily composed of conglomeritic sandstone and conglomerate, with locally interbedded shale in some areas of the Warren Point Sandstone (Milici 1969a & 1969b, Ferguson & Milici 1970).

The gorges are comprised predominately of five substrate types, which are generally associated their location on the steep slopes. The Upper slopes, ca. 460 m elevation to the plateau surface, are Signal Point Shales and Racoon Mountain Formations of the Gizzard Group. These are also of Pennsylvanian age like the plateau capstone, but these layers are composed predominately of shale and siltstone with only a small fraction of sandstone. The remaining rock layers from this point to the bottom of the gorges are of Mississippian age. The Pennington Formation begins around 460 m and descends to about 400 m elevation. This formation, which underlies the majority of the midslopes, is mainly shale and siltstone. The lower slopes, approximately 335-400 m, consist of Bangor Limestone with small-interspersed areas containing sandstone of the Hartselle Formation. Monteagle Limestone underlies many of the streambeds in the bottom of the gorges (Milici 1969a & 1969b, Ferguson & Milici 1970).

Numerous large conglomeratic sandstone boulders are strewn about many of the steep gorge slopes and within and along the creeks in the gorges. These displaced and reworked boulders reflect the erosion and breaking or faulting of the conglomeratic sandstone layers of the upper plateau surface. Occasionally, limestone boulders are located near areas of exposed limestone layers. These exposed limestone layers affect the

stream flow during times of decreased precipitation in most gorges. Numerous streams in the gorges appear to be seasonal, but actually the majority retreat below the surface (sink belowground) into the karst features that exist in the Monteagle and Bangor Limestone layers.

A generalized geologic map (Figure 5) was constructed with GIS that utilized digital data compiled by USGS (2000). The data is understood to be coarse in resolution since they are based on the 1:250,000 geologic maps of Tennessee.

Soils

The soils of the upper plateau surface are mainly loams and silt loams. Hartsells Loam, Lonewood Loam, and Ramsey Loam soil types are the most dominate soil types on the rolling surface of the plateau. Hartsells Loam is moderately deep, loamy, and well-drained soil that develops primarily from acid sandstone. Lonewood Loam is deep, loamy and well-drained soil that is formed from shale, siltstone, and some sandstone. Ramsey Loam is relatively shallow, excessively drained, formed from acidic sandstone. The Ramsey Loam usually occurs in areas occupied today by the pine and mixed hardwood forests (Moore *et al.* 1981, Davis 1993).

A few other soil types occur less frequently on the upper plateau surface. Lonewood Silt Loam is deep, loamy, relatively well drained, and occurs in flats areas or those with gradual slopes. Gilpin Silt Loam is moderately deep, loamy, well drained, and occurs on hillside slopes. Shale and Siltstone serve as the parent material for both the

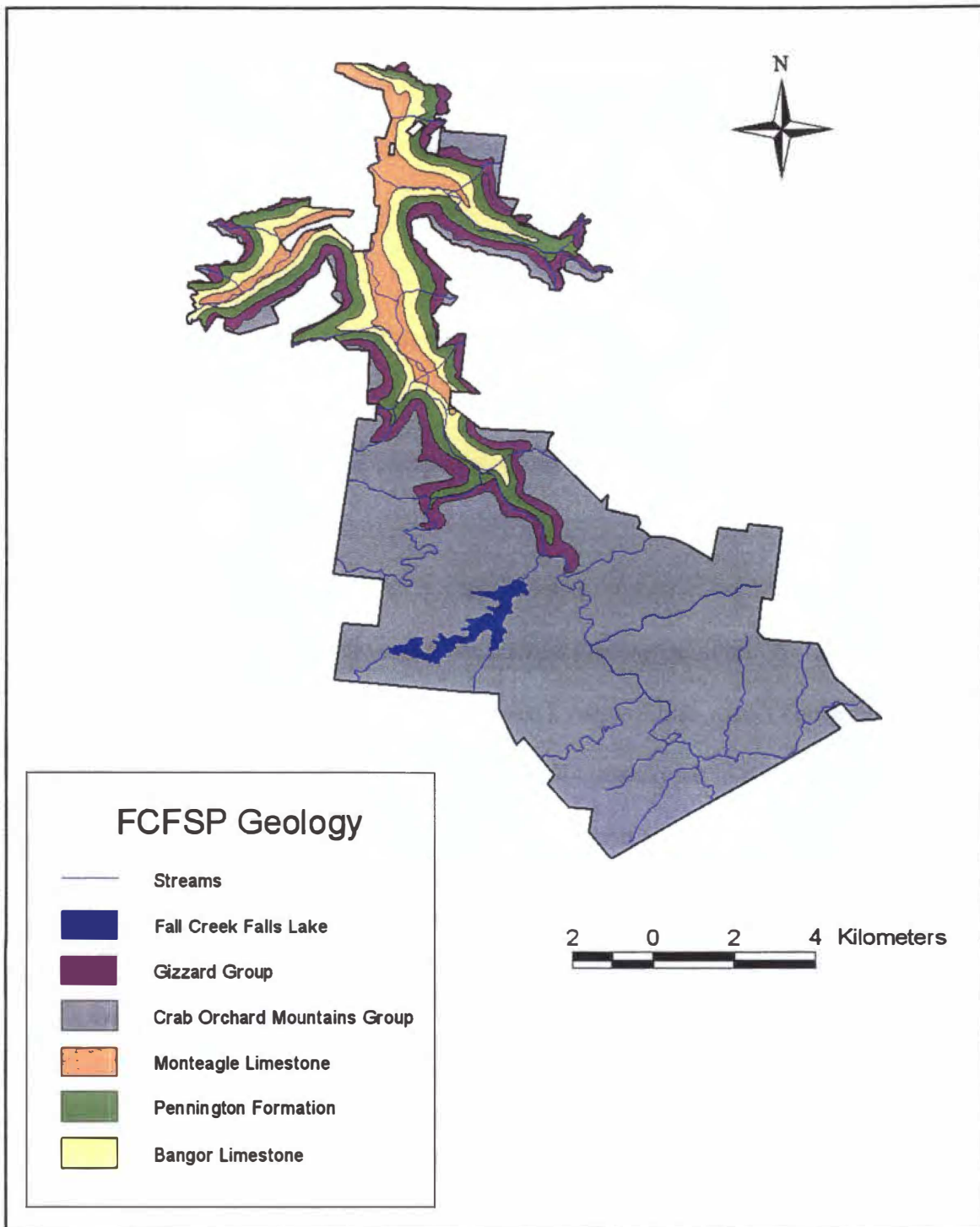


Figure 5. Geologic map of FCFSP, Van Buren and Bledsoe Counties, Tennessee (USDA 2000).

Lonewood Silt Loam and the Gilpin Silt Loam. Along the rocky rims of the gorges are soils of the Ramsey-Rock outcrop complex, which are shallow, permeable, and intermixed with the exposed sandstone bedrock that also serves as its parent material (Moore *et al.* 1981, Davis 1993).

Soils of the mid to upper slopes of the steep gorges are generally quite shallow and composed of either the Ramsey-Rock outcrop complex or the Bouldin stony loam. The Bouldin stony loam is deep, well drained, typically found on steep rocky slopes, and has developed from the underlying sandstone and shale. As the slope of the gorges gradually decreases and the gorge opens up, areas along the creeks possess Welchland Cobbly Loams and small patches of Sequatchie Loam, which are derived from the underlying shale, limestone, and sandstone. The Welchland Cobbly Loam is a deep, well-drained dark brown soil with numerous intermixed rocks or pebbles located on gentle slopes that occur along streams and mesic coves. Sequatchie Loam is very similar to the Welchland Cobbly Loam with the main difference being the lack of the intermixed rocks. The Sequatchie Loam was utilized for agriculture in the gorges of the park, not only because it is somewhat fertile, but also because it usually occurs in flat open areas (Moore *et al.* 1981, Davis 1993).

A generalized soil map (Figure 6) was constructed with GIS that used digital data compiled by U.S. Geological Survey Natural Resources Conservation Service [USDA, NRCS] (1994). This data is understood to be coarse in resolution since they are based on the 1:250,000 soil maps of Tennessee.

Climate

The climate data from the area surrounding Fall Creek Falls State Park is summarized from data collected from 1971-2000 by the National Oceanic and Atmospheric Administration [NOAA] (2000). The NOAA data is collected from the following Tennessee weather stations in close proximity to the park: Crossville Experiment Station (36° 01' N; 85° 08' W), McMinnville (35° 41' N; 85° 48' W), and Pikeville (35° 37' N; 85° 12' W). The reason for incorporating three stations is that none are located extremely close to the site and also because of the topographic variability in the park. The Crossville station (552 m elevation) is located atop the Cumberland Plateau, ca. 43 km from the park. The Pikeville station (268 m elevation), ca. 16.5 km from the park, is located in the Sequatchie Valley to the east of the park. The McMinnville station (287 m elevation) is located in the Eastern Highland Rim, ca. 37 km from the park. It is assumed that the climate at all three stations may resemble that of the park, since they are located in geographic positions that represent the various elevations found in the park.

Data collected from 1971-2000 for each station was plotted for both average monthly precipitation and temperature. Another plot was then constructed to average the data for all three weather stations. The highest average temperature was documented during June-July and the lowest average temperatures were recorded December-February (Figure 7). The winter months, November-March with the exception of February, had the highest precipitation values (Figure 8). The months of June-October had the lowest

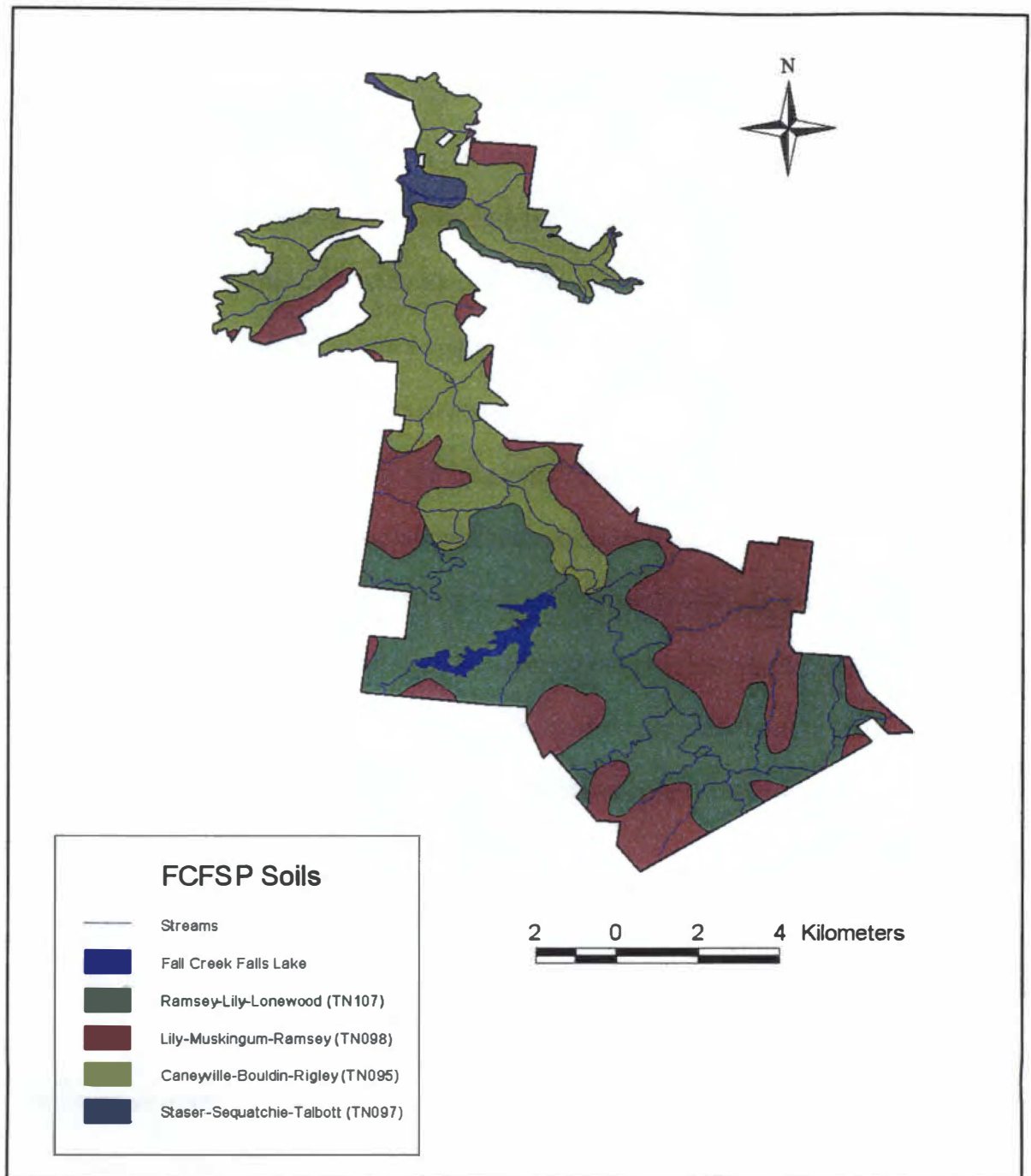


Figure 6. Soil map of FCFSP, Van Buren and Bledsoe Counties, Tennessee (USDA, NRCS 1994).

precipitation values. Stream flow in many areas is greatly reduced or appears non-existent during the months with low precipitation.

Climatic variability is likely within this site due to its unique topography.

Dickson (1960) elaborated on this by addressing the effects of elevation on temperature and precipitation. He noted that there is an average increase of 16 ° C for every 305 meters of elevation gain, which implies that the plateau surface may have a higher average temperature than the gorges of the park. The elevation gradient that occurs on the plateau can also have an effect on the precipitation of the area. The source of moist air for this region is the Gulf Coastal Plain further south, therefore there tends to be decreasing precipitation values from south to north. This precipitation gradient is slightly masked on the plateau since the cooling of air as it ascends toward the plateau surface results in the condensation of moisture and subsequent rainfall on the plateau (Dickson 1960).

The climate of this site cannot be explained with one broad description due to the extreme topographic fluctuations of the landscape. Many of the deep gorges, cave openings, and sinks in the park exhibit a microclimate of cold-air drainage that is more mesic and cool than the surrounding areas of the gorges and plateau surface. This unique microclimate may result from geologic features, exposure, reduced evapotranspiration, topography, or mature forests that shade the slopes. During a study of the gorges of the

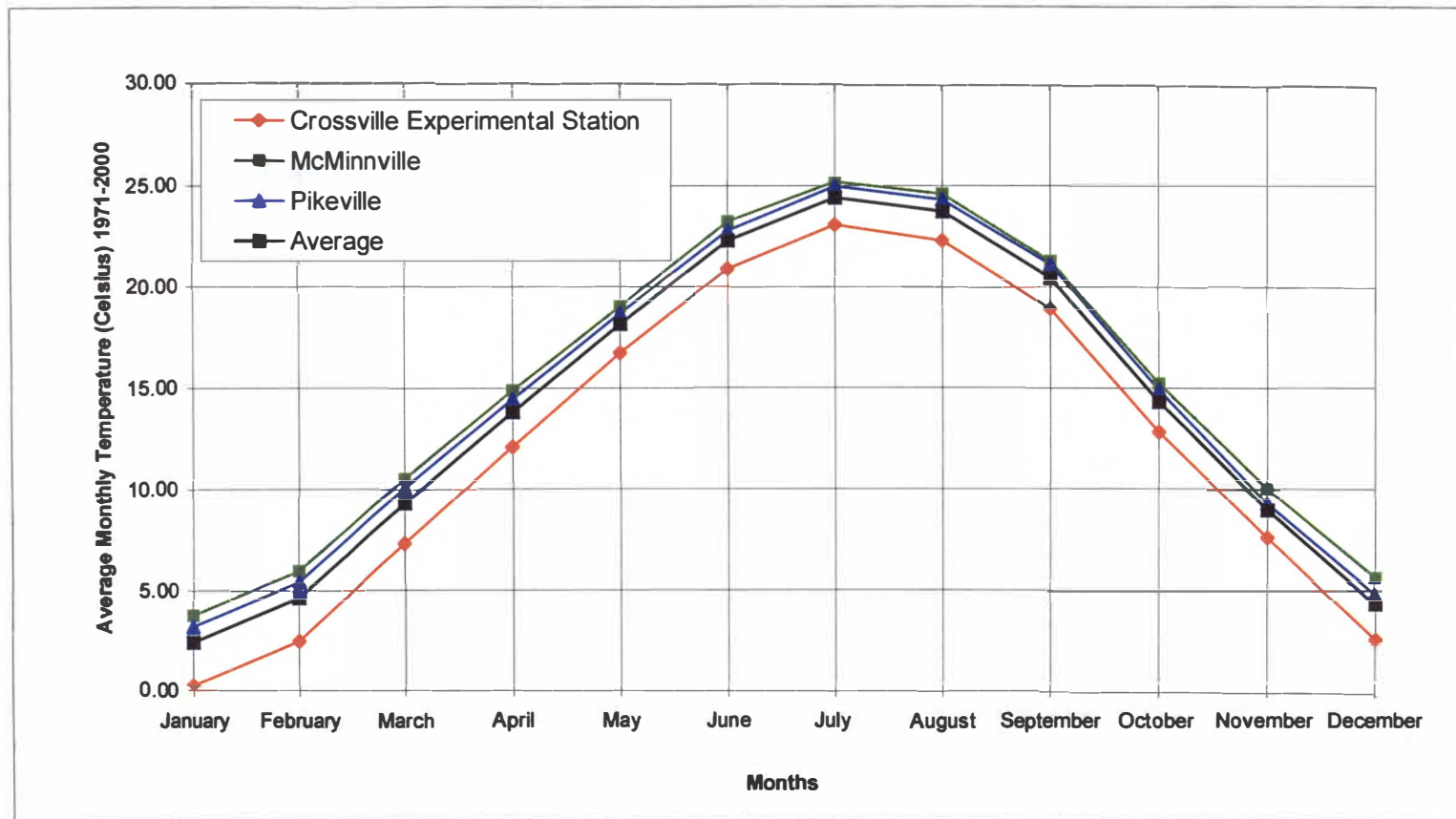


Figure 7. Average monthly temperature for the Cumberland Plateau near FCFSP, Van Buren and Bledsoe Counties, Tennessee.

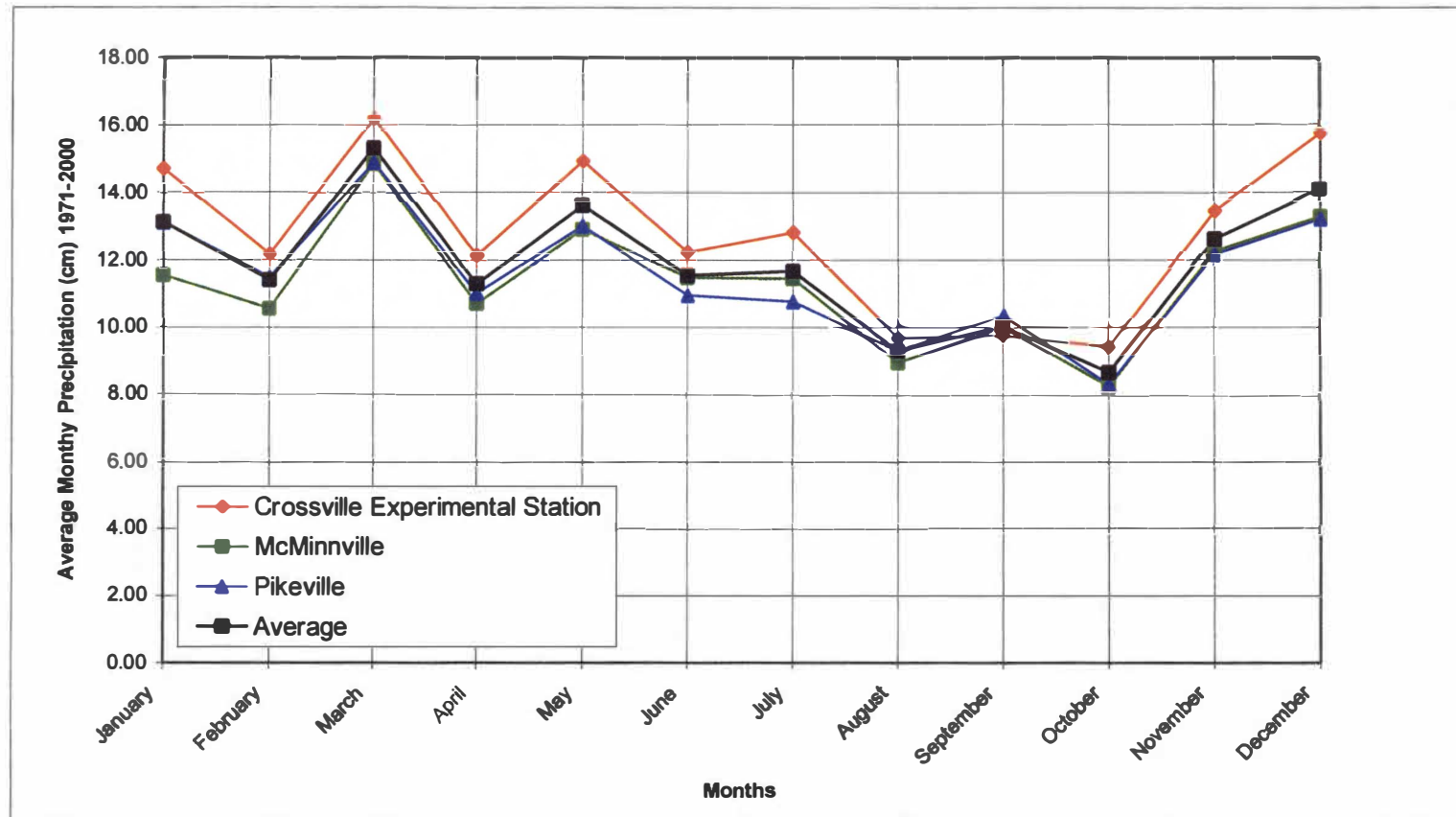


Figure 8. Average monthly precipitation for the Cumberland Plateau near FCFSP, Van Buren and Bledsoe Counties, Tennessee.

Cumberland Plateau, Caplenor (1979) noted the unique mesic and cool environments associated with many of the deep gorges.

Watersheds

Portions of numerous Cumberland Plateau watersheds are afforded varying amounts of protection due to their location within the boundaries of FCFSP. Many of these watersheds produce some of the most unique features of the park. These include spectacular waterfalls, expansive cave systems, and riparian vegetation zones. These watersheds are Cane Creek, Piney Creek, Dry Fork, and Glade Creek. A map of the generalized watershed boundaries (Figure 9) was constructed with GIS utilizing digital data produced by USDA, NRCS (2000).

Cane Creek Watershed covers a significant portion of the park and includes Cane Creek, both along the plateau and in the gorge, and its numerous supply tributaries. The Piney Creek Watershed is restricted to the areas adjacent to Piney Creek both upon the plateau and once it descends into Piney Creek Gorge, until its intersection with Cane Creek. A small portion of the Glade Creek Watershed is located along the eastern boundary of the park near Bradden Knob. One of the more controversial watersheds in the park, Dry Fork, is located in Dry Fork Gorge. This watershed has the second largest cave room in the United States, which is part of Rumbling Falls Cave system, and was at one time

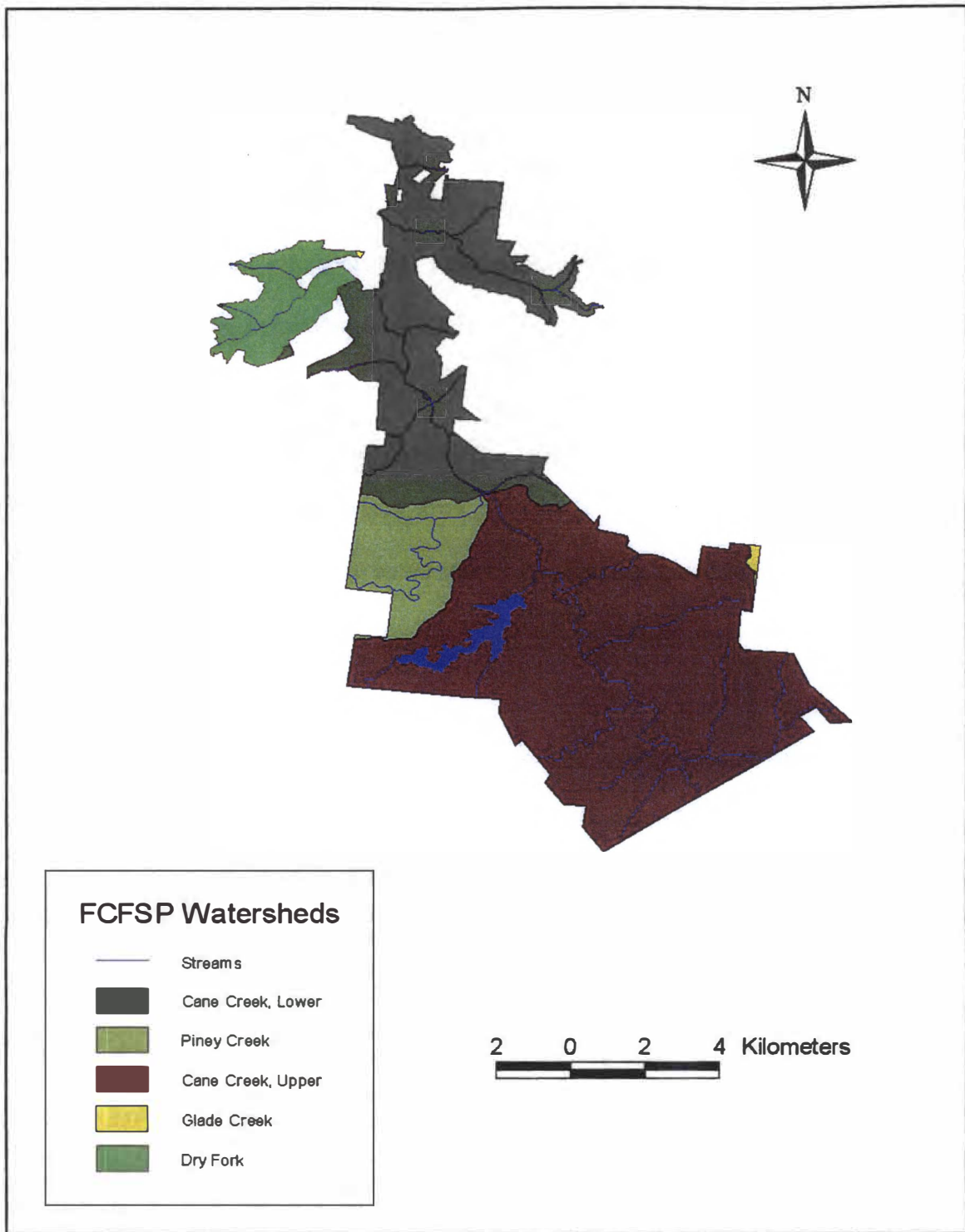


Figure 9. General outline of the watersheds located within the boundaries of FCFSP, Tennessee (USDA, NRCS 2000).

the center of controversy regarding a sewage treatment plant constructed in Spencer, Tennessee. In 2000, the town of Spencer sought to dispose of “degraded” water, or water that has been processed, directly into the gorge (Paine 2001). This plan of action was halted by a court injunction on March 26, 2002 due to a flawed permitting process (Paine 2002).

Chapter 3: Vegetation of the Cumberland Plateau

Vegetation

Gattinger (1902) published the first flora of Tennessee and noted the Cumberland table-land in Middle Tennessee. He chose Lookout Mountain near Chattanooga, TN for a type locality of this area and included a brief description of the vegetation from the summit. One of the first extensive descriptions of the plateau vegetation was from Killebrew and Safford (1874).

The Table Land, as a general rule, is thinly wooded, but it has much valuable timber, chiefly oaks and chestnuts. The mountain sides, gulfs, and ravines are very heavily timbered with chestnut, poplar, ash, maple, walnut, buckeye, cherry, linden, beech, and other varieties. In the coves and valleys there are still large quantities of very fine timber, which is almost valueless for want of transportation.

The Cumberland Plateau is included in the Mixed Mesophytic Forest Region by Braun (1950). The term "mixed mesophytic" was first used by Braun to describe an area with the potential to reach a late-successional climax forest association that is shared by a number of taxa, instead of only a few dominant taxa. The term "potential" is important when discussing the mixed mesophytic forest since this association is predicted to be the climax vegetation that will develop in an area via natural succession under certain climatic conditions. Some of the canopy taxa included in her broad definition of mixed mesophytic include: *Fagus grandifolia*, *Liriodendron tulipifera*, *Tilia americana* var. *americana*, *Acer saccharum*, *A. rubrum*, *Castanea dentata*, *Aesculus flava*, *Quercus rubra*, *Q. alba*, *Tsuga canadensis*, *Betula allegheniensis*, *Prunus serotina*, *Magnolia*

acuminata, and *Fraxinus americana*. The designation “Mixed Mesophytic Forest” is quite broad and it can further be divided into a number of association-segregates, which describes the mixed mesophytic forests based on dominant taxa within a given community (Braun 1950).

Braun (1950) further classified the plateau in the vicinity of Fall Creek Falls State Park (FCFSP) as belonging the “Cliff Section” of the Mixed Mesophytic Forest Region. Lucy Braun visited the park while doing research in the plateau region and took extensive notes on the vegetation. She documented that little of the original upland forest remained due to prior landscape alteration and that the plateau surface was composed primarily of *Querus* spp. with other taxa such as *Carya* spp., *Liriodendron tulipifera*, *Castanea dentata*, *Nyssa sylvatica*, and *Tilia americana* var. *americana* occurring less frequently. This upland forest that is dominated by oak-hickory forests, therefore represents a physiographic climax “maintained by topography (old) and soil (sandy leached or lithosol), frequently affected by fire.” However, since this physiographic climax only occupies a relatively small area, it is still included in the Mixed Mesophytic Forest Region.

In contrast to the upper plateau forests, the gorge slopes located throughout the park adhere to the definition of a mixed mesophytic forest. She described the north and northwest trending slopes of Cane Creek gorge east of Spencer, TN and the deeper valleys and gorges of FCFSP as possessing components of the mixed mesophytic forest. It was also noted that oaks and hickories are more abundant on the east, south, and southeast trending slopes of the gorges (Braun 1950).

Sherman (1958) studied the vegetation of five gorges of the Cumberland Plateau in Tennessee. This study resulted in the designation of three broad forest community types that occupied the slopes of these gorges: (1) mixed mesophytic (2) chestnut oak (3) oak-hickory. The mixed mesophytic community existed in the most favorable habitats, while the chestnut oak community occupied the dry upper slopes. The oak-hickory community was found to be more common in the intermediate areas between the other two habitats.

The Kùchler (1964) classification of future “potential vegetation” for the plateau near FCFSP was very similar to that of Braun (1950). He classified that portion of the plateau as belonging to the Mixed Mesophytic Forest and the Oak-Hickory-Pine Forest. The Oak-Hickory-Pine Forest is more common throughout the southeastern United States, but few disjunct examples of this forest type are found scattered along the southern portion of the Cumberland Plateau. His recognition of the Oak-Hickory-Pine Forest along that section of the plateau somewhat agrees with Braun (1950). The main difference is that Braun considered the area to represent a physiographic climax that is lumped under the Mixed Mesophytic Forest Region instead of a completely separate vegetation assemblage.

Donald Caplenor (1965) originally studied the vegetation of the gorges in FCFSP. This was a detailed study of the gorges owned by the park in the mid-1950's. The vegetation of the gorges was divided into six communities based on intensive random

sampling of the gorges. The forest communities he proposed were: mixed mesophytic, oak-hickory, hemlock-yellow birch, hemlock-basswood, hemlock, and chestnut oak. The mixed mesophytic community was the most common throughout the gorges, with the other community types usually occupying unique topographical niches such as narrow gorges or upper slopes. The oak-hickory association was documented from southwest and west trending slopes, which supports the observations of Braun (1950). However, Caplenor was skeptical of the theory posed by Braun that the oak-hickory communities result from loss of mesophytic taxa from the community since he observed many young individuals of mesophytic canopy taxa in the understory of the oak-hickory community. In conclusion, he noted that there was insufficient data from this study to refute Braun and that the “existence of these stable, mature communities in a small areas within a given climate appear to defy the concept of “climatic climax” (Caplenor 1965).

Quarterman *et al.* (1972) investigated the virgin mixed mesophytic forests of Savage Gulf, in Grundy County, Tennessee. The two primary community types delineated in this study were the mixed mesophytic forest, which was comparable to the mixed mesophytic community described by Braun (1950) from the Cumberland Mountains in Kentucky, and the oak-hickory-tuliptree forest. The mixed mesophytic communities were located on the north trending slopes while the oak-hickory-tuliptree communities occupied the south trending slopes. The oak-hickory-tuliptree did not quite fit into either the oak-hickory described by Caplenor (1965) or the oak-chestnut of Braun (1950). In conclusion, it was determined that Savage Gulf “appears to be the only large

virgin tract of typical mixed mesophytic forest remaining in Tennessee” (Quarterman *et al.* 1972).

Schmalzer (1978) described 14 community types using cluster analysis of data collected from five coves in the Cumberland Plateau in Tennessee. The communities were consistent with the previously discussed vegetation studies (Braun 1950, Küchler 1964, Caplenor 1965, Quarterman *et al.* 1972) with the main differences being shifts in dominate taxa for each community and the numbers of distinct community types produced from the rigorous analysis. The principal variable that formed the community clusters was topographic moisture while secondary variables included soil pH and texture differences of geologic substrates.

