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The Flora of Citico Creek Wilderness Study Area, Cherokee National Forest, Monroe County, Tennessee

Jeffry Lowell Malter
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a thesis written by Jeffry Lowell Malter entitled "The Flora of Citico Creek Wilderness Study Area, Cherokee National Forest, Monroe County, Tennessee." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Botany.

A. Murray Evans, Major Professor

We have read this thesis and recommend its acceptance:

Clifford C. Amundsen, David K. Smith

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

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

To the Graduate Council:

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Accepted for the Council:

Vice Chancellor
Graduate Studies and Research

THE FLORA OF CITICO CREEK WILDERNESS STUDY AREA, CHEROKEE NATIONAL FOREST, MONROE COUNTY, TENNESSEE

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

Jeffry Lowell Malter

December 1977

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ABSTRACT

Citico Creek Wilderness Study Area, located entirely within the Cherokee National Forest, Monroe County, Tennessee, is under consideration for inclusion in the National Wilderness System. A study of the vascular flora of this 6,716 hectare area was conducted between March, 1976 and September, 1977. A total of 536 taxa, including 259 county records, was determined. This represents approximately 23% of the state flora.

Pertinent literature on the history, climate, geology, soils, and vegetation of the area is summarized. Particular note has been made of rare plants, with seven on the Tennessee list being found. One of these, Juncus gymnocarpus Coville, is reported for the first time in Tennessee outside the Great Smoky Mountains National Park. Plants found in the study area and listed on the rare plant lists of neighboring states are also discussed.

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INTRODUCTION

As part of the National Wilderness System, Citico Creek Wilderness Study Area (WSA) has been set aside for a period of five years, from 1975 through 1980. In these years, scientific studies will play a role in determining the eventual status for its inclusion in or exclusion from the wilderness system. Together with political and economic factors, this area will either be permanently set aside or returned to the normal multiple use activities of the Forest Service.

A first step in determining the character of an area is the identification of its constituents. The aim of this study has been to determine the vascular plant component. The appropriate literature associated with this work has been consulted to help put the area into a physical and biological perspective.

The biological impact of human use in the Citico Creek WSA has been investigated and has been shown to considerably alter, at times, the natural vegetation of the area. Despite these events, the regrowth of the forest into a heavily vegetated timberland, has proceeded with a rapid pace. That the vegetation will continue to mature, if left undisturbed may someday restore this area to one with a truly mature aspect.

Although a flora cannot be fully understood until its vegetative history has been scientifically determined, this study is the first such step towards that understanding. As little physical work has been done in the area which would explain the geological and subsequent topographic events which have formed and altered the landscape, some extrapolations from work in surrounding areas have been made. Though in detail there may be some error, statements have been made regarding the geology that hopefully will help give a framework for the ensuing biological and physical events in the area.

Of particular interest to the author are the human events that have shaped the forest to what it is in the 1970's. A series of events is discussed that helps in understanding how the forest changed from one of maturity, through the days of its being logged almost in totality, to its current phase of secondary growth as a predominantly hardwood forest.

After listing and briefly describing the sites of collection within the study area, a discussion of the plants listed on the rare plant lists of Tennessee and a number of other states is made. This area is only one of several in the Southern Appalachians, where many rare or unusual species have been saved from the workings of civilization.

It is hoped that this work will have some role in the preservation of the Citico Creek area. Containing several

stands of virgin timber and a flora and fauna with a number of species considered to have some degree of rarity, this section of the Unicoi Mountains is worthy of permanent wilderness status. The action of various governmental agencies, in regards to the future of the Citico Creek Wilderness Study Area, will hopefully take this, and other scientific work done in the area into consideration, when making the final decisions on the preservation and future integrity of a land the Cherokee Indians referred to as Sitiku, meaning place of clean fishing waters.

CHAPTER I

LOCATION

Citico Creek Wilderness Study Area (Citico Creek WSA) is located entirely within the Cherokee National Forest, Monroe County, Tennessee. It lies between north latitudes 35° 21' and 35° 27', and west longitudes 84° 01' and 84° 06'. The 6,716 hectares (h) are owned entirely by the United States Forest Service. Figure 1 shows its location in relation to the surrounding vicinity.

The topography of this area has been mapped by the United States Geological Survey, in cooperation with the Tennessee Valley Authority (TVA) and is described on two 7.5 minute series topographic quadrangles: Whiteoak Flats, Tennessee-North Carolina, 1957 and Big Junction, Tennessee-North Carolina, 1957.

The northernmost point of the study area is Farr Gap (see Figure 2). From there the boundary follows Doublecamp Creek in a southwesterly direction, parallel to Doublecamp Creek Road, until its junction with Citico Creek. Following Citico Creek south, the border is the Creek, paralleled by Forest Service Road H-35, until it turns sharply due west. The road is the boundary as far as Beehouse Gap, at the junction of H-35 and the Flats Mountain Trail. The west border is Flats Mountain itself,

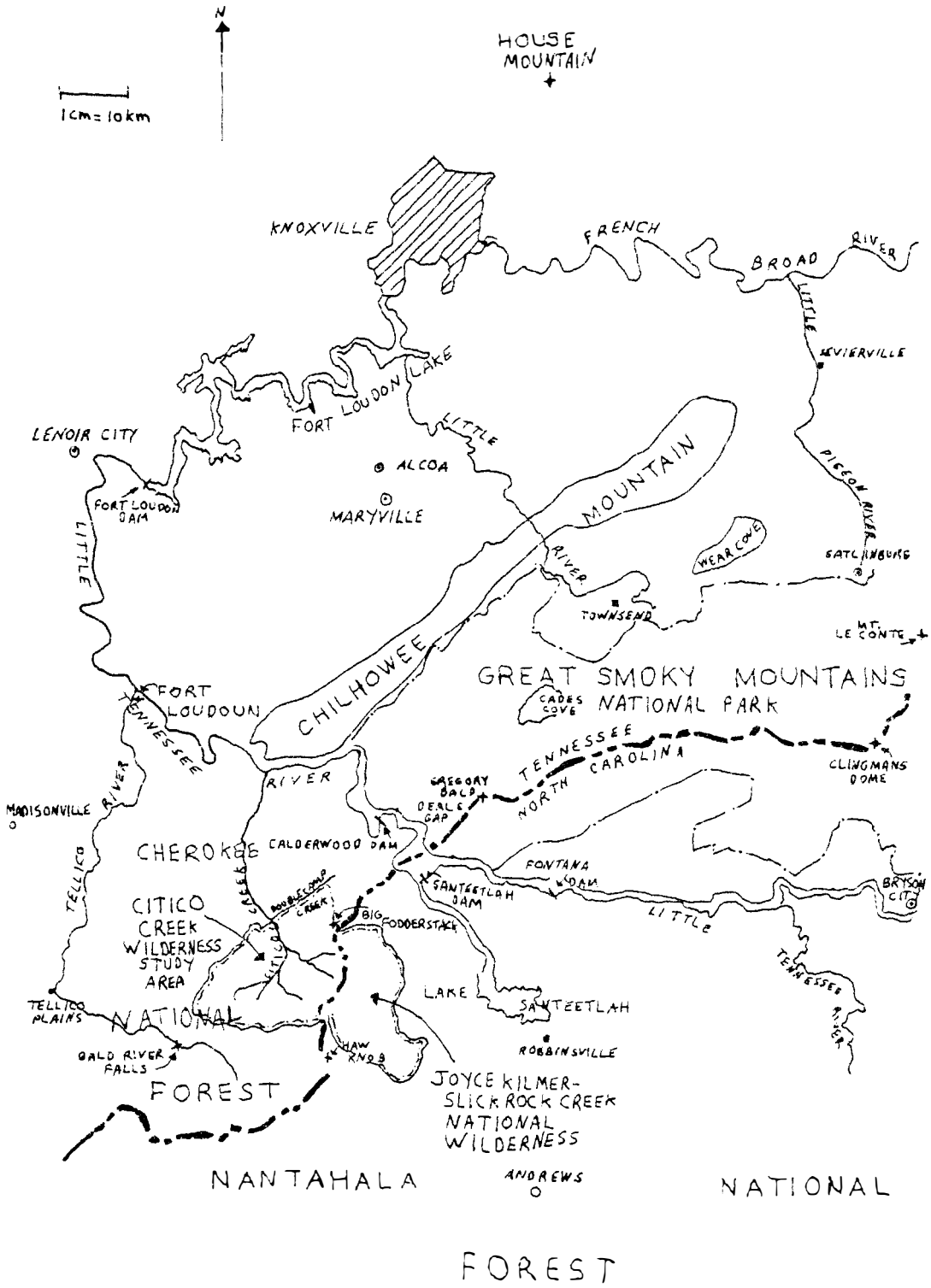

Figure 1. General location of the Citico Creek Wilderness Study Area.

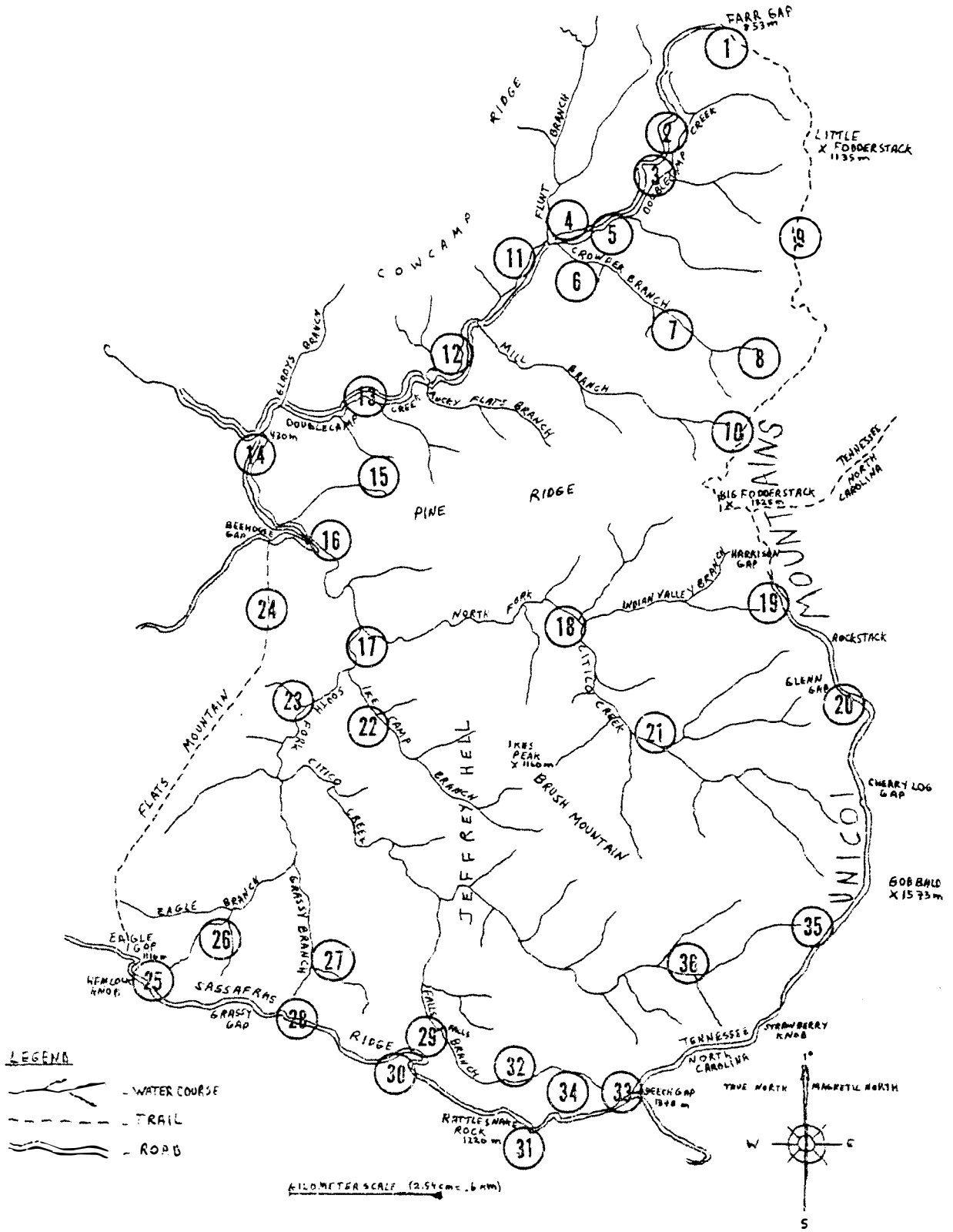

Figure 2. Location of collecting sites.

with a trail running south along the entire ridge. The southwestern corner is at the junction of Flats Mountain and Eagle Gap, northwest of Hemlock Knob.

The southern border is Sassafras Ridge, which extends east from Hemlock Knob to the Tennessee-North Carolina border at Beech Gap. The east border follows the state line along the Unicoi Mountain ridge to a point west of Bob Bald, and then proceeds northwest to a point just east of Big Fodderstack Mountain. Here, the east border diverges from the state line, which continues in a northeasterly direction. The study area boundary follows the ridge line from Big Fodderstack to Little Fodderstack and then continues on the ridge to meet Farr Gap.

To the east of Citico Creek WSA lies the Joyce Kilmer-Slickrock Creek National Wilderness. The areas to the north, west and south of Citico Creek WSA have recently been proposed as additional National Wilderness as part of the RARE II program of the U. S. Forest Service. This is a program to inventory roadless tracts of land within the National Forest system.

Figure 2 shows the major topographic features along the border of the Citico Creek WSA.

CHAPTER II

GENERAL DESCRIPTION

Physiography

Citico Creek WSA lies in the Southern section of the Blue Ridge Province of the Appalachian Mountains (Fenneman, 1938). Elevations range from 425 to 1,575 meters (m). Two ridges, Pine Ridge and Brush Mountain, extend in an east-west direction off the main north-south ridge on the eastern border. These ridges create steep slopes that give the terrain a rugged character, with 25% of the slopes at more than 60 degrees, 75% of the land more than 30 degrees, and only less than 10% of the land with 10 degree slopes or less.

Two creeks have their drainage in the study area. Doublecamp Creek, which forms the north border, has half of its drainage system within the study area. Crowder, Mill, Rocky Flats, Laurel, and three unnamed branches flow in a northwesterly direction into Doublecamp Creek. Citico Creek forks just inside the study area, southwest of Pine Ridge. The North Fork has its origin just below the state line on the Unicoi Mountain crest and has numerous tributary streams feeding into it, the largest being Indian Valley Branch. These streams have a westerly flow. The South Fork lies between Brush Mountain and Flats Mountain, and

its main tributaries, Ike Camp, Grassy and Eagle Branches, and their tributaries, flow in a northerly direction.

Forest

With 99% of the area in forested land, covering the steep terrain, incised and carved by streams and waterfalls, the area is deserving of the wilderness name it carries. Though less than 5% of this area remains as virgin forest, Forest Service cultural practices have been slight in the last 40 years. Only two areas have been cut, amounting to less than 3% of the total forest, since 1935. The forest has regrown to a mature secondary woodland, with more than 70% in hardwood.

Of particular interest and value are two stands of virgin forest. The Falls Branch Scenic Area contains a 72 h area dominated by a mature beech-maple forest and a sheer 25 m waterfall. This is located to the northwest of Rattlesnake Rock, a sandstone outcrop on Sassafras Ridge. The other, between Glenn Gap and the headwaters of Indian Valley Branch, is a virgin hemlock-hardwood stand of 77 h.