Hinkle (1989) studied the forest communities of the entire Cumberland Plateau in Tennessee by sampling numerous plots on both the plateau surface and in the ravines and gorges. The collected data was then subject to a cluster analysis to segregate the different community types present across the plateau. The analysis of the upland plateau data demonstrates that 12 community types exist in the upland portions of the plateau. Oak species were common in most of these community types with the exception of microhabitats along flood plain terraces. In regards to the oak-hickory community used by many ecologists (Braun 1950, Küchler 1964) to describe the vegetation of plateau he stated, “oak-hickory should not be applied to the Tennessee Plateau Upland...hickories did not account for much of the importance value of any oak dominated Upland community.” He described twelve community types from the ravines and gorges of the

plateau, which “compared relatively well with Braun’s (1950) Mixed Mesophytic vegetation and its “association segregates.”

Previous Vascular Floristic Studies

Numerous vascular floristic studies have been performed on the Cumberland Plateau in Tennessee during the later half of the 20th century. Examples of these studies include: Clark (1966), Caplenor (1978, 1979), Wofford *et al.* (1979), Jones (1989), Schmalzer (1989), Clements and Wofford (1991), Allawos (1994), Goodson (2000), Shaw (2000), Bailey (2001), and Beck (2001). This floristic research has produced data supporting the idea that the Cumberland Plateau is one of the more unique and diverse physiographic provinces in Tennessee. It has been noted by botanists (Clark 1966, Thomas 1966, B. Eugene Wofford pers. comm., Shaw 2000) that the flora of Cumberland Plateau is little studied when compared to work that has been pursued in the Unaka physiographic province. Fortunately, the botanical richness of the Cumberland Plateau is finally being realized due to a number of recent floristic studies from this region. Many of the studies focused predominately on the mesic gorge habitats, therefore it must also be stated that the highly manipulated upper plateau surface is in need of more research before we have an accurate overview of its botanical richness.

Chapter 4: Vegetation and Landscape History

Cumberland Plateau Vegetation History

It is important to consider vegetation shifts that occur on a geologic time scale when analyzing the present-day floristic composition of an area. The taxa found in an area are the result of numerous migrations, retreats, and evolutionary processes that occurred during past glacial/interglacial cycles. These glacial events are believed to result from Milankovitch cycles, which are attributed to predictable changes in the earth orbital geometry in relation to the sun (Imbrie and Imbrie 1979, Hays *et al.* 1976). Delcourt *et al.* (1993) suggest that the “southeastern biotic communities as we know them today have assembled only in the time since the last major glaciation, the past 20,000 years.” This statement is based on the relatively recent analyses of pollen and charcoal from lake sediment and soil cores throughout the southeastern United States. This type of evidence provides an overview of the vegetation and associated natural or anthropogenic disturbance events by the analysis and radiocarbon dating of pollen and charcoal extracted from the sediment cores.

The mystery surrounding the distribution and origin of many taxa is slowly being unraveled as more studies are pursued focusing on paleoecological reconstruction, genetic structure of populations, and floristic inventories. Braun (1950) questioned the southern displacement of mixed mesophytic taxa during the glaciation events associated with the Pleistocene. She felt that the distribution of the present-day deciduous forests had been obtained by the close of the Tertiary, approximately two million years ago.

However, some recent paleoecological evidence provided in Delcourt and Delcourt (1977, 1979), Delcourt, H.R. (1979), Delcourt, P.A. (1980), and Watts (1980) documents the southern displacement of numerous mixed mesophytic taxa during the Pleistocene.

Vegetation history of the region around Fall Creek Falls State Park (FCFSP) is likely comparable to the findings of a paleoecological analysis of Anderson Pond in Tennessee (H.R. Delcourt 1979). Anderson Pond is located ca. 37 km west of the park in the Eastern Highland Rim. This study provides a 25,000-year vegetation chronology developed from standard pollen analysis techniques.

The lowest sediments analyzed from the core taken at Anderson Pond were radiocarbon dated to 25,000 $\pm$ 3000 yr BP (before present). The period from 25,000 to 19,000 yr BP was dominated by jack pine, spruce and fir. Deciduous taxa represented in the pollen spectrum to a lesser extent include: oak, ash, ironwood, hickory, birch, butternut, willow, elm, hackberry, black gum, viburnum, and red maple. This vegetation assemblage hints that the glacial-age climate was not extremely cold since it was able to support both northern evergreen species and deciduous taxa.

The pollen sediments representing 19,000 to 16,300 yr BP reflect a much colder climate, which corresponds to the Late Wisconsin glaciation event. The dominant taxa during that time were spruce and jack pine, both of which are more northern taxa adapted to the cooler climate. Mixed mesophytic forest taxa could have been intermixed with the dominant evergreen taxa in low abundances during this time period. These deciduous

taxa appeared in the pollen spectrum early in this time period, but a decline in their abundance was observed throughout this time period. Delcourt (1979) theorized that the south-facing gorges of the Highland Rim and Cumberland Plateau could have provided refuge for many of the mixed mesophytic taxa during this time period. Cyperaceae and Poaceae dominated the non-arboreal pollen (NAP) percentages, which include shrubs and herbaceous taxa.

During 16,300 to 12,500 yr BP the cold climate associated with the Wisconsin glacial event began to ameliorate possibly leading to an increase in growing seasons and less intense winters. The pollen data indicate that jack pine significantly decreased in dominance while there was a steady increase in the many deciduous taxa. Evergreen and deciduous taxa well represented throughout this time interval were: spruce, fir, oak, ash, ironwood, hickory, birch, and elm. Beech and sugar maple were first observed in the pollen spectrum at approximately 13,000 yr BP, possibly due to a migration event or the eventual development of a habitat suitable for these taxa. Late in this time interval (12,750 to 12,500 yr BP) taxa associated with aquatic habitats were represented in NAP pollen percentages. The elevated NAP percentages occur during a time of increased sedimentation of inorganic compounds into the catchment, which could be evidence of rapid landscape change at the Pleistocene-Holocene boundary (Delcourt 1979).

The early Holocene (12,500 to 9,500 yr BP) is a time when mixed mesophytic forest taxa are well represented in the pollen record and the climate was thought to be cool and mesic. Oak, ash, and ironwood were the dominant vegetation during this time

period with other less dominant deciduous taxa that included: hickory, birch, walnut, elm, beech, sugar maple, basswood, and hemlock. This shift to vegetation dominated by mixed mesophytic taxa was accompanied by a notable decrease of jack pine, fir, and spruce. A notable introduction into the pollen spectrum was hemlock at approximately 10,800 yr BP.

The arboreal vegetation of the area exhibited comparatively little change from 9,500 yr BP to the present. A notable increase of warm-temperate taxa (*i.e.* magnolia, holly, chestnut, sweet gum, black gum, and red maple) was recorded at 9,500 yr BP and around 8,000 yr BP there was an increase of oak, ash, hickory, birch, alder, buttonbush, and Virginia willow. These observed increases in warm-temperate taxa correspond to an inferred warming and drying period during the mid-Holocene (8,500 to 5,000 yr BP). This shift toward more warm-temperate taxa somewhat displaced the mixed mesophytic taxa and Delcourt (1979) suggested that those more mesic taxa were restricted to northeast-trending gorges in middle Tennessee during the mid-Holocene. However, the mixed mesophytic taxa did continue to appear in the pollen record after 5,000 yr BP to the present day. The NAP pollen percentages from this time period are predominately composed of pollen from swamp/wetland vegetation. An increase in sedimentation and changes in pollen composition to include high levels of ragweed and red maple signified the presence of human settlers around 1790 AD (Delcourt 1979).

Native Americans and the Landscape

It is important to consider the impact of Native Americans when looking at vegetation shifts on a geologic time scale. There is evidence that people altered the landscape in some areas of the Southern Appalachians (Delcourt & Delcourt 1997, Delcourt & Delcourt 1998) and in sections of the northern Cumberland Plateau (P.A. Delcourt *et al.* 1998). The influence of Native Americans on the landscapes of the northern Cumberland Plateau is well summarized by Delcourt *et al.* (1998). They state that “the strong coincidence in time of prehistoric human occupation in rockshelters, domestication of native plants, and increases in local fires evident in the charcoal record...argues for a cause-and-effect relationship between Native American activities and changes in forest vegetation during the past 3,000 years.”

Paleoindian occupation in Tennessee began sometime before 10,000 yr BP. These people were primarily nomadic, which may explain the lack of the extensive settlements in the archeological records. Franklin (2002) pursued an archeologic study from the Upper Cumberland Plateau (UCP) and found only scant evidence of Paleoindian occupation in this area. A more populace group, the Archaic Indians existed in Tennessee from ca. 10,000 to 2,700 yr BP. These people are considered to be the most populace group of native peoples to inhabit Van Buren County (Medley 1987). Their lifestyle was also nomadic in nature, however archeological evidence from this period has been encountered in the caves and rockshelters of the region. Franklin (2002)

provides evidence supporting extensive occupation of this area during the Early and Late Archaic Periods.

The Woodland Indians were the next group of native peoples to inhabit the UCP, from 2700-1050 yr BP (Franklin 2002). Satz (1979) stated that these Indians were not nomadic, but instead lived in small villages. This lifestyle likely attributed to some landscape alteration in regions of their occupation. The Mississippian Indians, existing from 1050-350 yr BP, were the next group of native peoples documented from Tennessee. This group depended heavily on agriculture and many feel that it is unlikely they inhabited the area around FCFSP due to the rugged nature of the terrain associated with the Cumberland Plateau (Medley 1987). However, there is now evidence suggesting that the Mississippian peoples existed in higher numbers on the UCP than previously documented (Franklin 2002).

After 400 yr BP, the Cherokee, Shawnee, Creek, Yuchi, and Chickasaw Indians were known to inhabit parts of Tennessee. Use of the Black Fox Trail and the historic removal of the Cherokee on the Trail of Tears circa 1835 AD are both noted as occurring in portions of Van Buren County. Although there is evidence of these native peoples in that state, there is little evidence around the park for expansive villages and it has been proposed that this area served as hunting grounds for the Indians (Medley 1987). The historic documentation of native peoples throughout the area is scarce and Myers *et al.* (as cited in Medley 1987) states “less is known of the ancient inhabitants of the Cumberland Valley than...those of almost any other region in the United States.”

Fortunately, there is an ongoing archeological study of FCFSP that is being pursued by faculty at Middle Tennessee State University and the University of Tennessee. Hopefully this research will provide information to further clarify the types of people and their influence upon the region.

Early Settlers and the Landscape

The area that now includes the park was likely first settled in the late 1800's. A timber mill operated along Cane Creek near the base of Cane Creek Cascades (near present-day Cascades Nature Center) and this continued to exist until approximately 1929. Overall the area was owned by only a few individuals, some of which were absentee owners such as the Van Buren Coal and Lumber Company and the Inman Land Company (Medley 1987). Information pertaining to landscape manipulation on the plateau surface is limited, but it is likely that the area experienced timber removal and clearing for agricultural purposes.

Caplenor (1965) provided a detailed account of human influence on the gorges within the original boundaries of the park. These areas largely avoided the human influence until a large-scale logging operation in 1921 and 1922. This logging operation included all of Cane Creek gorge south to Fall Creek gorge, the lower half of Piney Creek gorge, and all of Johnny Branch gorge (Walling Mill). The majority of the logging was selective in nature focusing primarily on tulip tree, oaks, chestnut, and some hickory. Complete clearing of the forest only occurred in one chestnut stand on a south-trending slope adjacent to Piney Creek gorge and in the north end of Cane Creek gorge in the

vicinity of a sawmill. He believed that the heads of some gorges contained examples of virgin forest that had avoided timber operations and fire (Caplenor 1965).

Information pertaining to historical landscape alteration of the newly acquired areas is scarce. There is however some evidence for homesteads, quarries, and agricultural lands that still persists. It is also likely that many of the gorge slopes and bottomlands in these new areas were cleared in a similar fashion described by Caplenor (1965) for the area within the park's original boundaries. In the north end of Cane Creek gorge, as the gorge opens up, there are cleared agricultural lands and an old homestead in the bottoms. The Wheeler family occupied this site until ca. 1980; therefore the area is commonly referred to as the "Wheeler Farm." The Camps Gulf addition contains remnants of two or three homesteads located along the old road that dissects the gorge. Two limestone quarries within this new section of the park have been closed for a number of years. The only remaining artifacts of these operations are the limestone highwalls created by the mining activities.

Chapter 5: Methods

Collection of Vascular Plants and Associated Data

A vascular plant inventory was conducted during the 2001-2002 growing seasons. A total of 45 collecting trips were logged from March 20, 2001 to October 26, 2002. I was the primary investigator on all collecting trips, but numerous expert botanists assisted in the field throughout the study. All field assistants are recognized for their contributions in the Acknowledgments section of this document. Primary modes of transportation within the park were walking, biking, canoeing, rappelling, and riding around in a Kawasaki Mule[®].

The goal of this study was to as completely as possible document the vascular flora of the park. Therefore, systematic sampling of randomly selected plots was not a feasible method for acquiring data due to the likelihood of overlooking rare or unique plant habitats. Due to the overwhelming size of the park, areas within the park were prioritized according to habitat richness or uniqueness. These areas were either identified during random exploration, topographic and geologic map interpretation, or discussions with park staff. The surveys focused extensively on the aforementioned areas, but also incorporated all other accessible areas to a lesser extent.

When possible, three specimens of each species were collected with care so as to not impact vulnerable populations. Federally or state-listed threatened and endangered (T&E) species were not always collected, but instead documented with photos and GPS

coordinates. Equipment used for the collection and field processing of specimens included: collection bags, pruning clippers, digging utensil, plant press, newspapers, field notebook, and Magellan 315[®] GPS receiver.

For each species the following information was recorded in the field:

- Collection number (FCF-###)
- Collectors Present
- Date
- Location and Directions to Site (written and GPS coordinates)
- Elevation (using GPS and Maptech© mapping software)
- Plant / Population health or vigor for T & E species
- Tentative family, genus, species
- Plant habitat and associated dominant taxa
- Relative Abundance within study site (adapted from White 1982)

Very rare—a single locale, few individuals

Rare—One or two localities, generally small populations

Scarce—Several localities, or scattered small populations

Infrequent—Scattered localities throughout

Occasional—Well-distributed but not anywhere abundant

Frequent—Generally encountered

Common—Characteristic and dominant

Plant Identification and Flora Overview

Final plant identifications were assigned after consulting appropriate botanical manuals that include Radford *et al.* (1968), Strausbaugh and Core (1978), Wofford (1989), Cronquist (1991), Wofford and Chester (2002), and Jones (in preparation). To further verify the identifications, The University of Tennessee Herbarium (TENN) collections were examined. Specimens from the genus *Carex* were sent to Robert F.C. Naczi, a recognized sedge expert at Delaware State University, for final annotation. Each specimen was processed according to standard herbaria procedure. The first set of specimens is deposited at TENN and duplicates will be sent as exchange specimens to regional herbaria.

All data collected in the field and finalized in the lab were entered into a searchable Microsoft Access[®] database constructed with applicable fields for this study.

An annotated checklist was compiled (Appendix 1), which includes the following information: accepted species name and authority as listed in the PLANTS Database (USDA, NRCS 2002), common name, relative abundance within the study area, habitat(s), voucher number, commonly used synonymy, and federal or state rare plant status, if applicable.

The rare plant list of the Tennessee Natural Heritage Program (TDEC 2001) was consulted for identifying federal and state listed rare taxa from FCFSP. A population status report was prepared for each population of T&E taxa for the appropriate state and

federal agencies. Invasive non-native taxa were assigned invasive rank categories as listed by the Research Committee of the Tennessee Exotic Pest Plant Council [TN-EPPC] (1996). These categories signify a taxon's aggressiveness and its potential impact to native vegetation.

Community Descriptions

Extensive vegetation notes were collected during field reconnaissance, which aided in the delineation and description of the plant communities and associated microhabitats. Information pertaining to community characteristics such as topographical location and unique climate were included in the description of each community. Common and unique taxa of the canopy, shrub, and herbaceous layer were also included to provide an overview of the community. The general locations of the more common communities were then incorporated into a GIS platform to produce a vegetation map of FCFSP.

Data Analyses

The flora of FCFSP was analyzed to discern any notable trends in the geographical affinity of the documented taxa and also to compare the botanical richness of the site relative to other areas on the Cumberland Plateau. The following distribution categories were adapted from Oxendine (1971), Clements (1987) Allawos (1994) for the analysis:

- 1) Intraneous— taxa with distributions that include and extend well beyond the study area
- 2) Extraneous— taxa where the study site marks the approximate extent of the range
- 3) Endemic— taxa that are primarily restricted to the Blue Ridge and Appalachian Plateau Province
- 4) Introduced — taxa whose native range lies outside of the North American continent

The intraneous, extraneous, and endemic categories were further divided in order to better understand distributional trends within each category. Taxa within intraneous and endemic categories were designated as being northern, southern, or central in distribution while extraneous taxa were separated into either northern or southern. The northern and southern designations were based upon where the center of distribution is located relative to the position of Tennessee. A taxon with a central distribution is one that is dispersed, nearly equally, to the north and south of the study site.

The species richness of FCFSP was analyzed and compared to other study sites on the Cumberland Plateau using the species area curve of Thompson and Wade (1991). Their richness analysis is based on the equation $S=272A^{0.113}$, where a predicted richness number (S) can be formulated by inserting a known area in hectares (A). The comparison

between sites is then based on the percent deviation from the predicted richness value exhibited by the site.

Chapter 6: Results

Floristic Summary

A total of 881 taxa were identified from FCFSP (Appendix 1). These taxa are documented from both the 2,224 accessioned collections of the author and 48 previously collected specimens from the park deposited in the herbaria of University of Tennessee (TENN) and Vanderbilt University (VDB at BRIT). These taxa represent 446 genera and 131 families. There are 110 non-native taxa, which compose 12% of the flora (Table 1). This study produced a total of 301 county records, first documented occurrences, for Van Buren and Bledsoe counties, Tennessee.

Plant Communities and Habitats

The following is a description of 17 plant communities and eight microhabitats occurring within those communities in FCFSP. These communities and microhabitats were determined from field reconnaissance that focused on repetitious floristic composition (canopy, subcanopy/shrub, and herb layers), forest physiognomy, and physiographic features (topography, elevation, soils). The previous vegetation work of Caplenor (1965) was consulted for guidance when determining gorge communities. The communities are divided into three main categories, which are gorges, plateau uplands, and disturbed areas. The communities included for the gorges and plateau uplands are generally considered natural communities, while the disturbed areas have experienced a great deal of anthropogenic disturbance in recent history. The general boundaries for the

Table 1. Floristic Summary of FCFSP, Van Buren and Bledsoe Counties, Tennessee.

Division	Family	Genera	Total Species	Native	Non-native	Species Composition
	Number.....					Percent
Lycopodiophyta	3	4	7	7	0	0.79
Polypodiophyta	14	23	32	32	0	3.63
Pinophyta	2	4	7	7	0	0.79
Magnoliophyta	(112)	(415)	(835)	(725)	(110)	(94.78)
Liliopsida	16	84	196	166	30	22.25
Magnoliopsida	96	331	639	559	80	72.53
Total	131	446	881	771	110	100

most common communities were incorporated into a GIS platform in order to produce a general vegetation map of the park (Figure 10).

Gorges

Seven communities and five microhabitats are attributed to the gorges of FCFSP. The gorge areas, with the exception of one large open area in the north end of Cane Creek gorge, are predominately forested. This open area, known as the Wheeler Farm, was inhabited until ca. 25 years ago and consists of a large open fallow field and a homestead adjacent to Cane Creek. The fallow field will not be discussed in this section since it is treated as a disturbed community. Extensive logging is documented to have occurred in many of the gorges, but presently these areas are forested and in a state of advanced succession. The habitats in the gorges are Hemlock, Hemlock-Basswood, Hemlock-Yellow Birch, Mixed Mesophytic, Oak-Hickory, Tuliptree-Pine-Oak-Red Maple, and Riparian. Notable microhabitats in the gorges are Cave Openings/Sinks, Waterfall Spray Zones, Boulder Fields, Sandstone/Limestone Cliffs, and Limestone Outcrops.

Many of the habitats within the gorges support spectacular spring and early summer floral displays from an abundance of common wildflowers. In the following community descriptions, when an area is described as having common wildflowers, it is implied that many of the following wildflowers are present: *Arisaema triphyllum*, *Asarum canadense*, *Podophyllum peltatum*, *Cardamine angustata*, *C. concatenata*, *C. diphylla*, *Stellaria pubera*, *Sedum ternatum*, *Dicentra cucullaria*, *Geranium maculatum*, *Hydrophyllum canadense*, *Iris cristata*, *Synandra hispidula*, *Caulophyllum thalictroides*, *Disporum*

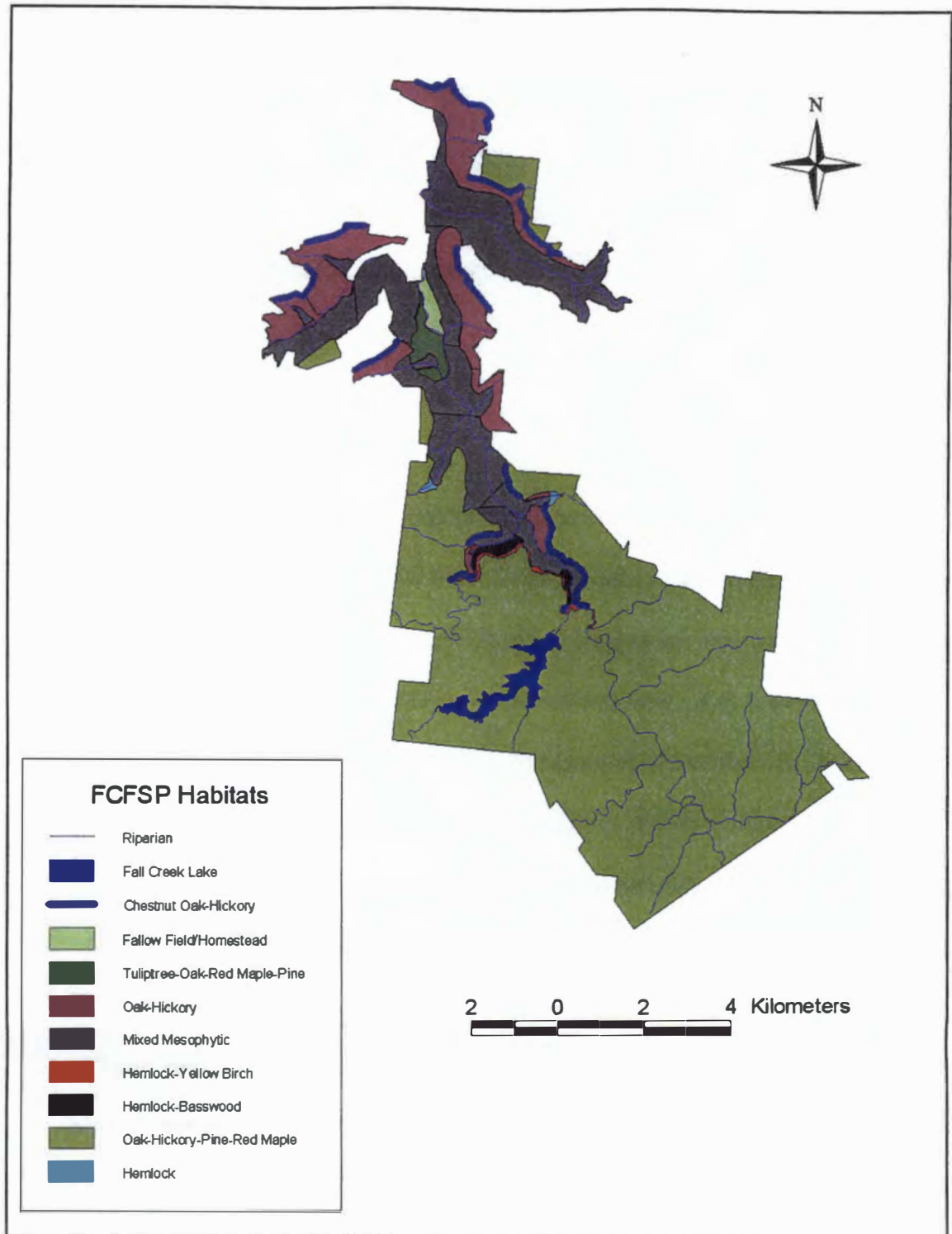


Figure 10. Vegetation map and general habitat locations in FCFSP, Van Buren and Bledsoe Counties, Tennessee.

lanuginosum, *Erythronium americanum*, *Maianthemum racemosum* ssp. *racemosum*, *Polygonatum biflorum*, *Trillium cuneatum*, *T. grandiflorum*, *T. recurvatum*, *T. sulcatum*, *Uvularia grandiflora*, *U. perfoliata*, *U. sessilifolia*, *Sanguinaria canadensis*, *Stylophorum diphyllum*, *Phlox divaricata*, *Actaea pachypoda*, *Delphinium tricorne*, *Thalictrum thalictroides*, *Mitella diphylla*, *Tiarella cordifolia*, *Viola blanda*, *V. canadensis*, *V. pubescens*, *V. rostrata*, and *V. striata*.

Hemlock

The hemlock community is restricted to upper reaches of a few streams that enter the gorges from the plateau surface. This habitat is quite mesic and seems to be located only in the more narrow and rugged heads of the gorges. The most extensive examples of this habitat occur along two creeks, which are known as Whetstone Branch and Walling Mill. The canopy is dominated by *Tsuga canadensis*, but other less abundant species are *Magnolia tripetala*, *Liriodendron tulipifera*, *Betula lutea*, *Oxydendrum arboreum*, and *Acer pensylvanicum*. Components of the shrub layer include *Rhododendron maximum*, which is the most abundant shrub, *Kalmia latifolia*, *Parthenocissus quinquefolia*, *Toxicodendron radicans*, and *Smilax rotundifolia*. The herbaceous layer is rather sparse beneath the dense canopy and subcanopy and the majority of the flora consists of pteridophytes such as *Polypodium appalachianum*, *Dryopteris marginalis*, *Polystichum acrostichoides*, and *Huperzia lucidula*. In some of the more open areas along the streams there is *Laportea canadensis*, *Aster* spp., and numerous common wildflowers.

Hemlock-Basswood

The Hemlock-Basswood Community is primarily located on northeast-trending lower slopes north of Fall Creek Gorge and also along the north-trending lower slopes of Piney Creek Gorge. At both sites, this assemblage is adjacent to the Hemlock-Yellow Birch and Mixed Mesophytic Communities. Topographically, this community is located on the lower to mid-slopes, which are generally steep with large boulders strewn about, as the gorges begin to widen towards the north.

The canopy is dominated by *Tsuga canadensis* and *Tilia americana* var. *americana* in conjunction with many other associated overstory taxa shared with the Mixed Mesophytic and Hemlock-Yellow Birch Communities. These taxa include *Acer saccharum*, *Betula lutea*, *Liriodendron tulipifera*, *Carya cordiformis*, *Aesculus flava*, *Magnolia acuminata*, *Quercus rubra*, *Fagus grandifolia*, and *Acer pensylvanicum*. *Rhododendron maximum* dominates the shrub layer, which also includes *Asimina triloba*, *Ribes cynosbati* (most commonly on boulders), *Lindera benzoin*, *Hamamelis virginiana*, *Parthenocissus virginiana*, *Euonymus americanus*, *Hydrangea arborescens*, and *Smilax rotundifolia*. The herbaceous layer is quite diverse and includes numerous common wildflowers. Other herbaceous taxa encountered include *Phacelia bipinnatifida*, *Laportea canadensis*, *Polystichum acrostichoides*, *Dryopteris marginalis*, *D. intermedia*, *Huperzia lucidula*, and *Thaspium barbinode*. Two rare herbaceous taxa documented from this habitat are *Panax trifolius* and *Hydrocotyle americana*.

Hemlock-Yellow Birch

This community, located at the beginning of Cane Creek, Fall Creek, and Piney Creek Gorges, generally occupies the narrow and more rugged portions of the gorges in FCFSP. The slopes are steep and are commonly littered with large sandstone boulders and loose rock. Due to the northern orientation of these areas and the depth and narrowness of the gorge, these areas receive very little direct sunlight. This factor in conjunction with the flow of the water creates a microclimate much cooler and mesic than in other areas of the park with the exception of the Cave Openings and Sinks.

The canopy is dominated by *Tsuga canadensis* and *Betula alleghaniensis*, but many other taxa are represented in this habitat, including *Tilia americana* var. *americana*, *Oxydendrum arboreum*, *Acer rubrum*, *A. saccharum*, *A. pensylvanicum*, *Ostrya virginiana*, and *Ulmus rubra*. The shrub layer is dominated by *Rhododendron maximum*, which effectively shades most of the forest floor, although some other less abundant taxa are found in natural open areas that are sometimes created by tree falls. These include *Sambucus racemosa* var. *racemosa*, *Clethra acuminata*, *Cornus alternifolia*, *Hamamelis virginiana*, *Hydrangea arborescens*, *Vitis aestivalis* var. *aestivalis*, *Parthenocissus quinquefolius*, *Rhus radicans*, *Philadelphus hirsutus*, and *Ribes cynsobati*. Pteridophytes such as *Dryopteris intermedia*, *D. marginalis*, *D. goldiana*, *Deparia acrostichoides*, *Cysopteris bulbifera*, *Polystichum acrostichoides*, and *Huperzia lucidula* dominate the herbaceous layer. Due to the rocky and rugged nature of the community, many of the other herbaceous taxa grow upon rocks and boulders on the slopes and edges of the creek. Some examples of these taxa include *Thalictrum clavatum*, *Aruncus dioicus*, *Phacelia*

bipinnatifida, *Stellaria pubera*, *Anemone quinquefolia*, *Heuchera villosa* var. *villosa*, *Chelone glabra*, *Hepatica nobilis* var. *acuta*, *Solidago caesia* var. *curtisii*, and *Symphyotrichum urophyllum*.

Mixed Mesophytic

The Mixed Mesophytic Community is the most common community throughout the gorges of FCFSP. It occupies the majority of lower to mid-slopes of the gorges that have semi-steep to gentle slopes, a northern or eastern aspect, and a mesic climate. The topography is less rugged than the Hemlock, Hemlock-Basswood, or Hemlock-Yellow Birch communities and in some places it exists on horizontal benches in areas where the gorge broadens towards the north. In many areas this habitat is adjacent to the Riparian Habitat that extends along the creeks in the gorges. There is a noticeable gradation from the Mixed Mesophytic to the Riparian habitat and as one moves progressively closer to the creeks, since species such as *Tsuga canadensis*, *Betula alleghaniensis*, and *Liriodendron tulipifera* become more abundant. It is difficult to delineate the boundary between these two communities, but the areas ca. 5 m on each side of the creek commonly possessed a higher frequency of riparian and more mesic taxa.

The canopy of this habitat is dominated by *Carya glabra*, *Tilia americana* var. *americana*, *Liriodendron tulipifera*, *Acer saccharum*, *Fagus grandifolia*, *Tsuga canadensis*, *Quercus rubra*, *Oxydendrum arboreum*, and *Ostrya virginiana*. This community shares many taxa with the Hemlock, Hemlock-Basswood, and Hemlock-Yellow Birch communities, but differs in the fact that it doesn't appear to have one or

two dominant taxa. Instead, there tends to be multiple co-dominants that exist simultaneously throughout this habitat. Other notable canopy taxa that are less frequent include *Cladrastis kentuckea*, *Aesculus flava*, *Carya cordiformis*, *Nyssa sylvatica*, *Juglans cinerea*, *Magnolia acuminata*, *M. macrophylla*, *Staphylea trifolia*, and *Fraxinus americana*.

There are numerous components of the shrub layer including *Hamamelis virginiana*, *Cornus florida*, *Asimina triloba*, *Toxicodendron radicans*, *Euonymus americana*, *E. atropurpurea*, *Rhododendron maximum*, *Hydrangea arborescens*, *Lindera benzoin*, *Smilax rotundifolia*, *S. tamnoides*, *Parthenocissus quinquefolia*, *Vitis vulpina*, and *V. aestivalis* var. *aestivalis*. The herbaceous layer of this community is quite rich with numerous common wildflowers. Some of the more notable herbs and pteridophytes of this community include *Polystichum acrostichoides*, *Dryopteris intermedia*, *Adiantum pedatum*, *Dioscorea villosa*, *Polygonum virginianum*, *Laportea candensis*, *Hybanthus concolor*, *Symphyotrichum* spp., *Solidago* spp., *Carex plantaginea*, *C. cumberlandensis*, *C. blanda*, *Chasmanthium latifolium*, *Brachyleytrum erectum*, *Aruncus dioicus*, *Desmodium* spp., *Rudbeckia fulgida* var. *umbrosa*, *Galium aparine*, *G. triflorum*, and *Lobelia cardinalis*. Some of the more rare components of the herbaceous layer are *Panax quinquefolius*, *P. trifolius*, *Hydrastis canadensis*, *Polymnia laevigata*, *Allium burdickii*, *Cypripedium pubescens*, and *Triphora trianthophora*.

Oak-Hickory

The Oak-Hickory Community is common on most south and southwest-trending slopes in the gorges. This habitat generally occupies the mid to upper slopes, extending to the gorge rim in places, where the slopes tend to be steep with a more xeric climate due to the direct sunlight they receive during most of the day. This habitat abuts the many cliff faces that line the gorges in many areas and in other places there are limestone outcrops that support unique vegetation assemblages.

The two most common genera of canopy trees that occupy this habitat are *Quercus* and *Carya*; *Quercus alba* and *Carya glabra* are the most common. Other components of the canopy include *Quercus rubra*, *Q. velutina*, *Liriodendron tulipifera*, *Carya ovalis*, *Oxydendron arboreum*, *Sassafras albidum*, *Cornus florida*, *Acer rubrum*, and *Nyssa sylvatica*. The shrub layer possesses species such as *Kalmia latifolia* (often forming dense thickets), *Calycanthus floridus* var. *floridus*, *Parthenocissus quinquefolia*, *Smilax rotundifolia*, *S. glauca*, *Vitis rotundifolia*, *Vaccinium arboreum*, *V. stamineum*, *Hamamelis virginiana*, and *Stewartia ovata*. The herbaceous layer is one of the most sparsely vegetated of the gorge habitats and the many of the species tend to flower in the summer or early fall. Some examples of herbaceous taxa are *Desmodium* spp., *Eurybia divaricata*, *Helianthus microcephalus*, *Coreopsis major*, *Solidago* spp., *Medeola virginiana*, *Viola hirsuta*, *Dichanthelium* spp., *Mitchella repens*, *Polystichum acrostichoides*.

Tuliptree-Pine-Oak-Red Maple

The Tuliptree-Pine-Oak-Red Maple Community is located in Cane Creek Gorge, south of the fallow fields of the old Wheeler homestead, and extends just south of Indian Camp Branch Gorge. This area appears to be in an early stage of secondary succession after large disturbances that may have included farming and logging. The age of the forest stand is assumed to be around 20-30 years with many small diameter trees intermixed with numerous saplings of trees more common in the Oak-Hickory and Mixed Mesophytic Communities. This community is situated in an area where Cane Creek Gorge begins to broaden into a flattened plane to the north. Due to its location and exposure, the area is relatively xeric with only a small slightly mesic area, which is located along Indian Camp Branch. There is an overgrown access road that runs parallel to Cane Creek, which extends through the middle of this habitat.

The woody vegetation of this area consists of *Liriodendron tulipifera*, *Pinus virginia*, *Quercus* spp., *Acer rubrum*, *Sassafras albidum*, *Nyssa sylvatica*, *Stewartia ovata*, *Rhododendron maximum*, *Ulmus rubra*, *Robinia pseudoacacia*, and *Toxicodendron radicans*. Non-native taxa were common throughout this habitat, especially along the road. Inside the forest and along the edges, some of the more common native taxa include *Desmodium* spp., *Solidago* spp., *Rudbeckia* spp., *Pycnanthemum pycnanthemoides* var. *pycnanthemoides*, *Chrysopsis mariana*, *Lespedeza repens*, *Silphium asteriscus* var. *asteriscus*, and *Scutellaria incana* var. *punctata*.

Riparian

The Riparian Habitat is found along the many creeks that flow through the gorges. In some areas the Mixed Mesophytic and Hemlock-Yellow Birch Communities line the creeks making it difficult to discern the riparian habitat from the surrounding forest communities, especially in the narrow gorges. Another unique factor is the seasonality of flow levels and presence or absence of water throughout the year. Due to the underlying limestone in the gorges, many of the creeks disappear into sinks during times of low water (late May-October of most years).

Commonly the streams are lined by mesic canopy taxa such as *Tsuga canadensis* and *Betula alleghaniensis*, which enable a person to trace the route of the streams from aerial maps. Other woody taxa encountered along the streams include *Acer negundo*, *Sambucus nigra* ssp. *canadensis*, *Rhododendron arborescens*, *Liquidambar styraciflua*, *Chionanthus virginiana*, *Platanus occidentalis*, *Cephalanthus occidentalis*, *Viburnum prunifolium*, *Salix caroliniana*, *S. humilis* var. *humilis*, *S. nigra*, *Itea virginica*, and *Dirca palustris*. Many herbs were documented along the edges of and within the streambeds including *Onoclea sensibilis*, *Juncus effusus*, *Ligusticum candense*, *Xanthorhiza simplicissima*, *Impatiens capensis*, *Spigelia marilandica*, *Trautvettaria carolinensis*, *Mimulus ringens*, *Physostegia virginiana* ssp. *praemorsa*, *Boehmeria cylindrica*, and *Pilea pumila*. Rare taxa that inhabit the riparian areas include *Vittaria appalachiana* and *Spiraea virginiana*. Unfortunately, *Spiraea japonica*, an aggressive invasive taxon, was observed growing along Cane Creek and Dry Fork. If left unmanaged, this taxon could be quite detrimental to this habitat in the future.

Gorges: Notable Microhabitats

Cave Openings and Sinks

The gorges of Fall Creek Falls are underlain by a karst topography that produces unique habitats in the form of caves and sinks. There are numerous examples of each formation that occur throughout the gorges. Predominately, they are located in either the Mixed Mesophytic or Oak-Hickory Communities. These areas are structured in such a way that they provide a sunken topography or an exposed limestone cliff. There is always an extremely mesic and cool microclimate associated with these sites that exists only a short distance from the formation. The vegetation at some of these formations commonly differ significantly from the plant community adjacent to the site due to geology and/or microclimate differences.

Most of these sites support the majority of the common wildflowers listed for the gorges and in most cases individuals are more robust and flower later than normal due to the cool climate. Some of the taxa observed in this microhabitat include *Philadelphus hirsutus*, *Staphylea trifolia*, *Celtis laevigata*, *Carya cordiformis*, *Cystopteris bulbifera*, *Aquilegia canadensis*, *Diplazium pycnocarpon*, *Dryopteris goldiana*, *Allium burdickii*, *Festuca subverticillata*, *Carex plantaginea*, *Circaea alpina*, *Astilbe biternata*, *Heuchera villosa* var. *villosa*, *Phacelia bipinnatifida*, *Hydrophyllum macrophyllum*, and *Parietaria pensylvanica*.

Waterfall Spray Zones

The gorges of FCFSP contain a large number of waterfalls, which vary in height from 78 meters to less than one meter. The areas adjacent to and behind the waterfalls provide a mesic and cool environment. The areas surrounding most of the waterfalls are usually extremely moist and provide habitat for diverse populations of bryophytes that cover the rock faces, streambed, and adjacent ground. Some of the vascular plants observed in this habitat include *Asplenium trichomanes*, *Cystopteris bulbifera*, *Adiantum capillus-veneris*, *Thalictrum clavatum*, *Hydrangea arborescens*, *Saxifraga careyana*, *Heuchera villosa* var. *villosa*, and *Dirca palustris*.

Boulder Fields

In the Hemlock, Hemlock-Basswood, Hemlock-Yellow Birch, Mixed Mesophytic, and Oak-Hickory Communities there are areas where large boulders are strewn about the slopes. The majority of the boulders are composed of sandstone, but a few limestone boulders do exist in areas near limestone outcrops, caves, and sinks. Some of these boulders, more commonly in mesic habitats, are host to small plant assemblages that take advantage of the soil that has accumulated on top of the rock substrate. Vascular plants documented growing on the boulders include *Asplenium rhizophyllum*, *A. resiliens*, *Polypodium appalachianum*, *Berberis canadensis*, *Sedum ternatum*, *Dryopteris intermedia*, *Hydrophyllum canadense*, *Phacelia bipinnatifida*, *Ribes cynosbati*, *Erythronium americanum*, *Hepatica nobilis* var. *acuta*, and *Viola blanda*.

Cliffs

Large vertical sandstone cliffs line many sections of Cane Creek, Piney Creek, and Fall Creek gorge. These cliffs can be observed at waterfall overlooks and also from the numerous pull-offs along Gorge Scenic Drive. There are some smaller limestone cliffs that occur above a few of the cave openings and sink formations. Overall, these cliffs are sparsely vegetated with the majority of the vascular plants occupying small ledges on the cliff where soil has accumulated. The most notable taxon from this habitat is *Thuja occidentalis*, which grows upon the cliff below Rockhouse Creek Falls near the Cascades Nature Center. Other taxa that occur in this habitat are *Aquilegia canadensis*, *Silene rotundifolia*, *Asplenium montanum*, *Heuchera parviflora*, *H. villosa* var. *villosa*, and *Pellaea atropurpurea*. Another taxon, *Parietaria pensylvanica* was observed on the ground at the base of many cliffs.

Limestone Outcrops

Limestone outcrops occur in the Oak-Hickory Community of Cane Creek Gorge, Dry Fork Gorge and along Perry Branch, near Camps Gulf. These areas support a unique vegetation assemblage that utilizes the basic soils associated with the exposed limestone. Some examples of taxa that are restricted to this habitat within the park are *Nestronia umbellula*, *Acer leucoderme*, *Rhus aromatica*, *Berberis canadensis*, *Euphorbia mercurialina*, *Frasera caroliniensis*, *Allium cernuum*, *Polygonatum pubescens*, *Fraxinus quadrangulata*, *Clematis viorna*, *Ptelea trifoliata*, and *Sideroxylon lycioides*.

Upland Plateau Surface

Six communities and two microhabitats are found on the upland plateau surface.

The area considered as the plateau surface is the land located within the borders of the park that extends to the rim of the gorges. The vegetation of the plateau is rather difficult to delineate without extensive sampling and remote sensing due to its heterogeneous nature. The areas of the park that lie upon the plateau are primarily forested, with the exception of areas that have been developed for recreation, transportation, or flooded by the creation of Fall Creek Lake. The dominant upland community is the Mixed Oak-Hickory-Red Maple-Pine, but within this community there are many other intermixed vegetation types. These other communities include the Shortleaf Pine-White Oak, Virginia Pine, Chestnut oak, Riparian, and the Plateau Lake. Two unique microhabitats found upon the plateau are Upland Swales and Sandstone Outcrops.

Mixed Oak-Hickory-Red Maple-Pine

The Mixed Oak-Hickory-Red Maple-Pine community is the most dominant vegetation type encountered on the plateau surface. Vegetation components of this assemblage can be found in many of the other communities on the plateau. The climate on the plateau surface is somewhat xeric and the area does not tend to support a very dense herbaceous layer. The majority of the herbaceous taxa flower in the summer or fall, which causes the community to have an open appearance for most of the year. There are a few areas, located adjacent to streams or moist depressions, which tend to have more dense vegetation.

The species composition of this community has a high amount of variability due to factors such as soil, aspect, topography, and climate. However, some of the common canopy taxa in this habitat are *Quercus alba*, *Q. velutina*, *Q. coccinea*, *Q. prinus*, *Q. stellata*, *Carya alba*, *C. ovata*, *Acer rubrum*, *A. saccharum*, *Pinus virginiana*, *P. echinata*, *Fagus grandifolia*, *Diospyros virginiana*, *Sassafras albidum*, *Nyssa sylvatica*, and *Oxydendrum arboreum*. Components of the subcanopy include *Ilex montana*, *I. opaca*, *Viburnum acerifolium*, *Calycanthus floridus* var. *floridus*, *Cornus florida*, *Kalmia latifolia*, *Rhododendron canescens*, *Vaccinium arboreum*, *V. corymbosum*, *V. pallidum*, *V. stamineum*, *Amelanchier arborea*, *Stewartia ovata*, *Toxicodendron radicans*, *Vitis aestivalis* var. *aestivalis*, *V. rotundifolia*, *Smilax* spp., and *Rubus* spp.

Taxa that commonly inhabit the herbaceous layer are *Polystichum acrostichoides*, *Sanicula candensis*, *Chrysopsis mariana*, *Coreopsis major*, *Doellingeria umbellata*, *Eupatorium serotinum*, *Helianthus microcephalus*, *Pityopsis graminifolia*, *Rudbeckia hirta* var. *hirta*, *Solidago* spp., *Symphyotrichum* spp., *Dichanthelium* spp., *Lobelia puberula*, *Desmodium* spp., *Monarda fistulosa*, *Hypoxis hirsuta*, *Oxalis violacea*, *Andropogon virginicus*, *Danthonia sericea*, *Lysimachia quadrifolia*, *Galium* spp., *Viola pedata*, and *V. pubescens*. Some of the more rare or unique taxa in this community are *Hypericum crux-andreae*, *Cypripedium acaule*, *Plantanthera ciliaris*, *Eryngium yuccifolium*, *Castanea dentata*, *Dichanthelium dichotomum* var. *ensifolium*, *Poa saltuensis*, *Aletris farinosa*, *Malus coronaria*, *Salix humilis* var. *tristis*, and *Xyris torta*.

Shortleaf Pine-White Oak

The Shortleaf Pine-White Oak community is relatively rare in the park, with the most notable example located on the point that extends out between Whetstone Creek and Cane Creek, just northwest of Piney Creek Gorge. The remaining examples of this habitat tend to exist on the higher xeric ridges in the park. The dominant canopy species are *Pinus echinata* and *Quercus alba* with few other associates from the surrounding Mixed Oak-Hickory-Red Maple-Pine Community. The subcanopy of this community was rather open with an occasional individual of *Kalmia latifolia*, *Cornus florida*, *Calycanthus floridus* var. *floridus*, *Vaccinium* spp., or *Smilax* spp. The herbaceous layer was also sparsely vegetated with taxa such as *Mitchella repens*, *Gaultheria procumbens*, and *Cypripedium acaule*.

Virginia Pine

The Virginia Pine community is a nearly monospecific stand dominated by *Pinus virginiana* and is found scattered throughout the Mixed Oak-Hickory-Red Maple-Pine Community. This vegetation type is not very common and has actually decreased in abundance over the past few years due to pine bark beetle infestations and large storm events. It is difficult to describe specific locations of this community due to its seemingly random distribution across the plateau surface, but along the rims of the gorges it tends to be the dominant community. As stated earlier, *Pinus virginiana* is the dominant canopy taxon, although other *Quercus* spp. and *Carya* spp. have been observed, in low abundance, as associates. Due to the degradation of this community from the aforementioned natural impacts, there are numerous canopy openings, which are

permitting the establishment of some hardwood species. Taxa commonly encountered in the subcanopy include *Kalmia latifolia*, *Vaccinium arboreum*, *V. corymbosum*, *V. pallidum*, and *Smilax* spp. The herbaceous layer in this community is rather sparse and includes taxa such as *Piptochaetium avenaceum*, *Pteridium aquilinum*, *Chimaphila maculata*, *Mitchella repens*, *Gaultheria procumbens*, *Epigaea repens*, *Danthonia spicata*, and *Tephrosia virginiana*.

Chestnut Oak

The Chestnut Oak community is usually located at or near the rim of the gorges on south or southwest-trending xeric slopes adjacent to the Virginia Pine Community. This association is included in the upland plateau section of the habitat descriptions since it is found both on the extreme upper slopes and on the upper plateau surface adjacent to the gorges. The dominant canopy taxon is *Quercus prinus*, but other canopy associates are *Acer rubrum*, *Robinia pseudoacacia*, *Liriodendron tulipifera*, *Nyssa sylvatica*, *Sassafras albidum*, *Carya glabra*, and *Oxydendrum arboreum*. The subcanopy shares many species with the Oak-Hickory and Virginian Pine Communities including *Kalmia latifolia*, *Vaccinium arboreum*, *Viburnum acerifolium*, *Ilex montana*, *Amelanchier arborea*, *Cornus florida*, and *Smilax* spp. Characteristic taxa of the herbaceous layer are *Desmodium* spp., *Danthonia spicata*, *Dichanthelium* spp., *Solidago* spp., *Chrysopsis mariana*, *Piptochaetium avenaceum*, *Doellingeria umbellata*, and *Coreopsis major*.

Riparian

Numerous streams meander across the plateau surface, which provide a habitat for more mesic taxa in this normally xeric area. When looking at aerial photographs, it is easily recognized since the streams are commonly lined by *Tsuga canadensis*. This taxon tends to be the most dominant canopy component, but the subcanopy is quite diverse with numerous taxa that are generally associated with riparian habitats. Some components of the subcanopy include *Alnus serrulata*, *Betula nigra*, *Sambucus nigra* ssp. *canadensis*, *Rhododendron maximum*, *Viburnum nudum* var. *cassinoides*, *Lyonia ligustrina*, *Chionanthus virginicus*, *Crataegus calpodendron*, *Photinia pyrifolia*, *Physocarpus opulifolius*, *Rosa palustris*, *Cornus amomum*, *Cephalanthus occidentalis*, *Carpinus caroliniana*, *Salix caroliniana*, *S. nigra*, and *Itea virginica*. Characteristic taxa of the herbaceous layer are *Ligusticum canadense*, *Eupatorium fistulosum*, *Hypericum crux-andreae*, *Osmunda cinnamomea*, *Xanthorhiza simplicissima*, *Boehmeria cylindrica*, *Coreopsis tripteris*, *Carex torta*, and *C. lurida*. A few rare taxa encountered during this survey and restricted to this community are *Spiraea virginiana*, *Hexastylis contracta*, *Potamogeton epihydrus*, and *Ludwigia linearis*.

Fall Creek Lake

Fall Creek Lake, which covers approximately 140 hectares, was created in 1966 by the construction of a dam on Fall Creek above Fall Creek Falls gorge. This lake has numerous microhabitats for aquatic and semi-aquatic vegetation both along its margins and in the open water. Along the margins of the lake aquatic taxa occur both in the

emergent zone and the seasonally dewatered mudflats. The open water of the lake only supports two taxa, *Potamogeton diversifolius* and *Callitriche heterophylla*.

The forest around the lake tends to extend nearly to the edge of the water, which leaves little room for the establishment of woody taxa that one tends to associate with wetlands or riparian habitats. The only areas that commonly have riparian taxa are near the inlet streams towards the southern end of the lake. These woody taxa include *Salix nigra*, *Cornus amomum*, *Fraxinus pennsylvanica*, *Lyonia ligustrina*, *Itea virginica*, *Photinia melanocarpa*, *Alnus serrulata*, *Viburnum nudum* var. *cassinoides*, and *Betula nigra*. Characteristic taxa of the emergent zone are *Dulichium arundinaceum*, *Eleocharis quadrangulata*, *Schoenoplectus purshianus*, *S. tabernaemontani*, *Juncus diffisissimus*, *J. nodatus*, *Typha latifolia*, and *Phragmites australis*. During the late summer and early fall, as the rainfall decreases on the plateau, extensive mudflats are exposed due to water draw down. These mudflats support taxa such as *Isoetes valida*, *Pilularia americana*, *Eleocharis acicularis*, *Sagittaria latifolia*, *Eryngium prostratum*, *Oxypolis rigidior*, *Helenium flexuosum*, *Scirpus cyperinus*, *Juncus acuminatus*, *J. coriaceous*, *J. effusus*, *Lycopus virginicus*, *Ludwigia alternifolia*, *Leersia oryzoides*, *Carex lurida*, *Lindernia dubia*, and *Mimulus ringens*.

Upland Plateau Surface: Notable Microhabitats

Sandstone Outcrops

Sandstone Outcrops are found along the rims of the gorges in areas where there are extremely xeric conditions and thin soils. Generally this microhabitat is associated

with the Virginia Pine community. Canopy species include *Pinus virginiana*, *Quercus velutina*, *Q. marilandica*, *Q. prinus*, *Nyssa sylvatica*, and *Oxydendrum arboreum*. Other woody taxa encountered on the outcrops are *Vaccinium arboreum*, *Cornus florida*, *Smilax* spp., and *Amelanchier arborea*. Characteristic herbaceous taxa from this habitat are *Liatris microcephala*, *Hypericum gentianoides*, *Spiranthes tuberosa*, *Diodia teres*, *Lechea racemulosa*, *Eupatorium rotundifolium* ssp. *ovatum*, *Solidago roanensis*, *Packera anonyma*, *Euphorbia corollata*, and *Helianthus microcephalus*.

Upland Swales

The upland swales provide one of the more unique habitats on the plateau. They occur where there are low-lying depressions in the plateau surface, which allow for the pooling of water from natural springs, streams, and rainwater. Typically, these areas retain moisture during most of the year, but can dry out during times of severe drought. Woody taxa associated with this habitat are *Acer rubrum*, *Viburnum nudum* var. *nudum*, *Crataegus calpodendron*, *Photinia pyrifolia*, *Itea virginica*, and *Lyonia ligustrina*. Herbaceous taxa characteristic of this habitat include *Viola cucullata*, *Bartonia paniculata*, *Plantanthera clavellata*, *Osmunda regalis* var. *spectabilis*, *O. cinnamomea*, *Parnassia asarifolia*, *Thelypteris noveboracensis*, *Xanthorhiza simplicissima*, and *Polystichum acrostichoides*.

Disturbed Areas

The four main areas that contain disturbed habitats are Park Facilities, Roads and Parking Areas, Clearings and Old Homesteads, and Quarries. The above areas are

developed for recreation, transportation, or have had historic anthropogenic disturbance that persists, such as old homesteads and limestone quarries. Moist Depressions, which are common in disturbed areas, are treated as a microhabitat.

All of these areas, except for the quarry and the wet depressions, commonly have ruderal taxa, a general term due to their high abundance, predominately non-native status, and since they are typically restricted to disturbed habitats. The following taxa are those considered to be “weedy”: *Taraxacum officinale*, *Cichorium intybus*, *Eupatorium capillifolium*, *Daucus carota*, *Achillea millefolium*, *Ambrosia trifida*, *A. artemisiifolia*, *Calystegia sepium*, *Melilotus alba*, *Vicia sativa* ssp. *nigra*, *Cardamine hirsuta*, *Dichondra carolinensis*, *Cerastium glomeratum*, *Chamaesyce maculata*, *Salvia lyrata*, *Dactylis glomerata*, *Verbascum thapsus*, *Trifolium pratense*, *T. repens*, *Glechoma hederacea*, *Oxalis stricta*, *Plantago lanceolata*, *P. rugelii*, *Agrostis gigantea*, *A. stolonifera*, *Lolium pratense*, *Poa pratensis*, *Sherardia arvensis*, *Veronica* spp., and *Viola sororia*.

Park Facilities

The Park Facilities category includes the areas surrounding buildings, campgrounds, overlooks, picnic areas, group campgrounds, and recreation facilities such as the swimming pool, tennis courts, golf course, and softball fields. Many of these areas have flowerbeds, with planted annual taxa maintained by the park staff, and mowed open areas that extend up to the forest edge. The vegetation of these highly manipulated areas is often dominated by non-native vegetation and is comprised of predominately “weedy”

taxa. Many of the non-native taxa in these areas are considered to be invasive and are in need of management. Some examples of these invasive taxa are *Lonicera japonica*, *L. maackii*, *Elaeagnus umbellata*, *Microstegium vimineum*, *Albizia julibrissin*, *Euonymus alatus*, *E. fortunei*, *Lespedeza cuneata*, *Lespedeza bicolor*, *Sorghum halepense*, and *Rosa multiflora*.

Roads and Parking Areas

This category includes the margins of roads and parking areas that can either be covered by pavement, gravel, and or dirt. Mowing is common along the roads and at the edges of parking areas, which allows for the establishment of numerous “weedy” taxa. The paved roads and parking areas that are frequented by visitors to the park are obviously impacted more by non-native invasive taxa, but some of the gravel service roads also contain these components. These areas share the same invasive taxa as the park facilities with the addition of *Paulownia tomentosa*, *Ailanthus altissima*, and *Pueraria montana* var. *lobata*, and are located mainly along State Highway 30 as it heads into Cane Creek Gorge from the park’s north entrance. Many native forest taxa take advantage of the direct sunlight at exposed forest edges along the roads, which results in some of the more showy floral displays on the plateau surface during the summer and early fall. Some of the aforementioned taxa are *Asclepias tuberosa*, *Tephrosia virginiana*, *Desmodium* spp., *Solidago* spp., *Symphyotrichum* spp., *Liatris* spp., *Rudbeckia* spp., *Helianthus* spp., *Clitoria mariana*, and *Ceanothus americanus*.

Clearings and Old Homesteads

Areas devoid of forest that were previously cultivated, inhabited, or are presently maintained as clearings for wildlife management or powerline right-of-ways are included in this category. These sites tend to have a high abundance of “weedy” taxa similar to the other disturbed areas. Many open areas or fields exist on the plateau surface, most commonly beneath powerlines and where the Tennessee Wildlife Resource Agency (TWRA) maintains forest food plots for wildlife. Invasive taxa documented from these areas include *Lonicera japonica*, *L. maackii*, *Euonymus alatus*, *E. fortunei*, *Elaeagnus umbellata*, *Albizia julibrissin*, *Lespedeza cuneata*, *Ligustrum sinense*, *Microstegium vimineum*, *Rosa multiflora*, and *Ailanthus altissima*.

Several unkempt homesteads are scattered throughout the park. These sites are not maintained and only a few have remnants of the old house foundations. Due to the degradation of the cultural artifacts, these areas are most easily identified by the existence of taxa that were frequently planted by the prior inhabitants. Characteristic taxa indicative of old homesteads are *Narcissus poeticus*, *Hemerocallis fulva*, *Forsythia viridissima*, *Lonicera japonica*, *Rosa multiflora*, *Ligustrum sinense*, *Vinca minor*, and *Rubus phoenicolasius*.

The two largest fields in the park possess taxa that are commonly associated with fallow fields. The largest, which is located in the northern part of Cane Creek Gorge as it begins to broaden, contains the remnants of the old Wheeler homestead. Another sizeable field is located adjacent to Group Camp #2, situated west of the Inn.

Characteristic taxa of these fallow fields are *Eupatorium hyssopifolium*, *E. serotinum*, *Coryza canadensis* var. *canadensis*, *Erechtites hieracifolia*, *Elephantopus tomentosus*, *Rudbeckia* spp., *Solidago* spp., *Verbesina alternifolia*, *V. occidentalis*, *Vernonia gigantea*, *Barbarea vulgaris*, *Amphicarpaea bracteata*, *Perilla frutescens*, *Rubus argutus*, *Pycnanthemum tenuifolium*, *Allium vineale*, *Panicum anceps*, *Phleum pratense*, *Andropogon virginicus*, *Setaria parviflora*, *Solanum carolinense*, and *Valerianella radiata*.

Quarries

Two historic quarries are within the boundaries of the park. The largest quarry is located along State Highway 30 approximately 7 km east of Spencer, TN. A smaller quarry is located approximately 250 m northeast of Camps Gulf and is accessible via a gravel road that is located just before the bridge over Cane Creek along State Highway 285. The limestone boulders and exposed highwalls from rock mining provide a unique habitat for numerous calciphiles. Taxa commonly observed in this habitat are *Juniperus virginiana*, *Pellaea atropurpurea*, *Celtis laevigata*, *Philadelphus hirsutus*, *Cercis canadensis*, *Rosa carolina*, *Sedum ternatum*, and *Manfreda virginica*.

Disturbed Areas: Notable Microhabitat

Wet Depressions

This microhabitat, which is formed by human activity, is defined as a relatively small area that holds water for a prolonged period during the growing season and supports wetland taxa. These wet depressions are commonly found in dirt or gravel roads

where ruts have begun to form, areas where earth has been moved for construction, and in the ditches along most roads. Taxa observed in or around the edges of these wet depressions are *Sagittaria latifolia*, *Eclipta prostrata*, *Cyperus strigosus*, *C. flavescens*, *Juncus coriaceus*, *J. effusus*, *Panicum anceps*, *Polygonum caespitosum* var. *longisetum*, *Samolus valerandi* ssp. *parviflorus*, *Tridens flavus*, *Sparganium americanum*, and *Typha latifolia*.

Data Analyses

Geographical Distribution

In order to better understand the geographical affinities of the flora, each taxon was categorized into four geographical categories based on their distribution as illustrated in The PLANTS Database (USDA, NRCS 2002). The results of this analysis and examples of taxa for each distribution category are found in Table 2.

Species Richness Comparison

A quantitative floristic comparison was preformed to assess the relative botanical richness of FCFSP in relation to other study sites on the Cumberland Plateau. This comparison utilized the species-area curve of Wade and Thompson (1991). Sites included in this comparison are FCFSP, Wolf Cove (Clements and Wofford 1991), Obed Wild and Scenic River (Schmalzer *et al.* 1985), Savage Gulf (Wofford *et al.* 1979), North

Table 2. Distribution characteristics of the vascular flora from FCFSP, Van Buren and Bledsoe Counties, Tennessee.

Category	Sample	Taxon	Range	Number of Taxa	Percent
Intraneous					
Northern	<i>Tsuga canadensis</i>		(north) ME to MN; (south) AL to GA	107	12.15
Central	<i>Juglans nigra</i>		(north) ME to ND; (south) FL to TX	546	61.98
Southern	<i>Vaccinium arboreum</i>		(north) s. IL to s. IN; (south) FL to TX	52	5.90
Extraneous					
Northern	<i>Acer pensylvanicum</i>		(north) ME to MN; (south) n. GA to SC	25	2.84
Southern	<i>Calycanthus floridus</i> var. <i>floridus</i>		(north) PA; (south) FL to MS	12	1.36
Endemic					
Northern	<i>Clethra acuminata</i>		(north) s. PA to e. KY and WV; (south) n. GA	5	0.57
Central	<i>Berberis canadensis</i>		(north) s. PA to MO; (south) AL to GA	18	2.04
Southern	<i>Polymnia laevigata</i>		(north) w. Ky to e. MO; (south) FL to MS	6	0.68
Non-native	<i>Pueraria montana</i> var. <i>lobata</i>	Asia		110	12.49

White Oak Creek Gorge (Allawos 1994), and Prentice Cooper State Forest and Wildlife Management Area (Beck 2000). The quantitative summary of this analysis is found in Table 3.

Table 3. Floristic Comparison of FCFSP and other vascular plant studies from the Cumberland Plateau Physiographic Province in Tennessee.

Cumberland Plateau Floras	Approximate Area (ha)	Number of Known Species	Number of Predicted Species	Percent Deviation
Wolf Cove (Clements and Wofford 1991)	1,000	573	594	-3.54
Obed Wild and Scenic River (Schmalzer <i>et al.</i> 1985)	4,000	734	694	+5.76
Savage Gulf (Wofford <i>et al.</i> 1979)	4,046	673	695	-3.17
North White Oak Creek Gorge (Allawos 1994)	5,407	526	718	-26.8
Fall Creek Falls State Park (Fleming 2003)	8,900	881	760	+15.9
Prentice Cooper State Forest and Wildlife Management Area (Beck 2000)	10,800	1,038	777	+33.6

Chapter 7: Discussion

Plant Communities and Habitats

Gorges

The gorges of Fall Creek Falls State Park (FCFSP) are divided into seven distinct plant communities and five microhabitats. The communities were delineated and described from extensive field reconnaissance that was aided by a past vegetation study from FCFSP by Caplenor (1965). The gorge communities described by Caplenor (1965) were reassessed by ground-truthing a general habitat map produced in his publication. Walk-through surveys verified many of the communities that he described within the original boundaries of the park. Since his study was only limited to the original boundaries of the park, the newly acquired gorge habitat was surveyed and community designations in new areas were delineated based on factors that include aspect, slope location, moisture, and canopy composition. The only vegetation in the newly acquired areas that did not conform to his designations was the Tuliptree-Pine-Oak-Red Maple Community. This area was located north of the original boundaries and is undergoing natural succession due to previous logging and possible cultivation.

The plant communities in the gorges are listed in descending order of aerial extent: Hemlock, Tuliptree-Pine-Oak-Red Maple, Hemlock-Yellow Birch, Riparian, Hemlock-Basswood, Oak-Hickory, and Mixed Mesophytic. Braun (1950), during her trip to FCFSP, described the gorge slopes as possessing mixed mesophytic taxa with an abundance of oaks and hickories on the east, south, and southeast-trending slopes. In a

broad sense the gorge communities do adhere to the mixed mesophytic designation with exposed areas possessing more xeric taxa. The designation of the gorges as being part of the Mixed Mesophytic Forest Region of Braun (1950) is in agreement with several floristic and vegetation studies completed on other gorges along the Cumberland Plateau in Tennessee (Sherman 1958, Clark 1966, Caplenor 1965, Quaterman *et al.* 1972, Schmalzer 1978, Caplenor 1979, Wofford *et al.* 1979, Hinkle 1989, Schmalzer 1989, Clements and Wofford 1991, Allawos 1994, Beck 2000).

Gorges that are deep and narrow, generally contain more mesic community types such as the Hemlock and Hemlock-Yellow Birch. These areas tend to be less exposed to direct sunlight and provide a wet and cool climate. As the gorges broaden towards the north, the north-trending slopes possess small pockets of Hemlock-Basswood and expansive areas of the Mixed Mesophytic community type. The Mixed Mesophytic vegetation type is by far the most dominant community in the gorges, as it exists on most slopes that are exposed to the north or northeast. The Riparian community, located along the numerous streams that flow through the gorges, is commonly situated adjacent to the more mesic plant communities that are mentioned above.

The Oak-Hickory community is common along east, south, and southeast-trending slopes, which are slightly more xeric than the north or northeast trending slopes. Vegetation assemblages that occupy certain slopes and not others can be the result of environmental variables associated with the aspect or gradient of a slope. Mowbray and Oosting (1968) stated, "segregation of vegetation components is associated with the

complex microenvironment gradients related to slope exposure and position on the slope.” The slopes with increased solar exposure likely have higher average temperature and increased evapotranspiration, resulting in a more xeric habitat.

The notable microhabitats within the gorges include: Cave Openings and Sinks, Waterfall Spray Zones, Boulder Fields, Cliffs, and Limestone Outcrops. These microhabitats were recognized based on rare vegetation assemblages, microclimate, or geologic substrate.