Animal Life

The dominant animal life of the Citico Creek WSA are large game mammals: bear, boar, and deer. Other mammals, including bobcat, fox, woodchuck and rabbit, and abundant game birds, such as turkey and grouse, are common in the forest. The streams support abundant populations

of trout, including native brown, rainbow, speckled, as well as many other fish species.

The forest generally has the diversity of faunal species characteristic of the Southern Appalachians. Recent studies have shown that at least 14 species of salamanders (Robert L. Jones, Department of Zoology, The University of Tennessee, Knoxville, personal communication) and several small mammals on the Tennessee Special Concern list (Tennessee Heritage Program, 1977) are present.

In November this is one of the preferred areas for hunting European wild boar, a species introduced from eastern Europe. These large mammals are prized by hunters for their deftness, size, and quality of meat. Some damage to the herbaceous layer has been done by the rooting of this often noxious animal (Tennessee Game and Fish Commission, 1972).

Current Use

Human activity in the study area is principally recreational, with camping, fishing, hunting, and hiking the main activities. There are 90 kilometers (km) of hiking trails with some following the routes of former logging railroads (Sullivan and Daniel, 1975).

Citico Creek WSA is currently under consideration for inclusion in the National Wilderness System. It was classified as a Wilderness Study Area in 1975 by the

Eastern Wilderness Area Act, and set aside for a period of study, until 1980. Either before or after this date, a decision will be made by the U. S. Congress concerning its inclusion in the National Wilderness System.

CHAPTER III

HISTORY

Human Habitation and Use

Investigations into the human habitation and use in the Citico Creek area begin with the prehistoric native Americans who lived along the Little Tennessee River. Evidence for a long and continuous settlement of the large floodplain areas along the river are well documented, dating from at least 10,000 years before the present (King, et al., 1969). Though not determined with any degree of certainty, general statements on the mountains being the source of much game and fish for these populations is possibly correct.

More recent settlement was by the Cherokee Indians who occupied the area in recent times and were present in rather large numbers (up to 5,000 at a time) at least through 1761 (Dickens, 1976; Mooney, 1898; Thomas, 1894). According to these authors, as well as the various reports of the Fort Loudon Wars of 1760-61, documented by Major John Doughty (Storm, 1945), the Cherokee Indians did much hunting in the mountains, which included bobcat, beaver, deer, bear, buffalo and small game. That some of these species are now extinct in the region is, no doubt, due in part to sustained hunting by the European settlers.

Although the major trails of many Indian and white peoples were along the larger rivers, accounts of travel in the high mountains for passage between the Carolinas and the valley to the west of the mountains are frequent. One of the main paths was along the Tellico River and its headwaters, though undoubtedly the proximity of similar avenues of passage through the mountains, such as that along the Beech Gap area and down through the Citico watershed, were also used.

Of note, however, is the fact that no archeological sites have been uncovered in the mountainous regions, although investigations by archeologists have not concentrated on this region (Dr. Gerald Schroedl, The University of Tennessee, Department of Anthropology, personal communication and USDT, Federal Highway Administration, 1976).

In the period following the initial establishment of towns such as Knoxville and Madisonville, in the late 18th and early 19th century and through the 1880's, the main inhabitants of the area were the mountain settlers. Some settlers inhabited the balds and high mountain meadows of the flat ridges later to become the border between the states of North Carolina and Tennessee.

In the 1840's, Robert Stratton settled an area now known as Stratton Meadows (Arthur, 1914). He and others became expert big game hunters and until ownership of the forests fell into the hands of northern banks and logging

concerns, they raised cattle, tended small gardens and generally led the solitary yet satisfying life of the 19th century pioneer (see Yarbrough, 1968 and Van Noppen and Van Noppen, 1973, for interesting accounts of the fate of some of these isolated pioneers in the hands of post Civil War "bushwackers" and criminals).

As the post Industrial Revolution society began to use up the natural resources of the Northeast, the settlement of the western and southern mountains, particularly for their timber resources, began in earnest. The birth of the conservation movement in the late 1860's and early 1870's coincided with the ravaging of the land for human use.

In the 1880's, timbering interests explored and began the logging of the Great Smoky Mountains (Lambert, 1961). The Citico Creek area was developed some 10 years later, with the culminating point being the forces behind the Smoky Mountain Timber and Improvement Company. In 1902 a survey of the Doublecamp Creek and Citico Creek watersheds was conducted by field crews of this company, with plans to build a major rail line, for commercial timber exploitation, that would extend to the North Carolina border (Knoxville Journal and Tribune, 1902). The rail line would connect through to Slickrock Creek, where stood

> the finest timber lands he has ever seen, barring none. Pine, oak, poplar and hemlock abound and along Slickrock Creek, cherry and ash are found in

> great plenty. Some of the poplar trees, so Mr. Nichols states, are more than eight feet in diameter, and the forest affords uniformly good timber throughout its entire length and breadth, speaking with respect to the 43,000 acres of land owned or controlled by the company.

Rail lines for up to six Shay locomotives were completed by 1910 and ran from the junction of the North and South Forks of the Citico Creek to the Little Tennessee River, where, after passing over a large trestle bridge, they connected through to Maryville and the rail lines of the Little River Railroad, coming out of the Smoky Mountains proper (Sulzer, 1975). Further up the smaller coves were smaller lines that led up to the ridge beyond Indian Valley Branch, the remains of which are barely discernible. The trestle bridge over Citico Creek at the junction of the forks is the last solid remnant of this railroad, though its route is now the present North Fork trail.

By the early 1920's the names and ownership of the logging operations had changed and the last private holdings were held by the Babcock Boom and Lumber Company. After nearly 50 years of cutting the virgin timber by various "Timber Improvement Companies," the forests of the eastern United States began to lose their vast source of ancient and valuable wood. This was true for the Citico area as well, for by 1925 much of the land had been cut and only small pockets of virgin timber remained.

Seeing that the forests would soon be depleted, causing a lack of future forest resources, and also having

the more immediate effects on soil erosion and ensuing sedimentation of clean and navigable waterways, the Congress enacted the Weeks Law in 1911. This law was designed to protect the remaining forests and insure the integrity of the headwaters of navigable streams (National Forest Reservation Commission, 1920). Congress enacted to appropriate funds for the purchase of private lands, to become National Forests, that would be more appropriately regulated for the benefit of future Americans.

One also sees, however, that the lumber companies must have had a strong lobby, for orders were generally issued to purchase lands only after the last timbering had been completed (National Forest Reservation Commission, 1920, p. 24). By 1936, the entirety of the private holdings on the western slopes of the Unaka Mountains in those counties outside the newly forming National Park was generally cut over by the time of final purchase by the federal government. Established on June 14, 1920, the forest lands were consolidated into the Cherokee National Forest on July 8, 1936.

Going back to 1925, in early September, a severe drought, lasting all summer in most of the southeast, culminated in a series of severe fires from south of Cleveland to north of Johnson City. The great fire of September 5-10, 1925, destroyed 7,000 h of land in the Citico Creek area, having started in logging slash at the

town of Jeffrey, located at the North and South Forks of the Citico Creek. Destroying 75 homes, killing two loggers, and spreading southeast through Jeffrey's Hell and into North Carolina, the fire devastated the land, including most of the human habitations, which had become quite extensive by that time. Populations had reached a maximum of 500, including a small hospital, commissary and post office (the name Hell being dropped for the convenience of the U. S. Post Office), before this catastrophe (Chattanooga Daily Times, 1925a and 1925b; Federal Writer's Project, 1939; Knoxville Journal, 1925; and see the following for historical accounts of Jeffrey's Hell: Weals, 1953).

In December, 1925, the Babcock Boom and Lumber Company removed all the remaining rail line, including the remnants of several locomotives and cars that had derailed in attempting to salvage the already cut timber, as well as human lives, in the midst and aftermath of the great fire. Logging continued sporadically over the next 10 years, but became quite difficult, as enormous growths of rosebay rhododendron had developed on hundreds of hectares in the area between the north and south forks, leading up to Sassafras Ridge.

Only Falls Branch and several other pockets of timber were left uncut before the Forest Service finally established complete ownership of the area in 1936

(Maughan, 1939). In 1939 the Falls Branch Botanical Reserve was established for botanical studies. None were conducted in the area, however, and in 1953 the name was changed to Falls Branch Scenic Area, probably in conjunction with a move by the Cherohala Commission and the towns of Tellico Plains and Robbinsville to develop the area as a major tourist attraction with a new major highway to be constructed along Sassafras Ridge connecting the two towns (Blount County Planning Commission, et al., 1979; Knoxville Journal, 1959; Tennessee State Planning Commission, East Tennessee Office, 1966; and Yarbrough, 1965). The highway has yet to be completed 20 years later, and current controversy on its completion may, in part, center around rare plants and animals inhabiting its route.

History of Forest Conservation

In 1964 the Wilderness Act was finally enacted after almost a hundred years of urging by various groups and individual conservationists (Wilderness Society, 1974). Established to protect those lands of true wilderness, found principally within the National Forests, even if of secondary growth though maturing quality, the act was aimed primarily at western forest lands (Watkins and Watson, 1976 and Wolcott, 1973).

A long struggle by various conservation groups in the eastern part of the country eventually resulted in the

passage, in the closing moments of the 93rd Congress, of the Eastern Wilderness Area Act, Public Law 93-622, on January 3, 1975. Of primary interest was the immediate placement of almost 125,000 h of land east of the Rocky Mountains either in immediate National Wilderness status or as Study Areas, to be later considered for inclusion into the National Wilderness System.

Citico Creek Wilderness Study Area was included in this bill as a study area after much dispute, lasting three years, during which time it was alternately taken out of consideration and then placed back into the possibility of being made a wilderness legally protected by the federal government. Citizens for Eastern Wilderness, representing the interests of many other conservation organizations, was the prime mover behind Citico and adjacent areas, particularly the Joyce Kilmer-Slickrock Creek area, immediately made a National Wilderness by the bill. Of particular importance in establishing Citico Creek as a potential wilderness area were Ernest Dickerman, Dave Saylor and Ted Snyder, members of various conservation organizations, who, in a long series of Memoranda published by Citizens for Eastern Wilderness, discussed and fought for the protection of this valuable land.

As an official Wilderness Study area, a period of five years is set aside during which time the necessary studies may be made that would determine if a study area meets the

various prerequisites for permanent protection. One of the regulations stipulated under Public Law 93-622 is that during this period of study, the lands will actually be under wilderness protection.

One of the ongoing controversies concerning the Citico Creek WSA is that its southern border lies, in part, along a controversial road, the Tellico Plains-Robbinsville Highway, partially completed as of 1977. From the careful reading of the Final Environmental Impact Statement for this road (USDT, Federal Highway Administration, 1976), one readily sees that the Forest Service here and as documented elsewhere (Wolcott, 1973) has been partially deficient in carrying out the responsibilities of the bill.

In 1977 this was remedied by the RARE II program, in which the Forest Service, in conjunction with individuals, conservation organizations, and other interested parties, began a review of all roadless land in the National Forests. This new review of roadless areas may add additional land to be included into the Wilderness System, some of which is directly adjacent to Citico Creek WSA.

In summary, this area of the Southern Appalachians contains much forested land that has had a long history of human use and misuse, followed by recent attempts to preserve the last remnants of a once virgin forest. In outlining some of the events of this history that pertain

to the Citico Creek WSA, it is hoped that the findings of this study add another dimension to better understanding the flora, fauna and the physical parameters that make up this section of the Unaka Mountains.

Biological History

The Citico Creek WSA, located 8 km south of the Great Smoky Mountains National Park (GSMNP), is still relatively unknown in terms of its animal life. In part, no doubt, this is due to its proximity to the national park, which tends to attract scientific research to within its boundaries, leaving surrounding areas lacking in detailed or even survey quality work. Though this trend has begun to change in recent years and will no doubt be accelerated by the inclusion of additional national forest land into the national wilderness system, this area, as others in the vicinity, offers great opportunity for investigative endeavors.

Should this area, and others adjacent to it, become permanently established wilderness areas, they will make ideal settings for comparative work with the GSMNP, as the fauna of the park is relatively well known. Because the Citico Creek area lies adjacent to the Joyce Kilmer-Slickrock Creek National Wilderness, itself containing more than 6,000 h, is additional reason for faunistic, ecologic and long-term studies on the abundant fauna of these Southern Appalachian Mountains.

For a sense of balance in this botanically oriented study, a summary of previous work on the animals of the Citico Creek area is discussed in the following paragraphs. Early work in the area was naturally related to that of the Smoky Mountains and only relates to the Citico Creek area in an incidental way. More recent work has tended to regard this section of the Unaka Range as unique in and of itself, especially in regards to new species being discovered either in or in close proximity to the study area.

The earliest record of work in the area is that of the famous American malacologists, James H. Ferris and Henry A. Pilsbry (Abbott, 1976 and Pilsbry, 1900). Their terrestrial shell collecting trips throughout the North American continent naturally brought them to the Southern Appalachians. Over a period of years beginning in the late 1890's, they and their associates spent some time in the Smokies but rarely ventured south of the Little Tennessee River. Pilsbry, Ferris, and a party of other malacologists spent several days in the summer of 1899 collecting snails and other terrestrial invertebrates along the ridge line in the Bob Bald-Stratton Meadows vicinity, but they did not appear to venture far from the high ridge line. Nevertheless, they found an abundance of snail populations in the area.

Other than perhaps casual collecting of fish and other vertebrates from the area (Etnier, 1976b; Jones, 1977;

and Winfield, 1976), no scientific work was carried on until 1938 when LeRoy C. Stegeman (1938) conducted a study of the European wild boar. His work was centered on the Tellico Wildlife Management Area, of which the Citico Creek area is the central portion. This was a detailed field study on the habits and physical characteristics of this introduced species.

Brought from the Ural Mountains of Russia by way of Germany, they were intended for use on an enclosed game preserve in the Snowbird Mountains south of the study area in North Carolina. Readily escaping from their pens, they soon migrated north and have become established throughout the Unaka and Great Smoky Mountain ranges (Tennessee Game and Fish Commission, 1972). The damage to roots, the herbaceous layer, and the ensuing soil damage has been studied in the GSMNP (Harmon, 1977) and the experiences of this author in the Citico Creek area, noting similarly disturbed areas, lend additional support for the current move to extirpate this introduced and noxious pest.

Richard H. Conley, Vernon G. Henry, and George H. Matchke conducted an extensive survey of the hogs from 1959 to 1971, publishing their results in 1972 (Tennessee Game and Fish Commission, 1972). Their work was conducted in the Citico Creek, North River, and Tellico River watersheds. This is a most complete study on the hog, discussing their biology, effects on plant and animal

life, migration, hunting and future studies necessary for a better understanding of this species.

From 1960 until its conclusion in 1971, the Tennessee Valley Authority, the U. S. Forest Service, and the Tennessee Game and Fish Commission conducted the North Fork Citico Creek Watershed Study. This project produced a great quantity of hydrological and biological data (TVA, et al., 1962-1972). Though primarily centered around the conditions of stream quality in the North Fork of the Citico Creek, related biological data from surrounding areas can be found in the files of the agencies involved. Stream biology investigations were centered around the trapping and identification of fresh water vertebrates and invertebrates. Floristic work is mentioned in the section on botanical history. Aquatic insects were recorded on a regular basis over the 11-year period and identifications were made at least to the generic level. Data on fish species centered principally on species favored by anglers, particularly trout. Due to the withdrawal of funds for completion of the project, conclusive results were never drawn and thus the studies remain unpublished, even though the study reports are available for each year of the project.