Upland Plateau

The upper plateau surface with FCFSP is divided into six communities and two microhabitats, delineated and described from extensive field reconnaissance. The most dominant plant community on the plateau is the Mixed Oak-Hickory-Red Maple-Pine community. This community assemblage somewhat agrees with the observations of Wofford *et al.* (1979), Braun (1950), and Küchler (1964). Hinkle (1989) questioned the designation of Hickory as co-dominate on the plateau surface. Although it has been debated, Hickory does appear to be an important component of the upland vegetation at FCFSP, therefore it will be considered as co-dominate until proven otherwise by systematic sampling within the park.

The Shortleaf Pine-White Oak and the Virginia Pine communities are found intermixed within the Mixed Oak-Hickory-Red Maple-Pine community. These two vegetation types, which are limited in aerial extent, seem to be distributed

discontinuously across the plateau surface, however there is a likely a topographic, climatic, edaphic, geologic, or natural disturbance factor(s) that can better explain their distribution patterns. Hinkle (1989) delineated these two pine assemblages along with the Chestnut Oak and Riparian communities utilizing a cluster analysis of Cumberland Plateau vegetation. The Chestnut Oak community is generally restricted to the upper slopes and areas along the gorge rims within the park, while the Riparian community is found adjacent to the numerous streams that flow across the plateau surface. Fall Creek Lake possesses aquatic and marsh-like habitats that are not found elsewhere in the park.

The two microhabitats upon the plateau surface are the sandstone outcrops and upland swales. The sandstone outcrops are found along the gorge rims while the upland swales usually exist as moist depressions near streams and seeps.

Disturbed Areas

Historic and ongoing anthropogenic and biotic disturbance or development within the park has resulted in the existence of numerous disturbed localities. In an attempt to reasonably describe the vegetation found in these areas, four broad categories of sites that usually contain disturbed habitats and one microhabitat were described. The categories used were Park Facilities, Roads and Parking Areas, Clearings and Homesteads, and Quarries. The one microhabitat, Wet Depressions, is commonly encountered in many of the aforementioned areas. Overall, the park is relatively natural with few disturbed or developed areas found within the park boundary.

It is extremely difficult to provide a synopsis of the types of vegetation that comprise disturbed areas since there are a variety of both ruderal and native taxa that occupy these sites. The ruderal taxa are predominately non-native taxa and depending on the location of the site, the native vegetation components tend to reflect the surrounding plant communities. A recent biotic disturbance, the southern pine bark beetle (*Dendroctonus frontalis* Zimmermann), has resulted in the opening of numerous forest stands that are dominated by pine taxa. In areas where these pine stands are adjacent roads or developed areas, numerous non-native taxa have been observed encroaching upon these newly opened areas.

Rare Plants

Tennessee Department of Environment and Conservation [TDEC] (2001) provides a comprehensive listing of rare vascular plants in Tennessee along with their state and federal status, if applicable. Seventeen taxa found at FCFSP are listed as Endangered, Threatened, Special Concern, or Special Concern-Commercially Exploited in the state of Tennessee (Table 4). The U.S. Fish and Wildlife Service designates one taxon, *Spiraea virginiana*, as federally Threatened. The federal status of Threatened (T) denotes a “taxon that is likely to become an endangered species in the foreseeable future, throughout all or a significant portion of its range” (ESA 1988). A detailed summary from each population of listed taxa was provided to TDEC. The following list defines the rare plant status designations in Tennessee as adopted by TDEC for the species encountered in FCFSP (TDEC 2001):

Table 4. State and Federally Listed Taxa in FCFSP, Van Buren and Bledsoe Counties, Tennessee.

Family	Species	State Status	Federal Status
Aceraceae	<i>Acer leucoderme</i>	S	
Apiaceae	<i>Hydrocotyle americana</i>	E	
Araliaceae	<i>Panax quinquefolius</i>	S-CE	
Aristolochiaceae	<i>Hexastylis contracta</i>	S	
Berberidaceae	<i>Berberis canadensis</i>	S	
Cupressaceae	<i>Thuja occidentalis</i>	S	
Fagaceae	<i>Castanea dentata</i>	S	
Juglandaceae	<i>Juglans cinerea</i>	T	
Liliaceae	<i>Allium burdickii</i>	T-CE	
Marsileaceae	<i>Pilularia americana</i>	S	
Orchidaceae	<i>Cypripedium acaule</i>	E-CE	
Poaceae	<i>Dichanthelium dichotomum</i> var. <i>ensifolium</i>	S	
Poaceae	<i>Poa saltuensis</i>	S	
Potamogetonaceae	<i>Potamogeton epihydrus</i>	S	
Ranunculaceae	<i>Hydrastis canadensis</i>	S-CE	
Rosaceae	<i>Spiraea virginiana</i>	E	LT
Santalaceae	<i>Nestronia umbellula</i>	E	

State Status:

- (E) Endangered
(T) Threatened
(SC) Special Concern
(S-CE) Special Concern-Commercially Exploited

Federal Status:

- (LT) Listed Treated

Endangered (E)—any species or subspecies of plant whose continued existence as a viable component of the state’s flora is determined by the Commissioner to be in jeopardy.

Threatened (T)— any species or subspecies of plant which appears likely, within the foreseeable future, to become endangered throughout all or a significant portion of its range in Tennessee.

Special Concern (SC)—any species or subspecies of plant that is uncommon in Tennessee, or has unique or highly specific habitat requirements or scientific value and therefore requires careful monitoring of its status.

Special Concern-Commercially Exploited (S-CE)—due to large numbers being taken from the wild and propagation or cultivation insufficient to meet market demand.

Taxa that represent a new county record or are only found in a few counties throughout the state warrant further discussion. Three taxa from the park are new county records for Van Buren County, Tennessee as listed in TENN (2003): *Nestronia umbellula*, *Allium burdickii*, and *Acer leucoderme*. The discovery of *N. umbellula* is quite significant since it is only known from three other counties in Tennessee and this population represents the only site from the Cumberland Plateau in Tennessee, making it a physiographic record for the state. Horn and Kral (1984) first documented this taxon as

being within Tennessee. The population that they cite is located in the Eastern Highland Rim, which is located west of the Cumberland Plateau. Several small populations of *A. burdickii* are found within the park growing on north-trending lower slopes in the Mixed Mesophytic community. This taxon is only known from eight other counties in Tennessee. A few individuals of *A. leucoderme* were found in the Mixed Mesophytic community near limestone outcrops and sinks. This species is very rare on the Cumberland Plateau, with only one collection from Hamilton County, but is more common in the Unaka Mountains.

Two listed species were included in the vascular flora after verifying the identification of voucher specimens deposited at the University of Tennessee Herbarium (TENN). Attempts were made to rediscover the previously documented populations of *Hydrocotyle americana* and *Poa saltuensis*, but these were unsuccessful. The author believes that the species may still exist within the park since the park has only experienced small-scale disturbance in the areas that were described on the labels dating around 1940. The taxon *Berberis canadensis* was recently documented from Van Buren County and this study increases the distribution data for this species with the addition of two small populations.

Known populations of *Potamogeton epihydrus*, *Pilularia americana*, and *Spiraea virginiana*, were reexamined to verify their existence and to check on health and potential detrimental impacts. The *P. epihydrus* population seemed to be doing well and at one point during the two-year survey, flowers were observed above the surface of the water.

The *P. americana* location within the park is one of the first documented populations in Tennessee (Dennis and Webb 1981). The population appeared healthy and the abundance of individuals suggests that it is successfully reproducing. Large populations of *S. virginiana* were observed growing along the upland plateau streams in areas that appear to get scoured by the seasonal floodwaters. Most populations of this taxon were vegetative, but one large population of ca. 500 stems was observed flowering during the mid-summer. Two smaller undocumented populations of *S. virginiana* were observed along Cane Creek in bottom of Cane Creek gorge. It is likely that these populations were established from water-dispersed rhizomes from upstream populations (Murell 2003).

Invasive Taxa

The Tennessee Exotic Pest Plant Council (TN-EPPC) classifies 38 non-native taxa from FCFSP as invasive. These taxa are assigned to categories that signify the potential of each taxon to negatively affect native plant populations. The listed taxa documented in this study are summarized in Table 5. The following categories from TN-EPPC (1996) outline the invasive characteristics for each category:

Rank 1 — Severe Threat: Exotic plant species that possess characteristics of invasive species and spread easily into native plant communities and displace native vegetation

Table 5. Invasive taxa either recognized by TN-EPPC (1996) or the author documented as occurring in FCFSP, Van Buren and Bledsoe Counties, Tennessee.

Rank 1	Rank 2	Rank 3
<i>Ailanthus altissima</i>	<i>Albizia julibrissin</i>	<i>Bromus commutatus</i>
<i>Elaeagnus umbellata</i>	<i>Allium vineale</i>	<i>Cichorium intybus</i>
<i>Lespedeza cuneata</i>	<i>Artemisia vulgaris</i>	<i>Daucus carota</i>
<i>Ligustrum sinense</i>	<i>Bromus japonicus</i>	<i>Kummerowia striata</i>
<i>Lonicera japonica</i>	<i>Celastrus orbiculatus</i>	<i>Populus alba</i>
<i>Microstegium vimineum</i>	<i>Leucanthemum vulgare</i>	<i>Rubus phoenicolasius</i>
<i>Pawlonia tomentosa</i>	<i>Cirsium vulgare</i>	<i>Setaria faberi</i>
<i>Phragmites australis</i>	<i>Coronilla varia</i>	<i>Xanthium strumarium</i>
<i>Pueraria montana</i> var. <i>lobata</i>	<i>Dioscorea oppositifolia</i>	
<i>Rosa multiflora</i>	<i>Euonymus alata</i>	
<i>Sorghum halepense</i>	<i>Festuca pratensis</i>	
	<i>Lespedeza bicolor</i>	
	<i>Melilotus alba</i>	
	<i>Mosla dianthera</i>	
	<i>Polygonum caespitosum</i>	
	<i>Setaria viridis</i>	
	<i>Spiraea japonica</i>	
	<i>Verbascum thapsus</i>	
	<i>Vinca minor</i>	
	<i>Euonymus fortunei</i> *	
	<i>Lonicera maackii</i> *	

*- denotes taxa not currently recognized by TN-EPPC

Rank 2 — Significant Threat: Exotic plant species that possess characteristics of invasive species but are not presently considered to spread as easily into native plant communities as those species listed as Rank 1— Severe Threat

Rank 3 — Lesser Threat: Exotic plant species that spread in or near disturbed areas and are not presently considered a threat to native plant communities.

Within FCFSP, invasive species can be found in most of the sites classified as Disturbed Areas, along hiking trails, and along some of the creeks both in the gorges and on the plateau surface. It is assumed by the author that humans are the primary dispersers of these invasive propagules due to the location of many of the organisms. However, it must also be noted that wildlife, wind, and fluvial dispersal mechanisms play an important role in their movement across the landscape. Reicherd and White (2001) define an invasive species as “one that has or is likely to spread into native flora and managed plant systems, develop self-sustaining populations, and become dominant or disruptive (or both) to those systems.” The amount of impact and characteristics of these organisms is presently an area of both extensive research and debate (Parker *et al.* 1999, Ellstrand and Schierenbeck 2000, Lonsdale 1999).

Wilcove *et al.* (1998) state that “habitat loss is the single greatest threat to biodiversity, followed by the spread of alien species...[and] nearly half of the imperiled species in the United States are threatened by alien species.” Therefore, in an area such as FCFSP it is imperative to design and implement an invasive species management plan

in order to afford some protection to diverse flora of the park. Many of woody and some of the herbaceous taxa listed by TN-EPPC can be actively managed in order to control significant source populations and eradicate the smaller populations. This floristic survey provides the data necessary to begin the development of such a plan, since it provides important baseline information on presence/absence of these organisms.

The subsequent steps in developing a management plan are a bit more complex. Management must consider each invasion separately and evaluate what would be the proper management protocol. One proactive approach to curbing future introductions of invasive species is to closely monitor the planting of ornamentals in the park by maintenance staff. Riechard and White (1997) found that as many as 82% of 235 woody taxa identified as colonizing outside of cultivation had been used in landscaping. It is apparent that there is some validity to this statistic when observing types of invasive taxa within the park and their proximity to numerous park facilities and old homesteads.

The location and species characteristics have to be taken into consideration in order to successfully eradicate a population without harming the surrounding vegetation or polluting water resources. The fluvial dispersal of propagules throughout the park via the numerous streams is probably the most sensitive situation observed in the park. Invasive taxa observed along the creeks that appear to be spreading include: *Rosa multiflora*, *Euonymus alata*, *Elaeagnus umbellata*, *Lonicera japonica*, and *Spiraea japonica*. Unfortunately, this also happens to be the habitat preferred by listed taxa such as *Spiraea virginiana*, *Hydrocotyle americana*, *Potamogeton epiphydrus*, and *Hexastylis contracta*.

This example illustrates the importance of formulating a management protocol that incorporates the aforementioned factors.

Distribution Characteristics

The majority of the taxa documented in the flora of FCFSP have distribution ranges that can lie somewhere from Florida to Canada and from the eastern coast of the United States over to Oklahoma and Texas. A few taxa are distributed across the entire continental United States, while others are restricted to either the southern Appalachians or the Cumberland Plateau. An attempt was made to analyze the flora in order to gain a better understanding of the vegetation and how the distribution of the taxa relates to the evolution of the vegetation around FCFSP. This analysis was adopted from Oxendine (1971), Clements (1987), and Allawos (1994) and distribution data was obtained from The PLANTS Database (USDA, NRCS 2002) and TENN (2003).

The majority of the taxa in the flora are classified as intraneous (80.03%), which signifies that the site lies near the center of distribution for these taxa. Intraneous taxa with more “northern” affinities are 12.5% of the total value, while taxa with more “southern” affinities comprise only 5.9% of the value. That leaves 61.98 % of the intraneous taxa to be classified as possessing a more “central” distribution. Extraneous taxa represent only 4.2% of the total flora and from this category 2.84% are deemed “northern” and 1.36% as “southern.” A small percentage of the flora is represented by endemic taxa (3.29%). Of the endemic taxa, 0.57% is considered as “northern”, 2.04% as “central”, and 0.68% as “southern.” Non-native species comprise 12.49% of the flora.

This analysis provides some insight into the floristic composition of the park and origins of present flora. It is apparent that many of the taxa lie well within their normal distribution ranges with only a few taxa that are endemic solely to this region of the United States. Another interesting trend uncovered in this analysis is the high number of taxa that are “northern” relative to those that are more “southern” in distribution. This could possibly be evidence for the southern displacement of taxa to suitable habitats during full glacial times in the Pleistocene and the subsequent northward migration of taxa during periods of prolonged warming. Delcourt *et al.* (1993) propose that the southeast United States could have provided the seed source for the biotic communities of eastern North America post-glaciation.

Taxa with Unique Distributions

Several taxa from this study (Table 6) with unique distribution patterns in Tennessee are either disjunct from the Unaka Mountains to the Cumberland Plateau or mainly restricted to the Cumberland Plateau. These types of distribution patterns offer support the contention that taxa have migrated to areas of higher elevation during past glacial episodes and possibly persisted in Pleistocene refugia. Those data lend support to such a theory since a number of the taxa have disjunct populations that are found to the east in the higher elevation Unaka Mountains. The majority of the taxa that exhibit these distribution patterns exist in the gorges of the park with the exception of *Hexastylis*

Table 6. Taxa with unique distribution patterns documented from FCFSP, Van Buren and Bledsoe Counties, Tennessee.

Species	Disjunct (Cumberland Plateau and Unaka)	Mainly Restricted to Cumberland Plateau
<i>Acer leucoderme</i>	X	
<i>Acer pensylvanicum</i>	X	
<i>Baptisia tinctoria</i>	X	
<i>Betula alleghaniensis</i>	X	
<i>Carex glaucescens</i>		X
<i>Circaea alpina</i>	X	
<i>Clethra acuminata</i>	X	
<i>Danthonia compressa</i>	X	
<i>Galium lanceolatum</i>	X	
<i>Heuchera parviflora</i>		X
<i>Hexastylis contracta</i>		X
<i>Hydrocotyle americana</i>	X	
<i>Lactuca biennis</i>	X	
<i>Liatris microcephala</i>		X
<i>Ludwigia linearis</i>		X
<i>Panax trifolius</i>	X	
<i>Poa saltuensis</i>		X
<i>Sambucus racemosa</i> var. <i>racemosa</i>	X	
<i>Scutellaria pseudoserata</i>		X
<i>Silene rotundifolia</i>		X
<i>Spiraea virginiana</i>		X
<i>Thalictrum clavatum</i>	X	
<i>Thuja occidentalis</i>	X	
<i>Trillium sulcatum</i>		X

contracta and *Spiraea virginiana*, which are more commonly encountered on the plateau surface.

Paleoecological evidence of past vegetation assemblages and the migration of taxa on a geologic time scale provide a framework to analyze current distribution patterns of the taxa from FCFSP. Shanks (1958) proposed that species endemic to the Cumberland Plateau have persisted through time due to the stability of the upland erosion surface and persistence of habitats since Tertiary times. This theory however is problematic if the reasoning is based on the persistence of habitats since Tertiary times when considering the findings of H.R. Delcourt (1979). The existence of endemic taxa and those with more northern affinities is however better supported by the idea that the gorges of the plateau served as refugia for certain mixed mesophytic taxa during Pleistocene glaciation (Caplenor 1979, Delcourt 1979). Braun (1950) considered the refugia a feasible possibility for sites in closer proximity to the glacial boundary, but not as far south as the portion of the Cumberland Plateau near FCFSP. Recently, the use of molecular analysis has provided insights into the location of glacial refugia (Comes and Kadereit 1998). Walker (1987) and Murrell (2003) have both produced molecular evidence supporting that the Cumberland Plateau may have served as glacial refugia for *Thuja occidentalis* and *Spiraea virginiana*.

Comparison of Seven Cumberland Plateau Floras

There are limited techniques that can be employed when assessing the diversity of a natural area using solely floristic data due to numerous variables that cannot be accounted for with a simple formula. The number of taxa documented from the park (881) appears high, but this must be verified by comparing the richness of this site to similar sites on the Cumberland Plateau. A method commonly used is the species-area curve, which uses the number of taxa in a given location and relates that to the size of an area. The usefulness of this technique is questionable when comparing areas of differing sizes that have a heterogeneous landscape with many unique habitats (Monk 1971, Haas 1975, Boecklen and Gotelli 1984, Lomolino 2000).

The species area curve of Wade and Thompson (1991) was used to analyze the diversity of FCFSP relative to other sites on the Cumberland Plateau in Tennessee. This species area curve was calibrated to include areas of all sizes above 10 ha that lie within the Mixed Mesophytic and Western Mesophytic Forest as described by Braun (1950). Wade and Thompson found that this method explained 80% of the variation in the numbers of species from 24 sites selected, based on the thoroughness and quality of the survey.

Areas that exceed their predicted richness values are Prentice Cooper State Forest and Wildlife Management Area [PCFWMA] (+33.6 %), Fall Creek Falls State Park [FCFSP] (+15.9 %), and Obed Wild and Scenic River [OWSR] (+5.76%). The high value associated with PCFWMA is likely due to the elevated number of non-native taxa

(179 spp.) documented from the site. The sites with lower than predicted species richness are North White Oak Creek Gorge [NWOC] (-26.8%), Wolf Cove [WC] (-3.54), and Savage Gulf [SG] (-3.17). The flora of FCFSP ranks second in richness when compared with other sites from the Cumberland Plateau in Tennessee. The high richness of PCFWMA, FCFSP, and OWSR may be explained by the presence of diverse habitats and topographic variability within the areas. The lack of the aforementioned factors may be reason for the low values associated with NWOC, but without further knowledge of the site, further speculation is unwarranted. The values associated with WC and SV illustrate that these areas possess a species richness number close to the predicted values.

Current Landscape Overview

The status of the landscape surrounding the park is something that must be considered when trying to analyze the amount of preservation afforded to the natural resources of the park. The fragmentation of forests is global concern as native forests are removed to make way for other land uses or altered in such a way that their composition does not reflect its original state. Landscape changes can be linked to economic development, population growth, technology, and environmental change (Houghton 1994). When looking at a preserve such as FCFSP, it is important to view the area as one that is embedded in a landscape matrix. This landscape matrix can exist as native vegetation or other human modified forms such as agricultural fields, pine plantations, roads, or housing and business developments. A highly fragmented matrix possessing a different structure and composition than the reserve, increases the negative impacts of a high edge:area ratio. A reserve that has a high edge:area ratio requires a suitable buffer

zone in order to offer at least some protection from external factors. Franklin (1993) states that “if a reserve is embedded in a matrix of that is highly dissimilar—has a high contrast—a much larger reserved area is going to be required to achieve the same level of protection.”

When attempting to preserve the diversity in a reserve, habitat fragmentation can affect microclimate within a fragment and also on the biological processes associated with its geographic isolation (Saunders *et al.* 1991). The microclimate within the preserve can be altered when a new vegetation type that possesses different structure or composition is introduced to the area adjacent to the reserve. Changes in radiation fluxes, wind movement, and water flux can have detrimental effects on the vegetation located within the fragments. The isolation of fragments from areas that possess similar vegetation can negatively affect some natural ecosystem processes in the fragments. These natural processes can include exchange of genetic material, dispersal mechanisms, and establishment or deletion of biological components. “Long-isolated remnants can be expected to have lost a proportion of the species originally present, and gained an additional component of invading species that are capable of establishing in the fragmented system” (Saunders *et al.* 1991).

The fragmentation of landscapes is something that will surely continue forever, but developing a framework to hopefully ameliorate some of the deleterious impacts is imperative. The development of this framework is however a daunting task since one has to consider at what scale this conservation effort is to take place. The question of scale is

an important consideration and a decision must be made whether to preserve an individual taxon, the ecosystem inhabited by that taxon, or the landscape within which that ecosystem is embedded. Franklin (1993) argues that ecosystems and landscape-scale conservation is the only way to approach this question; since we don't completely understand all the components and processes of the systems and how all is interconnected. Poiani *et al.* (2000) support this argument and provide an example of how this type of strategy can be employed from the Yampa River in Colorado.

Currently, there are several GIS and remote sensing projects that are beginning to produce landscape level analysis and predictive models for the landscapes of the United States (Wear and Bolstad 1998, Kline *et al.* 2001, Evans *et al.* 2002). These analyses produce baseline data that can be used for land-use decisions and conservation strategies. This type of work is particularly important in the southeastern United States since the majority of the land is privately held and most decisions influencing the landscape as a whole are left up to owners and government agencies that offer guidance concerning land use.

Evans *et al.* (2002) studied forest change on the Cumberland Plateau in southern Tennessee in an attempt to quantify shifting land use in such a way that the information can be used as a guide for landscape-scale decisions. This study documented that from 1981-2000, there was a 14% decrease in the amount of area with intact native forest canopy on the southern Cumberland Plateau. More specifically, Van Buren County lost 18% of its native forest canopy during this time period. Most of the forest conversion

was attributed to pine plantations, agriculture, mining, and general development (Evans *et al.* 2002).

The landscape matrix surrounding FCFSP (Figure 11) illustrates the variety of land uses adjacent to the borders of the park and their approximate aerial extent (USGS 1992). The northeastern and northwestern boundaries of the park have a vegetation type that is listed as evergreen forest, which is not misleading except for the fact it represents pine plantations. The fragmentation of the park is underway and this is especially evident along its eastern and northern boundaries. Agricultural fields and other types of development tend to be located near transportation corridors, while the symmetrical pine plantations appear randomly scattered across the landscape. The impacts of the fragmentation is likely to be more severe in a reserve such as this due to the high edge:area ratio, which is associated with the total length of the boundary and the elongated shape of the park.

The current trend of development on the plateau near the boundaries of the park is a bit disheartening. During this study, the author observed a large housing development and a few smaller ones being constructed adjacent to the park boundary. It is understandable that there is a need for economic development in an area such as Van Buren County where there is not an extensive tax base. However, future development should take into consideration studies such as those pursued by Evans *et al.* (2002), so that responsible decisions can be made to lessen the impact of such endeavors.

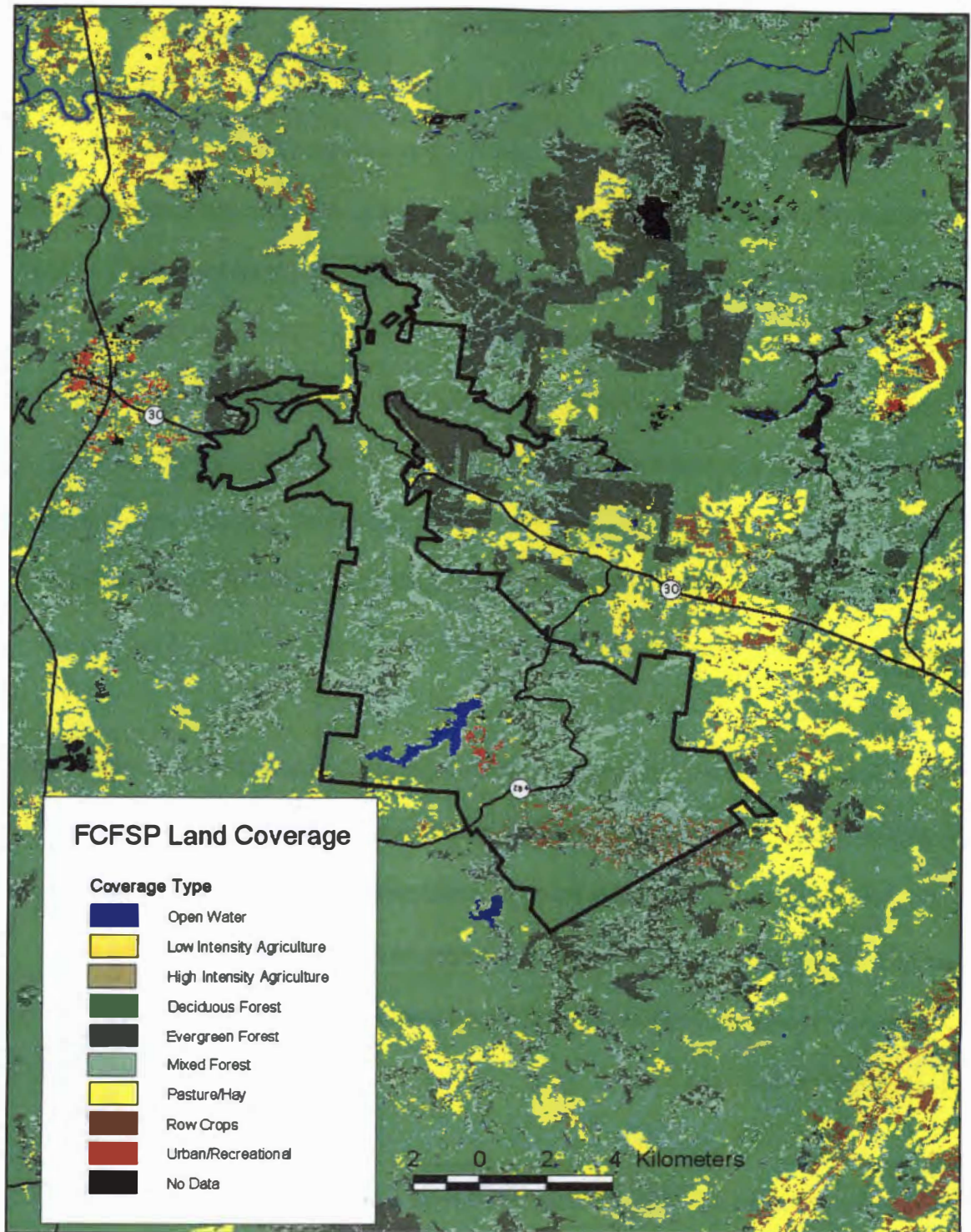


Figure 11. Land-use coverage from Van Buren and Bledsoe Counties, Tennessee in the vicinity of FCFSP (USGS 1992).

Conclusion

This study provides an overview of the vascular flora of Fall Creek Falls State Park (FCFSP). The 881 vascular plant taxa documented during this study, place this area as one of the most taxonomically rich areas within the state of Tennessee. The results of this study increase the baseline botanical knowledge of the Cumberland Plateau, which is becoming recognized as one of the richest physiographic provinces in the state. The diverse flora, plant communities, and microhabitats contained within the park can be attributed to factors that can include: diverse topographic relief, geology, soils, regional climate and microclimates associated with certain gorges and geologic features, and plant migrations that have occurred on a geologic time scale.

This study provides important baseline biological information that can be utilized by park managers, state conservation agencies, botanists, and ecologists. Another important role of such a study is to uncover deeper ecological questions that can be pursued in the future. These questions can include: the impacts of invasive taxa and management strategies, impacts of forest fragmentation on the park, as well as biogeographical inquiries.

The park affords much needed protection to a number of threatened and endangered taxa. The persistence of such taxa is dependent on the preservation of suitable habitat that is rarely if ever disturbed. However, it must be noted that natural flooding events may actually benefit certain taxa that inhabit riparian corridors, by

scouring away other competing vegetation and aiding in the dispersal of rhizomes downstream. Nevertheless, there are many types of disturbance events, either natural or anthropogenic, that can negatively impact these populations. The primary concern lies with the impact of invasive species on ecosystem components and processes. Fortunately, the impact of invasive taxa in the park at this time is minimal and most of the observed populations are currently at manageable levels. If the right steps are taken to actively manage aggressive populations and eradicate smaller populations of invasive taxa, then the future negative impacts of these organisms will be minimal.

The rich flora documented from the park is quite significant, but one must also realize that this site is located in a region of the state where the landscape is constantly changing due to a variety of reasons. Landscape studies such as that pursued by Evans *et al.* (2002) will become increasingly important as park managers and state officials make land use recommendations to the public and attempt to acquire land adjacent to the reserve. The park includes ca. 8,900 ha, however the area that is effectively preserved is much less when the effects of a high edge:area ratio is considered. A large amount of development is now taking place along the borders of the park and more is planned for the future (Stuart Carroll pers. comm 2003). Land acquisitions and conservation easements with neighboring landowners need to be pursued diligently in order to create a buffer zone around the park that can lessen impacts of regional development.

The unique distribution patterns of some taxa may be seen as support for the theory that the gorges of the Cumberland Plateau served as Pleistocene refugia for some

vascular plant taxa. Walker (1987) and Murrell (2003) have already done molecular work on *Thuja occidentalis* and *Spiraea virginiana*, respectively, to explore this possibility. The results of their work have added support for the refugia theory and further investigation along these lines is warranted for many other taxa discussed in this study. This type of work can have conservation implications due to the increased genetic variability observed in refugia populations and the decline of species on the periphery of their range due to biotic impacts (Newton *et al.* 1999).

In closing, I hope that this work will assist the park system in the management of this area and serve as an inspiration to others that are interested in pursuing botanical and ecological studies on the Cumberland Plateau of Tennessee.

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Appendix:
Annotated Checklist of the Vascular Flora of FCFSP,
Van Buren and Bledsoe Counties, Tennessee

Nomenclature in the annotated checklist follows the PLANTS database (USDA, NRCS 2002). This database is gradually becoming a recognized source for updated botanical nomenclature and is readily available to anyone with internet access. Nomenclature is rapidly evolving due to increased work in molecular systematics and this source attempts to keep track of these changes. Three taxa are not listed in the PLANTS database since they have been recently described in the literature. In those cases, the literature citation is included in the list for each of those taxa.

The plant families are arranged in alphabetical order within the following taxonomic groups:

Lycopodiophyta (Fern Allies)

Polypodiophyta (Ferns)

Pinophyta (Gymnosperms)

Magnoliophyta (Angiosperms)

Magnoliopsida (Monocots)

Liliopsida (Dicots)

The genera are arranged alphabetically within each family. Species and lesser taxa are then arranged alphabetically within each genus. An asterisk * precedes the scientific name of non-native taxa. Following the scientific name for each taxon is the authority, common name(s), relative abundance within the park, preferred habitat(s), voucher number, synonyms where pertinent, and literature citation for recently described taxa.

The following relative abundance categories follow White (1982) and they refer to the abundance of the taxa within the entire park:

Very rare	- A single locale, few individuals
Rare	- One or two localities, generally small populations
Scarce	- Several localities, or scattered small populations
Infrequent	- Scattered localities throughout
Occasional	- Well distributed but not abundant anywhere
Frequent	- Generally encountered
Common	- Characteristic and dominant

Habitats were delineated within the park from field reconnaissance that focused on repetitive floristic composition (canopy, subcanopy/shrub, and herb layers), forest physiognomy, and physiographic features (topography, elevation, soils). Each habitat is assigned a number designation that corresponds to the following list:

Gorges

1. Hemlock
2. Hemlock-Basswood
3. Hemlock-Yellow Birch
4. Mixed Mesophytic
5. Oak-Hickory
6. Tuliptree-Pine-Oak-Red Maple
7. Riparian

Notable Microhabitats within Gorges

8. Cave Openings/Sinks
9. Waterfall Spray Zones
10. Boulder Fields
11. Cliffs
12. Limestone Outcrops

Upland Plateau Surface

13. Mixed Oak-Hickory-Red Maple-Pine
14. Shortleaf Pine-White Oak
15. Virginia Pine
16. Chestnut Oak
17. Riparian
18. Fall Creek Lake

Notable Microhabitats on Plateau Surface

19. Sandstone Outcrops
20. Upland Swales

Disturbed Areas

21. Park Facilities
22. Roads and Parking Areas
23. Clearings and Old Homesteads
24. Quarries

Notable Microhabitat within Disturbed Areas

25. Wet Depressions

Voucher numbers of accessioned collections from Fall Creek Falls State Park are listed following the preferred habitat(s). Where pertinent, commonly recognized synonyms of scientific names are included in brackets []. Literature citations for recently named taxa are included in parentheses ().

LYCOPODIOPHYTA

Isoetaceae

Isoetes

I. valida (Engelmann) Clute; strong quillwort. Rare. Habitat(s): 18.
Voucher: FCF-1293.

I. x altonharvillii Musselman; quillwort. Very rare. Habitat(s): 18.
Voucher: FCF-1785. (Musselman *et al.* 1995)

Lycopodiaceae

Huperzia

H. lucidula (Michx.) Trevis.; shining clubmoss. Infrequent. Habitat(s): 1, 2, 3, 13, 15, 17. Voucher: H.H. Iltis 3287. [*Lycopodium lucidulum* Michx.]

H. porophila (F.E. Lloyd & Underw.) Holub.; rock clubmoss. Rare.
Habitat(s): 3. Voucher: FCF-2037. [*Lycopodium porophilum* Lloyd & Underwood]

Lycopodium

L. digitatum Dill. ex A. Braun; fan clubmoss. Infrequent. Habitat(s): 4, 13, 15, 17. Voucher: FCF-652. [*Diphasiastrum digitatum* (A. Braun) Holub]

L. obscurum L. var. *obscurum*; rare clubmoss. Scarce. Habitat(s): 1, 2, 3.
Voucher: FCF-941.

Selaginellaceae

Selaginella apoda (L.) Spring; meadow spike moss. Frequent. Habitat(s): 7.
Voucher: FCF-1905.

POLYPODIOPHYTA

Aspleniaceae

Asplenium

A. montanum Willd.; mountain spleenwort. Infrequent. Habitat(s): 10, 11.
Voucher: FCF-1740.

A. platyneuron (L.) Britton, Sterns & Poggenb.; ebony spleenwort. Occasional. Habitat(s): 13, 22. Voucher: FCF-1233.

A. resiliens Kunze; blackstem spleenwort. Scarce. Habitat(s): 10, 11, 19. Voucher: FCF-1165.

A. rhizophyllum L.; walking fern. Infrequent. Habitat(s): 10. Voucher: FCF-856.

A. trichomanes L.; maidenhair spleenwort. Very rare. Habitat(s): 9, 11. Voucher: FCF-2108.

Blechnaceae

Woodwardia areolata (L.) T. Moore; netted chain fern. Very rare. Habitat(s): 13, 15. Voucher: FCF-1748.

Dennstaedtiaceae

Dennstaedtia punctilobula (Michx.) T. Moore; eastern hayscented fern. Infrequent. Habitat(s): 3, 7. Voucher: FCF-1052.

Pteridium aquilinum (L.) Kuhn; western bracken fern. Frequent. Habitat(s): 13, 15. Voucher: FCF-471.

Dryopteridaceae

Athyrium filix-femina (L.) Roth subsp. *asplenioides* (Michx.) Hulten; lady fern. Occasional. Habitat(s): 3, 4, 12, 13. Voucher: FCF-1051.

Cystopteris bulbifera (L.) Bernh.; bublet bladder fern. Occasional. Habitat(s): 3, 4, 8, 9, 10, 11. Voucher: FCF-2109.

Deparia acrostichoides (Swartz) M. Kato; silver glade fern. Scarce. Habitat(s): 3, 4. Voucher: FCF-987. [*Athyrium thelyptroides* (Michx.) Desv.]

Diplazium pycnocarpon (Spreng.) M. Broun; glade fern. Infrequent. Habitat(s): 4, 5, 8. Voucher: FCF-986. [*Athyrium pycnocarpon* (Spreng.) Tidestrom]

Dryopteris

D. goldiana (Hook.) A. Gray; Goldie's wood fern. Rare. Habitat(s): 3, 4, 8. Voucher: FCF-848.

D. intermedia (Muhl.) A. Gray; intermediate wood fern. Occasional.
Habitat(s): 2, 3, 4, 10. Voucher: FCF-1908.

D. marginalis (L.) A. Gray; marginal wood fern. Occasional. Habitat(s):
3, 4, 8, 17. Voucher: FCF-1061.

Onoclea sensibilis L.; sensitive fern. Infrequent. Habitat(s): 7. Voucher: FCF-
2097.

Polystichum acrostichoides (Michx.) Schott; Christmas fern. Frequent.
Habitat(s): 2, 3, 4, 5, 8, 13, 15. Voucher: FCF-320.

Hymenophyllaceae

Trichomanes intricatum Farrar; weft fern. Rare. Habitat(s): 7, 10, 11. Voucher:
FCF-1571.

Marsileaceae

Pilularia americana A. Braun; American pillwort. Very rare. Habitat(s): 18.
Voucher: FCF-2225.

Ophioglossaceae

Botrychium

B. dissectum Spreng.; cutleaf grape fern. Infrequent. Habitat(s): 4, 13. Voucher:
FCF-1457.

B. virginianum (L.) Sw.; rattlesnake fern. Infrequent. Habitat(s): 4. Voucher:
FCF-287.

Osmundaceae

Osmunda

O. cinnamomea L.; cinnamon fern. Infrequent. Habitat(s): 17, 20.
Voucher: FCF-669.

O. regalis L. var. *spectabilis* (Willd.) A. Gray; royal fern. Scarce.
Habitat(s): 20. Voucher: FCF-244.

Polypodiaceae

Pleopeltis polypodioides (L.) Andrews & Windham ssp. *Michauxiana*
(Weatherby) Andrews & Windham; resurrection fern. Scarce.
Habitat(s): 10. Voucher: FCF-190. [*Polypodium polypodioides* (L.) Watt]

Polypodium appalachianum Haufler & Windham; Appalachian polypody.
Occasional. Habitat(s): 10. Voucher: FCF-573.

Pteridaceae

Adiantum

A. capillus-veneris L.; common maidenhair. Very rare. Habitat(s): 9.
Voucher: FCF-823.

A. pedatum L.; northern maidenhair. Infrequent. Habitat(s): 2, 4, 8, 9.
Voucher: FCF-288.

Schizaeaceae

Lygodium palmatum (Bernh.) Sw.; American climbing fern. Scarce. Habitat(s):
13, 15. Voucher: FCF-545.

Sinopteridaceae

Pellaea atropurpurea (L.) Link; purple cliffbrake. Infrequent. Habitat(s): 11, 12,
24. Voucher: FCF-1141.

Thelypteridaceae

Phegopteris hexagonoptera (Michx.) Fee; broad beech fern. Infrequent.
Habitat(s): 4, 5. Voucher: FCF-789. [*Thelypteris hexagonoptera* (Michx.)
Weath.]

Thelypteris noveboracensis (L.) Nieuwl.; New York fern. Occasional. Habitat(s):
13, 15, 20. Voucher: FCF-439.

Vittariaceae

Vittaria appalachiana Farrar & Mickel; Appalachian gametophyte. Very rare.
Habitat(s): 3, 7, 10. Voucher: FCF-1572.

PINOPHYTA

Cupressaceae

Juniperus virginiana L.; red cedar. Infrequent. Habitat(s): 12, 13. Voucher:
FCF-1.

Thuja occidentalis L.; northern white cedar, arbor vitae. Very rare. Habitat(s): 11. Voucher: FCF-1894.

Pinaceae

Pinus

P. echinata Mill.; shortleaf pine. Infrequent. Habitat(s): 13, 14. Voucher: FCF-2147.

P. strobus L.; eastern white pine. Infrequent. Habitat(s): 17, 22. Voucher: FCF-21.

P. taeda L.; loblolly pine. Very rare. Habitat(s): 22, 23. Voucher: FCF-2221.

P. virginiana Mill.; Virginia pine, scrub pine. Common. Habitat(s): 13, 15, 19. Voucher: FCF-4.

Tsuga canadensis (L.) Carriere; eastern hemlock, Canada hemlock. Common. Habitat(s): 1, 2, 3, 4, 17. Voucher: FCF-2228.

MAGNOLIOPHYTA: LILIOPSIDA

Agavaceae

Manfreda virginica (L.) Rose; agave, false aloe. Infrequent. Habitat(s): 5. Voucher: FCF-2177.

Yucca filamentosa L.; Adam's needle. Scarce. Habitat(s): 22, 23. Voucher: FCF-1831.

Alismataceae

Sagittaria latifolia Willd.; broadleaf arrowhead. Infrequent. Habitat(s): 18, 23, 25. Voucher: FCF-2152.

Araceae

Arisaema

A. dracontium (L.) Schott; green dragon. Scarce. Habitat(s): 4. Voucher: FCF-209.

A. triphyllum (L.) Schott; Jack in the pulpit. Occasional. Habitat(s): 2, 4, 8. Voucher: FCF-66.

Commelinaceae

* *Commelina communis* L.; Asiatic dayflower. Occasional. Habitat(s): 22, 23. Voucher: FCF-1174.

Tradescantia subaspera KerGawl. var. *montana* (Shuttlw. ex Britt.) E.S. Anderson & Woods; zigzag spiderwort. Infrequent. Habitat(s): 4. Voucher: FCF-1100. [*Tradescantia montana* Shuttlw. ex Britt.]

Cyperaceae

Carex

C. albolutescens Schwein.; greenwhite sedge. Rare. Habitat(s): 4, 5. Voucher: FCF-756.

C. albursina Sheldon; white bear sedge. Scarce. Habitat(s): 2, 3, 4, 5, 7, 8. Voucher: FCF-860.

C. amphibola Steud.; eastern narrowleaf sedge. Occasional. Habitat(s): 4, 5, 7, 9. Voucher: FCF-340.

C. blanda Dewey; eastern woodland sedge. Frequent. Habitat(s): 4, 5, 8, 13, 15, 22, 25. Voucher: FCF-866.

C. careyana Torr. ex Dewey; Carey's sedge. Occasional. Habitat(s): 4, 5, 7, 8. Voucher: FCF-323.

C. caroliniana Schwein.; Carolina sedge. Rare. Habitat(s): 13, 15. Voucher: FCF-1977.

C. cephalophora Muhl. ex Willd.; oval-leaf sedge. Scarce. Habitat(s): 4, 5. Voucher: FCF-2117.

C. communis Bailey; fibrousroot sedge. Scarce. Habitat(s): 4. Voucher: FCF-343.

C. complanata Torr. & Hook; hirsute sedge. Infrequent. Habitat(s): 13, 15, 17, 20. Voucher: FCF-421.

C. crinita Lam.; fringed sedge. Occasional. Habitat(s): 13, 17, 22, 25. Voucher: FCF-541.

C. cumberlandensis Naczi, Kral, & Bryson; Cumberland sedge. Common. Habitat(s): 4, 5, 7, 8, 9, 22. Voucher: FCF-326. (Naczi *et al.* 2001)

C. debilis Michx.; white edge sedge. Common. Habitat(s): 13, 15, 17, 25. Voucher: FCF-252.

C. digitalis Willd. var. *digitalis*; slender woodland sedge. Frequent. Habitat(s): 4, 13, 25. Voucher: FCF-310.

C. digitalis Willd. var. *macropoda* Fern.; slender woodland sedge. Rare. Habitat(s): 13, 25. Voucher: FCF-493.

C. frankii Kunth; Frank's sedge. Infrequent. Habitat(s): 7, 22, 25. Voucher: FCF-1180.

C. glaucescens Ell.; southern waxy sedge. Very Rare. Habitat(s): 13, 17, 18. Voucher: FCF-2176.

C. granularis Muhl. ex Willd.; limestone meadow sedge. Rare. Habitat(s): 4. Voucher: FCF-376.

C. hirsutella Mackenzie; fuzzy wuzzy sedge. Rare. Habitat(s): 4. Voucher: FCF-332.

C. intumescens Rudge; greater bladder sedge. Occasional. Habitat(s): 2, 3, 4, 13, 17, 25. Voucher: FCF-705.

C. jamesii Schwein.; James' sedge. Scarce. Habitat(s): 4, 5, 8, 22, 25. Voucher: FCF-908.

C. kraliana Naczi & Bryson; Kral's sedge. Infrequent. Habitat(s): 4, 7. Voucher: FCF-336. (Naczi & Bryson 2000)

C. laxiflora Lam.; broad looseflower sedge. Common. Habitat(s): 2, 3, 4, 7, 10, 13, 25. Voucher: FCF-293.

C. leavenworthii Dewey; Leavenworth's sedge. Very Rare. Habitat(s): 22. Voucher: FCF-158.

C. lucorum Willd. ex Link var. *austrolucorum* J. Rettig; Blue Ridge sedge. Rare. Habitat(s): 4. Voucher: FCF-371.

C. lurida Wahlenb.; shallow sedge. Occasional. Habitat(s): 4, 17, 21,

22, 25. Voucher: FCF-492.

C. oligocarpa Schkuhr ex Willd.; richwoods sedge. Scarce.
Habitat(s): 4, 5, 7. Voucher: FCF-335.

C. pennsylvanica Lam.; Pennsylvania sedge. Frequent. Habitat(s): 13,
15. Voucher: FCF-39.

C. planispicata Naczi; flat-spiked sedge. Scarce. Habitat(s): 4, 7.
Voucher: FCF-803.

C. plantaginea Lam.; platanleaf sedge. Occasional. Habitat(s): 2, 3,
4, 10. Voucher: FCF-118.

C. retroflexa Muhl. ex Willd.; reflexed sedge. Scarce. Habitat(s): 13,
15, 22. Voucher: FCF-430.

C. rosea Schkuhr ex Willd.; rosy sedge. Occasional. Habitat(s): 4, 5.
Voucher: FCF-815.

C. striatula Michx.; lined sedge. Very Rare. Habitat(s): 13, 25.
Voucher: FCF-528.

C. styloflexa Buckl.; bent sedge. Rare. Habitat(s): 13, 25. Voucher:
FCF-495.

C. swanii (Fern.) Mackenzie; Swan's sedge. Frequent. Habitat(s): 2,
3, 4, 5, 13, 15. Voucher: FCF-404.

C. texensis (Torr.) Bailey; Texas sedge. Rare. Habitat(s): 4. Voucher:
FCF-353.

C. virescens Muhl. ex Willd.; ribbed sedge. Infrequent. Habitat(s): 2,
3, 4, 13, 17. Voucher: FCF-272.

C. vulpinoidea Michx.; fox sedge. Occasional. Habitat(s): 13, 15, 22,
25. Voucher: FCF-729.

Cyperus

C. flavescens L.; yellow flat sedge. Infrequent. Habitat(s): 18, 21,
25. Voucher: FCF-1799.

C. strigosus L.; strawcolored flat sedge. Occasional. Habitat(s): 13,
18, 21, 23, 25. Voucher: FCF-1800.

Dulichium arundinaceum (L.) Britton; threeway sedge. Infrequent.
Habitat(s): 18. Voucher: FCF-1285.

Eleocharis

E. acicularis (L.) Roemer & Schultes; needle spike rush.
Infrequent. Habitat(s): 18. Voucher: FCF-2187.

E. obtusa (Willd.) Schult.; blunt spike rush. Occasional.
Habitat(s): 18, 25. Voucher: FCF-1786.

E. quadrangulata (Michx.) Roem. & Schult.; squarestem spike rush.
Infrequent. Habitat(s): 18, 25. Voucher: FCF-1249.

Kyllinga gracillima Miq.; pasture spike sedge. Infrequent. Habitat(s): 22, 25.
Voucher: FCF-1746. [*Kyllinga brevifolioides* (Thieret & Delahoussaye)
G.C. Tucker]

Rhynchospora capitellata (Michx.) Vahl.; brownish beak sedge. Occasional.
Habitat(s): 18, 23, 25. Voucher: FCF-1532.

Schoenoplectus

S. purshianus (Fern.) M.T. Strong; weakstalk bulrush. Infrequent.
Habitat(s): 18, 25. Voucher: FCF-2184. [*Scirpus purshianus* Fernald]

S. tabernaemontani (K.C. Gmel) Palla; softstem bulrush. Occasional.
Habitat(s): 18. Voucher: FCF-1288. [*Scirpus tabernaemontanii* C.C.
Gmel.]

Scirpus

S. atrovirens Willd.; green bulrush. Infrequent. Habitat(s): 25. Voucher:
FCF-690.

S. cyperinus (L.) Kunth; wool grass. Occasional. Habitat(s): 18, 25.
Voucher: FCF-1768.

Scleria triglomerata Michx.; whip nut rush. Rare. Habitat(s): 13, 15. Voucher:
J.K. Underwood 2935.

Dioscoreaceae

Dioscorea

* *D. oppositifolia* L.; Chinese yam. Scarce. Habitat(s): 4, 7, 22.
Voucher: FCF-2209. [*Dioscorea batatas* Dcne.]

D. villosa L.; wild yam. Occasional. Habitat(s): 4, 5, 13, 15. Voucher: FCF-791.

Iridaceae

Iris

I. cristata Sol.; dwarf crested iris. Occasional. Habitat(s): 2, 3, 4, 7, 17. Voucher: FCF-59.

I. verna L. var. *smalliana* Fernald ex M.E. Edwards; dwarf violet iris. Infrequent. Habitat(s): 13, 15. Voucher: FCF-2034.

Sisyrinchium

S. albidum Raf.; white blue-eyed grass. Infrequent. Habitat(s): 5, 22. Voucher: FCF-58.

S. angustifolium Mill.; narrowleaf blue-eyed grass. Occasional. Habitat(s): 5, 13, 15. Voucher: FCF-626.

S. atlanticum E.P. Bicknell; eastern blue-eyed grass. Infrequent. Habitat(s): 13, 15. Voucher: FCF-700.

Juncaceae

Juncus

J. acuminatus Michx.; tapertip rush. Frequent. Habitat(s): 18, 23, 25. Voucher: FCF-1296.

J. coriaceus Mack.; leathery rush. Infrequent. Habitat(s): 18, 23, 25. Voucher: FCF-1892.

J. diffusissimus Buckley; slimpod rush. Infrequent. Habitat(s): 17, 18, 18. Voucher: FCF-1921.

J. effusus L.; common rush. Occasional. Habitat(s): 7, 18, 25. Voucher: FCF-1314.

J. interior Wiegand; inland rush. Scarce. Habitat(s): 18, 22, 23, 25. Voucher: FCF-1312.

J. marginatus Rostk.; grassleaf rush. Rare. Habitat(s): 18, 25. Voucher: FCF-1238.

J. nodatus Coville; stout rush. Infrequent. Habitat(s): 18. Voucher: FCF-1290.

J. secundus Beauv. ex Poir.; lopsided rush. Rare. Habitat(s): 16, 17. Voucher: R.E. Shanks *et al.* 4511.

J. tenuis Willd.; path rush. Occasional. Habitat(s): 18, 25. Voucher: FCF-1114.

Luzula

L. bulbosa (A.W. Wood) Rydb.; bulbous wood rush. Scarce. Habitat(s): 4, 12, 13, 15. Voucher: FCF-331.

L. echinata (Small) F.J. Herm.; hedgehog wood rush. Infrequent. Habitat(s): 4, 12. Voucher: FCF-660.

L. multiflora (Retz.) Lej.; common wood rush. Occasional. Habitat(s): 4, 5, 13, 15, 22. Voucher: FCF-2058.

Liliaceae

Aletris farinosa L.; white colic root. Scarce. Habitat(s): 13, 15. Voucher: FCF-726.

Allium

A. burdickii (Hanes) A.G. Jones; narrowleaf wild leek. Rare. Habitat(s): 4, 8. Voucher: FCF-2054.

A. cernuum Roth; nodding onion. Scarce. Habitat(s): 12. Voucher: FCF-2167.

**A. vineale* L.; wild garlic. Infrequent. Habitat(s): 21, 22, 23. Voucher: FCF-470.

Chamaelirium luteum (L.) A. Gray; fairywand. Rare. Habitat(s): 16, 17. Voucher: FCF-286.

Disporum

D. lanuginosum (Michx.) G. Nicholson; yellow fairybells. Occasional. Habitat(s): 2, 3, 4, 5. Voucher: FCF-256.

D. maculatum (Buckley) Britton; spotted mandarin. Scarce. Habitat(s): 4, 5. Voucher: FCF-1950.

Erythronium americanum KerGawl; dogtooth violet. Occasional. Habitat(s): 4, 5, 10. Voucher: FCF-2052.

* *Hemerocallis fulva* (L.) L.; orange daylily. Scarce. Habitat(s): 23. Voucher: FCF-839.

Hypoxis hirsuta (L.) Coville; common goldstar. Occasional. Habitat(s): 5, 13, 22. Voucher: FCF-57.

Maianthemum racemosum (L.) Link ssp. *racemosum*; false solomon's seal. Infrequent. Habitat(s): 4. Voucher: FCF-298. [*Smilacina racemosa* (L.) Desf.]

Medeola virginiana L.; Indian cucumber root. Occasional. Habitat(s): 4, 5. Voucher: FCF-361.

* *Narcissus poeticus* L.; poet's narcissus. Scarce. Habitat(s): 23. Voucher: FCF-74.

Polygonatum

P. biflorum (Walt.) Elliott; true Solomon's seal. Occasional. Habitat(s): 4, 5, 13. Voucher: FCF-200.

P. pubescens (Willd.) Pursh.; hairy Solomon's seal. Infrequent. Habitat(s): 4, 12. Voucher: FCF-356.

Trillium

T. cuneatum Raf.; little sweet Betsy. Scarce. Habitat(s): 4, 5. Voucher: FCF-2022.

T. grandiflorum (Michx.) Salisb.; largeflowered trillium. Occasional. Habitat(s): 2, 3, 4, 5. Voucher: FCF-234.

T. recurvatum Beck.; bloody butcher, recurved trillium. Scarce. Habitat(s): 4, 12. Voucher: FCF-67.

T. sulcatum T.S. Patrick; southern red trillium. Occasional. Habitat(s): 2, 3, 4, 12. Voucher: FCF-143.

Uvularia

U. grandiflora Sm.; largeflower bellwort. Rare. Habitat(s): 4, 5. Voucher: FCF-782.

U. perfoliata L.; perfoliate bellwort. Infrequent. Habitat(s): 4, 5. Voucher: FCF-237.

U. sessilifolia; sessileleaf bellwort. Infrequent. Habitat(s): 4, 13.
Voucher: FCF-238.

Orchidaceae

Aplectrum hyemale (Muhl. ex Willd.) Nutt.; Adam and Eve. Infrequent.
Habitat(s): 4. Voucher: FCF-2050.

Corallorhiza odontorhiza (Willd.) Nutt.; autumn coralroot. Rare. Habitat(s): 13,
17, 22. Voucher: FCF-2231.

Cypripedium

C. acaule Aiton; moccasin flower. Infrequent. Habitat(s): 13, 15.
Voucher: FCF-220.

C. parviflorum Salisb.; lesser yellow lady's slipper. Very rare. Habitat(s):
13, 17. Voucher: R.E. Shanks *et al.* 4533.

C. pubescens Willd.; greater yellow lady's slipper. Rare. Habitat(s): 4.
Voucher: FCF-1968.

Galearis spectabilis (L.) Raf.; showy orchid. Rare. Habitat(s): 4, 12. Voucher:
FCF-1008. [*Orchis spectabilis* L.]

Goodyera pubescens (Willd.) R. Br.; downy rattlesnake plantain. Frequent.
Habitat(s): 4, 13, 15, 17. Voucher: FCF-1556.

Plantanthera

P. ciliaris (L.) Lindl.; yellow fringed orchid. Infrequent. Habitat(s): 5,
13, 15. Voucher: FCF-1555.

P. clavellata (Michx.) Luer.; small green wood orchid. Scarce.
Habitat(s): 13, 17, 20. Voucher: FCF-1535.

Spiranthes

S. lacera (Raf.) Raf. var. *gracilis* (Bigelow) Luer; northern slender ladies'-
tresses. Rare. Habitat(s): 23. Voucher: FCF-1462.

S. tuberosa Raf.; little ladies'-tresses. Very rare. Habitat(s): 19. Voucher:
FCF-1226.

Tipularia discolor (Pursh) Nutt.; crane-fly orchid. Infrequent. Habitat(s): 13.
Voucher: FCF-17.

Triphora trianthophora (Swartz) Rydb.; three birds orchid. Very rare. Habitat(s):
4. Voucher: FCF-1391.

Poaceae

Agrostis

* *A. gigantea* Roth; redtop. Infrequent. Habitat(s): 21, 22, 23. Voucher:
FCF-1719.

A. perennans (Walter) Tuck.; upland bent grass. Infrequent. Habitat(s):
13, 22. Voucher: FCF-1710.

* *A. stolonifera* L.; creeping bent grass. Infrequent. Habitat(s): 21, 22,
23. Voucher: FCF-1311.

Andropogon

A. gerardii Vitman; big bluestem. Infrequent. Habitat(s): 12, 13, 15, 22,
23. Voucher: FCF-2186.

A. virginicus L.; broomsedge bluestem. Frequent. Habitat(s): 13, 21, 22,
23. Voucher: FCF-1824.

Aristida dichotoma Michx. var. *dichotoma*; churchmouse threeawn. Infrequent.
Habitat(s): 5, 21. Voucher: E.S. Ford *et al.* 1955.

Arundinaria gigantea (Walt.) Muhl.; giant cane. Infrequent. Habitat(s): 12, 23.
Voucher: FCF-883.

Brachyelytrum erectum (Schreb. ex Spreng.) Beauv.; bearded shorthusk.
Occasional. Habitat(s): 4, 5, 22. Voucher: FCF-1421.

Bromus

* *B. commutatus* Schrad.; meadow brome. Scarce. Habitat(s): 22, 23.
Voucher: FCF-2093.

* *B. japonicus* Thunb. ex Murray; Japanese brome. Infrequent.
Habitat(s): 22. Voucher: FCF-744.

B. pubescens Muhl. ex Willd.; hairy woodland brome. Infrequent.
Habitat(s): 4, 5, 22, 23. Voucher: FCF-562.

Calamagrostis coarctata (Torr.) Eat.; arctic reed grass. Infrequent. Habitat(s):
13, 22, 23. Voucher: FCF-1703. [*Calamagrostis cinnoides* (Muhl.)
Barton]

Chasmanthium

C. latifolium (Michx.) Yates; Indian woodoats. Occasional. Habitat(s): 4, 5. Voucher: FCF-1118.

C. sessiliflorum (Poir.) Yates; longleaf woodoats. Infrequent. Habitat(s): 4, 13, 15, 17, 20. Voucher: FCF-974.

* *Dactylis glomerata* L.; orchard grass. Common. Habitat(s): 22, 23. Voucher: FCF-422.

Danthonia

D. compressa Austin; flattened oat grass. Scarce. Habitat(s): 13, 15, 17. Voucher: R.E. Shanks *et al.* 2961.

D. sericea Nutt.; downy danthonia. Infrequent. Habitat(s): 13, 15, 22. Voucher: FCF-589.

D. spicata (L.) P. Beauv. *ex* Roem & Schult.; poverty oat grass. Frequent. Habitat(s): 5, 13, 15, 16, 17, 19, 22. Voucher: FCF-642.

Diarrhena americana P. Beauv.; American beakgrass. Infrequent. Habitat(s): 4. Voucher: FCF-1000.

Dichanthelium

D. boscii (Poir.) Gould & C.A. Clark; Bosc's panic grass. Occasional. Habitat(s): 4, 5, 13, 15. Voucher: FCF-424. [*Panicum boscii* Poir.]

D. clandestinum (L.) Gould; deertongue. Occasional. Habitat(s): 23, 25. Voucher: FCF-868. [*Panicum clandestinum* L.]

D. commutatum (J.A. Schultes) Gould; variable panic grass. Infrequent. Habitat(s): 4, 5, 13, 15, 23. Voucher: FCF-613. [*Panicum commutatum* J.A. Schultes]

D. depauperatum (Muhl.) Gould; starved panic grass. Infrequent. Habitat(s): 5, 13, 15. Voucher: FCF-865. [*Panicum depauperatum* Muhl.]

D. dichotomum (L.) Gould var. *dichotomum*; cypress panic grass. Frequent. Habitat(s): 3, 4, 5, 13, 15, 16, 17, 18, 21, 22, 25. Voucher: FCF-957. [*Panicum dichotomum* L.]

D. dichotomum (L.) Gould var. *ensifolium* (Baldw. ex Ell.) Gould & C.A. Clark; cypress panic grass. Frequent. Habitat(s): 13, 15, 16. Voucher: FCF-406. [*Panicum ensifolium* (Baldw. ex Ell.) Gould]

D. laxiflorum (Lam.) Gould; openflower rosette grass. Infrequent. Habitat(s): 4, 13, 15. Voucher: FCF-341. [*Panicum laxiflorum* Lam.]

D. sphaerocarpon (Ell.) Gould var. *isophyllum* (Scribn.) Gould & C.A. Clark; roundseed panic grass. Infrequent. Habitat(s): 4, 5, 13, 15, 17, 22, 23. Voucher: FCF-1552. [*Panicum polyanthes* (J.A. Schultes) Mohlenbrock]

D. villosissimum (Nash) Freckmann; whitehair rosette grass. Occasional. Habitat(s): 13, 15, 25. Voucher: FCF-728. [*Panicum villosissimum* Nash]

* *Digitaria ischaemum* (Schreb. ex Schweigg.) Schreb. ex Muhl.; smooth crab grass. Occasional. Habitat(s): 21, 22, 23. Voucher: FCF-1927.

Echinochloa

* *E. colona* (L.) Link; jungle rice. Rare. Habitat(s): 21, 22, 25. Voucher: FCF-1822.

* *E. crusgalli* (L.) Beauv.; barnyard grass. Infrequent. Habitat(s): 21, 22, 25. Voucher: FCF-1820.

* *Eleusine indica* (L.) Gaertn.; Indian goose grass. Occasional. Habitat(s): 22, 25. Voucher: FCF-1818.

Elymus

E. hystrix L.; eastern bottlebrush grass. Occasional. Habitat(s): 7, 22, 23, 25. Voucher: FCF-920.

E. virginicus L.; Virginia wild rye. Frequent. Habitat(s): 4, 5, 13, 15, 22. Voucher: FCF-1124.

Festuca subverticillata (Pers.) E.B. Alexeev; nodding fescue. Occasional. Habitat(s): 3, 4, 8, 12. Voucher: FCF-1042.

* *Holcus lanatus* L.; common velvet grass. Infrequent. Habitat(s): 21, 22, 23. Voucher: FCF-692.

* *Hordeum vulgare* L.; common barley. Infrequent. Habitat(s): 22, 23. Voucher: FCF-468.

Leersia

L. oryzoides (L.) Sw.; rice cut grass. Occasional. Habitat(s): 18.
Voucher: FCF-1929.

L. virginica Willd.; white grass. Infrequent. Habitat(s): 4, 12, 18, 25.
Voucher: FCF-1471.

Lolium

* *L. arundinaceum* (Schreb.) S.J. Darbyshire; tall fescue. Occasional.
Habitat(s): 13, 15. Voucher: FCF-426. [*Festuca arundinacea* Schreb.]

* *L. perenne* L. ssp. *multiflorum* (Lam.) Husnot; Italian rye grass.
Infrequent. Habitat(s): 23. Voucher: FCF-467. [*Lolium multiflorum*
Lam.]

* *L. pratense* (Huds.) S.J. Darbyshire; meadow fescue. Frequent.
Habitat(s): 13, 21, 22. Voucher: FCF-584. [*Festuca pratensis* Huds.]

Melica mutica Walter; twoflower melic grass. Occasional. Habitat(s): 4, 5.
Voucher: FCF-176.

* *Microstegium vimineum* (Trin.) A. Camus; Nepalese browntop. Common.
Habitat(s): 4, 18, 21, 22, 23. Voucher: FCF-1941.

Panicum

P. anceps Michx.; beaked panic grass. Infrequent. Habitat(s): 13, 15, 21,
22, 23, 25. Voucher: FCF-1821.

P. flexile (Gattinger) Scribn.; wiry panic grass. Scarce. Habitat(s): 21, 25.
Voucher: FCF-1802.

P. rigidulum Bosc. ex Nees var. *elongatum* (Pursh.) Lelong; redtop panic
grass. Infrequent. Habitat(s): 18. Voucher: FCF-2183.

Paspalum

* *P. dilatatum* Poir.; dallis grass. Scarce. Habitat(s): 18, 22, 23.
Voucher: FCF-1882.

P. laeve Michx.; field paspalum. Occasional. Habitat(s): 25.
Voucher: FCF-1309.

P. setaceum Michx.; thin paspalum. Infrequent. Habitat(s): 22, 23.
Voucher: FCF-1369.

* *Phleum pratense* L.; timothy. Occasional. Habitat(s): 22, 23. Voucher: FCF-1209.

Phragmites australis (Cav.) Trin. ex Steud; common reed. Scarce. Habitat(s): 18. Voucher: FCF-1292.

Piptochaetium avenaceum (L.) Parodi; needle grass. Occasional. Habitat(s): 13, 15, 16. Voucher: FCF-297. [*Stipa avenacea* L.]

Poa

* *P. annua* L.; annual bluegrass. Common. Habitat(s): 13, 22, 23. Voucher: FCF-400.

P. autumnalis Muhl. ex Elliot; autumn blue grass. Occasional. Habitat(s): 4, 5, 7, 13, 15. Voucher: FCF-418.

P. chapmaniana Scribn.; Chapman's blue grass. Rare. Habitat(s): 22, 23. Voucher: H.H. Iltis 3347.

* *P. compressa* L.; Canada bluegrass. Infrequent. Habitat(s): 13, 15. Voucher: A.J. Sharp *et al.* 2968.

P. cuspidata Nutt.; early blue grass. Infrequent. Habitat(s): 4. Voucher: FCF-1959.

* *P. pratensis* L.; Kentucky bluegrass. Infrequent. Habitat(s): 13, 15, 21, 22, 23. Voucher: FCF-374.