In conjunction with the Forest Service, surveys of game animals were conducted and quantity and species presence were noted. Mention is made of bear, boar, deer, grouse, wild turkey and other small mammals both in these

reports, particularly in the one for 1967 (TVA, et al., 1968) and in the unpublished field surveys of the Forest Service, headquartered in Cleveland, Tennessee. Some of this data is summarized in the Final Environmental Statement of the Timber Management Plan (USFS, 1976). A list of mammals and birds considered to be rare, endangered or in some other category of concern is included, though actual habitat data for specific species are lacking for the Cherokee National Forest as a whole, or Citico Creek WSA in particular. A list of 18 such animals is included in this report.

In 1976, James McKee Winfield, Jr. (Winfield, 1976) completed a survey of the fishes of the Little Tennessee watershed. One hundred species are recorded for the entire system. The number in the Citico Creek system is perhaps one-third of this, but the exact number is not readily determined from the thesis. Of particular note in this study, however, are an undescribed species of a shiner, Notropsis, and Hybopsis monacha, the spotfin chub. The latter is currently under consideration for inclusion on the Federal Endangered Species List, and although its presence in the lower reaches of Citico Creek have not recently been verified, its former existence in the creek is well established (Winfield, 1976, p. 46).

The snail darter, Percina tanasi, is an endemic Little Tennessee River fish. Although it does not exist

in Citico Creek, it may have dependencies on the invertebrate fauna that does inhabit the creeks and streams of the higher elevations. It is restricted to the larger and slower flowing waters of the system (Etnier, 1976a and 1976b), feeding on the various snails, including an endangered Io, and other invertebrates all of which are involved in the general life cycle of the many fish species of the river system as a whole. Many have the higher and more remote streams as their habitat, at least for part of their life cycle. Thus, the importance of the Citico Creek WSA, as a key element in the natural environment of many inter-related species, is crucial for the survival of at least some members in the chain.

From 1975 through 1977, Robert L. Jones conducted ecological studies of salamander populations along the Crowder and Mill Branches of Doublecamp Creek (Jones, 1977). His study was limited to the food habits and behavior of six species of plethodont salamanders, but he has supplied by personal communication a count of at least 14 species found in the Citico Creek WSA. One of these, Desmognathus aeneus, the seepage salamander, is quite rare in Tennessee, recently found only here, in Polk County, Tennessee, and in the GSMNP. Presently it is not listed on the Tennessee state list of rare animals because it has only recently been found in the state. Another salamander in the genus Desmognathus was recently discovered by Steve Tilley of the

University of Massachusetts, Amherst. It appears to be a new species and will have as its type locality Stratton Meadows (Steve Tilley, personal communication). It is among the more recent discoveries of the area and is also known from the Falls Branch Scenic Area and Beech Gap, as well as being generally distributed in the Southern Appalachians.

In a continuing survey of the mammals of Tennessee, Michael L. Kennedy and Michael Harvey of the Memphis State University have investigated the mammals of the Falls Branch Scenic Area and adjacent localities along Sassafras Ridge (Kennedy and Harvey, 1977). Though primarily restricted to smaller mammals, such as shrews and mice, nevertheless their findings indicate several populations of mammals considered to be of special concern in Tennessee. These include the Smoky shrew, Sorex fumeus; the Masked shrew, Sorex cinereus; the Woodland Jumping mouse, Napaeozapus insignus; and the Star-nosed mole, Condylura cristata. As these investigations are still in progress, final results have yet to be published.

Further research will certainly uncover additional numbers of animals previously not known from within the immediate area. As Dr. David Etnier so succinctly points out for the Little Tennessee River (TVA, Office of Health and Environmental Science, 1972), the systematics of the fishes and caddis flies, to name but two groups, is still

in the discovery stage. So little is known about the general ecological relationships and requirements of the fauna of this area (though this could also be said of many other areas, including the GSMNP) that no further reason is needed to warrant continued and detailed investigations into the fauna of this region.

Botanical History

The history of botanical exploration and research inside the Citico Creek WSA is much simpler to account for than that of the faunal investigations. In examining the herbaria of The University of Tennessee, Knoxville and of Vanderbilt University, it was found that only 21 species, out of a total of 535 taxa for Monroe County, were collected from along the borders of the study area. Of these, 18 have been recollected by the author, with only Aralia nudicaulis and Viola striata, collected by Aaron J. Sharp (Department of Botany, The University of Tennessee, Knoxville) on May 30, 1940, and Heliopsis helianthoides, collected by Ken Rogers (formerly of the Department of Botany, The University of Tennessee, Knoxville) on July 20, 1965, not collected during the current study.

All of Sharp's collections were made along Sassafras Ridge, either at the former site of Hemlock Knob and the fire tower or at Beech Gap and its north slope within the Citico area. Other botanists, principally from The University of Tennessee, Knoxville have casually botanized Monroe

County and have visited locations in the study area, but to my knowledge little has actually been collected from within the main body of the Citico Creek WSA. Thus the area was selected, among other reasons, for its lack of knowledge concerning the flora.

The only other studies in the Citico Creek WSA were those conducted on the microalgae as part of the North Fork Citico Creek Watershed Study. This aspect of the study was conducted by the Tennessee Game and Fish Commission, and the results were never published except as part of the annual reports of the study (TVA, et al., 1962-1971). Tables of phytoplankton listed in these studies are very generalized and results were never published.

CHAPTER IV

CLIMATE

The climatic effects on the vegetation of the Southern Appalachians, particularly the Great Smoky Mountains, have been well documented by Shanks (1954) and Whittaker (1956). The rapid changes in elevation in the Citico Creek WSA, 1,150 m over a distance of 8.5 km, correlate well with similar variations in the Great Smoky Mountains, though maximum elevations are 450 m lower.

As part of the North Fork Citico Creek Watershed Study conducted between 1960 and 1971 (TVA, et al., 1962-1972), a series of four hydrologic stations was installed at the following elevations: 585 m, 1,165 m, 1,255 m, and 1,355 m. Precipitation, humidity, air and water temperatures, runoff and suspended sediment data are published in these reports and are partially summarized in the following paragraphs.

Yearly average precipitation averaged 178 cm and runoff 101 cm with 56% runoff of total precipitation. Air temperatures vary from -25° C to 34° C and averaged 12.4° C. Average relative humidity over an 11-year period was 86.1%.

March received the greatest amount of precipitation with an average of 24.3 cm or 13% of the total yearly rainfall, July was the second wettest month averaging 18.5 cm

or 10.4% of the yearly total, while the third wettest month was February with 18.2 cm or 10.2% of the total rainfall.

The driest month was October with 8.3 cm or 4.7% of the total yearly rainfall. Storms were greatest in March with the most severe one occurring March 24-26, 1965 when 19.25 cm of rain fell in less than 48 hours. The average severe storm for each year was 11.5 cm over a 29 hour period. TVA reports a snowfall average of 63.5 cm a year at the higher elevations, less than 3% of the annual precipitation. A comparison of precipitation data for three elevation stations reveals an increase in average yearly rainfall of 44.7 cm between elevations of 585 m and 1,355 m. This effect of increasing precipitation compares with similar data from the national park.

Haze is present on most days of the year and this southern extension of the Appalachian Mountains justifiably bears the name of "Smoky Mountains." Heavy storms in April, 1977, caused extensive flooding of all creeks, and Citico Creek rose more than 4.5 m above its banks. Flood waters generally continue to rise for at least several hours after heavy periods of precipitation and then recede quite rapidly, carrying much debris downstream and temporarily inundating many shrub and tree species along the banks. Several areas along both Doublecamp Creek and Citico Creek thus have a floodplain appearance, albeit a restricted one in area.

In summary, to quote from the North Fork Citico Creek Watershed Study (TVA, et al., 1968, Appendix C, pp. 6-7):

> With an average elevation of 855 meters, North Fork Citico watershed has a much cooler climate and heavier rainfall than most of the Tellico District. Air temperature rarely exceeds 32° C except on the south slopes of Pine Ridge Mountain. Winter temperatures often fall below freezing for several days at a time with a low of -18 to -23° C. Freezing and thawing occurs on south and west slopes or where there are seeps. The earliest killing frost generally occurs about September 25; the latest, about May 2. Occasionally killing frost occurs at higher elevations after trees leaf out.
>
> Humid conditions exist most of the time except on upper or middle south and west slopes. Relative humidity exceeds 80% on the average and reaches 100% on most days.

CHAPTER V

GEOLOGY

The geologic history of this portion of Monroe County is poorly understood. The two quadrangles containing the study area, Big Junction and Whiteoak Flats, have not been surveyed and no complete geological survey exists for this region (Dr. H. J. Klepser, Geology Department, The University of Tennessee, personal communication).

Although Keith (1895, 1896), King, et al. (1968), Rodgers (1953), Safford (1869), and others have surveyed the geology of East Tennessee, the only large area that is well described geologically is the Great Smoky Mountains National Park. The basis for understanding the geology of this portion of the Unaka Range is therefore inferred from these and other works (Burchfiel, 1941; Fenneman, 1938; King, et al., 1958). Several other works have been consulted that deal primarily with the Ridge and Valley section of Monroe County, but contain information relevant to adjacent areas (Biery, 1968; Collins, 1976).

The East-Central Sheet of the Geologic Map of Tennessee (Swingle et al., 1966) shows two Precambrian Groups, Great Smoky and Walden Creek. These comprise the rock formations of the Citico Creek WSA. Ninety percent of the area is underlain by the Great Smoky Group.

Both groups belong to the Ocoee Series which King, et al. (1958, p. 951) describe as a terrigenous clastic sedimentary rock with minor intercalations of limestone and dolomite. Terrigenous describes material derived from above sea level and deposited in deep ocean while clastic refers to rock derived from fragments of pre-existing material.

The bedrock is composed of metamorphic gneiss and schist in conjunction with granitic rocks. These rocks have been dated at one billion years of age. The actual uplifting of the basement complex and all superior layers occurred from the Ordovician through the post-Mississippian Periods, giving the area a mountainous aspect that remains to this day. These more recent uplifting and metamorphic changes have been dated back to three hundred million years B.P. The maximum height attained has been estimated to be 4,000 m, while during more recent times erosion and uplifting have generally kept pace with each other to maintain the present height during much of the Cenozoic.

The Ocoee Series itself is composed of Upper Precambrian sediments and metasediments. Collins (1976, pp. 90-93) discusses the nature of their origin as part of the inland seas that covered a vast area east of the Piedmont Region. Evidently the Great Smoky Group was deposited in deeper trenches and the Walden Creek Group was laid down in the shallower continental shelf areas.

The Thunderhead Sandstone dominates the Ocoee Series and is composed of coarse gray feldspathic sandstone, graywacke and conglomerate. King, et al. (1958) and Rodgers (1953, pp. 31-34) imply that it continues to the southwest of the GSMNP, beyond the Little Tennessee River. Collins and others, in more general statements on the geology of the high ridges and mountains of East Tennessee, state that this would be the principle rock of this area.

A small portion of the Walden Creek Group, underlying and outcropping along Doublecamp Creek and a short segment along Citico Creek to the south of its junction with Doublecamp Creek, is most probably composed of the Shields Formation. Its cliffs and massive ledges are composed of sandstone, argillaceous slate and conglomerate. Collins discusses this complex as being deposited on the continental slope in an asymmetrical fan pattern, due to the delta lying at a slight angle to the northeast.

Keith (1895) names a Citico conglomerate, it being the only rock-type mentioned with a name derived from within the area. King, et al. (1958, pp. 961-962) discusses the origin of this term and shows that it corresponds to the Shields Formation and abandons the name.

The most detailed diagrams of the faults of East Tennessee can be found in Watkins (1964). Faults are not found in the study area itself, though the Oconaluftee Fault skirts Salt Spring Mountain to the northwest,

crossing through Little Citico and Citico Creeks. The Great Smoky Fault, lying further west and continuing from the GSMNP, has been overthrust, as have all faults in the immediate area, in an east-northeast direction. They generally overlay deposits of limestone of later Ordovician origin, which have been eroded away, leaving large, flat coves, such as Cades and Wear.

Several papers (Keith, 1895; TVA, et al., 1967, Appendix C, p. 2; and others) state or imply that limestone occurs as pebbles or rock formations along Citico Creek. This probably refers to the mouth of the Citico River where it empties into the Little Tennessee. Here, on the bluffs above the large, broad, flat-bottomed valley, are outcrops of limestone and other formations more typical of those described from Cades Cove and other areas.

According to the Field Sheets of the Soil Survey of Monroe County (USDA, Soil Conservation Service, 1974) and conversations with M. E. Springer (Department of Plant and Soil Science, The University of Tennessee, Knoxville), no limestone exists further up the watershed of Citico Creek. No limestone has been found in the study area, which coincides with the absence of several species of plants, such as Asplenium rhizophyllum L.

Although important deposits of gold and other minerals have been found in adjacent areas (Hale, 1974), no mineral deposits of any commercial significance have

been found within the Citico Creek WSA (Paul Beham, U. S. Bureau of Mines, Pittsburgh, personal communication). In a report by the U. S. Forest Service (1975), no previous prospecting has uncovered any mineral deposits and no mining has been done. No mineral rights presently exist within the study area.

In summary, to paraphrase statements from the North Fork Citico Creek Watershed Study (TVA, et al., 1963), the metamorphic bedrock is underlain by granitic gneiss at considerable depths but no outcrops occur within the watershed. The original sedimentary rocks were subjected to varying degrees of metamorphism during the period of mountain building, followed by a continuing cycle of erosion. Mountain peaks are capped by sandstone, with one major outcrop (Rattlesnake Rock on Sassafras Ridge). Quartzite and conglomerates occur as dikes and veins throughout the area, leaving broken fragments of variable size on slopes and throughout the stream systems.

CHAPTER VI

SOILS

Two soil surveys have been completed for the area covered by the Citico Creek WSA. The most recent is the Monroe County Soil Survey (USDA, Soil Conservation Service, 1974). As part of the North Fork Citico Creek Watershed Project, Robinson (1963) completed a survey for that part of the watershed. Though the 1974 survey is more recent and incorporates the official reclassification of soil types, the information contained in Robinson's survey is more detailed and specific for the area under study, contains more correlative data for the surrounding forest, and discusses the cultural aspects of forest use. As such, information is derived principally from his work, though information is incorporated from other studies as well (Bowman, 1911; TVA, et al., 1962-1972, particularly 1968; and U. S. Department of Transportation, 1976).

Citico and Jeffrey Series soils are newly described soil types from the Citico Creek WSA (USDA, Soil Conservation Service, 1974). They correlate with the Ramsey Stony Silt Loam (Soil Mapping Unit 84DE1) and the Ramsey Stony Silt Loam (Soil Mapping Units 84F1 and 84G1), respectively. The Stony Colluvium, Ramsey Soil Material, of Robinson, also correlates with the Jeffrey Series.

The soils of the area have been put into six Series, each of which is broken down into more specific soil types, depending on texture, percent stone, slope angle, etc. These are summarized as follows, with cover percents referring only to the North Fork Citico Creek watershed.

1. Barbourville Series, 20%. These are well-drained, slightly acid soils found at the base of mountains, on flat ridge tops, and on wide slopes. These generally develop on north and east exposures, are dark gray to dark brown in color, of silt or sandy loam texture, and extend to more than 3 m in depth. Occasional outcrops of the bedrock occur on the more shallow sites.

These soils generally have a higher use tolerance, in terms of forest cultural activity, than other soils in the Citico Creek WSA (TVA, et al., 1967). Though not limited to these soils, some of the dominant trees are Yellow poplar, Red oak, White pine, Sugar maple, and Buckeye. The water storage capacity is good and root growth of trees and shrubs is deep.

2. Jefferson Series, 7%. These are very acid soils, generally found on well-drained south and east slopes at the base or on lower slopes of mountains. Their color is yellow-brown; they occur in depths up to 1-1/2 m and are loamy in texture. These soils are older than those of the Barbourville Series and are not as use tolerant, being found on 12%-30% slopes. Like the Barbourville

Series, their water storage capacity is excellent and their organic matter and natural plant nutrient material is considered to be medium in amount.

Trees most commonly associated with these soils are Yellow poplar, Sweet and Yellow birch, Hickory and White Oak.

3. Matney Series, 27%. The Matney Soils are very strongly acid and occur at the higher elevations, especially on flat ridges and the shallower slopes associated with these ridges. Some Matney Soils occur on 30%-60% slopes in conjunction with other soils of the area. They are dark brown or grayish-brown to dark yellowish-brown in color, of silt-loam texture, have up to 20% stone (10% higher than either the Barbourville or Jefferson soils) and are generally shallower or up to 1.2 m in depth. Their tolerance to any cultural use is poor to medium. They have an increasingly higher percentage of pine-hardwood type forest cover, with Pitch pine, Yellow birch, Chestnut oak, and other drier site species. These soils have a medium amount of organic matter and natural plant nutrients.

4. Ramsey Series, 31%. These are strongly acid soils found on steep slopes and ridges at the highest elevations. They are extremely shallow, being .6 m in depth at the most, and often only .15 m for extended areas. Their color is dark brown, grayish-brown or dark

yellowish-brown. They are stony silt loams and occur on 30%-90% slopes with all exposures, though generally more south and east facing. Use tolerance is very low and these soils are most subject to landslide and erosion from unstable weather conditions, producing wind-thrown trees, much soil creep and exposure of bedrock.

The Ramsey Series soils have a higher percentage of ericaceous shrubs than the other soil series, particularly Vaccinium spp. and Gaylussacia ursina, along with Rhododendron and Mountain laurel. Tree species are the dry site ones, including Pitch and Table mountain pine, Chestnut oak and Red maple. Water holding capacity is poor as there is a higher percentage of sand, derived from the underlying sandstone capping the mountain ridges.

5. Stony Colluvium, Ramsey Soil Material, 14%. These are young soils containing material derived from Ramsey and Matney Soil Series. They are black to dark yellowish-brown in color, very thin being 0.2 m in depth and of silt or sandy loam texture. They have a high stone content, ranging from 20% to 90%, and are found on 60%-90% slopes.

Their drainage is excessive, and they are extremely vulnerable to weathering and soil creep. Seepage may occur where bedrock is exposed and has been covered by herbaceous vegetation.

Trees are generally reduced in stature and a dense

layer of ericaceous shrubs may be present. These soils are extremely sensitive to any cultural use and erosion is difficult to contain.

6. Stony Alluvium, 1%. These are alluvial soils found at the widest areas along streams, usually on level to gently sloping floodplains. Soil texture is sandy, color is light yellow to light brown, and the soils are young, originating from all other soil series. Deposition occurs principally after periods of heavy or extended precipitation, being deposited with runoff. Stone content is variable, from 20%-80% while soil thickness is up to 1 m in depth. Drainage of alluvial soils varies with distance from streams, the greatest percolation being furthest from the creeks.

All soils of this area have their origin in the underlying sandstone, quartzite, slate, shale and conglomerate formations. Though depth varies from less than 1 m to 6 m, the high percentage of slopes with an angle of greater than 30% creates a soil cover highly susceptible to erosion, creep and ensuing bedrock exposure and boulder formation. Approximately 70% of the soils are shallow to moderate in depth, with deeper soils occurring at the base of mountains, along the shallower slopes and along coves. Some north slopes and flat ridges have deeper soils of the Barbourville Series. These too are subject to erosion as often steep slopes develop beyond the shallow slope aspects of

the flat ridge tops. Steep terrain creates rapid runoff conditions that prevent adequate containment during periods of heavy precipitation.

The cultural use of various soil types, as correlated with aspect, slope and vegetation, are well summarized in Robinson (1963, pp. 16-21) and TVA, et al. (1967, Appendix). Cautionary statements are made in both papers concerning the susceptibility of this steep, mountainous terrain to excessive use. Much of the area's recommended use is as diverse forest cover, particularly of the hardwood or hardwood pine type, as these best contain water runoff during periods of excessive precipitation.

CHAPTER VII

VEGETATION

The principal thrust of this study has been to determine the vascular flora of the Citico Creek WSA. As such, vegetation studies were not attempted. In reviewing the available literature, quantitative vegetative studies have not been found. The only available information is unpublished file data of the U. S. Forest Service, Cherokee National Forest (No Date). Their Continuous Forest Inventory (CFI) data for compartments and stands within have been reviewed, and all data in this chapter are drawn from these reports.

The vegetation of the Cherokee National Forest as a whole has been summarized in USFS, Cherokee NF (1975, pp. 9-11). Five major plant communities are described and each has been seen within the Citico Creek WSA. They are as follows:

1. Cove Hardwoods--primarily Yellow poplar-White oak-Red oak. These occur between 150 m and 1,220 m on north slopes, in coves and ravines, and moist flat areas along creeks. Associated species, in part, are Serviceberry, Witchhobble, Dog hobble and Rosebay rhododendron.

2. Oak-Hickory--primarily several species of oaks, including White, Chestnut, and Scarlet; hickories and Shortleaf and Virginia pines. These occur on the higher

mesic slopes, flat ridge tops, and in coves.

3. Dry slope and ridge pine communities--Virginia pine and associated ericaceous shrubs, such as blueberries and Mountain laurel; Shortleaf pine on drier sites, especially south facing slopes; and Pitch and Table mountain pine communities of the higher and more exposed slopes and flat ridge tops. These too tend to have a shrub understory of species in the Ericaceae.

4. Mesic hemlock--White pine, Hemlock, Yellow birch, Sugar maple, Basswood, Blackgum and other mesic hardwood species. Elevations are generally above 500 m and aspect is usually northern, including moist coves and ravines.

5. Northern hardwoods--Sugar maple, Beech, and Yellow birch are the dominant species, though Black cherry, Sweet birch and other hardwood species are found in abundance, along with Hemlock and some White pine. A richer understory of Mountain and Striped maple, Service-berry and Silverbell also occurs with the northern hardwood type.

The CFI data have been summarized in Tables 1-3 and generally correlate with the above statements. Forest types are defined in Society of American Foresters (1940). Caution in use of these statistics is recommended, as without quantitative plot data, the forester may too easily plug each stand into a predetermined forest type based on visual inspection alone.

Table 1. Area of Forest Land in Specific Forest Types.

Types	Hectares	% of Total Area
Pine		
Table Mountain Pine	46	.68
White Pine	51	.76
Shortleaf Pine	53	.79
Hemlock	147	2.19
Virginia Pine	175	2.61
Pitch Pine	1185	17.70
	1,657	24.73
Pine-Hardwood		
Pitch Pine-Oak	30	.44
White Pine-Upland Hardwood	157	2.35
	187	2.79
Hardwood-Pine		
Upland Hardwood-White Pine	79	1.18
Cove Hardwood-White Pine-Hemlock	467	6.98
	546	8.16
Hardwood		
Yellow Poplar	123	1.85
Sugar Maple-Beech-Yellow Birch	1,012	15.14
Yellow Poplar-White Oak-Red Oak	1,211	18.12
White Oak-Red Oak-Hickory	1,950	29.16
	4,296	64.27

Table 2. Age of the Forest, Using Ten Year Increments.

Year	Area in Hectares	% of Total Area
1967-76	152	2.27
1957-66	169	2.53
1947-56	14	.21
1937-46	392	5.87
1927-36	2,417	36.15
1917-26	1,516	22.68
1907-16	1,086	16.25
1897-06	198	2.97
1887-96	17	.26
Pre-1886	134	2.00
In process of regeneration	84	1.26
Diseased, damaged or sparse timber	510	7.63

Table 3. Correlation of Age with Forest Types.[a]

Forest Types	Hectares	% of Total Area
Total Pine + Pine-Hardwood Types	1,495	24.54
Total Pine + Pine-Hardwood 50 Years or Younger	1,086	17.83
Total Pine + Pine-Hardwood 51 Years or Older	409	6.71
Total Hardwood + Hardwood-Pine Types	4,598	75.47
Total Hardwood + Hardwood-Pine 50 Years or Younger	2,077	34.10
Total Hardwood + Hardwood-Pine 51 Years or Older	2,522	41.39

[a]This table excludes area designated as being in process of regeneration or as diseased, damaged or sparse timber. 6,686 h - 594 h = 6,092 h. All figures are based on 6,092 h as a total area.

Fourteen forest types have been recognized from the Citico Creek WSA area. Eight of these are in pine or pine-hardwood types, with the remaining six in hardwood or hardwood-pine types. A pine type is defined as having 50% or more of the basal area in coniferous species. A hardwood type has 75% or more in various hardwood species. Pine-hardwood or hardwood-pine types have at the most 50% coniferous types, with usually a figure closer to 25%.

The Citico Creek WSA has been subdivided into 18 compartments with a total area of 6,716 h (one stand from an adjacent compartment has been included in these statistics). Subtracting the 30 h classified as non-forested land, 6,686 h remain, from which most data are calculated.

Based on the material in the preceding three tables, the following generalities have been deduced:

A. Hardwood or hardwood-pine types occupy 72% (4,843 h) of the total study area.

B. 65% (4,297 h) is in pure hardwood type stands.

C. 11% (727 h) has been logged since 1937.

D. 75% (5,019 h) of the forest was logged in the period between 1907 and 1936, with the greatest percentage having occurred in the 1927-1936 period, just before the federal government took over much of the land and created the national forest in 1936.

E. Based on data in Table 3, one can determine that

the forests of Citico Creek WSA have regenerated into the hardwoods that presumably occupied the land as the original vegetation. Forty-one percent (2,522 h) of the total forested land is in hardwood type stands of 50 years of age or older. The author's opinion is that until quantitative vegetation studies are completed in the area under consideration, the factual data as discussed in this chapter can only be considered as tentative. Of particular concern are the floristic and vegetation relationships with areas in the immediate vicinity of the study area. The GSMNP (Cain, 1943; Hoffman, 1964; Whittaker, 1956; and numerous other uncited papers) and Joyce Kilmer Memorial Forest (Oosting and Bourdeau, 1955; and Tucker, 1973) have each had detailed vegetation and floristic work done in the last 40 years. It would be most pertinent to compare the flora and vegetation of the Citico Creek WSA area with these areas to better ascertain the history of the plant life. This would be especially important now, as the forest may be included in the National Wilderness System, and thus be preserved indefinitely. The ensuing changes could thus be correlated with those of surrounding areas to better know what the original vegetation of the southern Appalachians was under pre-settlement conditions.

CHAPTER VIII

FLORA

General Discussion

The main objective of this thesis has been to collect and determine the vascular flora of the Citico Creek Wilderness Study Area. A total of 536 taxa in 288 genera and 91 families was identified from 1,020 collections made between March, 1976 and September, 1977. Nomenclature follows that of Radford, Ahles, and Bell (1968), with the additional use of Fernald (1950) and Gleason (1952) in several cases. Appendices A, B, and C summarize the data on plants collected.

Collecting locations are identified in Figure 2, page 6, and each site has been designated with a number. These localities are described so that future workers will be able to relocate the original area of collections. Some of the sites are in open or disturbed habitats, therefore as these revegetate, the occurrence of species may change with time. This is especially pertinent as this area has yet to be officially designated as a National Wilderness.

Collecting localities were selected on a basis of habitat diversity. Familiarity with the study area, gained during the first collecting season, made a more precise selection of many sites during the second season.

All trails within the study were hiked at least three times, with some being hiked on a monthly basis, over the course of the two-year period. Collections were made bimonthly, with more frequent trips being made from April 1 through June 1. Earliest collections were made on March 13 and the latest on November 13.

During the summer of 1976, a University of Tennessee trailer was used by the author. This was situated at Indian Boundary Campground in the Cherokee National Forest. Electrical facilities were provided by the Forest Service that enabled the author to press plants on the same day of collection. A Coleman heater was used with a portable table and plant presses. Forest Service personnel provided logistic support in hooking the trailer up to electrical facilities and in providing trail maps and other available site information.

Should Citico Creek WSA receive official designation, then some of the collecting sites, especially those currently used as game clearings, and other peripheral areas on the border of the study area, may be subject to rapid changes in their flora. If this area is not designated as wilderness, then it will be subject to the normal culturing practices of the Forest Service. The 70 tree species determined in this study will be subject to change, as one of the current practices of the Forest Service is to clear cut and then replant with coniferous species, often

Pinus echinata and other species of Pinus.

Of particular interest to the author are those species of vascular plants found in submerged or partially wet habitats. This area is part of the drainage system of the Little Tennessee River and is thus affected to some degree by the activities of the Tennessee Valley Authority. The many small creeks and branches that empty into Citico Creek, which in turn drains into the Little Tennessee River, have also been affected by the building of commercial and logging roads (U. S. Department of Transportation, 1976; Venable, 1977a and 1977b; and Wilkins, 1960).

As the quality of water changes, and as the total area of flooding varies with regulation of waters further downstream, the species that are subject to partial flooding or total submersion are subject to change. A list of aquatic species, as determined by inclusion in several manuals of aquatic vascular plants (Beal, 1977; Eyles and Robertson, 1944; and Muenscher, 1944) is presented in Appendix C.

Voucher herbarium specimens of all plants collected for this study will be deposited in the Herbarium of The University of Tennessee, Knoxville (TENN). Duplicate material will be distributed to other herbaria, later to be determined.

Descriptions of Collecting Localities

1. Farr Gap (850 m). Overlooking the Slickrock Creek National Wilderness, this site is at the end of the Doublecamp Road. Dominant tree species are Pinus pungens, P. virginiana, and Acer rubrum, associated with an ericaceous understory.

2. Along Doublecamp Creek, its adjacent road, and an old logging road, well overgrown, following the second unnamed creek northeast of Crowder Branch (730 m-800 m). Pinus echinata, P. rigida, Quercus rubra, and Vaccinium species dominate this generally south facing area.

3. Hog Wallow (770 m). A very disturbed flat area 70 m in length that is constantly wet, with deep mud. Prunus americana, various Carex species, Osmunda regalis var. spectabilis and dense populations of Lobelia cardinalis and Chelone glabra are characteristic of this moist site. Thirty-eight species are recorded from this locale.

4. Wet ditch along Doublecamp Creek Road, 30 m east of the stone bridge over Doublecamp Creek. A rock wall, constantly moist with dense bryophytic growths, and a low ditch with Sphagnum spp., Rubus allegheniensis and Betula lenta comprise this locality. With 3 orchids and 24 other species collected from this interesting yet precarious locale, it is a small but rather unique area.