P. saltuensis Fern. & Wieg.; oldpasture blue grass. Rare. Habitat(s): 13, 15. Voucher: H.H. Iltis 3386. [*Poa languida* A.S. Hitchc.]

P. sylvestris A. Gray; woodland blue grass. Occasional. Habitat(s): 4, 5, 22. Voucher: FCF-857.

Saccharum alopecuroidum (L.) Nutt.; silver plume grass. Scarce. Habitat(s): 22, 23. Voucher: FCF-1729. [*Erianthus alopecuroides* (L.) Elliott]

Schizachyrium scoparium (Michx.) Nash.; little bluestem. Occasional. Habitat(s): 13, 15. Voucher: FCF-1914.

Setaria

* *S. faberi* Herrm.; Japanese bristle grass. Infrequent. Habitat(s): 23. Voucher: FCF-1210.

S. parviflora (Poir.) Kerguelen; marsh bristle grass. Occasional.
Habitat(s): 23. Voucher: FCF-1260.

* *S. viridis* (L.) Beauv. var. *viridis*; green bristle grass. Rare. Habitat(s):
24. Voucher: FCF-1138.

* *Sorghum halepense* (L.) Pers.; Johnson grass. Scarce. Habitat(s): 21, 22, 23.
Voucher: FCF-1877.

Sphenopholis nitida (Biehler) Scribn.; shiny wedgescale. Scarce. Habitat(s): 4.
Voucher: FCF-1971.

Sporobolus

* *S. indicus* (L.) R.Br.; smut grass. Rare. Habitat(s): 22. Voucher: FCF-
1336.

S. vaginiflorus (Torr. ex A. Gray) A.W. Wood; poverty dropseed. Very
rare. Habitat(s): 22, 25. Voucher: FCF-1811.

Tridens flavus (L.) Hitch.; purpletop tridens. Common. Habitat(s): 18,
22, 23. Voucher: FCF-2216.

Vulpia

* *V. myuros* (L.) K.C. Gmel.; rat tail fescue. Rare. Habitat(s): 13, 15.
Voucher: FCF-405. [*Festuca myuros* L.]

V. octoflora (Walt.) Rydb. var. *glauc*a (Nutt.) Fern.; sixweeks fescue.
Scarce. Habitat(s): 13. Voucher: H.H. Iltis 3346. [*Festuca octoflora*
Walt. var. *glauc*a (Nutt.) Fern.]

Potamogetonaceae

Potamogeton

P. diversifolius Raf.; waterthread pondweed. Infrequent. Habitat(s): 18.
Voucher: FCF-1295.

P. epihydrus Raf.; ribbonleaf pondweed. Very rare. Habitat(s): 17.
Voucher: FCF-1924.

Smilacaceae

Smilax

S. bona-nox L.; saw greenbrier. Occasional. Habitat(s): 5. Voucher:
FCF-766.

S. glauca Walter; cat greenbrier. Common. Habitat(s): 13, 15. Voucher: FCF-621.

S. herbacea L. var. *herbacea*; smooth carrion flower. Rare. Habitat(s): 4. Voucher: FCF-790.

S. hugeri (Small) J.B.S. Norton ex Pennell; Huger's carrion flower. Infrequent. Habitat(s): 4, 5. Voucher: FCF-255. [*Smilax ecirrata* (Engelm. ex Kunth) S. Watson var. *hugeri* (Small) H.E. Ahles]

S. rotundifolia L.; roundleaf greenbrier. Common. Habitat(s): 2, 4, 5, 13, 15, 17. Voucher: FCF-462.

S. tamnoides L.; bristly greenbrier. Infrequent. Habitat(s): 4, 5. Voucher: FCF-810. [*Smilax hispida* Muhl. ex Torr.]

Sparganiaceae

Sparganium americanum Nutt.; American bur reed. Rare. Habitat(s): 25. Voucher: FCF-1250.

Typhaceae

Typha latifolia L.; broadleaf cattail. Scarce. Habitat(s): 18, 25. Voucher: FCF-1251.

Xyridaceae

Xyris

X. difformis Chapm.; bog yellow-eyed grass. Very rare. Habitat(s): 17. Voucher: E.S. Ford *et al.* 1943.

X. torta J.E. Smith; slender yellow-eyed grass. Very rare. Habitat(s): 13, 15, 25. Voucher: FCF-2207.

MAGNOLIOPHYTA: MAGNOLIOPSIDA

Acanthaceae

Ruellia caroliniensis (J.F. Gmel.) Steud.; Carolina wild petunia. Occasional. Habitat(s): 4, 5, 7, 13, 22. Voucher: FCF-1943.

Aceraceae

Acer

A. leucoderme Small; chalk maple. Very rare. Habitat(s): 4, 12. Voucher: FCF-854. [*Acer saccharum* Marshall ssp. *leucoderme* (Small) Desmarais]

A. negundo L.; boxelder. Infrequent. Habitat(s): 7. Voucher: FCF-2092.

A. nigrum Michx. f.; black maple. Infrequent. Habitat(s): 4, 5. Voucher: FCF-1099. [*Acer saccharum* Marshall ssp. *nigrum* (F. Michx.) Desmarais]

A. pensylvanicum L.; striped maple. Infrequent. Habitat(s): 2, 3, 4. Voucher: FCF-1662.

A. rubrum L.; red maple. Common. Habitat(s): 13, 15, 20. Voucher: FCF-606.

A. saccharum Marshall ssp. *saccharum*; sugar maple. Common. Habitat(s): 4, 5. Voucher: FCF-1399.

Amaranthaceae

* *Amaranthus hybridus* L.; slim amaranth. Rare. Habitat(s): 21, 22. Voucher: FCF-2227.

Anacardiaceae

Rhus

R. aromatica Aiton; fragrant sumac. Scarce. Habitat(s): 5, 12. Voucher: FCF-761.

R. copallinum L.; winged sumac. Scarce. Habitat(s): 4, 5, 12, 23. Voucher: FCF-840.

R. glabra L.; smooth sumac. Occasional. Habitat(s): 5, 24. Voucher: FCF-763.

R. hirta (L.) Sudworth; staghorn sumac. Rare. Habitat(s): 4, 5. Voucher: H.H. Iltis 3393. [*Rhus typhina* L.]

Toxicodendron radicans (L.) Kuntze; poison ivy. Common. Habitat(s): 3, 4, 5, 13, 16, 17, 22, 23. Voucher: FCF-1720. [*Rhus radicans* L.]

Annonaceae

Asimina triloba (L.) Dunal; pawpaw. Infrequent. Habitat(s): 2, 4. Voucher: FCF-876.

Apiaceae

Angelica venenosa (Greenway) Fernald; hairy angelica. Infrequent. Habitat(s): 12, 13, 22, 23. Voucher: FCF-1318.

Chaerophyllum

C. procumbens (L.) Crantz; spreading chervil. Rare. Habitat(s): 4, 5, 22. Voucher: FCF-547.

C. tainturieri Hook.; hairyfruit chervil. Infrequent. Habitat(s): 4, 5, 22. Voucher: FCF-747.

Cryptotaenia canadensis (L.) DC.; Canadian honewort. Infrequent. Habitat(s): 4, 5, 7. Voucher: FCF-899.

* *Daucus carota* L.; Queen Anne's lace. Frequent. Habitat(s): 21, 22, 23. Voucher: FCF-560.

Erigenia bulbosa (Michx.) Nutt.; harbinger of spring, salt and pepper. Occasional. Habitat(s): 4, 5, 8. Voucher: FCF-1947.

Eryngium

E. prostratum Nutt.; creeeping eryngo. Occasional. Habitat(s): 18. Voucher: FCF-1279.

E. yuccifolium Michx.; rattlesnake master. Infrequent. Habitat(s): 13, 15, 18. Voucher: FCF-1283.

Hydrocotyle americana L.; American marsh pennywort. Very rare. Habitat(s): 2, 3, 10. Voucher: J.K. Underwood *et al.* 4099.

Ligusticum canadense (L.) Britton; Canadian licorice root. Occasional. Habitat(s): 4, 5, 7, 13, 15, 17. Voucher: FCF-1436.

Osmorhiza claytonii (Michx.) C.B. Clarke; Clayton's sweet cicely. Infrequent. Habitat(s): 4, 5. Voucher: FCF-300.

Oxypolis rigidior (L.) Raf.; stiff cowbane. Scarce. Habitat(s): 13, 18, 18, 25. Voucher: FCF-1536.

Sanicula

S. canadensis L.; Canadian black snakeroot. Occasional. Habitat(s): 3, 4, 5, 13. Voucher: FCF-1167.

S. marilandica L.; Maryland sanicle. Scarce. Habitat(s): 4, 8. Voucher: FCF-862.

S. odorata (Raf.) Pryer & Phillippe; clustered black snakeroot. Infrequent. Habitat(s): 4. Voucher: FCF-1944. [*Sanicula gregaria* Bickn.]

S. smallii E.P. Bicknell; Small's black snakeroot. Scarce. Habitat(s): 13, 15. Voucher: FCF-514.

S. trifoliata E.P. Bicknell; largefruit black snakeroot. Infrequent. Habitat(s): 4, 5. Voucher: FCF-2161.

Taenidia integerrima (L.) Drude; yellow pimpnel. Infrequent. Habitat(s): 5, 7. Voucher: FCF-2156.

Thaspium

T. barbinode (Michx.) Nutt.; hairyjoint meadow parsnip. Occasional. Habitat(s): 2, 3, 4, 5, 12. Voucher: FCF-155.

T. trifoliatum (L.) Gray var. *aureum* Britt.; yellow meadow parsnip. Infrequent. Habitat(s): 4, 5, 13. Voucher: FCF-511. [*Thaspium trifoliatum* (L.) Gray var. *flavum* Blake]

Zizia aptera (A. Gray) Fernald; meadow zizia. Occasional. Habitat(s): 5. Voucher: FCF-49.

Apocynaceae

Amsonia tabernaemontana Walter var. *tabernaemontana*; eastern bluestar. Rare. Habitat(s): 17. Voucher: FCF-2142.

Apocynum cannabinum L.; Indian hemp. Occasional. Habitat(s): 22, 23. Voucher: FCF-1187.

* *Vinca minor* L.; common periwinkle. Scarce. Habitat(s): 21, 22, 23. Voucher: FCF-8.

Aquifoliaceae

Ilex

I. montana Torr. & Gray ex Gray; mountain holly. Occasional. Habitat(s): 13, 15, 16, 17. Voucher: FCF-2235. [*Ilex ambigua* (Michx.) Torr. var. *montana* (Torr. & Gray) H.E. Ahles]

I. ambigua (Michx.) Torr.; Carolina holly. Infrequent. Habitat(s): 13, 15. Voucher: FCF-517.

I. decidua Walter; possum haw. Very rare. Habitat(s): 4, 7. Voucher: FCF-796.

I. opaca Aiton; American holly. Frequent. Habitat(s): 13. Voucher: FCF-2.

I. verticillata (L.) A. Gray; common winterberry. Infrequent. Habitat(s): 13, 16. Voucher: FCF-601.

Araliaceae

Aralia

A. racemosa L.; American spikenard. Rare. Habitat(s): 4. Voucher: FCF-1086.

A. spinosa L.; devil's walking stick. Infrequent. Habitat(s): 13. Voucher: FCF-676.

Panax

P. quinquefolius L.; American ginseng. Scarce. Habitat(s): 4, 5. Voucher: FCF-294.

P. trifolius L.; dwarf ginseng. Scarce. Habitat(s): 2, 4. Voucher: FCF-109.

Aristolochiaceae

Aristolochia

A. macrophylla Lam.; pipevine. Infrequent. Habitat(s): 4, 5. Voucher: FCF-367.

A. serpentaria L.; Virginia snakeroot. Scarce. Habitat(s): 4. Voucher: FCF-780.

Asarum canadense L.; Canadian wild ginger. Occasional. Habitat(s): 2, 4, 8.
Voucher: FCF-314.

Hexastylis

H. arifolia (Michx.) Small var. *ruthii* (Ashe) H.L. Blomquist; Ruth's little brown jug. Occasional. Habitat(s): 4, 5, 8. Voucher: FCF-845.

H. contracta H.L. Blomquist; mountain heartleaf. Scarce. Habitat(s): 7, 17. Voucher: FCF-959.

Asclepiadaceae

Asclepias

A. amplexicaulis Sm.; clasping milkweed. Infrequent. Habitat(s): 13, 15, 22. Voucher: FCF-1752.

A. exaltata L.; poke milkweed. Scarce. Habitat(s): 13, 15, 22, 23.
Voucher: FCF-586.

A. quadrifolia Jacq.; fourleaf milkweed. Infrequent. Habitat(s): 4, 5, 12.
Voucher: FCF-181.

A. syriaca L.; common milkweed. Infrequent. Habitat(s): 23. Voucher: FCF-909.

A. tuberosa L.; butterfly milkweed. Occasional. Habitat(s): 5, 13, 22, 23.
Voucher: FCF-768.

Asteraceae

Achillea millefolium L.; common yarrow. Occasional. Habitat(s): 21, 22, 23.
Voucher: FCF-479.

Ageratina altissima (L.) R.M. King & H. Rob; white snakeroot. Frequent.
Habitat(s): 4, 13, 22, 23. Voucher: FCF-1677. [*Eupatorium rugosum* Houtt.]

Ambrosia

A. artemisiifolia L.; annual ragweed. Frequent. Habitat(s): 21, 22, 23.
Voucher: FCF-1465.

A. trifida L.; great ragweed. Scarce. Habitat(s): 22, 23. Voucher: FCF-1725.

Antennaria

A. plantaginifolia (L.) Richardson; pussytoes. Occasional. Habitat(s): 13, 22. Voucher: FCF-391.

A. solitaria Rydb.; singlehead pussytoes. Infrequent. Habitat(s): 13, 22, 23. Voucher: FCF-9.

* *Arctium minus* Bernh.; lesser burdock. Scarce. Habitat(s): 21, 23. Voucher: H.H. Iltis 3525.

Arnoglossum atriplicifolium (L.) H.E. Robins; pale Indian plantain. Infrequent. Habitat(s): 4, 5, 12. Voucher: FCF-1463. [*Cacalia atriplicifolia* L.]

* *Artemisia vulgaris* L.; common wormwood. Rare. Habitat(s): 13, 15, 22. Voucher: FCF-1753.

Bidens

B. bipinnata L.; Spanish needles. Scarce. Habitat(s): 21, 22. Voucher: FCF-1743.

B. frondosa L.; devil's beggar tick. Infrequent. Habitat(s): 17, 21, 22. Voucher: FCF-1805.

Chrysopsis mariana (L.) Ell.; Maryland golden aster. Infrequent. Habitat(s): 4, 6, 13, 15, 16, 22, 23. Voucher: FCF-1878. [*Heterotheca mariana* (L.) Shinnars]

* *Cichorium intybus* L.; chicory. Occasional. Habitat(s): 22, 23. Voucher: FCF-2122.

Cirsium

C. carolinianum (Walter) Fernald & B.G. Schub.; soft thistle. Rare. Habitat(s): 13, 22. Voucher: FCF-591.

C. discolor (Muhl. ex Willd) Spreng.; field thistle. Infrequent. Habitat(s): 21, 22, 23. Voucher: FCF-1410.

* *C. vulgare* (Savi) Ten.; bull thistle. Infrequent. Habitat(s): 22. Voucher: FCF-750.

Conoclinium coelestinum (L.) DC.; blue mistflower. Infrequent. Habitat(s): 13, 17. Voucher: FCF-1712. [*Eupatorium coelestinum* L.]

Conyza

C. canadensis (L.) Cronq. var. *pusilla* (Nutt.) Cronq.; Canadian horseweed. Scarce. Habitat(s): 13, 22, 23. Voucher: FCF-1524.

C. canadensis (L.) Cronquist var. *canadensis*; Canadian horseweed. Occasional. Habitat(s): 21, 23, 25. Voucher: FCF-1859.

Coreopsis

C. major Walter; greater tickseed. Occasional. Habitat(s): 5, 13, 15, 22. Voucher: FCF-1012.

C. tripteris L.; tall tickseed. Infrequent. Habitat(s): 3, 4, 13, 17. Voucher: FCF-1477.

Crepis

* *C. capillaris* (L.) Wallr.; smooth hawksbeard. Very rare. Habitat(s): 21, 23. Voucher: FCF-533.

* *C. pulchra* L.; smallflower hawksbeard. Very rare. Habitat(s): 22, 23. Voucher: FCF-1473.

Doellingeria

D. infirma (Michx.) Greene; cornel leaf whitetop. Occasional. Habitat(s): 4, 5. Voucher: FCF-1642. [*Aster infirmus* Michx.]

D. umbellata (Mill.) Nees; parasol whitetop. Infrequent. Habitat(s): 4, 13, 15, 17. Voucher: FCF-1559. [*Aster umbellatus* P. Mill.]

* *Eclipta prostrata* (L.) L.; false daisy. Infrequent. Habitat(s): 18, 25. Voucher: FCF-1300.

Elephantopus

E. carolinianus Raeusch.; Carolina elephant's foot. Scarce. Habitat(s): 22, 23. Voucher: FCF-1492.

E. tomentosus L.; devil's grandmother. Infrequent. Habitat(s): 4, 13, 22, 23. Voucher: FCF-1638.

Erechtites hieracifolia (L.) Raf. ex DC.; American burnweed. Occasional. Habitat(s): 4, 13, 22, 23. Voucher: FCF-1860.

Erigeron

E. annuus (L.) Pers.; eastern daisy fleabane. Frequent. Habitat(s): 4, 8, 22. Voucher: FCF-741.

E. philadelphicus L.; Philadelphia fleabane. Occasional. Habitat(s): 4, 5, 21, 22, 23. Voucher: FCF-387.

E. pulchellus Michx.; robin's plantain. Infrequent. Habitat(s): 5, 22. Voucher: FCF-87.

E. strigosus Muhl. ex Willd.; prairie fleabane. Frequent. Habitat(s): 4, 13, 22, 23. Voucher: FCF-800.

Eupatorium

E. album L. var. *album*; white thoroughwort. Rare. Habitat(s): 13, 15, 22. Voucher: FCF-1330.

E. capillifolium (Lam.) Small; dog fennel. Scarce. Habitat(s): 22, 23. Voucher: FCF-1503.

E. fistulosum Barratt; trumpet weed. Frequent. Habitat(s): 7, 17, 18, 23. Voucher: FCF-2238.

E. hyssopifolium L.; hyssopleaf thoroughwort. Frequent. Habitat(s): 13, 22, 23. Voucher: FCF-1762.

E. perfoliatum L.; common boneset. Infrequent. Habitat(s): 18. Voucher: FCF-2179.

E. purpureum L.; sweetscented joe pye weed. Occasional. Habitat(s): 4, 5, 13. Voucher: FCF-1144.

E. rotundifolium L. ssp. *ovatum* (Bigelow) Montgom. & Fairbrothers; roundleaf thoroughwort. Frequent. Habitat(s): 13, 15, 19. Voucher: FCF-1232.

E. serotinum Michx.; lateflowering thoroughwort. Frequent. Habitat(s): 13, 15, 23. Voucher: FCF-2190.

E. sessilifolium L.; upland boneset. Rare. Habitat(s): 13, 15, 22. Voucher: FCF-1321.

Eurybia divaricata (L.) Nesom; white wood aster. Occasional. Habitat(s): 4, 5, 13, 15, 23. Voucher: FCF-1130. [*Aster divaricatus* L.]

Fleischmannia incarnata (Walter) R.M. King & H. Rob; pink thoroughwort. Infrequent. Habitat(s): 4. Voucher: FCF-1724. [*Eupatorium incarnatum* Walt.]

Gamochaeta purpurea (L.) Cabrera; spoonleaf purple everlasting. Occasional.
Habitat(s): 13, 15, 22. Voucher: FCF-436. [*Gnaphalium purpureum* L.]

Helenium

H. autumnale L.; common sneezeweed. Scarce. Habitat(s): 17. Voucher: FCF-1899.

H. flexuosum Raf.; purplehead sneezeweed. Infrequent. Habitat(s): 17, 18, 23. Voucher: FCF-1286.

Helianthus

H. angustifolius L.; swamp sunflower. Scarce. Habitat(s): 13, 15.
Voucher: FCF-1747.

H. atrorubens L.; purpledisk sunflower. Infrequent. Habitat(s): 5, 13, 15, 23. Voucher: FCF-2243.

H. decapetalus L.; thinleaf sunflower. Occasional. Habitat(s): 4, 7.
Voucher: FCF-1451.

H. hirsutus Raf.; hairy sunflower. Infrequent. Habitat(s): 13, 15, 23.
Voucher: FCF-1319.

H. microcephalus Torr. & A. Gray; small woodland sunflower.
Occasional. Habitat(s): 4, 5, 13, 15, 19. Voucher: FCF-2244.

H. strumosus L.; paleleaf woodland sunflower. Rare. Habitat(s): 13.
Voucher: FCF-2229.

Heliopsis helianthoides (L.) Sweet; smooth oxeye. Infrequent. Habitat(s): 4.
Voucher: FCF-1634.

Heterotheca camporum (Greene) Shinnery; lemon yellow false golden aster.
Occasional. Habitat(s): 4, 5, 13. Voucher: FCF-1359.

Hieracium

H. gronovii L.; queendevil. Infrequent. Habitat(s): 13, 15, 23. Voucher: FCF-1561.

H. venosum L.; rattlesnake weed. Occasional. Habitat(s): 5. Voucher: FCF-166.

* *Hypochoeris radicata* L.; hairy catsear. Very rare. Habitat(s): 3, 7. Voucher: FCF-1054.

Krigia

K. biflora (Walter) S.F. Blake; twoflower dwarf dandelion. Infrequent. Habitat(s): 5, 13, 15. Voucher: FCF-587.

K. caespitosa (Raf.) K.L. Chambers; weedy dwarf dandelion. Rare. Habitat(s): 4. Voucher: FCF-364.

K. virginica (L.) Willd.; Virginia dwarf dandelion. Rare. Habitat(s): 13, 15. Voucher: FCF-396.

Lactuca

L. biennis (Moench) Fernald; tall blue lettuce. Rare. Habitat(s): 22. Voucher: FCF-1356.

L. canadensis L.; Canada lettuce. Infrequent. Habitat(s): 13, 15, 23. Voucher: FCF-1880.

L. floridana (L.) Gaertn.; woodland lettuce. Infrequent. Habitat(s): 22. Voucher: FCF-1728.

* *L. saligna* L.; willowleaf lettuce. Scarce. Habitat(s): 22. Voucher: FCF-2188.

* *Leucanthemum vulgare* Lam.; oxeye daisy. Occasional. Habitat(s): 5, 13, 22, 23. Voucher: FCF-435. [*Chrysanthemum leucanthemum* L.]

Liatris

L. aspera Michx.; tall blazing star. Rare. Habitat(s): 13, 15. Voucher: R.E. Shanks *et al.* 3427.

L. microcephala (Small) K. Schum; smallhead blazing star. Infrequent. Habitat(s): 11, 19. Voucher: FCF-2195.

L. scariosa (L.) Willd.; devil's bite. Infrequent. Habitat(s): 13, 15. Voucher: FCF-1757.

L. spicata (L.) Willd.; dense blazing star. Infrequent. Habitat(s): 13, 15. Voucher: FCF-1329.

L. squarrosa (L.) Michx.; scaly blazing star. Rare. Habitat(s): 13, 15. Voucher: R.E. Shanks *et al.* 2977.

Packera

P. anonyma (Wood) W.A. Weber & A. Love; Small's ragwort.
Occasional. Habitat(s): 4, 13, 15, 19. Voucher: FCF-625. [*Senecio
anonymus* A.W. Wood]

P. obovata (Muhl. ex Willd.) W.A. Weber & A. Love; roundleaf ragwort.
Infrequent. Habitat(s): 4, 5, 12, 8. Voucher: FCF-2080. [*Senecio
obovatus* Muhl. ex Willd]

Pityopsis graminifolia (Michx.) Nutt.; narrowleaf silk grass. Frequent.
Habitat(s): 13, 15, 22, 23. Voucher: FCF-2202. [*Chrysopsis
graminifolia* (Michx.) Ell.]

Pluchea camphorata (L.) DC.; camphor weed. Infrequent. Habitat(s): 23, 25.
Voucher: FCF-1304.

Polymnia

P. canadensis L.; whiteflower leafcup. Infrequent. Habitat(s): 4, 5.
Voucher: FCF-1772.

P. laevigata Beadle; Tennessee leafcup. Occasional. Habitat(s): 4.
Voucher: FCF-1671.

Prenanthes

P. altissima L.; tall rattlesnake root. Occasional. Habitat(s): 5, 13, 22.
Voucher: FCF-1718.

P. serpentaria Pursh.; canker weed. Infrequent. Habitat(s): 13, 15, 23.
Voucher: FCF-1761.

Pseudognaphalium obtusifolium (L.) Hilliard & Burt; rabbit tobacco.
Occasional. Habitat(s): 5, 6, 13, 15, 23. Voucher: FCF-1884.
[*Gnaphalium obtusifolium* L.]

Pyrrhopappus carolinianus (Walter) DC.; false dandelion. Occasional.
Habitat(s): 5, 13, 15, 22, 25. Voucher: FCF-1071.

Rudbeckia

R. fulgida Aiton var. *umbrosa* (C.L. Boynton & Beadle) Cronquist; orange
coneflower. Frequent. Habitat(s): 4, 6, 13, 22, 23. Voucher: FCF-1396.

R. hirta L. var. *hirta*; blackeyed Susan. Infrequent. Habitat(s): 4, 5, 13,
23. Voucher: FCF-1188.

R. hirta L. var. *pulcherrima* Farw.; blackeyed Susan. Infrequent.
Habitat(s): 23, 25. Voucher: FCF-1302.

R. laciniata L. var. *laciniata*; cutleaf coneflower. Infrequent. Habitat(s):
4, 5, 6, 7, 23. Voucher: FCF-1371.

R. triloba L.; browneyed Susan. Occasional. Habitat(s): 4, 5, 13, 22, 23.
Voucher: FCF-1495.

Seriocarpus

S. asteroides (L.) Britton Sterns & Poggenb.; toothed whitetop aster.
Scarce. Habitat(s): 13, 15. Voucher: FCF-1320. [*Aster paternus* Cronq.]

S. linifolius (L.) Britton Sterns & Poggenb.; narrowleaf whitetop aster.
Infrequent. Habitat(s): 5, 13, 15. Voucher: FCF-981. [*Aster solidagineus*
Michx.]

Silphium

S. asteriscus L. var. *asteriscus*; starry rosinweed. Infrequent. Habitat(s):
4, 5, 6. Voucher: FCF-1452.

S. trifoliatum L. var. *latifolium* A. Gray; whored rosinweed. Rare.
Habitat(s): 7. Voucher: FCF-1199.

S. trifoliatum L. var. *trifoliatum*; whored rosinweed. Infrequent.
Habitat(s): 4, 7. Voucher: FCF-1121.

Smallanthus uvedalius (L.) Mackenzie ex Small; hairy leafcup. Occasional.
Habitat(s): 4, 5, 23. Voucher: FCF-1382. [*Polymnia uvedalia* L.]

Solidago

S. arguta Aiton var. *boottii* (Hook.) E.J. Palmer; Boott's goldenrod. Rare.
Habitat(s): 6. Voucher: FCF-1412.

S. arguta Aiton var. *caroliniana* Gray; Atlantic goldenrod. Occasional.
Habitat(s): 4, 13, 15, 23. Voucher: FCF-1590.

S. caesia L. var. *curtisii* (Torr. & Gray) Wood; mountain decumbent
goldenrod. Scarce. Habitat(s): 3, 4. Voucher: FCF-1654. [*Solidago*
curtisii Torr. & A. Gray]

S. caesia L. var. *caesia*; wreath goldenrod. Occasional. Habitat(s): 4, 13,
23. Voucher: FCF-1573.

S. canadensis L. var. *scabra* Torr. & Gray; Canada goldenrod. Common. Habitat(s): 13, 22, 23. Voucher: FCF-1688.

S. flexicaulis L.; zigzag goldenrod. Occasional. Habitat(s): 4, 5, 13. Voucher: FCF-1773.

S. gigantea Aiton; giant goldenrod. Frequent. Habitat(s): 6, 22, 23. Voucher: FCF-1380.

S. hispida Muhl.; hairy goldenrod. Rare. Habitat(s): 13, 15, 23. Voucher: FCF-1865.

S. nemoralis Aiton; gray goldenrod. Frequent. Habitat(s): 13, 15, 23. Voucher: FCF-1813.

S. odora Aiton; anise-scented goldenrod. Occasional. Habitat(s): 13, 15, 23. Voucher: FCF-1936.

S. roanensis Porter; Roane Mountain goldenrod. Scarce. Habitat(s): 6, 13, 15, 18, 19. Voucher: FCF-1616.

S. rugosa Aiton ssp. *aspera* (Aiton) Cronquist; wrinkleleaf goldenrod. Scarce. Habitat(s): 13, 15, 23. Voucher: FCF-1870.

S. speciosa Nutt. var. *erecta* (Pursh.) MacM.; showy goldenrod. Infrequent. Habitat(s): 4, 6, 13, 15, 23. Voucher: FCF-1699. [*Solidago erecta* Pursh]

S. speciosa Nutt. var. *speciosa*; showy goldenrod. Scarce. Habitat(s): 4. Voucher: FCF-1774.

* *Sonchus asper* (L.) Hill; spiny sow thistle. Scarce. Habitat(s): 21, 22, 23. Voucher: FCF-537.

Symphyotrichum

S. cordifolium (L.) Nesom; common blue wood aster. Frequent. Habitat(s): 4. Voucher: FCF-1769. [*Aster cordifolius* L.]

S. dumosum (L.) Nesom; rice button aster. Occasional. Habitat(s): 4, 13, 15, 21, 22, 23. Voucher: FCF-1866. [*Aster dumosus* L.]

S. lanceolatum (Willd.) Nesom; white panicle aster. Infrequent. Habitat(s): 13, 15. Voucher: FCF-1765. [*Aster lanceolatus* Willd.]

S. lateriflorum (L.) A. & D. Love var. *lateriflorum*; calico aster.
Occasional. Habitat(s): 7, 13, 22. Voucher: FCF-1427. [*Aster lateriflorus*
(L.) Britton]

S. ontarione (Wieg.) Nesom; bottomland aster. Rare. Habitat(s): 3, 4.
Voucher: FCF-1911. [*Aster ontarionis* Wiegand.]

S. patens (Ait.) Nesom var. *patens*; late purple aster. Occasional.
Habitat(s): 5, 13, 15. Voucher: FCF-1755. [*Aster patens* Aiton]

S. phlogifolium (Muhl. ex Willd.) Nesom; thinleaf late purple aster.
Scarce. Habitat(s): 13. Voucher: FCF-1597. [*Aster phlogifolius* Muhl.]

S. pilosum (Willd.) Nesom var. *pilosum*; hairy white oldfield aster.
Occasional. Habitat(s): 18, 22. Voucher: FCF-1735. [*Aster pilosus*
Willd.]

S. undulatum (L.) Nesom; waxyleaf aster. Infrequent. Habitat(s): 23.
Voucher: FCF-1848. [*Aster undulatus* L.]

S. urophyllum (Lindl.) Nesom; white arrowleaf aster. Occasional.
Habitat(s): 3, 4, 13, 15, 16. Voucher: FCF-1676. [*Aster urophyllus*
Lindl.]

* *Taraxacum officinale* Weber; dandelion. Common. Habitat(s): 21, 22, 23.
Voucher: FCF-2246.

Verbesina

V. alternifolia (L.) Britton; wingstem. Occasional. Habitat(s): 22, 23.
Voucher: FCF-1777.

V. occidentalis (L.) Walter; yellow crownbeard. Infrequent. Habitat(s):
22. Voucher: FCF-1732.

V. virginica L.; white crownbeard. Scarce. Habitat(s): 4, 22. Voucher:
FCF-1730.

Vernonia gigantea (Walter) Trel. ex Branner & Coville; giant ironweed.
Frequent. Habitat(s): 23. Voucher: FCF-1385.

* *Xanthium strumarium* L.; rough cocklebur. Scarce. Habitat(s): 18, 25.
Voucher: FCF-2226.

Balsaminaceae

Impatiens

I. capensis Meerb.; jewelweed. Occasional. Habitat(s): 4, 5, 7. Voucher: FCF-1381.

I. pallida Nutt.; pale touch-me-not. Infrequent. Habitat(s): 4, 5, 7. Voucher: FCF-1217.

Berberidaceae

Berberis canadensis Mill.; Canada barberry. Rare. Habitat(s): 12, 10. Voucher: FCF-189, FCF-2141.

Caulophyllum thalictroides (L.) Michx.; blue cohosh. Infrequent. Habitat(s): 2, 3, 4. Voucher: FCF-116.

Podophyllum peltatum L.; may apple. Infrequent. Habitat(s): 4, 5. Voucher: FCF-85.

Betulaceae

Alnus serrulata (Aiton) Willd.; smooth alder. Infrequent. Habitat(s): 7, 17. Voucher: FCF-950.

Betula

B. alleghaniensis Britton; yellow birch. Common. Habitat(s): 2, 3, 7. Voucher: FCF-2010.

B. nigra L.; river birch. Infrequent. Habitat(s): 7, 17. Voucher: FCF-2149.

Carpinus caroliniana Walter; ironwood. Infrequent. Habitat(s): 7, 17. Voucher: FCF-1178.

Corylus americana Walter; American hazelnut. Occasional. Habitat(s): 4, 13, 17. Voucher: FCF-1325.

Ostrya virginiana (Mill.) K. Koch; hophornbeam. Occasional. Habitat(s): 2, 4. Voucher: FCF-2102.