5. Doublecamp Creek, 0.8 km northeast of Crowder Branch (640 m). Tsuga canadensis and Rhododendron maximum

dominate along the creek. The only site where Thelypteris hexagonoptera was collected.

6. Lower Crowder Branch (585-685 m). Hemlock, Rosebay and mesic hardwood species dominate this varied site. From disturbed areas with dense growths of Phacelia purshii to rich cove sites, this locale abounds in moisture loving species. This area is especially rich in salamander populations (Jones, 1977).

7. Crowder Branch, middle portion (800-950 m). Open slopes with mixed hardwood species, including Cherry birch, Black and Scarlet oaks and Buckeye. Dense growths of Rosebay are present along the stream, with some large boulders in and along the creek and several small waterfalls in the springtime.

8. Head of Crowder Branch and deer clearing (975-1,000 m). An open grassy area with young Elderberry, some Beech and Hemlock stands.

9. Little Fodderstack area and along the Fodderstack Trail south (1,030-1,130 m). A flat ridge dominated by Chestnut oak and Red oak, some Table mountain pine, Pitch pine, and Dogwood.

10. Deer clearing on the ridge above the head of Crowder Branch (1,030 m). A very flat ridge top with White oak, Red oak, and Shagbark hickory. Views into North Carolina are particularly good from the ridge.

11. Dense stand of Rosebay along Doublecamp Creek, quite wet in the spring due to the floodplain type of terrain surrounding the creek (600 m).

12. Doublecamp Creek from Mill Branch to below Rocky Flats Branch (550 m). Virginia pine plantings, Yellow poplar, White oak, and Red oak dominate along the slopes south of the creek. Some disturbance by hogs was noticed along the stream and surrounding slopes.

13. Doublecamp Creek between Laurel Branch and Doublecamp Creek Campground at junction with Citico Creek (425-525 m). Steep cliffs along the south side of Doublecamp Creek with dense growth of Rosebay rhododendron are present with scattered stands of Hemlock, Virginia pine, Red oak, and other mixed hardwood species.

14. Doublecamp Creek Campground, old burn area along Citico Creek south of the campground and south along Citico Creek (450 m). Steep, moist cliffs along the creek with a dense understory of Maidenhair fern, some White trillium and a low forest cover of Rhododendron on the south side of the road dominate this locality. A fire burned 30 acres in 1971, and this area has not yet regrown, partially due to extensive recreational use.

15. Rocky Flats Trail and along Citico Creek for several hundred meters either side of the trail entrance. The trail itself is 5.5 km long and several habitats are present. Most of the collecting was done on the south

portion of the trail where Hemlock, Virginia pine, Sweet and Yellow birch, and Beech predominate, among other species. Large stumps of Chestnut are present, some 2.5 m in diameter. Some extensive colonies of Podostemum ceratophyllum are found in Citico Creek where the creek becomes gorge-like in appearance and along the flat areas of the creek southeast of Rocky Flats. This is the only locale where it was found. The river here is very fast flowing and contains many large boulders, small pools and much white water, even in late summer.

16. Citico Warden Station-Pinestand Ridge Trail area (500-800 m). A large sandstone outcrop on the north side of Citico Creek is covered with Vaccinium species and pines. Crossing the stream, one comes to a large, open field, formerly part of the old logging town known as Jeffrey that extended up Citico Creek to the junction of the North and South Fork of Citico Creek. Several foundations are present, remnants of apple orchards, and a large game clearing south of the old field, combine to give a variety of weedy and open habitats. Pinestand Ridge is dominated by Pitch pine on its south slope with an understory of blueberries, rhododendron, and greenbriars.

17. Junction of North and South Fork of Citico Creek and along North Fork for 1.5 km (550 m). A wooden trestle bridge is the last remaining sign of the old railroad that was built by the Babcock Boom and Lumber

Company in 1910. The North Fork is a steep cove with cove hardwood species and the terrain is characterized by many boulders and is quite moist. Several slopes are rich in Trillium species, and a total of 46 species of plants are collected from this locale.

18. Mid-way up the North Fork, including 0.6 km of the Indian Valley Branch (650-850 m). Several 20 m waterfalls in the Indian Valley Branch area characterize the steep terrain and mesic forest. Sugar maple, Beech, White pine, Sweet birch and a variety of understory species are present.

19. Big Fodderstack-Harrison Gap area (1,150-1,325 m). The head of Indian Valley Branch has an 80 h virgin Hemlock forest along and just below the ridge line. Several individuals are 6 m in circumference and there are some large Buckeye specimens. Along the ridge north of Rockstack is a wet seepage area with Chrysosplenium americanum, large stands of both species of Impatiens, Pin cherry, and Blackberry along the trail.

20. Glenn Gap and south along the state line (1,275 m). Often very wet due to the great amount of precipitation at the high elevations, several west facing slopes have rich Trillium erectum populations amidst large Beech, Buckeye, White oak, and other species.

21. Upper North Fork Citico Creek (850-1,100 m). Sugar maple, Yellow and Sweet birch, White oak, Sassafras,

and some dense stands of rhododendron characterize the upper reaches of the North Fork. Two waterfalls, 15 m and 20 m high, provide a variety of wet habitats.

22. Along Ike Camp Branch (570-670 m). Pitch pine, Yellow poplar and oak species dominate up this valley.

23. Lower South Fork Citico Creek (570-700 m). Cove hardwood species dominate along the generally northeast facing slopes, with rocks and small boulders along the lower slopes, containing populations of diverse springtime herbs.

24. Flats Mountain, north portion (600-975 m). A dry ridge with Pitch pine, Virginia pine and dense understory of ericaceous shrubs, principally blueberries. A massive stand of Indian pipe was seen covering an area of 15 m in late summer of 1976.

25. Eagle Gap and south end of Flats Mountain (1,100-1,220 m). This locality covers a large area along the old Forest Service road and has had some disturbance, in part, from construction equipment that built the new Tellico Plains-Robbinsville Highway. Some parts of the road, especially approaching Hemlock Knob, partially blasted away by the new road, are still quite pristine and have dense stands of White ash, Buckeye and a rich understory. A total of 87 species of plants was recorded for this locale, this being the highest species number recorded for any of the 36 locals in the study area. Eupatorium species, asters and goldenrods are in abundance, as are many other "weedy" species.

26. Eagle Branch (750-1,050 m). A diversity of cove hardwood species with Buckeye, Sugar maple, hickories and oaks predominating. Along the steep ridge between here and Grassy Branch is a very dense growth of rhododendron with a covering of Smilax rotundifolia. Mountain holly is also found here.

27. Grassy Branch (800-1,000 m). The creek is bounded by more open rhododendron stands than some of the other creeks, with White oak, hickories, birches and magnolias common. The only locality where the Cucumber tree was seen is along the ridge on the west side of this area.

28. Grassy Gap and along Sassafras Ridge (1,100 m). Recently disturbed due to the newly constructed road, the headwaters of Grassy Branch have become unsuitable for drinking and much of the ridge has been planted with Lespedeza bicolor. The ridge itself has beautiful stands of orange Flame azalea and dense growths of Mountain laurel beneath pine, oak and other dry site species. Wintergreen and several tall stands of sedge species are found under the pines and along the creek.

29. Falls Branch Scenic Area (975-1,125 m). This area of virgin forest covers 70 h and is characterized by very large Sugar maple, Buckeye, Basswood, Umbrella tree, Black cherry and a diverse understory, including Mountain holly, Clethra acuminata and Viburnum acerifolium. The falls

are 23 m and flow over a massive rock outcrop covered with large growths of Umbilicaria mammulata (Ach.) Tuck., a large umbilicate lichen. Though some of the slopes in the area appear to be disturbed by hogs, much of the area is pristine, with several bear dens in evidence above the falls amidst Hemlock, rhododendron and greenbriar thickets. Forty-seven species are recorded from this locale though many species were collected elsewhere that were not taken from here.

30. Laurel Branch head, opposite trail entrance to Falls Branch (1,150 m). Just on the south side of the ridge is a dense growth of seven species of ferns, including the Southern Appalachian gametophyte, Vittaria lineata, found in small rock ledges, associated with dense bryophyte growths. Though technically not within the study area, as the ridge top is the southern boundary, the likelihood that the entire virgin area of forest, of which 6 h exists south of the ridge, will be included within the wilderness is great.

31. Rattlesnake Rock (1,220 m). A sandstone outcrop that overlooks the entire Citico Creek area to the north, with views of the North River and Tellico River areas to the south. Twenty-seven species are recorded, with Red maple, Rosebay, Blackberry and Sweet pepperbush dominant. Several clumps of Corydalis sempervirens and many small clumps of Michaux's saxifrage bloom from May through late August and make the site particularly pleasant.

32. Jeffrey Hell, in part (1,160-1,220 m). This north facing slope is bissected by a Forest Service road that has several streams running across it. A dense cover of Rosebay on slopes and along the creeks and Sugar maple, Basswood, White oak and other mesic species characterize this area.

33. Beech Gap (1,380 m). On the state border overlooking North Carolina and the Joyce Kilmer-Slickrock Creek National Wilderness, this site is dominated by Beech and a very large Sugar maple at the crest, Buckeye and many herbaceous species in the clearing along the ridge. This was a favorite collecting site of Aaron J. Sharp (Botany Department, The University of Tennessee, Knoxville), in the 1940's. Of twenty species collected by him from this and locality #34, only Aralia nudicaulis and Viola striata were not collected during this study.

34. Deep woods and north facing slope, west of Beech Gap, and old Forest Service road from east of Rattlesnake Rock to Beech Gap (1,150-1,300 m). Along the road is a long distance telephone relay station, around which are several open areas containing large populations of Monarda species, Phlox species and many other wildflowers. The area is dominated by Sugar maple, Buckeye, Black locust and along a deer clearing opposite, English hawthorn. Descending down the north facing slope, usually very wet with many seepage areas, are many species of herbs with 42 species recorded.

35. Ridge road and slope from south of Glenn Gap to north of Beech Gap, excluding Bob Bald and the hill northwest of Bob Bald. Chestnut oak, Beech, some Hemlock and a variety of roadside herbs, including Stachys clingmanii, are found along the road. This is the only locale in Tennessee outside the GSMNP for Stachys clingmanii and only the second county in Tennessee outside the GSMNP where Hypericum mitchellianum has been collected.

36. Head of South Fork Citico Creek, south of the state line ridge. Containing stands of cove hardwoods, including Buckeye, Beech, White oak, Basswood, White pine and large Hemlocks, this area is similar to area 34 and contains several seasonal waterfalls.

CHAPTER IX

ENDANGERED PLANTS

With the increasing use of the environment for human functions, the original landscape has become proportionately diminished. The ensuing decrease in the diversity of the fauna and flora of the earth has been well documented in the last decade (Hopson, 1976; Moore, 1977; Prance and Elias, 1977). The scope of this chapter is to show the status of those plants found within the Citico Creek WSA and considered to have been adversely affected by the activities of civilization. For more general discussions on the status of individual species and their various environmental relationships, along with historical discussions on ecosystems and their recent changes, see Prance and Elias (1977).

Out of a flora of 536 taxa, 112 or 21% have been recognized as being rare, threatened, endangered, or have been accorded some legal status by 21 states. Seven plants have been found in the Citico Creek WSA that are listed for the state of Tennessee (Committee for Tennessee Rare Plants, 1977). Of these, five are new county records.

Kartesz and Kartesz (1977) list the status for all vascular plants in the United States, Canada, and some Caribbean islands. Table 4 gives the status of those

Table 4. List of Plants Found in the Citico Creek Wilderness Study Area and Included on the Rare Plant Lists of Tennessee and Six Surrounding States.[a]

Genus and Species	TN	AL	GA	KY	NC	SC	VA
Pteridophyta							
Cystopteris protrusa						t	
Lycopodium flabelliforme		S					
Polypodium virginianum		S					
Spermatophyta							
Acer pensylvanicum				*		t	
A. spicatum				*			
Aconitum uncinatum		E	e			t	
Actaea pachypoda		S					
Agrimonia pubescens						t	
Antennaria solitaria							R
Aralia spinosa		S					
Aristolochia macrophylla						t	@
Astilbe biternata							@
Campanula americana			e				
Carex baileyi					T		
C. muricata var. ruthii			e				
C. plantaginea						t	
C. torta			e				
C. trisperma	S				E		
Castanea dentata				E			@
Caulophyllum thalictroides						t	
Chrysosplenium americanum					E	t	

Table 4. (continued)

Genus and Species	TN	AL	GA	KY	NC	SC	VA
Cladrastis lutea		S	e	T	T		
Clethra acuminata				*			
Clintonia umbellulata							@
Corydalis sempervirens			e		T		
Cuscuta rostrata						t	
Cymophyllus fraseri	T				T		
Cypripedium acaule		T					
Dicentra canadensis			e				
D. cucullaria		S	e				
Diphylleia cymosa		S	e				
Gaultheria procumbens			e				
Gaylussacia ursina	T						
Gentiana decora			e		R		Z
G. quinquefolia				R			
G. saponaria		E					
Geum vernum					E		
Glyceria melicaria			e				
Habenaria clavellata							H
Hepatica acutiloba						t	
Heuchera villosa							Z
Houstonia serpyllifolia							Z
Hydrophyllum canadense			e				
Hypericum mitchellianum	T						L
Juncus gymnocarpus	T	T				t	
Lilium michauxii			e				
L. superbum		E	e	R			
Luzula acuminata var. carolinae			e				
Magnolia fraseri							E
Medeola virginiana				*			
Mitella diphylla			e				

Table 4. (continued)

Genus and Species	TN	AL	GA	KY	NC	SC	VA
Monarda clinopodia		S					
M. didyma			e			t	@
Muhlenbergia sylvatica			e				
Obolaria virginica			e				
Orchis spectabilis		S				t	@
Orobanche uniflora		S				t	
Panax quinquefolium	T	E	e	T	T	t	@
Phacelia bipinnatifida						t	Z
P. purshii			e			E	
Phlox amplifolia			e				
P. paniculata						t	
Pinus pungens						t	
Platanus occidentalis							@
Potentilla norvegica						t	
Prenanthes trifoliata						t	
Pyrularia pubera		S					
Rhododendron calendulaceum		S					
R. maximum							@
Rhus typhina		S	e				
Ribes cynosbati		S	e				
Salix sericea		S	e				
Sambucus pubens			e	*			
Saxifraga michauxii							@
S. micranthidifolia			e				
Stachys clingmanii	T						
S. riddelli							R
Stellaria corei					T		
Stewartia ovata		S	e	*		t	
Tiarella cordifolia						t	

Table 4. (continued)

Genus and Species	TN	AL	GA	KY	NC	SC	VA
Trautvetteria carolinensis						t	@
Trillium grandiflorum							@
T. undulatum			e	*			
Vaccinium hirsutum			e				
Veratrum parviflorum		S					
Viburnum alnifolium			e				
Viola affinis			e				
V. canadensis var. canadensis		S				t	
V. eriocarpa						t	
Yucca filamentosa			e				

E = Endangered
e = Rare and endangered
L = Limited distribution
R = Rare
S = Special species
T = Threatened
t = Threatened and endangered
Z = Depleted: habitat and numbers seriously reduced but not in immediate danger of extermination
@ = Depleted but not exterminated
* = Variable determination.

plants found in the Citico Creek WSA and also found in the seven states within a hundred mile radius of the study area. Brief definitions for each category are given, though the individual states may vary some in precisely defining each category. Kartesz and Kartesz (1977, Appendix A) list the individual laws of each state.

Two plants, Cymophyllus fraseri and Juncus gymnocarpus, are listed by the Department of the Interior, Fish and Wildlife Service (1975) as being threatened or endangered. These are the only plants from the study area currently on the federal list that may possibly be included under the Federal Endangered Species Act of 1973. As this list is currently undergoing revision, additional plants from the Tennessee list, or lists of other states, may receive some formal protection.

One is cautioned to regard various categories of endangerment with some forethought. Some plants on some lists have been included not necessarily because they have become so rare as to be at the point of extinction. As discussed in the Minnesota section of Kartesz and Kartesz (1977), "Even if a plant is widespread, many examples of it should be retained across its range, since it will differ genetically from place to place and it is important to keep as many different strains as possible."

That some plants in the following tables may be common in one area and rare in another can be explained by

distribution of the individual species. Other plants, often more showy, such as those of the Orchidaceae and other families, are subject to commercial exploitation and ensuing rarity or even extinction (see Benson, 1977 and Moore, 1977). Table 5 lists those plants either extinct, possibly extinct, or legally protected by the state in which it is found.

Table 5. List of Plants Found in the Citico Creek Wilderness Study Area and Considered to be Extinct, Possibly or Probably Extinct, or Given Some Legal Protection by Twenty-One States.

Genus	Extinct	Protected by State	Endangered and Protected by Law	Probably Extinct	Possibly Extinct
Pteridophyta					
Asplenium montanum	MI				
A. trichomanes		NM			
Dennstaedtia punctilobula	MI				
Thelypteris hexagonoptera	KA				
Spermatophyta					
Aralia racemosa				TX	
Asclepias tuberosa		NM, NY			
Calopogon pulchellus			VT		
Calycanthus floridus var. laevigatus				PA	
Carex stricta					TX
Castanea dentata	FL				
Chimaphila maculata		NY			
Cornus florida		NY			
Cypripedium acaule			VT		
Epigaea repens	IL	MN, NY	VT		
Goodyera pubescens			VT		
Habenaria ciliaris					RI
H. clavellata			VA		
Lilium superbum	FL				
Lobelia cardinalis		NY	VT		
Malaxis unifolia	IL		VT		RI
Monarda didyma		NY			

Table 5. (continued)

Genus	Extinct	Protected by State	Endangered and Protected by Law	Probably Extinct	Possibly Extinct
Orchis spectabilis			VT	RI	
Panax quinquefolium	FL	NY			OK, RI
Phlox carolina				TX	
Pycnanthemum pycnanthemoides				PA	
Quercus prinus				ME	
Rhododendron calendulaceum				PA	
R. maximum			VT		
Sanguinaria canadensis		NY			
Spiranthes cernua	UT		VT		
Tipularia discolor			VT		
Trautvetteria carolinensis	IL				
Viola pedata		NY			

CHAPTER X

SUMMARY

A vascular flora of 536 taxa in 288 genera and 91 families has been determined for an area of 6,716 h in the Cherokee National Forest, Monroe County, Tennessee. Named the Citico Creek Wilderness Study Area, it was set aside in 1975 for a period of five years during which time it is to be protected as a wilderness area, free from any cultural activities by the Forest Service. During this five-year period, scientific studies in conjunction with economic and political considerations will help determine the future use of this area.

In reviewing pertinent literature on the vegetation conditions of the forest, it was shown that after a period of heavy lumbering and cultural use, the forest has re-vegetated to a hardwood forest. With more than 70% in hardwoods, and 41% of this 50 years or older, the secondary growth of the forest has proceeded with great rapidity.

Thus, this area, once heavily used for human purposes, appears to be regaining the appearance of the original hardwood forest. The diversity of animal species found within the study area, though not completely studied, is no doubt partially dependent upon a diverse flora. Providing the place where this flora can continue to mature

will at the same time provide the critical habitats necessary for those animal species found in this part of the Southern Appalachians.

The various species of plants found in the Citico Creek Wilderness Study Area and considered rare by Tennessee and other states show that this area, like that of the Great Smoky Mountains National Park, provides a haven for these species. With the continuing encroachment upon the land by an ever-expanding society, the need to preserve a minimum of lands forever free from the hands of society is one step that will also insure the continuity of these and other plant and animal species.

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APPENDICES

APPENDIX A

Table 6. Systematic List of Plants with Common Names and Localities. Names Marked with an Asterisk (*) Are New Records for Monroe County, Tennessee.

Scientific Name	Common Name	Localities
PTERIDOPHYTA		
Lycopodiaceae		
Lycopodium flabelliforme (Fernald) Blanchard	Running Pine	3
* L. lucidulum Michaux	Shining Cl bmoss	15,34
* L. obscurum L.	Groundpine	15
Ophioglossaceae		
Botrychium biternatum (Sav.) Underwood	Southern Grapefern	
B. dissectum Sprengel	Common G.	7,30
B. virginianum (L.) Swartz	Rattlesnake Fern	2,15,17,18
Osmundaceae		
Osmunda cinnamomea L.	Cinnamon Fern	6,11
O. claytoniana L.	Interrupted F.	25
O. regalis L. var. spectabilis (Willd.) Gray	Royal F.	3
Pteridaceae		
Adiantum pedatum L.	Maidenhair Fern	17
Dennstaedtia punctilobula (Michaux) Moore	Hay-Scented F.	1,2,4,8,15,16,34
Pteridium aquilinum (L.) Kuhn	Bracken	12,15
Aspidiaceae		
Athyrium asplenioides (Michaux) A. A. Eaton	Southern Lady Fern	3,8,16,25,26
Cystopteris protrusa (Weatherby) Blasdell	Spreading Bladder F.	17,23
Dryopteris intermedia (Willd.) Gray	Fancy F.	6,11,16,29,30
D. marginalis (L.) Gray	Marginal Shield F.	18,24,31

Table 6. (continued)

Scientific Name	Common Name	Localities
Polystichum acrostichoides (Michaux) Schott	Christm s F.	7,15,17,30
Thelypteris hexagonoptera (Michau) Weatherby	Broad Beech F.	5
T. noveboracensis (L.) Nieuwland	New York F.	8,13,21,25,30
Aspleniaceae		
Asplenium montanum Willd.	Mountain Spleenwort	2,6,16,17
A. platyneuron (L.) Oakes	Ebony S.	16,18,23
A. trichomanes L.	Maidenhair S.	30
Polypodiaceae		
Polypodium virginianum L.	Rock Cap Fern	30,31
* Vittaria lineata (L.) J. E. Smith	Shoestring F.	30
SPERMATOPHYTA		
Gymnospermae		
Pinaceae		
* Pinus echinata Miller	Short-leaf Pine	1
* P. pungens Lambert	Table Mountain P.	1,9
P. rigida Miller	Pitch P.	1,2,3,9,25
* P. strobus L.	White P.	17
* P. virginiana Miller	Scrub P.	3
* Tsuga canadensis (L.) Carr.	Eastern Hemlock	15
Angiospermae		
Monocotyledoneae		

Table 6. (continued)

Scientific Name	Common Name	Localities
Poaceae		
* Agrostis hyemalis (Walter) BSP	Rough Bentgrass	3,25
A. perennans (Walter) Tuckerman	Perennial B.	2
* A. stolonifera L.	Redtop	13,28,31
Andropogon scoparius Michaux	Little Bluestem	2,6,12,28
A. virginicus L.	Broom Sedge	16,25
* Dactylis glomerata L.	Orchard Grass	10,13,35
Danthonia compressa Austin	Flattened Oat G.	25,32,34
* D. spicata (L.) Beauvois ex R. & S.	Poverty Oat G.	32
* Digitaria sanguinalis (L.) Scopoli	Crab G.	28
* Elymus virginicus L.	Wild Rye G.	28
* Festuca elatior L.	Fescue	1
Glyceria melicaria (Michaux) Hubbard	Slender Manna G.	3,34
* G. striata (Lam.) Hitchcock	Manna G.	29,32
Holcus lanatus L.	Velvet G.	1,33
* Hordeum pusilum Nuttall	Little Barley	28
Leersia virginica Willd.	Virginia Cutgrass	3
* Lolium multiflorum Lam.	Rye G.	28
Microstegium vimineum (Trinius) A. Camus		6
Muhlenbergia sylvatica (Torrey) Torrey ex Gray	Woodland Muhly	1,16
M. tenuiflora (Willd.) BSP	Slender M.	6
Panicum anceps Michaux		3,4,6,11
* P. clandestinum L.	Deerstongue Panic G.	15
P. commutatum Schultes var. commutatum		8
* P. commutatum Schultes var. ashei (Pearson) Fern.		32
P. dichotomum L.	Forked Panic G.	2,6
P. lanuginosum Ell.	Woolly Panic G.	34
P. laxiflorum Lam.		31
* P. lindheimeri Nash.		28

Table 6. (continued)

Scientific Na e	Common Name	Localities
P. microcarpon Muhl. ex Ell.	Barbed Panic G.	6,11,14
P. polyanthes Schultes		4,6
* Phleum pratense L.	Timothy	13
* Poa alsodes Gray	Grove Bluegrass	16
P. cuspidata Nuttall	Bluegrass	16,18,25,29
* P. pratensis L.	Kentucky B.	1
Sorghastrum nutans (L.) Nash.	Yellow Indian G.	28
* Triticum aestivum L.	Wheat	16
* Zea mays L.	Corn	16
Cyperaceae		
* Carex amphibola Steudel	Sedge	2
C. austro-caroliniana Bailey		11,17,23
* C. baileyi Britton		6
C. crinita Lam. var. crinita		8,17,23,32
* C. crinita Lam. var. gynandra (Schweinitz) Schweinitz & Torrey		3
* C. debilis Michaux var. debilis		16,31
C. debilis Michaux var. rudgei Bailey		7
C. frankii Kunth.		28
C. lurida Wahlenberg		2,13
* C. muricata L. var. ruthii (Mackenzie) Gleason		34
* C. nigromarginata Schweinitz		15
* C. pensylvanica Lam. var. distans Peck.		23
* C. pensylvanica Lam. var. pensylvanica		35
C. plantaginea Lam.		6,32
* C. radiata (Wahlenberg) Dewey		25,29
* C. retroflexa Muhl. ex Schkuhr.		1
C. rosea Schkuhr.		10,35

Table 6. (continued)

Scientific Name	Common Name	Localities
* C. scabrata Schweinitz		6,12
* C. stricta Lam.		13,16
C. torta Boott.		14,23
* C. trisperma Dewey		32
* C. virescens Muhl. ex Schkuhr.		3,6
C. vulpinoidea Michaux		3
Cymophyllus fraseri (Andrz.) Mackenzie	Fraser's Sedge	7,17
Rhynchospora capitellata (Michaux) Vahl.	Beak Rush	6,13
Scirpus cyperinus (L.) Kunth	Cottongrass Bullrush	6
S. polyphyllus Vahl.	Leafy B.	3
S. rubricosus Fernald		19
* Scleria triglomerata Michaux	Whip Nutrush	6
Araceae		
Arisaema triphyllum (L.) Schott	Jack-in-the-Pulpit	17
Commelinaceae		
* Commelina communis L.	Dayflower	3
* Tradescantia subaspera Ker.	Spiderwort	25
Juncaceae		
Juncus coriaceus Mackenzie	Leathery Rush	4,21
J. effusus L.	Soft R.	8,16,19,32
* J. gymnocarpus Coville	Coville's R.	3,6,32
* J. tenuis Willd.	Path R.	6,14,17,33
Luzula acuminata Raf. var. carolinae (Watson) Fernald	Woodrush	16,23,24,32
L. bulbosa (Wood) Rydberg	Bulb W.	17

Table 6. (continued)

Scientific Name	Common Name	Localities
L. echinata (Small) Hermann		18,28,33
* L. multiflora (Retzius) Lej.		32
Liliaceae		
* Allium tricoccum Aiton	Ramps	34
* A. vineale L.	Field Garlic	33
* Clintonia umbellulata (Michaux) Morong	Speckled Wood-Lily	7
* Disporum lanuginosum (Michaux) Nicholson	Yellow Mandarin	17,26,29
Erythronium americanum Ker	Trout Lily	25,26,32
* Lilium michauxii Poiret	Carolina L.	31
* L. superbum L.	Turk's-Cap L.	31
* Medeola virginiana L.	Indian Cucumber-Root	1,8
Polygonatum biflorum (Walter) Ell.	Common Solomon's Seal	16
* P. pubescens (Willd.) Pursh	Downy S. S.	32
* Smilacina racemosa (L.) Desf.	False S. S.	15,18
Smilax bona-nox L.	Saw Greenbriar	6
* S. glauca Walter	Glaucous-leaved G.	1,3,14,16,21
* S. rotundifolia L.	Common G.	1,7,15,29,31
* Stenanthium gramineum (Ker) Morong	Featherbells	25
Trillium catesbaei Ell.	Catesby's Trillium	6
T. cuneatum Raf. var. cuneatum	Toadshade	26
T. cuneatum Raf. var. luteum (Muhl.) Ahles	Yellow Trillium	24
* T. erectum L. var. album (Michaux) Pursh	White T.	15,17,26
* T. erectum L. var. erectum	Stinking Benjamin	6,20
T. erectum L. var. erectum X T. erectum L. var. album (Michaux) Pursh		26
T. grandiflorum (Michaux) Salisbury	Large-Flowered White T.	20,26

Table 6. (continued)

Scientific Name	Common Name	Localities
* T. undulatum Willd.	Painted T.	27
* Veratrum parviflorum Michaux	False Hellebore	29
* Yucca filamentosa L.	Yucca	2
Dioscoriaceae		
Dioscorea batatas Dcne.	Cinnamon Vine	3
D. villosa L.	Wild Yam	2,7,16,25,26,30
Amaryllidaceae		
Hypoxis hirsuta (L.) Coville	Yellow Star-Grass	1,4,7,15,16,23
Iridaceae		
Iris cristata Aiton	Dwarf Iris	6,15
Sisyrinchium angustifolium Miller	Blue-eyed Grass	2,16,25
Orchidaceae		
Calopogon pulchellus (Salisbury) R. Brown	Grass-Pink	4
* Cypripedium acaule Aiton	Pink Lady's Slipper	6,28
* Goodyera pubescens (Willd.) R. Brown	Downy Rattlesnake Plantain	16,21
Habenaria ciliaris (L.) R. Brown	Yellow Fringed-Orchid	4
H. clavellata (Michaux) Sprengel	Small Green Wood-Orchid	2,4
Malaxis unifolia Michaux	Green Adder's Mouth	34
* Orchis spectabilis L.	Showy Orchis	18,22
Spiranthes cernua (L.) Richard	Nodding Ladies' Tresses	4
* Tipularia discolor (Pursh) Nuttall	Crane-Fly Orchid	6
Dicotyledoneae		

Table 6. (continued)