Bignoniaceae

Bignonia capreolata L.; crossvine. Occasional. Habitat(s): 4, 5, 13, 22. Voucher: FCF-197. [*Anisostichus capreolata* (L.) Bureau]

Campsis radicans (L.) Seem. *ex* Bureau; trumpet creeper. Occasional.
Habitat(s): 4, 12, 13. Voucher: FCF-779.

Boraginaceae

Cynoglossum virginianum L.; wild comfrey. Infrequent. Habitat(s): 5, 12, 8.
Voucher: FCF-186.

Lithospermum

L. canescens (Michx.) Lehm.; hoary puccoon. Rare. Habitat(s): 5.
Voucher: FCF-46.

L. tuberosum Rugel *ex* DC.; tuberous stone seed. Occasional. Habitat(s):
4, 5, 12, 8. Voucher: FCF-878.

Myosotis verna Nutt.; spring forget-me-not. Infrequent. Habitat(s): 13,
21. Voucher: FCF-330.

Brassicaceae

Arabis laevigata (Muhl.) Poir. var. *laevigata*; smooth rock cress. Infrequent.
Habitat(s): 4, 5. Voucher: FCF-2047.

* *Barbarea vulgaris* R. Br.; garden yellow rocket. Infrequent. Habitat(s): 21, 22,
23. Voucher: FCF-720.

Cardamine

C. angustata O.E. Schultz; slender toothwort. Infrequent. Habitat(s): 4.
Voucher: FCF-2069. [*Dentaria heterophylla* Nutt.]

C. concatenata (Michx.) Sw.; cutleaf toothwort. Infrequent. Habitat(s): 4,
5, 8, 10. Voucher: FCF-2060. [*Dentaria laciniata* Muhl. *ex* Willd.]

C. diphylla (Michx.) Wood; crinkleroot. Scarce. Habitat(s): 2, 3, 4.
Voucher: FCF-111. [*Dentaria diphylla* Michx.]

* *C. hirsuta* L.; hairy bitter cress. Occasional. Habitat(s): 21, 22, 23.
Voucher: FCF-20.

* *Draba verna* L.; spring draba. Scarce. Habitat(s): 13, 23. Voucher: FCF-32.

* *Lepidium campestre* (L.) R.Br.; field pepperweed. Rare. Habitat(s): 22, 23, 25.
Voucher: FCF-727.

Rorripa palustris (L.) Besser ssp. *fernaldiana* (Butters & Abbe) Jonsell; Fernald's yellow cress. Scarce. Habitat(s): 7. Voucher: FCF-659.

Buxaceae

Pachysandra procumbens Michx.; Allegheny spurge. Scarce. Habitat(s): 4, 5, 12. Voucher: FCF-83.

Cabombaceae

Brasenia schreberi J.F. Gmel.; watershield. Very rare. Habitat(s): 25. Voucher: FCF-2134.

Callitrichaceae

Callitriche

C. heterophylla Pursh emend. Darby; twoheaded water-starwort. Scarce. Habitat(s): 18. Voucher: FCF-1294.

C. terrestris Raf. emend Torr.; terrestrial water-starwort. Rare. Habitat(s): 17. Voucher: FCF-1874.

Calycanthaceae

Calycanthus floridus L. var. *floridus*; eastern sweetshrub. Occasional. Habitat(s): 4, 5, 13, 14. Voucher: FCF-170.

Campanulaceae

Campanula divaricata Michx.; small bonny bellflower. Scarce. Habitat(s): 4, 5, 13. Voucher: FCF-1615.

Campanulastrum americanum (L.) Small; American bellflower. Infrequent. Habitat(s): 4, 17. Voucher: FCF-1010. [*Campanula americana* L.]

Lobelia

L. cardinalis L.; cardinal flower. Infrequent. Habitat(s): 4, 7, 17. Voucher: FCF-1461.

L. inflata L.; Indian tobacco. Frequent. Habitat(s): 4, 12, 17, 23. Voucher: FCF-1023.

L. nuttallii Roem. & Schult.; Nuttall's lobelia. Rare. Habitat(s): 3, 5, 7. Voucher: FCF-922.

L. puberula Michx.; downy lobelia. Infrequent. Habitat(s): 13, 15.
Voucher: FCF-1587.

L. spicata Lam.; palespike lobelia. Infrequent. Habitat(s): 13, 15.
Voucher: FCF-978.

Triodanis perfoliata (L.) Nieuwl. var. *perfoliata*; clasping Venus' looking glass.
Occasional. Habitat(s): 21, 22, 23. Voucher: FCF-2098. [*Specularia perfoliata* (L.) A. DC.]

Caprifoliaceae

Lonicera

* *L. japonica* Thunb.; Japanese honeysuckle. Frequent. Habitat(s): 21, 22, 23. Voucher: FCF-680.

* *L. maackii* (Rupr.) Maxim.; Amur honeysuckle. Very rare. Habitat(s): 22, 23. Voucher: FCF-1913.

L. sempervirens L.; coral honeysuckle. Scarce. Habitat(s): 4, 5. Voucher: FCF-198.

Sambucus

S. nigra L. ssp. *canadensis* (L.) R. Bolli; common elderberry. Occasional.
Habitat(s): 4, 7, 17, 22. Voucher: FCF-738. [*Sambucus canadensis* L.]

S. racemosa L. var. *racemosa*; red elderberry. Scarce. Habitat(s): 3.
Voucher: FCF-731. [*Sambucus racemosa* var. *pubens* (Michx.) House]

Symphoricarpos orbiculatus Moench; coralberry. Infrequent. Habitat(s): 5, 12, 13. Voucher: FCF-1029.

Viburnum

V. acerifolium L.; maple leaf viburnum. Common. Habitat(s): 5, 13, 15, 16. Voucher: FCF-246.

V. nudum L. var. *cassinoides* (L.) Torr. & Gray; withe rod. Infrequent.
Habitat(s): 17. Voucher: FCF-1342. [*Viburnum cassinoides* L.]

V. nudum L. var. *nudum*; possum haw. Very rare. Habitat(s): 20.
Voucher: FCF-242.

V. prunifolium L.; black haw, plumleaf viburnum. Very rare. Habitat(s): 7. Voucher: FCF-1202.

V. rufidulum Raf.; rusty black haw. Scarce. Habitat(s): 4, 5, 12, 13.
Voucher: FCF-173.

Caryophyllaceae

Cerastium

* *C. brachypetalum* Pers.; gray chickweed. Scarce. Habitat(s): 21, 22, 23.
Voucher: FCF-384.

* *C. glomeratum* Thuill.; sticky chickweed. Scarce. Habitat(s): 21, 22,
23. Voucher: FCF-35.

* *Dianthus armeria* L.; Deptford pink. Scarce. Habitat(s): 7, 22. Voucher: FCF-
903.

Sagina decumbens (Ell.) T. & G.; trailing pearlwort. Rare. Habitat(s): 22.
Voucher: H.H. Iltis 3305.

Silene

S. rotundifolia Nutt.; roundleaf catchfly. Rare. Habitat(s): 11. Voucher:
FCF-1919.

S. stellata (L.) W.T. Aiton; widowsfrill. Infrequent. Habitat(s): 4, 5.
Voucher: FCF-1112.

S. virginica L.; fire pink. Infrequent. Habitat(s): 4, 5. Voucher: FCF-78.

Stellaria pubera Michx.; star chickweed. Frequent. Habitat(s): 2, 3, 4, 5, 10.
Voucher: FCF-2073.

Celastraceae

* *Celastrus orbiculatus* Thunb.; Oriental bittersweet. Rare. Habitat(s): .
Voucher: FCF-2247.

Euonymus

* *E. alata* (Thunb.) Sieb.; winged burning bush. Infrequent. Habitat(s):
21, 22, 23. Voucher: FCF-449.

E. americana L.; strawberry bush. Frequent. Habitat(s): 4, 5, 17.
Voucher: FCF-1414.

* *E. fortunei* Hand.-Mazz.; winter creeper. Scarce. Habitat(s): 21, 23.
Voucher: FCF-1031.

E. atropurpurea Jacq.; eastern yahoo. Scarce. Habitat(s): 4, 12, 23.
Voucher: FCF-1211.

Cistaceae

Lechea

L. minor L.; thymeleaf pinweed. Scarce. Habitat(s): 13. Voucher: FCF-946.

L. racemulosa Michx.; Illinois pinweed. Rare. Habitat(s): 19. Voucher: FCF-1222.

Cletheraceae

Clethra acuminata Michx.; white alder. Rare. Habitat(s): 3, 17. Voucher: FCF-1275.

Clusiaceae

Hypericum

H. acutifolium Ell.; sharpleaf St. Johnswort. Rare. Habitat(s): 13, 15.
Voucher: FCF-1221. [*Hypericum denticulatum* Walt. var. *acutifolium* (Ell.) Blake]

H. crux-andreae (L.) Crantz; St. Peterswort. Scarce. Habitat(s): 13, 17.
Voucher: FCF-1287.

H. gentianoides (L.) Britt. Ster. & Pogg.; orange grass. Rare. Habitat(s): 19. Voucher: FCF-1225.

H. hypericoides (L.) Crantz ssp. *multicaule* (Michx. ex Willd.) Robson;
St. Andrew's cross. Rare. Habitat(s): 13, 15. Voucher: E.S. Ford *et al.* 1947. [*Hypericum stragulum* W.P. Adams & N. Robson]

H. hypericoides (L.) Crantz var. *hypericoides*; St. Andrew's cross.
Infrequent. Habitat(s): 13. Voucher: FCF-2222.

H. mutilum L.; dwarf St. Johnswort. Occasional. Habitat(s): 12, 13, 15, 22, 23, 25. Voucher: FCF-1055.

H. nudiflorum Michx.; early St. Johnswort. Rare. Habitat(s): 13, 15, 18, 25. Voucher: FCF-1529.

* *H. perforatum* L.; common St. Johnswort. Rare. Habitat(s): 23.
Voucher: FCF-1185.

H. punctatum Lam.; spotted St. Johnswort. Occasional. Habitat(s): 4, 5, 13, 15, 23, 25. Voucher: FCF-1780.

Convolvulaceae

Calystegia

C. sepium (L.) R. Br.; hedge false bindweed. Infrequent. Habitat(s): 22. Voucher: FCF-556.

Calystegia spithamea (L.) Pursh; low false bindweed. Rare. Habitat(s): 22, 23. Voucher: A.J. Sharp 18880.

* *Dichondra carolinensis* Michx.; Carolina pony's foot. Rare. Habitat(s): 21, 23. Voucher: FCF-2239.

Ipomoea pandurata (L.) G. Mey; man of the earth. Infrequent. Habitat(s): 6, 12, 22, 23. Voucher: FCF-1197.

Cornaceae

Cornus

C. alternifolia L.f.; alternate leaf dogwood. Infrequent. Habitat(s): 2, 3. Voucher: FCF-737.

C. amomum Mill.; silky dogwood. Frequent. Habitat(s): 4, 7, 17. Voucher: FCF-1440.

C. florida L.; flowering dogwood. Frequent. Habitat(s): 13, 14, 21, 22. Voucher: FCF-132.

Crassulaceae

Sedum

* *S. sarmentosum* Bunge; stringy stonecrop. Very rare. Habitat(s): 24. Voucher: FCF-776.

S. ternatum Michx.; woodland stonecrop. Occasional. Habitat(s): 4, 5, 12, 8, 10, 11. Voucher: FCF-2101.

Cucurbitaceae

Melothria pendula L.; Guadeloupe cucumber. Scarce. Habitat(s): 23. Voucher: FCF-1486.

Cuscutaceae

Cuscuta gronovii Willd.; scaldweed. Rare. Habitat(s): 17. Voucher: FCF-2194.

Ebenaceae

Diospyros virginiana L.; persimmon. Occasional. Habitat(s): 4, 5, 13, 15.
Voucher: FCF-1988.

Elaeagnaceae

* *Elaeagnus umbellata* Thunb.; Russian olive. Infrequent. Habitat(s): 21, 22, 23.
Voucher: FCF-1705.

Ericaceae

Epigaea repens L.; trailing arbutus. Occasional. Habitat(s): 13, 15. Voucher: FCF-31.

Gaultheria procumbens L.; teaberry. Infrequent. Habitat(s): 13, 15. Voucher: FCF-1340.

Kalmia latifolia L.; mountain laurel. Common. Habitat(s): 5, 13, 14, 15, 16.
Voucher: FCF-673.

Lyonia ligustrina (L.) DC.; maleberry. Infrequent. Habitat(s): 17, 18, 25.
Voucher: FCF-1021.

Monotropa

M. hypopithys L.; pinesap. Rare. Habitat(s): 4, 5, 13. Voucher: FCF-1620.

M. uniflora L.; Indian pine. Scarce. Habitat(s): 4. Voucher: FCF-1660.

Oxydendrum arboreum (L.) DC.; sourwood. Common. Habitat(s): 5, 13, 15, 16.
Voucher: FCF-1235.

Rhododendron

R. arborescens (Pursh) Torr.; sweet azalea. Occasional. Habitat(s): 7, 17.
Voucher: FCF-1011.

R. canescens (Michx.) Sweet; southern pinxter azalea. Frequent.
Habitat(s): 5, 13, 15. Voucher: FCF-44.

R. catawbiense Michx.; Catawba rosebay, purple laurel. Very rare.
Habitat(s): 17. Voucher: FCF-1998.

R. cumberlandense E. L. Braun; Cumberland azalea. Infrequent.
Habitat(s): 13, 15. Voucher: FCF-734.

R. maximum L.; great laurel. Common. Habitat(s): 1, 2, 3, 4, 17.
Voucher: FCF-1037.

Vaccinium

V. arboreum Marshall; farkleberry. Occasional. Habitat(s): 4, 13, 15.
Voucher: FCF-473.

V. corymbosum L.; highbush blueberry. Frequent. Habitat(s): 3, 13, 15,
16. Voucher: FCF-1995.

V. pallidum Aiton; lowbush blueberry. Frequent. Habitat(s): 13, 15.
Voucher: FCF-1991. [*V. vacillansi* Kalm. ex Torr.]

V. stamineum L.; deerberry. Infrequent. Habitat(s): 5, 13, 15, 16, 19.
Voucher: FCF-219.

Euphorbiaceae

Acalypha

A. gracilens A. Gray; slender threeseed mercury. Scarce. Habitat(s): 18,
21, 22. Voucher: FCF-1807.

A. rhomboidea Raf.; Virginia threeseed mercury. Infrequent. Habitat(s):
21, 22. Voucher: FCF-1407.

Chamaesyce

C. maculata (L.) Small; spotted sandmat. Infrequent. Habitat(s): 18, 21,
22, 25. Voucher: FCF-1242. [*Euphorbia maculata* L.]

C. nutans (Lag.) Small; eyebane. Infrequent. Habitat(s): 21, 22, 23, 25.
Voucher: FCF-1366. [*Euphorbia nutans* Lag.]

Croton monanthogynus Michx.; prairie tea. Infrequent. Habitat(s): 13, 21, 22,
23. Voucher: FCF-2240.

Euphorbia

E. corollata L.; flowering spurge. Frequent. Habitat(s): 5, 13, 15, 19, 22, 23, 24. Voucher: FCF-1607.

E. dentata Michx.; toothed spurge. Infrequent. Habitat(s): 22. Voucher: FCF-2189.

E. mercurialina Michx.; mercury spurge. Scarce. Habitat(s): 4, 5, 12. Voucher: FCF-302.

Fabaceae

* *Albizia julibrissin* Durrazz.; mimosa. Scarce. Habitat(s): 13, 21, , 22, 23. Voucher: FCF-719.

Amphicarpaea bracteata (L.) Fern.; American hog peanut. Infrequent. Habitat(s): 4, 22, 23. Voucher: FCF-2220.

Apios americana Medik.; groundnut. Scarce. Habitat(s): 17. Voucher: FCF-2241.

Baptisia tinctoria (L.) R.Br.; horsefly weed. Infrequent. Habitat(s): 17, 23. Voucher: FCF-2146.

Cercis canadensis L.; eastern redbud. Infrequent. Habitat(s): 5, 12, 24. Voucher: FCF-764.

Chamaecrista

C. fasciculata (Michx.) Greene; partridge pea. Infrequent. Habitat(s): 13, 15, 22. Voucher: FCF-1316. [*Cassia fasciculata* Michx.]

C. nictitans (L.) Moench.; partridge pea. Scarce. Habitat(s): 13, 22. Voucher: FCF-1363. [*Cassia nictitans* L.]

* *Coronilla varia* L.; purple crown vetch. Scarce. Habitat(s): 21, 22, 23. Voucher: FCF-531.

Cladrastis kentukea (Dum.-Cours.) Rudd; Kentucky yellow wood. Scarce. Habitat(s): 4, 7, 12. Voucher: FCF-820.

Clitoria mariana L.; Atlantic pigeonwings. Scarce. Habitat(s): 5, 22. Voucher: FCF-2171.

Desmodium

D. cuspidatum (Muhl. ex Willd.) Loudon; largebract tick trefoil.
Infrequent. Habitat(s): 5, 13, 22, 23. Voucher: FCF-2218.

D. glutinosum (Muhl. ex Willd) A.W. Wood; pointedlead tick trefoil.
Occasional. Habitat(s): 4, 5. Voucher: FCF-830.

D. marilandicum (L.) DC.; smooth small-leaf tick trefoil. Rare.
Habitat(s): 13, 15. Voucher: FCF-1566.

D. nudiflorum (L.) DC.; nakedflower tick trefoil. Occasional. Habitat(s):
4, 5, 13, 15. Voucher: FCF-947.

D. nuttallii (Schindl.) B.G. Schub.; Nuttall's tick trefoil. Rare. Habitat(s):
4. Voucher: FCF-1678.

D. paniculatum (L.) DC. var. *paniculatum*; panincledleaf tick trefoil.
Occasional. Habitat(s): 13, 15, 23. Voucher: FCF-1592.

D. pauciflorum (Nutt.) DC.; fewflower tick trefoil. Infrequent. Habitat(s):
4, 5. Voucher: FCF-1087.

D. perplexum Schub.; perplexed tick trefoil. Infrequent. Habitat(s): 13,
15, 18, 22, 23. Voucher: FCF-1598. [*Desmodium paniculatum* (L.) DC.
var. *dillenii* (Darl.) Isely]

D. rotundifolium DC.; prostrate tick trefoil. Infrequent. Habitat(s): 4, 5,
13, 15. Voucher: FCF-1673.

Galactia volubilis (L.) Britton; downy milk pea. Infrequent. Habitat(s): 13, 15,
22. Voucher: FCF-1229.

* *Kummerowia striata* (Thunb.) Schindl.; Japanese clover. Occasional.
Habitat(s): 13, 22, 23, 25. Voucher: FCF-1506. [*Lespedeza striata*
(Thunb.) Hook. & Arn.]

* *Lathyrus latifolius* L.; perennial pea. Rare. Habitat(s): 22, 23. Voucher: FCF-
767.

Lespedeza

* *L. bicolor* Turcz.; bush clover. Rare. Habitat(s): 13, 21, 22. Voucher:
FCF-1999.

* *L. cuneata* (Dum.-Cours.) G.Don; Chinese lespedeza. Occasional.
Habitat(s): 21, 22, 23. Voucher: FCF-1384.

- L. hirta* (L.) Hornem; hairy lespedeza. Infrequent. Habitat(s): 13, 15.
Voucher: FCF-1751.
- L. intermedia* (S. Watson) Britton; intermediate lespedeza. Occasional.
Habitat(s): 13, 15, 23. Voucher: FCF-1565.
- L. procumbens* Michx.; trailing lespedeza. Infrequent. Habitat(s): 13, 15,
23. Voucher: FCF-1862.
- L. repens* (L.) Barton; creeping lespedeza. Infrequent. Habitat(s): 6, 22,
23, 6. Voucher: FCF-1416.
- * *Medicago lupulina* L.; black medick. Infrequent. Habitat(s): 21, 22, 23.
Voucher: FCF-390.
- * *Melilotus alba* Medik.; white sweetclover. Infrequent. Habitat(s): 21, 22, 23.
Voucher: FCF-925.
- Mimosa microphylla* Dry.; littleleaf sensitive briar. Infrequent. Habitat(s): 5, 13,
15. Voucher: FCF-979. [*Schrankia microphylla* (Dryand.) J.F. Macbr.]
- Orbexilum pedunculatum* (Mill.) Rydb.; Sampson's snakeroot. Infrequent.
Habitat(s): 13, 15. Voucher: FCF-623. [*Psoralea psoralioides* (Walt.)
Cory var. *eglandulosa* (Ell.) Freeman]
- * *Pueraria montana* (Lour.) Merrill var. *lobata* (Willd.) Maesen & S.M. Almeida;
kudzu. Scarce. Habitat(s): 22. Voucher: FCF-2135.
- Robinia*
- R. hispida* L. var. *rosea* Pursh.; bristly locust. Scarce. Habitat(s): 13, 16.
Voucher: FCF-1979.
- R. pseudacacia* L.; black locust. Frequent. Habitat(s): 4, 5, 6, 13, 22, 23.
Voucher: FCF-184.
- Senna marilandica* (L.) Link; Maryland senna. Infrequent. Habitat(s): 5, 13, 15,
24. Voucher: FCF-1706. [*Cassia marilandica* L.]
- Stylosanthes biflora* (L.) BSP.; sidebeak pencil flower. Rare. Habitat(s): 13, 17.
Voucher: A.J. Sharp *et al.* 2990.
- Tephrosia virginiana* (L.) Pers.; Virginia tephrosia. Occasional. Habitat(s): 13,
15. Voucher: FCF-724.

Trifolium

* *T. pratense* L.; red clover. Occasional. Habitat(s): 21, 22, 23. Voucher: FCF-530.

* *T. repens* L.; white clover. Common. Habitat(s): 21, 22, 23. Voucher: FCF-1965.

Vicia

V. caroliniana Walter; Carolina vetch. Occasional. Habitat(s): 4, 5. Voucher: FCF-215.

* *V. sativa* L. ssp. *nigra* (L.) Ehrend.; garden vetch. Infrequent. Habitat(s): 5, 13, 22. Voucher: FCF-88. [*Vicia angustifolia* L.]

Fagaceae

Castanea

C. dentata (Marshall) Borkh.; American chestnut. Infrequent. Habitat(s): 13, 5. Voucher: FCF-633.

* *C. mollissima* Blume; Chinese chestnut. Very rare. Habitat(s): 23. Voucher: FCF-1216.

C. pumila (L.) Mill.; Allegheny chinquapin. Scarce. Habitat(s): 13, 15. Voucher: FCF-687.

Fagus grandifolia Ehrend.; American beech. Common. Habitat(s): 2, 3, 4, 5. Voucher: FCF-859.

Quercus

Q. alba L.; white oak. Common. Habitat(s): 4, 5, 13, 14. Voucher: FCF-916.

Q. coccinea Munchh.; scarlet oak. Occasional. Habitat(s): 13, 15. Voucher: FCF-2151.

Q. falcata Michx.; southern red oak. Occasional. Habitat(s): 13. Voucher: FCF-1793.

Q. marilandica Munchh.; blackjack oak. Occasional. Habitat(s): 13, 15. Voucher: FCF-2106.

Q. muehlenbergii Engelm.; chinquapin oak. Infrequent. Habitat(s): 5, 6. Voucher: FCF-2095.

Q. prinus L.; chestnut oak. Frequent. Habitat(s): 13, 16. Voucher: FCF-1237. [*Quercus montana* Willd.]

Q. rubra L.; northern red oak. Frequent. Habitat(s): 4. Voucher: FCF-2014.

Q. stellata Wangenh.; post oak. Occasional. Habitat(s): 13, 15. Voucher: FCF-1795.

Q. velutina Lam.; black oak. Frequent. Habitat(s): 13, 15. Voucher: FCF-2150.

Fumariaceae

Dicentra cucullaria (L.) Bernh.; dutchman's breeches. Infrequent. Habitat(s): 4, 5, 8. Voucher: FCF-2043.

Gentianaceae

Bartonia paniculata (Michx.) Muhl.; twining screwstem. Rare. Habitat(s): 17, 20. Voucher: FCF-2192.

Frasera caroliniensis Walter; American columbo. Very rare. Habitat(s): 5, 12. Voucher: FCF-2077. [*Swertia caroliniensis* (Walt.) Kuntze]

Gentiana

G. saponaria L.; harvestbells. Scarce. Habitat(s): 13, 15. Voucher: FCF-1643.

G. villosa L.; striped gentian. Rare. Habitat(s): 13, 15. Voucher: FCF-1580.

Gentianella quinquefolia (L.) Small; ague weed. Infrequent. Habitat(s): 4. Voucher: FCF-1781.

Obolaria virginica L.; Virginia pennywort. Infrequent. Habitat(s): 4. Voucher: FCF-2063.

Sabatia

S. angularis (L.) Pursh.; rose pink. Infrequent. Habitat(s): 22, 23, 25. Voucher: FCF-1219.

S. brachiata Ell.; narrowleaf rose gentian. Rare. Habitat(s): 13. Voucher: R.E. Shanks *et al.* 3431.

Geraniaceae

Geranium

G. carolinianum L.; Carolina geranium. Occasional. Habitat(s): 21, 22, 23. Voucher: FCF-472.

G. maculatum L.; wild geranium. Infrequent. Habitat(s): 4, 5, 8. Voucher: FCF-82.

Hamamelidaceae

Hamamelis virginiana L.; American witch hazel. Occasional. Habitat(s): 3, 12, 13, 17. Voucher: FCF-900.

Liquidambar styraciflua L.; sweet gum. Infrequent. Habitat(s): 7. Voucher: FCF-843.

Hippocastanaceae

Aesculus flava Sol.; yellow buckeye. Occasional. Habitat(s): 2, 4. Voucher: FCF-1096.

Hydrophyllaceae

Hydrophyllum

H. canadense L.; bluntleaf waterleaf. Occasional. Habitat(s): 4, 5, 8, 10. Voucher: FCF-1063.

H. macrophyllum Nutt.; largeleaf waterleaf. Rare. Habitat(s): 4, 8. Voucher: FCF-2044.

Phacelia bipinnatifida Michx.; purple phacelia. Occasional. Habitat(s): 2, 3, 4, 5, 8, 10. Voucher: FCF-104.

Juglandaceae

Carya

C. alba (L.) Nutt. *ex* Ell.; mockernut hickory. Frequent. Habitat(s): 4, 5, 13, 15. Voucher: FCF-717. [*Carya tomentosa* (Poir.) Nutt.]

C. cordiformis (Wangenh.) K. Koch; bitternut hickory. Infrequent. Habitat(s): 4, 5, 8. Voucher: FCF-1166.

C. glabra (Mill.) Sweet; pignut hickory. Occasional. Habitat(s): 4, 5, 13.
Voucher: FCF-1687.

C. ovata (Mill.) K. Koch *ovata*; shagbark hickory. Occasional.
Habitat(s): 4, 5, 13, 15. Voucher: FCF-1204.

C. pallida (Ashe) Engl. & Graebn.; sand hickory. Infrequent. Habitat(s):
13, 15. Voucher: FCF-2185.

Juglans

J. cinerea L.; butternut. Infrequent. Habitat(s): 4, 5, 23. Voucher: FCF-
1154.

J. nigra L.; black walnut. Occasional. Habitat(s): 5, 13, 22, 23. Voucher:
FCF-1215.

Lamiaceae

* *Ajuga reptans* L.; common bugle. Rare. Habitat(s): 21. Voucher: FCF-113.

Blephilia hirsuta (Pursh.) Benth.; wood mint. Infrequent. Habitat(s): 4, 5, 12.
Voucher: FCF-1162.

Collinsonia canadensis L.; richweed. Infrequent. Habitat(s): 3, 4, 12, 13, 17.
Voucher: FCF-2232.

* *Glechoma hederacea* L.; ground ivy. Occasional. Habitat(s): 21, 22, 23.
Voucher: H.H. Iltis 3302.

Hedeoma pulegioides (L.) Pers.; American false pennyroyal. Infrequent.
Habitat(s): 23, 25. Voucher: FCF-1526.

Lycopus

L. americanus Muhl. ex. Barton; American water horehound. Scarce.
Habitat(s): 18. Voucher: FCF-2212.

L. virginicus L.; Virginia water horehound. Occasional. Habitat(s): 6, 18,
25. Voucher: FCF-1564.

Monarda

M. clinopodia L.; white bergamot. Scarce. Habitat(s): 4, 5, 12. Voucher:
FCF-2084.

M. fistulosa L.; wild bergamot. Infrequent. Habitat(s): 5, 13, 23.
Voucher: FCF-1273.

* *Mosla dianthera* (Buch.-Ham. ex Roxb.) Maxim.; miniature beefsteak plant.
Infrequent. Habitat(s): 22, 23, 25. Voucher: FCF-1243.

* *Perilla frutescens* (L.) Britton; beefsteak plant. Infrequent. Habitat(s): 18, 21,
22, 23. Voucher: FCF-1937.

Physostegia virginiana (L.) Benth ssp. *praemorsa* (Shinners) P.D. Cantino;
obedient plant. Occasional. Habitat(s): 7. Voucher: FCF-896.

* *Prunella vulgaris* L.; common selfheal. Frequent. Habitat(s): 22, 25. Voucher:
FCF-585.

Pycnanthemum

P. muticum (Michx.) Pers.; clustered mountain mint. Infrequent.
Habitat(s): 13, 15, 23. Voucher: FCF-970.

P. pycnanthemoides (Leavenworth) Fern. var. *pycnanthemoides*; southern
mountain mint. Occasional. Habitat(s): 6, 13, 22, 23. Voucher: FCF-
1468. [*Pycnanthemum incanum* (L.) Michx.]

P. tenuifolium Schrad; narrowleaf mountain mint. Occasional. Habitat(s):
13, 15, 23. Voucher: FCF-1508.

Salvia lyrata L.; lyreleaf sage. Frequent. Habitat(s): 4, 13, 15, 22, 23, 25.
Voucher: FCF-1981.

Scutellaria

S. elliptica Muhl. var. *hirsuta* (Short & R. Peter) Fernald; hairy skullcap.
Occasional. Habitat(s): 13, 15. Voucher: FCF-1579.

S. incana Biehler var. *punctata* (Chapm.) C. Mohr; hoary skullcap.
Infrequent. Habitat(s): 5, 6, 7. Voucher: FCF-1444.

S. integrifolia L.; helmet flower. Infrequent. Habitat(s): 13, 23. Voucher:
FCF-1268.

S. pseudoserrata Epling; false-teeth skullcap. Scarce. Habitat(s): 4, 5, 12.
Voucher: FCF-880.

Stachys nuttallii Shuttlew. ex Benth; heartleaf hedge nettle. Rare. Habitat(s): 4,
7. Voucher: FCF-832.

Synandra hispidula (Michx.) Baill.; Guyandotte beauty. Rare. Habitat(s): 4, 7.
Voucher: FCF-142.

Trichostema dichotomum L.; forked bluecurls. Rare. Habitat(s): 13, 15.
Voucher: R.E. Shanks *et al.* 8925.

Lauraceae

Lindera benzoin (L.) Blume; spicebush. Occasional. Habitat(s): 4, 5. Voucher:
FCF-806.

Sassafras albidum (Nutt.) Nees; sassafras. Common. Habitat(s): 5, 13, 15, 16.
Voucher: FCF-604.

Linaceae

Linum

L. medium (Planch.) Britton var. *texanum* (Planch.) Fernald; stiff yellow
flax. Infrequent. Habitat(s): 18, 19, 23. Voucher: FCF-1234.

L. striatum Walter; ridged yellow flax. Rare. Habitat(s): 23. Voucher:
FCF-966.

L. virginianum L.; woodland flax. Rare. Habitat(s): 13. Voucher: FCF-
1014.

Loganaceae

Spigelia marilandica L.; Indian pink. Occasional. Habitat(s): 5, 7. Voucher:
FCF-554.

Lythraceae

Rotala ramosior (L.) Koehne; lowland rotala. Occasional. Habitat(s): 18.
Voucher: FCF-2223.

Magnoliaceae

Liriodendron tulipifera L.; tulip tree, tulip poplar. Common. Habitat(s): 2, 3, 4,
5, 13. Voucher: FCF-447.

Magnolia

M. acuminata (L.) L.; cucumber tree. Infrequent. Habitat(s): 2, 3, 4, 7.
Voucher: FCF-805.

M. macrophylla Michx.; big leaf magnolia. Occasional. Habitat(s): 4, 5.
Voucher: FCF-1624.

M. tripetala L.; umbrella magnolia. Infrequent. Habitat(s): 4, 5, 17.
Voucher: FCF-1007.

Melastomataceae

Rhexia

R. mariana L. var. *mariana*; Maryland meadow beauty. Rare. Habitat(s): 18, 25. Voucher: FCF-1267.

R. virginica L.; meadow beauty. Infrequent. Habitat(s): 13, 23. Voucher: FCF-965.

Menispermaceae

Cocculus carolinus (L.) DC.; Carolina coralbeads. Infrequent. Habitat(s): 4, 21, 22. Voucher: FCF-811.

Menispermum canadense L.; common moonseed. Infrequent. Habitat(s): 4, 5, 23. Voucher: FCF-305.

Moraceae

Morus rubra L.; red mulberry. Occasional. Habitat(s): 4, 5, 12, 23. Voucher: FCF-2121.

Nyssaceae

Nyssa sylvatica Marshall; black gum. Frequent. Habitat(s): 3, 7, 13, 17.
Voucher: FCF-1044.

Oleaceae

Chionanthus virginicus L.; white fringe tree. Infrequent. Habitat(s): 7, 12, 17.
Voucher: FCF-538.

* *Forsythia viridissima* Lindl.; forsythia. Occasional. Habitat(s): 21, 23.
Voucher: FCF-18.

Fraxinus

F. americana L.; American ash. Common. Habitat(s): 4, 5. Voucher: FCF-565.

F. pennsylvanica Marshall; green ash. Scarce. Habitat(s): 12, 18.
Voucher: R.L. Jones 5507.

F. quadrangulata Michx.; blue ash. Rare. Habitat(s): 5, 12. Voucher:
FCF-2089.

* *Ligustrum sinense* Lour.; Chinese privet. Scarce. Habitat(s): 5, 6, 22, 23.
Voucher: FCF-1447.

Onagraceae

Circaea

C. alpina L.; small enchanter's nightshade. Very rare. Habitat(s): 8.
Voucher: FCF-1161.

C. lutetiana (L.) A. & M. subsp. *canadensis* (L.) A. & M.; broadleaf
enchanter's nightshade. Infrequent. Habitat(s): 4, 5, 13, 17. Voucher:
FCF-831.

Ludwigia

L. alternifolia L.; seedbox. Occasional. Habitat(s): 18, 25. Voucher:
FCF-1258.

L. linearis Walt.; narrowleaf primrose willow. Rare. Habitat(s): 17.
Voucher: FCF-2233.

Oenothera

O. biennis L.; common evening-primrose. Infrequent. Habitat(s): 21, 25.
Voucher: FCF-1806.

O. fruticosa L. ssp. *fruticosa*; narrow-leaf evening-primrose. Rare.
Habitat(s): 13, 15. Voucher: R.E. Shanks *et al.* 4518.

Orobanchaceae

Conopholis americana (L.) Wallr.; American squawroot. Infrequent. Habitat(s):
4, 5. Voucher: FCF-179.

Epifagus virginiana (L.) Barton; beechdrops. Infrequent. Habitat(s): 4. Voucher:
FCF-1625.

Oxalidaceae

Oxalis

O. grandis Small; great yellow wood sorrel. Scarce. Habitat(s): 4, 5, 13.

Voucher: FCF-1603.

O. stricta L.; common yellow oxalis. Frequent. Habitat(s): 13, 21, 22, 23, 25. Voucher: FCF-1766.

O. violacea L.; violet wood sorrel. Infrequent. Habitat(s): 5, 13, 15. Voucher: FCF-100.

Papaveraceae

Sanguinaria canadensis L.; bloodroot. Infrequent. Habitat(s): 4, 5. Voucher: FCF-205.

Stylophorum diphyllum (Michx.) Nutt.; celandine poppy. Infrequent. Habitat(s): 4, 7. Voucher: FCF-2074.

Passifloraceae

Passiflora lutea L.; yellow passion flower. Occasional. Habitat(s): 4, 6, 12, 22, 23. Voucher: FCF-1438.

Phrymaceae

Phryma leptostachya L.; American lopseed. Infrequent. Habitat(s): 4, 5. Voucher: FCF-1158.

Phytolaccaceae

Phytolacca americana L.; American pokeweed. Infrequent. Habitat(s): 13, 23. Voucher: FCF-1013.

Plantaginaceae

Plantago

P. aristata Michx.; largebracted plantain. Infrequent. Habitat(s): 7, 23. Voucher: FCF-902.

* *P. lanceolata* L.; narrowleaf plantain. Frequent. Habitat(s): 21, 22, 23. Voucher: FCF-386.

P. rugelii Decne.; blackseed plantain. Frequent. Habitat(s): 21, 22, 23, 24. Voucher: FCF-1036.

P. virginica L.; Virginia plantain. Occasional. Habitat(s): 13, 21, 22. Voucher: FCF-399.

Platanaceae

Platanus occidentalis L.; American sycamore. Frequent. Habitat(s): 7. Voucher: FCF-1132.

Polemoniaceae

Phlox

P. amoena Sims; hairy phlox. Occasional. Habitat(s): 4, 5, 7, 13, 15. Voucher: FCF-474.

P. amplifolia Britton; largeleaf phlox. Infrequent. Habitat(s): 4, 5. Voucher: FCF-1085.

P. divaricata L.; sweet william, wild blue phlox. Frequent. Habitat(s): 4, 5, 7. Voucher: FCF-75.

P. glaberrima L.; smooth phlox. Scarce. Habitat(s): 4, 5, 7, 22. Voucher: FCF-683.

P. maculata L.; wild sweet william. Rare. Habitat(s): 7. Voucher: FCF-1194.

P. paniculata L.; fall phlox. Infrequent. Habitat(s): 4. Voucher: FCF-1106.

Polygalaceae

Polygala

P. ambigua Nutt.; whorled milkwort. Rare. Habitat(s): 13, 15. Voucher: A.J. Sharp *et al.* 2971. [*Polygala verticillata* L. var. *ambigua* (Nutt.) Wood]

P. curtissii A. Gray; Curtiss' milkwort. Infrequent. Habitat(s): 13, 15, 22, 23. Voucher: FCF-1334.

P. senega L.; Seneca snakeroot. Scarce. Habitat(s): 4. Voucher: FCF-1159.

P. verticillata L. var. *verticillata*; whorled milkwort. Infrequent. Habitat(s): 13, 22, 23. Voucher: FCF-1512.

Polygonaceae

Polygonum

P. amphibium L.; water knotweed. Scarce. Habitat(s): 18. Voucher: FCF-2180.

* *P. aviculare* L.; prostrate knotweed. Infrequent. Habitat(s): 21, 22, 23. Voucher: FCF-1744.

* *P. caespitosum* Blume var. *longisetum* (Bruijn) A.N. Steward; oriental ladysthumb. Occasional. Habitat(s): 7, 18, 21, 25. Voucher: FCF-1851.

P. punctatum Elliot; dotted smartweed. Occasional. Habitat(s): 4, 22, 23, 25. Voucher: FCF-1383.

P. sagittatum L.; arrowleaf tearthumb. Scarce. Habitat(s): 23. Voucher: FCF-2219.

P. scandens L.; climbing false buckwheat. . Habitat(s): 23. Voucher: FCF-1379.

P. virginianum L.; jumpseed. Occasional. Habitat(s): 4, 5. Voucher: FCF-1001.

Rumex

* *R. acetosella* L.; common sheep sorrel. Occasional. Habitat(s): 21, 22, 23. Voucher: FCF-381.

* *R. crispus* L.; curly dock. Scarce. Habitat(s): 22, 23. Voucher: FCF-886.

* *R. obtusifolius* L.; bitter dock. Scarce. Habitat(s): 22, 23. Voucher: FCF-2137.

Portulacaceae

Claytonia caroliniana Michx.; Carolina spring beauty. Occasional. Habitat(s): 2, 3, 4, 8, 10. Voucher: FCF-2045.

Primulaceae

* *Anagallis arvensis* L.; scarlet pimpernel. Rare. Habitat(s): 7. Voucher: FCF-1422.

Lysimachia

L. lanceolata Walter; lanceleaf loosestrife. Infrequent. Habitat(s): 4, 22, 23, 25. Voucher: FCF-885.

L. quadrifolia L.; whorled yellow loosestrife. Occasional. Habitat(s): 5, 13. Voucher: FCF-552.

L. tonsa (A.W. Wood) R. Knuth; southern yellow loosestrife. Occasional. Habitat(s): 3, 5, 7, 13, 15. Voucher: FCF-2005.

Samolus valerandi L. ssp. *parviflorus* (Raf.) Hutten; seaside brookweed. Rare. Habitat(s): 25. Voucher: FCF-769. [*Samolus parviflorus* Raf.]

Pyrolaceae

Chimaphila maculata (L.) Pursh.; spotted wintergreen. Occasional. Habitat(s): 4, 13, 15. Voucher: FCF-608.

Ranunculaceae

Actaea pachypoda Elliot; doll's eyes, white baneberry. Infrequent. Habitat(s): 2, 3, 4, 8. Voucher: FCF-72.

Anemone

A. quinquefolia L.; wood anemone. Infrequent. Habitat(s): 2, 3, 4. Voucher: A.J. Sharp 7026.

A. virginiana L.; tall thimbleweed. Occasional. Habitat(s): 2, 4. Voucher: FCF-998.

Aquilegia canadensis L.; red columbine. Scarce. Habitat(s): 8, 11. Voucher: FCF-318.

Clematis

C. viorna L.; vasevine. Rare. Habitat(s): 5, 12. Voucher: FCF-2079.

C. virginiana L.; virgin's bower. Infrequent. Habitat(s): 13, 23. Voucher: FCF-1518.

Delphinium tricornes Michx.; dwarf larkspur. Infrequent. Habitat(s): 4. Voucher: FCF-213.

Hepatica

H. nobilis Schreb. var. *acuta* (Pursh) Steyermark; sharplobe hepatica. Frequent. Habitat(s): 2, 3, 4, 5, 8, 10. Voucher: FCF-907. [*Hepatica acutiloba* DC.]

H. nobilis Schreb. var. *obtusa* (Pursh) Steyermark; roundlobe hepatica. Rare. Habitat(s): 3. Voucher: FCF-2036. [*Hepatica americana* (DC.) KerGawl.]

Hydrastis canadensis L.; goldenseal. Infrequent. Habitat(s): 4, 5, 8. Voucher: FCF-861.

Ranunculus

R. abortivus L.; littleleaf buttercup. Frequent. Habitat(s): 4, 21, 22, 23. Voucher: FCF-2031.

R. fascicularis Muhl. ex Bigelow; early buttercup. Scarce. Habitat(s): 4. Voucher: FCF-97.

R. hispidus Michx. var. *hispidus*; bristly buttercup. Occasional. Habitat(s): 4, 5. Voucher: FCF-96.

R. hispidus Michx. var. *nitidus* (Ell.) T. Duncan; bristly buttercup. Infrequent. Habitat(s): 4, 5. Voucher: FCF-187.

R. micranthus (A. Gray) Nutt. ex Torr. & Gray; rock buttercup. Rare. Habitat(s): 4. Voucher: FCF-1954.

R. recurvatus Poir.; blisterwort. Infrequent. Habitat(s): 4, 5, 13. Voucher: FCF-595.

* *R. sardous* Crantz; hairy buttercup. Rare. Habitat(s): 21, 25. Voucher: FCF-380.

Thalictrum

T. clavatum DC.; mountain meadow-rue. Rare. Habitat(s): 3, 9. Voucher: FCF-566.

T. dioicum L.; early meadow-rue. Infrequent. Habitat(s): 4, 8. Voucher: FCF-71.

T. pubescens Pursh; king of the meadow. Scarce. Habitat(s): 4, 7. Voucher: FCF-1193.

T. revolutum DC.; waxyleaf meadow-rue. Infrequent. Habitat(s): 5, 17.
Voucher: FCF-1030.

T. thalictroides (L.) Eames & B. Boivin; rue anemone. Occasional.
Habitat(s): 4, 5, 8. Voucher: FCF-53.

Trautvettaria carolinensis (Walter) Vail; Carolina bugbane. Infrequent.
Habitat(s): 7. Voucher: FCF-1170.

Xanthorhiza simplicissima Marshall; yellowroot. Infrequent. Habitat(s): 7, 17.
Voucher: FCF-230.

Rhamnaceae

Ceanothus americanus L.; New Jersey tea. Infrequent. Habitat(s): 5, 22, 24.
Voucher: FCF-765.

Frangula caroliniana (Walt.) Gray; Carolina buckthorn. Infrequent. Habitat(s):
5, 12, 13. Voucher: FCF-1142. [*Rhamnus caroliniana* Walter]

Rosaceae

Agrimonia

A. parviflora Aiton; harvestlice. Occasional. Habitat(s): 13, 22, 23.
Voucher: FCF-1390.

A. pubescens Wallr.; soft agrimony. Infrequent. Habitat(s): 23. Voucher:
FCF-1074.

A. rostellata Wallr.; beaked agrimony. Infrequent. Habitat(s): 4, 5.
Voucher: FCF-1206.

Amelanchier

A. arborea (F. Michx.) Fernald; common serviceberry. Occasional.
Habitat(s): 13, 15, 16, 19, 21, 22. Voucher: FCF-2030.

A. canadensis (L.) Medik.; Canadian serviceberry. Scarce. Habitat(s): 13,
15. Voucher: FCF-1962.

* *Aphanes microcarpa* (Boiss. & Reuter) Rothm.; slender parsley piert. Scarce.
Habitat(s): 21, 22, 23. Voucher: FCF-394.

Aruncus dioicus (Walter) Fernald; goat's beard. Infrequent. Habitat(s): 2, 3, 4, 8.
Voucher: FCF-570.

Crataegus

C. calpodendron (Ehrend.) Medik; pear hawthorn. Infrequent. Habitat(s): 5, 7, 13, 17, 20. Voucher: FCF-2163.

C. pruniosa (H.L. Wendl.) K. Koch; frosted hawthorn. Infrequent. Habitat(s): 4, 12, 13. Voucher: FCF-1993.

* *Duchesnea indica* (Andr.) Focke; Indian strawberry. Occasional. Habitat(s): 13, 21, 23. Voucher: FCF-1024.

Fragaria virginiana Duchesne; Virginia strawberry. Rare. Habitat(s): 15. Voucher: FCF-131.

Geum

G. canadense; white avens. Infrequent. Habitat(s): 4, 5, 13. Voucher: FCF-996.

G. virginianum L.; cream avens. Scarce. Habitat(s): 4, 5, 22, 24. Voucher: FCF-2129.

Malus

M. angustifolia (Aiton) Michx.; southern crab apple. Rare. Habitat(s): 13, 15. Voucher: FCF-2028.

M. coronaria (L.) Mill.; sweet crab apple. Scarce. Habitat(s): 13, 15. Voucher: FCF-1684.

* *M. pumila* Mill.; common apple. Rare. Habitat(s): 13, 15, 23. Voucher: FCF-2023.

Photinia

P. melanocarpa (Michx.) Robertson & Phipps; black chokeberry. Occasional. Habitat(s): 11, 13, 17, 18, 18. Voucher: FCF-228. [*Aronia melanocarpa* (Michx.) Elliot]

P. pyrifolia (Lam.) Robertson & Phipps; red chokeberry. Scarce. Habitat(s): 17, 20. Voucher: FCF-701. [*Aronia arbutifolia* (L.) Pers.]

Physocarpus opulifolius (L.) Maxim.; common ninebark. Infrequent. Habitat(s): 17. Voucher: FCF-534.

Porteranthus trifoliatus (L.) Britton; Bowman's root. Occasional. Habitat(s): 13, 15. Voucher: FCF-453.

Potentilla

P. canadensis L.; dwarf cinquefoil. Scarce. Habitat(s): 13, 15, 21, 22, 25.
Voucher: FCF-33.

P. simplex Michx. var. *simplex*; common cinquefoil. Occasional.
Habitat(s): 13, 15. Voucher: FCF-208.

Prunus

P. americana Marshall; American plum. Scarce. Habitat(s): 5, 12.
Voucher: FCF-2114.

P. angustifolia Marshall; Chickasaw plum. Infrequent. Habitat(s): 21, 23.
Voucher: FCF-2029.

* *P. persica* (L.) Batsch.; peach. Very rare. Habitat(s): 22. Voucher:
FCF-1339.

P. serotina Ehrend.; black cherry. Occasional. Habitat(s): 13, 15.
Voucher: FCF-24.

* *Pseudocdonia sinensis* (Dum.-Cours.) Schneid.; Chinese-quince. Very rare.
Habitat(s): 21. Voucher: FCF-446. [*Chaenomeles sinensis* Koehne]

* *Pyrus communis* L.; common pear. Rare. Habitat(s): 23. Voucher: FCF-1213.

Rosa

R. carolina L.; Carolina rose. Infrequent. Habitat(s): 5, 12. Voucher:
FCF-2078.

* *R. multiflora* Thunb. ex Murray; multiflora rose. Frequent. Habitat(s):
21, 22, 23. Voucher: FCF-488.

R. palustris Marshall; swamp rose. Scarce. Habitat(s): 17. Voucher:
FCF-1009.

Rubus

R. alleghaniensis Porter ex L.H. Bailey; Allegheny blackberry. Rare.
Habitat(s): 2, 4. Voucher: 27 July 1953, D. Caplenor 619.

R. argutus Link; southern blackberry. Common. Habitat(s): 13, 15, 18,
23. Voucher: FCF-961.

* *R. bifrons* Vest ex Tratt.; Himalayan berry. Scarce. Habitat(s): 23.
Voucher: FCF-1263.

R. flagellaris Willd.; northern dewberry. Common. Habitat(s): 5, 13, 15. Voucher: FCF-520.

R. hispidus L.; bristly dewberry. Common. Habitat(s): 13, 15. Voucher: FCF-695.

R. occidentalis L.; black raspberry. Frequent. Habitat(s): 13, 15, 23. Voucher: FCF-1205.

* *R. phoenicolasius* Maxim.; wineberry. Infrequent. Habitat(s): 4, 23. Voucher: FCF-990.

Spiraea

* *S. japonica* L.f.; Japanese spiraea. Scarce. Habitat(s): 7. Voucher: FCF-2155.

S. tomentosa L.; steeplebush, hardtack. Scarce. Habitat(s): 13, 15, 17. Voucher: FCF-1271.

S. virginiana Britton; Virginia meadowsweet, Appalachian spiraea. Scarce. Habitat(s): 17. Voucher: FCF-657.

Rubiaceae

Cephalanthus occidentalis L.; common buttonbush. Occasional. Habitat(s): 7, 17. Voucher: FCF-833.

Diodia

D. teres Walter; poorjoe. Scarce. Habitat(s): 15, 19. Voucher: FCF-1228.

D. virginiana L.; Virginia buttonweed. Occasional. Habitat(s): 4, 7, 13, 15, 25. Voucher: FCF-1303.

Galium

G. aparine L.; stickywilly. Frequent. Habitat(s): 4, 22, 23. Voucher: FCF-365.

G. circaezans Michx.; licorice bedstraw. Infrequent. Habitat(s): 2, 3, 4, 5, 13, 22. Voucher: FCF-551.

G. lanceolatum Torr.; lanceleaf wild licorice. Occasional. Habitat(s): 13, 15. Voucher: FCF-509.

* *G. parisiense* L.; wall bedstraw. Very rare. Habitat(s): 25. Voucher: FCF-1301.

G. pilosum Aiton; hairy bedstraw. Infrequent. Habitat(s): 4, 13, 23.
Voucher: FCF-1458.

G. tinctorium L.; stiff marsh bedstraw. Scarce. Habitat(s): 18, 25.
Voucher: FCF-1244.

G. triflorum Michx.; fragrant bedstraw. Occasional. Habitat(s): 4, 13, 15.
Voucher: FCF-1341.

Houstonia

H. caerulea (L.) Hook.; azure bluet. Frequent. Habitat(s): 12, 13, 15.
Voucher: FCF-451.

H. canadensis Willd.; Canadian summer bluet. Occasional. Habitat(s): 4,
5, 10, 13, 15. Voucher: FCF-1131.

H. purpurea (L.) Torr. & A. Gray var. *purpurea*; Venus' pride.
Occasional. Habitat(s): 4, 5, 12, 16. Voucher: FCF-1195.

Mitchella repens L.; partridge berry. Frequent. Habitat(s): 4, 5, 13, 15. Voucher:
FCF-362.

* *Sherardia arvensis* L.; blue field madder. Frequent. Habitat(s): 21, 22, 23.
Voucher: FCF-114.

Rutaceae

Ptelea trifoliata L.; common hoptree. Scarce. Habitat(s): 5, 12. Voucher: FCF-
2090.

Salicaceae

Populus

* *P. alba* L.; white poplar, silverleaf poplar. Scarce. Habitat(s): 23.
Voucher: FCF-1212.

P. deltoides Bartram ex Marshall; eastern cottonwood. Scarce.
Habitat(s): 5, 22. Voucher: FCF-2136.

Salix

S. caroliniana Michx.; Carolina willow. Occasional. Habitat(s): 7, 17.
Voucher: FCF-2237.

S. humilis Marshall var. *humilis*; prairie willow. Infrequent. Habitat(s): 7. Voucher: FCF-1430.

S. humilis Marshall var. *tristis* (Ait.) Griggs; prairie willow. Rare. Habitat(s): 13, 23. Voucher: FCF-2145. [*Salix humilis* Marshall]

S. nigra Marshall; black willow. Frequent. Habitat(s): 7, 17, 23. Voucher: FCF-152.

S. sericea Marshall; silky willow. Very rare. Habitat(s): 17. Voucher: FCF-1922.

Santalaceae

Commandra umbellata (L.) Nutt.; bastard toadflax. Scarce. Habitat(s): 13, 15. Voucher: A.J. Sharp 17350.

Nestronia umbellula Raf.; conjurer's nut, leech brush. Very rare. Habitat(s): 5, 12. Voucher: FCF-2139.

Sapotaceae

Sideroxylon lycioides L.; buckthorn. Rare. Habitat(s): 5, 12. Voucher: FCF-2082. [*Bumelia lycioides* (L.) Pers.]

Saxifragaceae

Astilbe biternata (Vent.) Britton; Appalachian false goat's beard. Infrequent. Habitat(s): 4, 8. Voucher: FCF-1062.

Heuchera

H. americana L.; American alumroot. Scarce. Habitat(s): 11. Voucher: FCF-1057.

H. parviflora Bartl.; littleflower alumroot. Very rare. Habitat(s): 11, 17. Voucher: F.H. Norris *et al.* 16217.

H. villosa Michx. var. *villosa*; hairy alumroot. Occasional. Habitat(s): 3, 4, 8, 9, 10, 11. Voucher: FCF-1125.

Hydrangea

H. arborescens L.; wild hydrangea. Frequent. Habitat(s): 3, 4, 9. Voucher: FCF-1097.

- H. cinerea* Ser.; ashy cinerea. Rare. Habitat(s): 2, 3. Voucher: J.K. Underwood *et al.* 4110.
- Itea virginica* L.; Virginia willow. Frequent. Habitat(s): 7, 17, 20. Voucher: FCF-931.
- Mitella diphylla* L.; bishop's cap. Infrequent. Habitat(s): 4, 5, 8. Voucher: FCF-80.
- Parnassia asarifolia* Vent.; kidneyleaf grass of Parnassus. Rare. Habitat(s): 20. Voucher: FCF-1843.
- Penthorum sedoides* L.; ditch stonecrop. Occasional. Habitat(s): 4, 12, 25. Voucher: FCF-1829.
- Philadelphus hirsutus* Nutt.; Cumberland mock orange. Infrequent. Habitat(s): 3, 4, 5, 8, 24. Voucher: FCF-784.
- Ribes cynosbati* L.; eastern prickly gooseberry. Infrequent. Habitat(s): 2, 3, 4. Voucher: FCF-575.
- Saxifraga careyana* A. Gray; golden eye saxifrage. Scarce. Habitat(s): 9, 11. Voucher: FCF-105.
- Tiarella cordifolia* L.; Allegheny foamflower. Occasional. Habitat(s): 4, 5, 8. Voucher: FCF-81.

Scrophulariaceae

- Agalinis purpurea* (L.) Pennell; purple false foxglove. Scarce. Habitat(s): 13, 18. Voucher: FCF-2178.
- Aureolaria*
- A. flava* (L.) Farw.; smooth yellow false foxglove. Rare. Habitat(s): 15. Voucher: H.H. Iltis 3522.
- A. laevigata* (Raf.) Raf.; entireleaf yellow false foxglove. Infrequent. Habitat(s): 13, 15. Voucher: FCF-1613.
- A. pectinata* (Nutt.) Pennell; combleaf yellow false foxglove. Rare. Habitat(s): 22. Voucher: R.E. Shanks *et al.* 8921.
- A. virginica* (L.) Pennell; downy yellow false foxglove. Infrequent. Habitat(s): 4, 5, 12, 17. Voucher: FCF-1147.

Chelone glabra L.; white turtlehead. Scarce. Habitat(s): 3, 4, 7. Voucher: FCF-2230.

Dasistoma macrophylla (Nutt.) Raf.; mullein foxglove. Rare. Habitat(s): 4, 12, 8.
Voucher: FCF-1840.

Gratiola

G. neglecta Torr.; clammy hedge hyssop. Occasional. Habitat(s): 18.
Voucher: FCF-2224.

G. virginiana L.; roundfruit hedge hyssop. Rare. Habitat(s): 17.
Voucher: FCF-1875.

Lindernia dubia (L.) Pennell; yellowseed false pimpernel. Infrequent. Habitat(s): 18.
Voucher: FCF-1789.

Mimulus

M. alatus Aiton; sharpwing monkey flower. Rare. Habitat(s): 18, 25.
Voucher: FCF-2169.

M. ringens L.; Allegheny monkey flower. Infrequent. Habitat(s): 7, 18,
25. Voucher: FCF-1915.

* *Paulownia tomentosa* (Thunb.) Steud.; princess tree. Rare. Habitat(s): 22, 24.
Voucher: FCF-1135.

Pedicularis canadensis L.; wood betony. Occasional. Habitat(s): 4, 5, 12.
Voucher: FCF-2053.

Penstemon canescens (Britton) Britton; eastern gray beard tongue. Occasional.
Habitat(s): 5, 12, 13, 15. Voucher: FCF-2119.

Verbascum

* *V. blattaria* L.; moth mullein. Scarce. Habitat(s): 22, 24. Voucher:
FCF-722.

* *V. thapsus* L.; common mullein. Scarce. Habitat(s): 22, 24. Voucher:
FCF-2124.

Veronica

* *V. arvensis* L.; corn speedwell. Occasional. Habitat(s): 21, 22, 23.
Voucher: FCF-392.

* *V. peregrina* L.; neckweed. Scarce. Habitat(s): 13, 15, 21. Voucher:
H.H. Iltis 3388.

* *V. serpyllifolia* L.; thymeleaf speedwell. Occasional. Habitat(s): 21, 22, 25. Voucher: FCF-395.

Simaroubaceae

* *Ailanthus altissima* (Mill.) Swingle; tree of heaven. Infrequent. Habitat(s): 22, 23. Voucher: FCF-819.

Solanaceae

Physalis longifolia Nutt. var. *subglabrata* Mack. & Bush; longleaf ground cherry. Rare. Habitat(s): 4, 5. Voucher: FCF-1157.

Solanum carolinense L.; Carolina horsenettle. Common. Habitat(s): 21, 22, 23. Voucher: FCF-753.

Staphyleaceae

Staphylea trifolia L.; bladdernut. Scarce. Habitat(s): 4, 12, 8. Voucher: FCF-319.

Theaceae

Stewartia ovata (Cav.) Weath.; mountain camellia. Infrequent. Habitat(s): 5, 6, 13, 15. Voucher: FCF-666.

Thymelaeaceae

Dirca palustris L.; leatherwood. Scarce. Habitat(s): 9, 7. Voucher: FCF-171.

Tiliaceae

Tilia

T. americana L. var. *americana*; American basswood. Common. Habitat(s): 4, 5. Voucher: FCF-850.

T. americana L. var. *heterophylla* (Vent.) J.W. Loudon; American basswood. Occasional. Habitat(s): 4. Voucher: FCF-2009.

Ulmaceae

Celtis

C. laevigata Willd.; southern hackberry. Infrequent. Habitat(s): 4, 5, 12, 8, 12, 24. Voucher: FCF-2164.

C. occidentalis L.; northern hackberry. Infrequent. Habitat(s): 4, 8, 13. Voucher: FCF-670.

C. tenuifolia Nutt.; dwarf hackberry. Scarce. Habitat(s): 4, 12, 13, 17. Voucher: FCF-1425.

Ulmus

U. alata Michx.; winged elm. Occasional. Habitat(s): 3, 4, 13. Voucher: FCF-808.

U. americana L.; American elm. Scarce. Habitat(s): 4, 7. Voucher: FCF-901.

U. rubra Muhl.; slippery elm, red elm. Occasional. Habitat(s): 2, 4, 5, 6, 7, 8, 12. Voucher: FCF-2013.

U. thomasi Sarg.; rock elm. Rare. Habitat(s): 3, 4, 7. Voucher: D.W. Pfitzer 3187.

Urticaceae

Boehmeria cylindrica (L.) Sw.; smallspike false nettle. Occasional. Habitat(s): 12, 17, 18. Voucher: FCF-1032.

Laportea canadensis (L.) Weddell; Canadian wood nettle. Frequent. Habitat(s): 4, 5. Voucher: FCF-1127.

Parietaria pensylvanica Muhl. ex Willd.; Pennsylvania pellitory. Scarce. Habitat(s): 8, 11. Voucher: FCF-317.

Pilea pumila (L.) A. Gray; Canadian clearweed. Occasional. Habitat(s): 4, 5, 7. Voucher: FCF-936.

Valerianaceae

Valerianella radiata (L.) Dufr.; beaked corn salad. Frequent. Habitat(s): 22, 23. Voucher: FCF-548.

Verbenaceae

Phyla lanceolata (Michx.) Greene; lanceleaf fogfruit. Infrequent. Habitat(s): 18.
Voucher: FCF-1257.

Verbena

V. simplex Lehm.; narrowleaf vervain. Infrequent. Habitat(s): 22.
Voucher: FCF-740.

V. urticifolia L.; white vervain. Occasional. Habitat(s): 4, 17, 23.
Voucher: FCF-1487.

Violaceae

Hybanthus concolor (T.F. Frost) Spreng.; eastern green violet. Scarce.
Habitat(s): 4. Voucher: FCF-235.

Viola

V. bicolor Pursh; field pansy. Frequent. Habitat(s): 21, 22, 23. Voucher:
FCF-398. [*Viola rafinesquii* Greene]

V. blanda Willd.; sweet white violet. Occasional. Habitat(s): 2, 3, 4, 5,
10. Voucher: FCF-108.

V. canadensis L.; Canadian white violet. Occasional. Habitat(s): 4, 5, 7.
Voucher: FCF-241.

V. conspersa Rchb.; American dog violet. Scarce. Habitat(s): 4, 7, 13, 15.
Voucher: FCF-1983.

V. cucullata Aiton; marsh blue violet. Scarce. Habitat(s): 20. Voucher:
FCF-221.

V. hastata Michx.; halberdleaf yellow violet. Occasional. Habitat(s): 4, 5,
13, 15. Voucher: FCF-28.

V. hirsutula Brainerd; southern woodland violet. Rare. Habitat(s): 13, 15.
Voucher: H.H. Iltis 3317.

V. palmata L.; early blue violet. Scarce. Habitat(s): 13. Voucher: FCF-
597.

V. pedata L.; birdfoot violet. Infrequent. Habitat(s): 5, 13, 15. Voucher:
FCF-549.

V. pubescens Aiton; downy yellow violet. Occasional. Habitat(s): 2, 3, 4. Voucher: FCF-110.

V. rostrata Pursh.; longspur violet. Infrequent. Habitat(s): 4. Voucher: FCF-89.

V. sagittata Aiton var. *sagittata*; arrowleaf violet. Scarce. Habitat(s): 4, 10. Voucher: H.H. Iltis 3422.

V. sororia Willd.; common blue violet. Common. Habitat(s): 4, 13, 15, 21, 22, 23. Voucher: FCF-223.

V. striata Aiton; striped cream violet. Infrequent. Habitat(s): 4, 5. Voucher: FCF-206.

V. x primulifolia L.; violet. Scarce. Habitat(s): 13, 15, 18, 25. Voucher: FCF-222. [*Viola primulifolia* L.]

Viscaceae

Phoradendron leucocarpum (Raf.) Reveal & M.C. Johnston; mistletoe. Scarce. Habitat(s): 13. Voucher: FCF-618. [*Phoradendron serotinum* (Raf.) Reveal & M.C. Johnston]

Vitaceae

Parthenocissus quinquefolius (L.) Planch.; Virginia creeper. Common. Habitat(s): 4, 5. Voucher: FCF-368.

Vitis

V. aestivalis Michx. var. *aestivalis*; summer grape. Frequent. Habitat(s): 3, 13, 15, 20. Voucher: FCF-2112.

V. cinerea (Engelm. in A. Gray) Engelm. ex Millardet var. *baileyana* (Munson) Comeaux; possum grape. Infrequent. Habitat(s): 4, 13, 15, 17, 22. Voucher: FCF-629.

V. labrusca L.; fox grape. Scarce. Habitat(s): 13, 15, 21, 22, 23. Voucher: FCF-715.

V. rotundifolia Michx.; muscadine. Occasional. Habitat(s): 5, 13, 15. Voucher: FCF-1589.

V. vulpina L.; frost grape. Infrequent. Habitat(s): 2, 4, 5, 13, 15, 24. Voucher: FCF-1143.

Vita

Chris A. Fleming was born on May 16, 1976 in the industrial town of Ashland, Kentucky. After graduating from Russell High School in 1994, he ventured away from Ashland and wound up at Berea College in Berea, Kentucky. Once he realized that he would not become the professional soccer player that he had dreamt of being, he decided he had better begin reading his textbooks and studying for classes. In 1999, he finally graduated from the first round of college education with a B.A. in Biology from Berea College. The time he spent at Berea College opened his eyes to a diverse array of environmental, cultural, and social issues. He knew that he liked plants, people, and Latin America, therefore he applied for a Thomas J. Watson Fellowship for a study of ethnobotany in Latin America. Fortunately, he was selected as a Watson Fellow, which enabled him to travel for a year studying plants, culture, and the amazing biodiversity "South of the Border." Upon returning from this adventure he was thrown into the Master's Program in Botany at the University of Tennessee, Knoxville, which began in Fall 2000. With his M.S. degree behind him, he is now embarking on a Ph.D. degree in the Department of Geography at the University of Tennessee, Knoxville.