Scientific Name	Common Name	Localities
Salicaceae		
* Salix alba L.	White Willow	6
* S. nigra Marshall	Black W.	16,17
S. sericea Marshall	Silky W.	13,17
Juglandaceae		
Carya cordiformis (Wang.) K. Koch	Bitternut Hickory	25
* C. glabra (Miller) Sweet	Pignut H.	1,25
* C. ovata (Miller) K. Koch	Shagbark H.	15
* C. pallida (Ashe) Engler & Graebner	Pale H.	21
Betulaceae		
* Alnus serrulata (Aiton) Willd.	Tag Alder	14,17
* Betula lenta L.	Cherry Birch	1,26
* B. lutea Michaux f.	Yellow B.	10,15,29
Carpinus caroliniana Walter	Ironwood	15
Ostrya virginiana (Miller) K. Koch	Hop Hornbeam	29
Fagaceae		
Castanea dentata (Marshall) Borkh.	American Chestnut	9,26,30
Fagus grandifolia Ehrhart	Beech	15,20,29
Quercus alba L.	White Oak	25,28
* Q. coccinea Muenchh.	Scarlet O.	32
* Q. marilandica Muenchh.	Black Jack O.	13
* Q. prinus L.	Chestnut O.	1,12
* Q. rubra L.	Red O.	1,2,23
* Q. velutina Lam.	Black O.	2,7,10,36

Table 6. (continued)

Scientific Name	Common Name	Localities
Ulmaceae		
Ulmus rubra Muhl.	Slippery Elm	17
Urticaceae		
Boehmeria cylindrica (L.) Swartz	False Nettle	29,34
* *Laportea canadensis* (L.) Wendell	Wood N.	6,26,27,29,30,34
Pilea pumila (L.) Gray	Clearweed	6
Santalaceae		
* *Pyrularia pubera* Michaux	Buffalo Nut	24
Aristolochiaceae		
Aristolochia macrophylla Lam.	Dutchman's Pipe	23,25,32
* *Asarum canadense* L.	Wild Ginger	17,18
Hexastylis arifolia (Michaux) Small	Little Brown Jug	17,21
Polygonaceae		
* *Polygonum cespitosum* Blume var. *longisetum* (DeBruyn) Stewart	Smartweed	6,25
P. hydropiperoides Michaux		34
* *P. pensylvanicum* L.		25
* *P. persicaria* L.		33,35
* *P. punctatum* Ell.		16
P. sagittatum L.	Tearthumb	2
* *Rumex acetosella* L.	Sheep-Sorrel	1,25,31,35
* *R. obtusifolius* L.	Bitter Dock	25,32
Tovara virginiana (L.) Raf.	Jumpseed	8

Table 6. (continued)

Scientific Name	Common Name	Localities
Phytolaccaceae		
* *Phytolacca americana* L.	Pokeweed	25,28
Portulacaceae		
* *Claytonia caroliniana* Michaux	Spring Beauty	25,26
C. virginica L.		6
Caryophyllaceae		
Cerastium nutans Raf.	Nodding Chickweed	7
* *Dianthus armeria* L.	Deptford Pink	20,25
* *Silene stellata* (L.) Aiton f.	Starry Campion	25,34
S. virginica L.	Fire Pink	11
Stellaria corei Shinners	Chickweed	23,25
* *S. media* (L.) Cyrillo		7,25,26,36
S. pubera Michaux	Giant C.	15
Ranunculaceae		
* *Aconitum uncinatum* L.	Blue Monkshood	34
Actaea pachypoda Ell.	White Baneberry	25,29,32
Anemone quinquefolia L.	Wood Anemone	11,12,15,26
Cimicifuga racemosa Nuttall	Black Cohosh	26
* *Clematis virginiana* L.	Virgin's Bower	3
Hepatica acutiloba DC.	Liverleaf	23
* *Ranunculus abortivus* L.	Buttercup	16
* *R. acris* L.		35
* *R. fascicularis* Muhl.	Tufted B.	25,35
R. hispidus Michaux		25
* *R. recurvatus* Poiret	Hooked Crowfoot	6,20,23,25,26

Table 6. (continued)

Scientific Name	Common Name	Localities
Thalictrum clavatum DC.	Mountain Meadow-Rue	18,29
* *T. dioicum* L.	Early M.	19,26,30
T. thalictroides (L.) Boivin	Windflower	15,16,21,26
Trautvetteria carolinensis (Walter) Vail	Carolina Tassel-Rue	29
Xanthorhiza simplicissima Marshall	Yellow-Root	13,17,21
Berberidaceae		
* *Caulophyllum thalictroides* (L.) Michaux	Blue Cohosh	21,26
Diphylleia cymosa Michaux	Umbrella-Leaf	29,30
* *Podophyllum peltatum* L.	May-Apple	15
Magnoliaceae		
* *Liriodendron tulipifera* L.	Yellow Poplar	12
Magnolia acuminata L.	Cucumber Tree	27
M. fraseri Walter	Umbrella Tree	23,26,29
Annonaceae		
Asimina triloba (L.) Dunal	Paw-Paw	6
Calycanthaceae		
Calycanthus floridus L. var. *laevigatus* (Willd.) T. & G.	Sweetshrub	1,23
Lauraceae		
* *Lindera benzoin* (L.) Blume	Spicebush	25
* *Sassafras albidum* (Nuttall) Nees	Sassafras	15
Papaveraceae		
Sanguinaria canadensis L.	Bloodroot	23,25

Table 6. (continued)

Scientific Name	Common Name	Localities
Fumariaceae		
Corydalis sempervirens (L.) Persoon	Pale Corydalis	29
* Dicentra canadensis (Goldie) Walpers	Squirrel Corn	25,26
* D. cucullaria (L.) Bernh.	Dutchman's Breeches	25,34
Brassicaceae		
* Arabis laevigata (Muhl. ex Willd.) Poiret	Smooth Rock Cress	25
* Barbarea verna (Miller) Ascherson	Winter C.	20,25
* B. vulgaris R. Brown var. arcuata (Opiz) Fries		32
* Brassica juncea (L.) Cosson	Chinese Mustard	3
* Capsella bursa-pastoris (L.) Medicus	Shepherd's Purse	16
Cardamine concatenata (Michaux) Ahles	Cut-Leaved Toothwort	15
* C. diphylla (Michaux) Wood	Two-Leaved T.	11,16,26
* Raphanus raphanistrum L.	Wild Radish	25
* Sisymbrium officinale (L.) Scopoli	Hedge Mustard	35
Podostemaceae		
Podostemum ceratophyllum Michaux	Riverweed	15
Saxifragaceae		
Astilbe biternata (Vent.) Britton	False Goatbeard	25
Chrysosplenium americanum Schweinitz	Golden Saxifrage	19,34
Heuchera villosa Michaux	Alumroot	18,29,31
Hydrangea arborescens L. ssp. arborescens	Wild Hydrangea	17,18
H. arborescens L. ssp. discolor (Seringe) McClintock		13
* Mitella diphylla L.	Bishop's Cap	15

Table 6. (continued)

Scientific Name	Common Name	Localities
* Philadelphus inodorus L.	Mock-Orange	15
* Ribes cynosbati L.	Prickly Gooseberry	3
Saxifraga michauxii Britton	Michaux's Saxifrage	31
* S. micranthidifolia (Haw.) Steudel	Mountain Lettuce	25,26
* Tiarella cordifolia L.	Foamflower	7,15,17,26,32
Hamamelidaceae		
Hamamelis virginiana L.	Witch-Hazel	14,16,25,31
* Liquidambar styraciflua L.	Sweet-Gum	15,17,18
Platanaceae		
Platanus occidentalis L.	Sycamore	6
Rosaceae		
* Agrimonia gryposepala Wallroth	Hairy Cocklebur	32,33
A. parviflora Aiton	Groovebur	10,17,19
* A. pubescens Wallroth	Soft G.	17
Amelanchier arborea (Michaux f.) Fernald var. arborea	Serviceberry	31
* A. arborea (Michaux f.) Fernald var. laevis (Wiegand) Ahles		13,26
Aruncus dioicus (Walter) Fernald	Goat's-Beard	25
* Crataegus flabellata (Bosc) K. Koch	English Hawthorn	34
* Fragaria virginiana Duchesne	Strawberry	16,26,36
* Geum canadense Jacquin	White Avens	8,16,18
* G. vernum (Raf.) T. & G.	Spring A.	23
* Gillenia trifoliata (L.) Moench	Indian Physic	10
* Malus pumila Miller	Apple	16

Table 6. (continued)

Scientific Name	Common Name	Localities
Potentilla canadensis L.	Five-Fingers	21,25,35
* P. norvegica L.	Cinquefoil	3
* P. recta L.		17,34
* P. simplex Michaux		8
* Prunus americana Marshall	Wild Plum	3
P. pensylvanica L. f.	Pin Cherry	19,35
* P. persica (L.) Batsch	Peach	12,17
P. serotina Ehrhart	Black C.	27
* Rosa multiflora Thunberg	Multiflora Rose	16
* R. palustris Marshall	Swamp R.	3
R. sp. (cultivar)		16
* Rubus allegheniensis Porter	Blackberry	2,11,19
* R. canadensis L.	Smooth B.	8,29,31
* R. flagellaris Willd.	Dewberry	2,10
* R. hispidus L.	Bristly D.	22
R. odoratus L.	Flowering Raspberry	12,16
Sorbus melanocarpa (Michaux) Schneider	Black Chokeberry	31
Fabaceae		
Amphicarpa bracteata (L.) Fernald	Hog Peanut	3,6,17
Apios americana Medicus	American Groundnut	3
Baptisia tinctoria (L.) R. Brown	Yellow Wild Indigo	1,2,4,12
* Cassia nictitans L.	Wild Sensitive Senna	4,6
Cercis canadensis L.	Redbud	14
* Cladrastis lutea (Michaux f.) K. Koch	Yellowood	29
* Coronilla varia L.	Crown Vetch	19
* Desmodium ciliare (Muhl. ex Willd.) DC.	Hairy Tick-Trefoil	15
* D. nudiflorum (L.) DC.	Bare-Stemmed T.	18

Table 6. (continued)

Scientific Name	Common Name	Localities
* D. nuttallii (Schindler) Schubert		11
* D. paniculatum (L.) DC.		6,16
* Lespedeza bicolor Turcz.		25
L. cuneata (Dumont) G. Don	Sericea	1,17,25
L. hirta (L.) Hornemann	Hairy Bush-Clover	6
L. intermedia (Watson) Britton	Wand B.	3,6,25
L. procumbens Michaux	Trailing B.	2
* L. repens (L.) Barton	Creeping B.	16
* L. striata (Thunberg) H. & A.	Japanese Clover	16
* Medicago lupulina L.	Black Medic	2,35
* Robinia kelseyi Hutchinson		24
R. pseudo-acacia L.	Black Locust	25,28,31
* Tephrosia spicata (Walter) T. & G.		28
T. virginiana (L.) Persoon	Goat's Rue	1
* Trifolium hybridum L.	Alsike Clover	9
* T. pratense L.	Red C.	1,2
* T. repens L.	White C.	1
Vicia caroliniana Walter	Carolina Wood Vetch	35
* V. dasycarpa Tenore	Smooth V.	33
Linaceae		
* Linum striatum Walter	Ridged Yellow Flax	2
Oxalidaceae		
* Oxalis acetosella L.	White Wood Sorrel	32
* O. stricta L.	Yellow W. S.	1,3,7,28,34

Table 6. (continued)

Scientific Name	Common Name	Localities
Polygalaceae		
Polygala curtissii Gray	Polygala	1,2
* *P. sanguinea* L.		24
Euphorbiaceae		
Euphorbia corollata L. var. *corollata*	Flowering Spurge	11,12,13
* *E. corollata* L. var. *zinniiflora* (Small) Ahles		12,13
E. mercurialina Michaux		14
Anacardiaceae		
* *Rhus copallina* L.	Winged Sumac	16,17
* *R. radicans* L.	Poison Ivy	15
* *R. typhina* L.	Staghorn S.	8
Aquifoliaceae		
Ilex ambigua (Michaux) Torrey var. *montana* (T. & G.) Ahles	Mountain Holly	25,26,29
I. opaca Aiton	H.	6,16
Celastraceae		
Euonymus americanus L.	Strawberry Bush	14,18,29
Aceraceae		
Acer pensylvanicum L.	Striped Maple	15,26
A. rubrum L.	Red M.	1,31
A. saccharum Marshall	Sugar M.	20,26
A. spicatum Lam.	Mountain M.	1

Table 6. (continued)

Scientific Name	Common Name	Localities
Hippocastanaceae		
Aesculus octandra Marshall	Buckeye	16,29,33
Balsaminaceae		
Impatiens capensis Meerb.	Spotted Touch-Me-Not	19,34
* *I. pallida* Nuttall	Jewel-Weed	32
Rhamnaceae		
Ceanothus americanus L.	New Jersey Tea	2
Vitaceae		
* *Parthenocissus quinquefolia* (L.) Planchon	Virginia Creeper	6,16
* *Vitis labrusca* L.	Fox Grape	8,18,25
V. rotundifolia Michaux	Muscadine	16
V. vulpina L.	Frost G.	17
Tiliaceae		
* *Tilia heterophylla* Vent.	Basswood	29,30,32
Theaceae		
Stewartia ovata (Cav.) Weatherby	Mountain Camellia	17,21
Hypericaceae		
* *Hypericum mitchellianum* Rydberg	Mountain St. John's-Wort	33
H. mutilum L. var. *parviflorum* (Willd.) Fernald	Slender S. J.	4,6,19
H. punctatum Lam.	S. J.	16,35
H. stragalum P. Adams & N. Robson		4,6,16

Table 6. (continued)

Scientific Name	Common Name	Localities
Violaceae		
* Viola affinis Le Conte	LeConte's Violet	15,17,18,26
* V. blanda Willd.	Sweet White V.	7,15,26,32
V. canadensis L. var. canadensis	Canada V.	26,29,33
* V. canadensis L. var. rugulosa (Greene) C. L. Hitchcock	Rydberg's Violet	18
* V. cucullata Aiton		19,23
* V. emarginata (Nuttall) Le Conte var. acutiloba Brainerd		6
* V. emarginata (Nuttall) Le Conte var. emarginata		29
* V. eriocarpa Schweinitz var. leiocarpa Fernald & Wiegand	Smooth Yellow V.	7,26
* V. fimbriatula Smith	Ovate-Leaved V.	6
V. hastata Michaux	Halberd-Leaved Yellow V.	1,15
* V. hirsutula Brainerd	Southern Wood V.	25
V. pedata L.	Bird's-Foot V.	8,15,29
* V. primulifolia L.	Primrose-Leaved V.	15
* V. rafinesquii Greene		16
V. rostrata Pursh	Long-Spurred V.	11,15,21
* V. rotundifolia Michaux	Round-Leaved V.	26
V. striata Aiton		33
Elaeagnaceae		
* Elaeagnus umbellata Thunberg	Silverberry	6
Melastomataceae		
Rhexia virginica L.	Meadow Beauty	4

Table 6. (continued)

Scientific Name	Common Name	Localities
Onagraceae		
* Circaea alpina L.	Small Enchanter's Nightshade	29,34
Epilobium coloratum Biehler	Purple-Leaved Willow Herb	4,19,20
* Oenothera biennis L.	Evening Primrose	4
Ludwigia alternifolia L.	Bushy Seedbox	4
L. palustris (L.) Ell.	Marsh S.	17
Araliaceae		
Aralia nudicaulis L.	Wild Sarsparilla	33
A. racemosa L.	Spikenard	6
* A. spinosa L.	Hercules Club	2,15,24
* Panax quinquefolium L.	Ginseng	26
Apiaceae		
Angelica venenosa (Greenway) Fernald		4,24
* Chaerophyllum tainturieri Hooker	Wild Chervil	34
* Cryptotaenia canadensis (L.) DC.	Honewort	17,30
* Daucus carota L.	Queen Anne's Lace	28
Ligusticum canadense (L.) Britton	Lovage	6
* Osmorhiza claytonii (Michaux) Clarke	Anise-Root	34
Oxypolis rigidior (L.) Raf.	Stiff Cowbane	3,6
Sanicula canadensis L.	Short-Styled Sanicle	16
* S. gregaria Bicknell		26
* S. smallii Bicknell	Small's S.	26
* S. trifoliata Bicknell	Large-Fruited S.	32,33
Taenidia integerrima (L.) Drude	Golden Alexander	8
Thaspium barbinode (Michaux) Nuttall	Meadow Parsnip	1,10,15,17

Table 6. (continued)

Scientific Name	Common Name	Localities
Nyssaceae		
Nyssa sylvatica Marshall	Black Gum	9,15,16
Cornaceae		
* *Cornus alternifolia* L. f.	Alternate-Leaved Dogwood	6
* *C. florida* L.	Flowering D.	15,16,29
Clethraceae		
Clethra acuminata Michaux	Sweet Pepperbush	2,11,13,18,31
Ericaceae		
* *Chimaphila maculata* (L.) Pursh	Pipsissewa	2,7
Epigaea repens L.	Trailing Arbutus	34
Gaultheria procumbens L.	Wintergreen	28
* *Gaylussacia ursina* (M. A. Curtis) T. & G. ex Gray	Huckleberry	2,6,9,10,16,24
Kalmia latifolia L.	Mountain Laurel	6
Leucothoe axillaris (Lam.) D. Don var. *editorum* (Fernald & Schubert) Ahles	Leucothoe	8,15,16,23
Lyonia ligustrina (L.) DC.	Male-Berry	1
* *Monotropa uniflora* L.	Indian Pipe	24
Oxydendrum arboreum (L.) DC.	Sourwood	1,24,28
* *Rhododendron calendulaceum* (Michaux) Torrey	Flame Azalea	1,25
R. maximum L.	Rosebay	6,14,15,18,29
Vaccinium arboreum Marshall	Sparkleberry	15
* *V. constablaei* Gray		25
* *V. corymbosum* L.	Highbush Blueberry	16,35
* *V. erythrocarpum* Michaux	Bearberry	3
V. hirsutum Buckley	Hairy Blueberry	1,3,25,31

Table 6. (continued)

Scientific Name	Common Name	Localities
V. stamineum L. var. *melanocarpum* Mohr	Squaw Huckleberry	24,25
V. vacillans Torrey	Lowbush B.	1,24
Diapensiaceae		
Galax aphylla L.	Galax	6,29
Primulaceae		
Lysimachia quadrifolia L.	Whorled Loosestrife	4,7,29,31
Ebenaceae		
Diospyros virginiana L.	Persimmon	16
Styracaceae		
Halesia carolina L.	Silverbell	11,16,20,26
Oleaceae		
Fraxinus americana L.	White Ash	1
Gentianaceae		
Gentiana decora Pollard	Showy Gentian	25
G. quinquefolia L.	Five-Flowered G.	13,20,34
G. saponaria L.	Soapwort G.	28
* *Obolaria virginica* L.	Pennywort	6
Asclepiadaceae		
Asclepias quadrifolia Jacq.	Four-Leaved Milkweed	2
* *A. tuberosa* L.	Butterfly M.	12,14
A. variegata L.	White M.	4,13,28

Table 6. (continued)

Scientific Name	Common Name	Localities
Convolvulaceae		
* Cuscuta rostrata Shuttlew. ex Engelm.	Dodder	20,25,29,30,32
Ipomea coccinea L.	Red Morning Glory	16
* I. pandurata (L.) G. F. W. Meyer	Man-Root	25
* I. purpurea (L.) Roth	Common M. G.	25
Polemoniaceae		
* Phlox amplifolia Britton	Large-Leaved Phlox	25,32
P. carolina L.	Thick-L. P.	28,34
P. divaricata L.	Blue P.	13,24
* P. paniculata L.	Summer P.	34
Hydrophyllaceae		
* Hydrophyllum canadense L.	Waterleaf	27
* H. macrophyllum Nuttall		14
Phacelia bipinnatifida Michaux	Fern-Leaved Phacelia	13
P. purshii Buckley	Pursh's P.	2,6
Lamiaceae		
Collinsonia canadensis L.	Horse Balm	25,32
* Lycopus virginicus L.	Virginia Bugleweed	2
* Monarda clinopodia L.	Basal Bee Balm	25,33
* M. didyma L.	Pink-Root Tea	29
* M. media Willd.		34
* Prunella vulgaris L.	Self-Heal	15,16,17,34
Pycnanthemum incanum (L.) Michaux	Hoary Mountain Mint	17,32
P. pycnanthemoides (Leavenw.) Fernald	Southern M. M.	2
* Salvia lyrata L.	Sage	6,16

Table 6. (continued)

Scientific Name	Common Name	Localities
* Satureja vulgaris (L.) Fritsch	Wild Basil	32,34
Scutellaria elliptica Muhl.	Hairy Skullcap	25
Stachys clingmanii Small	Clingman's Hedge-Nettle	34,35
S. riddellii House	Riddell's H.-N.	6,25
Solanaceae		
Solanum carolinense L.	Nightshade	16,34
Scrophulariaceae		
Aureolaria laevigata (Raf.) Raf.	Foxglove	4,6,16,25,29
Chelone glabra L.	White Turtlehead	3,6,19,29,34
Melampyrum lineare Desr.	American Cow-Wheat	8,25,27,29
Mimulus ringens L.	Monkey Flower	6
Pedicularis canadensis L.	Lousewort	2,8,25
* Verbascum thapsis L.	Wooly Mullein	12
* Veronica arvensis L.	Speedwell	1,34
Bignoniaceae		
Anisostichus capreolata (L.) Bureau	Cross Vine	25
Orobanchaceae		
* Conopholis americana (L.) Wallroth	Squaw-Root	23,29
* Epifagus virginiana (L.) Barton	Beech-Drops	7,20,33,34
* E. virginiana (L.) Barton, f. pallida Weatherby		34
Orobanche uniflora L.	Naked Broomrape	23
Plantaginaceae		
* Plantago lanceolata L.	English Plantain	1

Table 6. (continued)

Scientific Name	Common Name	Localities
* P. major L.	Whiteman's Foot	1,2
* P. rugelli Dcne.		16
Rubiaceae		
Diodia virginiana L.	Larger Button Weed	3
* Galium latifolium Michaux	Bedstraw	25
G. triflorum Michaux	Small B.	17,27
* Houstonia caerulea L.	Bluets	25,35
H. purpurea L.		6,10,11,16
H. serpyllifolia Michaux		17,18,34
* Mitchella repens L.	Partridge Berry	6,15,17,21,29
Caprifoliaceae		
Lonicera japonica Thunberg	Japanese Honeysuckle	3,4,6,12
L. sempervirens L.	Coral H.	16
* Sambucus pubens Michaux	Red Elderberry	18,19,29,33
Viburnum acerifolium L.	Maple-Leaved Viburnum	7,31
V. alnifolium Marshall	Hobblebush	29
Valerianaceae		
Valerianella radiata (L.) Dufr.	Beaked Corn Salad	1
Campanulaceae		
* Campanula americana L.	Tall Bellflower	32
C. divaricata Michaux	Bluebell	2,30
Lobelia cardinalis L.	Cardinal Flower	2,3
L. inflata L.	Indian-Tobacco	12,13,16,26,34
L. puberula Michaux	Downy Lobelia	2,12
* Specularia perfoliata (L.) DC.	Venus' Looking-Glass	16

Table 6. (continued)

Scientific Name	Common Name	Localities
Asteraceae		
* Achillea millefolium L.	Yarrow	3,28
* Ambrosia artemisiifolia L.	Ragweed	25,28
* Antennaria plantaginifolia (L.) Richardson	Plantain-Leaved Pussy-Toes	15,32
* A. solitaria Rydberg	Ladies Tobacco	15
* Anthemis arvensis L.	Dog Fennel	19
Arctium minus (Hill) Bernh.	Burdock	8
Aster cordifolius L.	Fall Aster	2,16,25
A. curtisii T. & G.		25
A. divaricatus L.	Heart-Leaved A.	1,2,7,25,29,34
A. dumosus L.	Bushy A.	2
A. paternus Cronquist	White-Topped A.	1,2,11,30
* A. pilosus Willd.	Frost A.	19
A. puniceus L.	Glossy-Leaved A.	6,25
A. solidagineus Michaux	Narrow-Leaved White-Topped A.	1
A. surculosus Michaux		6,11,25,28
* A. umbellatus Miller	Flat-Topped White A.	3
A. undulatus L. var. undulatus	Wavy-Leaved A.	2,12
A. undulatus L. var. loriformis Burgess		2
Cacalia atriplicifolia L.	Pale Indian-Plantain	25,34
* Carduus lanceolatus L.	Bull Thistle	19
* Chrysanthemum leucanthemum	Ox-Eye Daisy	16,29
* Coreopsis major Walter var. stellata (Nuttall) Robinson	Wood Tickseed	1,13,24,30
* Elephantopus carolinianus Willd.	Elephant's Foot	16
Erigeron annuus (L.) Persoon	Daisy Fleabane	4,6,17
* E. philadelphicus L.	Philadelphia F.	10,35

Table 6. (continued)

Scientific Name	Common Name	Localities
E. pulchellus Michaux	Robin's Plantain	7,14,28,35
* E. strigosus Muhl. ex Willd.		4,19
* Eupatorium album L. var. vaseyi (Porter) Cronq.	Thoroughwort	6
E. fistulosum Barratt	Hollow Joe-Pye-Weed	6
* E. purpureum L.	Sweet J.-P.-W.	2,25,26
E. rotundifolium L. var. ovatum (Bigelow) Torrey	Hairy T.	6
E. rugosum Houttuyn		20,25,29,34
E. serotinum Michaux		12
* Galinsoga ciliata (Raf.) Blake	Peruvian Daisy	25,35
Gnaphalium obtusifolium L.	Fragrant Cudweed	12,13
Helianthus atrorubens L.	Sunflower	2
H. microcephalus T. & G.	Small Wood S.	4,6,25
Heliopsis helianthoides (L.) BSP.	Ox-Eye	25
Heterotheca graminifolia (Michaux) Shinners	Golden Aster	1,6,11,13,14
H. mariana (L.) Shinners	Maryland G. A.	3
Hieracium gronovii L.	Hairy Hawkweed	6
H. paniculatum L.		1,4,25,30
H. venosum L.	Rattlesnake-Weed	6,9,25
* Lactuca biennis (Moench) Fernald	Wild Lettuce	17
L. floridana (L.) Gaertner	Woodland L.	2,15,25
Liatris scariosa (L.) Willd.	Blazing Star	2,6
Prenanthes altissima L.	Tall Rattlesnake-Root	6,17
* P. trifoliata (Cassini) Fernald	Gall-of-the-Earth	4,25
* Rudbeckia hirta L.	Black-Eyed Susan	25
R. laciniata L.	Coneflower	3
Senecio obovatus Muhl. ex Willd.	Groundsel	15,17
* S. smallii Britton	Ragwort	1,6,29
Solidago altissima L.	Goldenrod	12

Table 6. (continued)

Scientific Name	Common Name	Localities
S. arguta Aiton	Cut-Leaved G.	6,25,34
S. curtisii T. & G.		2,25,31
S. erecta Pursh.	Slender G.	25
S. nemoralis Aiton		13,14
S. odora Aiton	Sweet G.	1,2,6
S. puberula Nuttall	Downy G.	12
S. roanensis Porter	Tennessee G.	25,34,35
S. rugosa Miller	Rough-Leaved G.	2
* Taraxacum officinale Wiggers	Dandelion	15
* Verbesina occidentalis (L.) Walter	Crownbeard	6
* Vernonia altissima Nuttall	Tall Ironweed	6
* V. noveboracensis (L.) Michaux	New York I.	6

APPENDIX B

Table 7. Statistical Summary of the Flora.

Summary	Totals
Pteridophytes	24
Gymnosperms	6
Angiosperms	506
Monocots	116
Dicots	390
Total Taxa[a]	536
New County Records	259
Six Largest Families	
Asteraceae	65 species
Poaceae	37 "
Cyperaceae	29 "
Rosaceae	29 "
Fabaceae	28 "
Liliaceae	25 "
	185 = 35% of the Total Flora
Five Largest Genera	
Carex	23 species
Viola	17 "
Aster	12 "
Panicum	10 "
Solidago	9 "
	71 = 13% of the Total Flora

[a]State of Tennessee flora: 2,350 taxa (Sharp, et al., 1956 and 1960); Citico Creek WSA flora: 536 taxa; % of state taxa: 23%.

APPENDIX C

Table 8. List of Aquatic- or Wet-Environment Plants.

Plants	Plants
Acer rubrum	*Lobelia cardinalis*
Alnus serrulata	*Ludwigia alternifolia*
Aster puniceus	*L. palustris*
A. umbellatus	*Lycopus virginicus*
Boehmeria cylindrica	*Mimulus ringens*
Carex frankii	*Osmunda regalis* var. *spectabilis*
C. lurida	*Oxypolis rigidior*
C. stricta	*Pilea pumila*
C. torta	*Podostemum ceratophyllum*
C. vulpinoidea	*Polygonum pensylvanicum*
Epilobium coloratum	*P. persicaria*
Eupatorium rotundifolium	*P. punctatum*
Gentiana saponaria	*P. sagittatum*
Glyceria melicaria	*Rhexia virginica*
G. striata	*Rhynchospora capitellata*
Hypericum mutilum	*Salix nigra*
Impatiens capensis	*S. sericea*
I. pallida	*Scirpus cyperinus*
Juncus coriaceus	*S. polyphyllus*
J. effusus	*S. rubricosus*
J. gymnocarpus	*Viola primulifolia*
Leersia virginica	

VITA

Jeffry Lowell Malter was born in Brooklyn, New York on March 20, 1948. He attended elementary schools in Brooklyn and graduated from Sheepshead Bay High School in 1964. The next six years were spent in various means of employment and in traveling throughout North America and Europe. Among other jobs, work as a bibliographer at the East Asian Institute of Columbia University was most enlightening.

In 1970 he was trained as an EEG technican working in the field of physiological sleep research. For three years he worked at several of the leading hospitals and universities in New York City, carrying out various experiments and studies on the psychological, physiological and overall functions of sleep.

He enrolled at The City College of New York, as a part-time student in the evening school, in 1970. In June, 1975, he received a Bachelor of Science Degree from that institution, with a major in the biological sciences.

In the fall of 1975 he was admitted to The Graduate School of The University of Tennessee, Knoxville, in the Department of Botany. He was given a graduate assistantship and worked in the bryophyte and lichen herbarium. In September, 1976, he was given a graduate teaching assistantship, for which he taught in the General Biology Program.

He is a member of the American Bryological and Lichenological Society, the British Lichen Society, the John Burroughs Society and the Tagore Society. He has had several poems published and is active in the conservation movement.